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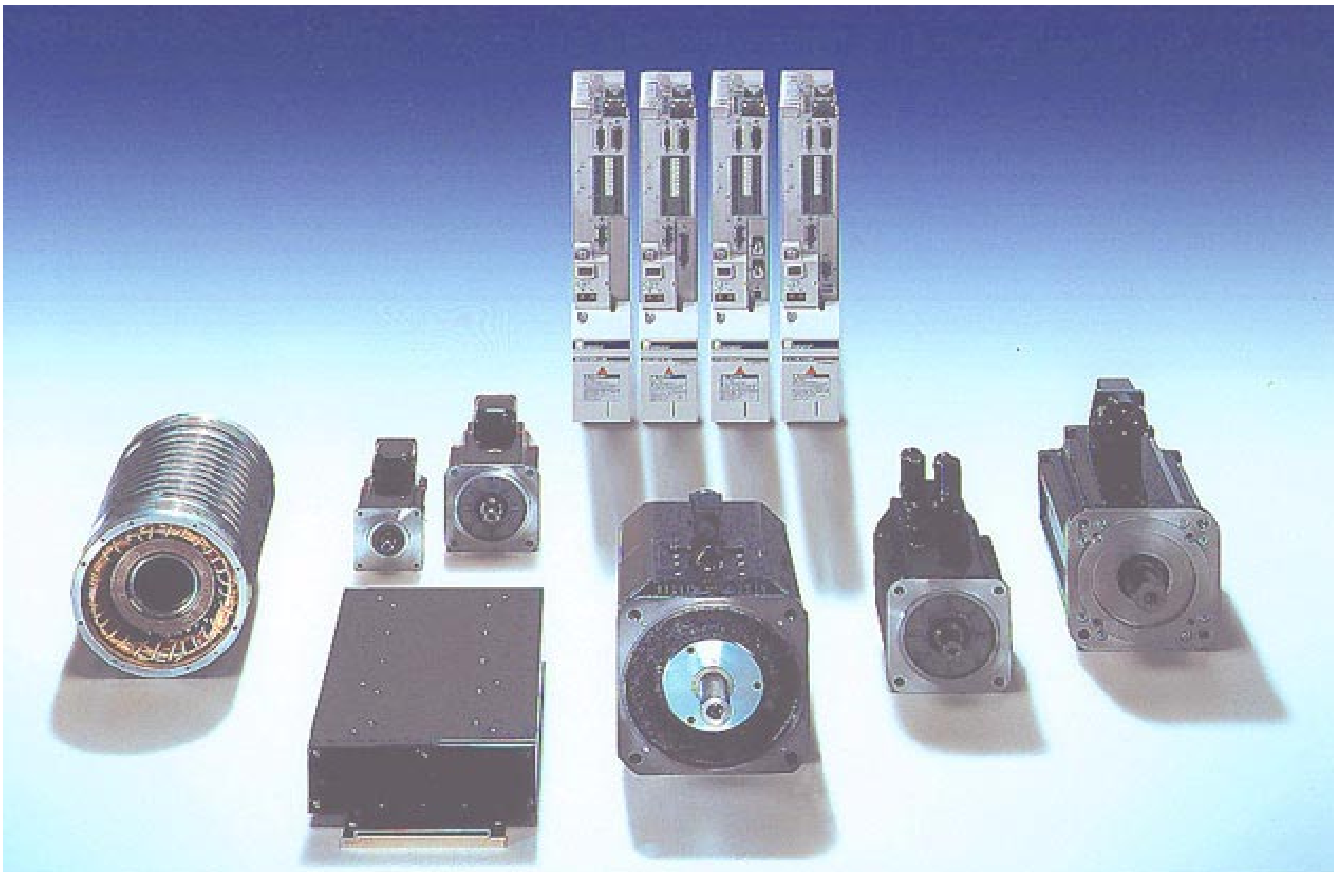

ECODRIVE03
Drive for Machine Tool Applications With SERCOS-, Analog- and Parallelinterface

Functional Description: SMT 01VRS

DOK-ECODR3-SMT-01VRS**-FKB1-EN-P

279087

Indramat

Title ECODRIVE03 Drive for Machine Tool Applications with SERCOS-, Analog- and Parallelinterface

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- Mappe 71-01V-EN / Register 3
- Based on: SMT 01V
- 209-0088-4312-01

What is the purpose of this documentation ?

The following documentation describes the functions of the firmware FWA-ECODR3-SMT-01VRS.

This documentation serves:

- for Description of all functional features
- for parameterization of the drive controller
- for data security of the drive parameter
- for error diagnosis and error removal

Cource of modifications

Document identification of previous and present output	Release Date	Remarks
DOK-ECODR3-SMT-01VRS**-FKB1-EN-P	04.98	First edition

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Contents

1 System Overview

1.1 ECODRIVE03 - the Universal Drive Solution for Automation

The universal automation system **ECODRIVE03** is an especially cost-effective solution for drive and control tasks.

Exceptional power data, extensive functions and an excellent price-performance ratio are characteristic of this system.

Further features of **ECODRIVE03** are its easy assembly and installation, extreme machine accessing and the elimination of system components.

ECODRIVE03 can be used to implement numerous drive tasks in the most varying of applications. Typical applications are:

- machine tools
- printing and paper processing machines
- handling systems
- packaging and food processing machines
- handling and assembly systems

1.2 ECODRIVE03 - a Drive Family

There are three application-related firmware variants available for the **ECODRIVE03 family**:

FWA-ECODR3-SMT-0xVRS-MS
- Drive for Machine Tool Applications With SERCOS-, Analog- and Parallelinterface

FWA-ECODR3-SGP-0xVRS-MS
- Drive for General Automation With SERCOS-, Analog- and Parallelinterface

FWA-ECODR3-FGP-0xVRS-MS
- Drive for General Automation With Profibus-Interface with Fieldbusinterface

The following function description relates to the firmware variant:

FWA-ECODR3-SMT-01VRS-MS
- Drive for Machine Tool Applications With SERCOS-, Analog- and Parallelinterface

For each listed variant, there is individual documentation.

1.3 Drive Controllers and Motors

Available controllers

The drive controller family of the **ECODRIVE03** generation is at present made up of four different units. These differentiate primarily in terms of which interface is used command communications.

- DKC 1.3 Parallel interface
- DKC 2.3 SERCOS interface
- DKC 3.3 Profibus interface
- DKC 11.3 analog interface

Each of these drive controllers is, in turn, available in a 40 A or a 100 A version.

Supported motor types

With **ECODRIVE03** firmware it is possible to operate

- synchronous motors for standard applications up to 48 Nm.
- synchronous motors for increased demands of up to 64 Nm.
- asynchronous motors for main spindle applications
- asynchronous kit motors
- linear synchronous and asynchronous motors

Fig. 1-1: Units and motors supported by the ECODRIVE03 family

1.4 Function Overview: FWA-ECODR3-SMT-01VRS-MS

Command Communications Interface

- SERCOS-Interface
- Parallel-Interface
- Analog-Interface.

Possible Operating Modes

- torque control
- velocity control
- Velocity Control
- position control
- drive-internal interpolation
- relative drive-internal interpolation
- jogging
- positioning block mode
- Stepper motor mode

Supported Types of Motors

- MKD
- 2AD
- 1MB
- LAF
- MKE
- Rotary synchronous kit motor
- MHD
- ADF
- MBW
- LAR
- Linear synchronous kit motor

Supported Measuring Systems

- HSF/LSF
- resolver
- sine encoder with 1Vss signals
- encoder with EnDat-Interface
- resolver without feedback data memory
- resolver without feedback data memory with incremental sine encoder
- gearwheel encoder with 1Vss signals

Which combination is possible, is outlined in section: "Setting the Measurement System"

General Functions

- Extensive diagnostics options
- Basic parameter block that can be activated for a defined setting of the drive parameters to default values.
- Customer passwords
- Error memory and operating hour counter
- Configurable signal status word
- Supports five (5) languages for parameter names and units and diagnoses (S-0-0095)
  - German
  - English
  - French
  - Spanish
  - Italian
- Settable drive-internal position resolution
- Evaluation of option (load-side) encoder for position and/or velocity control
- Evaluates absolute measuring system with setting of absolute dimension
- Modulo function
- Parametrizable torque limit
- Current limit
- Velocity limit
- Travel range limit:

  via travel range limit switch and/or position limit values
- Drive-side error reactions:

  error reaction "return limit"

  bet possible standstill "velocity command to zero"

  best possible standstill "Torque free"

  best possible standstill "velocity command to zero with ramp and filter

  power shutdown with fault

  NC reaction with fault

  E-Stop function
- Control loop settings

  base load function

  acceleration precontrol

  velocity mix factor

  velocity precontrol

  automatic control loop settings
- Velocity control loop monitor
- Positoin control loop monitor
- Drive halt

- Drive-Controlled Homing
- Command "Set Absolute Measuring"
- Analog output
- Analog input
- Oscilloscope function
- Probe function
- Command "Detect marker position“
- Programmable Limit Switch
- Encoder emulation
  absolute encoder emulation (SSI format)
  incremental encoder emulation
- Command Parking Axis
- Command Positive Stop Drive Procedure
- Command Spindle Positioning

Notes

2 Safety Instructions for Electrical Drives

2.1 Introduction

These instructions must be read and understood before the equipment is used to minimize the risk of personal injury and / or property damage. Follow these safety instructions at all times.

Do not attempt to install, use or service this equipment without first reading all documentation provided with the product. Please read and understand these safety instructions, and all user documentation of the equipment, prior to working with the equipment at any time. You must contact your local Indramat representative if you cannot locate the user documentation for your equipment. A listing of Indramat offices is supplied in the back of this manual. Request that your representative send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the product is resold, rented and/or otherwise transferred or passed on to others, then these safety instructions must accompany it.

WARNING

Improper use of this equipment, failure to follow the attached safety instructions, or tampering with the product, including disabling of safety device, may result in personal injury, severe electrical shock, death, or property damage!

2.2 Hazards by improper use

DANGER

High voltage and high discharge current!

Danger to life, risk of severe electrical shock and risk of injury!

DANGER

Dangerous movements!

Danger to life and risk of injury or equipment damage by unintentional motor movements!

WARNING

High electrical voltages due to incorrect connections!

Danger to life, severe electrical shock and serious bodily injury!

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

CAUTION

Surface of machine housing could be extremely hot! Danger of injury! Danger of burns!

CAUTION

Risk of injury due to incorrect handling!

Bodily injury caused by crushing, shearing, cutting and thrusting movements!

CAUTION

Risk of injury due to incorrect handling of batteries!

2.3 General

- INDRAMAT GmbH is not liable for damages resulting from failure to observe the warnings given in these instructions.
- Operating, maintenance and safety instructions in English must be ordered and received before initial start-up, if the instructions in the language provided are not understood perfectly.
- Proper and correct transport, storage, assembly, and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Trained and qualified personnel in electrical equipment:

  Only trained and qualified personnel may work on this equipment or within its proximity. Personnel are qualified if they have sufficient knowledge of the assembly, installation, and operation of the product as well as an understanding of all warnings and precautionary measures noted in these instructions.

  Furthermore, they should be trained, instructed, and qualified to switch electrical circuits and equipment on and off, to ground them, and to mark them according to the requirements of safe work practices and common sense. They must have adequate safety equipment and be trained in first aid.
- Use only spare parts approved by the manufacturer.
- All safety regulations and requirements for the specific application must be followed as practiced in the country of use.
- The equipment is designed for installation on commercial machinery.
- Start-up is only permitted once it is sure that the machine in which the product is installed complies with the requirements of national safety regulations and safety specifications of the application.

European countries: see Directive 89/392/EEC (Machine Guideline).

- Operation is only permitted if the national EMC regulations for the application are met.

  The instructions for installation in accordance with EMC requirements can be found in the INDRAMAT document "EMC in Drive and Control Systems“.

  The machine builder is responsible for compliance with the limiting values as prescribed in the national regulations and specific EMC regulations for the application.

  European countries: see Directive 89/336/EEC (EMC Guideline).

  U.S.A.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.
- Technical data, connections, and operational conditions are specified in the product documentation and must be followed.

2.4 Protection against contact with electrical parts and not grounded enclosures

Note: This section pertains to equipment and drive components with voltages over 50 Volts.

Touching live parts with potentials of 50 volts and higher applied to them or touching not grounded enclosures can be dangerous and cause severe electrical shock. In order for electrical equipment to be operated, certain parts must have dangerous voltages applied to them.

DANGER

High Voltage!
Danger to life, severe electrical shock and risk of injury!

⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and / or repair this equipment.

⇒ Follow general construction and safety regulations when working on electrical installations.

⇒ Before switching on power, the ground wire must be permanently connected to all electrical units according to the connection diagram.

⇒ At no time may electrical equipment be operated if the ground wire is not permanently connected, even for brief measurements or tests.

⇒ Before beginning any work, disconnect mains or the voltage source from the equipment. Lock the equipment against being switched on while work is being performed.

⇒ Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning work. Measure the voltage on the capacitors before beginning work to make sure that the equipment is safe to touch.

⇒ Never touch the electrical connection points of a component while power is turned on.

⇒ Before switching the equipment on, install those covers and guards provided with the equipment to prevent contact with live parts. Before operating, cover and guard live parts properly so they cannot be touched.

⇒ A residual-current-operated protective device (r.c.d.) must not be used on an AC drive! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

European countries: according to EN 50178/ 1994.

⇒ Electrical components with exposed live parts must be installed in a control cabinet to prevent direct contact.

European countries: according to EN 50178/ 1994.

U.S.A: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

DANGER

High housing voltage! High leakage current!
Danger to life and limb, danger of injury from electric shock!

⇒ Prior to powering up, connect the electrical equipment, the housing of all electrical units and motors to the protective conductor at the grounding points or ground them. This applies even to brief tests.

⇒ The protective conductor of the electrical equipment and units must always be connected to the supply network. Leakage current exceeds 3.5 mA.

⇒ Use at least a 10 mm^2 copper conductor cross section for this protective connection over its entire course!

⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. High voltage levels can occur on the housing that could lead to severe electrical shock and personal injury.

European countries: EN 50178 / 1994, section 5.3.2.3.

USA: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

2.5 Protection by protective low voltage (PELV) against electrical shock

All connections and terminals with voltages ranging between 5 and 50 volts on INDRAMAT products are protective low voltages designed in accordance with the following standards on contact safety:

- International: IEC 364-4-411.1.5
- EU countries: see EN 50178/1994, section 5.2.8.1.

WARNING

High electrical voltages due to incorrect connections!
Danger to life, severe electrical shock and/or serious bodily injury!

⇒ Only that equipment or those electrical components and cables may be connected to all terminals and clamps with 0 to 50 volts that are of the protective low voltage type (PELV = Protective Extra Low Voltage).

⇒ Only connect those voltages and electrical circuits that are safely isolated. Safe isolation is achieved, for example, with an isolating transformer, an optoelectronic coupler or when battery-operated.

2.6 Protection against dangerous movements

Dangerous movements can be caused when units have bad interfaces or motors are connected incorrectly.

There are various causes of dangerous movements:

- Improper or incorrect wiring or cable connections
- equipment is operated incorrectly
- probe parameters or encoder parameters are set incorrectly
- malfunctioning components
- errors in software or firmware

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

Although the monitoring circuits in the drive components make improper operation almost impossible, personnel safety requires that proper safety precautions be taken to minimize the risk of personal injury and/or property damage. This means that unexpected motion must be anticipated since safety monitoring built into the equipment might be defeated by incorrect wiring or other faults.

DANGER

Dangerous movements!
Danger to life and risk of injury or equipment damage!

⇒ In the drive component monitoring units, every effort is made to avoid the possibility of faulty operation in connected drives. Unintended machine motion or other malfunction is possible if monitoring units are disabled, bypassed or not activated.

⇒ Safe requirements of each individual drive application must be considered on a case-by-case basis by users and machine builders.

Avoiding accidents, personal injury and/or property damage:

⇒ Keep free and clear of the machine's range of motion and moving parts. Prevent people from accidentally entering the machine's range of movement:
- use protective fences
- use protective railings
- install protective coverings
- install light curtains / barriers

⇒ Fences should be strong enough to withstand maximum possible momentum.

⇒ Mount the Emergency Stop (E-stop) switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Do not operate the machine if it is not working.

⇒ Isolate the drive power connection by means of an emergency stop circuit or use a start inhibit system to prevent unintentional start-up.

⇒ Make sure that the drives are brought to standstill before accessing or entering the danger zone.

⇒ Disconnect electrical power to the equipment using a master lock-out and secure against reconnection for:
- maintenance and repair work
- cleaning of equipment
- long periods of discontinued equipment use

⇒ Avoid operating high-frequency, remote control, and radio equipment near equipment electronics and supply leads. If use of such equipment cannot be avoided, verify the system and the plant for possible malfunctions at all possible positions of normal use before the first start-up. If necessary, perform a special Electromagnetic Compatibility (EMC) test on the plant.

2.7 Protection against magnetic and electromagnetic fields during operations and mounting

Magnetic and electromagnetic fields in the vicinity of current-carrying conductors and permanent motor magnets represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

⇒ Persons with pacemakers and metal implants are not permitted to have access to the following areas:
- Areas in which electrical equipment and parts are mounted, being operated or started up.
- Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.

⇒ If it is necessary for a person with a pacemaker to enter into such an area, then a physician must be consulted prior to doing so.

⇒ Persons with metal implants or hearing aids must take care prior to entering into areas described above. It is assumed that metal implants or hearing aids will be affected by such areas: A physician must be consulted prior to working in and/or entering such areas.

2.8 Protection against contact with hot parts

CAUTION

Surface of machine housing could be extremely hot! Danger of injury! Danger of burns!

⇒ Do not touch housing surface near the source of heat! Danger of burns!

⇒ Prior to accessing a unit, wait ten (10) minutes to allow the unit to cool off.

⇒ If hot parts of the equipment are touched, such as the unit housing in which heatsink and resistor are located, then this can cause burns.

2.9 Protection during handling and installation

All INDRAMAT products should be handled and assembled according to the instructions in the documentation.

CAUTION

Risk of injury due to incorrect handling!
Bodily injury caused by crushing, shearing, cutting, and thrusting movements!

⇒ Observe installation instructions and safety regulations before handling and working on the product.

⇒ Use suitable lifting or moving equipment during installation. Refer to the user manual for the product.

⇒ Take precautions to avoid pinching and crushing.

⇒ Only use suitable tools specified in the user manuals and use them according the instructions.

⇒ Use lifting devices and tools correctly and safely.

⇒ Wear appropriate protective clothing, e.g., protective goggles, safety shoes, protective gloves.

⇒ Never stand under suspended loads.

⇒ Clean up liquids form the floor to prevent personnel from slipping.

2.10 Battery safety

Batteries contain reactive chemicals. Incorrect handling can result in injury or equipment damage.

CAUTION

Risk of injury due to incorrect handling!

⇒ Do not attempt to reactivate dead batteries by heating or other methods (danger of explosion and corrosion).

⇒ Never charge batteries (danger from leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not take batteries apart.

⇒ Handle carefully. Incorrect extraction or installation of a battery can damage equipment.

Note: Environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea transport in the sense of the legal requirements (Danger of explosion). Dispose of batteries separately from other refuse. Observe the legal requirements in the country of installation.

Notes

3 General Instructions for Installation

3.1 Explanation of Terms

It is helpful to explain the terms used in this document so that they will be better understood.

Parameter

Communication with the drive occurs (with a few exceptions) with the help of parameters. They can be used for

- Setting the configuration
- Parameterizing the control/drive settings
- Accessing control/drive functions and commands
- Configuring the cyclic telegrams

A parameter is identified with its ID numbers

All of the drive’s operating data are identified by ID numbers.

All the parameter ID numbers available in the drive are listed in parameter **S-0-0017, IDN List of all Operation Data**.

The Data Status

Each parameter is provided with a data status, which can also be read. It serves the following purposes:

- Identifying the validity/invalidity of the parameter
- Contains the command acknowledgment if the parameter acts as a command (see Commands"

Data Block Structure

Each parameter has 7 different data block elements that can be read or written by a SERCOS control system.

Data Block Structure: Element No.:	**Designation:**	**Remarks:**
1	ID Number	Parameter identification
2	Name	can be changed in language selection
3	Attribute	contains data length, type and decimal places
4	Unit	can be changed in language selection
5	Minimum Input Value	contains the minimum input value of the operating data
6	Maximum Input Value	contains the maximum input value of the operating data
7	Operating Data	actual parameter value

Fig. 3-1: Data Block Structure

Changing the operating data depends on the communication phase

Only the operating data can be changed; all other elements can only be read. The operating data can be write-protected either continuously or temporarily.

Possible Error Messages when Reading and Writing the Operating Data

Error:	Reason:
0x7004, Data not changeable	The operating data is write-protected
0x7005, Data currently write-protected	The operating data cannot be written to in this communication phase (see Supplement A: Writing to Parameters)
0x7006, Data smaller than minimum value	The operating data is smaller than its minimal input value
0x7007, Data larger than maximum value	The operating data is larger than its maximum input value
0x7008, Data is not correct	The value could not be accepted as written because internal tests lead to a negative result
0x7009, data write protected with password	The parameter cannot be write accessed as the customer password was activated in parameter **S-0-0267, Password**. All parameters listed in S-0-0192, IDN-list of backup operation data are therefore locked.

Fig. 3-2: Error messages while reading/writing operating data

Non-Volatile Parameter Storage Registers

All configuration and control settings are stored

Various non-volatile parameter storage registers that buffer operating data are contained in the drive. The operating data apply to:

- setting the configuration, or
- parameterizing the control drive settings

Each time operating data is written to it is stored.

Memory is available in the following structural component groups:

- Control drive
- Motor feedback (optional)
- Programming module

Parameters Stored in the Digital Drive

All operating data that apply only to the drive controller and that cannot be changed by the user are stored in the digital drive. This consists of the following parameters:

- **S-0-0110, Amplifier Peak Current**
- **S-0-0112, Amplifier Nominal Current**
- **S-0-0140, Controller Type**
- **P-0-0518, Amplifier Nominal Current 2**
- **P-0-0519, Amplifier Peak Current 2**
- **P-0-4002, Current-Amplify-Trim Phase U**
- **P-0-4003, Current-Amplify-Trim Phase V**
- **P-0-4015, Intermediate Voltage**
- **P-0-4035, Trim-Current**

Parameter Storage in Motor Feedback

All motor-dependent parameters are stored in the motor feedback with MHD, MKD and MKE motors.

Additionally, parameters for the "Load Default Feature"function and the motor feedback are stored here.

All parameters stored in the motor feedback data memory are there with both parameter block number 0 and 7. In parameter block 7 the original data without write access are stored in the motor feedback data memory. These are copied after powering up into the parameters of parameter block 0. The parameters of parameter block 0 take effect.

Parameters Stored in DSM Programming Module

By switching the programming module when devices are exchanged, the characteristics of the device that has been exchanged can be easily transferred to the new device.

All application parameters are stred in the programming module (control loop, mechanical system, interface parameters and so on).

All ID numbers backed up in this module are listed in parameter **S-0-0192, IDN-list of backup operation data**.

If the programming module is exchanged then these application parameters must be read out before hand so that they can be written into the new module after the exchange.

Data Saving

To save the data of the axis, all important and changeable parameters of the axis are filed in the list **S-0-0192, IDN-List of backup operation data**. By saving the parameters listed there with the control/parametrization surface, you can obtain a complete data backup of this axis after the first setup.

Parameter Buffer Mode

The drive controller is capable of storing data that is transmitted via the service channel either temporarily (in RAM) or permanently (in the EEPROM).

The parameter **S-0-0269, Parameter buffer mode** determines what will be done with the parameters.

Basic parameter block

The drive parameters are fixed at delivery at the factory. By executing the command **P-0-4094, C800 Command Base-parameter load** it is possible to reproduce this state at any time. The basic parameter block is constructed so that

- all optional drive functions are deactivated
- limit values for position are deactivated
- limit values for torque/force are set to high values
- and limit values for velocity and acceleration are set to lower values

Velocity control is the mode set.

Note: The basic parameter block does not guarantee a matching of the drive to the machine as well as, in some cases, to the motor connected and the measuring systems. The relevant settings must be made when first starting up the axis.

(See also: Basic Drive Functions" and Commissioning Guidelines"

Running the "load basic parameter block" function automatically

The drive firmware is on the programming module. In the event of a firmware exchange, the drive controller will detect this the next time the machine is switched on. In this case, the message "**PL**" appears on the 7-segment display. By pressing the "S1" key, the basic parameter block is activated.

Note: Any previous parameter settings are lost with the replacement of the firmware followed by "load base parameter block". If this is to be prevented, then the parmeters must be stored prior to an exchange and must be reloaded after exchange and load base parameter block.

Password

All important axis-specific parameters are stored in the programming module. If, e.g., a controller is replaced because of a defect then the features can be transferred to the new controller by simply using the old module. The affected parameters are stored in **S-0-0192, IDN-List of backup operation data.** To secure these parameters against unwanted or non-authorized changes, the customer password can be activated.

Accessing the password function implements parameter **S-0-0267, Password**. At delivery, this customer password function is not active. In this case, all axis-specific parameters can be changed.

The character sequence "007" in **S-0-0267, Password** is displayed. the customer password function is activated, so "***" isd displayed in **S-0-0267, Password**.

Length of password

At least three and no more than ten characters can be entered.

Activating and changing the customer password

To activate function customer password or change the passsword, it is necessary to input the following character sequence:

"old password", space, "new password", space, "new password"

in S-0-0267.

If function customer password is not activated, then the old password "007" must be used. If the function is active, then use the old customer password.

Deactivating the function customer password

"old customer password", space, "007", space, "007"

Lock parameter or make it write accessible

Upon activating function customer password, the parameters stored in **S-0-0192, IDN-list of backup operation data** after powering up, are write protected. They can be write accessed by entering the customer password in **S-0-0267, Password.**

By writing any character (minimum three, maximum ten) the parameters in **S-0-0192** can again be write accessed.

Note: Parameters stored in the motor feedback or drive controller data memory can generally not be changed by the user.

Commands

Commands are used to control complex functions in the drive. For example, the functions "Drive-Controlled Homing Procedure" or "Transistion Check for Communication Phase 4" are defined as commands.

Each command that is started must also be cleared.

A primary control can start, interrupt or erase a command.

Each command has a parameter with which the command can be controlled.

While a command is being executed, the diagnostic message "Cx" or "dx" appears in the H1 display, where x is the number of the command.

All commands used are stored in parameter **S-0-0025, IDN-list of all procedure commands.**

Command Types

There are 3 command types.

- **Drive-Controlled Command**
  - Eventually leads to an automatic drive operation or motion
  - Can be started only when controller enable is set
  - Deactivates the active operating mode during its operation
- **Monitor Command**
  - Activates or deactivates monitors or features in the control drive
- **Management Command**
  - executes management tasks; is not interruptable

Command Input and Acknowledgment

Control and monitoring of command execution occurs via the command input and command acknowlegment. The command input tells the drive if the command should be started, interrupted or ended. The commanded value is the operating data of the applicable parameter. The command input value can be

- not set and enabled (0)
- interrupted (1)
- set and enabled (3)

The drive gives the current condition of the command execution in the acknowledgment. It is contained in the data status of the command parameter.

The condition can be

- not set and enabled (0)
- in process (7)
- error, command execution not possible (0xF)
- command execution interrupted (5)
- command properly executed (3)

The **Change Bit Command** in the **Drive Status Word** helps the control recognize a change in the command acknowledgment by the drive. The bit is set by the drive if the command acknowledgment changes from the condition in process (7) to the condition error, command execution not possible (0xF) or command properly executed (3). The bit is cleared if the master clears the input (0).

The control system will recognize if the drive sets the change bit. It can read the corresponding data status of the command or the command itself, which was set sometime but has not been cleared. The control system will recognize from this if the command ended with or without an error in the drive. Afterwards this command should be cleared by the control.

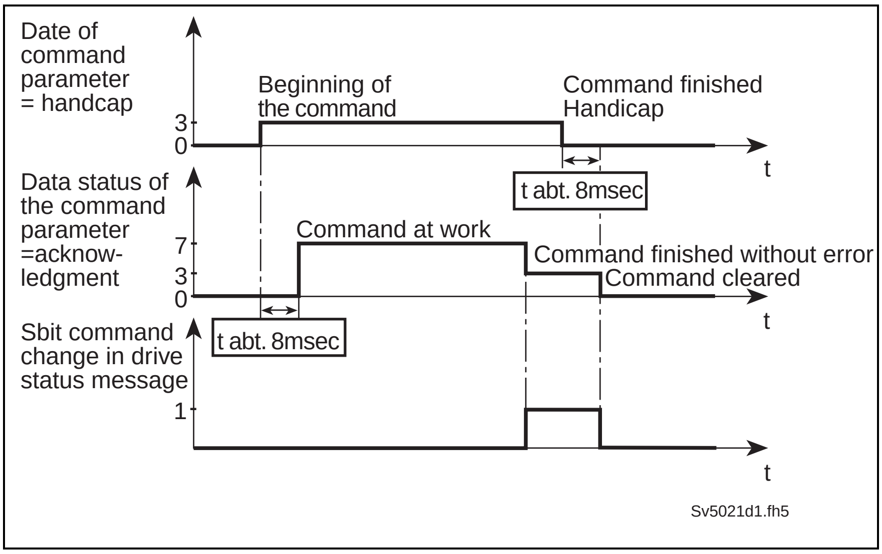


Fig. 3-3: Input, acknowledgment and Command Change Bit during proper execution

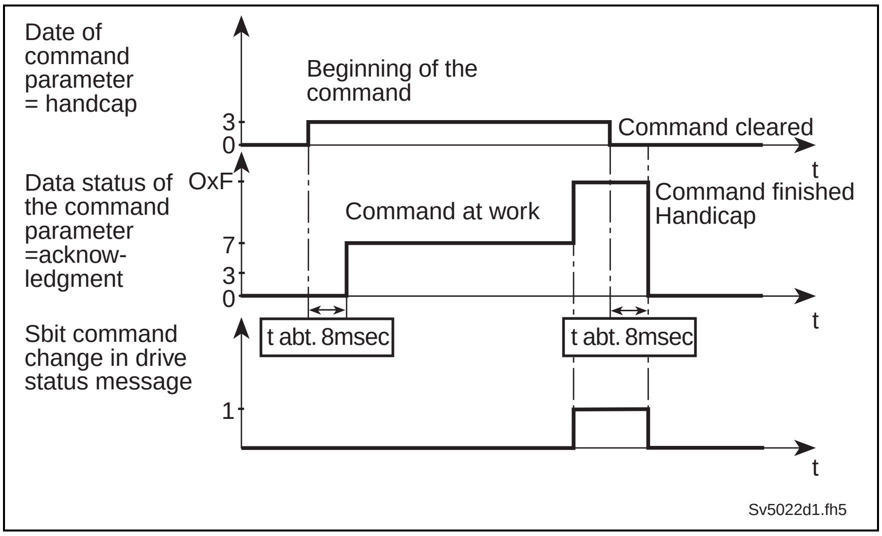


Fig. 3-4: Input, acknowledgment and KÄ bit during erroneous execution

A delay time of up to 8 ms can occur in the drive between receiving the command input and setting the command acknowledgment.

Operating Modes

Operating modes define which command values will be processed in which format, leading to the desired drive motion. They do not define how these command values will be transmitted from a control system to the drive.

One of the four selectable operating modes is active when the control and power supply is ready for operation and the controller enable signal is positive.

The drive displays **"AF"** in the H1 display.

All implemented operating modes are stored in parameter **S-0-0292, List of all operation modes.**

Warnings

Warnings do not cause automatic shutdowns

Many areas are monitored in connection with operating modes and parameter settings. A warning will be generated if a state is detected that allows proper operation for the time being, but will eventually generate an error and thereby lead to a shutdown of the drive if this state continues.

Warning Classes

The warning class is evident from the diagnostic message

Warnings can be separated into 2 classes. They are differentiated by whether the drive executes an automatic reaction when the warning appears.

Warning Class:	Diagnostic Message:	Drive Response:
With drive response	E8xx	reacts on its own specifically in terms of any occurring warnings
Without drive response	E2xx	--

Fig. 3-5: Breakdown of the Warning Classes

Warnings cannot be cleared externally.

Error

Many areas are monitored in connection with operating modes and parameter settings. An error message is generated if a condition is encountered which no longer allows proper operation

Error Classes

The error class is evident from the diagnostic message.

Errors are separated into four different error classes. They determine the drive's error response.

Error Class:	Diagnostic	Drive Response:
Fatal	F8xx	Torque free switching
Travel range	F6xx	Velocity command value switched to zero
Interface	F4xx	In accordance with best possible deceleration
Non-fatal	F2xx	In accordance with best possible deceleration

Fig. 3-6: Error class divisions

Drive's Error Response

If an error state is detected in the drive, the drive's error response will automatically be executed as long as the drive is in control. The H1 display flashes Fx / xx. The drive's reaction to interface and non-fatal errors can be parameterized with **P-0-0119, Best possible deceleration**. The drive switches to torque-free operation at the end of each error reaction.

Clearing Errors

Errors must be externally cleared.

Errors are not automatically cleared; they are cleared externally by:

Initiating the command **S-0-0099, C500 Reset class 1 diagnostic**

or Pressing the **"S1"** key.

If the error state is still present, then the error will be immediately detected again. A positive edge bit on the controller enable signal is necessary in order to turn the drive on.

Clearing Errors When Controller Enable Is Set

If an error is discovered while operating with set controller enable, the drive will execute an error response. The drive automatically deactivates itself at the end of each error response; in other words, the power stage is switched off and the drive switches from an energized to a de-energized state.

To reactivate the drive:

- clear the error
- enter a 0-1 edge bit into the controller enable

Note: To reactivate the drive after an error has been detected, not only must the error be cleared, but a 0-1 edge bit of the controller enable signal must also follow.

Error memory and operating hour counter

Once errors are cleared, they are stored in an error memory. The last 19 errors are stored there and the times they occurred.

Errors caused by a shutdown of the control voltage (e.g., **F870 +24Volt DC error**) are not stored in the error memory.

Simultaneously, there is an operating hour counter for control and power sections of the drive controller. This function has the following parameters:

- **P-0-0190, Operating hours control section**
- **P-0-0191, Operating hours power section**
- **P-0-0192, Error recorder diagnosis number**
- **P-0-0193, Error recorder, operating hours control section**

IDN List of Parameters

There are parameters in the drive that, in turn, contain ID numbers of drive parameters. These support the handling of the drive parameters with parametrization programs (e.g., Drivetop, Serctop, and so on).

S-0-0017, IDN-list of all operation data

The ID numbers of all parameters in the drive are in this parameter. This list supports, for example, the parametrization program in the menu of which "All drive parameters" the information as to which ID number is in this drive firmware is stored.

S-0-0192, IDN-list of backup operation data

In parameter **S-0-0192, IDN-list of backup operation data** the ID numbers of all those parameters are stored, that are stored in the programming module. These are the parameters that are needed for a proper operation of the drive. The control or the parametrization program uses this ID number list to secure a copy of the drive parameters.

S-0-0021, IDN-list of invalid op. data for comm. Ph. 2

In the data of these ID lists, the drive enters the ID numbers out of parameter **S-0-0018, IDN-list of operation data for CP2** which are recognized as invalid in command **S-0-0127, C100 Communication phase 3 transition check**. Parameters are recognized as invalid if:

- their checksums, that are stored together with the operating data in a non-resident memory (programming module, amplifier or motor feedback data memory), do not fit to the operating data,
- their operating data is outside of the minimum/maximum input range or
- their operating data has violated the plausibility rules.

In any event, the parameters entered upon negative acknowledgement of command **S-0-0127, C100 Communication phase 3 transition check** in **S-0-0021, IDN-list of invalid op. data for comm. Ph. 2** must be corrected.

S-0-0022, IDN-list of invalid op. data for comm. Ph. 3

The drive enters the ID numbers out of parameter **S-0-0019, IDN-list of operation data for CP3** into the data of this ID list, which were detected in command **S-0-0128, C200 Communication phase 4 transition check** as invalid. Parameters are detected as invalid if:

- their checksum, stored together with the operating data in a non-resident memory (programming module, amplifier or motor feedback data memory) do not match the operating data,
- their operating data are outside of the minimum/maximum input limits or
- their operating data has violated the plausibility rules.

In any event, the parameters entered upon negative acknowledgement of command **S-0-0128, C100 Communication phase 4 transition check** in **S-0-0022, IDN-list of invalid op. data for comm. Ph. 3** must be corrected..

S-0-0018, IDN-list of operation data for CP2

The ID numbers that were checked for validity in command **S-0-0127, C100 Communication phase 3 transition check** are stored in **S-0-0018, IDN-list of operation data for CP2**.

S-0-0019, IDN-list of operation data for CP3

The ID numbers that were checked for validity in command **S-0-0128, C200 Communication phase 4 transition check** are stored in **S-0-0019, IDN-list of operation data for CP3**.

S-0-0025, IDN-list of all procedure commands

The ID numbers of all the commands in the drive are stored in this parameter.

3.2 Parametrization Mode - Operating Mode

Command communication sets the communications phase and therefore the parametrization or operating modes

Given drive controllers without command communications interface or if the command communications is not active (command communications = could be SERCOS), then the drive switches automatically into operating mode after the control voltage is switched on.

If the command communications is active, then the drive controller does not automatically switch into operating mode after the control voltage is switched on. Only the command communications master can switch between parametrization modes and operating modes.

Parametrization surfaces that communicate with the drive controller vua the RS232/485 can switch from parametrization and operating mode as long as the drive is not in control mode and command communications is not active.

The switch from parametrization to operating mode is controlled by starting and ending commands

- **S-0-0127, C100 Communication phase 3 transition check,**
- **S-0-0128, C200 Communication phase 4 transition check**
- **P-0-4023, C400 Communication phase 2 transition**

If the drive reaches phase 4 without an error, then on the 7-segment display on the front of the drive amplifier the message (H1) "**bb**" appears. The corresponding diagnosis is: **A013 Ready for power on**

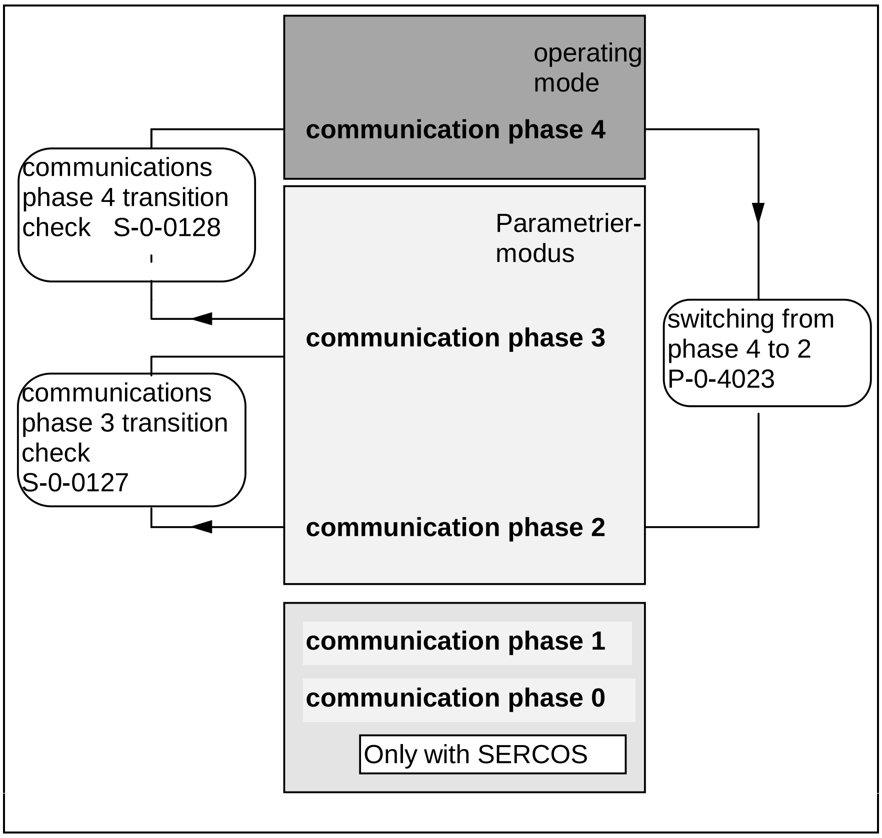


Fig. 3-7: The communications phases

Checks in the Transition Commands

To switch from communications phase 2 to 3 and 3 to 4 it is necessary to activate transition checks in the drive first. This includes a number of checks and parameter conversions.

The causes and help with transition command errors are specified in the diagnostics description.

S-0-0127, C100 Communication phase 3 transition check

In transition command C1 checks command communications timing. For units without command communications, these checks are irrelevant. (Command communications can include, e.g. SERCOS and so on).

The following checks are conducted in command C1.

Checking telegram configurations of the command communications

This checks whether the parameters selected for the configurable data block in the master data telegram or drive data telegram can be configured. It is also checked whether the allowable lenth of the configurable data block has been maintained.

Command errors :

- **C104 Config. IDN for MDT not configurable**
- **C105 Configurated length > max. length for MDT**
- **C106 Config. IDN for AT not configurable**
- **C107 Configurated length > max. length for AT**

can occur in this case.

Checking validity of communications parameters

If a parameter needed for transition to phase 3 has never been written into or the backup is faulty, then command error

- **C101 Invalid communication parameter (S-0-0021)**

is generated. The ID no. of the faulty parameters are listed in:

- **S-0-0021, IDN-list of invalid op. data for comm. Ph. 2**

They are made valid by writing into them.

Extreme value check of communications parameters

If during the extreme value check of the parameters relevant to command communications an error is generated, then command error

- **C102 Limit error communication parameter (S-0-0021)**

is generated. The ID numbers of the faulty parameters are listed in

- **S-0-0021, IDN-list of invalid op. data for comm. Ph. 2**

and must be corrected.

Checking plausibility and maintaining marginal conditions of command communications

Check timing parameters of command communications in phases 3 and 4 for plausibilit and maintaining marginal conditions.

Command errors

- **C108 Time slot parameter > Sercos cycle time** (only with Sercos)
- **C109 Position of data record in MDT (S-0-0009) even** (only with Sercos)
- **C110 Length of MDT (S-0-0010) odd** (only with Sercos)
- **C111 ID9 + Record length - 1 > length MDT (S-0-0010)** (only with Sercos)
- **C112 TNcyc (S-0-0001) or TScyc (S-0-0002) error**
- **C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) error**
- **C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)**
- **C115 T2 too small** (only with Sercos)

can occur.

S-0-0128, C200 Communication phase 4 transition check

During this command, the following checks are run.

Checking P-0-4014 for plausibility

If in parameter **P-0-4014, Motor type** 1 (MHD) or 5 (MKD/MKE) are selected and the motor feedback data memory has not found that type, then command error

- **C204 Motor type P-0-4014 incorrect**

is generated.

Checking validity

If a parameter needed for transition to phase 4 has never been written into, and its backup is faulty, then command error

- **C201 Invalid parameter(s) (->S-0-0022)**

is generated. The ID number of the faulty parameters are listed in

- **S-0-0022, IDN-list of invalid op. data for comm. Ph. 3**

and are made valid by writing into.

Reading the controller memory

The drive controller reads the EEPROM memory of the drive controller operating data. If an error occurs during this process, then command error:

- **C212 Invalid amplifier data (->S-0-0022)** appears**.**

The ID number of the faulty parameter is written in

- **S-0-0022, IDN-list of invalid op. data for comm. Ph. 3.**

Checking whether optional encoder is needed

Checking, as per operating mode parameters **S-0-0032..35** or referencing parameter **S-0-0147**, whether a second encoder is needed but there isn't one, as 0 is entered in parameter **P-0-0075, Feedback type 2**. The faulty operating parameters or referencing parameters are listed in:

- **S-0-0022, IDN-list of invalid op. data for comm. Ph. 3**

Command error

- **C210 Feedback 2 required (->S-0-0022)** appears.

Checking whether motor encoder is availablet

Check whether a motor encoder is available (**P-0-0074, Feedback type 1** = 0) and no "2" is entered in function parameter **P-0-0185, Function of encoder 2** for load-side motor encoder. If this is the case, then command error

- **C236 Feedback 1 required (P-0-0074)**

is generated.

Checking motor encoder settings

If the encoder parametrized in parameter **P-0-0074, Feedback type 1** is not available, or its data cannot be read, then this error message is generated

- **C217 Feedback1 data reading error**

Checking optional encoder settings

If the encoder interface selected in parameter **P-0-0075, Feedback type 2** is already occupied by the motor encoder, then this error message is generated:

- **C234 Encoder combination not possible**

If a second encoder with feedback data memory is used, but its data cannot be read, then error message

- **C218 Feedback 2 data reading error**

is generated. If "load side motor encoder" has been selected in parameter **P-0-0185, Function of encoder 2** but no rotary asynchronous motor is available, then error message

- **C235 Load-side motor encoder with inductance motor only**

is generated.

Reading out feedback data memory

The parameters stored in the memory of motors with feedback data memory are read. If an error occurs during this process, then command error

- **C211 Invalid feedback data (->S-0-0022)** is generated.

Checking maximum travel range

Check whether an internal position resolution has been set via parameter **S-0-0278, Maximum travel range** which guarantees the correct commutation of the motor. If not, then this command error appears:

- **C223 Input value for max. range too high.**

Checking scaling

Check internal ability to illustrate conversioni factors from display format to an internal one and vice versa for scaling-dependent dta. If an error occurs, then one of the following command errors can be generated:

- **C213 Position data scaling error**
- **C214 Velocity data scaling error**
- **C215 Acceleration data scaling error**
- **C216 Torque/force data scaling error**

Checking all parameters for extreme values and possible bit combinations

All parameters are checked for maintaining extreme values or permissible bit combinations. If can error occurs, then command error

- **C202 Parameter limit error (->S-0-0022)**

is generated. The ID number o the faulty parameter is listed in

- **S-0-0022, IDN-list of invalid op. data for comm. Ph. 3**

and must be corrected.

Checking modulo range

Checking whether an activated modulo scaling of the position of parameter **S-0-0103, Modulo value** can be processed. If so, then command error

- **C227 Modulo range error**

is generated.

Checking the conversion of internal formats

The physical values of parameters (input format with decimal places and units) are converted to internal formats. This conversion is monitored. If incongruencies are detected during this process, then command error

- **C203 Parameter calculation error (->S-0-0022)**

is generated. The ID number of the faulty parameter is listed in

- **S-0-0022, IDN-list of invalid op. data for comm. Ph. 3**

and must be corrected.

Checking encoder initialization

Encoder initialization is listed. Errors can occur depending on encoder type (e.g., index length wrong in DSF feedback). Then one of the following command errors

- **C220 Feedback 1 initializing error**
- **C221 Feedback 2 initializing error**

are generated.

Checking controller type

Depending on controller type, various internal settings are performed. if parameter **S-0-0140, Controller type** cannot be read, then command error

- **C228 Controller type S-0-0140 wrong**

is generated.

Absolute encoder monitoring

If the actual position of an absolute encoder is outside of the range of the last actual position +/- prior to the last shutdown, **P-0-0097, Absolute encoder monitoring window**, then error

- **F276 Absolute encoder out of allowed window**

is generated. The transition command is wrongly acknowledged, but instead the error must be cleared with the execution of command **S-0-0099, C500 Reset class 1 diagnostic**.

(Also see section: "Clear error"

3.3 Commissioning Guidelines

For commissioning drive controllers, the parametrization interface DRIVETOP can be used.

The procedures for commissioning a drive controller entails 11 steps (IBS-1..11). The sequence is illustrated below.

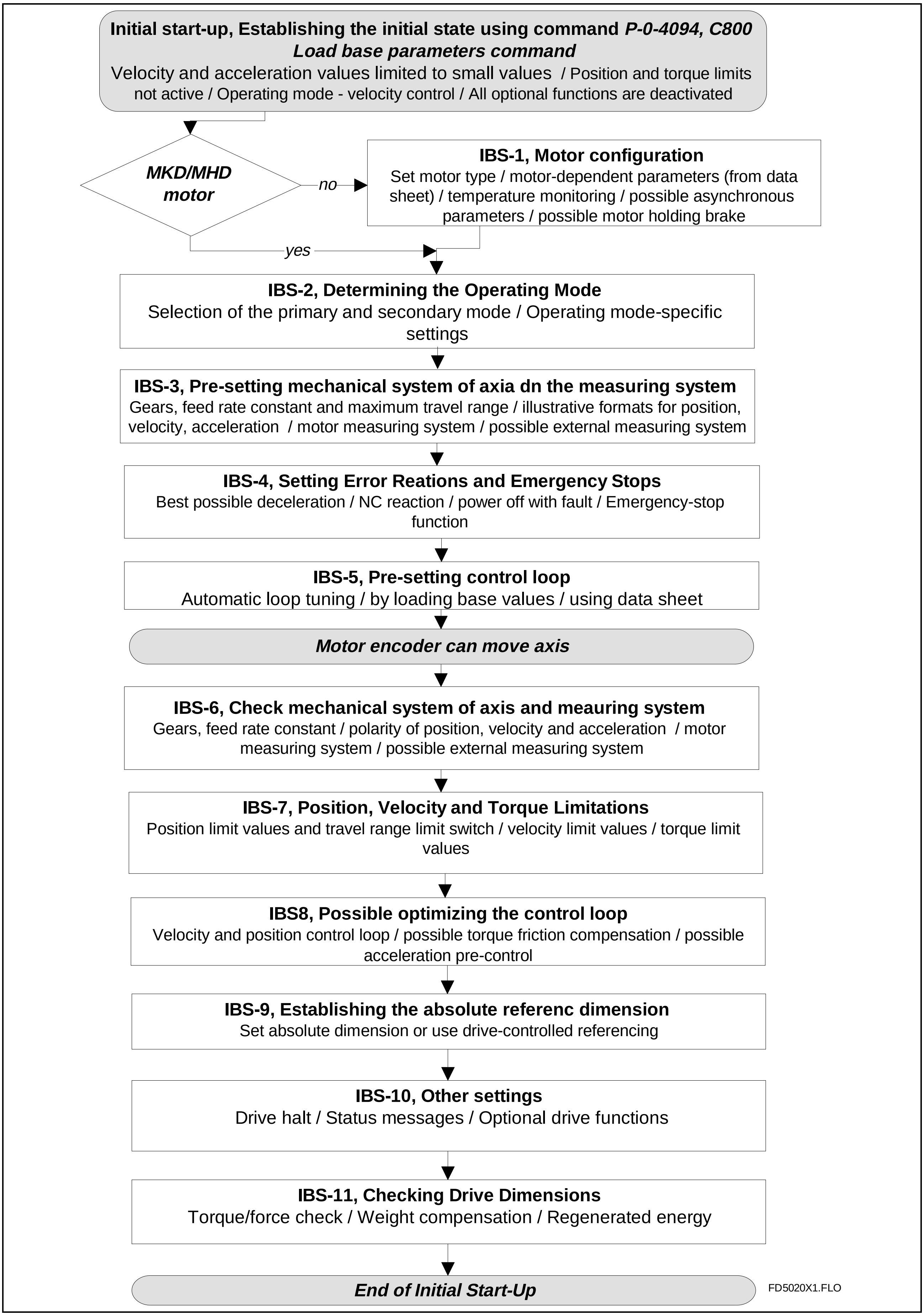


Fig. 3-8:Commissioning guidelines

IBS-1, Motor configuration

These guidelines are needed in the case where the motor used does not have a motor feedback memory. It is necessary with these motors

- to enter the parameters for motor features (peak current, maximum velocity, etc.) using the data sheet or with DRIVETOP using data from the motor data bank.
- The parameters for the motor temperature warning and off thresholds must be parametrized as well
- and giving a motor holding brake, these must be properly set also.

Those motors with data memory such as

- MHD and
- MKD motors

are recognized by the drive and motor parameters are automatically set.

(See also chapter: "Setting the Motor Type"

IBS-2, Determining the Operating Mode

In this step, the main and auxiliary operating modes are selected.

Operating-mode specific settings must be made.

In particular, necessary limit values, optionally usable filters and the available operating modes must be defined.

(See also section: "Operating Modes"

IBS-3, Pre-setting the axis mechanics and measuring systems

In this step, the parameters needed for determining and processing position, velocity and acceleration data are set. These include the following parameters for the following settings:

- mechanical gear ratio between motor and load as well as any existing feedrate constants of the drive of linear slides
- scaling settings for showing position, velocity and acceleration parameters of the drive. This sets, for example, whether the data is motor shaft or load related and which LSB valence these have, e.g., position data with 0.001 degrees or 0.0001 inches and so on.
- Interfaces, rotational directions and the resoluton of the motor encoder, and where available, optional encoders.

(See also chapter : -"Physical Values Display Format"
-"Mechanical Transmission Elements"
-"Setting the Measurement System"

IBS-4, Setting the error reactions and E-stop

In this step, the reaction of the drive in the event of an error is set as well as the triggering of the drive's own E-stop input. The following parametrizations must be performed:

- type and mode of error reactions in drive
- selection whether NC reaction in error case should happen
- selection whether and when the power supply is switched off and whether a package reaction is to be conducted
- Configuration of the E-stop input

(See also chapter: "Drive Error Reaction")

IBS-5, Pre-setting Control Loop

The parameters for current, velocity and position control loops are set in this step. This is done either by:

- Execute command **P-0-0162, D900 Command Automatic control loop adjust** or
- Execute command **S-0-0262, C700 Command basic load** or
- by inputting the controller values specified in the data sheet.

Setting the control loop in this way makes ensures a good level of quality for most applications. Should additional optimization of the control loop parameters become necessary (velocity and position control loop parameters, compensation functions and precontrol), then use commissioning step no. 8.

(See also chapter: "Control Loop Settings")

IBS-6, Checking axis mechanics and measuring system

The presettings made in IBS 2 are checked here and modified, if necessary. This means that the axis must be moved by jogging. The following checks must be made:

- check the rotational direction of the motor encoder. With non-inverted position polaritiy (**S-0-0055, Position polarities** = 0), the values in parameter **S-0-0051, Position feedback 1 value** should have a rising order with a clockwise rotation of the motor. (This check need not be performed in MDD and MKD motors. If this is not the case, then bit 2 in **S-0-0277, Position feedback 1 type** must be inverted.
- By moving the axes and examining the position feedback value of the motor encoder in parameter **S-0-0051, Position feedback 1 value** it can be controlled whether a distance in this process is correctly displayed. If not, then the settings for mechanical gear ratio, feedrate constants and encoder resolution must be checked.

- Given a second encoder, by moving the axis and examining the position feedback value of the external encoder in parameter **S-0-0053, Position feedback 2 value** it can be checked whether a distance is correctly displayed with this process. **S-0-0051, Position feedback 1 value** and **S-0-0053, Position feedback 2 value** should run parallel when jogging a specific path. If not, then check the settings in **P-0-0075, Feedback type 2, S-0-0117, Feedback 2 Resolution, S-0-0115, Position feedback 2 type** and **P-0-0185, Function of encoder 2.**

(See also chapter : -"Physical Values Display Format"
-"Mechanical Transmission Elements"
-"Setting the Measurement System"

IBS-7, Limits for position, velocity and torque

The limits for the travel range are conducted by setting

- position limits values and/or
- travel range limit switches

as well as the limit values for the axis velocity and maximum drive torque/force are parametrized also.

(See also chapter: -"Torque/Force Limiting"
-"Travel Range Limits"
-"Limiting Velocity"

IBS-8, Optimizing the control loop

This step is only necessary if the settings for velocity and position control loops in IBS 4 did not achieve the needed quality. As such, optimize the control behavior as follows:

- modify the parameter for velocity and position control loops
- possibly activate the acceleration pre-control
- possibly activate the friction torque compensation
- possibly activate the velocity mixture and
- possibly activate the notch filter.

(See also chapter: "Control Loop Settings"

IBS-9, Establishing absolute reference measuring

- Here the absolute reference measuring is set in terms of the machine zero point of the position feedback value from motor encoder and possibly optional encoder. The position feedback values at first show any, not machine zero point related values. By conducting
- setting absolute measuring (with absolute encoders) or
- drive-controlled homing

the coordinate systems of the position encoder and the coordinate system of the machine are made congruent.

(See also chapter: -"Drive-Controlled Homing"
-"Set Absolute Measuring"

IBS-10, Other settings

Here

- drive halt function is parametrized,
- the language selected,
- general status message settings and
- the optional drive function settings are conducted.

(See also chapter: -"Drive Halt"
-"S-0-0013, Class 3 diagnostics"
-"S-0-0182, Manufacturer class 3 diagnostics"
-"Optional Drive Functions"
-"Language Selection"

IBS-11,Controlling drive dimensions

The power-related drive checks are conducted here. It is checked whether the continuous and peak power of drive amplifier and motor meet the requirements. The following checks are conducted for this purpose:

- generated torque/force of motor is checked. At a constant speed 60% and in rapid traverse 75% of the continuous torque at standstill of the motor should not be exceeded
- during the acceleration phase 80% of the maximum torque of the motor/controller combination may not be exceeded
- the thermal load of the drive amplifier should equal a maximum of 80%

(See also chapter: "Monitoring the Thermal Load of the drive controller"

With vertical axis, the weight compensation must be set so that the current consumption with upwards and downwards motions of the axes have the same minimum value.

Check the regenerated peak power and regenerated continuous power.

3.4 Diagnostic Configurations

Overview of Diagnostic Configurations

The diagnostics are configured into 2 groups:

- Current operating status and diagnostics
- Class diagnostics

Additionally, there are parameters for all important operating data that can be transmitted both via the command communications (SERCOS, Profibus, ...) as well as the parametrization interface (RS-232/485 in the ASCII protocol or SIS (serial Indramat protocol).

Drive-Internal Diagnostics

The current operating condition of the drive is evident by which errors, warnings, commands and drive stop signals are available and which operating mode is active. Whether the drive is in preparation for operation or in parameter mode also is displayed.

The current operating condition can be determined from

- the 2-part seven-segment display (H1 display)
- the diagnostic parameter **S-0-0095, Diagnostic Message**
- the parameter **S-0-0390, Diagnostic Message Number**
- the parameter **P-0-0009, Error Message Number**
- the parameter **S-0-0375, List of diagnostic numbers**

The current diagnostic message with the highest priority is always shown in the H1 display, in the diagnostic parameter **S-0-0095, Diagnostic Message** and in the parameter **S-0-0390, Diagnostic Message Number**. The parameter **P-0-0009, Error Message Number** will contain a value unequal to 0 if an error is present.

The last displayed diagnostic numbers are displayed in chronological order in parameter **S-0-0375, List of diagnostic numbers**.

An overview of all diagnostic messages can be found in the diagnostic description in Supplement B.

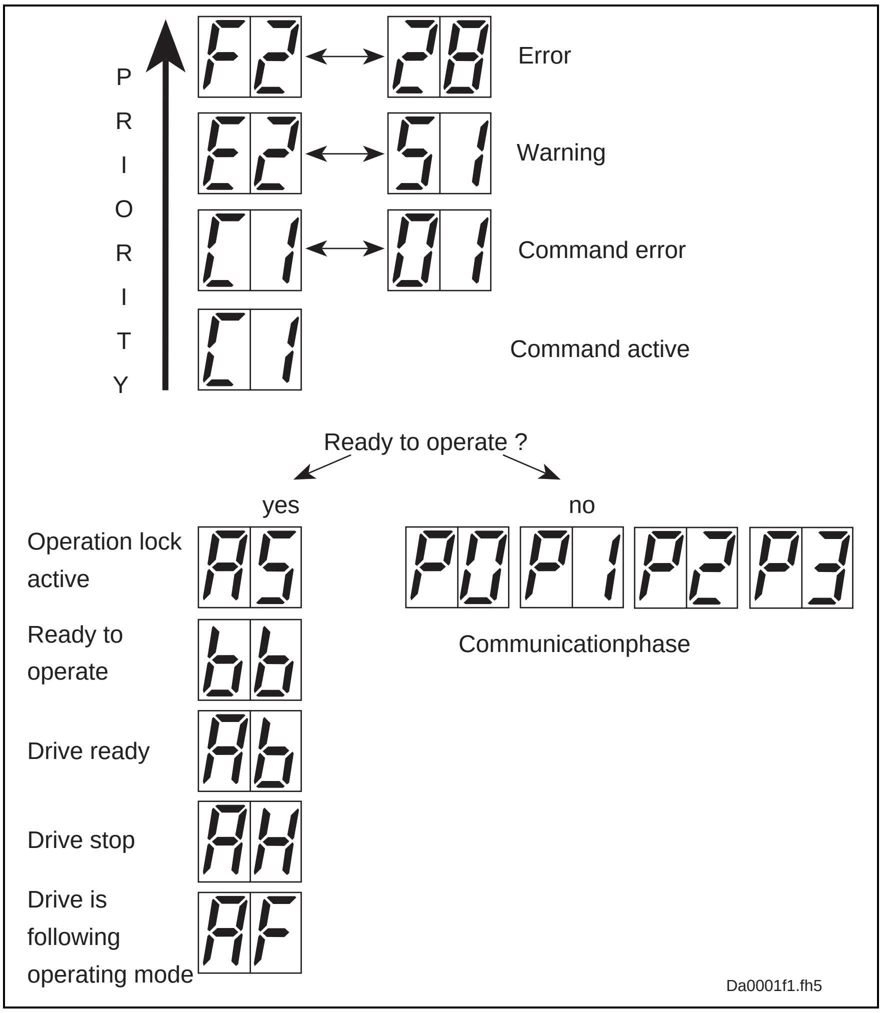


Fig. 3-9: Priority-dependent diagnostic formation in the H1 display

Diagnostic Message Composition

Each operating condition is designated with a diagnostic message, which consists of a

- diagnostic message number and a
- diagnostic text

For example, the diagnostic message for the non-fatal error "Excessive Control Deviation" is displayed as follows.

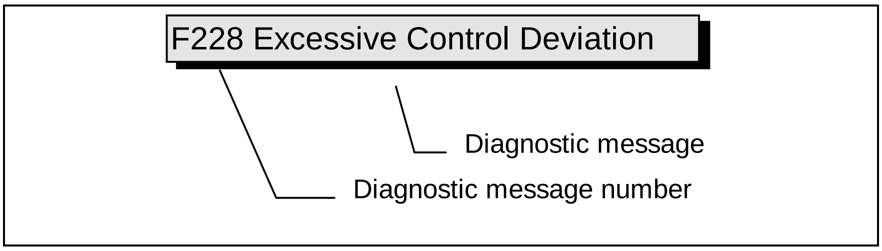


Fig. 3-10: Diagnostic message composition with a diagnostic message number and text

The H1 display alternates "F2" and "28". The diagnostic message number appears in hexadecimal format in the parameter **S-0-0390, Diagnostic Message Number**. In this example, this would be (0x)F228.

The diagnostic message number and the diagnostic text are contained as a string "**F228 Excessive deviation**" in the parameter **S-0-0095, Diagnostic Message**.

H1-Display

The diagnostic number appears on the two-part seven-segment display. The form of the display emerges from the graphic "Priority-Dependent Display of the Diagnostic Message".

With the help of this display, it is possible to quickly determine the current operating status without using a communication interface.

The operating mode cannot be seen on the H1-Display. If the drive follows the operating mode and no command was activated, then the symbol "AF" appears on the display.

Diagnostic Message

The diagnostic message contains the diagnostic number followed by the diagnostic text, as shown in the example, "Excessive Control Deviation." It can be read with the parameter **S-0-0095, Diagnostic Message** and directly displays the operation status on an operator interface.

The diagnostic message language can be changed.

Diagnostic Message Number

The diagnostic message number contains only the diagnostic number without the text. It can be read with the parameter **S-0-0390, Diagnostic Message Number** .

Error Number

The error number contains only the error number without the diagnostic text. It can be read with the parameter **P-0-0009, Error Message Number** and can indicate an error condition without a language barrier. This parameter contains a value unequal to "0" if an error is present in the drive.

An error is formed from the bottom 3 digits of the diagnostic number. For example, the error "**F228 Excessive deviation**" with the diagnostic message number "(0x)F228" would produce the error number "228."

List of diagnostic numbers

The 50 previously displayed diagnostic numbers are displayed in chronological order in parameter **S-0-0375, List of diagnostic numbers**. Every change in contents of **S-0-0390, Diagnostic message number** means that the old contents are transfered into **S-0-0375, List of diagnostic numbers**. If **S-0-0375, List of diagnostic numbers** is read, then the last replaced diagnostic number appears in the first element; the diagnotic number displayed penultimately is displayed in the second element and so on.

The following illustrated explains the relationship between **S-0-0375, List of diagnostic numbers** and **S-0-0390. Diagnostic message number** with the use of an example.

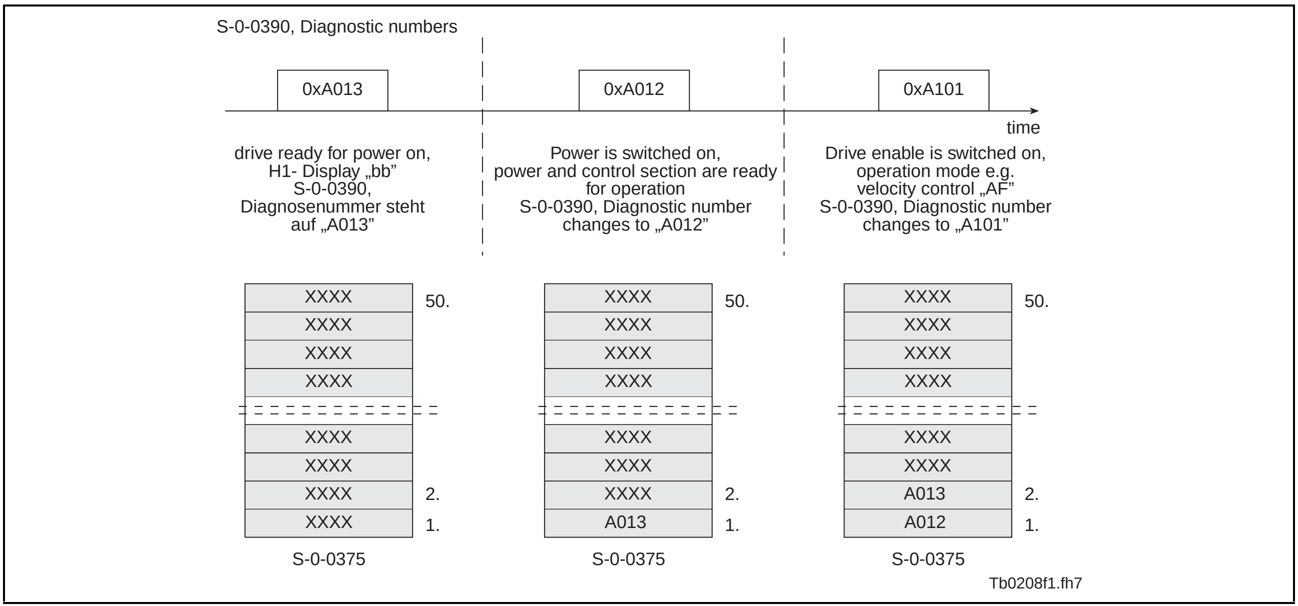


Fig. 3-11: Example for generating **S-0-0375, List of diagnostic numbers**

Permanently-Configured Collective Indication

There are parameters that represent a collective indication for the display of operating states. These are individually listed

- **S-0-0011, Class 1 diagnostics**
- **S-0-0012, Class 2 diagnostics**
- **S-0-0013, Class 3 diagnostics**
- **S-0-0182, Manufacturer class 3 diagnostics**

S-0-0011, Class 1 diagnostics

In parameter **S-0-0011, Class 1 diagnostics** there are bits for the various errors. A bit is set in this parameter in the event of a drive error. Simultaneously, bit "Drive lock, error in class 1 diagnostics" is set in the **drive status word.**

All bits in class 1 diagnostics, are cleared upon execution of the command **S-0-0099, C500 Reset class 1 diagnostic**.

(See section: clear error)

The following bits are supported in status class 1.

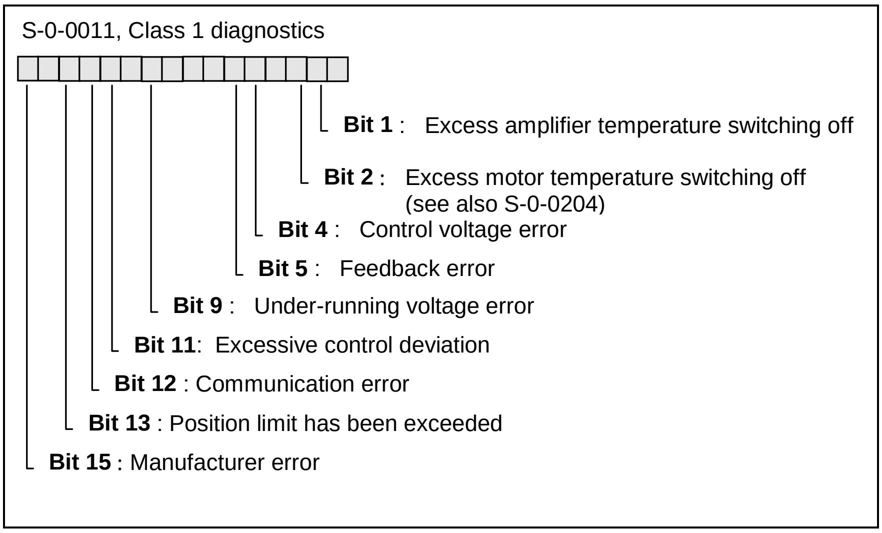


Fig. 3-12: S-0-0011, Class 1 diagnostics

S-0-0012, Class 2 diagnostics

Toggeling a bit is signaled with a change bit in the drive status word

There are bits for various warnings in this parameter. In the event of a warning, a bit is set in this parameter. Simultaneously, bit "Change bit class 2 diagnostics" is set in the **drive status word.** This change bit is cleared by reading **S-0-0012, Class 2 diagnostics.** Via parameter **S-0-0097, Mask class 2 diagnostic** warnings can be masked in terms of their effect on the change bit.

The following bits are supported in class 2 diagnostics.

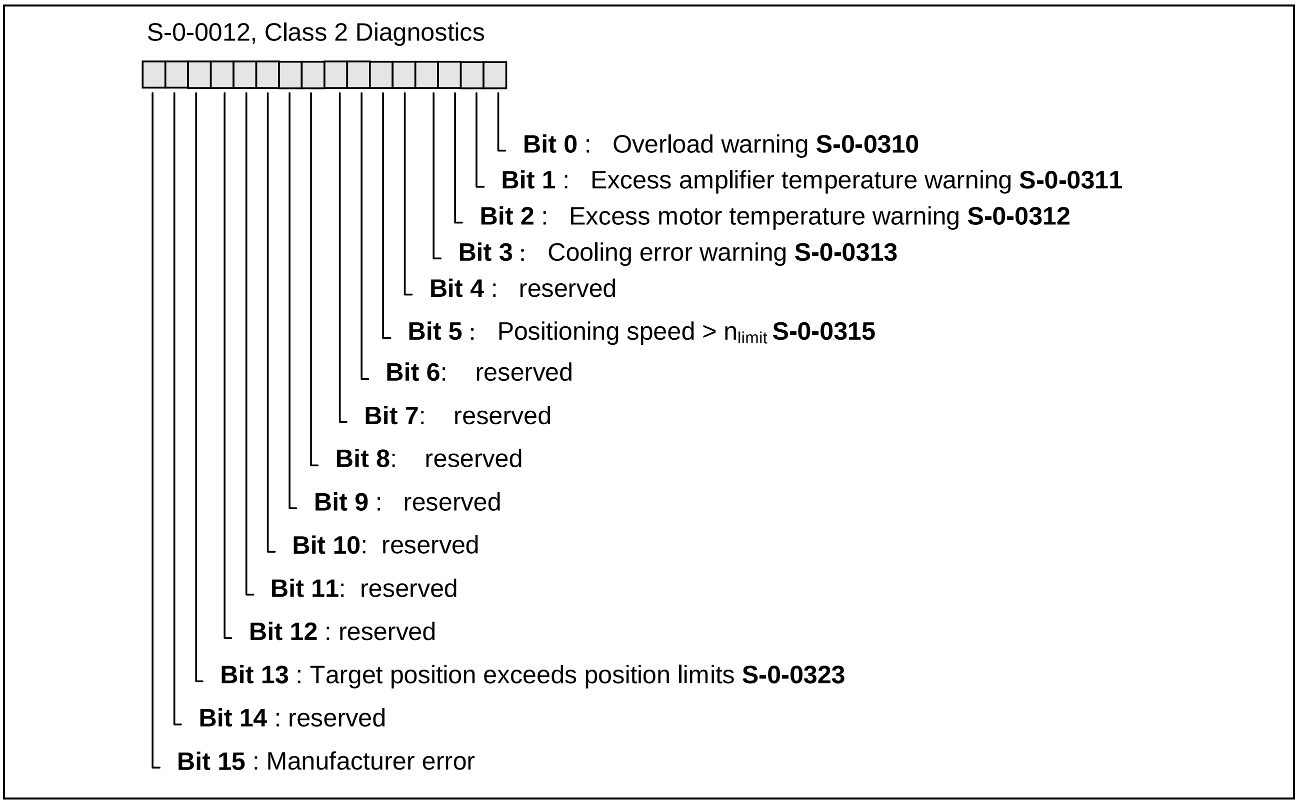


Fig. 3-13: Structure of parameter S-0-0012, Class 2 diagnostics

Each of these messages is stored in turn in its own parameter (S-0-0310..S-0-0323).

S-0-0013, Class 3 diagnostics

Various messages about operating states are stored here. If the state of a message changes, then a bit is set here as well in **drive status word** ("Change bit class 3 diagnostics"). This change bit is cleared again by reading **S-0-0013, Class 3 diagnostics.** Via parameter **S-0-0098, Mask class 3 diagnostic** warnings can be masked in terms of their effect on the change bit.

The following bits are supported in class 3 diagnostics.

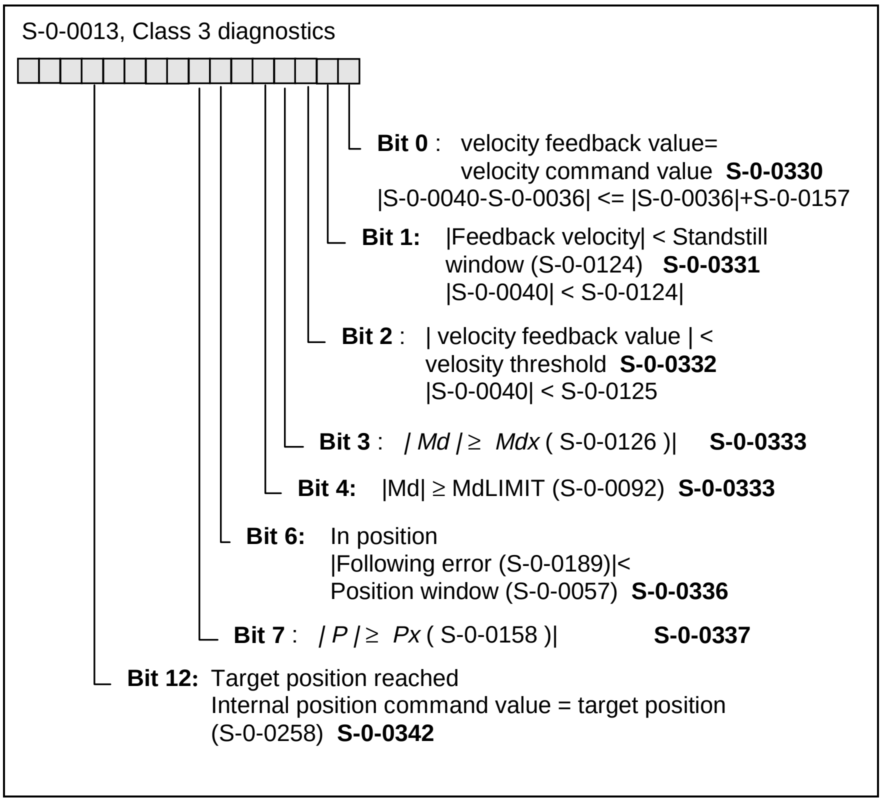


Fig. 3-14: Structure of S-0-0013, Class 3 diagnostics

Each of these messages is stored in turn in its own parameter (S-0-0330..S-0-0342).

Change bit of class 2 and 3 diagnostics in the drive status word

If the state of a bit changes in **S-0-0012, Class 2 diagnostics** or **S-0-0013, Class 3 diagnostics** then the change bit status class 2 or 3 is set in the drive stastus word. A read access to both parameter clears this change bit. By seting the change bit as a result of a bit toggle in S-0-0012 or S-0-0013 it is possible to mask with the help of parameter **S-0-0097, Mask class 2 diagnostic** or **S-0-0098, Mask class 3 diagnostic**.

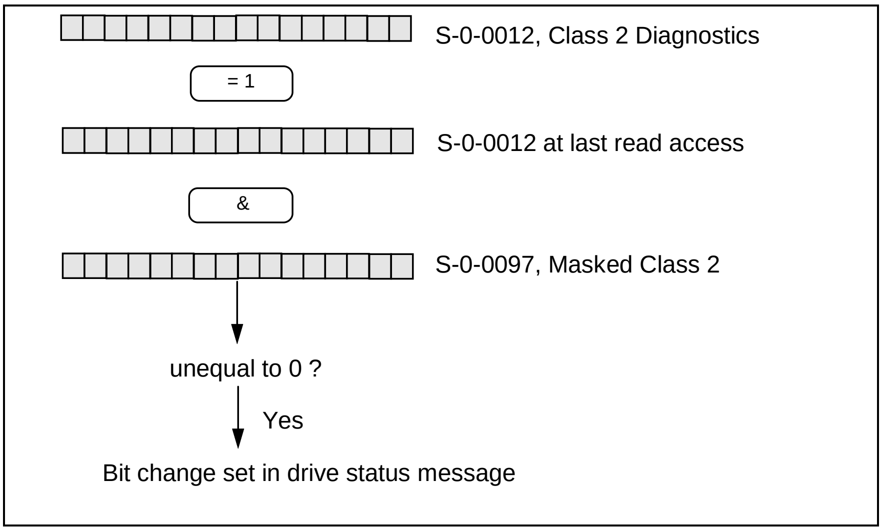


Fig. 3-15: Generating the change bit of class 2 diagnostics

S-0-0182, Manufacturer class 3 diagnostics

In parameter **S-0-0182, Manufacturer class 3 diagnostics** various messages about the operating states are stored there as well. If the state of a message changes, then this is not signaled with a change bit.

The following bits are supported in manufacturer's class 3 diagnostics.

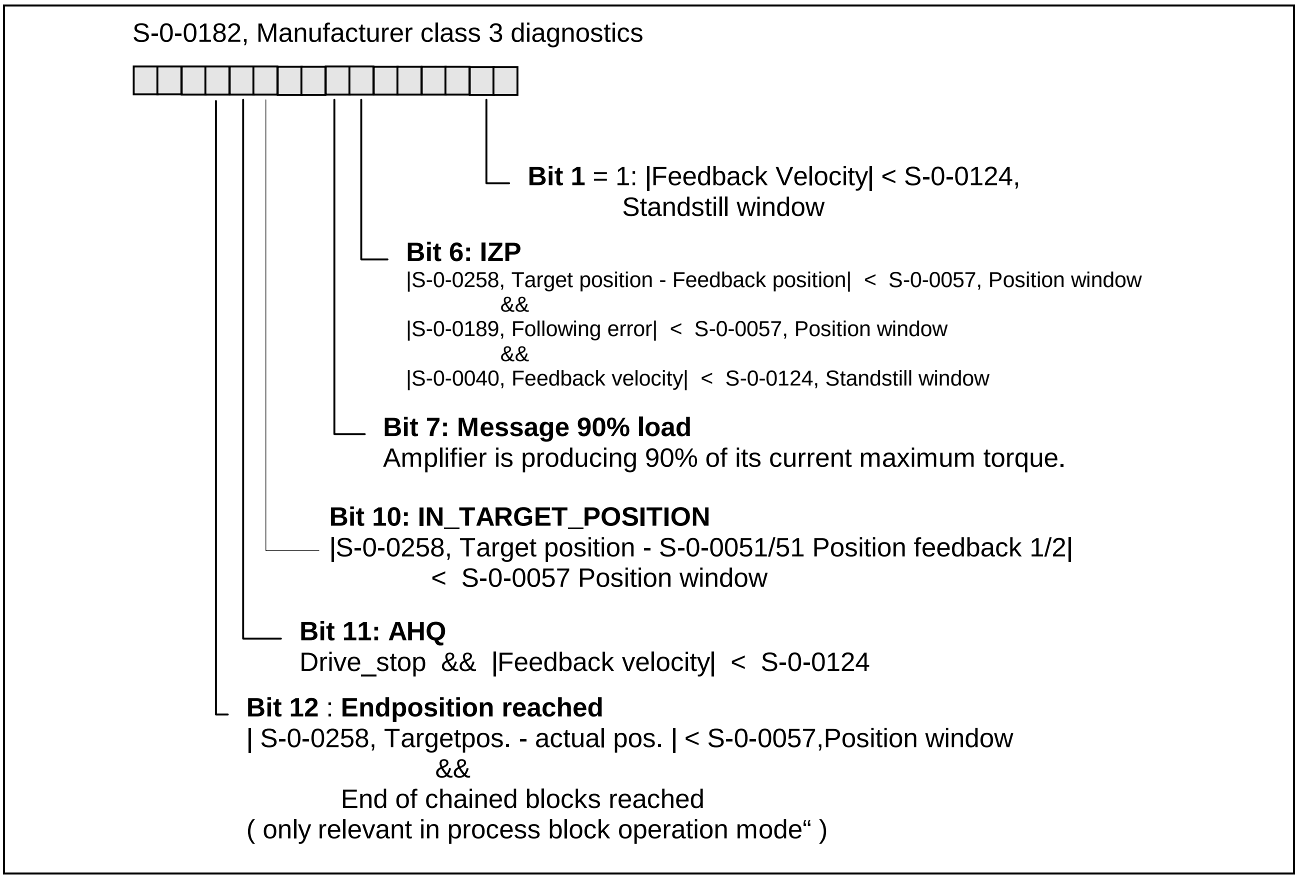


Fig. 3-16: Structure of S-0-0182, Manufacturer class 3 diagnostics

3.5 Language Selection

With the parameter **S-0-0265, Language Selection** you can switch between several languages for

- Parameter names and units
- Diagnostic texts

At this time, the following languages are implemented:

Value of S-0-0265:	Language:
0	German
1	English
2	French
3	Spanish
4	Italian

Fig. 3-17: Language Selection

4 Communication Through the SERCOS-interface

4.1 Overview of SERCOS Communication

The basic features of the SERCOS interface are:

- **Data exchange cycle of set and actual values with exact time equidistance**
- **Synchronization of measurement point and command value input**
- **Overall synchronization of all drives connected to the control**
- **Minimum cycle time 0.5 ms / maximum cycle time 65 ms**
- **Baud rate selectable, either 2 or 4 MBaud**
- **Service channel for settings and diagnostics**
- **Data transfer through fiber optic ring**
- **Configuration of the telegram contents**
- **SERCOS compatibility class C, Granularity 1, i.e., a multiple of 1000 usec can be programmed as cycle time.**

The features of the interface are mentioned here briefly. More detailed information is included in the SERCOS interface specification.

4.2 Data Transfer Cycle through SERCOS

To synchronize the drives in a ring, the **Master Synchronization Telegram** (MST) is sent at the beginning of every SERCOS cycle. The MST contains only the preset communication phase information from the master.

You can configure the master data and drive telegram.

Once during every Sercos cycle, a **Master Data Telegram** (MDT) is sent from the control to every drive. The master control word, the service channel and a configurable data block are included here. In this data block, the command and limit values are contained, which are sent by the control according to the operation mode of the drive. The contents of this data block can be configured through the telegram settings.

The master data telegram is received by all drives in the ring at the same time.

In addition, a **Drive Telegram** (AT) is sent during each Sercos cycle time from every drive to the control. The drive status word, the service channel and a configurable data block are contained here. This data block contains mainly actual and status values, which are needed to operate the corresponding drives by the control.

Master Control Word

The master control word is part of the Master Data Telegram. The most important control information for the drives is contained here, such as

- **Drive ON and Drive enable**
- **Drive Stop**
- **Interpolator cycle**
- **Set operation mode**
- **Real-time control bit 1 and 2**
- **Control information for the service channel**

The master control word is structured as follows:

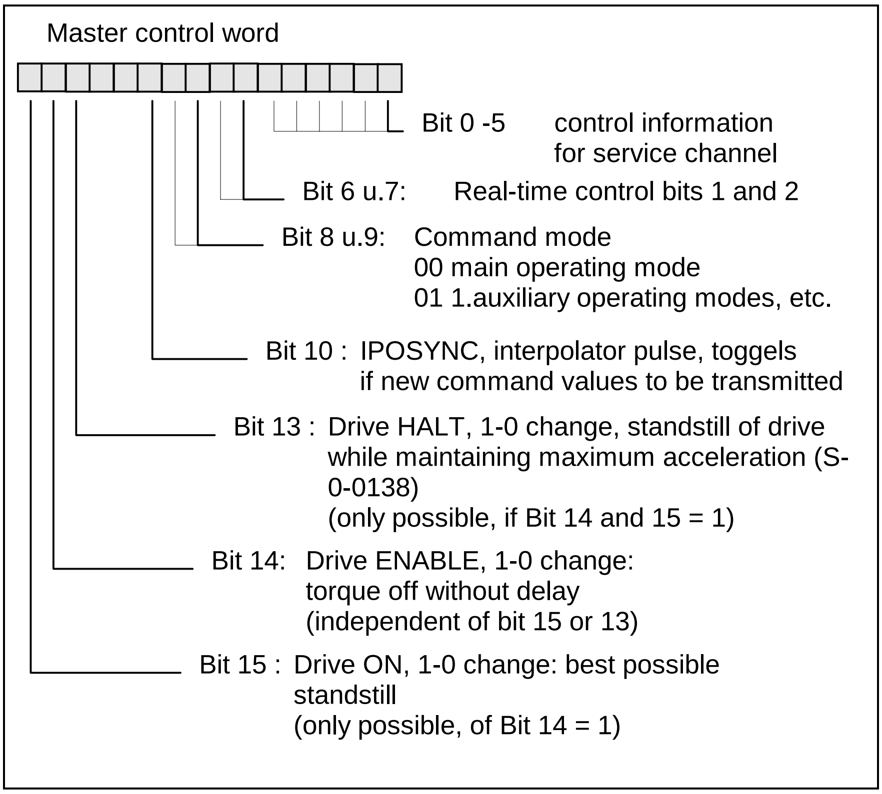


Fig. 4-1: Structure of the master control word

The master control word is transferred through the service channel to the control by using the parameter **S-0-0134, Master control word**.

Drive enable

The activation of the drive is done through a 0-1 edge of the drive enable signal. For drive controllers with a SERCOS Interface, the drive enable signal corresponds to bit 15 in the master control word of the master data telegram.

To have the drive enable signal accepted (meaning that the drive is ready to accept commands from the control), the following requirements must be fulfilled:

- SERCOS Interface in operating mode (Communication phase 4)
- No drive error
- Power section enabled

In this condition, the drive displays "**Ab**" on the seven-segment display, and the drive diagnostic from the parameter **S-0-0095, Diagnostic message** is **A012 Control and power sections ready for operation**.

If the drive enable is set, the seven-segment display changes to "**AF**". After that it displays the drive diagnostic for the activated operation mode (i.e., **A101 Drive in VELOCITY control**).

If the drive enable is activated without a DC bus voltage ("**Ab**" doesn’t appear on the H1 display), the error message **F226 Undervoltage in power section** will be displayed.

Drive Status Word

The drive status word is part of the drive telegram. All important status information for the drive is contained here.

- **Readiness for use of the control and power sections**
- **Drive error**
- **Change bits for diagnostics class 2 and 3**
- **Current operation mode**
- **Real-time status bits 1 and 2**
- **Status information for the service channel**

The drive status word is structured as follows:

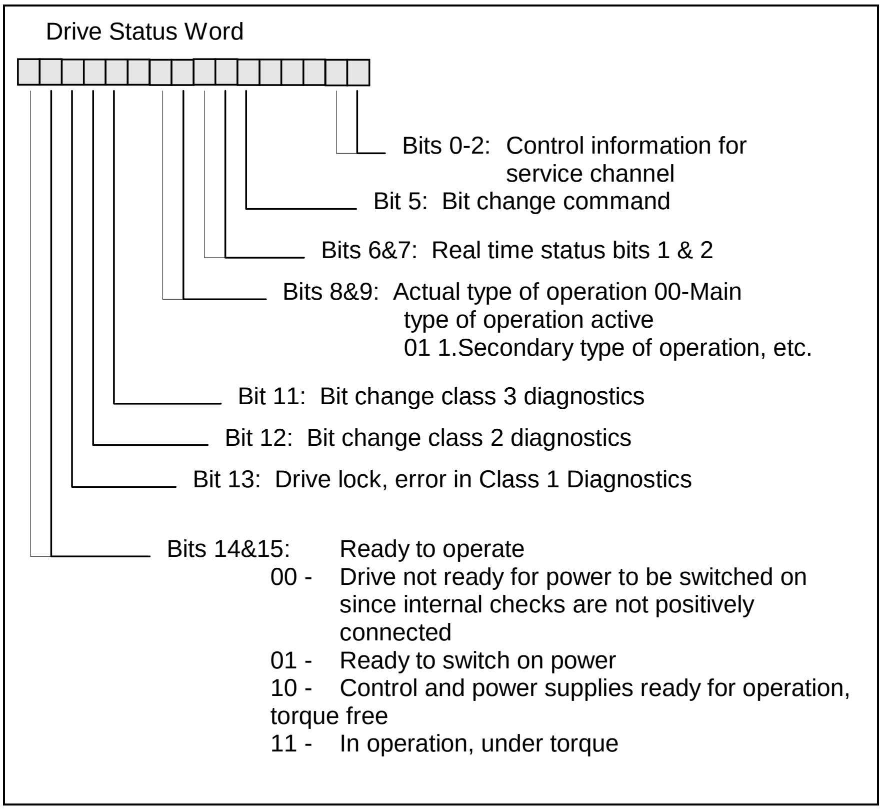


Fig. 4-2: Structure of the drive status word

The drive status word is transferred through the service channel to the control with the parameter **S-0-0135, Drive status word**.

Acknowledge of the Drive Enable

The drive confirms the drive enable setting in the drive status word of the drive telegram. Bits 14 and 15 of "10" (control and power section enabled, temporarily) changes to "11" (in operation, temporarily enabled) after the drive enable is activated and has been accepted.

The confirmation of the drive enable setting in the status word is acknowledged after the drive has sufficient time to prepare for its operation mode. For example, the asynchronous motor uses this time to magnetize itself.

If the drive enable is disabled, the drive performs its reaction through parameter **P-0-0119, Best possible deceleration**. Here, time passes between resetting and confirming the reset. This time depends on

- the setting of the parameter P-0-0119, Best possible deceleration
- the existence of a motor brake and its parameterization.
- the velocity of the axis before the reset of the drive enable

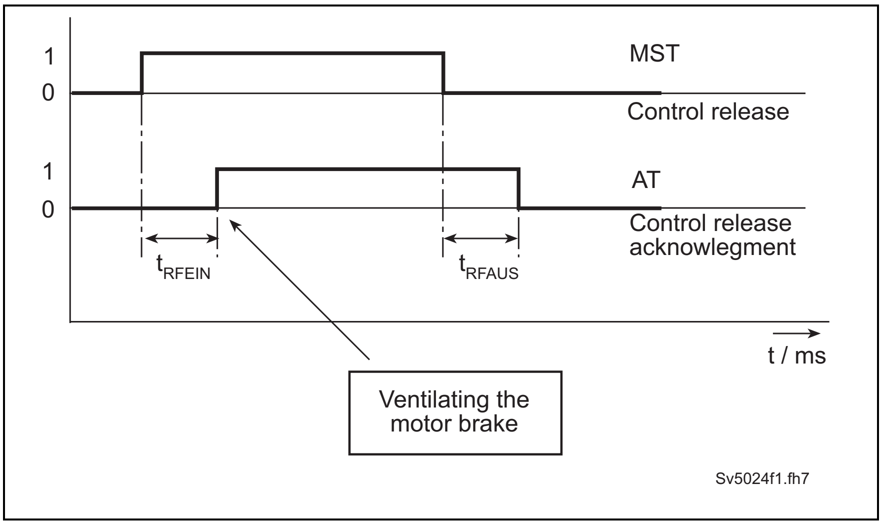


Fig. 4-3: Confirmation of the drive enable

Typical values for t_{RFEIN} are about 8 ms for synchronous motors or 300ms for asynchronous motors.

Note: During the time t_{RFEIN}, the control should set its command values to reach a set velocity of 0. The activation of the optional motor brake takes place after the drive enable confirmation time (0-1 edge from confirmation of drive enable).

4.3 Real-Time Control and Status Bits

In the master control and drive status words, there are 2 configurable real-time bits. The configuration of these binary signals is achieved through parameters

- **S-0-0301, Allocation of real-time control Bit 1**
- **S-0-0303, Allocation of real-time control Bit 2**
- **S-0-0305, Allocation of real-time status Bit 1**
- **S-0-0307, Allocation of real-time status Bit 2**

The parameter number that will be assigned to the corresponding real-time status bit is set here. Bit 0 of this parameter will be sent cyclically to the master or the drive via the real-time status or control bit.

4.4 Transmission of non-cyclical Data through SERCOS

The non-cyclical data (data that is not time-critical) is transmitted via the **service channel**.

The transmission via the service channel is done in several steps for the MDT and AT, and the transmission of an element could last over several Sercos cycles.

The service channel is used for

- **Parameterization** and
- **Diagnostic**

4.5 Startup for the SERCOS Interface

To start the interface you have to:

- **connect the fiber optic cable**
- **set the drive address**
- **check the distortion indicator**
- **set the transmission rate**
- **set the transmission power**

Adjustments of the SERCOS Interface

All settings can be done with switches on the front plate of the interface

The settings should be complete before connecting communication to the fiber optic ring.

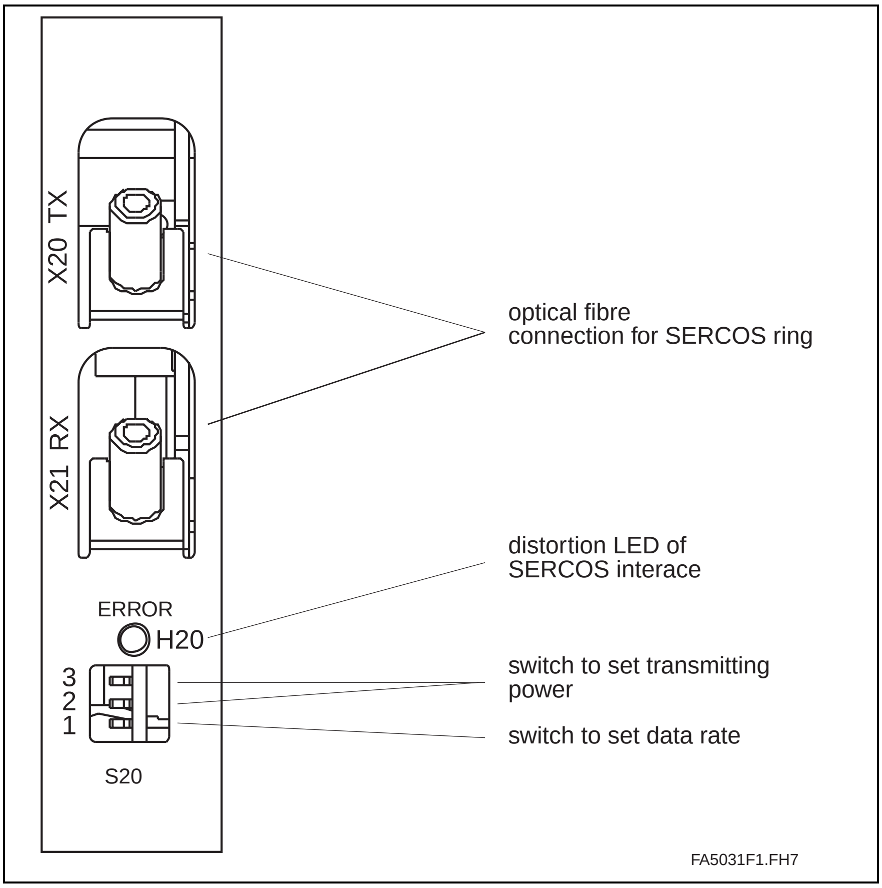


Fig. 4-4: View of interrface to command communication

See also Supplement B,

Diagnostic Explanations: **E410 Slave not scanned or adress 0**.

Connecting the Fiber Optic Cables of the SERCOS Interface

The connection between the control and the digital drives is done with fiber optic cables (LWL).

SERCOS interface (IEC 1491)

The used toplogy is a ring structure according to SERCOS interface (IEC 1491).

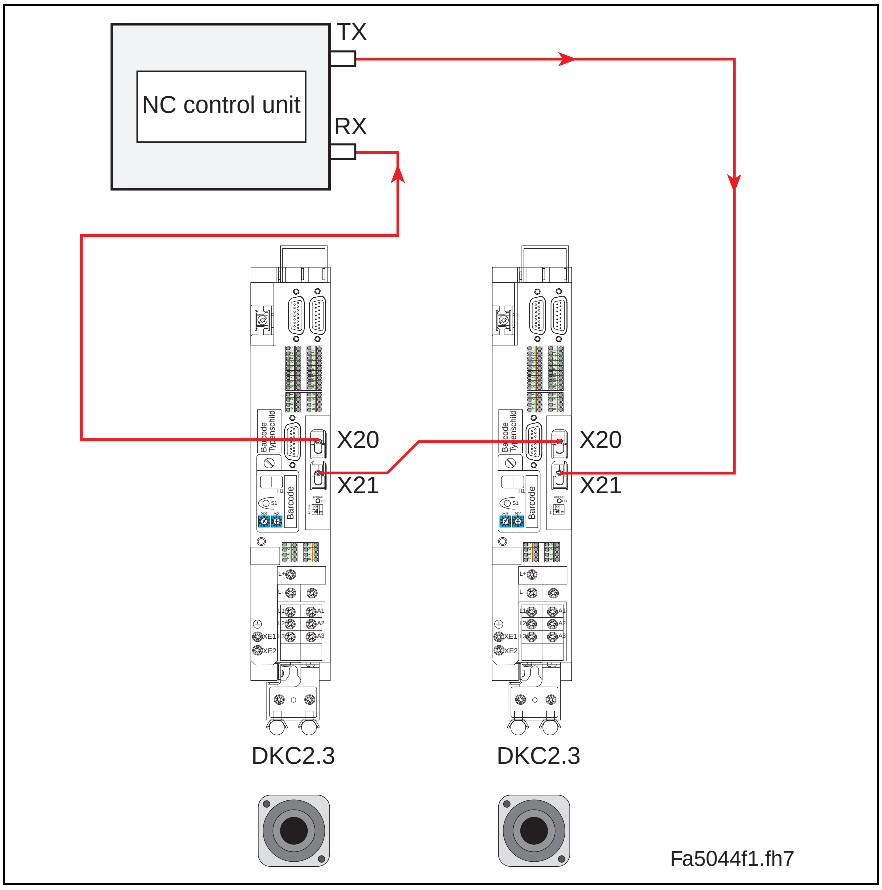


Fig. 4-5: Ring topology

The ring starts and ends at the control.

The optical output of the control is connected with the optical input of the first drive (X21). The output of the latter (X20) is connected with the input of the next drive, and so on. The output of the last drive is connected with the input of the control.

Setting the Drive Address of the SERCOS Interface

The drive adress is set via switches S2 and S3 on the programming module. Addresses ranging from 0 to 99 can be programmed.

The drive address is not dependent on the sequence of drive connections through the fiber optic ring.

After setting all the addresses, you can switch on the arrangement.

Checking the Distortion Indicator of the SERCOS Interface

The next step is to check whether every station gets a sufficient optical signal level , in other words whether the receiver is not under- or overloaded.

Distortion indicator may not be lit nor glow (flicker)!

For normal operation, the distortion indicator LED H20 stays dark.

If it’s lit, examine the transmission path in front of that station.

To do so, the distortion display of the drives are checked in signal flow direction starting from the sender output of the master (control). (See Fig. 4-4: View of interrface to command communication).

The distortion display of the drives is the LED "H20“.

Check distortion indicator in "direction of the light“

At first, check the 1st drive in the ring. If its distortion indicator is dark, go to the next drive. Do this up to the last drive and then at the master’s input (control).

If one of the indicators is lit, check the following:

- Is the transmission (baud) rate set correctly?
- Is the transmission power of the predecessor in the ring correct? (or too high or too low)
- Is the fiber optic cable to the predecessor defective?

Using the Distortion Indicator

A distortion indicator H20 lights in the following cases:

- wrong transmission (baud) rate
- wrong transmission power
- fiber optic connection defective

Therefore, in the case of a lit distortion indicator lamp, check the following:

Checking the transmission rate

Check the transmission rate at the control and at the implicated drive.

Checking the transmission power

Check the transmision power at the control and at the physical predecessor of the implicated drive. (See Setting the optical Transmission Power).

Checking the fiber optics

Check the fiber optic cable and its connectors from the physical predecessor to the implicated drive.

Transmission Rate of the SERCOS interface

The baud rate is set at factory to 2Mbaud. It can be programmed via switch S20,1 on the interface module .

Baud rate:	**Switch S20,1:**	**Comment**
2 Mbaud	OFF	state at delivery
4 Mbaud	ON	

Fig. 4-6: Programming the transmisison rate

Setting the optical Transmission Power

Transmission power is set via switches S20,2 and S20,3 on the interface module.

LW length	**0 .. 15 m**	**15 m ..30 m**	**30 m .. 50 m**
	S20,2 = OFF S20,3 = OFF	S20,2 = ON S20,3 = OFF	S20,2= ON S20,3 = ON

Fig. 4-7: Setting transmission power with plastic LWLs

LWL length	**0 .. 500 m**
	S20,2 = ON / S20,3 = ON

Fig. 4-8: Setting the transmisiosn power with glass LWLs

Checking the Fiber Optics

When the transmission rate and power are correctly set, and there is still no communication, the LWL (fiber optic connection) can be defective. In this case, the distortion indicator lamp will light, too.

Reason for a faulty LWL can be damage or bad manufacturing (connector mounting, ...).

Perhaps you can recognize a defective LWL when hardly some light comes out at its end, or that, for example, the optical fiber has been torn back into the connector (check the face of the connector). Further examinations cannot be done with simple means.

The only remedy is an exchange of the defective LWL cable.

4.6 SERCOS Telegram Configuration

To operate the drive properly, the settings of the telegram send and receive times, their lengths, and content have to be transmitted from the SERCOS master to the drive.

Configuration of the Telegram Send and Receive Times

The requirements to calculate the time slot parameter (telegram send and receive times) are stored in the following parameters within the drive:

- **S-0-0003, Minimum AT transmit starting time (T1min)**
- **S-0-0004, Transmit/receive transition time (TATMT)**
- **S-0-0005, Minimum feedback acquisition time(T4min)**
- **S-0-0088, Receive to receive recovery time (TMTSG)**
- **S-0-0090, Command value transmit time (TMTSG)**

The SERCOS Master calculates from the information received from all drives the time slot parameters for the operation of the communication phase 3. Those values are transferred to the drive in communication phase 2 through the parameters

- **S-0-0002, SERCOS Cycle time (Tscyc)**
- **S-0-0006, AT Transmission starting time (T1)**
- **S-0-0007, Feedback acquisition starting time (T4)**
- **S-0-0008, Command valid time (T3)**
- **S-0-0009, Beginning address in master data telegram**
- **S-0-0010, Length of master data telegram**
- **S-0-0089, MDT Transmit starting time (T2)**

The drive checks these settings while processing the command **S-0-0127, C100 Communication phase 3 transition check**. The following error messages may appear:

- **C101 Invalid communication parameter (S-0-0021)**
- **C108 Time slot parameter > Sercos cycle time**
- **C109 Position of data record in MDT (S-0-0009) even**
- **C110 Length of MDT (S-0-0010) odd**
- **C111 ID9 + Record length - 1 > length MDT (S-0-0010)**
- **C112 TNcyc (S-0-0001) or TScyc (S-0-0002) error**
- **C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) error**

- **C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)**
- **C115 T2 too small**

Configuration of Telegram Contents

The telegram contents are set through these parameters:

- **S-0-0015, Telegram Type Parameter**
- **S-0-0016, Custom Amplifier Telegram Configuration List**
- **S-0-0024, Config. List of the Master Data Telegram**

However, the drive-directed conditions for the type and number of configured data must be in the set range. Those are provided by the drive in

- **S-0-0185, Length of the configurable data record in the AT**
- **S-0-0186, Length of the configurable data record in the MDT**
- **S-0-0187, List of configurable data in the AT**
- **S-0-0188, List of configurable data in the MDT**

The drive checks these settings while processing the command **S-0-0127, C100 Communication phase 3 transition check**. The following error messages may appear:

- **C104 Config. IDN for MDT not configurable**
- **C105 Configurated length > max. length for MDT**
- **C106 Config. IDN for AT not configurable**
- **C107 Configurated length > max. length for AT**

Note: Parameter **S-0-0188, List of configurable data in the MDT** is also used for the configuration of the multiplex channel. There are therefore parameters in S-0-0188 that have a variable data length (list parameters). These can, however, only be used as multiplex data. Such IDNs may not be entered in **S-0-0024, Config. list of the master data telegram**. If such are entered, then **C104 Config. IDN for MDT not configurable** is generated.

4.7 SERCOS Interface Error

If conditions are detected in the drive that prevent the correct operation of the interface, or if error values are recognized during the initialization phase, the drive responds by resetting to communication phase 0. This means that no drive telegrams will be sent. The drive proceeds with the programmed error reaction (see **P-0-0119, Best possible deceleration**) and waits for the reinitialization of the SERCOS ring through the master.

Possible errors could be:

- **F401 Double MST failure shutdown**
- **F402 Double MDT failure shutdown**
- **F403 Invalid communication phase shutdown**
- **F404 Error during phase progression**
- **F405 Error during phase regression**
- **F406 Phase switching without ready signal**

Diagnostic of the interface Status

The parameter **S-0-0014, Interface status** is used to analyze the existing initialization error and the current communication phase.

Error Count for Telegram Interrupts

The drive checks every received master synchronization and master data telegram for

- **the correct receive time set point,**
- **the assigned telegram length and**
- **the correct CRC check sum**

A telegram interrupt is registered with an incrementation in the error counter. For this purpose, these two parameters are used: **S-0-0028, MST error counter** and **S-0-0029, MDT error counter**.

These parameters are cancelled by switching the communication phase from 2 to 3 (S-0-0028) or from 3 to 4 (S-0-0029).

4.8 Multiplex Channel

Overview

The multiplex channel makes it possible to update a limited cyclical data channel. This also enables cyclical list element accessing with index changes.

Note: To be able to use the mechanism it is necessary to use command communications via SERCOS or Profibus and configure the multiplex parameter in the cyclical telegrams.

With the help of the multiplex channel it is possible:

- to cyclically exchange more parameter contents despite limited maximum number of transmittable bytes in the master data telegram and drive telegram
- to access individual list elements using both indices S-0-0362 and S-0-0366
- by incrementing index S-0-0368 to transmit in each cycle the multiplexed data with a cycle time of *Tscyc * number of multiplex data* or
- to structure the index in terms of the operating mode and thus to transmit only those parameters needed for the activated mode

Pertinent Parameters

The following parameters are used:

- **S-0-0360, MDT Data container A**
- **S-0-0362, List index, MDT data container A**
- **S-0-0364, AT Data container A**
- **S-0-0366, List index, AT data container A**
- **S-0-0368, Addressing for data container A**
- **S-0-0370, Configuration list for the MDT data container**
- **S-0-0371, Configuration list for the AT data container**

Functional Principle Multiplex Channel

Configuration

S-0-0370, Configuration list for the MDT data container

The IDNs are entered in parameter **S-0-0370, Configuration list for the MDT data container** which are dependent on the index in **S-0-0368, Addressing for data container A,** low byte, and transmitted to **S-0-0360, MDT Data container A**. Write accessing S-0-0370 is only possible in communications phase 2.

S-0-0371, Configuration list for the AT data container

The IDNs are entered in parameter **S-0-0371, Configuration list for the AT data container A** that are dependent on indices in **S-0-0368, Addressing for data container A, (**high byte), and transmitted to **S-0-0364, AT Data container A**. Write accessing S-0-0371 is only possible in communications phase 2.

Note: A maximum of 32 IDNs can be configured in S-0-0371.

Addressing the Data Container

S-0-0368, Addressing data container A

Parameter **S-0-0368, Addressing for data container A** contains indices for the selection of the parameters transmitted in the data container.

The graph below illustrates the configuraiton lists with the maximum number of elements (32).

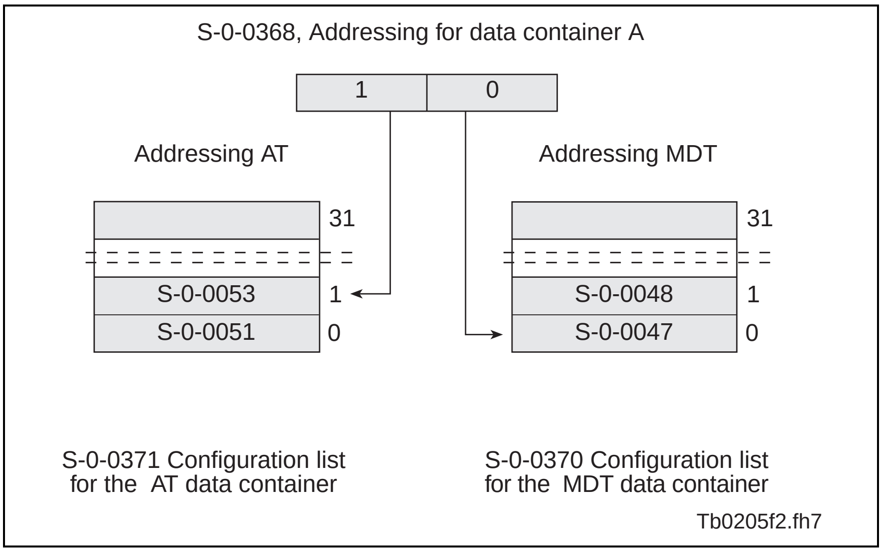


Fig. 4-9: Functional principle of addressing data container A

Note: Only bits 0..5 (for MDT) and bits 8..13 (for AT) are used for addressing with parameter S-0-0368. The other bits are cut off.
This is why no value exceeding 31 can be used for addressing.

Note: Parameter **S-0-0368, Addressing for data container A** can, depending on requirements, be configured in MDT, write accessed via the required data channel or some other interface.

Using the Data Container

S-0-0360, MDT Data container A

In parameter **S-0-0360, MDT Data container A** the master transmits the data which was writte to the target parameter in the drive.

The target parameter is that parameter addressed via S-0-0368 in the configuration list (S-0-0370).

Note: Parameter S-0-0360 is **not write accessible via the requried data channel.** The display format is hexidecimal without decimal places.

S-0-0364, AT Data Container A

The drive copies the data of the source parameter into parameter **S-0-0364, AT Data container A**.

The source parameter is that parameter addressed via S-0-0368 in the configuration list (S-0-0370).

Note: Parameter S-0-0364 is **not write accessible via the requried data channel.** The display format is hexidecimal without decimal places.

Processing Single List Elements

Using both addressing parameters

- **S-0-0362, List index, MDT data container A**
- **S-0-0366, List index, AT data container A**

it is possible to access single elements of list parameters. It is thus possible to cyclically and by element write into list parameters. The element to be written into or read of a list parameter is written into both parameters.

Note: The parameters become effective if in **S-0-0368, Addressing for data container A** a list parameter is addressed. If the addressed parameter is not a list parameter, then the ealuaton of parameters S-0-0362 and S-0-0366 is terminated.

The following illustrates the processing of a list element with the use of the multiplex channel.

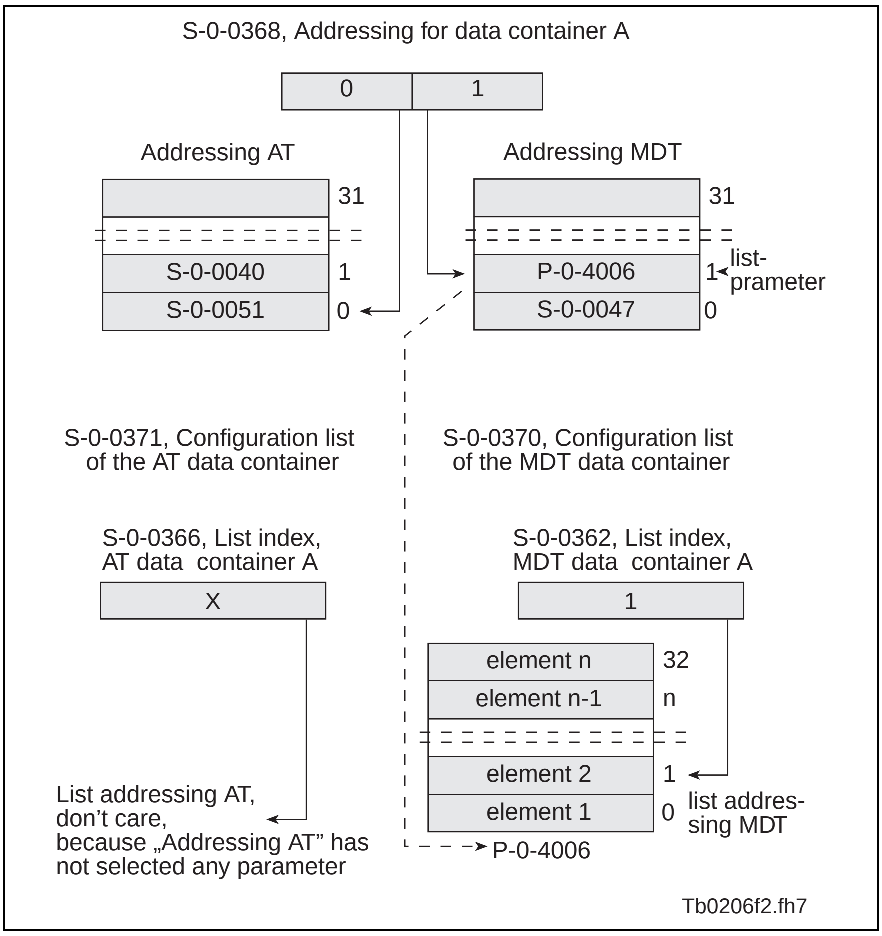


Fig. 4-10: Processing list elements with the multiplex channel, here for the MDT container

Diagnostic Messages

In conjunction with the multiplex channel, various checks are conducted:

Checks in transition command

Checking the Configured IDN Order

The temporal sequence of the processing of cyclical MDT data in the drive has an order specified with which the configured IDNs are entered in parameter **S-0-0024, Config. list of the master data telegram**.

If both the parameter **S-0-0360, MDT Data container A** and **S-0-0368, Addressing for data container A** are configured in the MDT, then the MDT data container will only be properly processed if the addressing was previously processed.

To maintain the correct order when configuring the MDT, the drive checks in command **S-0-0127, C100 Communication phase 3 transition check** whether the IDN S-0-0368 is configured before S-0-0360. If not, then the drive generates a command error message.

- **C118, MDT order for configuration faulty**

Checking the Configuration Lists

It must be ensured that the ID numbers in the configuration lists can be cyclically configured.

This is why it is checked in command **S-0-0127, C100 Communication phase 3 transition check**, whether ID numbers in **S-0-0187, List of configurable data in the AT** or **S-0-0188, List of configurable data in the MDT** are contained in the list.

The following errors are possible:

If list **S-0-0370, Configuration list for the MDT data container** has one or more IDNs which are not available are not in **S-0-0188 ,List of configurable data in the MDT** then error message

- **C104 Configured ID number for MDT not configurable**

is generated.

If list **S-0-0371, Configuration list for the AT data container** contains one ore more IDNs that are not available or not in **S-0-0187, List of configurable data in the AT** then error message:

- **C106 Configurated ID numbers for AT not configurable**

is generated.

Checking the input

Checking for Existing ID Numbers

When inputting S-0-0370 and S-0-0371 the following checks are conducted:

- It is checked whether the entered IDN is available. If not, then required data channel error message "0x1001, ID number not available“ is generated.
- It is checked whether the entered IDN in parameter **S-0-0188, List of configurable data in the MDT** is available. If not, then required data channel error message "0x7008, Data not correct“ is generated.

Checking while running

Checking the Indices

The drive monitors whether the index shows non-insetalled locations in lists **S-0-0370, Configuration list for the MDT data container or S-0-0371, Configuration list for the AT data container.**

If it does, then warnings:

- **E408 Invalid addressing of MDT data container A**
- **E409 Invalid addressing of AT data container A**

is generted.

Note: The warnings can only occur if the lists has fewer ID number entries than is maximumly possible.

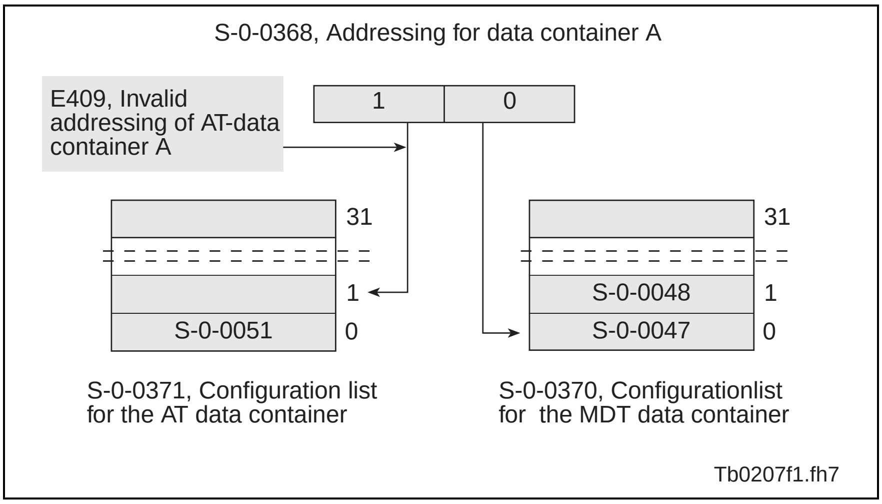


Fig. 4-11: Invalid addressing of MDT data container A

5 Command Communications with Analog Interface

5.1 Overview

In DKC01.3 or DKC11.3 the drive enable, drive halt/start and clear errors are specified via a digital input. Diagnoses such as drive errors and warnings are output via digital outputs.

Note: If the Sercos Interface is not active with a DKC02.3 or the fieldbus interface with the DKC03.3, then the analog interface can be used in both of these units as well.

5.2 Pertinent Parameters

- **S-0-0134, Master control word**
- **S-0-0135, Drive status word**
- **S-0-0099, C500 Reset class 1 diagnostic**

5.3 How it Works

Digital inputs

Digital inputs are read in every 500us and filtered with a digital filter so that the drive can detect a signal change within 2ms. Due to the digital processing, the signals are active in the drive within 10ms.

The digital input signals are displaced in parameter **S-0-0134, Master control word**.

See section: Master Control Word"

Drive enable

The drive is activated via a 0-1 edge of the drive enable signal which is displayed in bit 15 of the master control word.

For the drive enable signal to be accepted, i.e., for the drive to switch from an off to an on state, the following conditions must be met:

- no drive error
- power section must be on

The drive displays **"Ab"** in this state. The diagnosis via parameter **S-0-0095, Diagnostic message** reads **A012 Control and power sections ready for operation**.

Once the drive enable is set, then the 7-segment display reads "**AF**". The diagnosis then shows the activated state, e.g., **A101 Drive in VELOCITY control**.

Drive Halt/Start

The signal is state-controlled and zero active, i.e., if the signal =0V then the drive is in "Drive Halt“. The input signal is displayed in bit 13 of the master control word.

Clear error

A 0-1 edge at error input starts the clear error command. By activating the clear error command, all drive errors are cleared.

Acknowledge drive enable

The drive acknowledges the drive enable in the drive status word Bits 14 and 15 change there from "10" (control and power sections ready to operate, torque free) to "11" (in operation, with torque), if drive enable is activated and accepted.

The duration between setting and acknowledging the setting of the drive enable equals that time that the drive needs to establish complete operational readiness. For example, an asynchronous motor uses this time to magnetize.

When removing the drive enable, the drive conducts the reaction parametrized in **P-0-0119, Best possible deceleration**. Here as well, this takes a certain length of time between resetting and acknowledging the reset. This depends on

- Setting in parameter **P-0-0119, Best possible deceleration**
- whether there is a motor brake and its parmetrization
- the velocity of the axis at the time of drive enable reset

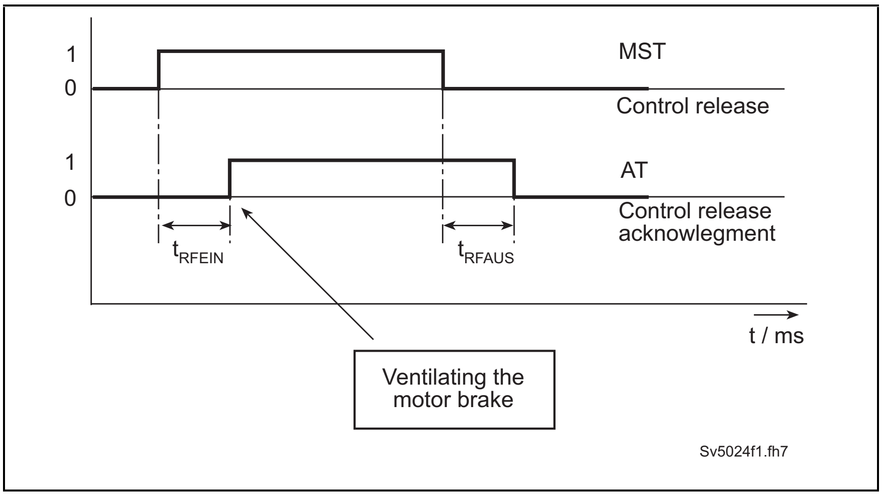


Fig. 5-1: Acknowledge drive enable

Typical values for t_{RFEIN} are about 10msec in synchronous and 300msec in asynchronous motors.

Note: During time tRFEIN the drive should set the command value so that a command sdpeed of 0 results. Any cooling of an existing motor brake does not occur until after the point in time when drive enable is acknowledged (tRFEIN + brake delay time).

Digital outputs

If there is a drive error, then bit 13 is set in parameter **S-0-0135, Drive status word**. The bit is output on digital outputs "A error“.

If there is a warning diagnosis, then this is displayed by setting digital outputs "A warning“.

5.4 Connecting Signals to DKCxx.3

See Project Planning Manual.

Section: Electrical connections unit type dependent.

Notes

6 Command Communication Using Parallel Interface

6.1 Overview

The DKC01.3 is outfitted with freely-configurable inputs and outputs in addition to the digital inputs of its basic unit (drive enable, drive halt/start, delete error).

The outputs are allocated by configuring the signal status word. Bits 0 through 9 are, in this case, the digital outputs of the parallel interface (X15/14 to X15/23).

The inputs are allocated by configuring the signal control word. Bits 0 through 9, in this case, are the digital inputs of the parallel interface (X15/1 to X15/10).

6.2 Pertinent Parameters

- **S-0-0144, Signal status word**
- **S-0-0145, Signal control word**
- **S-0-0026, Configuration list signal status word**
- **S-0-0027, Configuration list signal control word**
- **S-0-0328, Assign list signal status word**
- **S-0-0399, IDN list of configurable data in the signal control word**

6.3 Functional Principle

Configurable outputs

The signal status word in a DKC01.3 is generated every 2ms. Bits 0 - 9 are mapped on the parallel interface.

Allocation of signal status word to digital outputs:

Bit number in the signal status word	Digital output of the parallel interface
0	X15/14
1	X15/15
2	X15/16
3	X15/17
4	X15/18
5	X15/19
6	X15/20
7	X15/21
8	X15/22
9	X15/23

Fig. 6-1: Allocation of signal status word to digital outputs

See also section: "Configurable Signal Status Word"

Configurable Inputs

All inputs are digitally filtered. The read-in cycle takes 2ms. In other words, the filtering and probing results in a reaction time equal to a minimum of 1.5 and a maximum of 4ms.

The digital inputs of the parallel interface are mapped on bits 0-9 of the signal control word.

Allocation of signal control word to digital inputs

Bit number in the signal status word	Digital input of the parallel interface
0	X15/1
1	X15/2
2	X15/3
3	X15/4
4	X15/5
5	X15/6
6	X15/7
7	X15/8
8	X15/9
9	X15/10

Fig. 6-2: Allocation of signal control word to digital inputs

See also section: "Configurable Signal Control Word"

Application: Stepper Motor Mode with Parallel Interface

(See also section: "Operating Mode: Stepper motor Operations"

The parallel interface is needed to operate the drive as if it were a stepper motor. The inputs for the stepper motor signals are permanently allocated to the function. The inputs for jogging and referencing must be allocated accordingly.

Note: The command "Load base parameters“ configures the inputs as specified in the terminal diagrams.

Application: Positioning Block Mode with Parallel Interface

(See also section: "Positioning Block Mode"

The parallel interface is needed to operate the drive in positioning block mode. Positioning block select, jogging inputs, referencing input, the start input and outputs are configured with command "Load base parameters“ as per the terminal diagrams.

Positioning block select, start signal:

A positive edge at the start signal effects a toggling of parameter **S-0-0346, Setup flag for relative command values**. The inputs for the position block select are mapped on the parameter positioning block selection. By toggling parameter **S-0-0346, Setup flag for relative command values** the relevant positioning block is started.

Block select acknowledgment, In-Pos message: The acknowledgement of the block selection ensues as soon as the positioning block isset. The in-pos message is simultaneously updated.

Jogging input: Selecting the jogging inputs effects an internal switch to jogging mode. The switch can only be made every 8 ms which means that the reaction time to a jog input can equal up to 12 ms.

Application: Analog Main Spindle with Parallelinterface

(See also section:: "Spindle Positioning"

To operate as an analog unit with main spindle functions, the spindle positioning command can be allocated to an input. The main spindle messages must be allocated to the digital outputs.

Notes

7 Motor Configuration

7.1 Characteristics of the Different Motor Types

You can use the following motor types.

MHD	**LAF/LAR**
MKD/MKE	**LSF**
2AD/1MB/ADF	**MBS**
synchron kit motor	

The individual motor types differ in the following points:

- Availability of data memory in the motor feedback for all motorspecific parameters
- Synchronous motor - Asynchronous motor
- Linear motor - Rotary motor
- Temperature check can be changed or not.
- Basic load (load default) possible or not
- Motor encoder interface setting can be changed or one setting only
- Start of commutation offset setting command possible or not
- Motor temperature sensor with PTC or NTC features

The individual motor types have the following characteristics

Motor type	Motor feedback data memory	Sync./Async.	Temp. Check	Motor-encoder interface	Load default	Temp. Sensor
MHD/MKD/MKE	yes	synchronous	fixed	fixed (1)	possible	PTC
2AD/ADF	no	asynchronous	param.	param.	no	NTC
1MB	no	asynchronous	param.	param.	no	NTC
LAF/LAR	no	asynchronous	param.	param.	no	PTC
LSF	no	synchronous	param.	fixed (8)	no	PTC
2AD with PTC	no	asynchronous	param.	param.	no	PTC
MBS	no	synchronous	param.	param.	no	PTC

Fig. 7-1: Characteristics of the Motor Types part 1

Motor type	Value for P-0-4014:	Remarks to setting the motor type:	
MHD/MKD/MKE	1	automatic detection	
2AD/ADF	2	must be set	
1MB	3	must be set	
LAF/LAR	4	must be set	
LSF	5	automatic detection	
2AD with PTC	6	must be set	
MBS	7	must be set	

Fig. 7-2: Characteristics of the Motor Types part 2

Motor Feedback-Data Memory

The motor feedback data memory contains all motor-related parameters

For MHD, MKD and MKE motors, a motor feedback-data memory is provided, in which all motor-dependent parameters are stored. The drive controller recognizes this automatically and reads those parameters after turning on the device from the data memory with the command **S-0-0128, C200 Communication phase 4 transition check**.

The data memory contains values for the following parameters:

- **S-0-0109, Motor Peak Current**
- **S-0-0111, Motor Current at Standstill**
- **S-0-0113, Maximum Motor Speed (nmax)**
- **S-0-0141, Motor Type**
- **P-0-0018, Number of Pole Pairs/Pole Pair**
- **P-0-0051, Torque/Force constant**
- **P-0-0510, Moment of inertia of the rotor**
- **P-0-0511, Brake current**

Motor types without motor feedback memory necessitate that these parameters are input with initial start-ups using the data sheet.

Linear-Rotational

Depending on the setting of either rotary or linear motor, the units of measurement and the decimal places are changed by the parameters.

Depending on whether a linear or rotary motor is being used, changes in the units and the number of decimal places will be made by the parameters. The following table displays the differences in scaling of these parameters:

ID number:	Rotational:	Linear:
S-0-0100	0,1 As/rad	0,1As/m
S-0-0113	0,0001 RPM	0,0001 mm/min
S-0-0116	Cycles/Rev.	0.00001 mm
P-0-0018	Pole pairs	0,1mm
P-0-0051	Nm/A	N/A
S-0-0348	mAs²/rad	mAs²/mm

Fig. 7-3: Scaling in Linear or Rotary Motors

The selected motor type also affects the scaling of the position data.

For example, it is impossible to set rotary motor settings for linear motors and linear motor settings for rotary motors. This would generate the command error **C213 Position data scaling error** during a phase progression.

Synchronous-Asynchronous

Specific parameters are used only for synchronous motors, others only for asynchronous motors.

There are differences in the use and review of the parameters in the command **S-0-0128, C200 Communication phase 4 transition check**.

They are:

Synchronous:

- **P-0-4004, Magnetizing current** is set to 0
- **P-0-0508, Commutation offset** is checked for validity

Asynchronous:

- **P-0-4004, Magnetizing current** is initialized
- **P-0-0508, Commutation offset** is not checked

Temperature Monitoring

The switch-off limit for the motor temperature check is fixed at one point for MHD-, MKD, MKE motors.

The following parameters are used to monitor the motor temperature : :

S-0-0201, Motor warning temperature

S-0-0204, Motor shutdown temperature

For MHD, MKD and MKE motors, the parameter default values are:

S-0-0201, Motor warning temperature = 145,0°C

S-0-0204, Motor shutdown temperature = 155,0°C

Those default values can be used to help set the parameters for all other motor types. However, you must ensure that the switch-off limit is not set higher than the maximum permissible temperature of the motor.

The maximum input value for **S-0-0201, Motor warning temperature** is **S-0-0204, Motor shutdown temperature**.

If the temperature of the motor exceeds the value in **S-0-0201, Motor warning temperature**, the warning message **E251 Motor overtemp. prewarning** is generated.

If the temperature rises to the motor switch-off temperature, the error message **F219 Motor overtemp. shutdown** is displayed.

The minimum input value for **S-0-0204, Motor shutdown temperature** is **S-0-0201, Motor warning temperature**.

To display the motor temperature, the parameter **S-0-0383, Motor Temperature is used.**

The drive controller checks for proper functioning of the motor temperature monitoring system. If discrepancies occur (temperature drops below -10 degrees), the warning **E221 Warning Motor temp. surveillance defective** will be displayed for 10 seconds. After that, the error message **F221 Error Motor temp. surveillance defective** is generated.

Load Default Feature

MHD, MKD and MKE motors have a data memory in their feedbacks. The data memory contains a set of default control parameters in addition to all motor-dependent parameters.

These parameters are activated with the load default feature.

(See also "Load Default"

7.2 Setting the Motor Type

The setting of the motor type is done either:

- automatically by reading the motor feedback memory, or
- through the input of the parameter **P-0-4014, Motor Type.**

This depends on the motor type used.

The motor type should be set before start up because the motor type affects the following drive functions:

- a data memory in the motor feedback for all motor-specific parameters
- synchronous motor / asynchronous motor
- linear motor - rotary motor
- temperature monitor can be parametrized or not
- load base value function is possible or not
- motor encoder interface is parametrizable or permanently set
- start of commutation offset setting command possible or not
- motor temperature sensor or with PTC or NTC features

Automatic Setting of the Motor Type for Motors with Feedback Memory

MHD, MKD and MKE motors have a motor feedback data memory, in which the motor type is stored (along with other information). The drive controller recognizes these motor types automatically and the following is executed:

- the value of the parameter **P-0-4014, Motor Type** is set to its proper value and will be write-protected.
- the value of the parameter **P-0-0074, Interface Feedback 1** is set to the defined value for the corresponding motor type.
- all bits except bit 6 are set for absolute/not-absolute to "0" in the parameter **S-0-0277, Position feedback 1 type parameter**.
- all motor-dependent parameters are read out of the motor feedback data storage (see Motor Feedback-Data Memory). The parameter in the motor feedback memory are set with parameter block number 7. These are fetched and copied into the relevant parameters with parameter block number 0.
- the value of **S-0-0201, Motor warning temperature** will be set to 145,0°C, and the **S-0-0204, Motor shutdown temperature** will be set to 155,0°C.
- The value of **P-0-0525, Type of motor brake** is set to "0". The value of **P-0-0526, Brake control delay** is set to 150 ms.

This procedure is followed right after switching on as in the command **S-0-0128, C200 Communication phase 4 transition check**. The command error message, **C204 Motor type P-0-4014 incorrect**, will be generated in case an MHD, MKD and MKE motor is selected in **P-0-4014, Motor type** but the corresponding character sequence cannot be found in the motor feedback data memory.

Setting of the Motor Type through P-0-4014, Motor Type

For motors without motor feedback data memory, you have to set the motor type through **P-0-4014, Motor type**.

See also chapter: Characteristics of the Different Motor Types"

7.3 Asynchronous Motors

With the Firmware, you can use asynchronous motors in the entire rpm range, including constant power range.

In addition to the general motor parameters, you have to set the following asynchronous motor parameters for specific motors according to the Indramat default:

- **P-0-4004, Magnetizing current**
- **P-0-4012, Slip factor**
- **P-0-0530, Slip Increase**
- **P-0-0531, Stall Current Limit**
- **P-0-0533, Flux Loop Prop. Gain**
- **P-0-0534, Flux Loop Integral Action Time**
- **P-0-0535, Motor voltage at no load**
- **P-0-0536, Motor voltage max.**

The user has one additional parameters to adjust the drive to his requirements.

- **P-0-0532, Premagnetization factor**

Basics for the Asynchronous Motor

Asynchronous motors are divided in three working ranges.

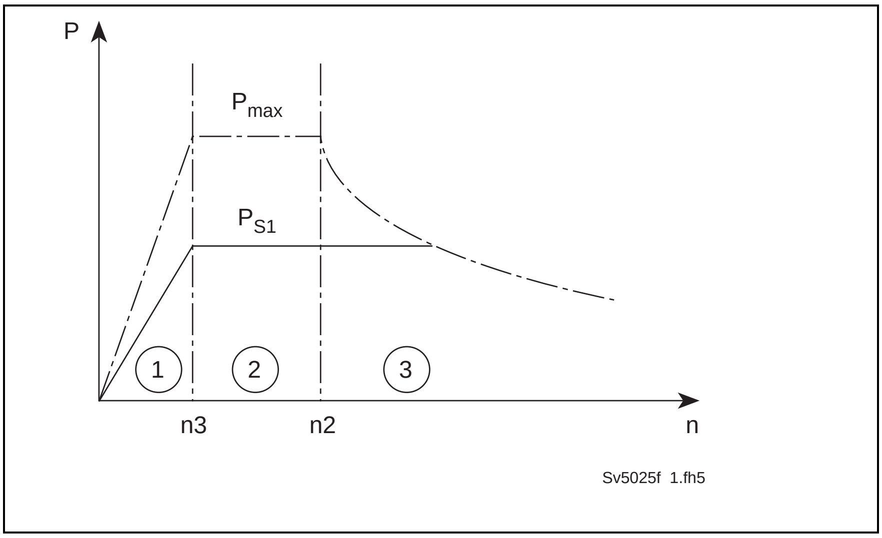


Fig. 7-4: Subsections of Work Ranges

Section 1:

The **Basic RPM Range** is defined by a constant torque and a fixed torque/force constant (parameter P-0-0051). In idle, the programmed magnetization current flows. The motor voltage is less than the maximum control output voltage. The corner RPM n1 is directly proportional to the DC bus voltage.

Section 2:

Range of Constant Power. The motor voltage is constant; the idle voltage and the corresponding magnetization and torque constants fall with increasing velocity. The slip is increased correspondingly.

The adjustment of magnetization current and slip is executed automatically by the vector control. The voltage is decreased during idle to the motor idle voltage (P-0-0535), and when fully in use it is increased to the maximum motor voltage (P-0-0536).

Section 3:

Range of decreasing Peak Power. The motor works at the sweep limit; an actual sweep is eliminated with the vector control. According to the parameter "sweep current limit," the peak current will be decreased enough so that the maximum power cannot be exceeded. An increase in current would lead only to wasted power and reduced shaft power. The peak power in range 3 is proportional to the square of the DC bus voltage. It is ensured that the maximum power always is reached for each DC bus voltage without parameter adjustment.

The power in range 3 cannot be extended through the use of more powerful controllers.

Torque Evaluation

In contrast to the RAC, 100% torque is not the peak value, but the motor set value according to the ID plate. Since the peak torque of asynchronous motors is limited to 2.5 times of the set value, you can reach torques up to 250%.

The significance of the torque values changes in the field-weakening range since the torque in the controller is set equal to the torque-producing current Iq. The torque, however, is the product of Iq and air gap induction, which decreases in the field-weakening range.

The assignment of the torque values in the different velocity ranges is displayed in the following picture:

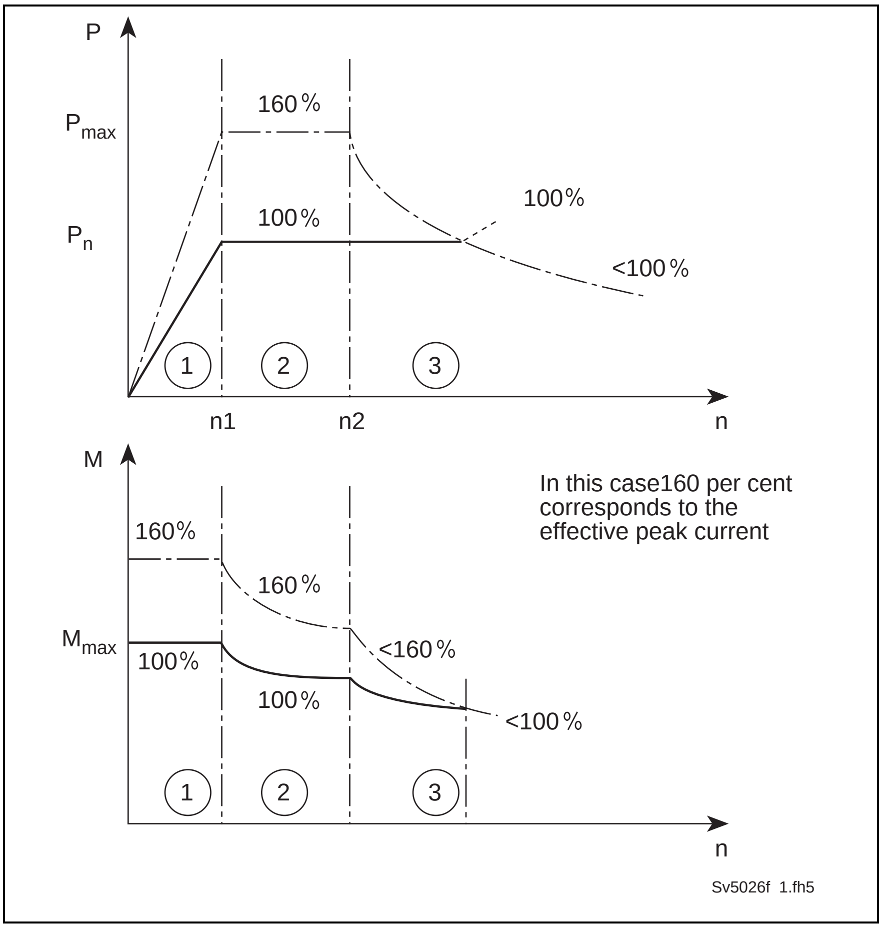


Fig. 7-5: Torque assignment

In range 1, the torque value is the actual torque. 100% = rated torque.

In range 2, the torque value is equal to the power.
100% = rated power according to selection list. (The rated power of the motor rating plate is not relevant here since it could relate to another DC bus voltage.)

Range 3 is similar to the evaluation of range 2, except that the preset torque decreases in correspondence to the increasing velocity of the peak power. For high velocity, the maximum torque value can drop below 100%.

In braking mode, you can reach 50% higher torque values in this range than in driving mode.

User-defined Settings for the Asynchronous Motor

To operate an asynchronous motor, you have to set the specific motor parameters in the controller. The Parameters are stored in the Parameterstorage and are therefore transferable to another controller.

Note: Motor-specific parameters are used by all controls in the same manner. The resulting power characteristics curve depends on the current and especially on the DC bus voltage. Several additional parameters are available so the user can optimize the drive to his requirements.

Scaling Factor Pre-Magnetizing

With the pre-magnetizing scaling factor (P-0-0532), you can set the active magnetization current.

The following applies:

Effective magnetization current = magnetization voltage • scaling factor pre-magnetizing

Fig. 7-6: Calculation of the Effective Magnetization Current

If the pre-magnetizing scaling factor is at 100%, the motor is completely magnetized. There is a linear connection between set current and torque according to the torque constant P-0-0051. The torque builds up without delay. The drive has perfect servo properties.

The disadvantages are the high iron loss and the higher noise level in idle and in work mode, especially at 4kHz switching frequency, when the full magnetization current is flowing. For main spindle applications, it has proven successful to reduce the pre-magnetizing scaling factor to 50%. Through this procedure, the motor stays cooler and is not as noisy, while peak power is maintained. The extended start control time (only for jumps that exceed half the peak torque) and the missing linearity of torque and voltage do not distort the main spindle drives.

The qualitative connection between the pre-magnetizing scaling factor and drive behavior is displayed in the following graphic:

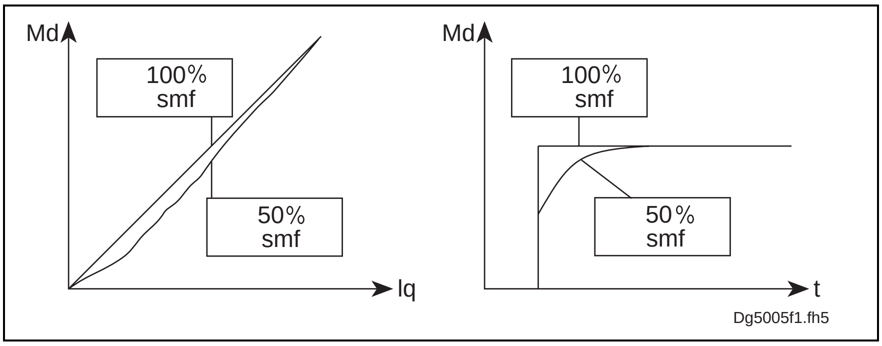


Fig. 7-7: Connection of pre-magnetizing scaling factor and drive behavior

The torque buildup is delayed by about 200ms during pre-magnetizing because the air gap range can only increase slowly in relation to the rotor time constant.

By reducing the pre-magnetizing scaling factor, you can achieve a better synchronous operation (in the one-thousandth degree range). This will reduce distorted torques, which result from saturation effects in the motor and from unavoidable deviations from an ideal sine form. To keep the torque linear in this case, the slip factor must be increased in the same measure at which the pre-magnetizing scaling factor was decreased. Warning: Torque constant, continual torque and peak torque are reduced!

Example: The synchronous operation should be improved in a servo drive. The pre-magnetizing scaling factor is set to 40%, and the slip factor is set to 2.5 times of the original value. The continual and peak torque decrease to approximately 40%. The reference speed increases to 2.5 times the velocity.

7.4 Synchronous Motors

With this drive firmware it is possible to operate not only Indramat motors with housing such as

- MHD and
- MKD and MKE motors

but also rotary and linear synchronous kit motors such as MBS and LSF. INDRAMAT motors with housing have a stator, rotor, bearings and feedback already built in. They have motor feedback memory in which

- motor parameters
- motor feedback parameters
- synchronous motor-specific parameters and
- default control parameters

are stored. This motors are recognized by the firmware and all settings automatically instituted. With these motors the alignment between the physical rotor positon and the position as supplied by the feedback has been performed at the factory prior to delivery. The resulting offset is stored in parameter **P-0-0508, Commutation offset** in the motor feedback memory (synchronous motor specific parameters).

INDRAMAT motors with housing configured at the factory

This motors can, therefore, immediately be operated without the need for motor-specific settings.

In the case of synchronous kit motors, additional settings must be made at the time of commissioning.

These are:

- motor parameters must be input and
- commutation offset must be determined.

To input the motor parameters, a data sheet from the motor manufacturer can be used. The commutation offset, on the other hand, is determined with the help of command **P-0-0524, Commutation adjustment command.**

WARNING

Error in the control of motor and moving elements.

⇒ Determining the commutation offset must be conducted each time after there has been a change in the mechanical relationship between motor feedback and motor. This is the case, for example, when the encoder or motor are replaced.

Determining the commutation offset

A condition for a chronologically constant torque of the synchronous machine is a fixed allocation between the stator current vector and the vecot of the rotor flow. If the angle between these two vectors, hereinafter termed γ equals 90°, then the motor will generate its maximum torque. A synchronous motor is operated in this state.

In order to set the stator current vector correctly, the data on γ is needed. This generally necessitates a measuring system which can supply absolute information about this angle. Once the measuring system is mounted to the motor, only the absolute raw position is at first available. The difference between raw positon and absolute angle of rotor and stator field is designated the commutation offset. This is stored, if available, in the motor feedback data memory in parameter **P-7-0508, Commutation offset**.

If this parameter is to be determined, then the commutation setting function must be activated. The following two parameters are intended for this purpose:

- **P-0-0523, Commutation, probe value**
- **P-0-0524, Commutation adjustment command**

Two different processed have been implement. These are:

- mechanical reference between rotor and stator is entered in P-0-0523 and then commutation offset is computed while command P-0-0524 is executed.
- Automatic determination of the commutation offset by switching defined stator current vector on with accompanying automatic measurement.

Which process is used at the state of the **P-0-0524, Commutation adjustment command** depends on the type of motor which has been mounted. It thus applies:

Motor type	Process
LSF (synchronous linear)	reference between rotor and stator is measured (see item 1)
MBS (synchronous rotary)	automatic determination (see item 2)

Fig. 7-8: Setting the commutation offset

Note: To successfully conduct the command, the motor measuring system must be completely operable. The rotational direction of the measuring system must also be set! (See chapter: "Motor Encoder"

Determining the commutation offset in rotary synchronous motors (MBS)

With rotary synchronous motors, the commutation offset is determined by switching into a defined stator current vector. The rotor moves into a torque free positioin. If the unadulterated position of this torque-free position is measured, then the commutation offset can be determined therefrom. This procedure is repeated several times at various positions. The mean value of these measurements equals the commutation offset.

The torque-free position cannot be reached due to extremely friction in the system, then command error

- **D301 Drive not ready for commutation command**

is generated.

Th chronological sequece of stator current and relevant angle is illustrated below.

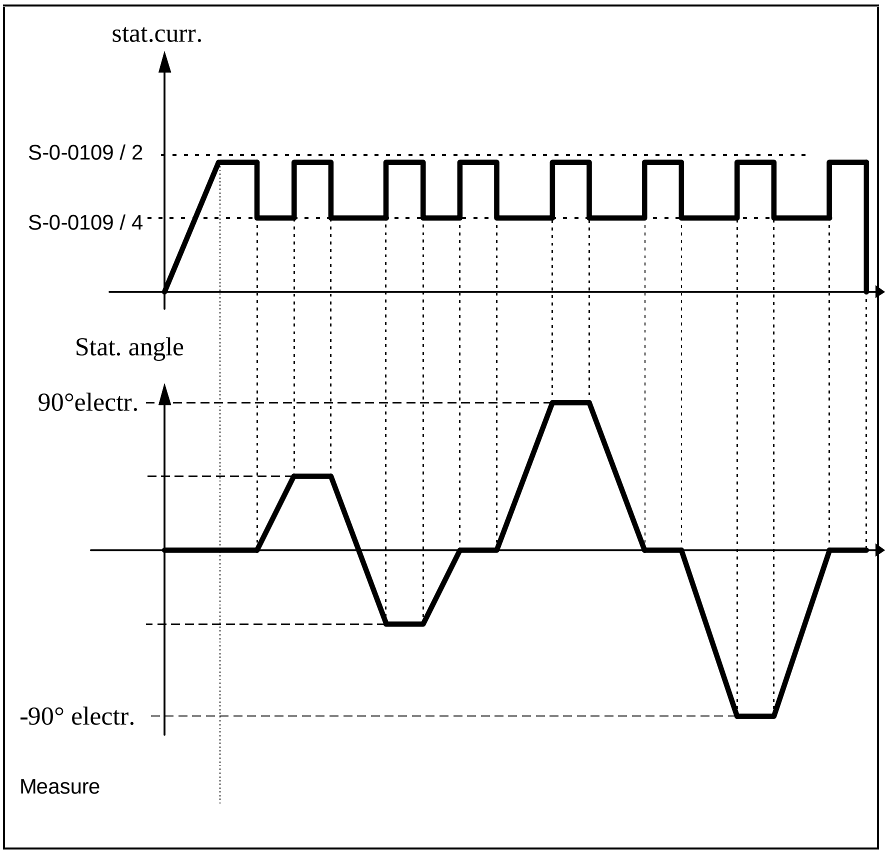


Fig. 7-9: Current and position upon execution of commutation offset determinatino in MBS motors

At command start, the drive must be in mode torque control. If not, then command error

- **D301 Drive not ready for commutation command**

is generated.

In order to be able to re-establish the relationship between motor encoder and rotor after power voltage is switched back on, only those motor encoders are permitted with have an absolute positoin of at least equal to one pole pair. The following input values for parameter **P-0-0074, Feedback type 1** are permitted:

Possible values for P-0-0074, Feedback type 1 with motor type MBS (rotary synchronous kit motor)	Motor encoder interface
1	DSF or resolver with feedback data storage
8	Heidenhain encoder with Endat Interface
10	Resolver without feedback data storage *)
11	Resolver + incremental encoder with sine signals without feedback data memory *)

Fig. 7-10: Possible motor encoders with motor types "rotary synchronous kit“

Note: *) This motor encoder type has no feedback data memory. Commutation offset is therefore stored in parameter **P-0-0508, Commutation offset** in the programming module. Upon replacement of the module, the value of parameter **P-0-0508, Commutation offset** must be re-entered or the parameter must be stored and loaded out of the previous module.

Determining the commutation offset in linear synchronous motors (LSF)

The commutation offset in linear synchronous motors (LSF) is fixed by measuring the distance between front end of primary part and setting device of the secondary part. This value plus the motor type dependent primary nominal value is entered in parameter **P-0-0523, Commutation, probe value.** Then the command **P-0-0524, Commutation adjustment command** is started. The drive computes the commutation offset from the measured value. To successfully conduct the command, the following conditions must be met:

- The direction of movement of the measuring system must be set so that if the primary part is moving towards the front end at which the power cable of the motor branches off (front end 1, see picture 2), then **S-0-0051, Position feedback 1 value** is moving in a positive direction. (With inverted position polarity!) If this is not the case, then the direction of movement of the motor encoder must be inverted. Do this in bit 3 of **S-0-0277, Position feedback 1 type.**
- The power cables of the motor must be correctly connection (three phases must be assigned).
- The drive must be in **A013 Ready for power on.**
- A characteristic value, K_{entire}, for the primary part of the motor must be determined.

If these conditions have been met, then the distance between front end 2 of the primary part of the setting device (d) can be measured and this value plus the primary part characteristic value K_{entire} can be entered in P-0-0523. Front end 2 means the front end opposite the end where the power cables of the motor emerge.

$$\text{P-0-0523} = d + K_{entire}$$

P-0-0523: value determined for parameter P-0-0523
d: measured distance between front end of primary part and setting device
K_{entire}: primary part characteristic value

Fig. 7-11: Determining the measured value of the commutation offset setting in LSF motors

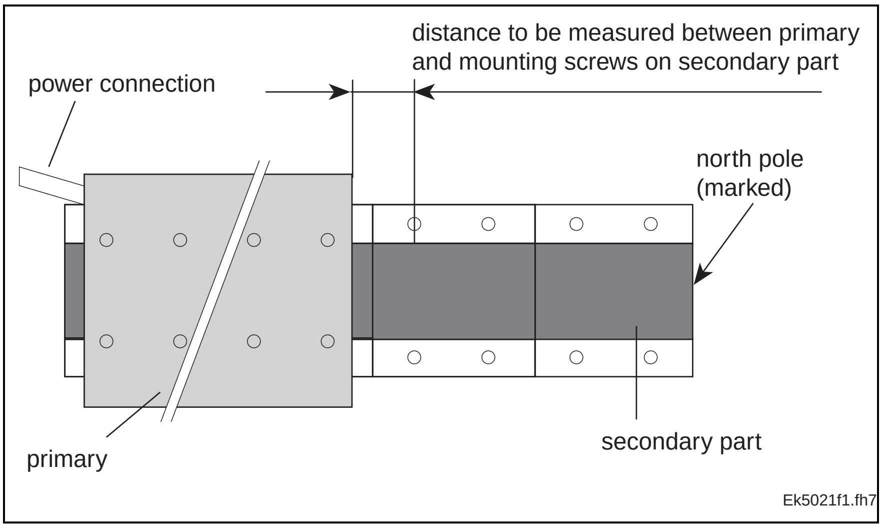


Fig. 7-12: Overview of determining the commutation offset in LSF

Finally, the command **P-0-0524, Commutation adjustment command** is started. The commutation offset is computed during this process.

At command start, the drive must be **A013 Ready for power on.** If not, then command error

- **D301 Drive not ready for commutation command**

is generated.

The command must be cleared when all is completed!

7.5 Motor Holding Brake

A motor holding brake can be mounted via a potential-free contact built into the drive controller . It prevents unwanted axis movements when the drive enable signal is off.

Note:	The holding brake is not a working brake. It wears down after about 20,000 motor revolutions if the brake is closed.

To set the motor holding brake, use parameters

- **P-0-0525, Type of motor brake**
- **P-0-0526, Brake control delay**

The parameters for the motor holding brake are automatically set in motors with motor feedback data memory

These are automatically set in MHD, MKD and MKE motors. For all other motor types, the values which must be entered are specified in the data sheet of the motor or the motor brake.

Setting the Motor Brake Type

It it set in **P-0-0525, Type of motor brake** whether it is a self-holding (MHD, MKD or MKE motor) or a self-releasing brake.

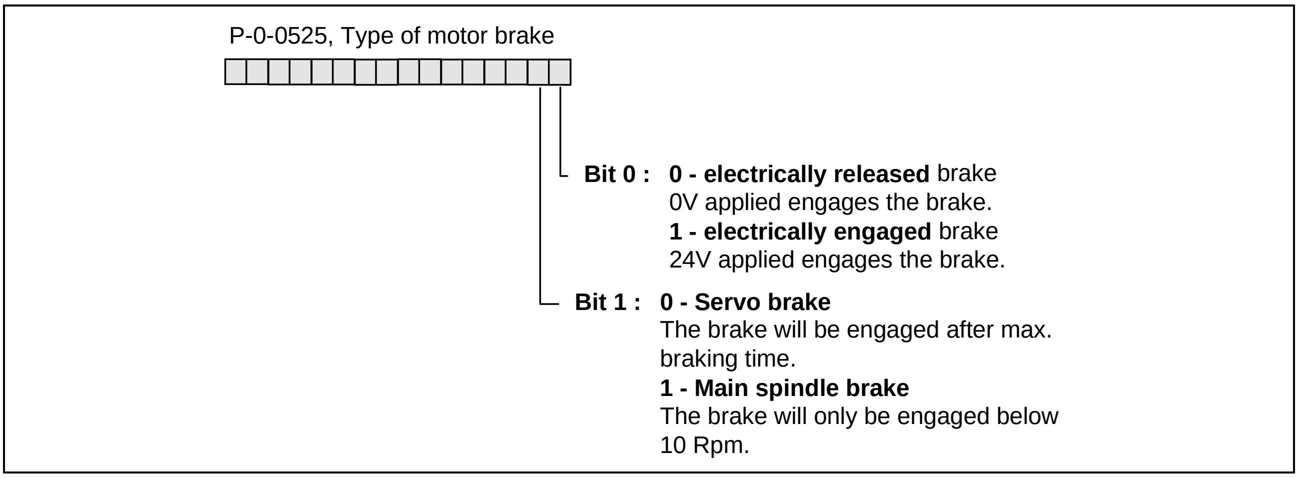


Fig. 7-13: Setting the motor brake type

Setting the Motor Brake Integral Action Time

In **P-0-0526, Brake control delay** it is necessary to set the time that the motor brake control needs to actually apply the brake.

A standard value for the direct connection of holding brakes of Indramat motors equals 150msec.

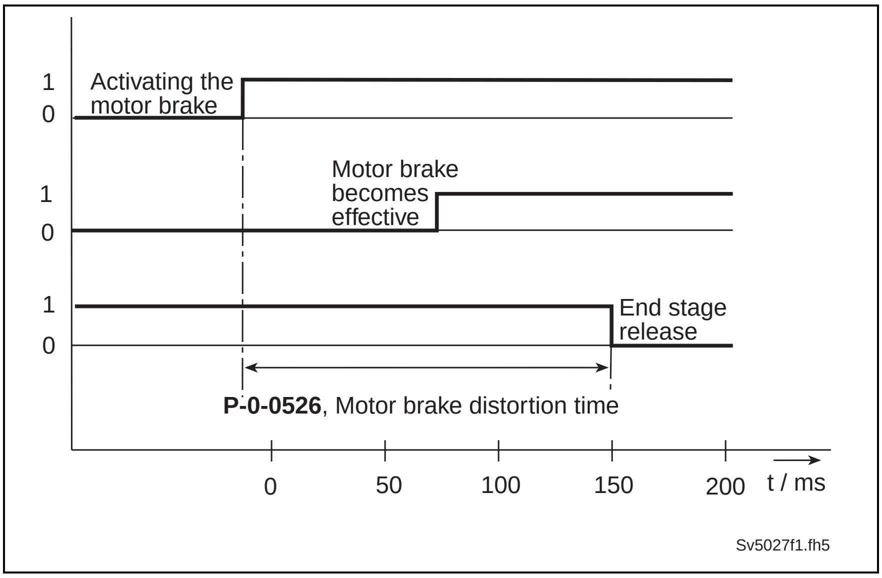


Fig. 7-14: Setting motor brake integral action time

Connecting the Motor Holding Brake

See relevant Project Planning Manual for details.

8 Operating Modes

8.1 Setting the Operating Mode Parameters

With the help of the parameters:

- **S-0-0032, Primary Mode of Operation**
- **S-0-0033, Secondary Operating Mode 1**
- **S-0-0034, Secondary Operating Mode 2**
- **S-0-0035, Secondary Operating Mode 3**

4 different operating modes can be preselected simultaneously.

Bits 8 and 9 of the master control word define which of the four modes will be operative. The operation can be switched between the 4 operating modes.

The operating modes can be preselected in parameters S-0-0032..35. The operating modes can be selected by entering a bit code.

Certain positions are fixed in this bit list.

In bit 3, you can choose between working with position control with or without lag.

The following applies:

Bit 3 = 0 position control with lag

Bit 3 = 1 position control without lag

In the parameter description, you will find for the parameters listed above an overview of the possible input values for the bit arrays.

8.2 Determining the Active Operating Mode

Bits 8 and 9 in the master control word determine which of the 4 preselected operating modes will be active.

Bit 8 and 9 in the master control word:	Active operating mode:
0 0	Primary mode of operation
0 1	Secondary mode of operation 1
1 0	Secondary mode of operation 2
1 1	Secondary mode of operation 3

Fig. 8-1: Determining the Active Operating Mode

If 0 is entered in the operating mode parameters and the operating mode is activated, then the error **F207 Switching to uninitialized operation mode** will be generated.

8.3 Operating Mode: Torque Control

In operating mode **torque control** the drive is set with a torque command value. The diagnosis with an active mode reads **A100 Drive in TORQUE control** .

The command value is set in parameter **S-0-0080, Torque/Force command**.

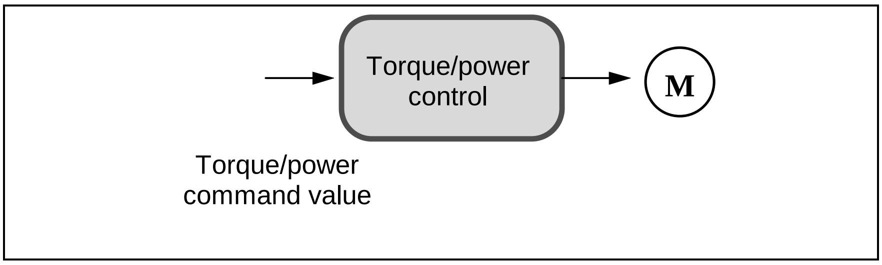


Fig. 8-2: Block diagram of torque control

Pertinent Parameters

- **S-0-0080, Torque/Force command**
- **P-0-4046, Active peak current**
- **P-0-0176, Torque/Force command smoothing time constant**

Torque Control

The command value in **S-0-0080, Torque/Force command** is limited with the effective peak current **P-0-4046, Active peak current**. This current is based on the current and torque limits.

(See section: "Current Limit"and Torque Control"

The limited torque command value is filtered through a filter of the 1^{st} order. The time constant of the filter is set in parameter **P-0-0176, Torque/Force command smoothing time constant**.

After limiting and filtering, the effective torque-generating command value is generated. It is the command value for the effective current control.

Using „Analog output of predefined signals“ the effective command current analog can be output.

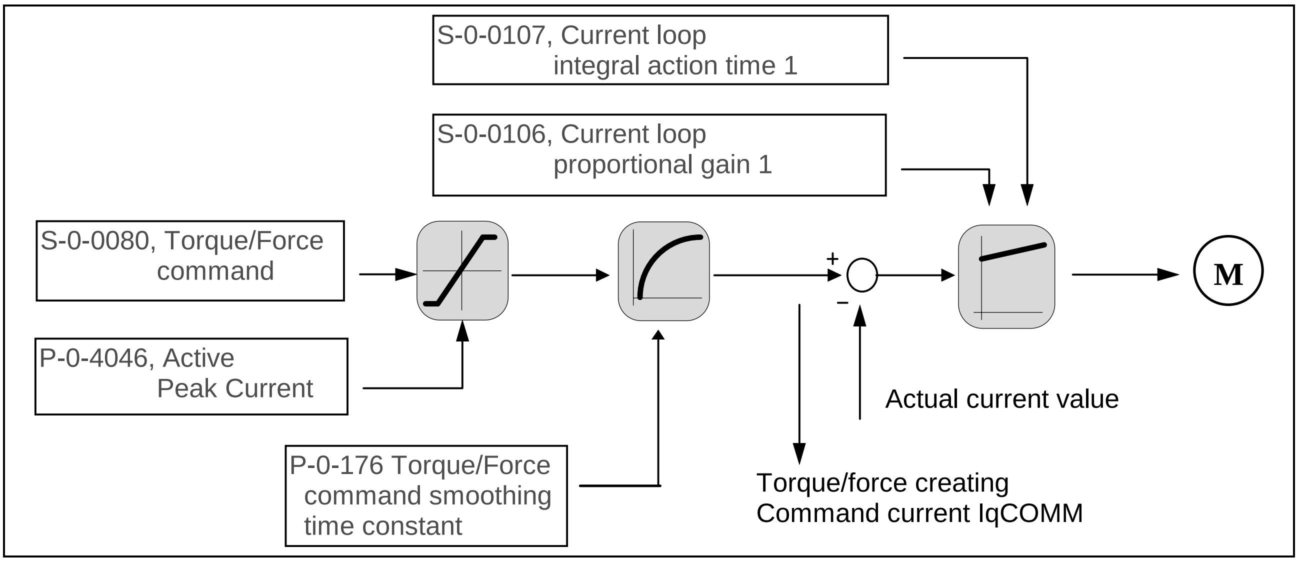


Fig. 8-3: Torque control

The torque command value can also be set analog. The signal selection of analog channel 1 in parameter **S-0-0080, Torque/Force command** must be parametrized first to do so.

Diagnostic Messages

Operating mode-specific monitors are

- Monitoring actual velocity for a 1.125 fold value of parameter **S-0-0091, Bipolar velocity limit value**.

(See section: "Limiting to Bipolar Velocity Limit Value"

If this value is exceeded, then error **F879 Velocity limit S-0-0091 exceeded** is generated.

8.4 Operating Mode: Velocity Control

A velocity value is commanded to the drive in the **Velocity Control** operating mode. The velocity command value is limited with ramps and a filter. The diagnostic message reads **A101 Drive in VELOCITY control** when the operating mode is active.

The command values are specified in the parameters **S-0-0036, Velocity command value** and **S-0-0037, Additive velocity command value**.

Pertinent Parameters

- **S-0-0037, Additive velocity command value**
- **S-0-0036, Velocity command value**
- **S-0-0091, Bipolar velocity limit value**
- **P-0-1201, Ramp 1 pitch**
- **P-0-1202, Final speed of ramp 1**
- **P-0-1203, Ramp 2 pitch**
- **P-0-1222, Velocity command filter**

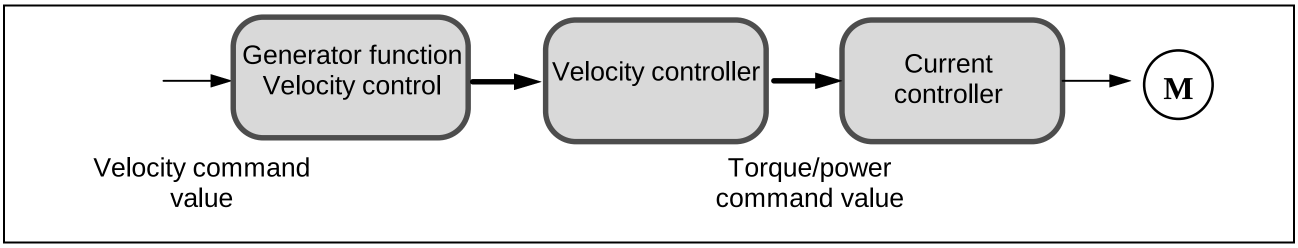


Fig. 8-4: Velocity control block diagram

Generator function Velocity control

The given **S-0-0036, Velocity command value** is limited to **S-0-0091, Bipolar velocity limit value**. Is the command value higher the message **E263 Velocity command value > limit S-0-0091** is shown. The command value is then accel limited via **P-0-1201, Ramp 1 pitch**. If command velocity exceeds the velocity in parameter **P-0-1202, Final speed of ramp 1,** then the command value is accel limited in terms of value **P-0-1203, Ramp 2 pitch**. The limit velocity command is jerk limited by means of a filter of the 1st order (**P-0-1222, Velocity command filter)**.

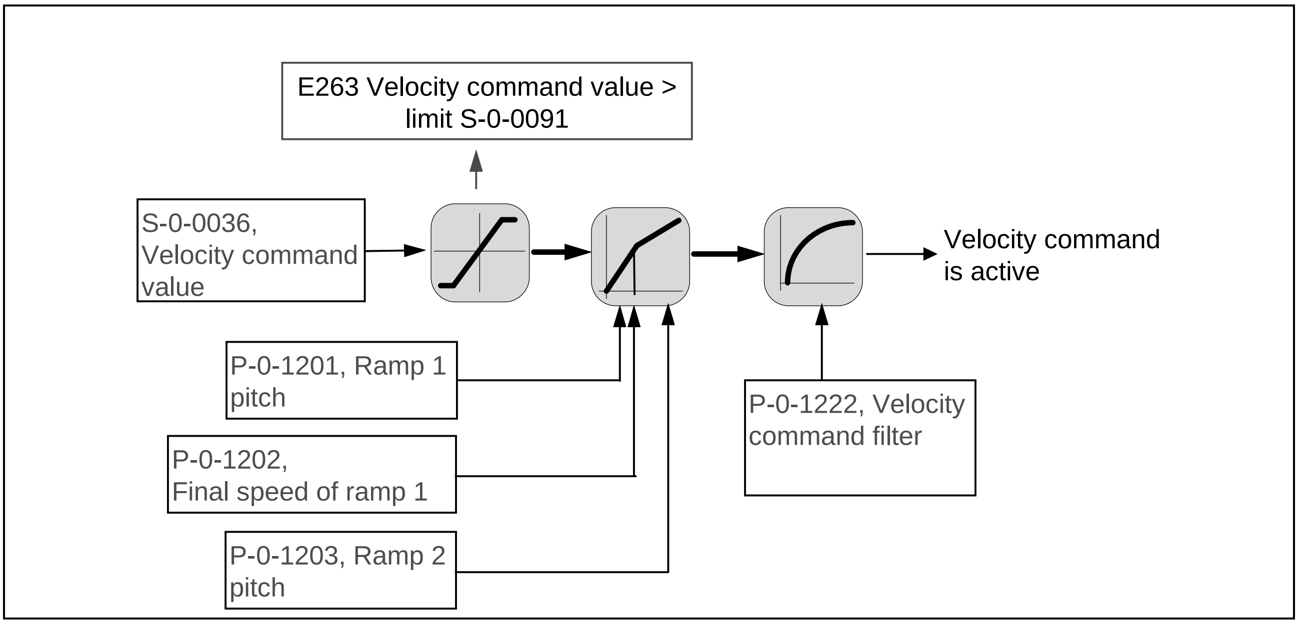


Fig. 8-5: Generator Function: Velocity Controller

See also chapter: "Velocity Controller"

See also chapter: "Current Controller"

Velocity Controller

The effective velocity command value is added with **S-0-0037, Additive velocity command value**.

Further he is limited to **S-0-0091, Bipolar velocity limit value**.

(See also chapter: "Limiting to Bipolar Velocity Limit Value"

If the resulting command value is at the limit, the warning **E259 Command velocity limit active** is displayed.

The velocity control difference is produced by including the actual velocity in the control loop. The raw feedback velocities of the motor and, if available, the external encoder can be combined into an effective actual velocity value. (See also chapter: " Setting the Velocity Mix Factor"

Via **P-0-0004, Velocity loop smoothing time constant** you can limit the band of the control difference for the current controller.

This variable is then relayed to the current and toqrue limits.

(See also chapter: " Current Limit" and Torque/Force Limitation"

To filter mechanical resonance frequencies, a notch filter can be applied to this torque/force command value. Using parameter **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop** the frequency range which must be suppressed and be parametrized.

(See also "Setting the Velocity Controller"

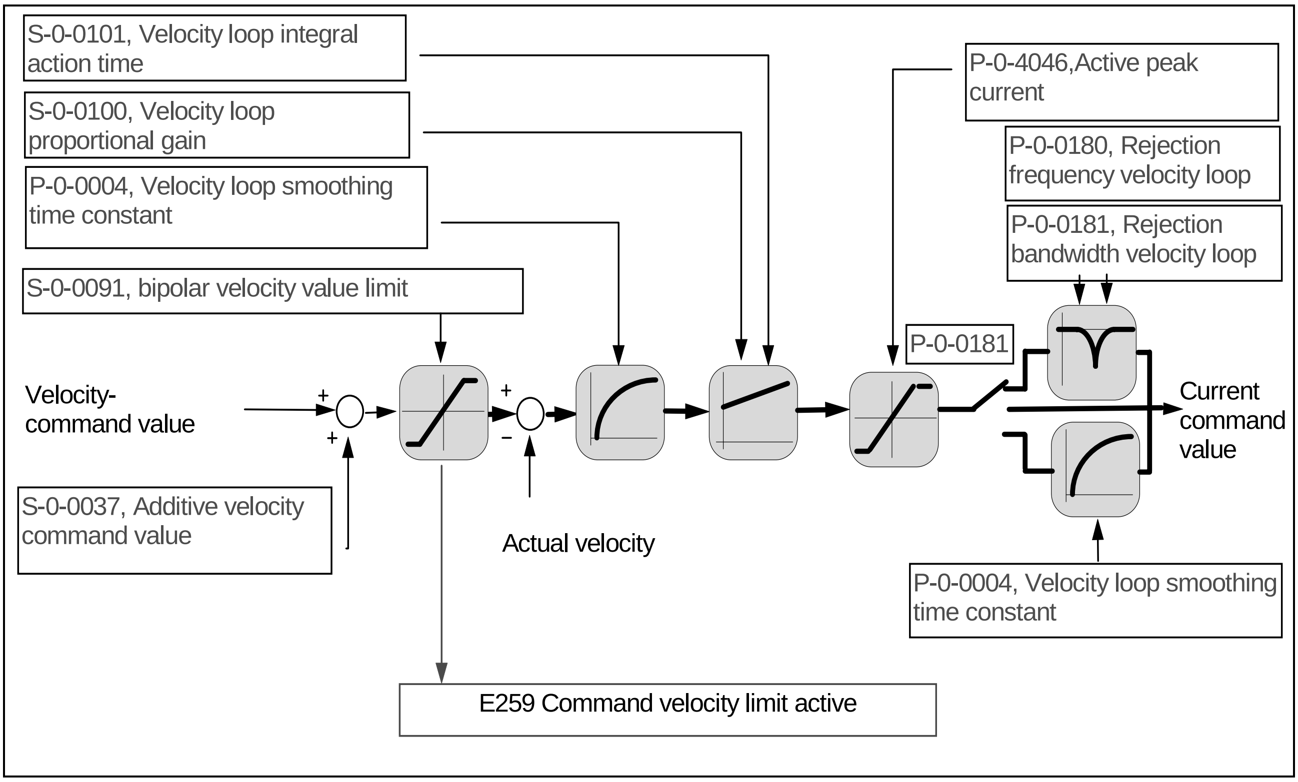


Fig. 8-6: Velocity Controller

See also chapter: "Generator function Velocity control"

See also chapter: "Current Controller"

Current Controller

The current controller is parameterized with **S-0-0106, Current loop proportional gain 1** and **S-0-0107, Current loop integral action time 1**.

(See also chapter: "Setting the Current Controller")

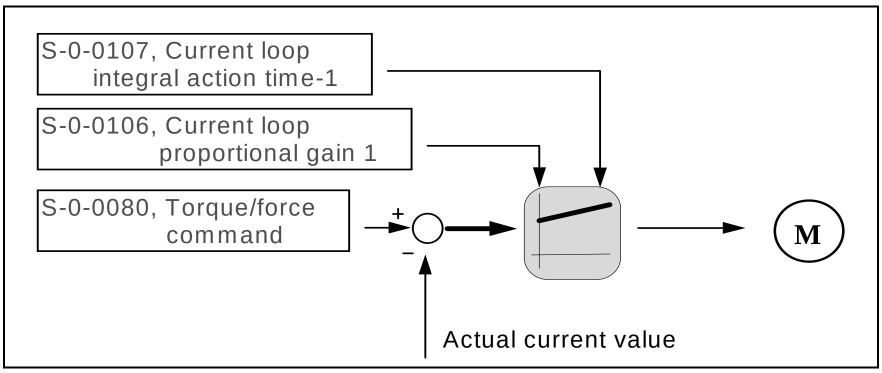


Fig. 8-7: Current Controller

Hardware

The velocity command can also be set via analog inputs. Only analog channel 1 should be used (probe time). Parameter **P-0-0212, Analog inputs, IDN list of assignable parameters** must indicate parameter **S-0-0036, Velocity command value**.

Diagnostic Messages

Operating mode specific monitors are

- **E259 Command velocity limit active**
  If the resulting command value is in the limit, then warning **E259 Command velocity limit active** is displayed.

E263 Velocity command value > limit S-0-0091 .
Parameter **S-0-0036, Velocity command value** is set to the value of parameter **S-0-0091, Bipolar velocity limit value**. The warning **E263 Velocity command value > limit S-0-0091** is generated**.**

8.5 Operating Mode: Position Control

A position value is commanded to the drive every NC-cycle time in the **Position Control** operating mode. When this mode is activated, the diagnostic message is one of the following:

- **A102 Position Control Encoder 1**
- **A103 Position Control Encoder 2**
- **A104 Position Control Encoder 1 Lagless Positioning**
- **A105 Position Control/ Encoder 2 / Lagless Positioning**

The command value is specified in the parameter **S-0-0047, Position Command Value** .

Monitors specific to this operating mode are:

- Monitoring the command velocity at the value of the parameter **S-0-0091, Bipolar Velocity Limit Value**.

If this value is exceeded, the error **F237 Excessive position command difference** is generated.

The command value specified in **S-0-0047, Position Command Value** is interpolated within the NC cycle time and is then given to the position controller.

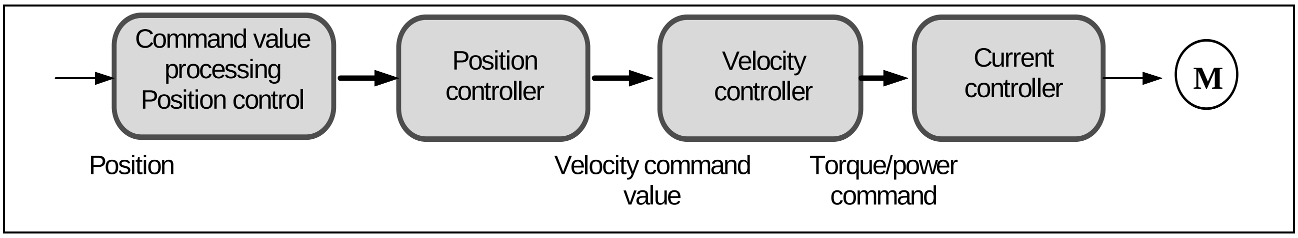


Fig. 8-8: Position control block diagram

Command value processing: Position Control

A command velocity is formed from two successive position command values. The **S-0-0001, NC Cycle Time (TNcyc)** acts as the time base.

The instructions for calculating the command velocity are as follows:

$$Vcommand = \frac{Position\ command\ value(k) - Position\ command\ value(k-1)}{S-0-0001}$$

Vcommand: Command velocity

Fig. 8-9: Calculating the command velocity

This velocity is monitored to see if it exceeds **S-0-0091, Bipolar Velocity Limit Value** (see also chapter: Position Command Value Monitoring". If S-0-0091 is exceeded, the error F237 Excessive position command difference is genereted.

The commanded position profile can be filtered with the parameter **P-0-0099, Position command smoothing time constant**.

The position loop is closed every 250 µs. The position command value is also fine interpolated within the NC cycle time.

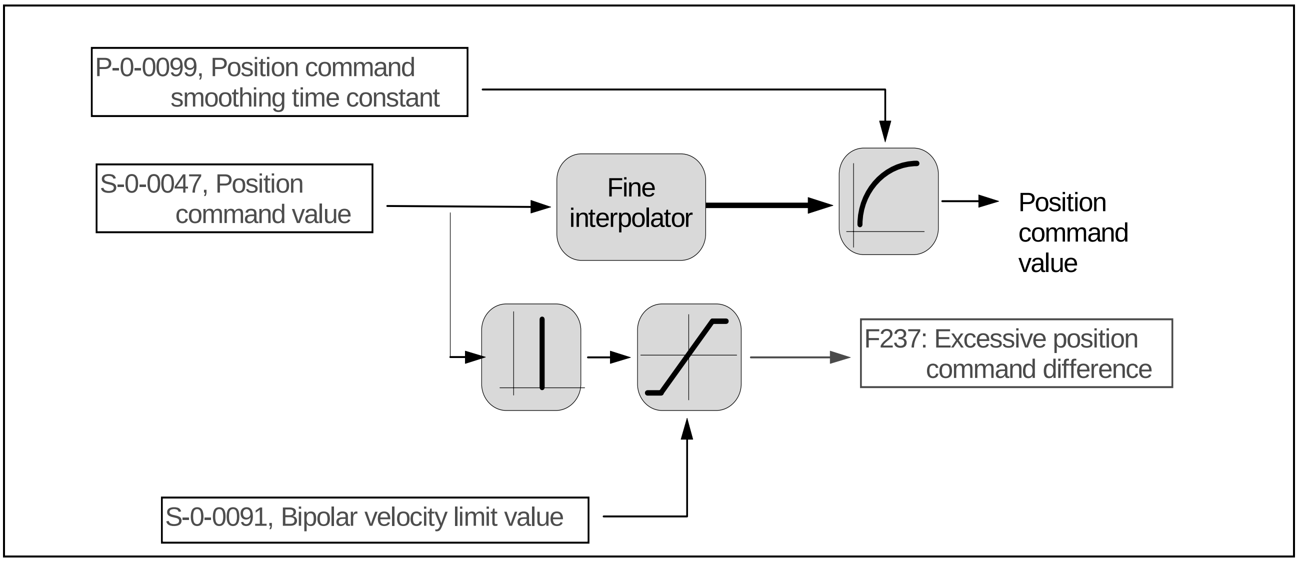


Fig. 8-10: : Command value processing: position control

See also "Current Controller"

See also "Velocity Controller"

See also "Position Controller"

Position Controller

The position controller error is computed from the effective position command value from the generator function of the active operating mode and the actual position value (encoder 1 or encoder 2) used for the controller.

This is given to the position controller, whose control gain is set with **S-0-0104, Position Loop Kv-Factor** .

Bit 3 in the operating mode parameters (S-0-0032..35) indicates if positioning should be subject to the following errors.

With lagless position control, an acceleration feed forward component can be included with parameter **S-0-0348, Acceleration Feedforward prop. Gain**.

(See also"Setting the Acceleration Feed Forward"

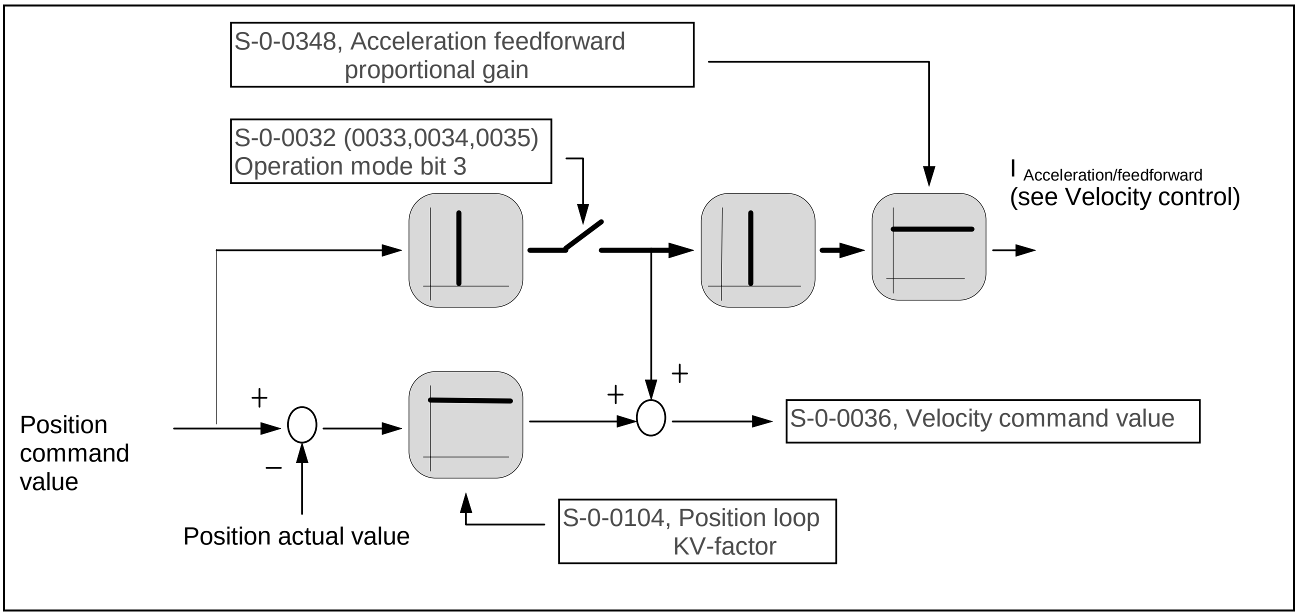


Fig. 8-11: Position controller

See also "Current Controller"

See also "Velocity Controller"

See also "Command value processing : Position Control"

Position Command Value Monitoring

If the drive is operated in the position control mode with cyclical position commands, new position values are transmitted to the drive every SERCOS cycle. The difference between the current and the last position command value is checked for validity.

Reasons monitoring is activated:

- Erroneous control system command values
- Command value transmission error

If the **Position Control** operating mode is active, the velocity produced by the difference in successive values of parameter **S-0-0047, Position Command Value** is compared to

- **S-0-0091, Bipolar Velocity Limit Value**

S-0-0001, NC Cycle Time (TNcyc) acts as the time base for converting the position command value differences into a velocity. It is assumed that position command values are given cyclically in the NC cycle time. This is normally the case in the position control operating mode.

If the command velocity resulting from the position command value exceeds **S-0-0091, Bipolar Velocity Limit Value**, the error

- **F237 Excessive position command difference**

is generated. For diagnostic purposes, both of the parameters

- **P-0-0010, Excessive Position Command Value**
- **P-0-0011, Last valid Position Command Value**

will be saved. The velocity produced by the difference of the two values generated the error.

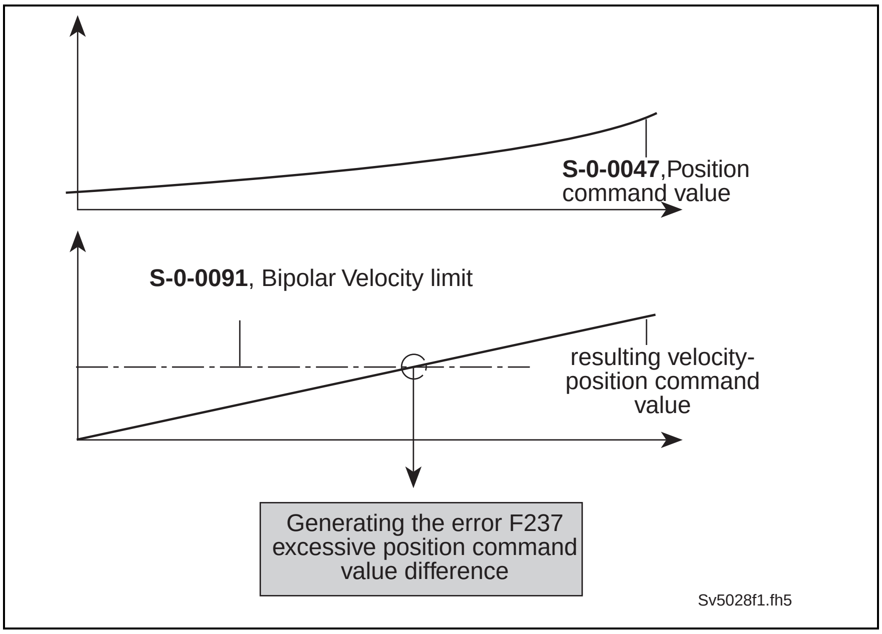


Fig. 8-12: Monitoring the position command value differences and generating the error **F237 Excessive position command difference**

Setting Position Command Value Monitoring

The position command value monitor works with the parameter **S-0-0091, Bipolar Velocity Limit Value**. S-0-0091 should be set approx. 5..10% above the planned maximum velocity of the shaft.

8.6 Operating Mode: Drive Internal Interpolation

The drive is given a target position in the **Drive Internal Interpolation** operating mode. When the operating mode is activated, the diagnostic message is one of the following:

- **A106 Drive Controlled (Internal) Interpolation / Encoder 1**
- **A107 Drive Controlled Interpolation / Encoder 2**
- **A108 Drive Controlled Interpolation / Encoder 1 / Lagless**
- **A109 Drive Controlled Interpolation / Encoder 2 / Lagless**

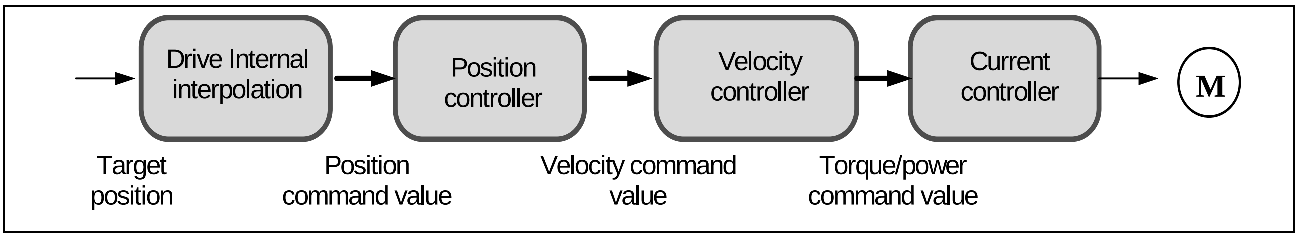


Fig. 8-13: Drive-internal interpolation diagram

Functional principle Drive Internal Interpolation

The target value is entered in the parameter **S-0-0258, Target Position** . The drive generates the position command profile necessary to move to the target position using the following parameters as limits:

- **S-0-0259, Positioning velocity**
- **S-0-0260, Positioning acceleration**
- **S-0-0193, Positioning jerk**
- **S-0-0108, Feedrate override**

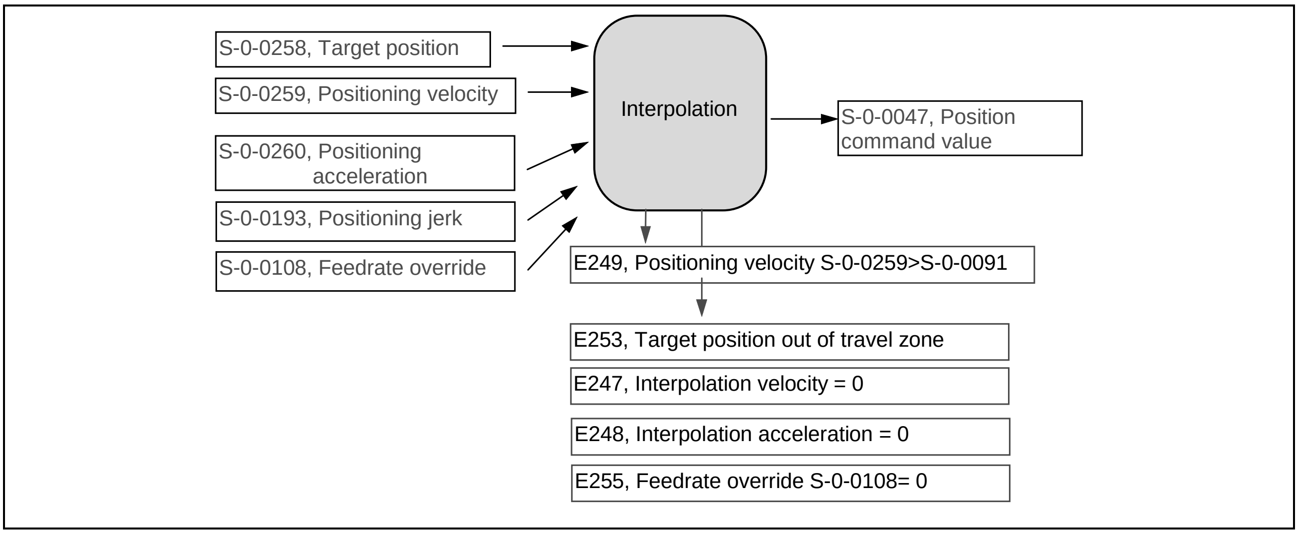


Fig. 8-14: Generator function drive internal generator function

See also "Position Controller"

See also "Velocity Controller"

See also "Current Controller"

Monitoring in mode: "Drive-internal interpolation"

The following checks are executed:

- If axis limit value monitoring is activated (Bit 4 of **S-0-0055, Position Polarity Parameter** is set) and the measurement system used for the operating mode has been homed, the parameter **S-0-0258, Target Position** is monitored for staying within the axis limit values. If these are exceeded, the warning **E253 Target position out of travel zone** is generated.

  The prescribed target position will not be accepted.

- If the prescribed positioning velocity **S-0-0259, Positioning velocity** exceeds the maximum allowable (**S-0-0091, Bipolar Velocity Limit Value**), the warning **E249 Positioning velocity S-0-0259 > S-0-0091** will be generated.

  The drive will move at the velocity **S-0-0091, Bipolar Velocity Limit Value** to the new target position.

- If the positioning velocity specified in **S-0-0259, Positioning velocity** equals 0, then warning **E247 Interpolation velocity = 0** is generated.

- If the factor affecting positioning velocity as set in **S-0-0108, Feedrate override** equals 0, then warning **E255 Feedrate-override S-0-0108 = 0** is generated.
- If the positioning acceleration specified in **S-0-0260, Positioning acceleration** equals 0, then warning **E248 Interpolation acceleration = 0** is generated.

Status messages during operating mode "Drive-internal interpolation"

In parameters S-0-0013, class 3 diagnostics and S-0-0182, manufacturers class 3 diagnostics there are the following status messages specifically for this mode:

- ***target position reached***, bit 12 of **S-0-0013, Class 3 Diagnostics** is 1, if it applies: internally effective command value equals **S-0-0258, Target Position**. This message then becomes 1, if the position command value generated by the drive-internal interpolator reaches the set target value.
- ***In target position***, bit 10 of **S-0-0182, Manufacturer Class 3 Diagnostics** is 1, if it applies: absolute difference between **S-0-0258, Target Position** and **S-0-0051/53, Position Feedback Value 1/3** smaller than **S-0-0057, Position window**. This message then becomes 1, if the relevant position feedback value is target positoin range +/- positioning window.
- ***IZP***, bit 6 of **S-0-0182, Manufacturer Class 3 Diagnostics** is a link of several status messages and is 1 if it applies: ***In target position*** = 1, i.e., absolute difference between **S-0-0258, Target Position** and **S-0-0051/53 Position feedback value 1/2** smaller than **S-0-0057, Position window** AND ***IN_POSITION*** = 1, i.e., amount of **S-0-0189, Following Error** smaller than **S-0-0057, Position window** AND ***Vist = 0***, amount of **S-0-0040, Velocity Feedback Value** smaller than **S-0-0124, Standstill window.**

The following profile explains how the status messages work:

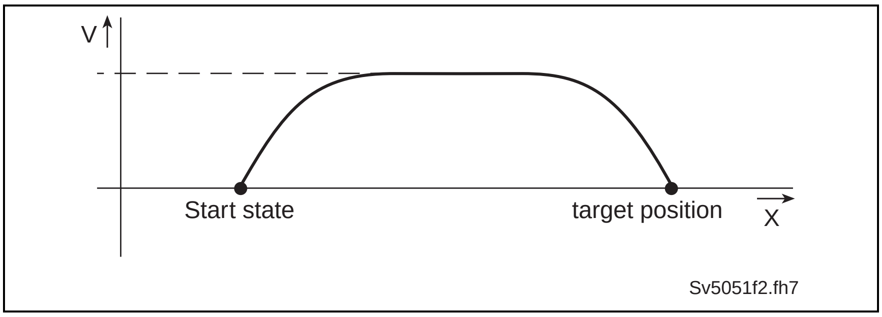


Fig. 8-15: Profile to explain how the interpolation status messsages work

In this example, the drive is on the start position, when the new target position is given.

The following time diagrams result:

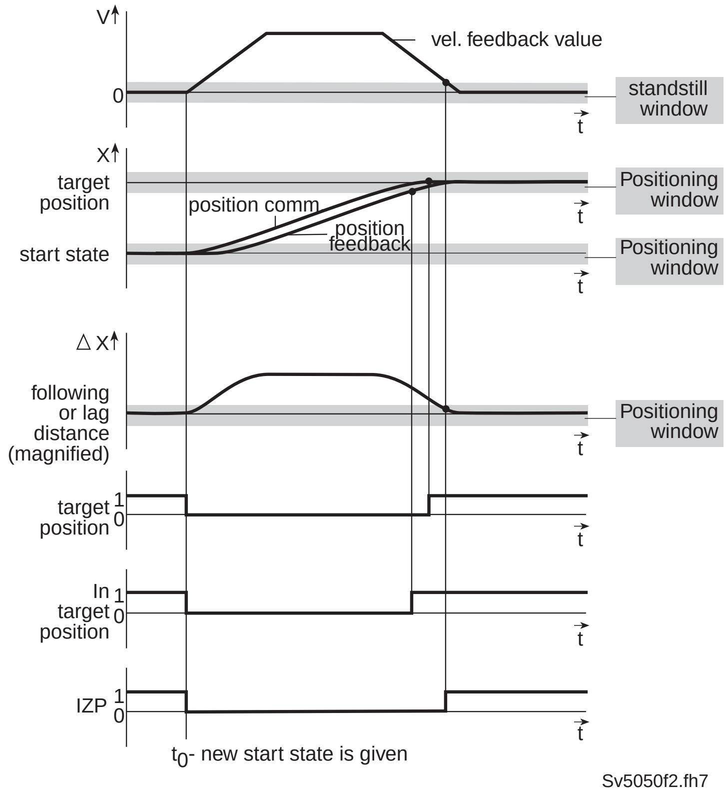


Fig. 8-16: Generating the status bit of the operating modes with drive-internal interpolation

8.7 Operating Mode: Relative drive-internal interpolation

In operating mode **Relative drive-internal interpolation** the drive is given a path in parameter **S-0-0282, Travel distance.** If bit 0 of the acceptance parameter **S-0-0346, Setup flag for relative command values** toggels (change), then it is added to the target position in **S-0-0258, Target position**. The drive generates the needed position command value profile to bring itself to the target position. It hereby maintains the velocity, accel and jerk limit values.

In units equipped with parallel interface or parallel inputs the positioning block transfer input effects parameter **S-0-0346, Setup flag for relative command values.**

A positive edge at positioning block transfer input toggles parameter S-0-0346.

Pertinent Parameters

- **S-0-0258, Target position**
- **S-0-0282, Travel distance**
- **S-0-0259, Positioning Velocity**
- **S-0-0260, Positioning Acceleration**
- **S-0-0193, Positioning Jerk**
- **S-0-0346, Setup flag for relative command values**
- **S-0-0393, Command value mode**
- **S-0-0108, Feedrate override**

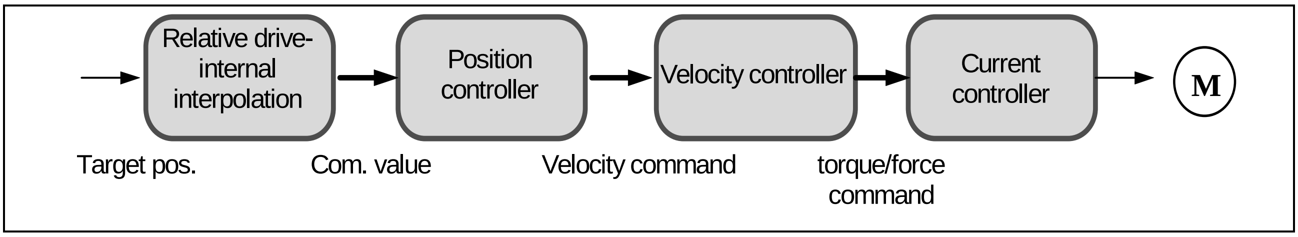


Fig. 8-17: Block diagram of relative drive-internal interpolation

Function principle: Relative drive-internal interpolation

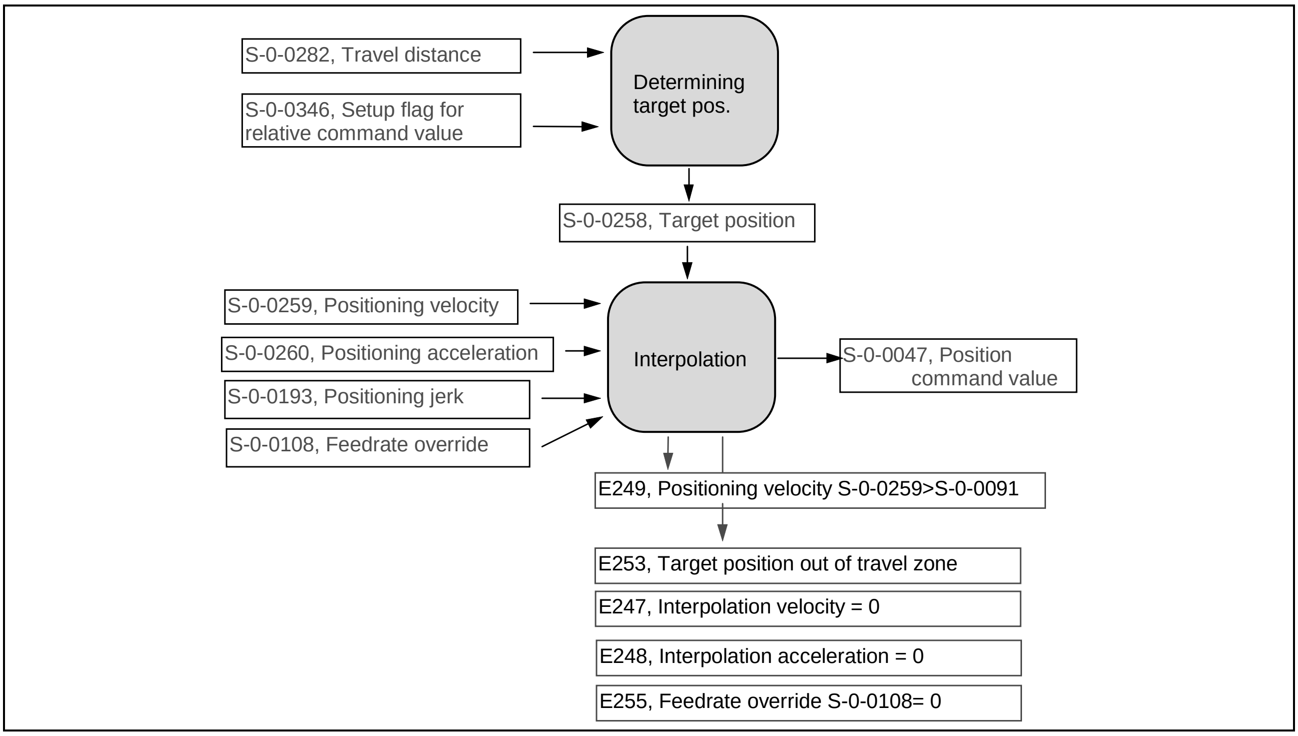


Fig. 8-18: Function principle relative drive-internal interpolation

See also chapter: "Position Controller"

See also chapter: "Velocity Controller"

See also chapter: "Current Controller"

After the operating mode is activated, the drive first positions to that position specified in parameter **S-0-0258, Target position**.

The parameter is stored when the control voltage is switched off so that if an absolute measuring system is used, the target position is still retained. The reference dimension is not lost.

If there is no absolute measuring system then the actual position value is preset in parameter **S-0-0258, Target position**.

Upon activating the operating mode "Relative drive-internal interpolation“ the traversing path relates to the actual position or the value in parameter **S-0-0258, Target position**.

Parameter S-0-0393, Command value mode bit 2 = 0.

The drive positions, upon activation, to the value in parameter **S-0-0258, Target position**. Thus, if the operating mode is interrupted (failure) it is still possible to run to the target position that should have been run to prior to the fault. This means that the **Residual path** is traversed. **Reference dimension** is retained.

Parameter S-0-0393, Command value mode bit 2 = 1.

Upon activation of the operating mode, the drive relates the traversing path in terms of the actual position. Parameter **S-0-0258, Target position** is thus set to the actual position. In other words, after a possible interrupt, the drive remains standing on the actual position value. After toggling the parameter **S-0-0346, Setup flag for relative command values** the traversing path relates to the actual position value and the reference dimension is lost after the interruption.

Diagnostic Messages

The diagnoses read as follows upon activation of an operating mode:

- **A146 Relative drive controlled interpolation, encoder 1**
- **A147 Relative drive controlled interpolation, encoder 2**
- **A148 Relative drive contr. interpolation, enc. 1, lagless**
- **A149 Relative drive contr. interpolation, enc. 2, lagless**

Given an activated operating mode, the followng checks are conducted:

- **E253 Target position out of travel range**
  If position limit value monitor is active (bit 4 of **S-0-0055, Position Polarity Parameter** is set) and the measuring system used for the mode is in reference (**S-0-0403, Position feedback value status** = 1), then the sum of **S-0-0282, Travel distance** and **S-0-0258, Target Position** is monitored to ensure that it maintains the position limit value. Otherwise, the sum of the overtravelling of the drive-internally depicted numeric range (visible in the minimum and maximum input values of the travel distance parameter) is monitored. In either case, if the allowable range is exceeded, the warning **E253 Target position out of travel zone** is generated. The set travel path is not accepted if the acceptance toggles.
- **E249 Positioning velocity S-0-0259 > S-0-0091**
  If the positioning velocity set in **S-0-0259, Positioning velocity** exceeds maximum allowable velocity set in **S-0-0091, Bipolar Velocity Limit Value** then the warning **E249 Positioning velocity S-0-0259 > S-0-0091** is generated. The set travel path is not accepted if the acceptance toggels.
- **E247 Interpolation velocity = 0**
  If the positioning velocity set in **S-0-0259, Positioning velocity** equals 0, then warning **E247 Interpolation velocity = 0** is generated.
- **E255 Feedrate-override S-0-0108 = 0**
  If the factor affecting the positioning velocity in **S-0-0108, Feedrate override** equals 0, then warning **E255 Feedrate-override S-0-0108 = 0** is generated.
- **E248 Interpolation acceleration = 0**
  If the positioning acceleratiion set in **S-0-0260, Positioning acceleration** equals 0, then the warning **E248 Interpolation acceleration = 0** is generated.

Status messages during operating mode "Relative drive-internal interpolation"

see chapter:

"Status messages during operating mode Drive-internal interpolation"

8.8 Positioning Block Mode

Positioning blocks that have been programmed can be run with this mode. The drive runs position controlled to target position, while maintaining speed, acceleration and jerk limits as defined for this block.

The block selection actuates the positioning blocks. A digital input can be used to select a block in units equipped with a positioning interface (DKC01.3).

Following block processing permits execution of several positioning blocks processed in direct sequence without having to re-issue a start signal each time.

Typical applications are positioning processes which cover long distances at high speeds (rapid traverse) and then position at end position at low speeds without any intermediate stops.

- Taking up or putting down transport goods by robots.
- Execution of joining processes in assembly facilities

A following block chain is made up of a start block and one or more following blocks. The start block is selected and activated in the usual manner. The transition to a following block, however, can vary.

Note: Following block mode is possible with absolute and relative positioning blocks. The distance remaining is stored. The final block of a chain is not defined as a following block. This identifies the end of the chain.

Pertinent Parameters

- **P-0-4006, Process block target position**
- **P-0-4007, Process block velocity**
- **P-0-4008, Process block acceleration**
- **P-0-4009, Process block jerk**
- **P-0-4019, Process block mode**
- **P-0-4026, Process block selection**
- **P-0-4051, Process block acquittance**
- **P-0-4052, Positioning block, last accepted**
- **P-0-4057, Positioning block, input linked blocks**
- **P-0-4060, Process block control word**
- **S-0-0346, Setup flag for relative command values**
- **S-0-0182, Manufacturer class 3 diagnostics**
- **S-0-0259, Positioning Velocity**

How it works

A positioning block is selected in positioning block mode via parameter **P-0-4026, Process block selection**. A positioning block is defined in terms:

- **P-0-4006, Process block target position,**
- **P-0-4007, Process block velocity,**
- **P-0-4008, Process block acceleration,**
- **P-0-4009, Process block jerk,**
- **P-0-4019, Process block mode.**

Parameter **P-0-4019, Process block mode** determines how the target position is processed (absolute, relative). Each parameter has 64 elements, whereby the elements of the same number write this number into the travel profile of the positioning block.

With parameter **P-0-4060, Process block control word** the positioning speed can be limited to the value set in parameter **S-0-0259, Positioning Velocity**. Otherwise, the speed set in **P-0-4007, Process block velocity** is used.

Once a positioning block is completed (|target position actual position value| < positioning window), bit 12 is set in parameter **S-0-0182, Manufacturer class 3 diagnostics**.

Activating Positioning Blocks

"Positioning block mode" must be entered as the main mode. By activating drive enable and setting drive halt =1 the drive is in main operating mode.

A positioning block is started by toggeling parameter **S-0-0346, Setup flag for relative command values**. As long as the parameter does not toggle, the drive remains on actual positoin or is brought position-controlled to a standstill.

The block is selected via parameter **P-0-4026, Process block selection**.

See also chapter: "Positioning block mode with parallel interface".

Given parallel control and to monitor the block selection lines, acknowledgement **P-0-4051, Process block acquittance** must be evaluated or via the parallel inputs in the DKC01.3.

Positioning Block Modes

Parameter **P-0-4019, Process block mode** is used to set the manner in which the target position is processed in parameter **P-0-4006, Process block target position**.

Possible positioning block modes:

- **Absolute Positioning**
- **Relative Positioning**
- **Relative Positioning with residual path memory**
- **Infinite travel in positive / negative direction**
- **Following block processing**

Absolute Positioning

Prerequisite: Parameter **P-0-4019, Process block mode** = 1

In an absolute positioning block, the target position is a fixed (absolute) position within the machine coordinate system.

Prerequisites for the execution of absolute positioning blocks:

- The drive must be referenced.
- The travel range can be limited with position limit value. Absolute positioning blocks are only executed if the target position lies within the allowable travel range.

Example Absolute positioning with target position = 700

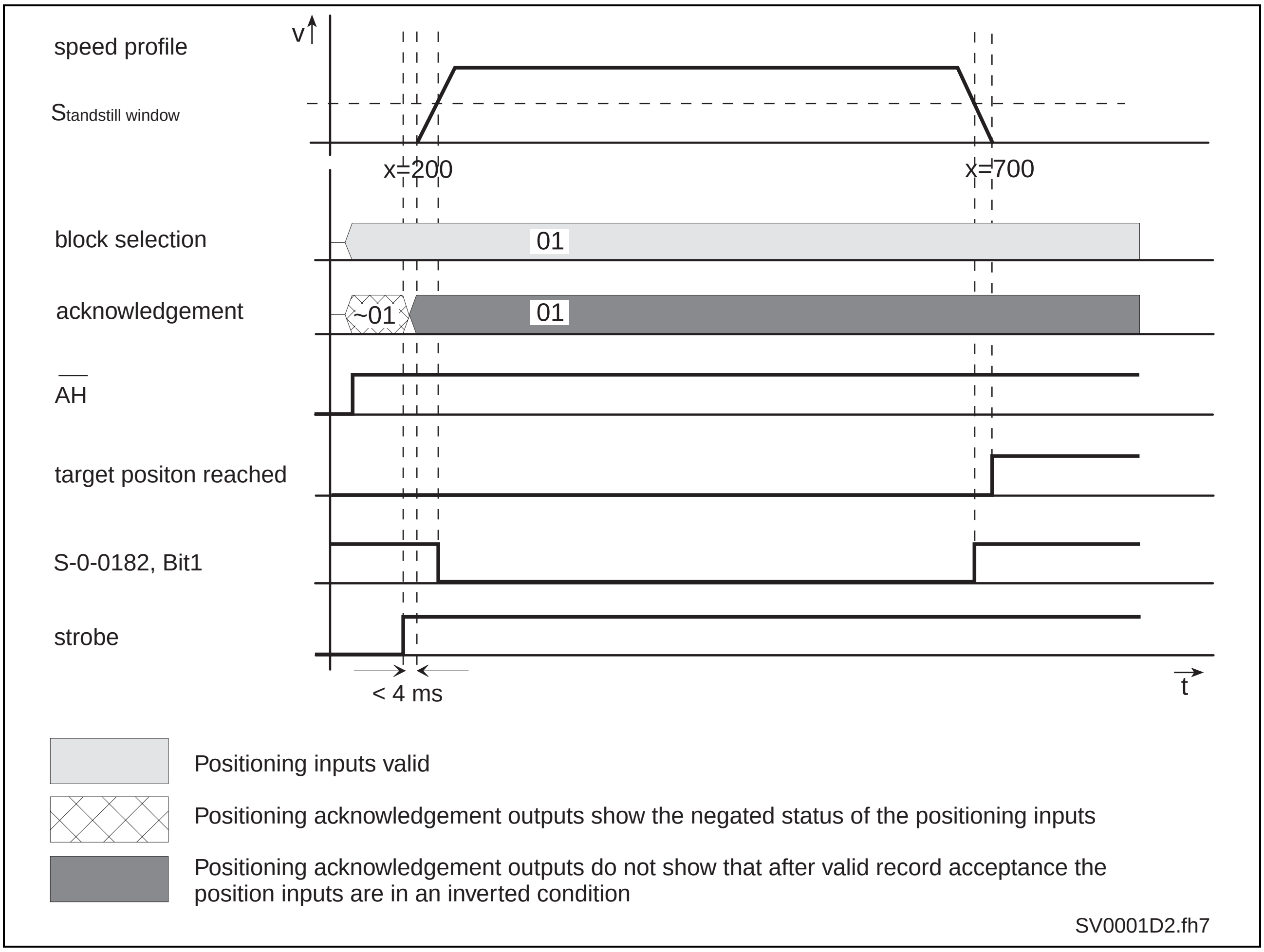


Fig. 8-19: Absolute positioning block

Relative positioning

Prerequisite: Parameter **P-0-4019, Process block mode** = 2

Relative positioning blocks are executed if the drive has not been referenced.

Reference position In relative positioning blocks without residual path storage, the target postion in the positioning blocks are added to the **current position** aufaddiert.

Residual path If positioning blocks are interrupted, then a part of a path to the target position remains. This remaining distance is the residual path.

Chain dimensional reference

By sequencing relative positioning blocks it is possible to position with chain dimensional reference. If a relative block is interrupted **without residual** path storage, then this chain reference is **lost**.

If the positioning block is completed, i.e., the drive reaches target poition and message "end position reached" activated, then positioning is possible without the loss of the chain reference.

Note: If infinite positioning in either a forward or backward direction is achieved by sequencing relative positioning blocks (transport belt), then the position data must be scaled in modulo format . (Modulo value = transport belt length or modulo value = 2 times the maximum travel distance.)

Example

Relative positioning without residual path storage with target position = 700 (current position = 200).

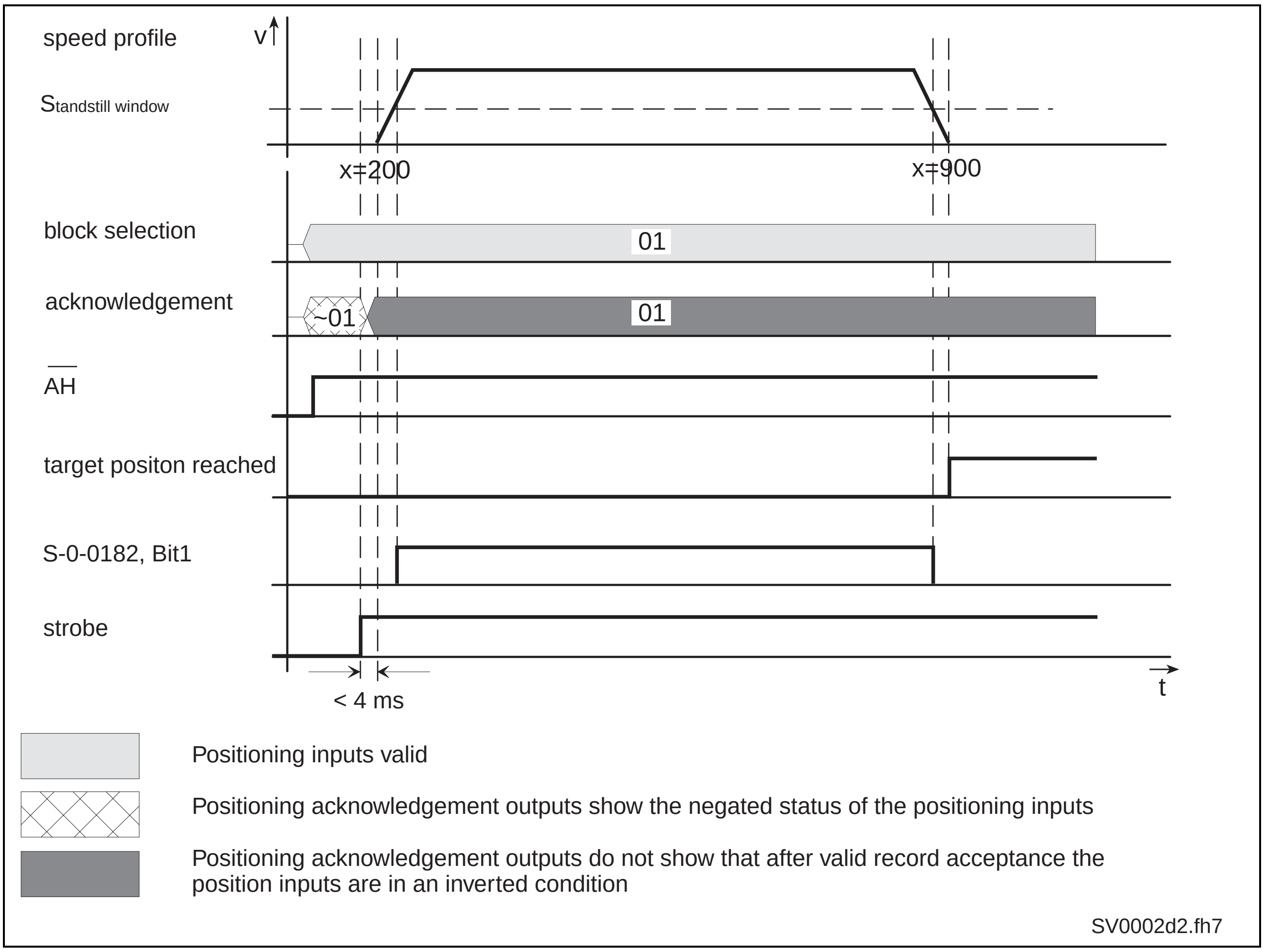


Fig. 8-20: Relative positioning block without residual path storage

Example

Relative positioning without residual path storage with target position = 700 (current position = 200). Terminate and start a relative positioning block without residual path storage again.

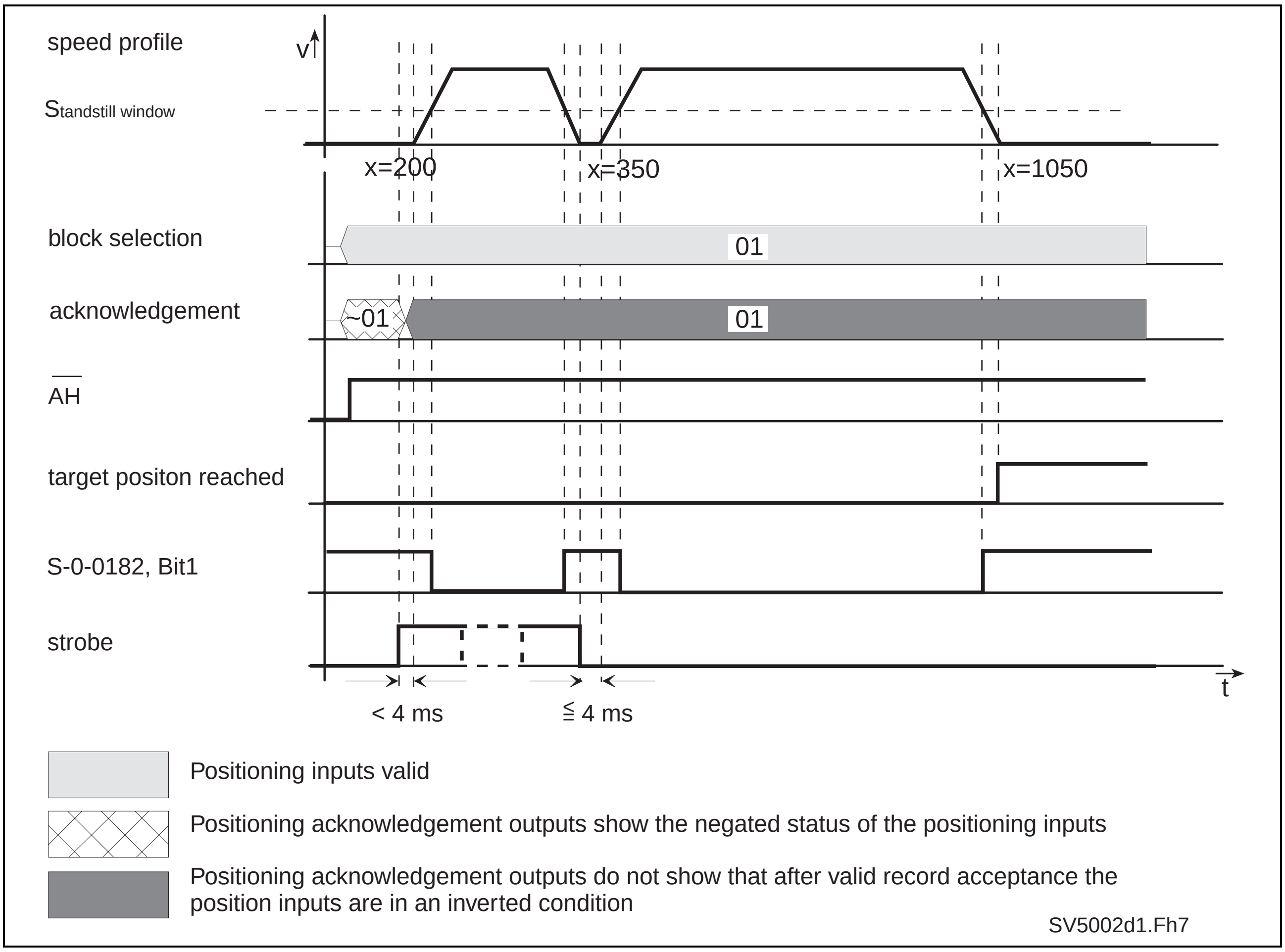


Fig. 8-21: Terminating a relative positioning block without residual path storage

Relative positioning with residual path storage

Prerequisite: Parameter **P-0-4019, Process block mode** = 102h

Relative positioning blocks with residual path storage are also executed if the drive is not referenced.

In a relative positioning block with residual path storage, the target position is a relative path which relates to the target position which last generated the message "end position reached".

Chain dimensional reference

By sequencing relative positioning blocks it is possible to position with chain dimensional reference. If a relative block is interrupted **with residual** path storage, then this chain reference is **retained**.

Note: The rest of the path is discarded once a different positioning block is started.

Example Relative positioning with residual path storage with target position = 700 without interruption (message: "End position reached" with position = 200).

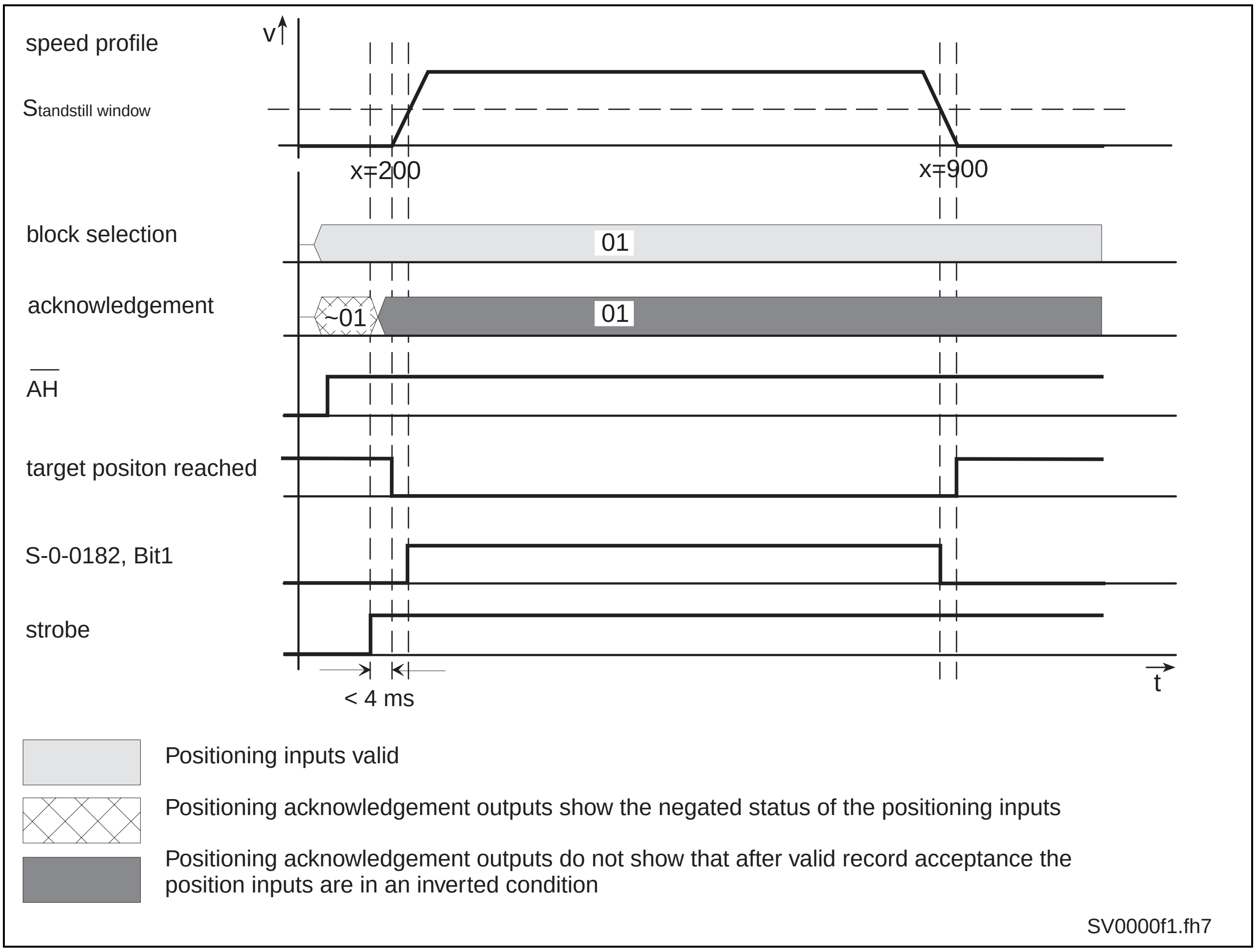


Fig. 8-22: Relative positioning block with residual path storage

Relative positioning block with residual path storage after activating drive enable

Reference position The **last "End position reached" message** is used as reference position.

Note: The chain reference dimension is guaranteed.

Example An interrupted relative positioning block with residual path storage after active drive enable with target position = 600.

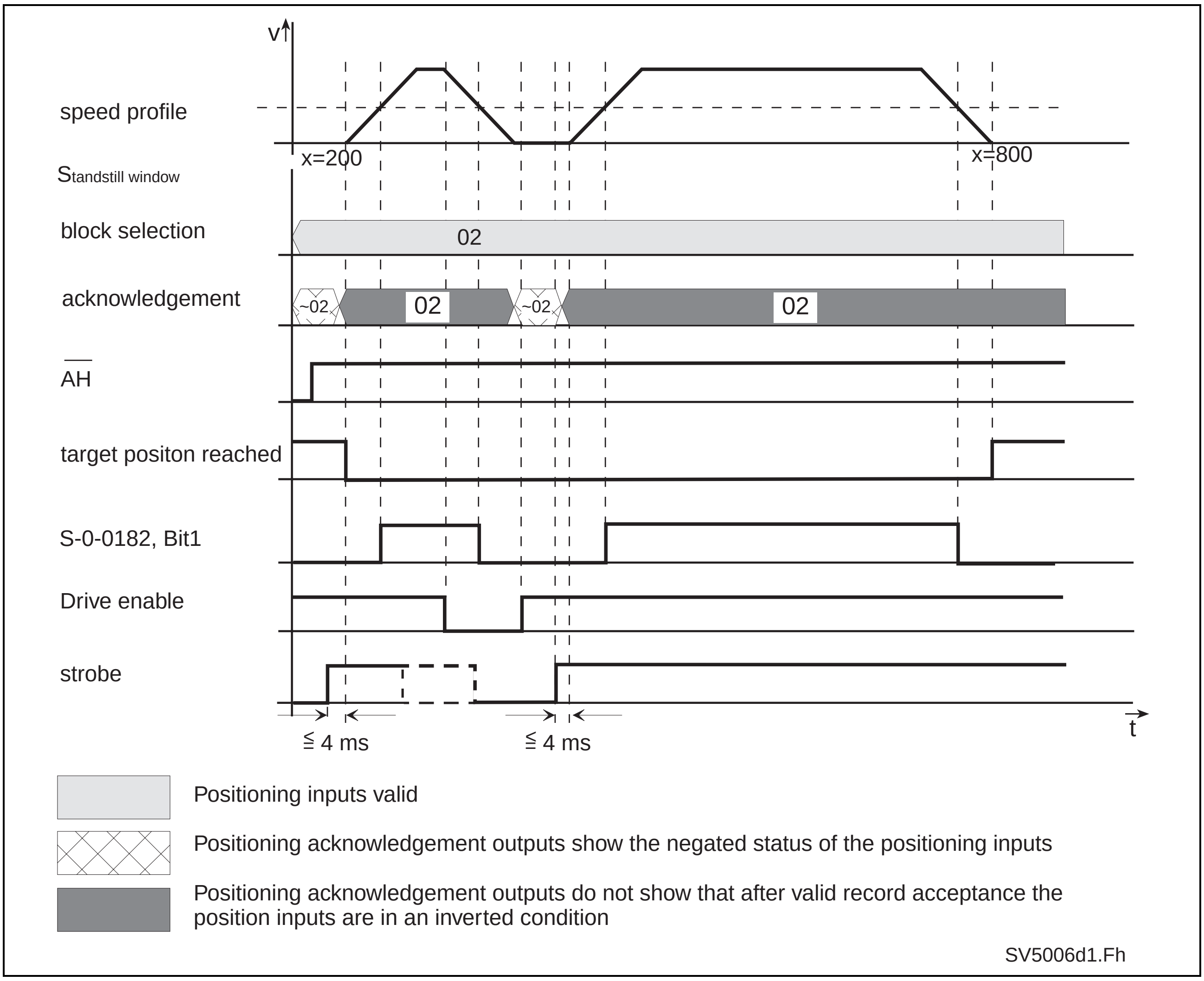


Fig. 8-23: Relative positioning block with residual path storage after activating the drive enable

Relative positioning block with residual path storage after interrupting with jog mode

Example Interrupted relative positioning block **with** residual path storage after jogging with target position = 600 **without overrunning the target position** while jogging.

Reference position The **last "End position reached" message** is used as reference position.

Behavior The stretch jogged between the **interruption** and **restart** of the positioning block is taken into account. The drive continues to run to the already computed target position.

Note: The chain dimensional reference is guaranteed.

Example Interrupted relative positioning block **with** residual path storage after jogging with target position = 600 **with overrunning the target position** while jogging.

Behavior The drive runs back to the target position set prior to the interruption.

Note: The chain dimensional reference is guaranteed.

Reference position The **last "End position reached" message** is used as reference position.

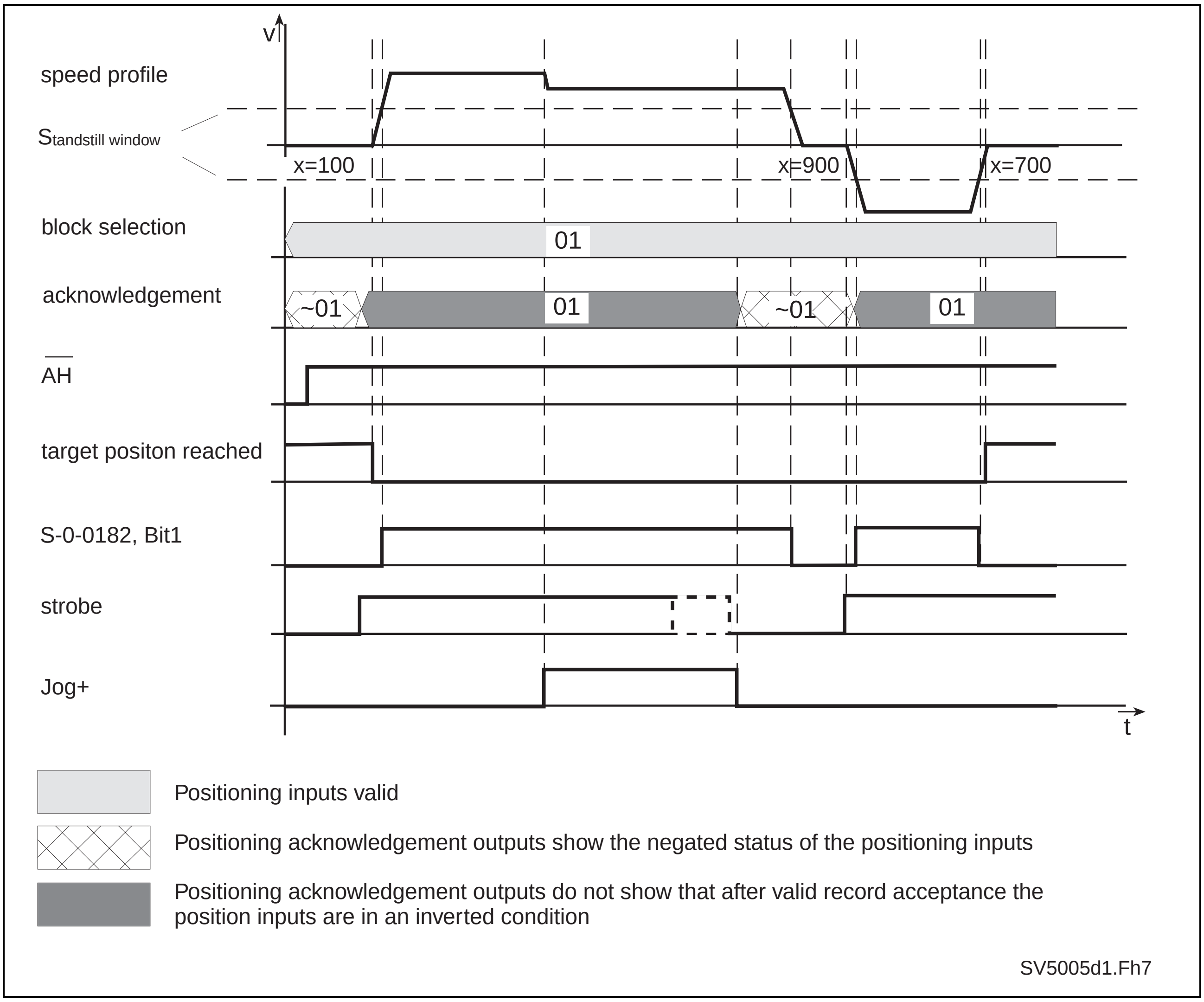


Fig. 8-24: Relative positioning block with residual path storage after jogging

Relative positioning block with residual path storage after switching drive controller control voltage on and off

If an **absolute encoder** is used then it is possible tht the chain reference is retained after switching control voltage on and off. The previously computed target position is stored at power shutdown. The rest of the distance is run after the interrupted relative positioning block with residual path storage is activated.

Behavior

If a **single turn encoder** is used, then the remaining path is discarded and added to the actual position.

Reference position

The **last "End position reached" message** is used as reference position.

Note: If a positioning block is not accepted then the drive behaves as if it had never been started.

Infinite running in a positive / negative direction

If an axis is to be run with defined speed, acceleration and jerk without a specific target position, then the travel block mode: **"Travelling in a positive direction"** or **"Travelling in a negative direction"** must be specified. The drive runs in the set direction until the start signal is reset or the position limit value or the travel range limit switch is reached.

The set target position has not importance in this positioning mode.

Parameter **P-0-4019, Process block mode** =

- 4h travel in positive direction
- 8 h travel in negative direction

See also section: Operating Mode: Jogging"

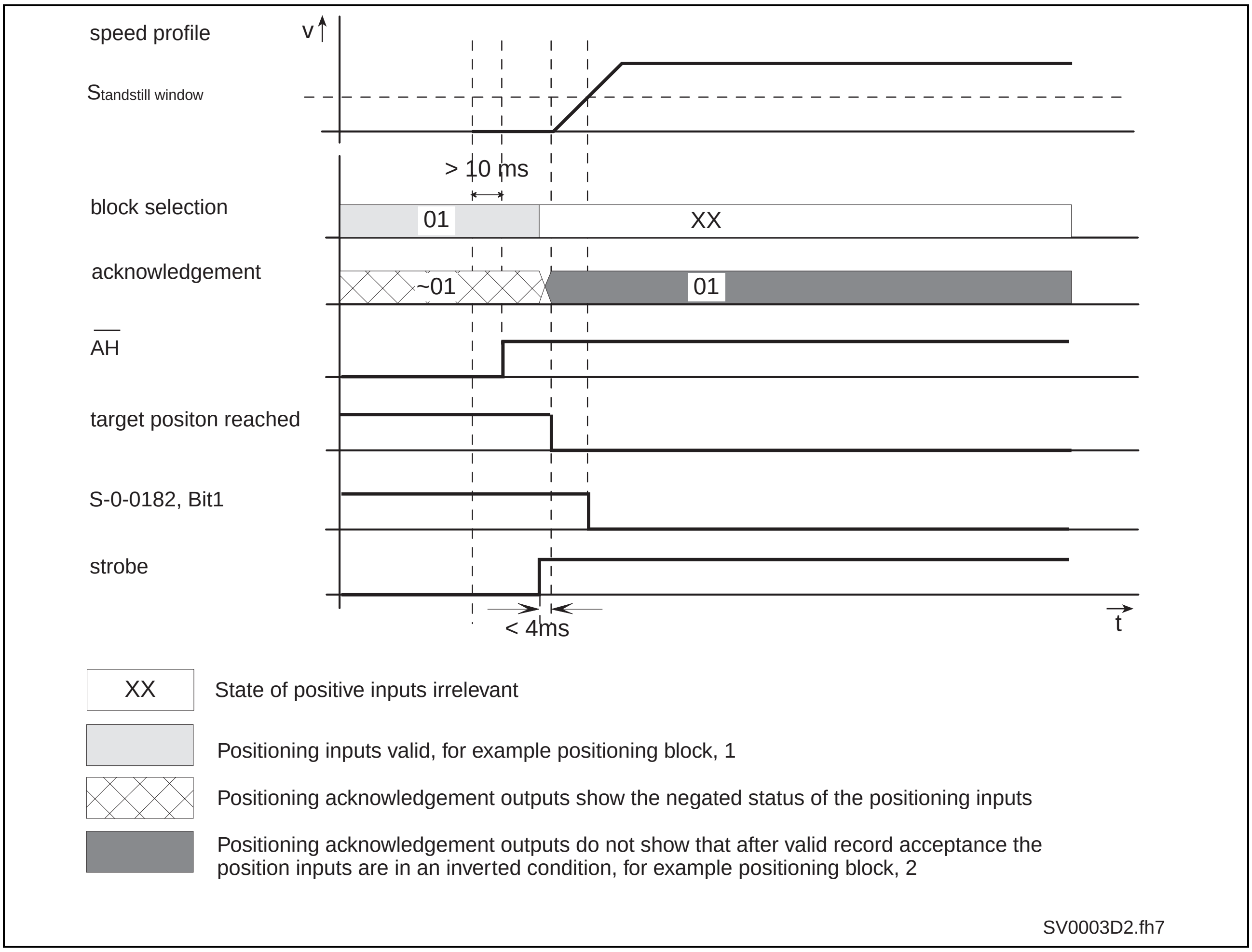


Fig. 8-25: Example: Infinite travel in positive / negative direction

Following block processing

Selecting and activating a following block

Selecting and activating a block with following block is performed in the usual manner. The following block is that block with the next highest block number. A following block can also have a following block so that after a start block up to 63 following blocks can be set. The potential following block of the block with number 63 is block 0.

Conditions to continue in following block mode

There are basically **two modes** for continuing block mode. These are also broken down into:

1) Position-dependent continue block mode

With position-dependent continue block mode, the following block is switched into at the target position of the start block.

There are **three different** types of block transitions:

a) Block transition at old positioning speed (Mode 1)

P-0-4019, Process block mode =11h: absolute block with following block

P-0-4019, Process block mode =12h: relative block with following block

P-0-4019, Process block mode =14h: infinite block in positive direction with following block

P-0-4019, Process block mode: infinite block in negative direction with following block

In this mode, the target position of the start block is run through at the speed of the start block and then switched to the positioning speed of the following block.

Definition

With relative and absolute blocks, the drive runs in the direction of the target position. As soon as the **target position is exceeded**, it switches to the **next block n+1.**
With infinite blocks, the drive runs positive or negative. As soon as the **target position is exceeded**, the drive switches to **next positioning block n+1.**
"n" represents the block currently in process.

Note: If the target position is not in travel direction, then it will never be reached. The drive does not switch to the next positioning block.

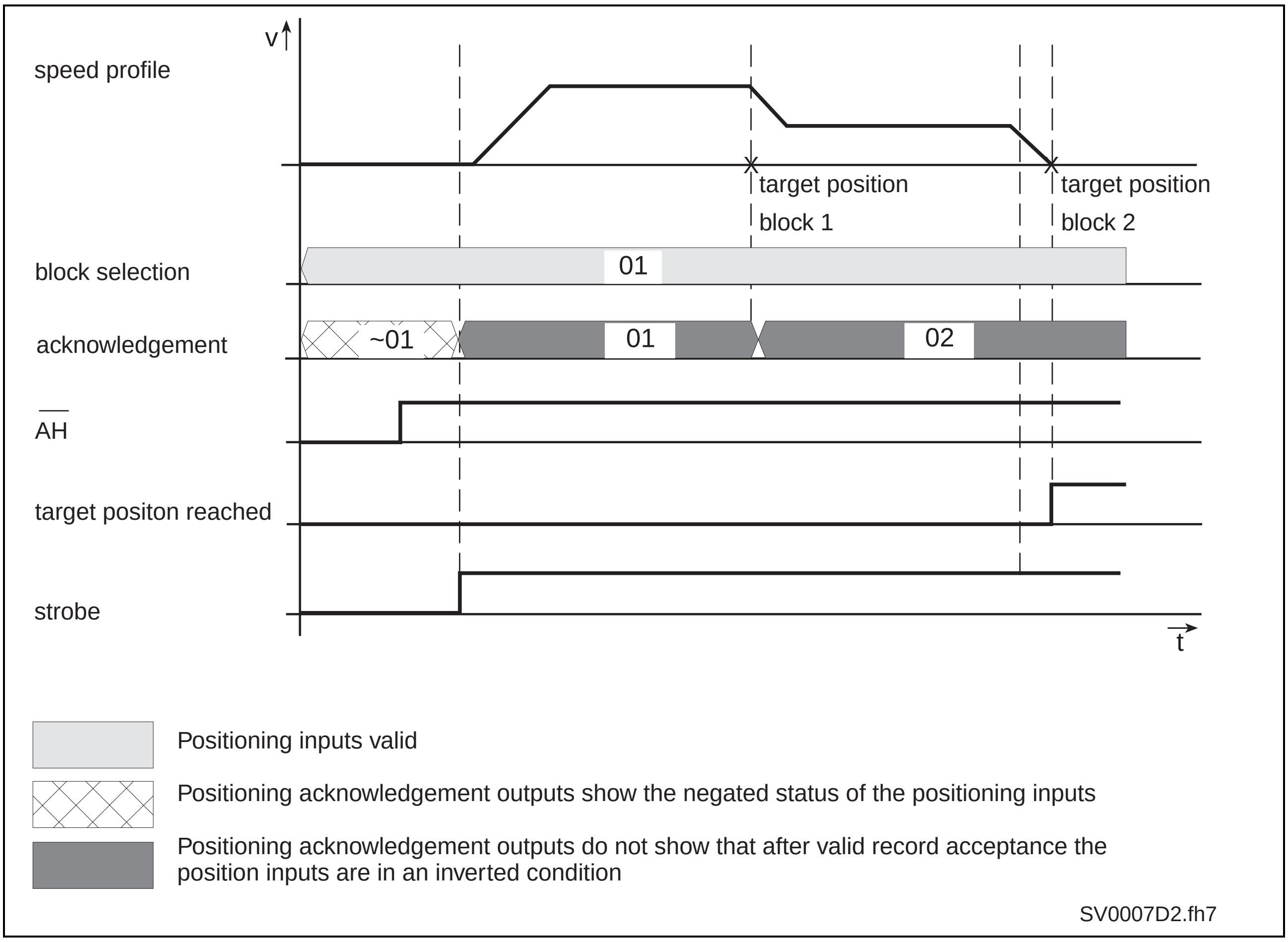


Fig. 8-26: Example: Position-dependent block commutation (mode 1)

b) Block transition with new positioning speed (Mode 2)

P-0-4019, Process block mode =21h: absolute block with following block

P-0-4019, Process block mode =22h: relative block with following block

P-0-4019, Process block mode =24h: infinite block in positive direction with following block

P-0-4019, Process block mode =28h: infinite block in negative direction with following block

In following block mode 2, position-depenent block commutation means that the target position of the start block is run through at the positioning speed of the following block.

Definition

The drive runs in the direction of the target position $\mathbf{X_n}$ (with infinite blocks in set direction) set in **current position block n**. In good time, there is acceleration $\mathbf{a_n}$ to the **next** positioning speed $\mathbf{v_{n+1}}$ so that the speed $\mathbf{v_{n+1}}$ can be achieved prior to target position $\mathbf{X_n}$.

The switch to the next positioning block does not occur here either until the next target position is overrun.

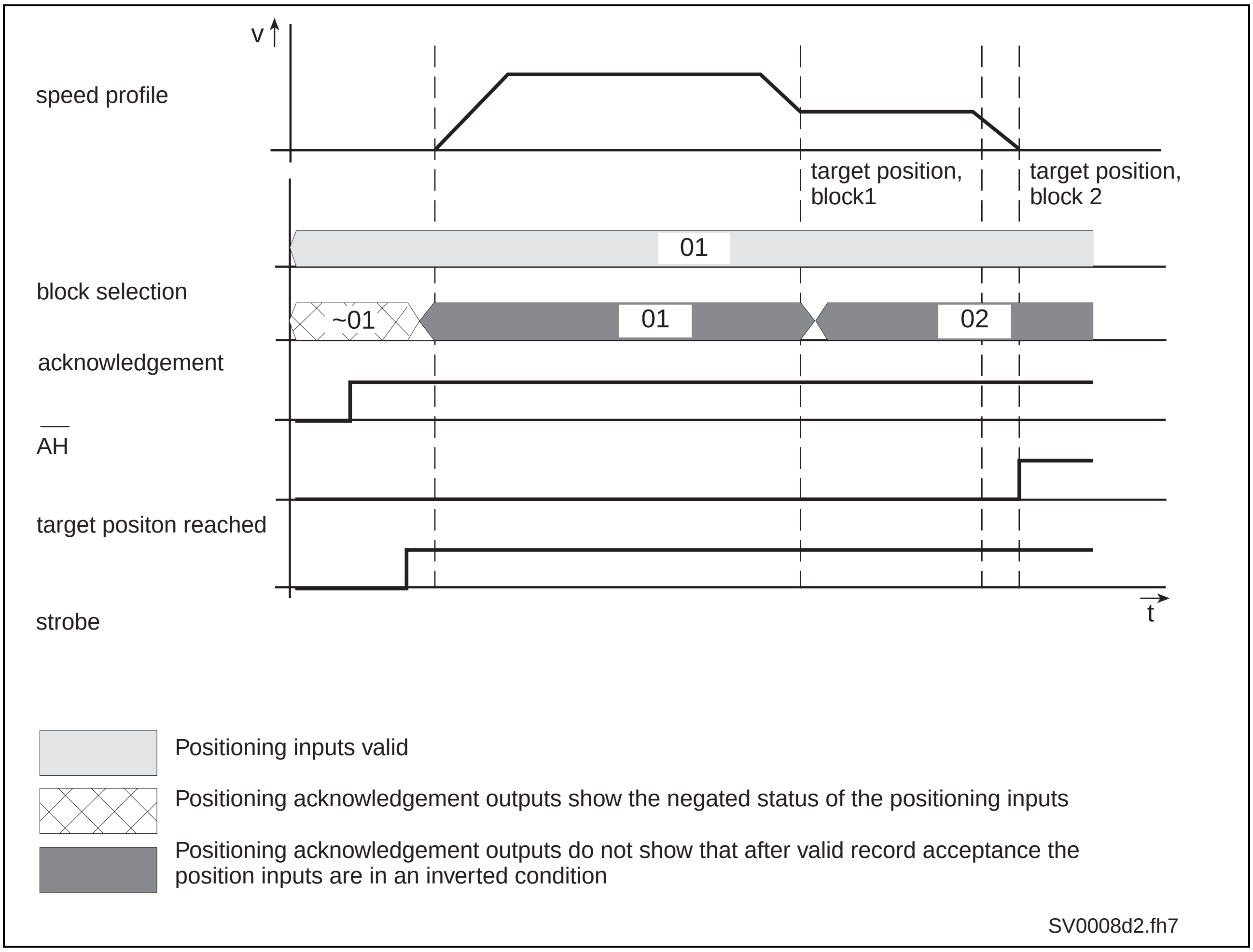


Fig. 8-27: Example: Position-dependent block commutation (Mode2)

c) Block transition with intermediate halt

P-0-4019, Process block mode =41h : absolute block with following block

P-0-4019, Process block mode =42h : relative block with following block

With block commutation with intermediate stop, the drive positions at the target position of the start block. Once the position command is at the target position, the following block is automatically started without a new start signal generated externally.

This means:

Definition

Another mode is a switching with intermediate stop when the target position is overrun.

The drive is decelerated to speed 0 at the target position and then accelerated to the new positioning speed.

Note: Commutation takes place if the internal command value generator reaches the target position. With very small jerk values result in a creeping to target position which is like a dwell time.

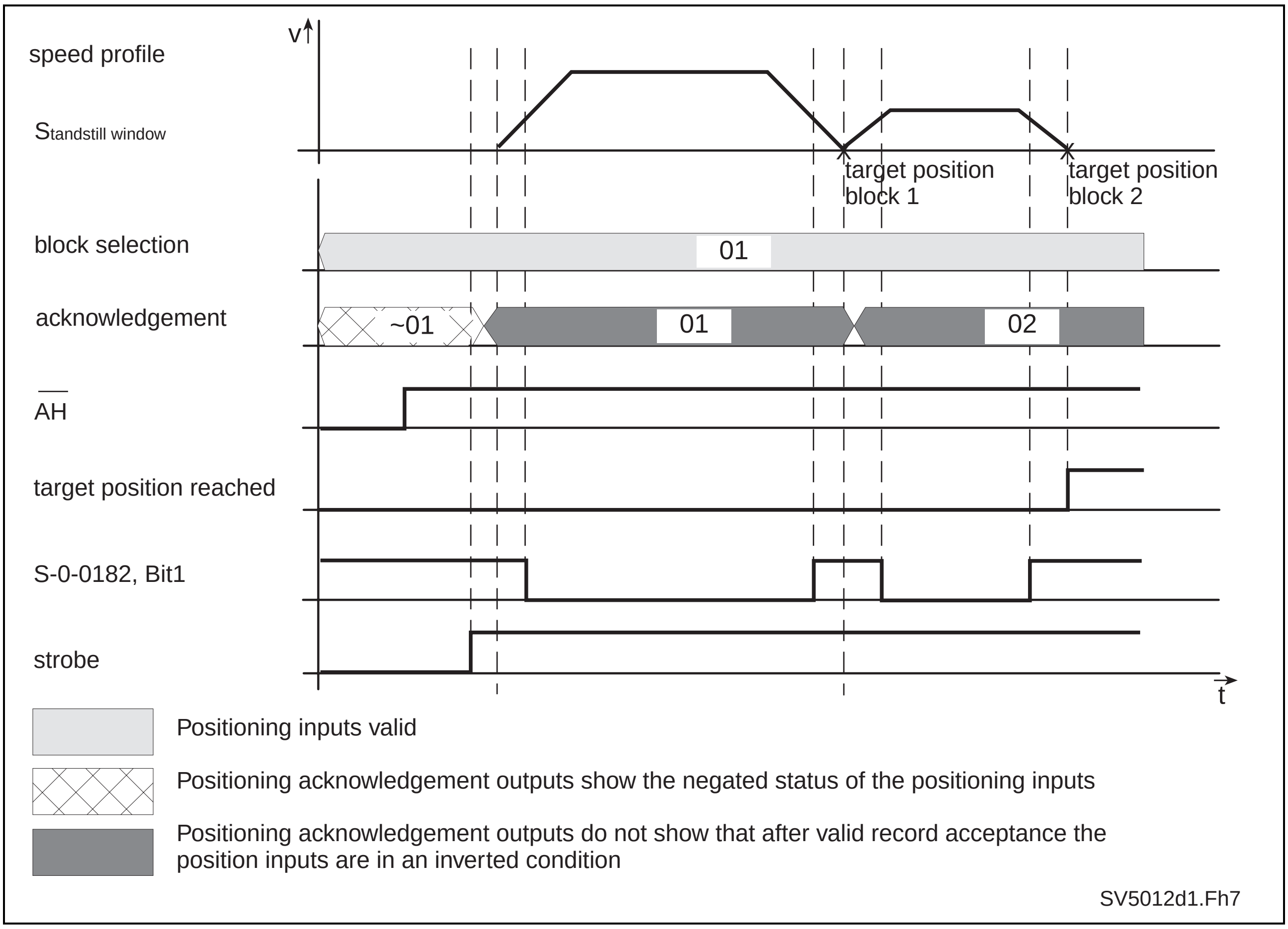


Fig. 8-28: Example: Following block commuttion with target position with intermediate halt

Note: This mode **must be used** if there is to be a change in direction with two sequential following blocks within one following block change. Otherwise, the position at which the direction is to be changed will be overrun.

2) Switching signal dependent block commutation

P-0-4019, Process block mode = 81h: absolute block with following block

P-0-4019, Process block mode = 82h: relative block with following block

P-0-4019, Process block mode = 84h: infinite block in positive direction with following block

P-0-4019, Process block mode = 88h infinite block in negative direction with following block

Block commutation to a block with the next highest block number is triggered with an externally applied switching signal.

Switching with cams

The switching signal dependent block commutation makes a transition to a following block possible based on an external switching signal. As signal input the two following block inputs are available.

The state of the hardware signals is shown in parameter **P-0-4057, Positioning block, input linked blocks**.

Definition

The drive switches to the **next travel block** n+1 as soon as the input for the **following block cam 1** goes from **0->1**. If the target position is not reached then the new positioning block is switched into while travelling.

The drive switches to the **penultimate travel block** n+2 as soon as the input for the **following block cam 2** goes from **0->1**. If a following block cam is actuated during this run, then the drive switches to the next positioning block.

Reference position

A following relative positioning block references that position at which the following block cam was switched.

Note: The following block cams are checked ever 2 ms. The accuracy of the position detected therefore depends considerably on the speed at the time of overrun.

Allocation table for cams

Cam 2	Can 1	Drive reaction
0	0	drive runs to target position of block n
X	0->1	block n+1 started
0->1	X	block n+2 started

Fig. 8-29: Drive reaction with different switching signal sequences

X = Don’t Care

n = positioning block selected via parallel inputs or parameter **P-0-4026, Process block selection**.

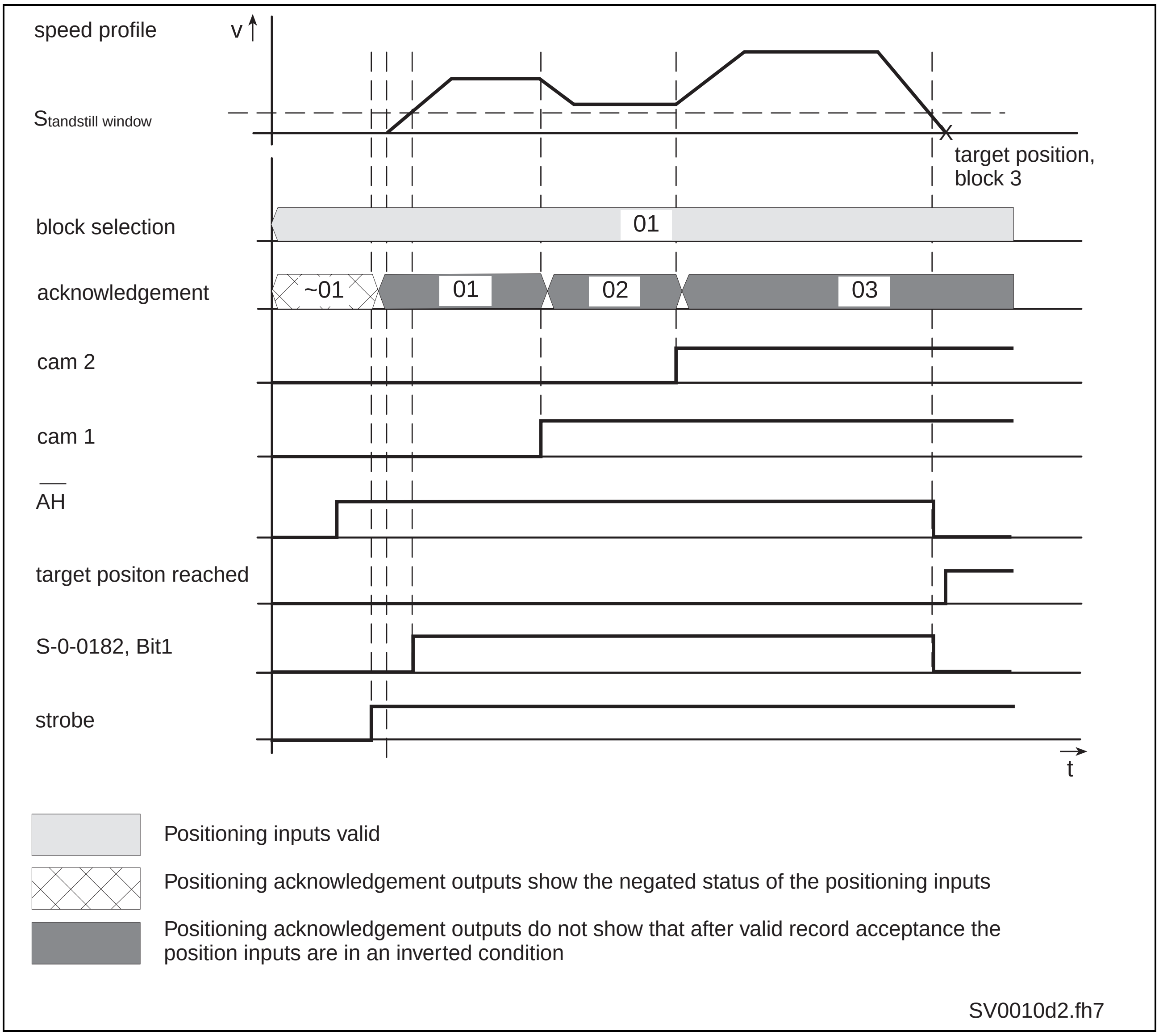


Fig. 8-30: Example: switching signal dependent block commutation

No switching signal for block commutation

If the start block of a switching-signal dependent following block is an absolute or relative positioning block, then the drive positions on target position if the switching signal for block commutation does not arrive. The drive thus generates the message "End position reached" after the following block chain is completed. If a switching signal is applied during the course of processing, then the drive will execute the following block.

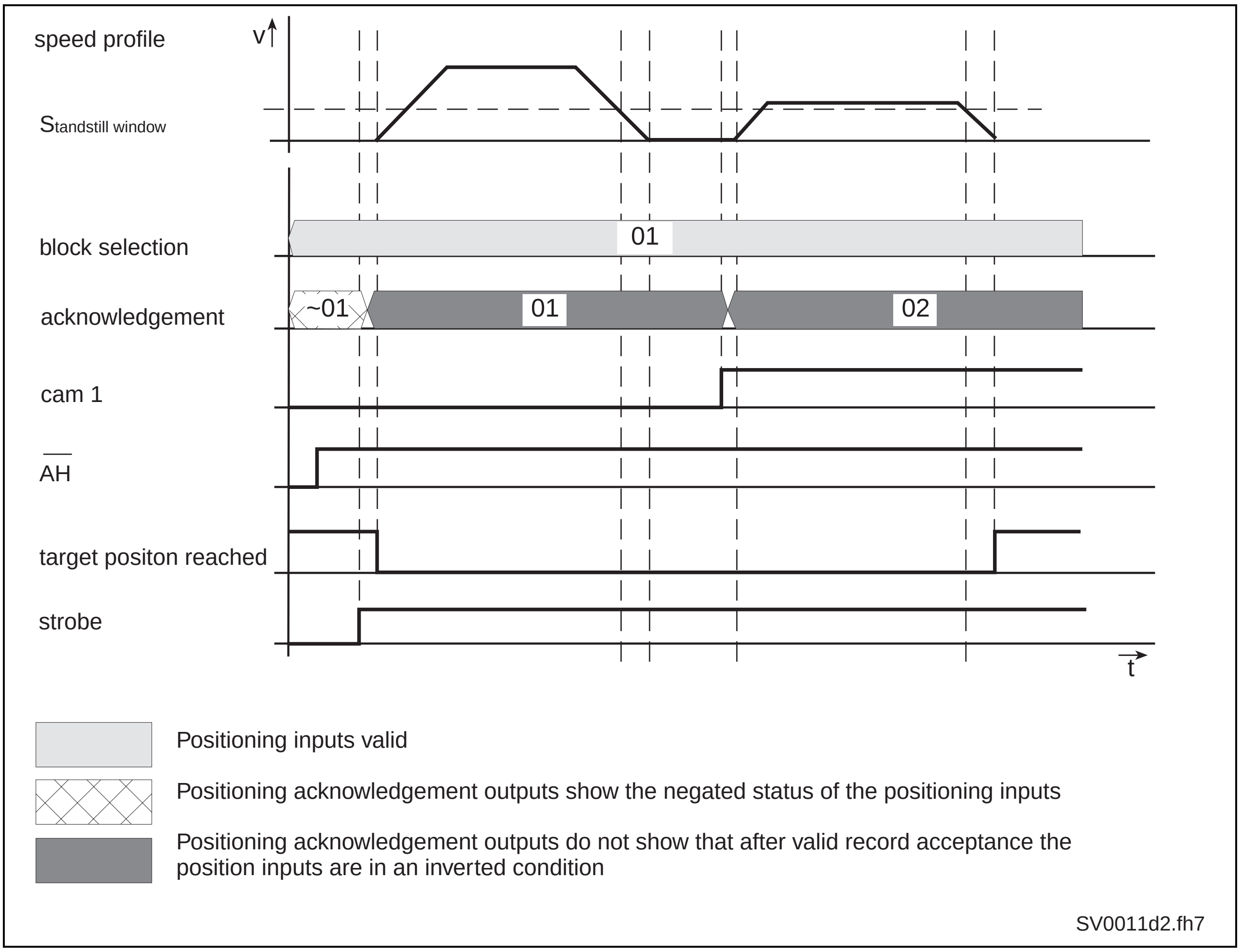


Fig. 8-31: Example: Switching-signal dependent block expansion (behavior with no switching signal)

Note: All four commutation conditions are constantly queried and evaluated to be able to switch to the correct following block even after the following block chain is interrupted. Only the first commutation conditions occurring during a break is recognized however. All others are not taken into account!

Interrupting a following block chain

An interruption can occur with

- a removal of the drive enable
- or a removal of the drive start signal.

Depending on the block type of the following block sequence that was interrupted and the events occuring this interruptioin, the following block chain is differently processed after a restart.

Note: In following block mode only relative positioning blocks with residual path storage can be used as otherwise the chain dimension reference will be lost.

Interrupting a following block chain by selecting the same block number

Given an interruption (e.g., with drive halt), a restart will end the following block chain.

Reference position

The reference position is the original start position of the block chain.

The chain is retained as only absolute and relative positioning blocks with residual path storage are used in following block mode!

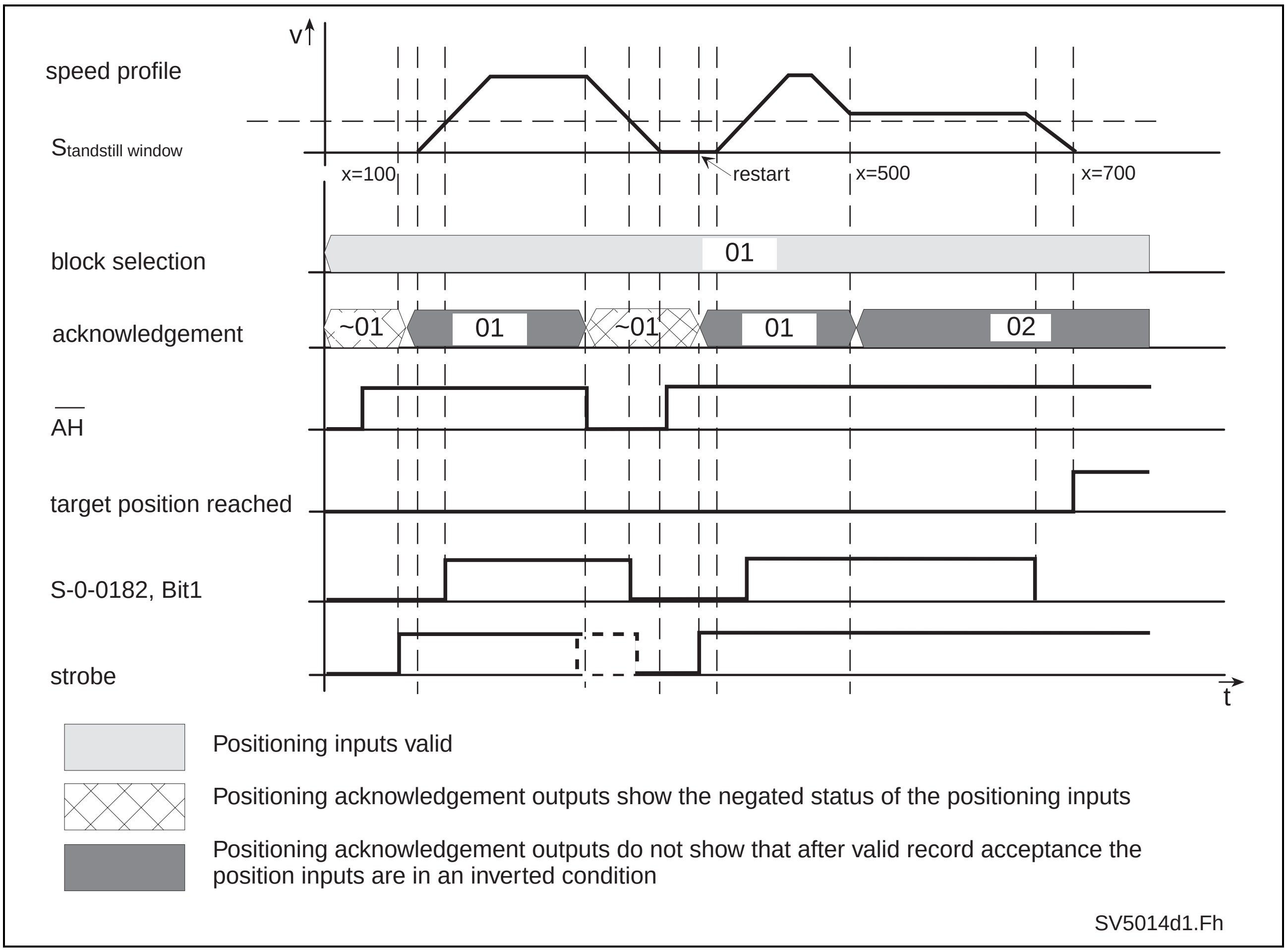


Fig. 8-32: Example: Following block interrupt with same block selected

Changing into jog mode

Note: Given a change into a different mode with an interrupt, the previously interrupt chain is completed upon restart unles a new block is selected. Given a following block with commutation due to target position means that only the overruning of the target position of the current position block will be detected. The following block is completed from this position. The commutation conditions due to switching signals is always detected.

Terminating a following block chain and selecting a new block number

If a **new block number** is selected during an interruption (e.g., with drive halt), then the previously interrupted following block chain is **not completed** after a restart. Instead the current block is executed.

Reference position

Current actual position value.

Note: The chain dimension reference is lost if the following block is interrupted.

The conditions for the interruption of following blocks also apply after the control voltage is switched off if an absolute encoder is used.

Interrupting a following block chain with absolute following blocks

An interuption with absolute positioning blocks represents no problem as the absolute dimension is always guaranteed.

.. when selecting a new block number

If a new block number is selected with an interruption, then the interrupted following block **is not completed** if **S-0-0346 Setup flag for relative command values,** is toggeled. Instead, the current block is executed.

.. with selecting the same block number

If a new block number is selected with an interruption, then the interrupted following block **is completed** if **S-0-0346 ÜSetup flag for relative command values** is toggled.

Parametrization notes for positioning blocks

Taking drive limits into account

When parametrizing following blocks the maximum values of the drive must be taken into account.

These are:

- maximum accel capability
- maximum speed (mains voltage dependent)

If blocks are parametrized that demand values greater than the maximum value of the drive, then this will inevitably generate a lag error. The drive will signal error **"F228 Excessive deviation"** to indicate that it cannot comply with the position command value.

Minimum values for accel and jerk

General information

Accel values that are too small can also cause problems which is why the following should be taken into account with fixing the positioning blocks.

- **Minimum accel value**

$$acceleration > \frac{\text{speed difference}^2}{2t \arg et position difference} = \frac{\left(\mathrm{v}_{\mathrm{n}+1} - \mathrm{v}_{\mathrm{n}}\right)^2}{2 \cdot \left(\mathrm{X}_{\mathrm{n}+1} - \mathrm{X}_{\mathrm{n}}\right)}$$

$$X_{n+1} = \mathrm{t} \arg et \text{position of the block n} + 1$$
$$v_n = \mathrm{b}lockspeed \ \mathrm{n}$$
$$v_{n+1} = \mathrm{b}lockspeed \ \mathrm{n} + 1$$

Fig. 8-33: Minimum accel value with following block mode (translatory)

Note: The above relationship applies to a very large jerk, i.e., a jerk filter that has been switched off (= 0). If such a filter is used, then the computed values are doubled. The stretch to be run with a block and its speed are generally fixed in percents. If the above minimum accel value computed with the above already causes the maximum value of the previous section to be exceeded, then a lower positioning speed must be selected.

- **Minimum jerk value**

If accel values are parametrized too small, then this could mean that the parametrized speed is not reached. What results is the socalled "Triangular mode".

Directional change within a following block chain

Note: If a directional change takes place when changing block n to block n+1 of a following block, then mode "Switching to target position with halt" must be used for block n to even enable dead beat behavior.

Explanation

Following block n with mode 1 following by **following block with intermediate halt**, because a **change in direction** occurs when changing from block n to block n+1.

This means there is a sign change for the speed for target position n+1. If the accel parametrized in block n+1 is too small to decel within the path difference = X_{n+1}-X_n from speed v_n to value 0, then the parmetrized target position X_{n+1} will be overrun.

This can cause software or hardware limit switches to trigger.

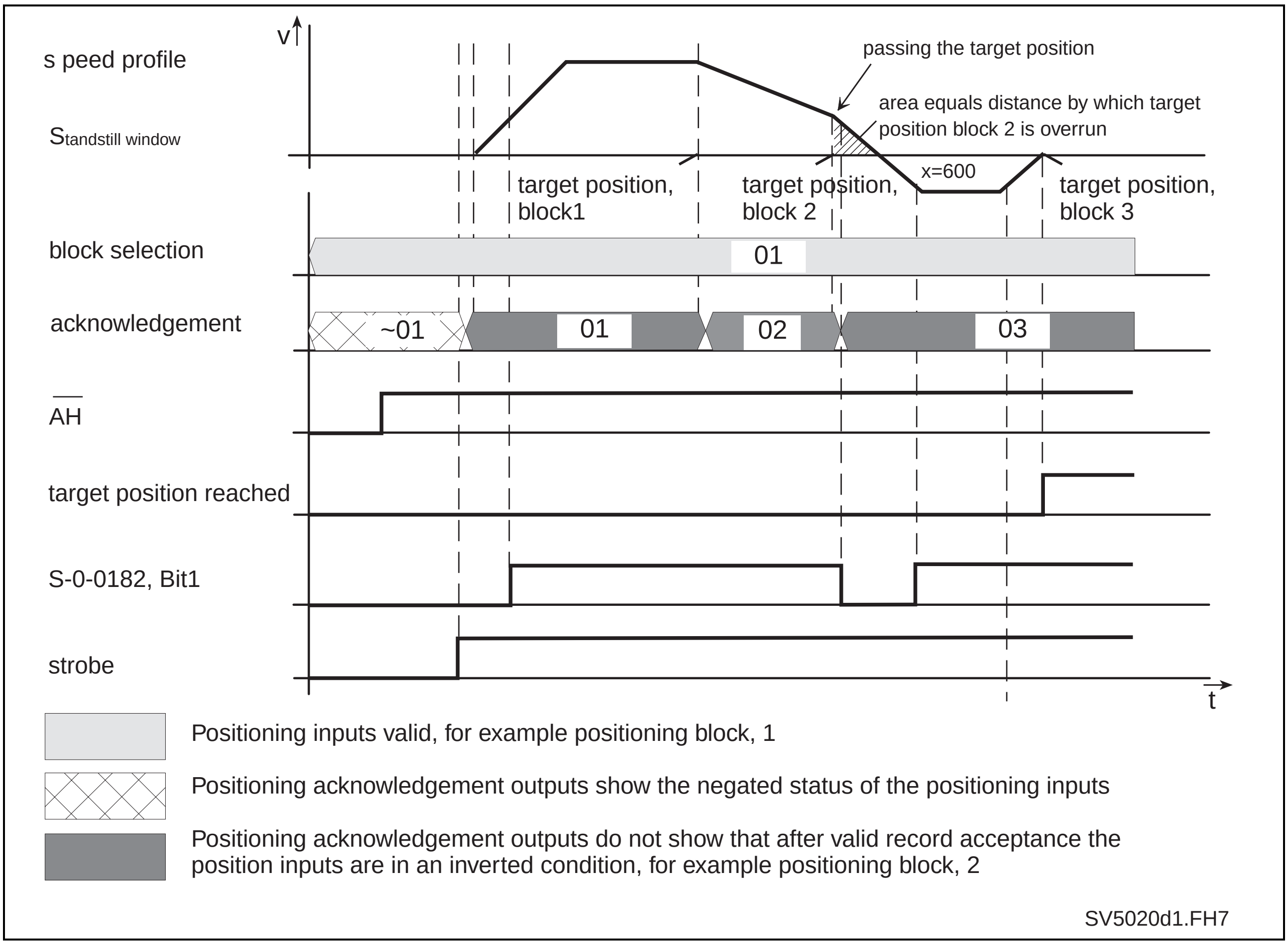


Fig. 8-34: Parametrizing a following block with directional change

Note: In this case it is urgently necessary to take the above rule of thumb into account for minimum acceleration to avoid overshooting of position!

Acknowledge positioning block selected

Acknowledge with drive enable removed

After removing the drive enable the **last accepted positioning block** is output. If the drive is at the target position of the last positioning block, then the message "**end position reached**" is additionally generated.

Note: The message "End position reached" is retained even after the drive enable signal is removed.

The example below shows the same absolute positioning block being started once more time.

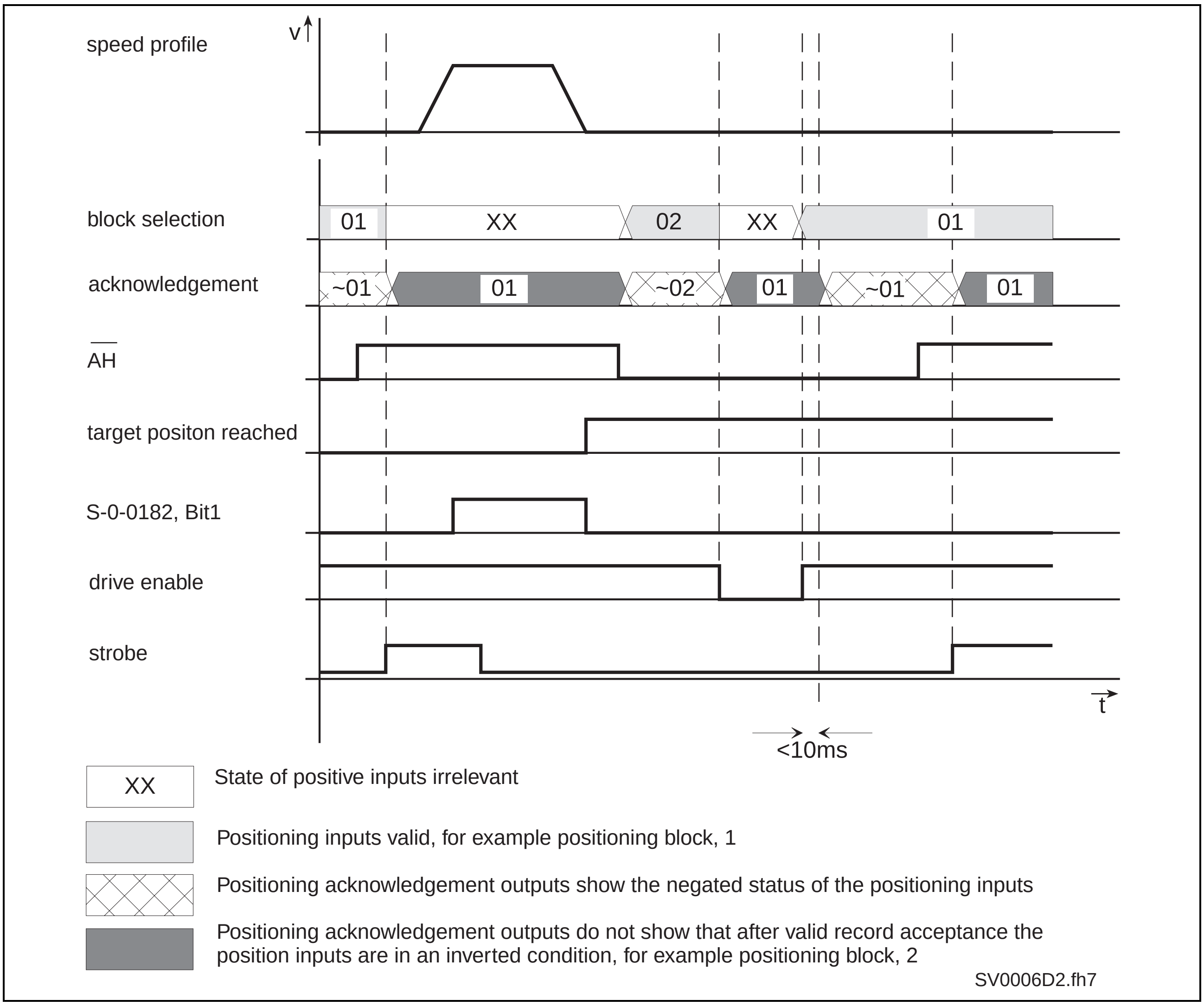


Fig. 8-35: Acknowledging and signalling **"End position reached"** after drive enable removed

Acknowledge with control voltage interrupt

If the control voltage is switched off, then the last positioning block is secured is stored in parameter **P-0-4052, Positioning block, last accepted.** This means that after powering up the last positioning block is output.

Absolute encoder

If an **Absolute encoder** is used, then it can be decided after the control voltage is switched off and on whether the drive is at the target position of the last positioning block (IN-POS message active).

The INPOS message is fixed as soon as the drive is ready to operate again (bb contact closed).

Singleturn encoder

If a **Singleturn encoder** is used, then the IN-POS message is not clearly defined after a power interrupt until the firt target position is approached or referenced.

Note: The INPOS message is only retained if the axis is not moving during the interruption. If the axis is moved into the positioning window during the interruption, then the INPOS message will also be generated. After activating the drive enable, positioning block acknowledge changes to as described in "Acknowledge with drive enable removed".

Positioning block mode with parallel interface

Parallel interface with DKC01.3... means that special hardware, acknowledge and status messages available.

With a parallel interface, ten freely configurable digital inputs and ten freely-configurable digital outputs are available. By configuring parameters **S-0-0145, Signal control word** and **S-0-0144, Signal status word** the positioning interface is determined.

The signal control word and status word must be configured with a hardware allocation to connector X20 (parallel interace).

Configuration signal control word

- Bits 0-5 of positioning block select (P-0-4026 Bit 0-5)
- Bit 6 S-0-0346 bit 0
- Bit 7 command drive-guided referencing (S-0-0148)
- Bit 8 and 9 jogging input (P-0-4056 bit 0 and 1)

Configuration signal status word

- Bit 0-5 positioning block, acknowledge (P-0-4051 Bit 0-5)
- Bit 6 S-0-0182 Bit 12 "End position reached“
- Bit 7 S-0-0182 Bit 1 "Standstill“
- Bit 8 S-0-0403 position status bit 0
- Bit 9 S-0-0059 position switch point bit 0

It is then possible to select a block directly via the parallel inputs if bit 0 has been set to = 1 in parameter **P-0-4060, Process block control word.**

Note: With "Load default parameters" the signal control word is preset as described above.

See also the project planning manaul *on Input and outputs for positioning block mode*.

Diagnostic messages

- **E248 Interpolation acceleration = 0**
- **E249 Positioning velocity S-0-0259 > S-0-0091**
- **E253 Target position out of travel range**
- **E254 Not homed**
- **E255 Feedrate-override S-0-0108 = 0**
- **E258 Selected process block is not programmed**
- **E264 Target position out of num. range**

8.9 Operating Mode: Stepper motor Operations

In "Stepper motor mode"" the drive behaves like a conventional stepper motor drive. This means that conventional stepper motor controls can be used to control the drive.

The operating mode is only available in conjunction with the parallel interface. This is why it is only used with DKC01.3 units.

Note: **Due to the digital imitation of a stepper motor drive, the use of the controller in precision applications is not recommended**.
INDRAMAT offers exceptionally well-suited drive systems with SERCOS interface for applications such as these.

It is only available in the main operating mode (**S-0-0032, Primary mode of operation**).

The drive is in this mode in position control. The position command values are set by the relevant stepper motor signals. The read-in steps are added up and smoothed with a PT1 filter and then specified to the position controller.

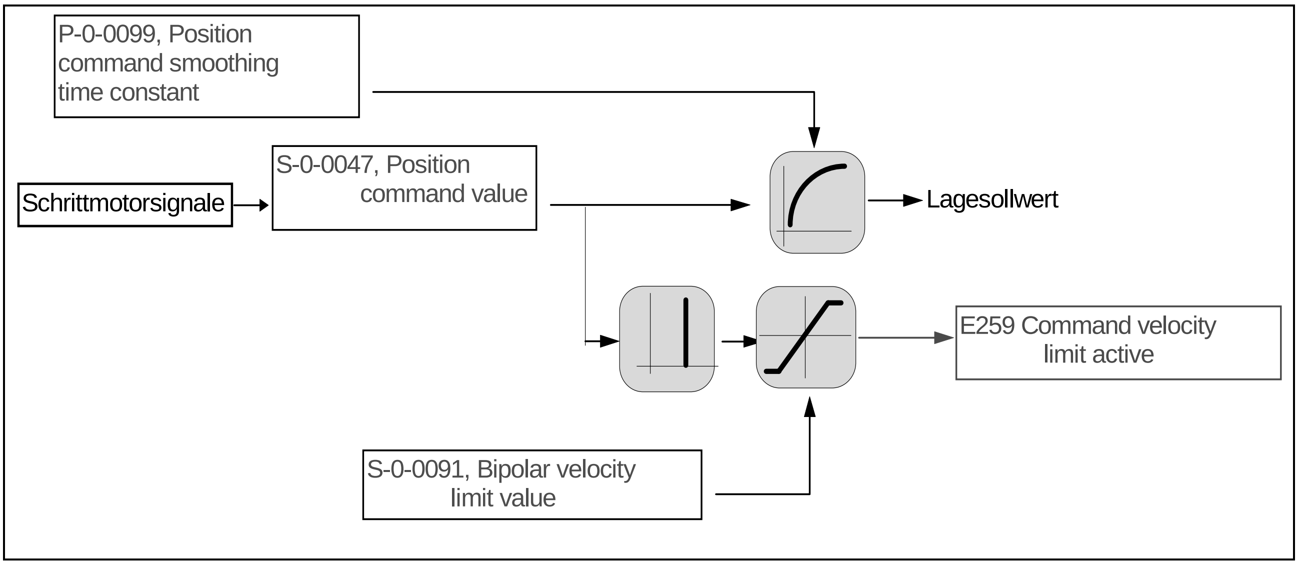


Fig. 8-36:Processing stepper motor signals

The operating mode always relate to the actual position values of encoder 1.

Pertinent parameters

- **P-0-4033, Stepper motor resolution**
- **P-0-4034, Stepper motor interface mode**
- **P-0-0099, Position command smoothing time constant**

Stepper motor signal processing

In "Stepper motor mode" the drive converts externally fed in pulses into defined position changes. Using parameter **P-0-4034, Stepper motor interface mode various** it is possible to select various modes:

- quadrature signals
- forwards/backwards signals
- one step and one direction signal

The pulses pending processing are applied at the relevant inputs of the parallel interface.

The number of steps per motor revolution can be set in parameter **P-0-4033, Stepper motor resolution**. The steps are set in increments of mm in linear motors.

Note: The drive only processes the fed in pulses if both drive enable and AH/start signal are applied and no drive error is pending. In other words, fed in pulses are lost if the drive is without drive enable or in "drive halt". The processed pulses are given to the position controller without filtering.

Interface Mode

The stepper motor signals must meet the demands illustrated in the figure below.

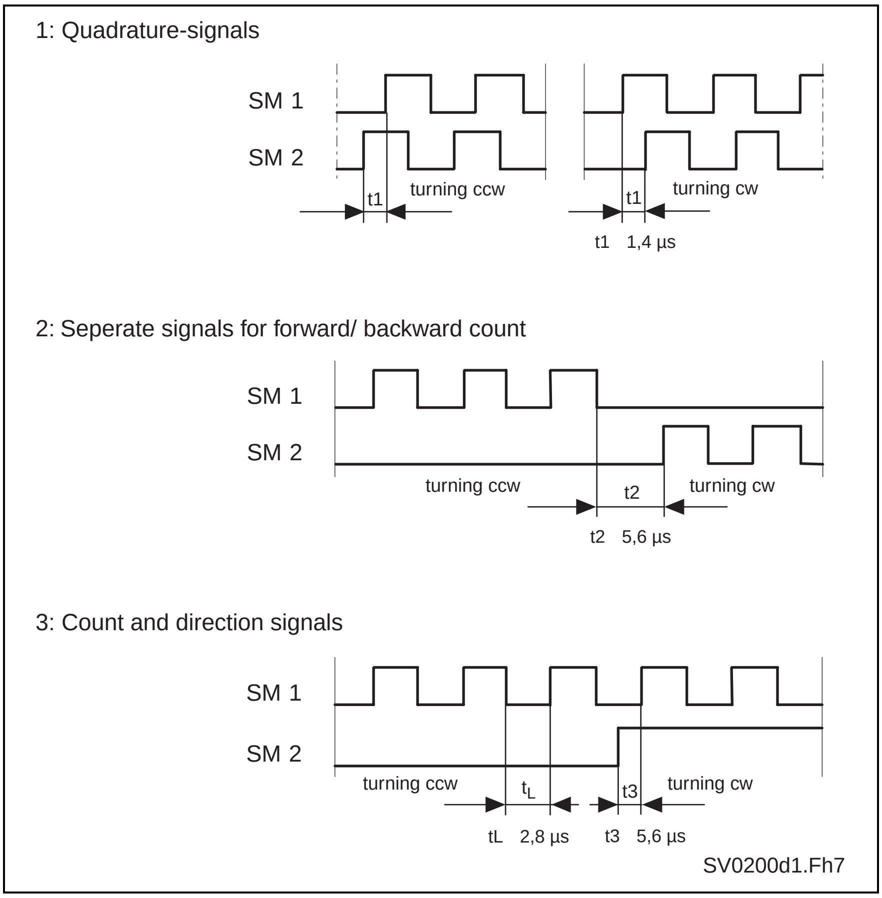


Fig. 8-37:Stepper motor interface

Diagnostic Messages

The in-position message must be configured via the signal status word. It makes sense to allocated bit 6 in parameter **S-0-0013, Class 3 diagnostics** (lag error < position window).

Connecting the Parallel Interface

The allocation of the parallel interface connections is described in detail in the Project Planning Manuals.

See Project Planning Manual: Control inputs for Stepper Motor Operations.

8.10 Operating Mode: Jogging

Operating mode is used to run an axis in "Manual mode", i.e., without the use of the control program.

In units with positioning interface or step-motor interface, it is possible to mount circuits at the jogging inputs which can be moved to use the axes.

Pertinent Parameters

- **P-0-4030, Jog velocity**
- **P-0-4056, Jog inputs**
- **S-0-0260, Positioning Acceleration**
- **S-0-0193, Positioning Jerk**

Additional parameters

- **S-0-0403, Position feedback value status**
- **S-0-0055, Position polarities**
- **S-0-0049, Positive position limit value**
- **S-0-0050, Negative position limit value**

How it works

Activating the operating mode ogging:

The bit strip

1100,0000,0001,1011 b

must be entred in parameter **S-0-0033, Secondary operation mode 1**.

The mode can only be entered as 1 auxiliary mode.

Functional Sequence of operating mode jogging

Upon activation of the mode, the drive runs position controlled while maintaining the speed limit value (**P-0-4030, Jog velocity**), the acceleration limit value (**S-0-0260, Positioning Acceleration**) and the jerk limit value (**S-0-0193, Positioning Jerk**).

Jogging direction is fixed in parameter **P-0-4056, Jog inputs**.

Jog inputs	Drive	Display
01b	moving forward	JF
10b	moving backward	Jb

Fig. 8-38: Relationship of jog input to travel direction

If position status = 1 (drive is referenced) and position limit value monitor activated (S-0-0055, Position polarities Bit 4 =1), then the drive positions to the relevant position limit value. The corresponding position limit value is written into parameter S-0-0258, Target position.

Note: The speed at which the drive moves when jogging can be influenced with the help of the **Override function**. Function **Positioning at limited speed** also has an immediate effect on the jog speed (see also section: "Mode: Drive Internal Interpolation"

Diagnostic Messages

Warning "**E831 Position limit reached during jog**“ is generated if the drive positions at the position limit value.

The warning is cleared:

- once the mode is changed and
- after jogging in the opposite direction.

Hardware Requirements for operating mode jogging

In units with positioning interface (e.g., DKC01.3) parameter **P-0-4056, Jog inputs** is write accessed directly by the hardware inputs jog+ (jog inputs =1) and jog- (jog inputs =2). The entry into the 1st auxiliary mode and the switch to auxiliary mode take place automatically.

9 Basic Drive Functions

9.1 Physical Values Display Format

Data exchange between the controller and the primary control system or user interface occurs by reading and writing controller parameters. Information about the unit and the number of decimal places (see also Parameter" is necessary for interpreting the operating data of a parameter. The LSB value of the operating data is produced from these data. The following illustration shows this with an example.

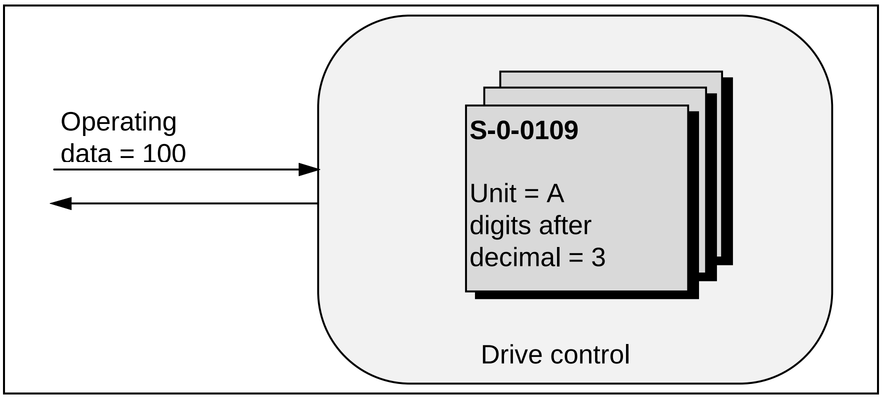


Fig. 9-1: Example for interpreting operating data in the drive

The combination of unit and number of decimal places is expressed with the term scaling.

The operating data of the parameter S-0-0109 is given the value 100 in the picture shown above. When combined, the unit A(mps) that belongs to this parameter and the number of decimal places produce the physical value **0.100 A**.

Each parameter can therefore be called up with a unit and the number of decimal places. The combination of these two criteria is united under the term **scaling**. When interpreting operating data, these must always be included in the analysis. Units and number of decimal places are listed along with all other parameter attributes in Supplement A, Parameter Description, for each parameter.

Adjustable Scaling for Position, Velocity, and Acceleration Data

The LSB value of position, velocity, and acceleration data can be set by adjustable scaling.

The parameter scaling for

- position,
- velocity and
- acceleration data

can be adjusted. It can be set by the user with scaling parameters. It enables

1. the value of this data to be made compatible for exchange between control system and control drive, or, in other words, the data can be exchanged in the control system’s internal format. The control system will not need to convert this data.

2. this data to conform to machine kinematics. Linear movements can be described with linear units, for example, and rotary movements can be described with rotary units.

It is possible to select between linear and rotary scaling, and preferred and parameter scaling, as well as between motor and load reference.

Linear - Rotary Scaling

Adjustable scaling allows either linear or rotary scaling to be selected. Linear motors normally use a linear scale. Rotary motors use either a rotary or linear scale if their rotary movement is converted into a linear movement (with a ball roll spindle, for example).

Preferred Scaling - Parameter Scaling

Adjustable scaling allows either preferred scaling or parameter scaling to be selected. If preferred scaling is selected, the appropriate scaling factor parameters and scaling exponent parameters in **S-0-0128, C200 Communication phase 4 transition check** are overwritten with preferred values. This sets a pre-defined scaling. The scaling factor parameter and the scaling exponent parameter are not entered. The concrete preferred scaling adjusts itself to the selection of linear or rotary scaling.

The following preferred scalings are available:

Physical Value:	Rotary Preferred Scaling:	Linear Preferred Scaling (mm):	Linear Preferred Scaling (Inch):
Position data	0.0001 Degrees	0.0001 mm	0.001 Inches
Velocity Data	0.0001 RPM, or 10^-6 Rev/s	10^ 6 m/min	10^-5 in/min
Acceleration Data	0.001 rad/s²	10^-6 m/s²	--

Fig. 9-2: Preferred scaling - parameter scaling

Motor Reference - Load Reference

Either motor reference or load reference can be selected when adjusting the scaling.

With rotary load reference, the scaled data from the motor format is converted to the transmission output format with the transmission ratio **S-0-0122, Output revolutions of load gear / S-0-0121, Input revolutions of load gear**.

With linear load reference, the scaled data from the motor format is converted to feed constant spindle format with the transmission ratio **S-0-0122, Output revolutions of load gear / S-0-0121, Input revolutions of load gear** and the feed constant **S-0-0123, Feed constant**.

The following restrictions apply in relationship to the motor type being used :

- Rotary motor reference cannot be set with linear motors.
- Linear motor reference cannot be set with rotary motors.

Display Format of Position Data

The scaling of drive controller position data is adjustable. This is done with the parameters

- **S-0-0076, Position Data Scaling Type**
- **S-0-0077, Linear Position Data Scaling Factor**
- **S-0-0078, Linear Position Data Scaling Exponent**
- **S-0-0079, Rotational position resolution**

This differentiates between linear and rotary scaling. **S-0-0079, Rotational position resolution** sets the rotary position scaling. **S-0-0077, Linear Position Data Scaling Factor** and **S-0-0078, Linear Position Data Scaling Exponent** set the linear position scaling.

The scaling type is set in **S-0-0076, Position Data Scaling Type**.

The parameter is defined as follows:

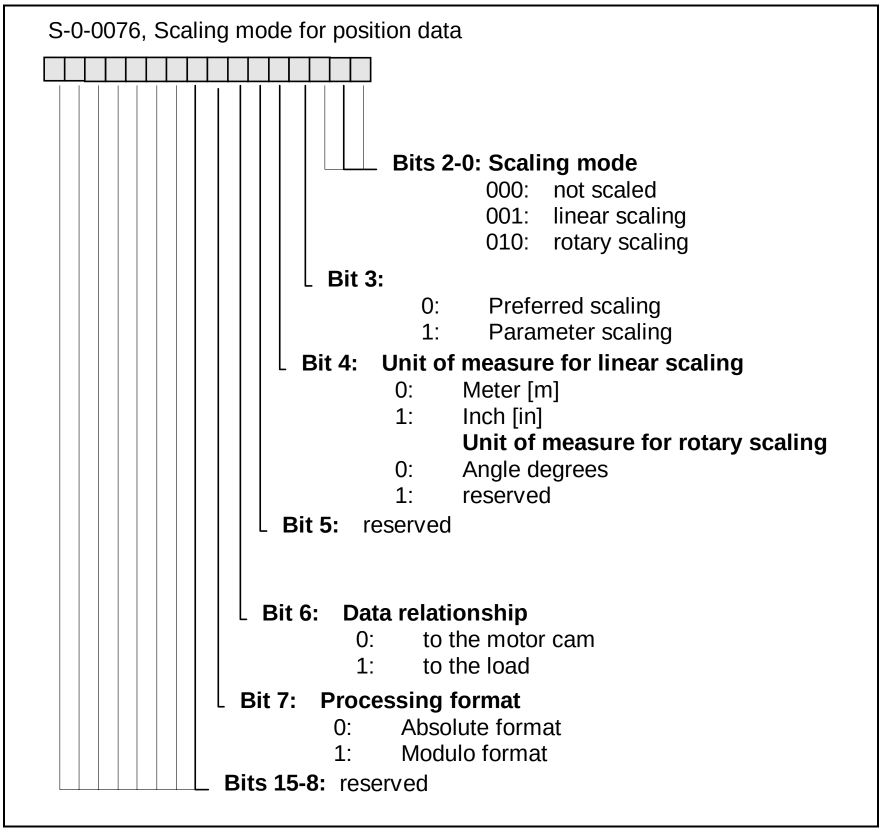


Fig. 9-3: Parameter S-0-0076

The actual scaling type is set in bit 0..2.

In Bit 3, either preferred scaling (parameters **S-0-0077, Linear Position Data Scaling Factor**, **S-0-0078, Linear Position Data Scaling Exponent** or **S-0-0079, Rotational position resolution** are pre-defined and cannot be changed) or parameter scaling (scaling is determined by entering this parameter) can be selected. (see Preferred Scaling - Parameter Scaling"

Bit 4 indicates the measurement unit. With linear scaling, either mm or inch can be selected here.

Bit 6 defines motor or load reference.

Bit 7 determines the processing format (see Modulo Feature"

The scaling type setting is checked for plausibility in **S-0-0128, C200 Communication phase 4 transition check**, and the command error message **C213 Position Data Scaling Error** is generated, if necessary.

Velocity Data Display Format

The scaling of the drive controller's velocity data is adjustable.

This is done with the parameters

- **S-0-0044, Velocity data scaling type**
- **S-0-0045, Velocity data scaling factor**
- **S-0-0046, Velocity data scaling exponent**

The scaling type is set in **S-0-0044, Velocity data scaling type**. The parameter is defined as follows:

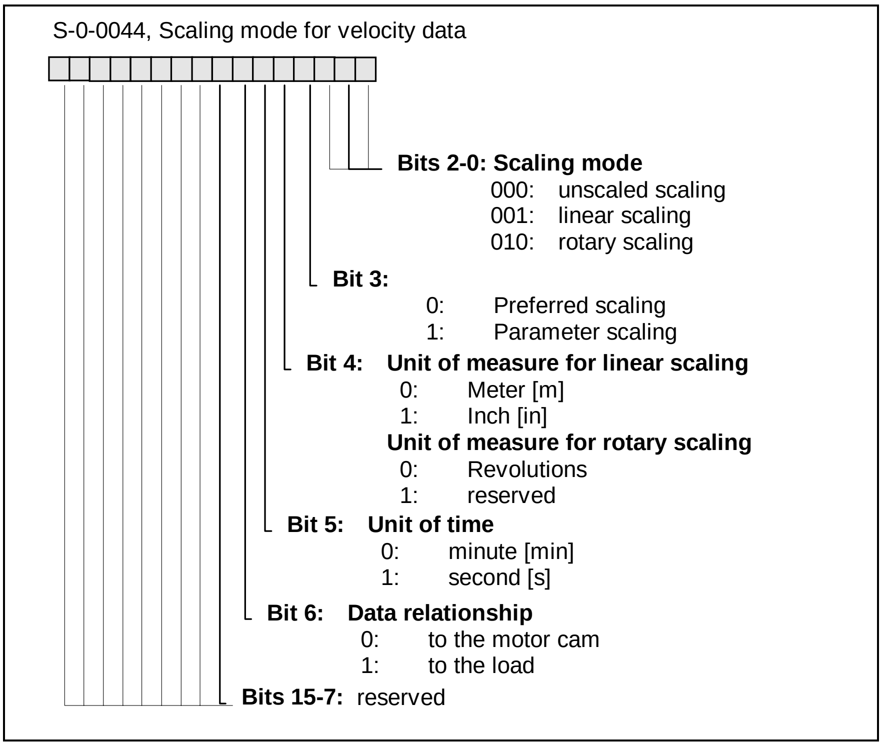


Fig. 9-4: Parameter S-0-0044

The actual scaling type is set in bit 0..2.

In bit 3, either preferred scaling (parameters **S-0-0045, Velocity data scaling factor** and **S-0-0046, Velocity data scaling exponent** are pre-defined and cannot be changed) or parameter scaling (scaling is determined by entering this parameter) can be selected. (see Preferred Scaling - Parameter Scaling"

Bit 4 indicates the measurement unit. With linear scaling, either m or inch can be selected here.

Bit 5 specifies the unit of time, either minutes or seconds.

Bit 6 defines motor or load reference.

The scaling type setting is checked for plausibility in **S-0-0128, C200 Communication phase 4 transition check,** and the command error message **C214 Velocity Data Scaling Error** is generated, if necessary.

Acceleration Data Display Format

The scaling of the drive controller's acceleration data is adjustable.

This is done with the parameters

- **S-0-0160, Acceleration data scaling type**
- **S-0-0161, Acceleration data scaling factor**
- **S-0-0162, Acceleration data scaling exponent**

The scaling type is set in **S-0-0160, Acceleration data scaling type**. The parameter is defined as follows:

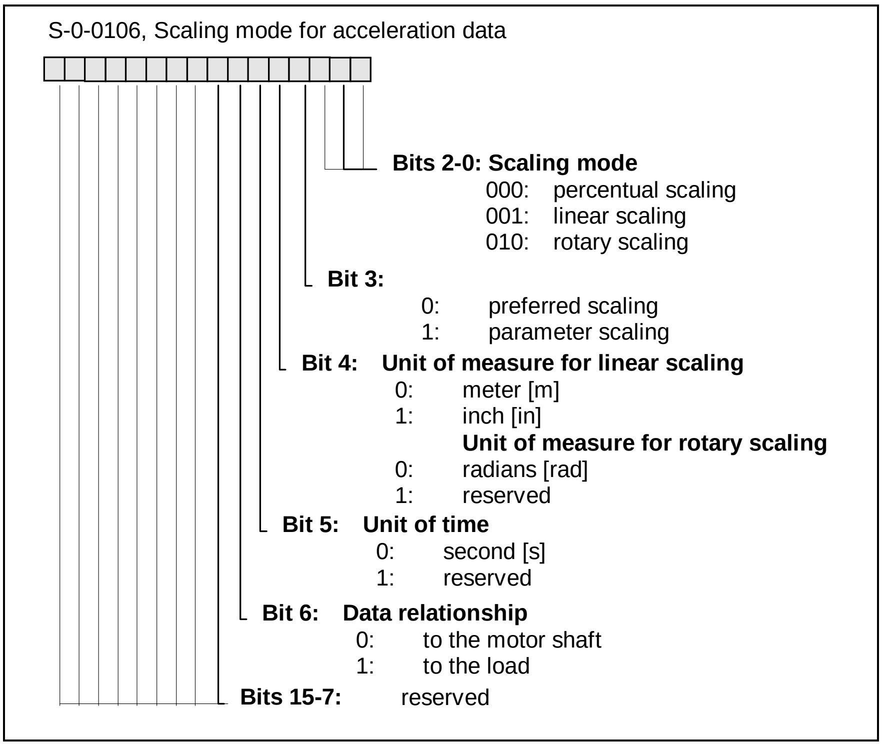


Fig. 9-5: Parameter S-0-0160

The actual scaling type is set in bit 0..2.

Either preferred scaling (parameters **S-0-0161, Acceleration data scaling factor** and **S-0-0162, Acceleration data scaling exponent** are pre-defined and cannot be changed) or parameter scaling (scaling is determined by entering this parameter) can be selected in bit 3. (see Preferred Scaling - Parameter Scaling"

Bit 6 defines motor or load reference.

The scaling type setting is checked for plausibility in **S-0-0128, C200 Communication phase 4 transition check,** and the command error message **C215 Acceleration Data Scaling Error** is generated, if necessary.

Command Polarities and Actual Value Polarities

The drive-internal polarities of position, velocity, torque/force and actual value are fixed. The following applies:

Motor type:	Drive internal positive direction definition:
Rotary motors	Clockwise rotation facing the motor shaft
Linear motors	Move in the direction of the frontal area of the power cable on the primary component

Fig. 9-6: Drive internal positive direction definition

The positive direction is specified by the manufacturer for MHD-, MKD and MKE motors. Asynchronous motors and linear synchronous motors should be set in this direction during installation. (see "Other Motor Encoder Characteristics" The command polarity and value polarity of the drive is thereby fixed.

If the drive's definition of the positive direction does not conform to the requirements of the machine, the parameters

- **S-0-0055, Position Polarity Parameter**
- **S-0-0043, Velocity polarity parameter**
- **S-0-0085, Torque/Force polarity parameter**

can invert the command and actual value polarities.

Note: If the polarity needs to be changed, all 3 parameters should always be inverted at the same time, so that the polarities of the position, velocity, and torque/force have the same sign.

The following illustration shows the operating characteristics of the polarity parameters.

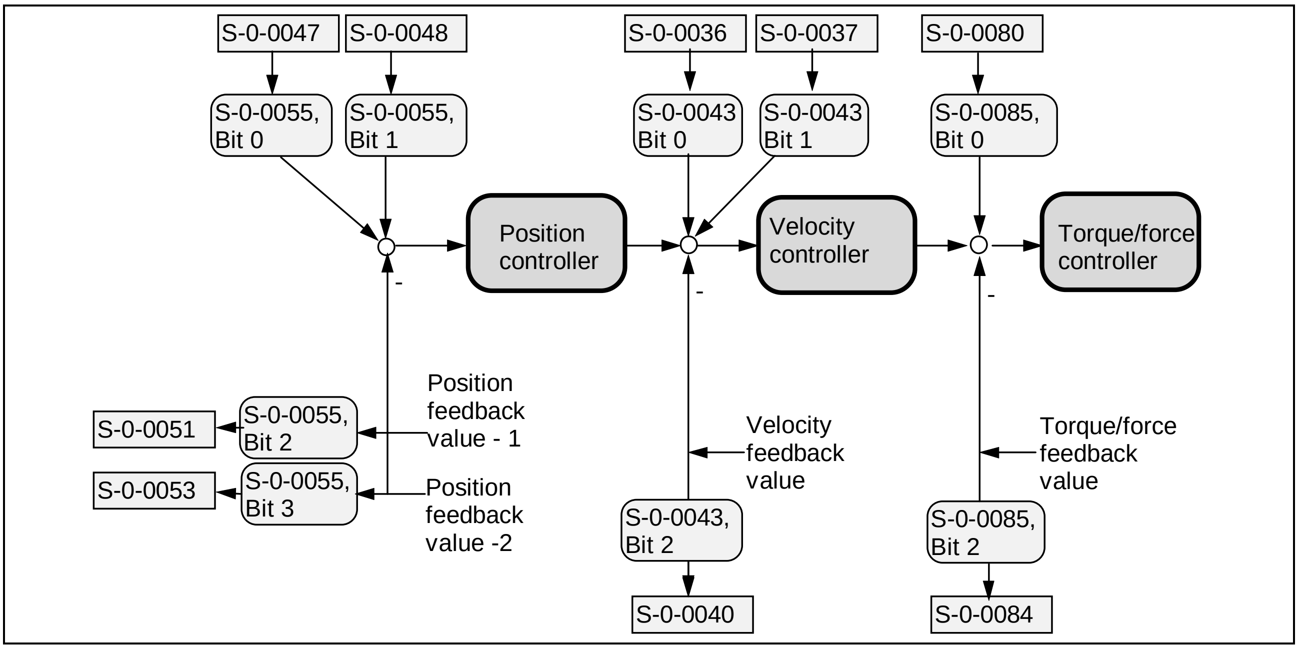


Fig. 9-7: Polarity parameter operating characteristics

The polarity parameters affect only the display values, not the control feedback values.

The drive software only allows all bits within a polarity parameter to be inverted. If bit 0 is inverted, all other bits of the parameter are also inverted. This prevents setting positive feedback in the regulator loops because of faulty command and feedback value polarities.

Mechanical Transmission Elements

Mechanical transmission elements are gearboxes and feed mechanisms between the motor shaft and the load. Entering these data is necessary for the load to convert the position, velocity, and acceleration physical values, if these are scaled for the load. (See also "Adjustable Scaling for Position, Velocity, and Acceleration Data". To see if this parameter has been entered correctly, move the shaft and compare the path followed with the position feedback value and the path actually taken.

Transmission Ratio

The transmission ratio can be determined with the parameters

- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**

The ratio between transmission input and transmission output is parameterized here.

Example:

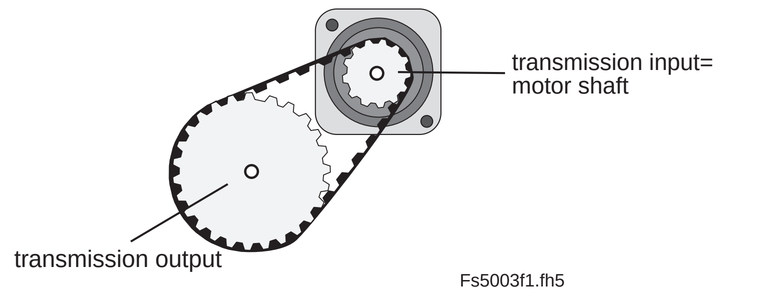


Fig. 9-8: Transmission ratio parameterization

In the illustration above, 5 transmission input revolutions (= motor revolutions) were equivalent to 2 transmission output revolutions. The proper parameterization for this would be :

S-0-0121, Input revolutions of load gear = 5

S-0-0122, Output revolutions of load gear = 2

Feed Constant

The feed constant defines which linear path the load should follow per transmission output revolution. It is specified in the parameter **S-0-0123, Feed constant**.

The value programmed here is used along with the transmission ratio for converting the position, velocity, and acceleration data from motor reference to load reference.

Example:

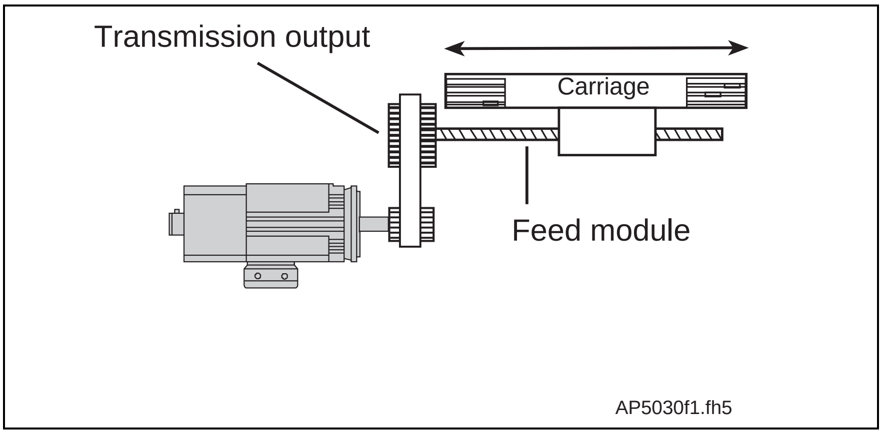


Fig. 9-9: Feed constant parameterization

In the illustration above, the feed module would cover 10 mm per transmission output revolution. The proper parameterization for this would be :

S-0-0123, Feed Constant = 10 mm/Rev

Modulo Feature

When the modulo function is activated, all position data within the modulo range are displayed.

When the modulo function is activated, all position data are displayed in the range 0..(modulo value-1). This makes it possible to have shafts continuously moving in one direction without an overflow in the position data.

The modulo value is set with the parameter **S-0-0103, Modulo Value**.

The modulo function is activated by the parameter **S-0-0076, Position Data Scaling Type**.

(See also "Display Format of Position Data"

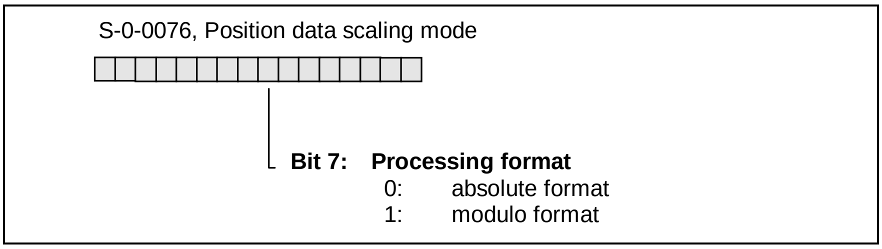


Fig. 9-10: Setting absolute format - modulo format

Note: Modulo processing of position data according to is only allowed with rotary motor types. This is checked in **S-0-0128, C200 Communication phase 4 transition check** and acknowledged by the command error **C213 Position Data Scaling Error** if necessary.

The following illustration elucidates the difference in displaying the position data in absolute format and modulo format:

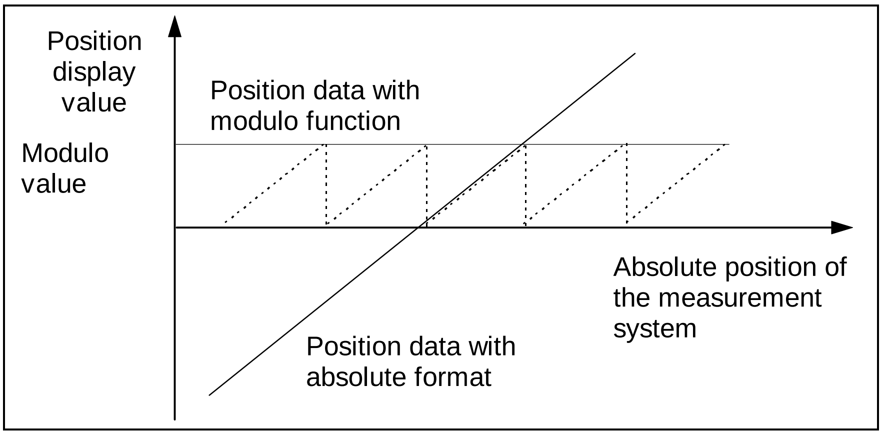


Fig. 9-11: Display value of positions in absolute format and modulo format

Modulo Processing-Limiting Conditions

If modulo processing of position data is selected, in connection with

- the active operating mode and
- the selected position scaling

the following limiting conditions for error-free processing of the position data must be observed. Compliance with the limiting conditions is checked in **S-0-0128, C200 Communication phase 4 transition check**, and the command is terminated with the error **C227 Modulo Range Error** if necessary.

The limiting conditions for error-free modulo value processing are as follows:

- The modulo range **S-0-0103, Modulo Value** may not be greater than half the maximum travel range. The maximum travel range depends on the motor feedback being used (see also "Drive-internal format of position data"
- If rotary or linear position scaling with load reference and without angle synchronization is used as the operating mode, the product of **S-0-0103, Modulo Value, S-0-0116, Resolution of motor feedback** and **S-0-0121, Input revolutions of load gear** must be smaller than 2^63.

If, in addition to this, an external measurement system is used, the additional requirements are:

- If rotary position scaling with motor reference and no angle synchronization operating mode is used, the product of **S-0-0103, Modulo Value**, **S-0-0117**, **Feedback 2 Resolution** and **S-0-0122, Output revolutions of load gear** must be smaller than 2^63.
- If rotary position scaling with motor reference and angle synchronization operating mode is used, the product of **S-0-0237, Slave drive 1 revs.**, **S-0-0117**, **Feedback 2 Resolution** and **S-0-0122, Output revolutions of load gear** must be smaller than 2^63.

Processing Command Values in Modulo Format, Shortest Path - Direction Selection

The interpretation of position command values such as **S-0-0047, Position Command Value** and **S-0-0258, Target Position** when the modulo function has been activated is dependent on the selected mode.

The following possibilities exist:

- Shortest Path
- Positive Direction
- Negative Direction

The parameter **S-0-0393, Command value mode for modulo format** can be used to set the mode. This parameter is effective only if modulo format has been activated in **S-0-0076, Position Data Scaling Type**.

The following settings can be entered:

S-0-0393:	Meaning:
0	Shortest Path
1	Positive Direction
2	Negative Direction

Fig. 9-12: Selecting modulo mode

Modulo Mode "Shortest Path"

The next command value is reached with the shortest path. If the difference between two successive command values is greater than half of the modulo value, the drive moves toward the command value in the opposite direction.

Modulo Mode "Positive Direction"

The command value is always approached in a positive direction, regardless of whether or not the difference between two successive command values is greater than half of the modulo value.

Modulo Mode "Negative Direction"

The command value is always approached in a negative direction, regardless of whether or not the difference between two successive command values is greater than half of the modulo value.

9.2 Setting the Measurement System

The drive controller is equipped with two permanently installed encoder interfaces, i.e., X4 and X8.

The encoder interface 1 (X4) is designed so that the following encoder types can be evaluated:

Encoder interface 1: X4

- digital servo feedback (DSF, HSF)
- resolver
- resolver without feedback data memory

Using encoder interface 2 (X8) it is possible to evaluate the following encoder types:

Encoder interface 2: X8

- incremental encoder with sine signals 1Vss
- incremental encoder with square-wave signals
- measuring system with EnDat interface
- gearwheel encoder with 1Vss signals

Both encoder interfaces can be used to connect either a motor or an optional encoder.

At which interface the motor encoder should be connected and what type it is is set in parameter:

- **P-0-0074, Feedback type 1**

If an optional encoder is also to be used, the parameter

- **P-0-0075, Feedback type 2**

must be used to define encoder interface and encoder type.

The following table explains the relationship:

Measuring system type:	Interface	Value in P-0-0074/75
digital servo feedback or resolver	1	1
incremental encoder with sine signals from Heidenhain with 1V signals	2	2
Incremental encoder with square wave signals from Heidenhain	2	5
Encoder with EnDat-interface	2	8
gearwheel encoder with 1Vss signals	2	9
Resolver without feedback data storage	1	10
Resolver without feedback data storage + incremental encoder with sine signals	1 + 2	11
Hall encoder + square wave encoder	1 + 2	12
ECI encoderr	1	13

Fig. 9-13: Measuring systems > connections

The table illustrates that some combinations are not possible as each encoder interface is only physically present once.

To display the actual position value of the individual measuring systems, use parameters:

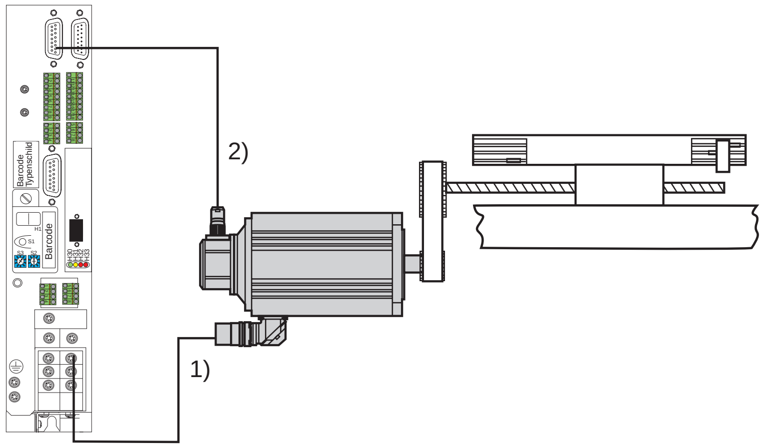
- **S-0-0051, Position feedback 1 value**
- **S-0-0053, Position feedback 2 value**

To set the absolute reference of actual position value 1/2 to the machine zero point, use commands

- **S-0-0148, C600 Drive controlled homing procedure command or**
- **P-0-0012, C300 Command 'Set absolute measurement'**

Motor Encoder

The measurement system which is directly coupled with the motor shaft without a gearbox between them is called the motor encoder. As the motor is usually coupled to the load with a mechanical gearbox and probably a feed unit, this is also called an indirect distance measurement. If a further measurement system is attached directly to the load, than this direct distance measuring (see "Optional encoder". Hereafter, are shown typical applications of indirect distance measuring



1) Power connectopn of motor

2) Connection of motor encoder (indirect position acquisition)

Ap5134f1.fh7

Fig. 9-14: Application: Motor encoder with linear servo axis

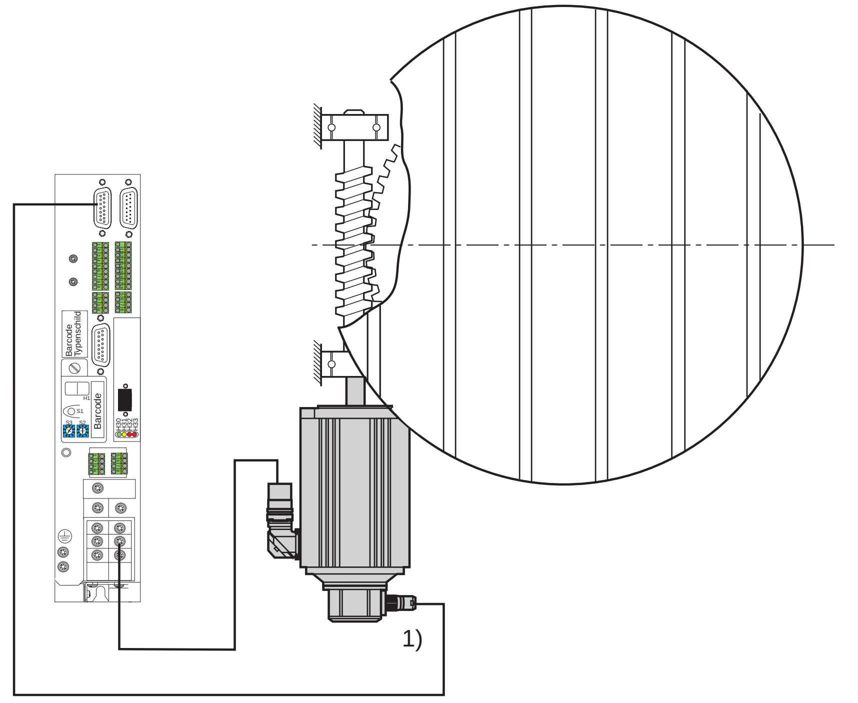


Fig. 9-15: Application: Motor encoder with rotary servo axis

The following parameters

- **P-0-0074, Feedback type 1**
- **S-0-0116, Feedback 1 Resolution**
- **S-0-0277, Position feedback 1 type**

are used to parameterize the motor feedback. These specify the interface number to which the measurement system is connected, the motor feedback resolution, as well as the direction of movement, etc. The parameter **S-0-0051, Position feedback 1 value** displays the position of the motor feedback.

The absolute Measurement relative to the machine zero point is set with

- **S-0-0148, C600 Drive controlled homing procedure command**

or, for absolute encoders,

- **P-0-0012, C300 Command ’Set absolute Measurement’**

Determining the Feedback Interface of the Motor Feedback

Determining the encoder interface of the motor encoder is done with the parameter **P-0-0074, Feedback type 1**. The number of the motor encoder type must be entered. The motor encoder interface in P-0-0074 is automatically set in some motor types.

(See also chapter: "Characteristics of the Different Motor Types"

The following measurement systems and modules may be used with motors with motor encoder interfaces that can be parameterized.

Measuring system:	Encoder interface	Value in P-0-0074	For synchronous motors	For asynchronous motors
not available (only with rotary asynchronous motors)	-	0	no	yes
digital servo feedback (LSF,HSF) or resolver	1	1	yes	yes
Incremental encoder with sine signals from (1V signals)	2	2	no	yes
Incremental encoder with square wave signals from Heidenhain	2	5	no	yes
encoder with EnDat interface from Heidenhain	2	8	yes	yes
gearwheel encoder with 1Vss signals	2	9	no	yes
resolver without feedback data memory	1	10	yes	no
resolver without feedback data memory plus incremental encoder with sine signals	1 + 2	11	yes	no
Hall encoder plus square wave encoder	1 + 2	12	yes	no
ECI encoder	1	13	yes	yes

Fig. 9-16: Determining encoder interface for the motor encoder

Note: The motor encoder is only then unnecessary if you work with a loadside motor encoder. This is only possible with rotary asynchronous motors (**P-0-4014, Motor type** = 2 or 6). In this case, the external encoder is the only control encoder (see also "Optional encoder"

Motor Encoder Resolution

The motor encoder resolution is parameterized in the parameter **S-0-0116, Feedback 1 Resolution**. Enter the graduation scale of the motor feedback. If using a measurement system with intrinsic feedback data storage, the resolution will be taken from this and does not need to be entered.

Measurement systems with feedback storage:

- DSF, HSF
- Resolver
- EnDat

Depending on whether a rotary or linear motor is used, the units and the number of decimal places are changed via **S-0-0116, Feedback 1 Resolution**.

(see also chapter: Linear-Rotational"

Other Motor Encoder Characteristics

To parameterize the other motor encoder characteristics, such as

- Direction of movement not-inverted/inverted
- Distance-coded reference mark yes/no
- Rotary / linear measurement system
- Absolute evaluation possible
- Absolute evaluation activated

use **S-0-0277, Position feedback 1 type**. The structure of this parameter is as follows:

S-0-0277, Position feedback 1 type

Bit 0 : Encoder type
0: rotary
1: linear

Bit 1 :Distance-coded reference marker
0: no distance-coded reference marker
1: distance-coded reference marker

Bit 3 :Rotational direction
0: non-inverted
1: inverted

Bit 6 :Absolute evaluation possible
0: Absolute evaluation not possible
1: Absolute evaluation possible

Bit 7 :Absolute evaluation activated
0: Absolute evaluation activated (only if bit 6 = 1)
1: Absolute evaluation deactivated

Fig. 9-17: Parameter S-0-0277

The bits in the position encoder type parameter are partially set or deleted by the drive itself.

There are following dependencies:

- If the connected motor has a motor feedback memory (MDD, MKD or MKE), then bits 0, 1 and 3 are cleared.
- If the connected motor is a linear motor, then bit 0 is set to 1.
- Depending on the absolute encoder range and the maximum travel range or modulo value, bit 6 is either set or cleared.

(See also chapter: "Other Settings for Absolute Measurement Systems"

Optional encoder

A control with optional encoder facilitates higher contour precision of the machined workpieces in terms that it offers higher positioning accuracy. With setting the operation mode, you can determine that the position control in the drive is done with the position feedback of the optional encoder. Additionally, the velocity control can be completely or partially done with the velocity feedback signal of this measurement system.

(See also sections: "Operating Modes" and "Setting the Velocity Mix Factor"

Typical application examples are shown in the following two pictures:

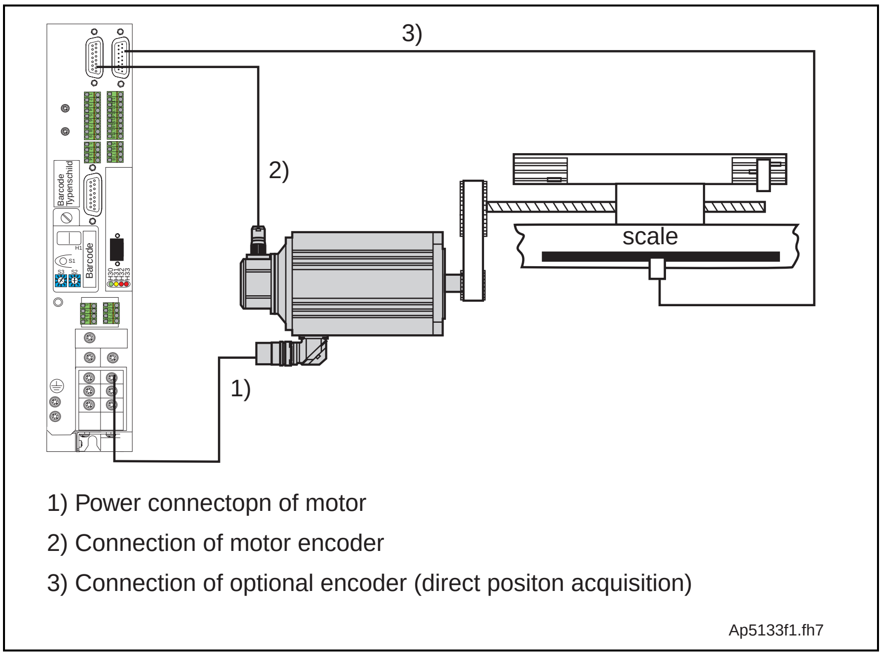


Fig. 9-18: Application: Optional encoder by linear servo axis

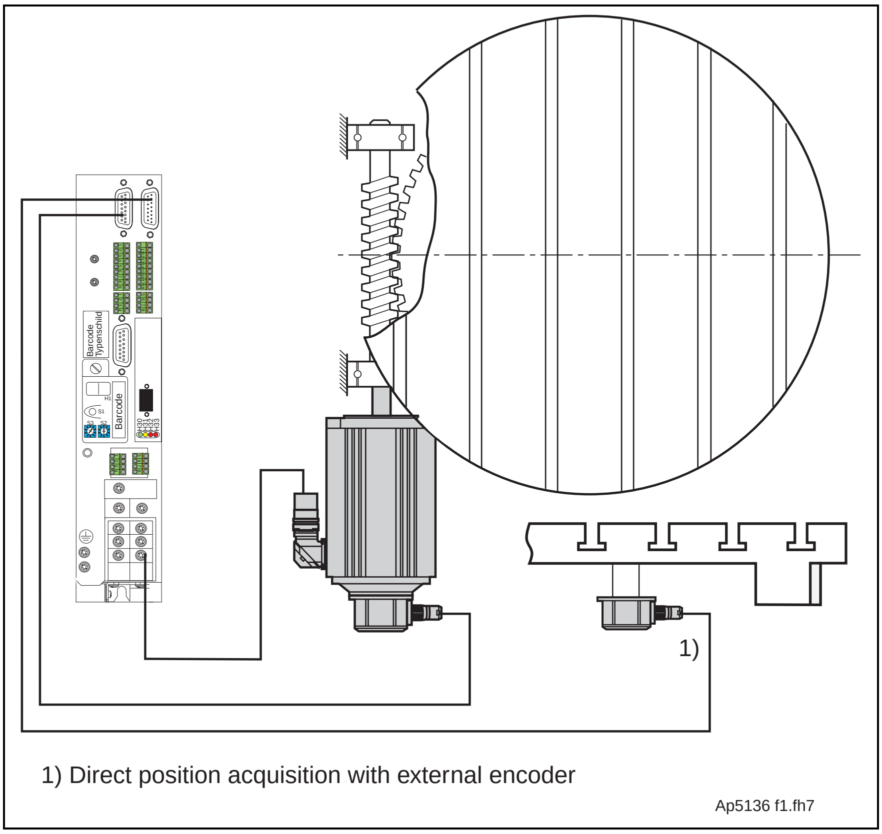


Fig. 9-19: Application: Optional encoder by rotary servo axis

The optional encoder is parameterized with the

- **P-0-0075, Feedback type 2**
- **S-0-0117, Feedback 2 Resolution**
- **S-0-0115, Position feedback 2 type**
- **P-0-0185, Function of encoder 2**

parameters. These specify the interface number to which the measurement system is connected, the resolution of the optional encoder, as well as the direction of movement, etc. The parameter **S-0-0053, Position feedback 2 value** displays the position of the optional encoder.

Set the reference measure to the machine zero point as follows:

- **S-0-0148, C600 Drive controlled homing procedure command**

or, for absolute encoders,

- **P-0-0012, C300 Command 'Set absolute measurement'**

The optional encoder can be used for different purposes.

The evaluation mode for the optional encoder is set in parameter **P-0-0185, Function of encoder 2**.

Value in P-0-0185, Function of encoder 2	Meaning
0	Optional encoder as an additional load-side control encoder for position and/or velocity control loops. Signal frequency monitored for exceeding mximum frequency of the interface. Upon exceeding this, error F246 Max signal frequency for encoder 2 exceeded is generated and the position status (S-0-0403) cleared.
2	Optional encoder as only load-side control encoder (only with rotary asynchronous motors). In this case, there is no other motor encoder (P-0-0074 = "0“). Parameter P-0-0121, Velocity mix factor Feedback 1 & 2 must be set to 100%.
4	Optional encoder as spindle encoder. Handled like „optional encoder as additional load-side control encoder for position and/or velocity control loops". Upon exceeding signal frequency, no error is generated but rather only the position status cleared.

Fig. 9-20: Function of the optional encoder

Determining the Encoder Interface of the Optional Encoder

Determining the encoder interface of the optional encoder uses parameter **P-0-0075, Feedback type 2**. The number of the encoder type must be entered there. The following measuring systems and modules are permitted for the evaluation of the optional encoder.

Measuring system:	Interface	Value in P-0-0075
not available	--	0
digital servo feedback	1	1
Incremental encoder with sine signals from Heidenhain with 1V signals	2	2
Incremental encoder with square wave signals from Heidenhain	2	5
encoder with EnDat interface	2	8
gearwheel encoder with 1Vss signals	2	9
ECI encoder	1	13

Fig. 9-21: Encoder interface of the optional encoder

If "0" is entered in **P-0-0075, Feedback type 2** as encoder type, then the encoder evaluation of the optional encoder is switched off.

Optional Encoder Resolution

To parameterize the resolution of the optional encoder use the parameter **S-0-0117, Feedback 2 Resolution**.

This parameter indicates the number of lines of the optional encoder. If using a measurement system with intrinsic feedback data storage, the resolution will be taken from this and does not need to be entered.

Measurement systems with feedback storage are available if

- **DSF, HSF**
- **EnDat**

is used as the optional encoder interface.

Depending on whether a rotary or linear measurement system was parameterized in bit 0 of **S-0-0115, Position feedback 2 type**, the unit and number of digits after the decimal is switched by **S-0-0117, Feedback 2 Resolution**.

Rotary: Cycles/Rev.

Linear: 0.00001 mm

Actual Feedback Value Monitoring

In applications where an optional measurement system is used, the position feedback monitor can offer an additional margin of safety.

The actual position monitor compares **S-0-0051, Position feedback 1 value** and **S-0-0053, Position feedback 2 value** and is thus capable of diagnosing the following axis error:

- Slip in the drive mechanical system
- Measurement system errors (as far as this is not recognized by the other measurement system monitors)

To set the monitor function use the parameter

- **S-0-0391, Monitoring window feedback 2**

If an error occurs, the error message **F236 Excessive position feedback difference** is generated.

Basic Operating Characteristics of the Position Feedback Monitor

The position feedback monitor compares the position feedback value of the encoder 1 with the encoder 2. If the deviation of both position values is greater than **S-0-0391, Monitoring window feedback 2**, the error **F236 Excessive position feedback difference** is generated. As a result, the motor and optional encoder position status are cleared.

The position feedback value is only active if an optional encoder is available and evaluated and if **S-0-0391, Monitoring window feedback 2** is not parameterized with a 0.

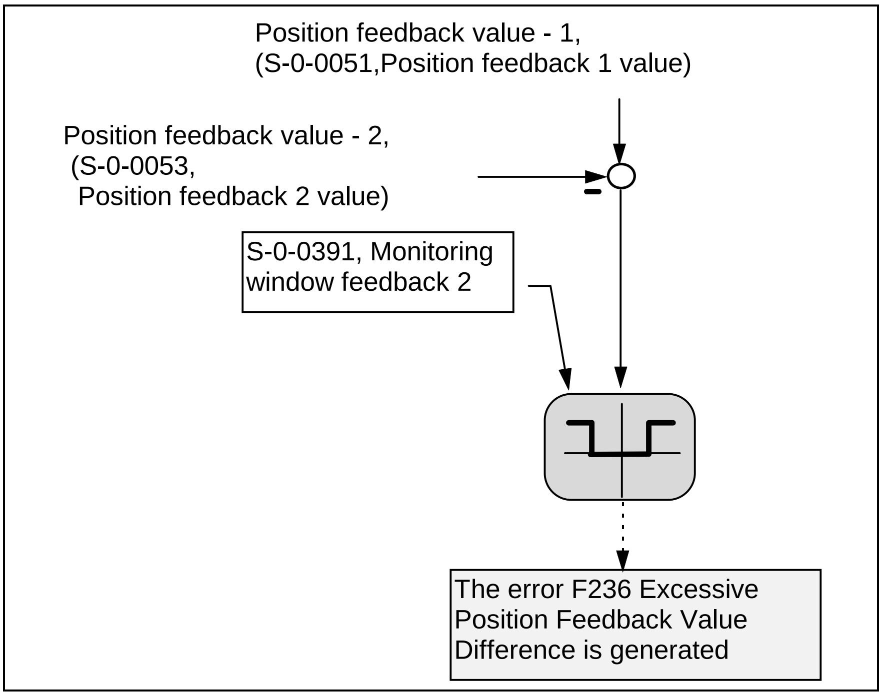


Fig. 9-22: Position feedback value monitoring schematic

Setting the Position Feedback Monitoring Window

The requirements for setting the position feedback value monitor are:

- All drive regulator loops must be set correctly.
- The axis mechanical system must be in its final form.
- The axis must be homed.

The monitoring window must be determined according to the application. The following basic procedure is recommended for doing this:

- Run a typical operating cycle. While doing this, set the planned acceleration and velocity data of the axis.
- Enter progressively smaller values in the parameter **S-0-0391, Monitoring window feedback 2** until the drive gives the error message **F236 Excessive position feedback difference**. Depending on the mechanical system, you should start with 1..2 mm and decrease the window in steps of 0.3 ... 0.5 mm.
- The value at which the monitor is triggered should be multiplied with a tolerance factor of 2 ... 3 and entered in parameter **S-0-0391, Monitoring window feedback 2**.

When determining the monitoring window, make sure that the position feedback monitor works dynamically. This means that even dynamic deviations of both position feedback values in acceleration and braking phases are registered. This is why it is not enough to use statical axis errors as the basis for the setting.

Deactivating the Position Feedback Monitor

It is possible to turn off the position feedback monitor in applications where the optionally connected measurement system does not control the axis position but is used for other measurements. To do this, enter 0 in the parameter **S-0-0391, Monitoring window feedback 2**.

Other Optional Encoder Characteristics

To parameterize any other characteristics of the optional encoder, such as

- Direction of movement not-inverted/inverted
- Distance-coded home mark yes/no
- Rotary / linear measurement system
- Absolute evaluation possible
- Absolute evaluation activated

use **S-0-0115, Position feedback 2 type**

The structure of this parameter is as follows:

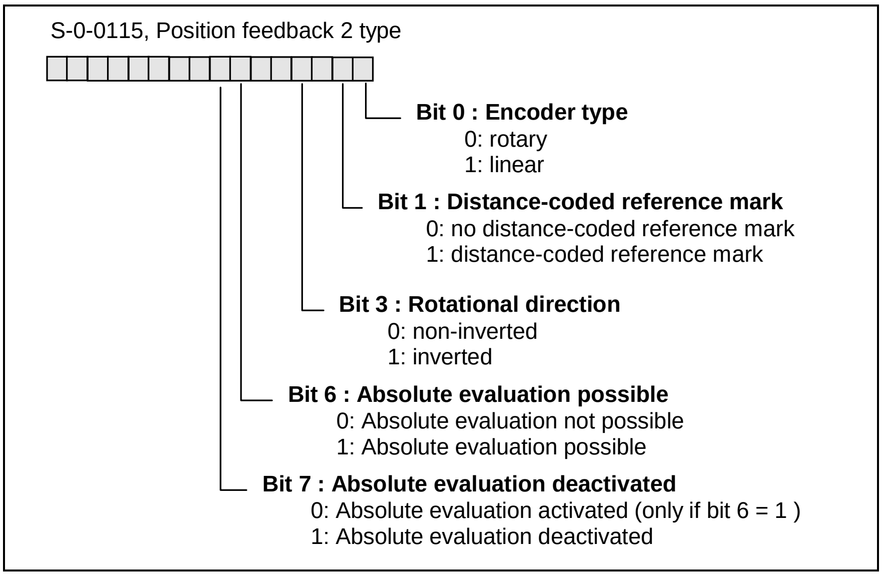


Fig. 9-23: Parameter S-0-0115

The bits in the position encoder type parameter are partly set or cleared by the drive itself. There is following dependency:

- Depending on the absolute encoder range and the maximum travel range or modulo value, bit 6 is either set or cleared.

(See also chapter: "Other Settings for Absolute Measurement Systems"

Actual Feedback Values of Non-Absolute Measurement Systems After Initialization

If an absolute measurement system is not available, then the position feedback values in the command **S-0-0128, C200 Communication phase 4 transition check** are initialized as shown below, depending on whether the parameter **P-0-0019, Position Start Value** was written in the previous communication phase 2 or 3 or not.

P-0-0019 written:	Position feedback value 1	Position feedback value 2
no	init. motor encoder raw value	init. motor encoder raw value
yes	position start value	position start value

Fig. 9-24: Non-absolute measurement system position feedback values after initialization

Warning

No valid position feedback values exist before the measurement system is initialized.
The initialization is done in the transition check for communication phase 4.

Some measurement systems have limitations concerning the maximum velocity during their initialization.

Measurement system	Max. initialization velocity
DSF	300 Rpm
EnDat	Initialization should occur at standstill
Multiturn resolver	300 Rpm

Fig. 9-25: Velocity allowed during initialization

Drive-internal format of position data

There are two different formats in the drive used to display position data. We differentiate between

- **display format** and
- **drive-internal format**.

The **display format** defines the unit, i.e., the LSB value with which the position data are exchanged between drive and control/surface. When a position data parameter such as, **S-0-0051, Position feedback 1 value** is read, it is sent in this format to the control. The display format is set with parameter **S-0-0076, Position Data Scaling Type**, **S-0-0077, Linear Position Data Scaling Factor**, **S-0-0078, Linear Position Data Scaling Exponent** and **S-0-0079, Rotational position resolution**. The control generally sets the format.

(See also "Physical Values Display Format"

The drive-internal positon resolution depends on the travel range to be described

The **drive-internal format** determines the LSB value, the position command and feedback value editing as well as how the position control loop in the drive is performed. The drive uses the value of parameter **S-0-0278, Maximum travel range** to calculate the drive-internal format.

Note: If the value set in **S-0-0278, Maximum travel range** is used as set at delivery, then the drive-internal format generally meets most demands given a sufficiently high resolution. Only if excessively high demands are made of the drive-internal format of the position data or with very long travel ranges it becomes necessary to optimize the setting.

Functional principle of the drive-internal position data formats

Position data processing in the drive has a constant data width from which the resolution of the position data to cover the travel range of the axis depends.

It applies:

Note: The longer the distance to be represented, the smaller the drive-internal position resolution.

These parameter values are used to compute the **drive-internal resolution**:

- **S-0-0116, Feedback 1 Resolution** and
- **S-0-0256, Multiplication 1**.

The parameters for the encoder resolution are listed in the data sheets of the measuring system or they are automatically read out of the feedback memory if such a measuring system is present. The number of lines per encoder revolution or the grid constant of a linear scale (distance per division period) is set there. The parameter values for the multiplication are calculated by the drive during command **S-0-0128, C200 Communication phase 4 transition check**. They describe the resolution per division period (dp).

It thus applies for the drive-internal resolution:

for rotary motors:

$$\text{Resolution} = \text{encoderresolution} \times \text{multiplication}$$

Resolution:	drive-internal resolution of position data [Incr/rev]
multiplication:	value in S-0-0256 or S-0-0257 [Incr/dp]
encoder resolution:	value in S-0-0116 or S-0-0117 [dp/Incr]

Fig. 9-26: Drive-internal resolution of rotary motors

and for linear motors:

$$\text{Resolution} = \frac{\text{multiplication}}{\text{encoderresolution}}$$

Resolution:	drive-internal resolution of positon data [Incr/mm]
multiplication:	value in S-0-0256 or S-0-0257 [Incr/dp]
encoder resolution:	value in S-0-0116 or S-0-0117 [dp/mm]

Fig. 9-27: Drive-internal resolution of linear motors

Examples:

1. MKD motor, S-0-0116 = 4, S-0-0256 = 32768, therefore: drive-internal resolution = 131072 increments/motor revolution, therefore, an LSB value of 0.00275 degrees.
2. Linear scale as optional measuring system, S-0-0117 = 0.02 mm (grid division = 20µm), S-0-0257 = 32768, therefore: drive-internal resolution of approximately 1638400 increments/mm, therefore, an LSB value of 0.00061 µm (How to compute the drive-internal resolution if an optional encoder is used, is described in greater detail below).

Note: The value for the multiplication is limited to
4 .. 4194304
for technical reasons.

Setting the drive-internal position data format

To set the drive-internal resolution, use the parameter

S-0-0278, Maximum travel range.

Setting the maximum travel range at start-up

This parameter must be set at the time where an axis is commissioned to a value that equals at least the distance that the axis must travel. While executing the command **S-0-0128, C200 Communication phase 4 transition check,** the drive computes the values for **S-0-0256, Multiplication 1** and, if an optional measuring system is mounted, for **S-0-0257, Multiplication 2** as well. These parameters thus help to display the resolution.

Multiplication is only reduced if the travel range can no longer be described

The maximum possible resolution of the position feedback value of a position encoder for technical reasons equals 32768 increments per division period of the measuring system. This maximum resolution is only reduced if the travel range is set so large that it can no longer be described with the maximum resolution.

To compute the **multiplication**, the following calculations are conducted in the command **S-0-0128, C200 Communication phase 4 transition check**:

for **rotary** measuring systems:

$$\text{multiplication} = \frac{2^{31}}{\text{travel range} \times \text{encoder resolution}}$$

travel range:	travel range shown in encoder revolutions
multiplication:	value in S-0-0256 or S-0-0257
encoder resolution:	value in S-0-0116 or S-0-0117

Fig. 9-28: Relationship between maximum travel range and multiplication with rotary measuring systems

Examples:

1. MHD motor with S-0-0116 = 512, maximum travel range 2048 motor revolutions, therefore, a multiplication of 2^31 / (2048 • 512) = 2048.
2. MHD motor with S-0-0116 = 512, maximum travel range 20 motor revolutions, therefore, a multiplication of 2^31 / (20 • 512) = 209715. The next higher value equals 32768, thus a multiplication = 32768.

for <u>linear</u> scales:

$$\text{multiplication} = \frac{2^{31} \times \text{encoder resolution}}{\text{travel range}}$$

travel range:	travel range shown in mm
multiplication:	value in S-0-0256 or S-0-0257
encoder resolution:	value in S-0-0116 or S-0-0117

Fig. 9-29: Relationship between maximum travel range and multiplication in linear scales

Example:

Linear scale with 0.02mm grid division, maximum travel range 5m, therefore a multiplication of $2^{31} \times 0.02 / 5000 = 8589$ ($\rightarrow$ 8192).

This results in a resolution of 0.02mm / 8192 = 0.002441 µm.

Note: When computing multiplication always use the next lower binary value of the precise results.

Drive internal representation of position data when an optional encoder is present

If an optional encoder is mounted, the multiplication of the motor encoder is guided by the optional encoder

If there is an optional measuring system, then the multiplication of this encoder is computed as per the above formula in terms of the travel range set. The multiplication of the motor encoder is calculated so that it also covers this travel range. This means that values exceeding 32768 can be generated depending on the mechanical transformation elements!

Example: MKD motor with <u>rotary</u> optional encoder

motor encoder resolution	= 4
optional encoder resolution	= 1000
travel range	= 50 revolutions
gear ratio	= 1:1

1. Calculating the multiplication of the optional encoder:

$2^{31} / (1000 \bullet 50) = 42949$, technical maximum 32768, thus S-0-0257 = 32768.

This results in a resolution of 0.00001098 Degrees.

2. Calculating the multiplication of the motor encoder

$2^{31} / (4 \bullet 50) = 10737418$, the next smaller binary value = 8388608, thus S-0-0256 = 8388608. However, the technical maximum resolution is 4194304. Therefore, we set the value in S-0-0256 to 4194304. The resolution is 0.0002146 Degrees.

The resolution can never exceed 4194304 • S-0-0116!

Example: MHD motor with <u>linear</u> optional encoder

Resolution of the motor encoder	= 256
Resolution of the optional encoder	= 0.02 mm
Travel range	= 5 m
feed constant	= 10 mm
Gear transmission ratio	= 3:1

1. Calculating the multiplication of the optional encoder :

$2^{31} \bullet 0.02\text{mm} / 5000\text{mm} = 8589$

Technically reasonable is a maximum of 8192, therefore

S-0-0257 = 8192. This gives a resolution of 0.00244 µm.

2. Calculation of the Multiplication of the motor encoder:

5m of travel range give 500 gear output revolutions and therefore 1500 gear input revolutions (motor revolutions).

$2^{31} / (256 \bullet 1500) = 5592$, the nearest smaller binary value = 4096, therefore S-0-0256 = 4096.

This results in a resolution of 0.000343 Degrees referred to the motor shaft.

Processing format of the drive-internal position command interpolator

In the drive-internal position command interpolator, the position command profile for the drive-controlled travel commands such as drive halt, drive-controlled homing, operating mode drive-internal interpolation and so on are generated. The format of the drive-internal position data affect the maximum acceleration limit which can be pre-defined for the interpolator.

The limits are not valid for cyclic command values, e.g. in operation mode Position control.

The following relationships apply:

for **rotary** motors:

$$amax = \frac{51.471.854.040}{\text{encoder resolution} \times \text{multiplication}} \left[\frac{rad}{s^2}\right]$$

amax: maximum acceleration of position command of the interpolator
encoder resolution: value in S-0-0116
multiplication: value in S-0-0256

Fig. 9-30: Maximum acceleration of the position command interpolator as dependent on the drive-internal position data format

for **linear** motors:

$$amax = \frac{8.192.000.000 \times \text{encoder resolution}}{\text{multiplication}} \left[\frac{mm}{s^2}\right]$$

amax: maximum acceleration of position command of the interpolator
encoder resolution: value in S-0-0116 in mm
multiplication: value in S-0-0256

Fig. 9-31: Maximum acceleration of the position command interpolator as dependent on the drive-internal position data format

Example:

MHD motor with S-0-0116 = 512, multiplication = 32768, equalling a maximum acceleration of the position command interpolation of 3067 rad/s².

9.3 Other Settings for Absolute Measurement Systems

Encoder Types and Pertinent Interfaces

The following table outlines which absolute measuring system can be used as motor encoder or as an optional encoder. Listed aso is the encoder interface that is recommended.

Measuring system:	**Interface (input no.):**	**as motor encoder**	**as optional encoder**
Single/multiturn DSF	Standard(1)	yes	yes
Single/Multiturn LSF	Standard(1)	yes	yes
Single/multiturn resolver	Standard(1)	yes	no
Linear scales from Heidenhain with EnDat interface	Optional(8)	yes	yes
Single/multiturn rotary encoder from Heidenhain with EnDat interface	Optional(8)	yes	yes

Fig. 9-32: Absolute measuring system and their interfacesn

Absolute encoder range and absolute encoder evaluation

Motor and/or optional encoders can be used as absolute encoders

As motor and/or optional measuring system those measuring systems can be used that supply absolute position information within one or several revolutions (single or multiturn encoder) or a within a specific traversing distance (absolute linear scales).

The information about which range (absolute encoder range) a measuring system can supply absolute position information about is stored in the ata memory of the measuring system or the drive software. Absolute measuring systems do not have to be homed after initialization of the drive firmware. The actual position value lies within the absolute encoder range, machine zero related, after initialization. It is only necessasry to conduct a single setup procedure (setting absolute dimension).

Whether a motor or an optional measuring system are to be evaluated as encoders, depends on the following variables:

- the absolute encoder range (**S-0-0378, Absolute encoder 1, range / S-0-0379, Absolute encoder 2, range)** of the pertinent encoder.
- the set position scaling (position data represented absolute or in modulo formats) in **S-0-0076, Position data scaling type**
- the travel range set in **S-0-0278, Maximum travel range** or
- the modulo value set in parameter **S-0-0103, Moduleo value.**

Note the following relationships:

Position scaling (Bit 6 of S-0-0076)	**S-0-0278, Max. travel range**	**S-0-0103, Moduleo value**	**Absolute encoder evaluation possible**
Absolute format	<= ½ * S-0-0378 / S-0-0379	not relevant	yes
	> ½ * S-0-0378 / S-0-0379	not relevant	no
Modulo format	S-0-0103	<= S-0-0378/S-0-0379	yes
	S-0-0103	> S-0-0378/S-0-0379	no

Fig. 9-33: Absolute encoder evaluation as depends on position format, modulo format and maximum travel range

The check whether a measuring system can be evaluated as an absolute system is conducted during command **S-0-0128, C200 Communication phase 4 transition check**. The results are displayed in bit 6 of the relevant position encoder type parameter (S-0-0277 / S-0-0115).

Activating the absolute encoder evaluation

If the absolute evaluation of a measuring system is possible but not wanted, this can be deselected in bit 7. The measuring system is then treated as if it were a non-absolute (single turn) encoder.

The position encoder type parameter is structured as follows:

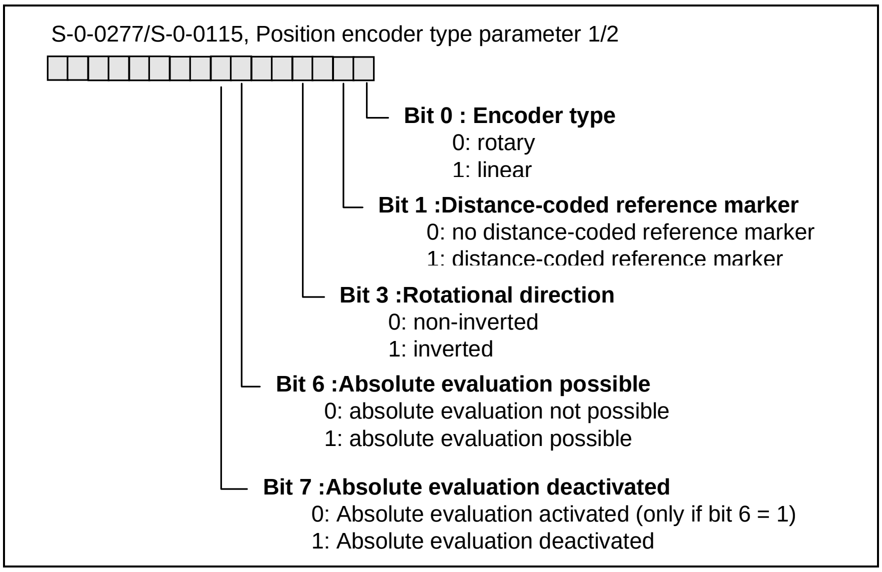


Fig. 9-34: Structure of the position encoder type parameter

Pre-requisites for correctly generating absolute position information:

The correct generation of the machine zero-point related actual position value is only possible if the relevant conditions have not changed. Only then can the measurement-system related absolute position information of the machine zero point related actual position value be determined out of command **S-0-0128, C200 Communication phase 4 transition check.** The conditions for the correct conversion of the measurement system related position information in the machine zero point related actual position value are made up of:

Monitoring absolute encoder evaluation conditions

- the rotational direction of the measuring system set in parameters **S-0-0277, Position feedback 1 type** or **S-0-0115, Position feedback 2 type** in bit 3
- the position polarity set in **S-0-0055, Position polarities**
- the multiplication determined based on **S-0-0278, Maximum travel range** displayed in parameters **S-0-0256, Multiplication 1** or **S-0-0257, Multiplication 2**.

If one of these three conditions changes, then the position status of the relevant measuring system is cleared (**S-0-0403, Position feedback value status** = "0“) and the error **F276 Absolute encoder out of allowed window** is generated.

Absolute Encoder Monitoring

If the absolute evaluation of a measuring system has been activated (position encoder type parameter S-0-0277 or S-0-0115 = 01xx.xxxxb), then in command **S-0-0128, C200 Communication phase 4 transition check** the actual position value is generated and monitored. The monitoring of the actual position value is only active if the encoder is in reference.

Functional principle of the absolute encoder monitor

When turning off the drive's power supply, the current actual position of the axis is loaded into resident memory. When switching the axis back on, the difference of the stored position and the newly initialized position of the measuring system is built. If this difference is greater than the parameterized position window in parameter **P-0-0097, Absolute encoder monitoring window**, the error message **F276 Absolute encoder out of allowed window** is given.

Note: The monitor is deactivated if 0 is parametrized in **P-0-0097, Absolute encoder monitoring window**.

The absolute encoder monitor is appropriate for the following applications:

- The motor is equipped with a holding brake.
- The drive mechanical system is self-locking and cannot be moved manually.

Note: If two absolute measuring system are mounted (motor and optional encoder) then the monitor is only set to the encoder selected with bit 3 of **S-0-0147, Homing parameter**.

Setting the Absolute Encoder Monitor

The absolute encoder monitoring window must be set by the user. Always select greater than the maximum allowable motion of the axis when shutdown. Assuming that the axis has a brake or is self-locking, you can enter 0.1 motor revolutions (36° in reference to the motor shaft) as a standard value for the parameter **P-0-0097, Absolute encoder monitoring window**.

Absolute encoder monitoring with two absolute encoders

If there are absolute measuring systems and the absolute encoder monitor of the position data is activated, then the following restriction applies:

If both motor and optional encoder are evaluated absolutely, then only that one is monitored as an absolute encoder that has been set in bit 3 of parameter **S-0-0147, Homing parameter**.

See also chapter: Absolute Encoder Monitoring"

Deactivating the Absolute Encoder Monitor

The absolute encoder monitor cannot be effectively used with axis that can or must be moved manually when switched off. The absolute encoder monitor should be turned off in such situations in order to prevent unnecessary error conditions.

The absolute encoder monitor can be turned off by writing 0 to P-0-0097.

Moduleo Analysis of Absolute Measurement Systems

If measuring systems are evaluated absolutely and modulo evaluation of the position data is activated, then the following restrictions apply:

If both motor encoder and optional encoder are to be evaluated absolutely, then only that one is evaluated as an absolute encoder, which is set in bit 3 of parameter **S-0-0147, Homing parameter**.

(See also chapter: "Modulo Feature"

Actual Feedback Values of Absolute Measurement Systems After Initialization

The condition of the position feedback values of the motor feedback and, if available, of the optional feedback after initializing the position feedback values in the command **S-0-0128, C200 Communication phase 4 transition check** depends on:

- Bit 3 in **S-0-0147, Homing parameter**
- Availability of an absolute feedback as the motor or optional feedback.

Motor feedback:	Optional feedback:	S-0-0147 Bit 3:	S-0-0051, Position feedback value 1:	S-0-0053, Position feedback value 2:	S-0-0403, Pos. status:
absolute	not absolute	0	absolute value of motor feedback	absolute value of motor feedback	1
absolute	not absolute	1	absolute value of motor feedback	absolute value of motor feedback	0
not absolute	absolute	0	absolute value of optional feedback	absolute value of optional feedback	0
not absolute	absolute	1	absolute value of optional feedback	absolute value of optional feedback	1
absolute	absolute	arbitrary	absolute value of motor feedback	absolute value of optional feedback	1

Fig. 9-35: Position feedback values of absolute measurement systems after initialization

Note: Absolute position is lost with changes in polarity, scaling, gearbox and so on.

9.4 Drive Limitations

Current Limit

The current limit limits the command current to the parameters

- **P-0-4046, Active peak current** or
- **P-0-4045, Active permanent current**

The active continuous current designates the current that can be continuously taken from the drive, whereas the active peak current is only available for short periods of time.

If the peak current is demanded from the drive for longer periods of time, the drive controller's internal thermal load monitor will make sure that the allowable output current is reduced from the active peak current to the active continuous current. Both parameters are produced from the applicable drive controller data, such as the peak amplifier current (**S-0-0110, Amplifier peak current**) etc., as well as the contents of the following parameters:

- **P-0-4004, Magnetizing current** (for asynchronous motors)
- **S-0-0109, Motor peak current**
- **S-0-0111, Motor current at standstill**
- **S-0-0092, Bipolar torque/force limit value**
- **P-0-0109, Torque/force peak limit**
- **P-0-4011, Switching frequency**

Setting the Active Peak Current

The parameter **P-0-4046, Active peak current** may not be set separately, but is instead a result of the following parameters:

- **S-0-0110, Amplifier peak current**
- **S-0-0109, Motor peak current**
- **P-0-4004, Magnetizing current**
- **S-0-0092, Bipolar torque/force limit value**
- **P-0-0109, Torque/force peak limit**

- In addition:The allowable peak amplifier current is limited to the **S-0-0109, Motor peak current**, if this is smaller.
- As the process continues, the value determined in the step before is reduced in connection with **P-0-4004, Magnetizing current**. The magnetizing current is 0 if there is a synchronous motor.
- Limit to **P-0-0109, Torque/force peak limit** and **S-0-0092, Bipolar torque/force limit value** (See also chapter: Torque/Force Limiting")
- Dynamic reduction during operation by monitoring the thermal load of the drive controller. (See also chapter: "Monitoring the Thermal Load" on page 9-31)

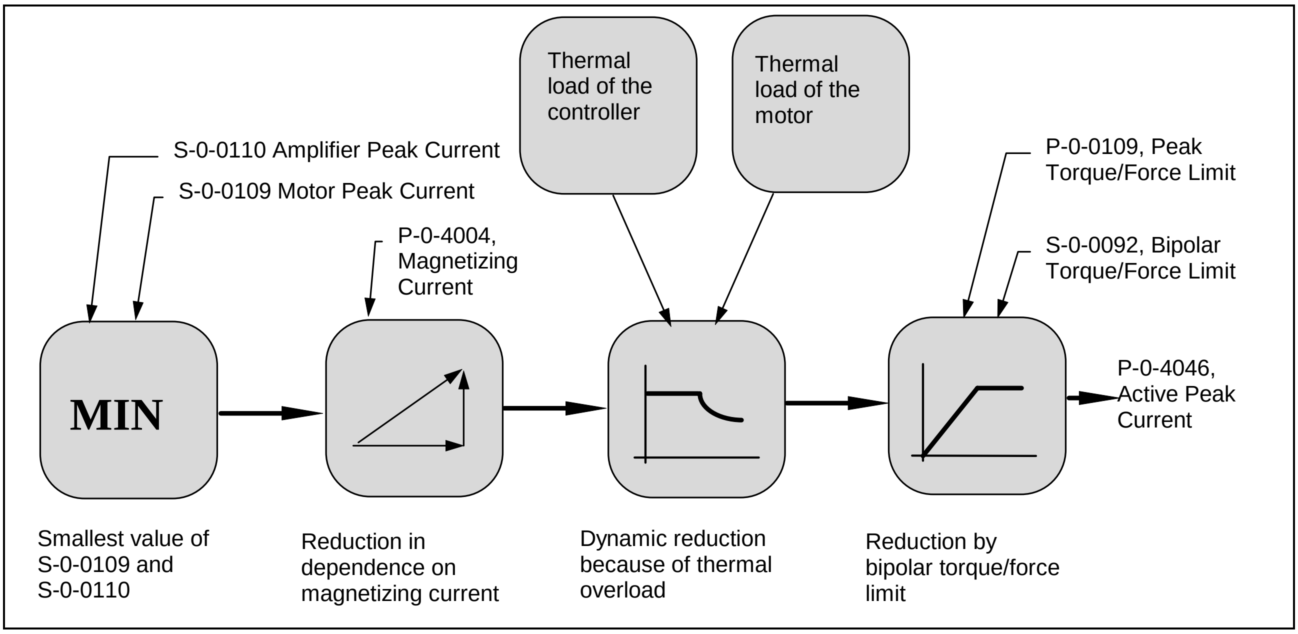


Fig. 9-36: Determining the torque-producing peak current

Setting the Active Continuous Current

The content of the parameter **P-0-4045, Active permanent current** is a result of the following parameters:

- **P-0-4011, Switching frequency**
- **P-0-4004, Magnetizing current**
- **P-0-4046, Active peak current**

To obtain this:

- The corresponding continuous current is determined from the selected switching frequency via the applicable drive controller data.
- As the process continues, the value determined under 1. is reduced in connection with **P-0-4004, Magnetizing current**. The magnetizing current is 0 if there is a synchronous motor.
- The determined value is limited to the **P-0-4046, Active peak current**.

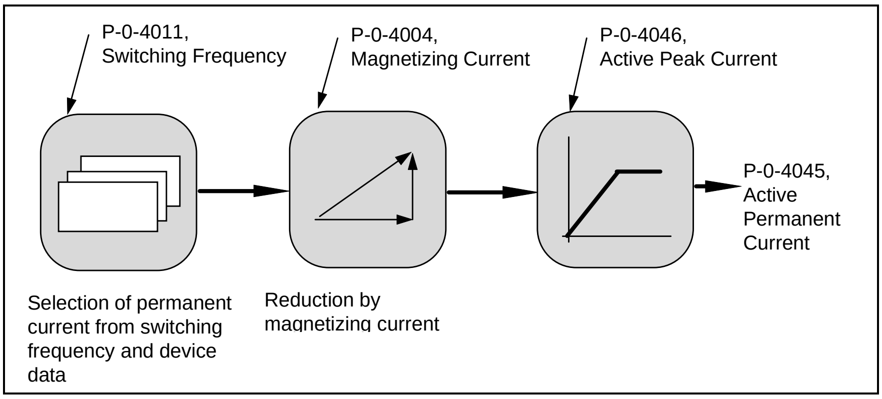


Fig. 9-37: Setting the active continuous current

Monitoring the Thermal Load of the drive controller

The thermal drive controller load indicates how much the drive controller’s power stage unit is loaded by the delivered command current. To do this, information from the

- drive controller specific data ,
- the command current profile and
- the selected switch frequency

is used to continually calculate the power transistors’ chip overtemperature. This may not become greater than the allowed chip overtemperature. If this condition is reached, the control drive will react by dynamically reducing the command current.

(See also chapter: Setting the Active Peak Current on page 9-30.)

The drive controller will generate the warning **E257 Continuous current limit active**.

For diagnostic purposes, a warning threshold can be set with **P-0-0127, Overload warning**. For practical purposes, a value of 80% thermal load is parameterized here. This value should not be exceeded during normal drive operation. If the thermal load exceeds the value parameterized in **P-0-0127, Overload warning**, the drive controller will generate the warning **E261 Continuous current limit prewarning**.

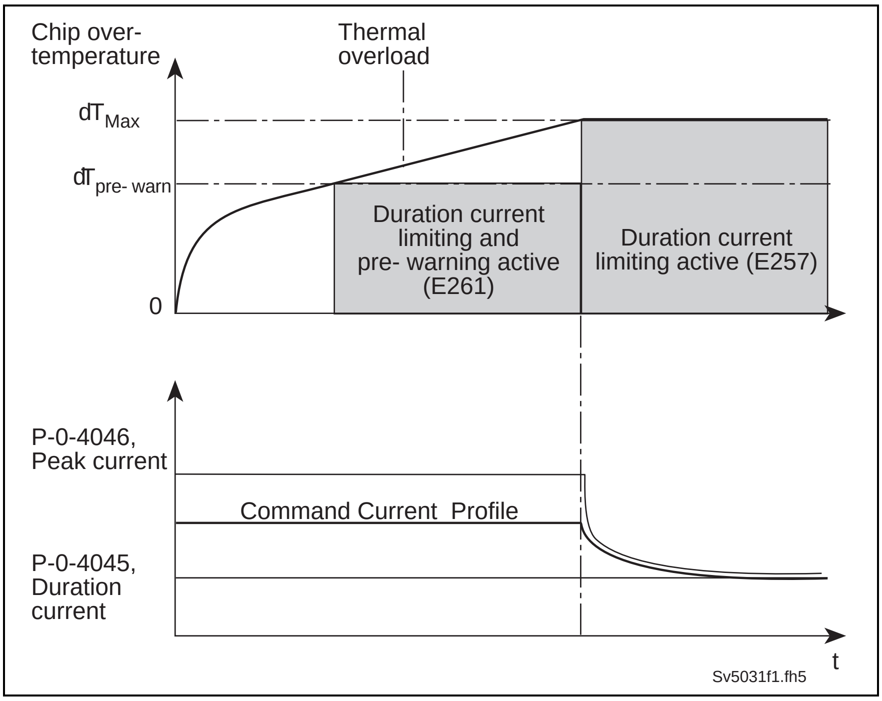


Fig. 9-38: Monitoring the thermal load and continous current limit

Checking the Thermal Load of the drive controller

The parameter **P-0-0141, Thermal drive load** is for diagnostic purposes. In this parameter, 0% corresponds to a chip overtemperature of 0 Kelvin, 100% corresponds to the maximum chip overtemperature. The thermal load should not exceed a value of 80% for the applied operating cycles if the drive is set up correctly. It typically takes about 10 minutes to warm up a drive controller's power stage to its final temperature. To check the thermal load of a drive during installation without having to run operating cycles during this period of time, the drive controller load can be preset with 80%. This can happen by writing an arbitrary value to the parameter **P-0-0141, Thermal drive load**. A typical operating cycle must be simultaneously run for a short while. The thermal load should be observed while this is being done, and it should show a falling tendency. Otherwise the drive is incorrectly set up for the application. To check the thermal load for further increase above 80%, the

- Overload warning by means of **P-0-0127, Overload warning** and/or
- the output of the thermal load at the analog output

may be used. The following illustration shows the typical process of the thermal load, as it can be observed by means of the analog output. During the execution of an operating cycle, the load is preset with 80% by writing to P-0-0141.

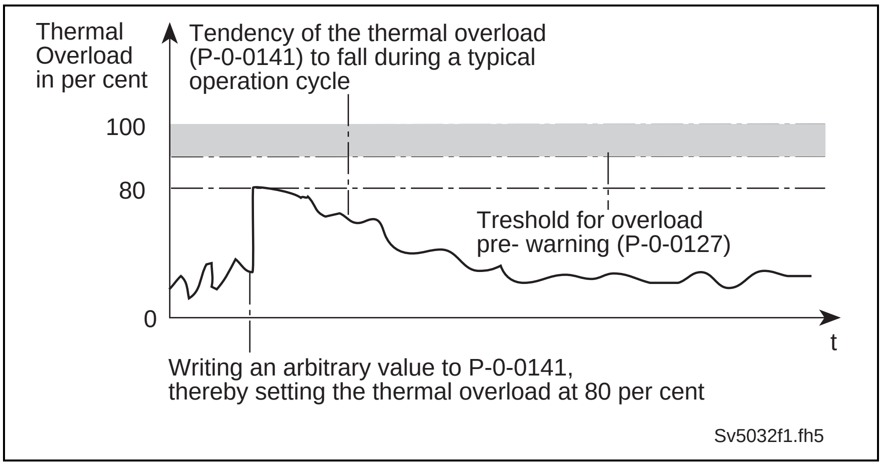


Fig. 9-39: Checking the Thermal Load

Monitoring of the thermal Motor Load

The motor may be loaded with 4 times the **S-0-0111, Motor current at standstill** for 400 ms. The permanently permissible current is 2.2 times that value. If the motor overload limit is active, then the warning **E225 Motor overload** is generated, and the bit 0 (overload warning) is set in **S-0-0012, Class 2 diagnostics**. The limited peak current is displayed in **P-0-4046, Active peak current**.

Torque/Force Limiting

The maximum allowable torque can be limited by the user with the parameters

- **S-0-0092, Bipolar torque/force limit value**
- **P-0-0109, Torque/force peak limit**

These parameters determine what percentage of **S-0-0111, Motor current at standstill** is made available to the user.

The parameter **S-0-0092, Bipolar torque/force limit value** is designed to allow variable limits of the maximum drive torque to values smaller than the maximum allowable drive torque while it is in operation. This is useful when temporarily moving toward a positive stop, for example.

Each drive produces a specific peak torque based on the maximum allowable current of the applicable motor/drive controller combination, which is desirable for acceleration procedures in many applications. Nevertheless, there are times when the maximum peak torque must be limited to lesser values for technical reasons specific to an application. The maximum peak torque of a drive can be limited as appropriate for an application with the parameter **P-0-0109, Torque/force peak limit**. The parameter overrides everything else to ensure that the maximum peak torque allowed for the application cannot be exceeded even if **S-0-0092, Bipolar torque/force limit value** is set arbitrarily high.

The maximum output current is thus determined together with the current limit, which is displayed in **P-0-4046, Active peak current.**

(See also chapter: Current Limit")

The following illustration shows the connection between the current limit and the torque/force limit of the maximum allowed torque in determining the maximum output current.

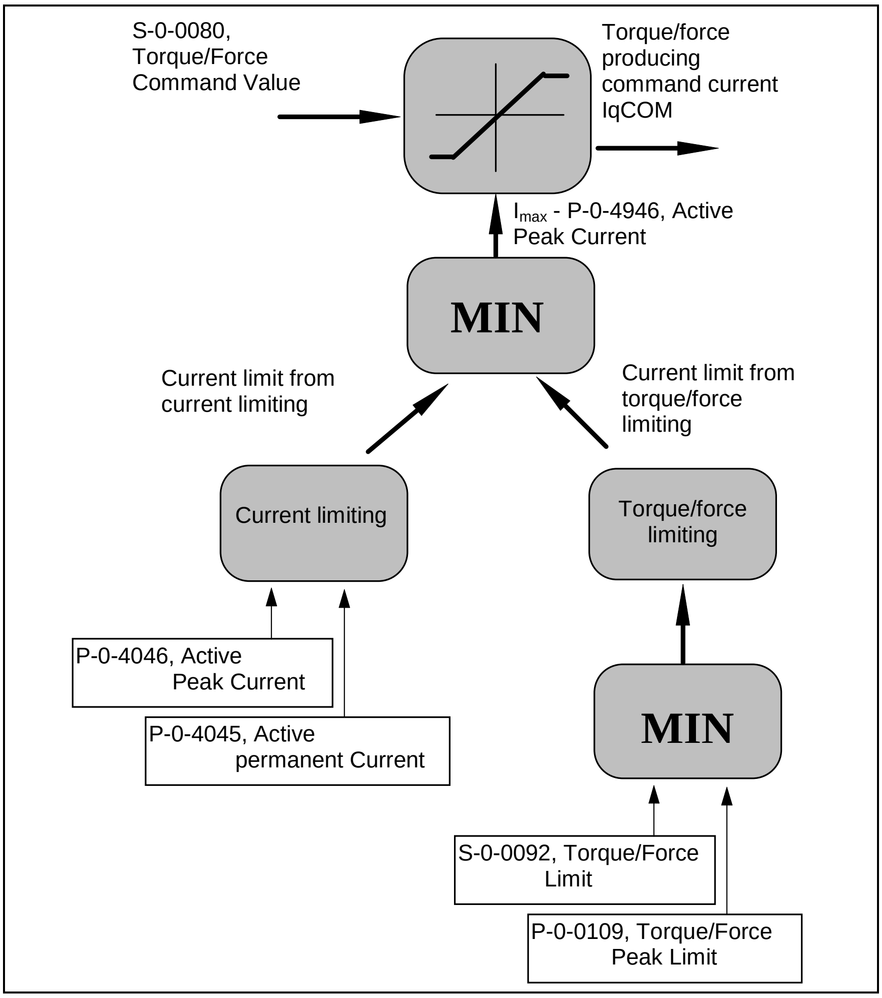


Fig. 9-40: Current limitation and torque/force limitation

The current limit and the torque/force limit both affect the torque-producing command current limit.

The active value is always the smaller value of

- Current limit value from current limitation
- Current limit value from torque/force limitation

This is displayed in the parameter **P-0-4046, Active peak current.**

Limiting Velocity

The following parameters limit the velocity of the drive:

- **S-0-0113, Maximum Motor Speed (nmax)**
- **S-0-0091, Bipolar Velocity Limit Value**

The parameter **S-0-0091, Bipolar Velocity Limit Value** is designed to allow variable limits of the maximum velocity to values smaller than the maximum allowable velocity during operation.

The parameter **S-0-0113, Maximum Motor Speed (nmax)** designates the maximum possible motor velocity. It is contained in the motor encoder data storage of MHD-, MKD and MKE motors and does not need to be entered, but with other types of motors this value must be taken from the motor parameter specifications.

Limiting to Maximum Motor Velocity

The maximum motor velocity defines the maximum velocity of the drive. It becomes active and is included in the calculation of

- the maximum value entered in the parameter **S-0-0091, Bipolar Velocity Limit Value**

Limiting to Bipolar Velocity Limit Value

The bipolar velocity limit value defines the maximum velocity of the drive for the user. It becomes active as

- the monitor of the encoder velocity in the **torque control** operating mode
- the limit for the resulting command value in the velocity controller
- the monitor of the position command value difference in the **position control** operating mode (see also "Position Command Value Monitoring"
- the limit of **S-0-0036, Velocity Command Value** in the **velocity control** operating mode

Monitoring the Feedback Velocity in the Torque Control Operating Mode

Monitoring the Feedback Velocity in the **Torque Control** operating mode occurs at 1.125 times the value of **S-0-0091, Bipolar Velocity Limit Value**. If this value is exceeded, the fatal error

- **F879 Velocity limit S-0-0091 exceeded**

is generated. The drive switches to torque-free operation afterwards.

Limiting the Resulting Command Value in the Velocity Controller

In all operating modes in which the velocity controller is active (all operating modes except for **Torque Control**), the given velocity command value is limited to the value of **S-0-0091, Bipolar Velocity Limit Value**. If this condition is reached, the warning

- **E259 Command Velocity Limit active**

is generated.

Limiting S-0-0036, Velocity Command Value in the Velocity Control Operating Mode

In the velocity control operating mode, the input of **S-0-0036, Velocity Command Value** is limited to **S-0-0091, Bipolar Velocity Limit Value**. If the value entered in S-0-0036 exceeds this limit, the warning

- **E263 Velocity command value > limit S-0-0091**

is generated.

Travel Range Limits

To avoid accidents and damages to the machine, many safety precautions are provided. A part of these safety measures refers to limiting the allowed working range. These limits can be introduced by following measures :

- Software limits in the control (only active with axis in reference)
- Position limits in the drive (only active with axis in reference)
- Limit switches in the drive
- Safety limit switches (in the emergency/safety chain)

Pertinent Parameters

- **S-0-0049, Positive position limit value**
- **S-0-0050, Negative position limit value**
- **S-0-0055, Position polarities**
- **S-0-0403, Position feedback value status**
- **P-0-0090, Travel limit parameter**
- **P-0-0222, Status Inputs travel range limits**

Functional principle of travel range limits

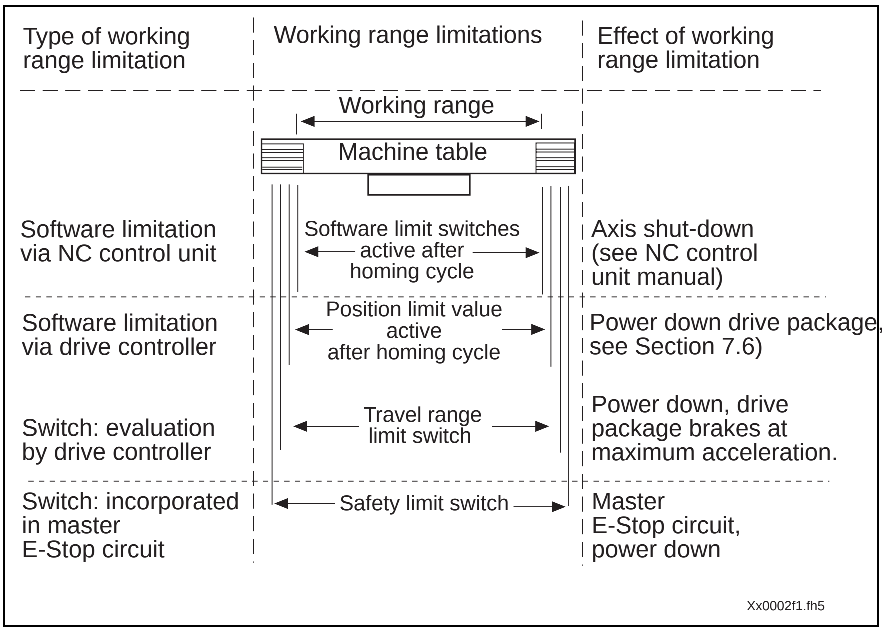


Fig. 9-41: Effect and ways of limiting the working range

There are two methods in the drive itself..

These are the monitors for

- Travel zone limit switches and
- Position Limit Values for the axis

The travel range is exceeded when either a travel zone limit switch is activated or one of the two axis limit values is exceeded by the homed position feedback value that is, the value referring to the machine zero point.

The drive’s response to exceeding the travel range is selectable. The following possibilities exist:

- An error with a "Set Velocity Command Value to Zero" reaction and automatic drive enable shutoff
- A warning with a "Set Velocity Command Value to Zero" reaction and automatic reset when the error conditions are gone.

This is set in bit 2 of **P-0-0090, Travel limit parameter**:

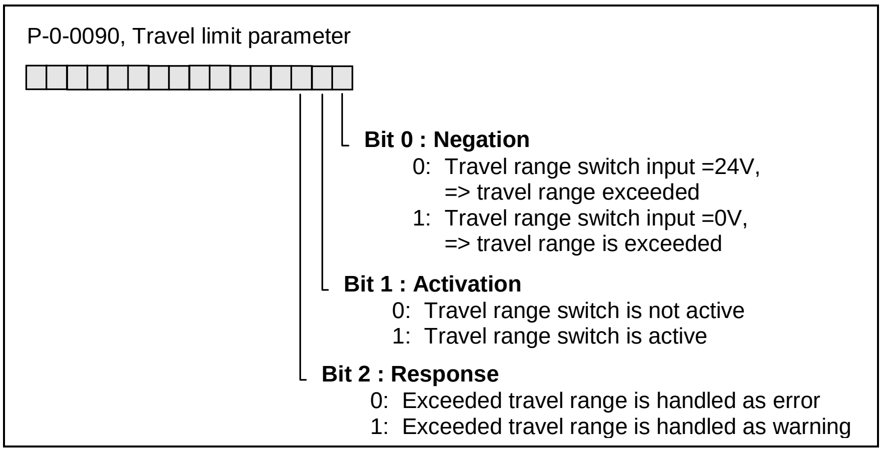


Fig. 9-42: Setting the drive reaction to exceeding the travel range (bit 2)

Note: Decelerating the axis with the use of a velocity command value ramp is not possible! Braking always occurs at maximum allowable torque (see **P-0-4046, Active peak current**).

Exceeding the Travel Range as an Error

If a 0 is entered in bit 2 of P-0-0090, then exceeding the travel range is handled as an error with the reaction of the velocity command value being set to zero. (See also chapter: "Velocity Command Value Reset"

After the velocity command value has been set to zero, the drive turns off the internal drive enable and becomes torque-free. The ready-to-operate contact opens.

For re-installation

- Clear the error with the command **S-0-0099, C500 Reset class 1 diagnostic** or press the S1 button.
- Reactivate the drive with the 0-1 edge of the drive enable signal.

If the error condition is still present, that is, if the limit switch is still activated or if the axis limits are still exceeded, only command values that go back into the allowable range will be accepted. Monitoring the command values is dependent on the active operating mode.

The following applies:

Operating Mode:	Command Value Check:
Torque control	Polarity of **S-0-0080, Torque/Force command**
All operating modes with drive-internal velocity control	Polarity of the internal velocity command value
All operating modes with drive-internal position control	Polarity of the velocity created by the given position command values

Fig. 9-43: Monitoring the command values in error conditions

If command values are given that would lead out of the allowable travel range, the travel range error will be generated again.

Exceeding the Travel Range as a Warning

If a 1 is entered in bit 2 of **P-0-0090, Travel limit parameter,** then exceeding the travel range as a warning is handled with setting the velocity command value to zero.

The drive does not turn off its internal drive enable. If the error condition is still present, that is, if the limit switch is still activated or if the axis limits are still exceeded, only command values that go back into the allowable range will be accepted. Monitoring the command values is dependent on the active operating mode. (See previous chapter.)

Travel Zone Limit Switch Monitoring

The state of the travel range limit switch is illustrated in parameter **P-0-0222, Status Inputs travel range limits**. Bit 0, in this case, is the positive end switch, bit 1 the negative one.

The monitor for exceeding the travel zone limit switch is only activated if

- the monitor is switched on in bit 1 of **P-0-0090, Travel limit parameter**

Exceeding the travel zone limit switch is recognized when these are activated. The diagnostic message depends on the type of reaction:

How handled:	SS display:	Diagnostic message:
As an error	F643	**F643 Positive travel limit switch detected**
	F644	**F644 Negative travel limit switch detected**
As a warning	E843	**E843 Positive limit switch activated**
	E844	**E844 Negative limit switch activated**

Fig. 9-44: Diagnostic message when travel zone limit switch is exceeded

Travel Zone Limit Switches - Activation and Polarity

The travel zone limit switches are activated with the parameter **P-0-0090, Travel limit parameter**. Additionally, the inputs can be inverted in this parameter (0V on E2/3 -> Travel range exceeded).

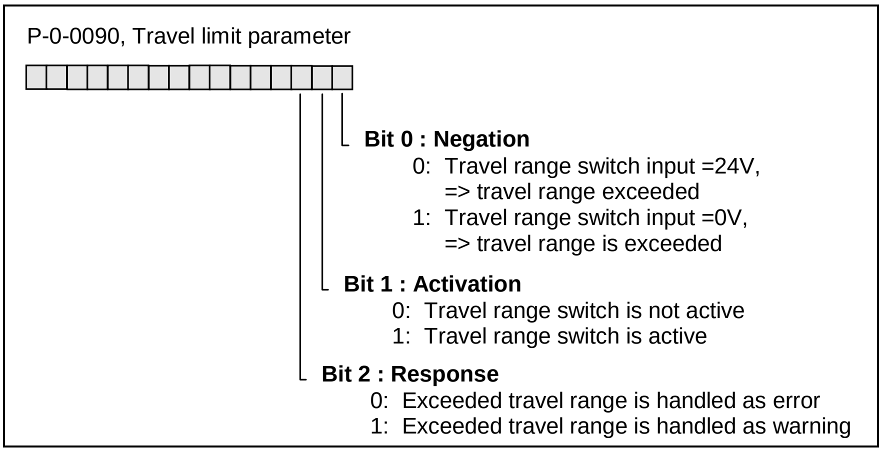


Fig. 9-45: Activating and negating the limit switches (bit 0 or 1)

Axis Limit Values

The monitor for exceeding the axis limit parameters:

- **S-0-0049, Positive position limit value**
- **S-0-0050, Negative position limit value**

is executed only if

- the encoder system of the active operating mode has been homed, i.e. the position encoder values are in relation to the machine's zero point. The **S-0-0403, Position feedback value status** is therefore 1

AND

- the monitor for the axis limit values in **S-0-0055, Position polarities**, bit 4 was activated.

It is recognized that the axis limit values have been exceeded if the position feedback value of the active operating mode exceeds the travel range set by the axis limit values.

Bit 3 of the parameter **S-0-0147, Homing parameter** determines whether the position feedback value of the encoder 1 or of encoder 2 is monitored. If drive-internal interpolation is used as the active operating mode, the drive checks to see if the target position is outside of the axis limit values. If it is, the drive will not move and the warning **E253 Target position out of travel range** is generated, and bit 13 in parameter **S-0-0012, Class 2 diagnostics** is also set.

The diagnostic message for the case that the axis limit values have been exceeded depends on the type of reaction:

How handled:	SS display:	Diagnostic message:
As an error	F629	**F629 Positive travel limit exceeded**
	F630	**F630 Negative travel limit exceeded**
As a warning	E829	**E829 Positive position limit exceeded**
	E830	**E830 Negative position limit exceeded**

Fig. 9-46: Diagnostic message when axis limits have been exceeded

Axis Limit Values - Activation

The axis limit value monitor is activated in bit 4 of **S-0-0055, Position polarities**.

S-0-0055, Position polarities

Bit 4 : Position limit values
0 : not active
1 : active

Fig. 9-47: Activating the axis limits

Travel Zone Limit Switches - Connection

see project planning

9.5 Drive Error Reaction

The error response depends on the current error class.

If an error is recognized in the drive controller, a preset error response occurs.

This drive error response depends on

- the error class of the current error

and the setting of the parameters

- P-0-0117, NC Reaction on Error

- P-0-0118, Power off on Error

- P-0-0119, Best Possible Deceleration

Note: The error class determines whether the reaction parametrized as above can be done in case of error or not.

There are 4 error classes, which have different priorities.

(see also "Error Classes"

Error Class	Diagnostic Messages	Drive Response
Fatal	F8xx	The error response parameter settings in **P-0-0117, Activation of NC Response During an Error** and **P-0-0119, Best Possible Deceleration** will be ignored, since a driver response is impossible. Torque/force is instantly cut off.
Travel range	F6xx	Independently from the settings in parameters **P-0-0117, NC Reaction on Error** and **P-0-0119, Best possible deceleration**, the velocity command value is immediately set to zero. This response corresponds to the setting P-0-0117 = 0 (no NC Reaction) P-0-0119 = 0 (Velocity Command Value Reset). This setting provides the fastest stop of the axis if the drive range is exceeded.
Interface	F4xx	A response from the control is impossible, since the communication to the control became inoperative. The drive proceeds instantly with **P-0-0119, Best possible Deceleration**.
Non-fatal	F2xx F3xx	The drive conducts the decel procedure set in **P-0-0117, NC reaction on error** and **P-0-0119, Best possible deceleration.** If NC reaction is set as an error response, then the drive continues to operate for 30 seconds after detecting an error, as if no error had been detected. The NC has this time to bring the axis to a controlled standstill. The drive then conducts the response set in P-0-0119.

Fig. 9-48: Error Response of the Drive

Best Possible Deceleration

The drive’s response to interface and non-fatal errors can be parameterized by **P-0-0119, Best possible Deceleration** .

At the end of each error response, the drive’s torque is cut off.

The following settings are possible:

Value of P-0-0119:	Response
0	Velocity Command Value Reset
1	Torque Disable
2	Velocity command value to zero with command ramp and filter
3	Return motion

Fig. 9-49: Setting options for Best possible Deceleration

The drive response, which is defined as "Best possible Deceleration," controls the response of the drive if

- the drive enable signal changes from 1 to 0 (disable the drive enable)
- the operating mode is switched to parameter mode while the drive is enabled. (Reset of the communication phase)

Velocity Command Value Reset

If 0 is set for "Best Possible Deceleration," the drive will stop the velocity control in case of an error with the command value = 0. The drive stops with its maximum permissible torque/force.

(see also Current Limit"

The proceeding for the motor brake (if mounted) and the enable for the power stage during velocity command value deceleration to zero is displayed in the following picture.

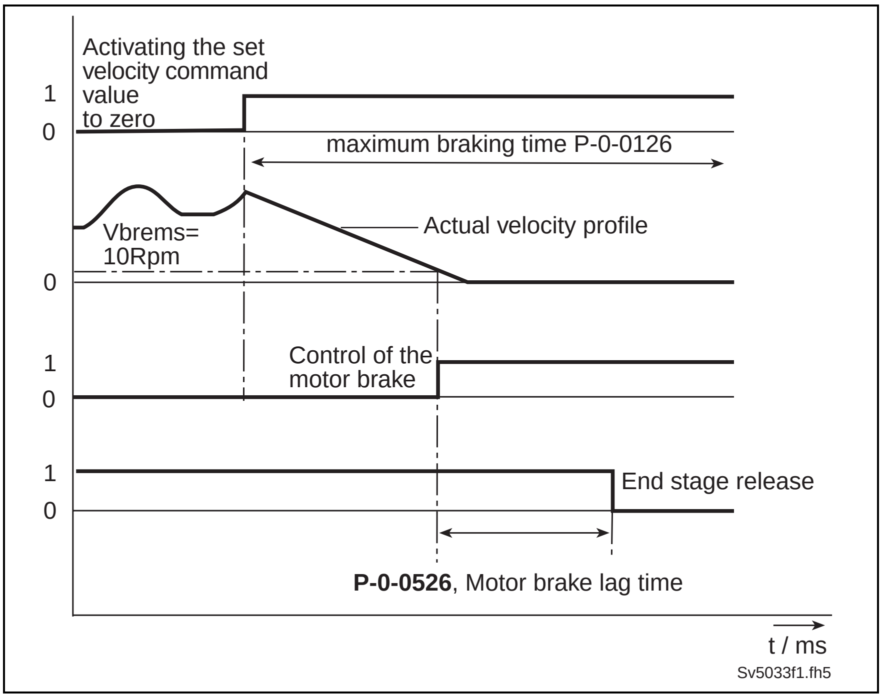


Fig. 9-50: Time sequence of the velocity command value reset

WARNING

If **P-0-0126, Maximum braking time** is set too low:

Danger of damaging the motor brake

⇒ The value for P-0-0126, Maximum braking time always must be set greater than the time needed to decelerate the axis through the velocity command value reset, taking into consideration the max. possible velocity.

If the value entered in P-0-0126 is too small, then the error reaction could be terminated without the axis standstill still.

The holding brake is then activated at a velocity not equal to 0 if an "0" has been set in bit 1 of parameter **P-0-0525, Type of motor brake** for the servo brake.

If the motor holding brake is activated at excessively high speed, then this will eventually cause damage to the brake.

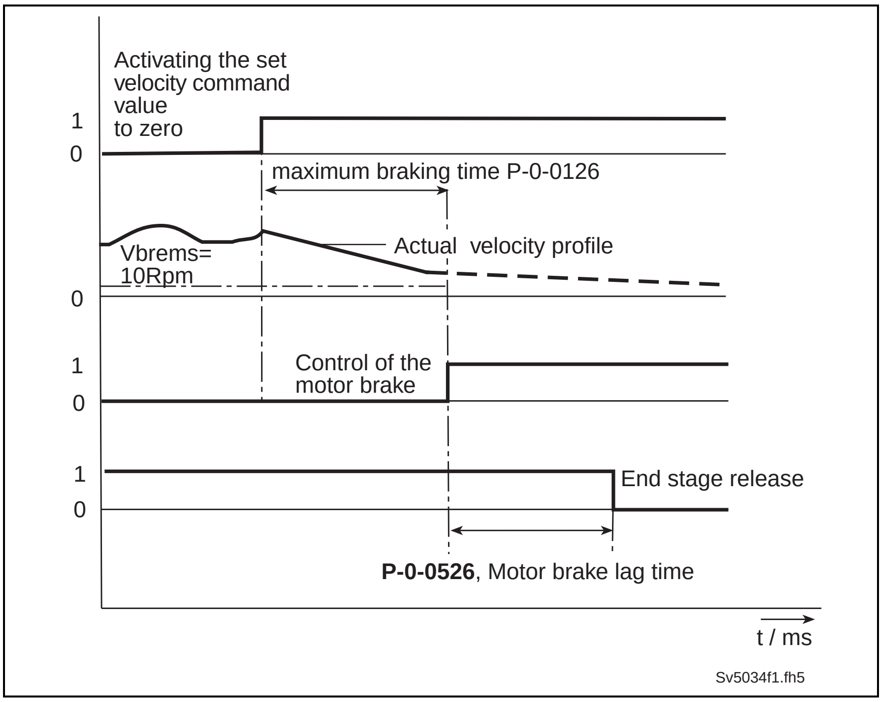


Fig. 9-51: Chronological sequence of speed command vaue to zero in the event tht the maximum decel time is set too small and brake type = servo brake (P-0-0525, bit1 = 0)

Disable Torque

The reaction torque to zero makes no sense if motor brake is available

If a fatal error occurs, then the drive is switched torque-free. The motor remains at speed. The drive is braked in this case only by the frictional torque.The time to standstill can be considerable. The error reaction "Torque to zero" is unavoidable with fatal errors, e.g., in the case of endstages or feedback defects!

DANGER

Drive continues to move unbraked with error!

Danger to life if safety doors are open at the machining cells from parts in motion!

⇒ Check drive for motion (e.g., using **S-0-0040, Velocity feedback value,** if possible) and wait standstill!

Controlling the motor holding brake

The motor holding brake control takes place dependent on **Bit 1** of parameter **P-0-0525, Type of motor brake.** It can be set here whether the brake applies immediately upon removal of torque or not until the motor is standing.

P-0-0525 Type of motor brake, Bit 1 = 0

The motor holding brake is immediately activated.

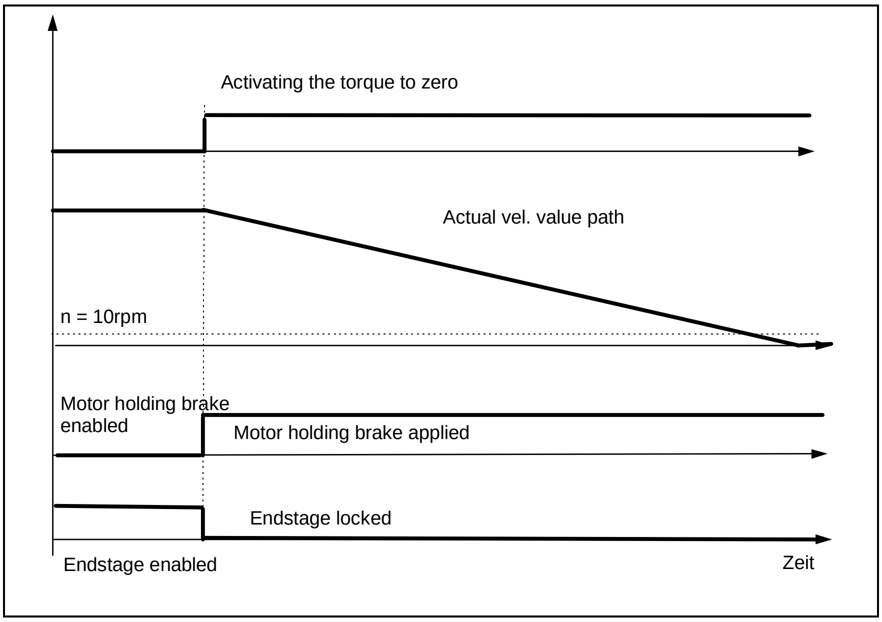


Fig. 9-52: Time diagram with torque to zero and **P-0-0525, Type of motor brake, Bit 1 = 0**

P-0-0525 Type of motor brake, Bit 1 = 1

The motor holding brake is not activated until the velocity of the motor is below 10min^{-1}.

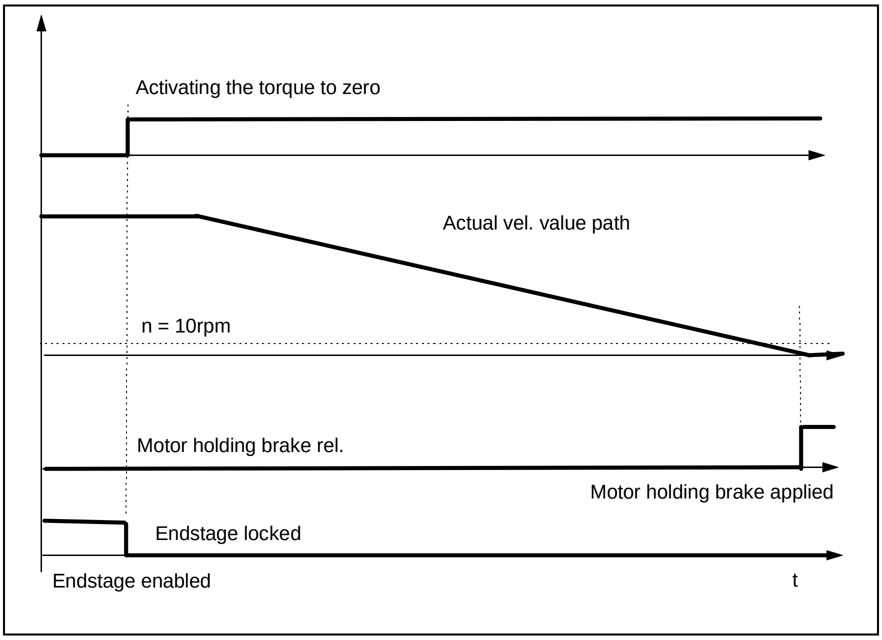


Fig. 9-53: Time diagram with torque to zero and **P-0-0525, Type of motor brake, Bit 1 = 1**

Also see section: "Motor Holding Brake"

Velocity command value to zero with filter and ramp

If "2" is entered in parameter **P-0-0119, Best possible deceleration**, then in the event of an error, the drive is brought to a standstill with velocity control with a command value ramp with end value zero. The speed command value is lead over a jerk-limited command value smoothing filter. The parameters used in this case are:

- **P-0-1201, Ramp 1 pitch**
- **P-0-1202, Final speed of ramp 1**
- **P-0-1203, Ramp 2 pitch**
- **P-0-1222, Velocity command filter**

To control the motor holding brake, the following parameters are also used:

- **P-0-0525, Type of motor brake**
- **P-0-0526, Brake control delay** and
- **P-0-0126, Maximum braking timeMaximale Bremszeit**

Activating the motor holding brake depends on P-0-0525, bit 1

Activating the motor holding brake in this case depends on the motor holding brake type set in parameter **P-0-0525, Type of motor brake.** If a "1" has been entered there in bit 1 for **spindle brake** then the motor holding brake is generally activated once the actual speed is less than 10 rpm (for rotary motors) or 10mm/min (linear motor).

Spindle brake

The endstage is deactivated in a delayed fashion by **P-0-0526, Brake control delay**. The time in P-0-0526 is the time the brake needs to safely clamp. Parameter **P-0-0526, Brake control delay** is automatically set in MKD and MHD motors to 150msec.

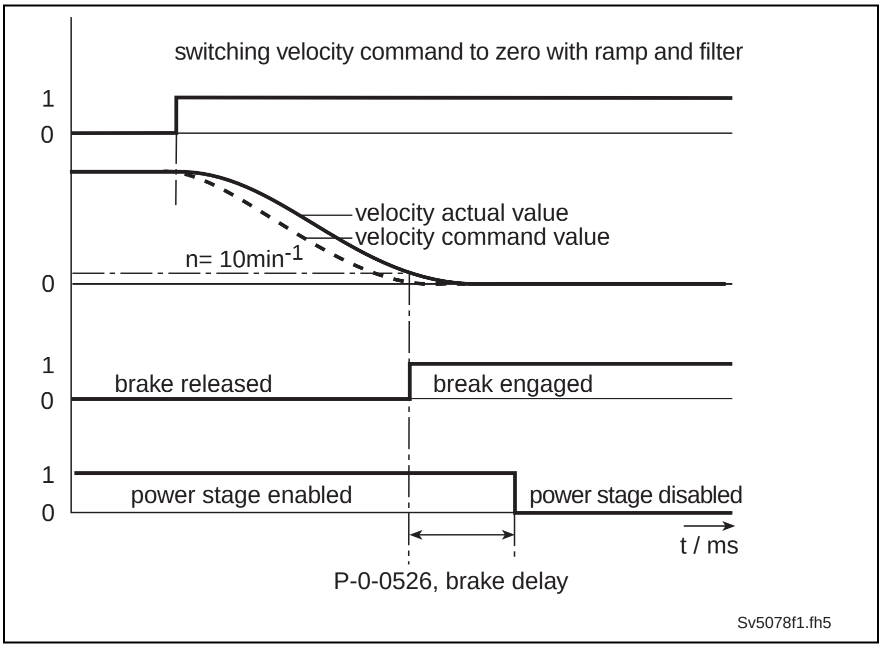


Fig. 9-54: Time diagram with command value to zero with filter and ramp and P-0-0525, Holding brake type, bit 1 = 1 (spindle brake)

If "0" is entered in bit 1 of parameter **P-0-0525, Type of motor brake** for *Servo brake* then the motor holding brake is activated after the time set in **P-0-0126, Maximum braking time** since the beginning of velocity command value to zero has run out.

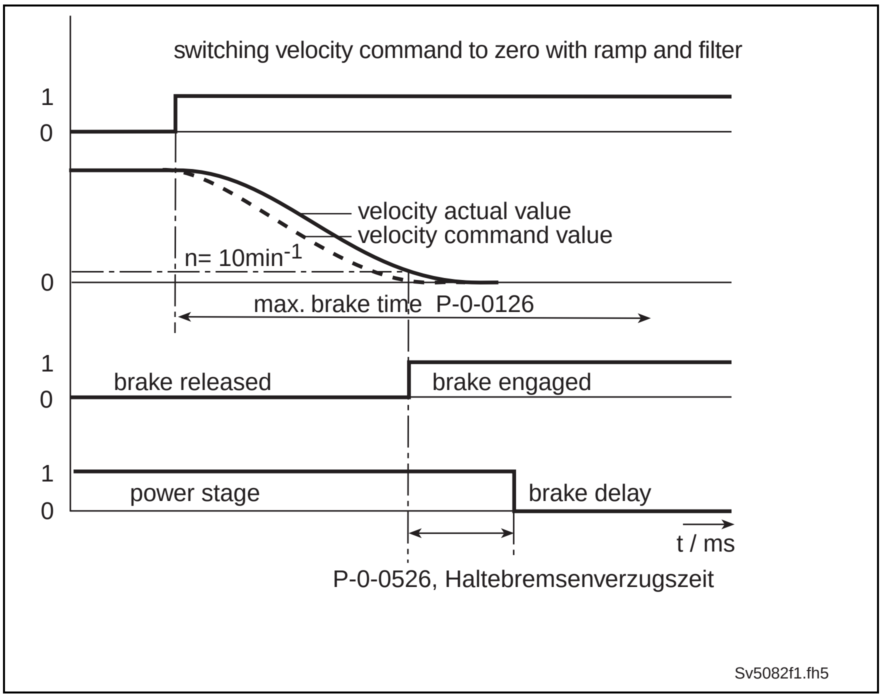


Fig. 9-55: Time diagram with command value to zero with filter and ramp and P-0-0525, Holding brake type, bit 1 = 0 (servo brake) and actual brake time < P-0-0126

Parameter **P-0-0126, Maximum braking time** helps to monitor decel time and ensures that the motor holding brake is activated if the theoretical decel time is exceeded as a result of an error.

Note: The value in P-0-0126, **Maximum decel time** must be set so that the drive can be brought safely to a standstill out of maximum velocity with greatest possible moment of inertia and load.
ATTENTION: If the value in **P-0-0126, Maximum braking time** is set too small, then the error reaction is terminated and the motor brake activated at a speed greater than 10 rpm. This will eventually damage the brake!

The actual brake time can exceed the set **P-0-0126, Maximum braking time** if:

- the command value ramp was modified without adjusting to P-0-0126 or
- the drive can no longer follow the set velocigy command value profile because of an error.

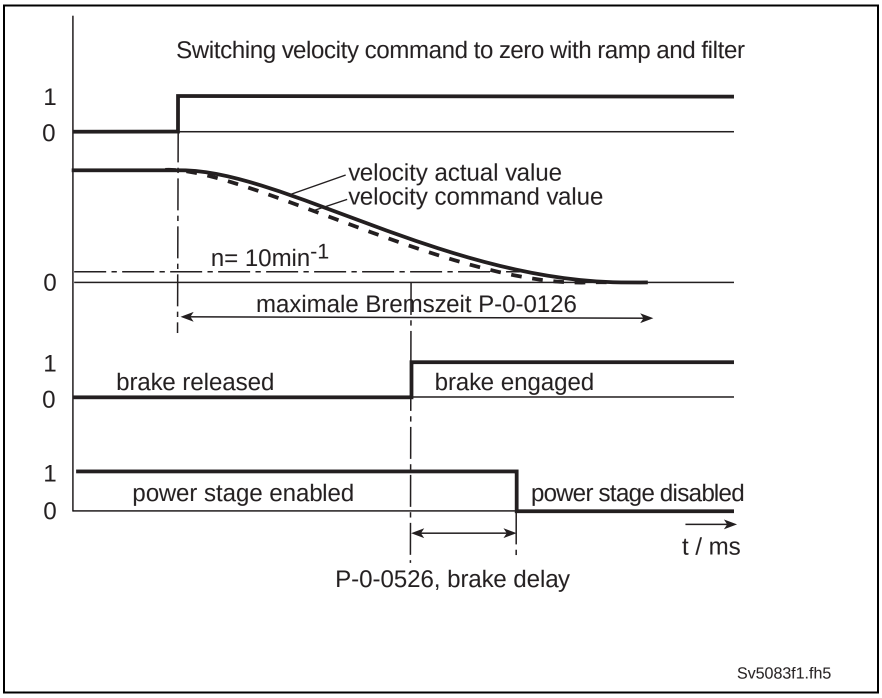


Fig. 9-56: Time diagram with command value to zero with filter and ramp and P-0-0525, Holding brake type, bit 1 = 0 (servo brake); actual brake time > P-0-0126, as ramp is too flat

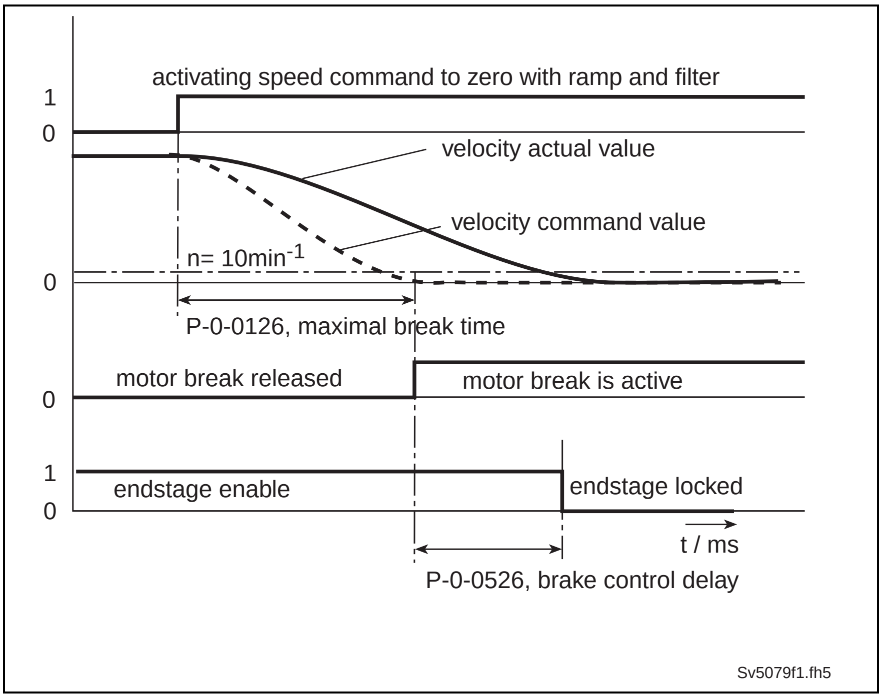


Fig. 9-57: : Time diagram with command value to zero with filter and ramp and P-0-0525, Holding brake type, bit 1 = 0 (servo brake); actual brake time > P-0-0126 as drive cannot follow ramp

Return motion

If a 3 has been set for "Best possible Deceleration" as a return motion, then the drive generates a position command profile to complete the desired travel distance in the case of an error. In other words, in the case of an error a specific process (travel) block is activated.

This travel block is defined by the parameters

- **P-0-0096, Distance to move in error situation**
- **S-0-0091, Bipolar velocity limit value**
- **S-0-0138, Acceleration bipolar**
- **S-0-0349, Jerk limit bipolar**

Once the drive has covered the distance, i.e., has reached the desired target position, then the motor holding brake is activated (if mounted) and the drive is switched torque free at the end of the motor brake delay time. The distance to move is considered as completed, i.e., the motor holding brake is activated, if

- target position = active position command value, i.e., bit 12 in **S-0-0013, class 3 diagnostics** = 1 and
- Vactual = 0, i.e., bit 1 in **S-0-0013, class 3 diagnostics** = 1 (feedback velocity smaller than **S-0-0124, Standstill window**).

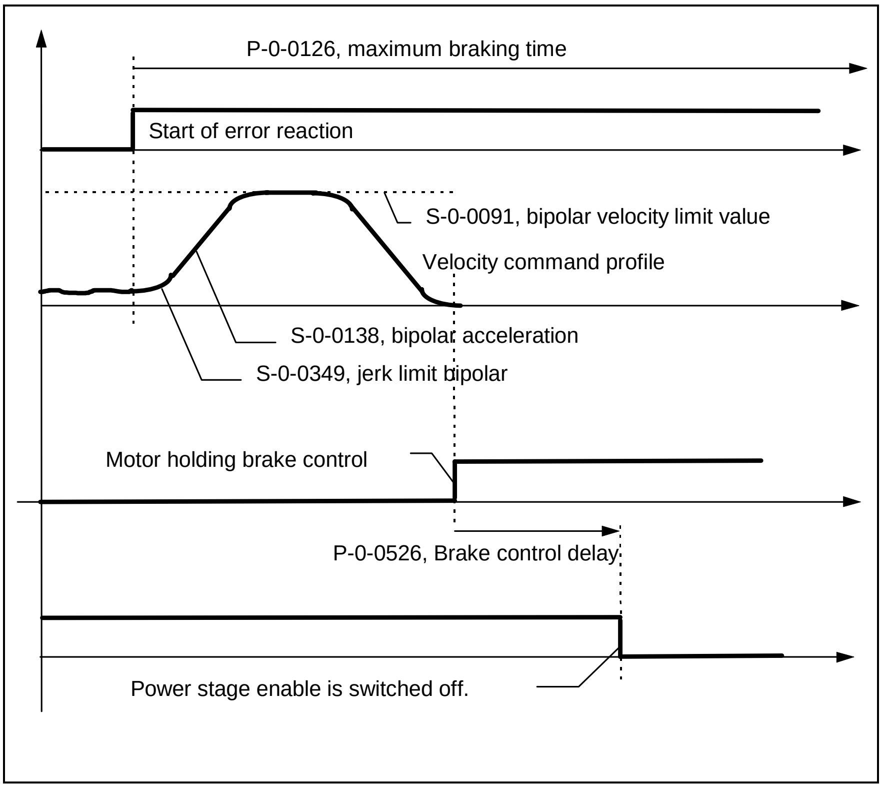


Fig. 9-58: Time sequence of the error reaction "return motion"

Error reaction "Return motion" with position limit values activated

If the drive-internal position limit values (**S-0-0049, positive position limit value and S-0-0050, negative position limit value**) have been activated, in other words,

- in **S-0-0055, position polarity parameter** bit 4 for "activating the position limit value" has been set to 1 and

- the encoder set in **S-0-0147, homing parameter, bit 3** is in reference (**S-0-0403, position status** = 1),

then the drive will not leave the travel range set when executing the error reaction "return motion". If the drive is in a position that would take it outside of the position limit values when executing a return motion, then the drive will, in this case, move to a position just in front of the relevant position limit value (precisely by **S-0-0057, Positioning window** in front of the position limit value.

Power off on error

Project planning prescribes that power must be turned on via the BB contact. This means that power can only be switched on if the BB relay is closed. On the other hand, powering up requires the BB contact to open.

The signalling of a drive error to the drive package or the power supply module can be activated via parameter **P-0-0118, Power off on error** Communication utilizes signal **BBdrive** (X11/5 and X11/14).

The Structure of the Parameter:

P-0-0118, Power off on error

Bit 0 : Package reaction or power off on error
0: no package reaction on error and therfore no power off on error (exception bleeder overload always switches power off)
1: package reaction and power off on error

Condition power on
0: power on possible with no error and operating mode (comm.phase 4)
1: power on possible if no error ("passive axis")

Bit 2 : Instant of power off on error (only if bit 0 =1)
0: message generated immediately when error occurs (package reaction of all controllers on same power supply module (preferred setting)
1: message not generated until error reaction completed This means that power will not be shut off until the end of the error reaction

Bit 3 : Reaction to DC bus undervoltage
0: undervoltage is treated as if it were an error of non-fatal warning
1: undervoltage treated as if it were a fatal warning and prevents operation of motor

Bit 4 : Automatic clearing of the undervoltage error
0 : undervoltage error is stored
1 : undervoltage error deleted by drive upon removal of drive enable

Bit 5 : Undervoltage as non-fatal warning
0 : undervoltage as error or fatal warning
1 : undervoltage error treated as if it were a non-fatal warning

Fig. 9-59: P-0-0118, Power off on error

Power off and package reaction on error

In the case of drive packages (this is defined as a collection of multiple drives that that have a power supply common to all and which can execute errors commonly), it is possible to inform the individual controllers and any power supply module which may be present as to whether the drive has detected an error as a result of which the power source must be shutdown. This communication utilizes signal line **BBdrive** (x11/5 and X11/14).

If the controllers without error detect the error state on the signal line BB drive, then they will, in turn, also conduct the error reaction and shut power off.

The point in time at which the drive package is signalled (at start or end of the error reaction) is set in bit 2.

Condition for Power On

Using bit 1 of **P-0-0118, Power off on error** it is possible to set that point in time at which the drive signals its readiness to operate and therefore at which power can be switched on.

If bit 1 is set, then power can be switched on immediately after initialization of the drive, in other words, already in communication phase 0 ("passive axis“).

If bit 1 = "0“, then the drive must be in communications phase 4 and without error before the power can be switched on for the first time.

In units that cannot release energy generated during brake (by means of bleeders or a mains-regenerated power supply) bit 2 should be set to 1 to prevent the drive coasting.

Reaction to Undervoltage (DC bus voltage too small)

Bits 3, 4 and 5 of **P-0-0118, Power off on error** offer various options on how to handle Undervoltage.

Undervoltage is present if the drive has been enabled (subject to torque) and the DC bus voltage drops below the minimum value (about 75% of the mean value of a periodic quantity).

Undervoltage as fatal warning

Bit 3 = 1 means that undervoltage will be treated as a "fatal warning".

This makes sense if the energy in the DC bus must be retained for that period of time which a control needs to start a synchronized deceleration of several drives.

The drive does not signal a class 1 diagnostics error and the reaction parametrized in **P-0-0119, Best possible deceleration** is also not conducted.

Switching the motor off leads to a slower drop in the DC bus voltage. This means that asynchronous motors can still have a magnetic field when the control starts the synchronized deceleration of the drive. Braking then takes place in generator mode.

Note: If the DC bus voltage does not rise above the undervoltage threshold within 100ms then error F226 Undervoltage in power section is generated.

Automatic deleting of the undervoltage

If undervoltage is treated as an error (bit 3, 5 = 0), then bit 4 can be used to set an automatic delete of the error once the control removes the drive enable signal.

This makes sense if the error occurs even with normal shutdowns and the cause is simply that the drive does not remove the enable fast enough.

Undervoltage as non-fatal warning

Bit 5 = 1 can be used to switch every reaction to undervoltage off. Only a warning is generated.

Note: If the DC bus voltage does not rise above the undervoltage threshold within 100ms then error F226 Undervoltage in power section is generated.

NC Response in Error Situation

NC response during an error situation is only possible during non-fatal errors. Otherwise the drive reacts immediately with an error response.

If the drive control device recognizes an error, it sends a message to the control (CNC) . The control can then decelerate the servo axis of the machine without possible damage.

If this is desired, you have to delay the drive error reaction to allow the axis to continue movement to the values set by the control. This is achived by setting the time delay between the recognition of the error and the drive’s error reaction. This can be set in parameter **P-0-0117, NC Reaction on Error**.

The following applies:

Value of P-0-0117	Function
0	Drive proceeds the error reaction immediately after recognition of the error.
1	Drive continues for 30 sec in the selected operating mode, then follows the "best possible deceleration".

Fig. 9-60: NC Reaction on Error

Note: Activating the "NC Reaction on Error" is only recommended for controls that have a corresponding error reaction procedure.

Emergency stop feature

The E-Stop function supports the braking of the drive via a hardware input on the drive controller. It thus represents the option of shutting down the drive parallel to command communication, in an emergency.

Activation and the how to set the deceleration:

The following parameters are used:

- **P-0-0008, Activation E-Stop function**
- **P-0-0223, Status Input E-Stop function**

Functional principle of the E-Stop function

By activating the E-Stop function (bit 0 = 1) the drive executes, upon actuation of the E-stop input, the selected reaction for deceleration. This reaction depends on bit 2 of P-0-0008.

After activation of the E-Stop Input (bit 0 = 1), the drive is prompted to perform the selected procedure to shutdown the drive. This reaction at first depends on bit 2 of P-0-0008.

Interpretation as warning

If the interpretation "fatal warning" has been parametrized there (bit 2 = 1), then the drive responds as with switching off the external drive enable with the reaction parametrized in **P-0-0119, Best possible deceleration**. The warning diagnosis **E834 Emergency-Stop** appears. Bit 15 is set in **S-0-0012, Class 2 diagnostics** (manufacturer specific warning). Simultaneously, the bit "change bit class 2 diagnostics“ is set in the drive status word. This change bit is cleared by reading **S-0-0012, Class 2 diagnostics.**

Using parameter **S-0-0097, Mask class 2 diagnostic,** warnings can be masked in terms of their effects on the change bits.

The functional principle at work when actuating the E-Stop input is that of a series connection to an external drive enable. In other words, when activating the E-Stop input, the drive responds as if the external drive enable had been switched off.

To **re-activate the drive**, the E-Stop input must become inactive, and another **0-1 edge** must be applied to the external **drive enable**.

Interpretation als error with adjustable reaction

If bit 2 has been set to treat it as an error, then the reaction selected in bit 1 is performed. The error diagnosis **F434 Emergency-Stop** (or **F634 Emergency-Stop**), E-stop activated appears, and bit 15 is set in parameter **S-0-0011, Class 1 diagnostics** . Bit 13 is set in the drive status word of the drive telegram, i.e., drive interlock, error with class 1 diagnostics is set. The error can be cleared via command **S-0-0099, C500 Reset class 1 diagnostic, or** key S1 on the drive controller if the E-stop input is no longer activated.

This function basically works as if an error had occurred in the drive. The drive reaction is immediate and without delay, independent of parameter **P-0-0117, NC reaction on error.**

If bit 1 = 0, the drive shuts down according to **P-0-0119, Best possible deceleration**. The diagnosis upon activating the E-stop input then reads **F434 Emergency-Stop.**

Interpretation as error with reaction as "Velocity command value to zero"

If bit 1 is set to 1 , then the drive is braked at maximum torque, if an E-Stop of the drive is triggered, until the speed = 0, regardless of the error reaction set in parameter P-0-0119. This corresponds to the best possible standstill "Velocity command value to zero". The diagnosis with the activation of the E-Stop input then reads **F434 Emergency-Stop.**

The state of the E-Stop input can be controlled via parameter **P-0-0223, Status Input E-Stop function**. The state of the E-stop input is stored there in bit 0.

Activation and Polarity of the E-Stop Input

For the activation of the E-Stop input and the selection of a response for shutdown of the drive, use parameter **P-0-0008, Activation E-Stop function**.

The following applies:

P-0-0008, Activating E-stop function

Bit 0 : Activating E-Stop
0: inactive
1: active

Bit 1 : Error class with interpretation as error (Bit 2 = 0)
0: best possible standstill (P-0-0119)
1: velocity command value to zero

Bit 2 : Interpretation
0: as non-fatal error
1: fatal warning

Fig. 9-61: P-0-0008, Activation of E-Stop-Function

The input polarity cannot be selected. It is always 0-active; i.e., 0 V on E6 of the connector means the E-Stop is active.

If the evaluation of the E-Stop signal is activated, the monitoring of +UL (external +24 V) is also activated, if it has not yet been active.

Connection of the Emergency-Stop Input

see project planning manual.

9.6 Control Loop Settings

General Information for Control Loop Settings

The control loop settings in a digital drive controller are important for the characteristics of the servo axis. Determining the control loop settings requires expert knowledge.

"Optimizing" the regulator settings is generally not necessary!

For this reason, application-specific control parameters are available for all digital INDRAMAT drives. These parameters are either contained in the feedback data memory and can be activated through the command **C700 Command basic load** (with MHD, MKD and MKE motors) or they must be input via the setup/service program. (See also Load Default Feature"

In some exceptions, however, it may be necessary to adjust the control loop settings for a specific application. The following section gives a few simple but important basic rules for setting the control loop parameters in such cases.

In every case, the given methods should only be seen as guidelines that lead to a robust control setting. Specific aspects of some applications may require settings that deviate from these guidelines.

The control loop structure is made up of a cascaded (nested) **position, velocity and torque/force loop**. Depending on the operating mode, only the torque control loop or the torque and velocity control loops can become operative. The control is structured as depicted below:

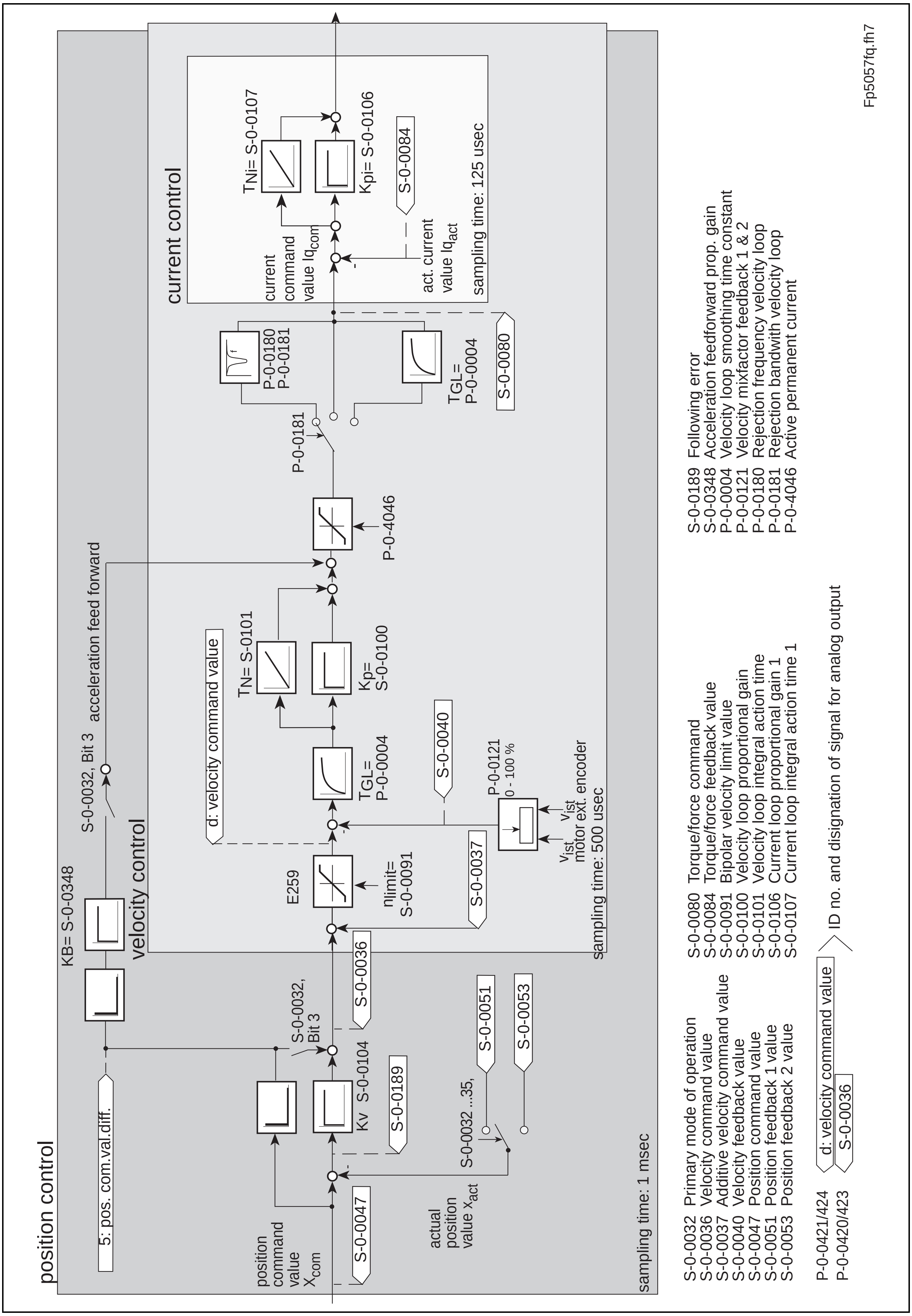


Fig. 9-62: Control structure

Load Default

With the command **Basic Load**, you can activate the default control parameters for motor types with **motor feedback data memory** such as

- MHD
- MKD
- MKE

With these parameters, the relevant control parameters for the appropriate motor type used can be set. The parameters are pre-defined by the manufacturer for the moment of inertia relationship of $J_{own} = J_{load}$.

Most applications can work with these values.

Default values can be set for the following parameters:

- **S-0-0106, Current loop proportional gain 1**
- **S-0-0107, Current loop integral action time 1**
- **S-0-0100, Velocity loop proportional gain**
- **S-0-0101, Velocity loop integral action time**
- **P-0-0004, Smoothing Time Constant**
- **S-0-0104, Position loop Kv-factor**
- **P-0-0181, Rejection bandwidth velocity loop**

The feature **Load Default Settings** can be activated in two different ways:

- Automatic activation during the command procedure **S-0-0128, C200 Communication phase 4 transition check** for the first operation of this motor type with this drive.
- With the command procedure **S-0-0262, C700 Basic Load**

Automatic Execution of the Load Default Feature

If a controller has been operated with a specific type of motor, then the controller will detect this from that point forward. During the execution of command **S-0-0128, C200 Communication phase 4 transition check** it compares parameter **S-7-141, Motor type**, which is read out of the data memory, with the value for parameter **S-0-0141, Motor type** which is backed up in the parameter memory of the controller. If these two parameters are different, then error **F208 UL The motor type has changed** is generated. "UL" appears in the 7-segment display.

Before the user can reset the error and thus start the base load function, the option of secure a specific set of controller parameters is available.

Error **F208 UL The motor type has changed** can be reset in three different ways:

1.) executing the command
S-0-0099, C500 Reset class 1 diagnostic

2.) Actuating key S1

3.) Applying 24 V at error reset input

In all three cases, the load base values function is activated.

If the execution of load base values is not posible, then the relevant command error of command **S-0-0262, C700 Command basic load** will appear**.**

(Also see section: "Error Conditions of the Load Default Settings Procedure"

Run the Load Default Settings feature as a command

With parameter **S-0-0262, C700 Basic load**, the feature can be run as a command. This might be useful if manually changed control parameters are to be set back to the default values.

Error Conditions of the Load Default Settings Procedure

If the feature started by running the command **S-0-0262, C700 Basic load** is not successfully processed, then the reason for this error is displayed either on the 7-segment display or with the diagnostic parameter **S-0-0095**.

The following could cause an error during basic load:

SS Display	Diagnostic Message:	Cause:
C702	Default parameters not available	Basic load (or load defaults) is impossible for the motor type selected, only for MHD-, MKD and MKE
C703	Default parameters invalid	Connection of drive to motor encoder data memory is interrupted or feedback is defective
C704	Parameters not copyable	The existing default value cannot be processed since, for example, the extreme value limit was exceeded in the default value
C705	Locked with password	A customer password has been set which locks out changes to parameters

Fig. 9-63: Possible errors during Basic Load command

If a parameter can not be set on its default value, the parameter is set invalid in its data status. This serves safety purposes and helps in diagnosing errors.

Setting the Current Controller

The parameters for the current loop are set by INDRAMAT and cannot be adjusted for specific applications. The parameter values set at the factory are activated with the command **S-0-0262, C700 Command basic load** for MKD/MHD motors or must be retrieved from the motor data sheet.

The parameters for the current controller are set via the parameters

- **S-0-0106, Current loop proportional gain**
- **S-0-0107, Current Loop Integral Action Time**


Warning

Changing the values defined by INDRAMAT
can result in damages to the motor and the drive controller.
⇒ Changes to the current controller parameters are not permitted.

Setting the Velocity Controller

Pre-requisites:

The current control must be correctly set.

The velocity controller is set via the parameters

- **S-0-0100, Velocity Loop Proportional Gain**
- **S-0-0101, Velocity Loop Integral Action Time**
- **P-0-0004, Smoothing Time Constant**

as well as the parameters

- **P-0-0180, Rejection frequency velocity loop**
- **P-0-0181, Rejection bandwidth velocity loop**

These can be set either by running once the load default feature or by following the procedure hereafter.

Preparations for Setting the Velocity Controller

A number of preparations must be made in order to be able to set the velocity loop (controller):

- The mechanical system must be set up in its final form in order to have original conditions while setting the parameters.
- The drive controller must be properly connected as described in the user manual.
- The safety limit switches must be checked for correct operation (if available)
- The Mode: Velocity Control" must be selected in the drive.

The controller setting must be selected for the start of parameterization as follows:

S-0-0100, Velocity Loop Proportional Gain = default value of the connected motor.

S-0-0101, Velocity Loop Integral Action Time = 6500 ms

P-0-0004, Smoothing Time Constant = Minimum value (= 500µs)

P-0-0181, Rejection bandwidth velocity loop = 0 Hz

Note: When determining the velocity control parameters, no compensation function should be active.

Definition of the Critical Proportional Gain and P-0-0004, Smoothing Time Constant

- After turning on the controller enable, let the drive move at a low velocity. Rotational motors: 10...20RPM, linear-Motors: 1...2 m/min)
- **Raise the S-0-0100, Velocity loop-proportional gain** until unstable behavior (continuous oscillation) begins.
- Determined the frequency of the oscillation by oscilloscoping the actual velocity (see also "Analog Output"). If the frequency of the oscillation is much higher than 500Hz, raise the **P-0-0004, Smoothing Time Constant** until the oscillation ends. After this,

increase the **S-0-0100, Velocity Control Proportional Gain** until it becomes unstable again.

- **Reduce the S-0-0100, Velocity loop proportional gain** until the oscillation ends by itself.

The value found using this process is called the "critical velocity loop proportional gain".

Determining the Critical Integral Action Time

- **Set S-0-0100, Velocity Loop Proportional Gain** = 0.5 x critical proportional gain
- **Lower S-0-0101, Velocity controller integral action time** until unstable behavior results.
- **Raise S-0-0101, Velocity controller integral action time** until continuous oscillation vanishes.

The value found using this process is called the "Critical Integral Action Time."

Determining the Velocity Controller Setting

The critical values determined before can be used to derive a control setting with the following features:

- Independent from changes to the axis since there is a large enough safety margin to the stability boundaries.
- Safe reproduction of the characteristics in series production machines.

The following table shows many of the most frequently used application types and the corresponding control loop settings.

Application Type:	Velocity controller proportional gain	Velocity loop Integral Action Time:	Comments:
Feed axis on standard tool machine	Kp = 0.5 • Kpcrit	Tn = 2 • Tncrit	Good stiffness and good command response
Feed axis on perforating press or chip-cutter machines	Kp = 0.8 • Kpcrit	Tn = 0	High proportional gain; no I-part, to achieve shorter transient periods.
Feed drive for flying cutting devices	Kp = 0.5 • Kpcrit	Tn = 0	Relatively undynamic control setting without I-part, to avoid structural tension between the part to cut off and the machine.

Fig. 9-64: Identification of Velocity Controller Settings

See also Supplement B, Diagnostic Explanations: **F878 Velocity loop error**.

Filtering oscillations from mechanical resonance

The drives are able to suppress oscillations caused by the drive train (gear) between the motor and the axis or by the spindle mechanics even in a narrow band. Thus, an increased drive dynamics with good stability can be achieved.

The mechanical system of rotor-drive train-load is induced to generate mechanical oscillations as a result of position/velocity feedback in a closed control loop. This behavior identified as a "two mass oscillator" is generally within the 400 to 800 Hz range, depending on the rigidity (or elasticity) and spatial volume of the mechanical system.

This "two mass oscillation" usually has a clear resonance frequency which can be specifically suppressed by a notch filter (band suppressor) provided in the drive.

By suppressing the rejection frequency the dynamics of the velocity and position control loops in terms of control can be significantly improved compared to without a band suppression filter.

This results in greater contour accuracy and smaller cycle times for positioning processes, leaving sufficient stability margin.

The rejection frequency and bandwidth can be set. The rejection frequency is the one with highest attentuation, the bandwidth determines the frequency range, at whose borders the attenuation is 3dB less. Greater bandwidth leads to smaller band attenuation of the center frequency!

The following parameters can be used to set both:

- **P-0-0180, Rejection frequency velocity loop**
- **P-0-0181, Rejection bandwidth velocity loop**

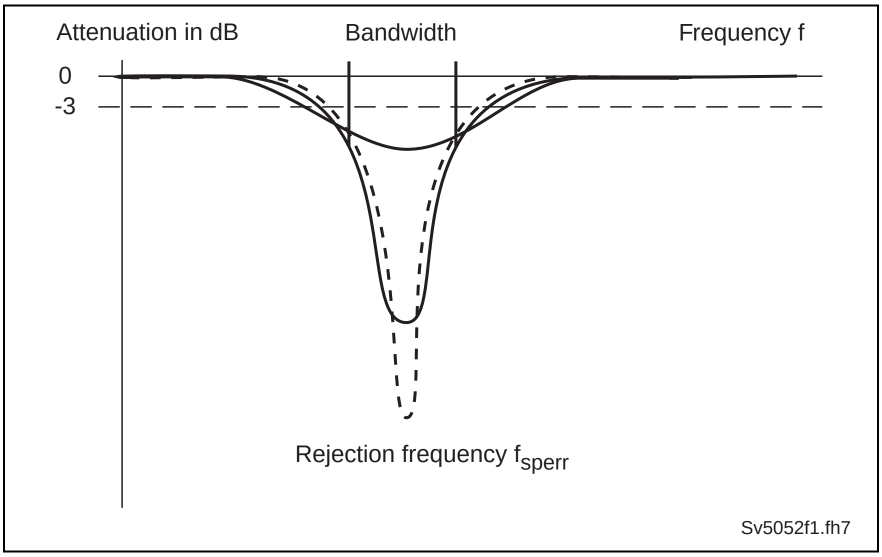


Fig. 9.65: Amplitude response of the rejection filter in terms of bandwidth - qualitative

To set the band filter, we recommend the procedure described as follows:

Pre-settings

⇒ Set rejection filter inactive. Set 0 in parameter **P-0-0181 Rejection bandwidth velocity loop.**

Determing resonance frequency

⇒ Connect oscilloscope to analog output channels. Assign velocity feedback value to analog output 1 (in **P-0-0420, Analog output 1, signal selection** "S-0-0040" and in **P-0-0422, Analog output 1 scaling** enter the scaling, e.g., 100 Rpm / 10 Volts.

- or -

⇒ Use the oscilloscope function of the drive to display velocity feedback value.

⇒ Excite the drive mechanics, e.g., tap lightly with a rubber hammer.

⇒ Record the time of the velocity oscillations with an oscilloscope or oscilloscope function and analyze the clearly salient frequencies. If the oscilloscope function is used, then the resonance frequency can be directly read out of the frequency readout.

Determining the initial state of the loop

⇒ Set the drive enable signal and optimize the velocity loop with inactive rejection filter (see "Setting the Velocity Controller"

⇒ Record step response of the velocity feedback and the torque/force generating command current with a small velocity command step. (The torque-generating command current may not enter the limit during this process.)

Turn rejection filter on and check the effect

⇒ Enter the most salient frequency in Hz in parameter **P-0-0180, Rejection frequency velocity loop.**

⇒ Enter a minimum bandwidth in parameter **P-0-0181, Rejection bandwidth velocity loop,** e.g., 25 Hz.

⇒ Record the previous step response again.

If the step response features less overshoot and shorter periods of oscillation, then:

⇒ Check whether increasing the value of **P-0-0181, Rejection bandwidth velocity loop** causes an improvement

- or -

⇒ check whether a change in the value of **P-0-0180, Rejection frequency velocity loop** means an improvement.

If the step response results in the same behavior, then:

⇒ Check the resonance frequency analysis

- or -

⇒ clearly increase the value in **P-0-0181, Rejection bandwidth velocity loop.**

Optimize rejection filter or velocity loop

⇒ with the pre-optimized values of **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop,** optimize the velocity controller again (see above).

The step responses defined above must have a similar appearance with higher values for **S-0-0100 Velocity loop proportional gain** and / or smaller values for **S-0-0101 Velocity loop integral action time.**

An additional optimizing run may be necessary for **P-0-0180 Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop** using the step response (see above).

Optimizing the Notch Filter or the Velocity Controller

⇒ With the pre-optimized values of **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop**, optimize again the velocity controller (as above).

The transient response defined above must have a similar aspect at higher values for **S-0-0100 Velocity loop proportional gain** and/or smaller values for **S-0-0101 Velocity loop integral action time**.

⇒ If necessary, run another optimization for **P-0-0180 Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop** according to the transient response.

Filtering with double smoothing filter

⇒ Optimization of the control loop with a notch filter (band suppression) does not always make the regulation good enough. This happens for example when the closed loop does not have significant resonance frequencies. Activation of a second smoothing filter (with low pass response) can, depending from the case, improve the regulation quality as desired.

⇒ To do this, set the parameter **P-0-0181, Rejection bandwidth velocity loop** to **-1**. The notch filter as well as the assigned parameter **P-0-0180, Rejection frequency velocity loop** are deactivated. Instead of the notch filter, a smoothing filter is activated in the control loop. This uses the same smoothing time constant T_{gl} as the smoothing filter with **P-0-0004 Velocity loop smoothing time constant**. Together with the smoothing filter at the input of the velocity controller, you obtain a low pass filter of 2nd order (2 poles). Frequencies greater than the cutoff frequency $f_g = 1/2\pi T_{gl}$ are much more suppressed and cannot excite oscillations in the control loop any more. The parameter for the filter is **P-0-0004 Velocity loop smoothing time constant**.

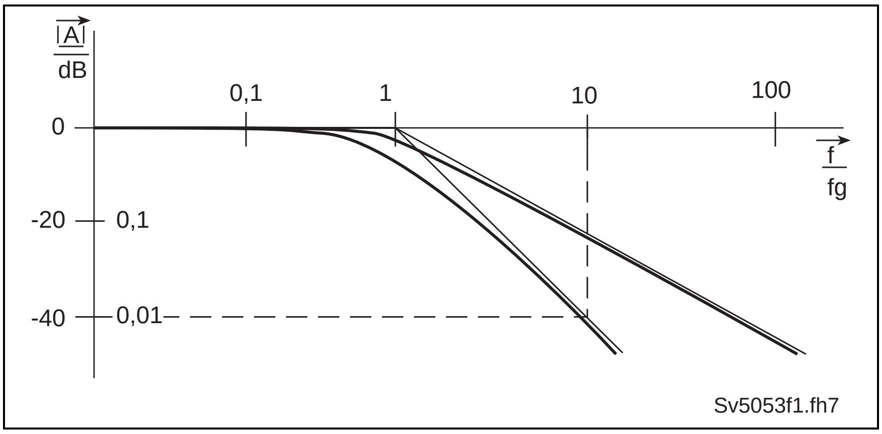


Fig. 9-66: Frequency response of low pass filters with 1 pole and with 2 poles

Note: The adjustment is the same as described under "**Definition of the Critical Proportional Gain and P-0-0004, Smoothing Time Constant"**

Velocity Control Loop Monitoring

The correct function of the velocity loop is monitored.

If the velocity control loop monitor detects a fault in the velocity control loop then error

- **F878 Error in velocity control loop**

is generated.

Note: The velocity control loop monitor is only active is an operating mode is active with which the velocity control loop in the drive is closed and monitoring activated.

Activating the monitor

The monitor is activated with parameter **P-0-0538, Motor function parameter 1,** Bit 8.

The structure of the parameter:

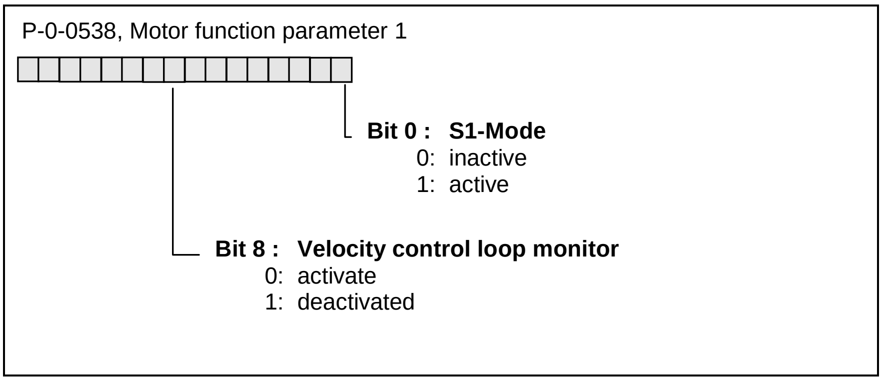


Fig. 9-67: P-0-0538, Motor function parameter 1

Note: It is highly recommended not to deactivate the velocity control loop monitor activated at the factor as it represents a basic safety function of the drive!

The causes of a monitor trigger

The velocity control loop monitor is designed to actuate with those faults that could lead the motor torque in the wrong direction.

The following options are basically possible:

- incorrect poles with motor connection
- wrong commutation angle
- faults in the velocity encoder

Setting the position controller

Pre-requisite:

Current and speed control must be correctly set.

The position controller can be set with the parameter

- **S-0-0104, Position Controller Kv Factor**

This can be set by either executing the load default settings procedure or by following the process below.

Preparations for Setting the Position Control Loop

A number of preparations must be made in order to be able to set the position controller properly:

- The mechanical system must completely assembled and ready for operation.
- The drive controller must be properly connected as described in the user manual.
- The safety limit switches must be checked for correct operation (if available)

- Operate the drive in a mode that closes the position loop in the drive (Mode: Position Control"
- The velocity controller must be properly tuned. The start value chosen for the K_v-factor should be relatively small ($K_v = 1$).
- For the determination of the position controller parameter, no compensation function should be activated.

Determing the Critical Position Controller Gain

- Move axis at a slow velocity, i.e., with a jog function at a connected NC Control (Rotating Motors: 10...20 Rpm, linear-Motors: 1...2m/min).
- Raise the K_v-factor until instability appears.
- Reduce the Kv-factor until the continuous oscillation ends by itself.

The Kv factor determined through this process is the "Critical position control loop gain".

Determining the Position Controller Setting

In most applications, an appropriate position controller setting will lie between 50% and 80% of the critical position controller loop gain.

This means: **S-0-0104, Position Loop KV-Factor** = 0.5..0.8 • K_{vcrit}

Position Control Loop Monitoring

The position control loop monitor helps to diagnose errors in the position control loop.

Reasons for errors in the position control loop can be:

- Exceeding the torque or acceleration capability of the drive.
- Blocking of the axis' mechanical system
- Disruptions in the position encoder

The monitoring of the position circuit is only active when an operation mode with closed position loop is active in the drive. To set and check the monitoring function, two parameters are used:

- **S-0-0159, Monitoring Window**
- **P-0-0098, Max. Model Deviation**

If the drive detects an error in the position control loop, the error message

- **F228 Excessive deviation**

is issued.

General Operating Characteristics of Position Control Loop Monitoring

To monitor the position control loop, a model actual position value is computed, which depends only on the commanded position profile and the set position loop parameters. This model position is compared continuously to the actual position. If the deviation exceeds **S-0-0159, Monitoring Window** for more than 8msec, an error **F228 Excessive deviation** will be generated.

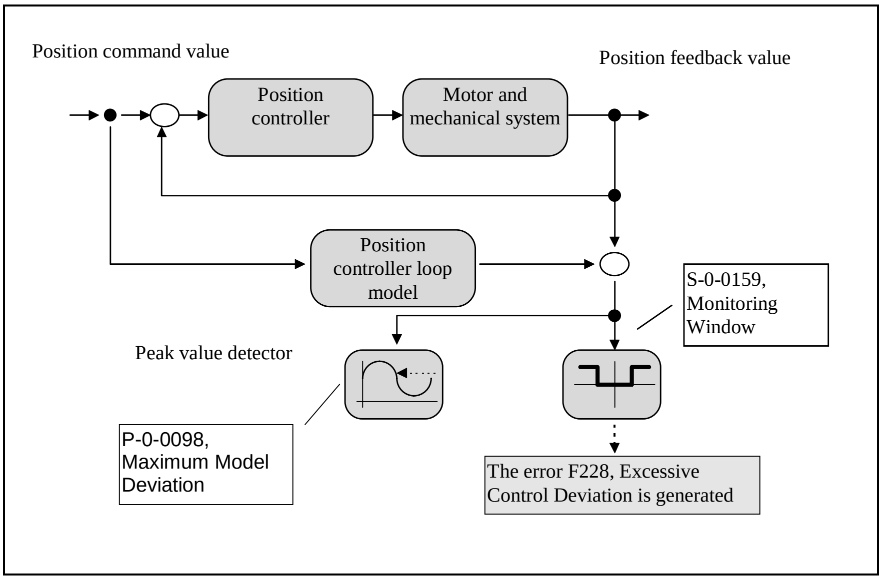


Fig. 9-68: Schematic of Position Control Loop Monitoring

For accurate monitoring, always the actual feedback value from the position control is used. This means that for position control with the motor encoder, position feedback value-1 is used; and for position control with the external encoder, the position feedback value-2 is used.

Setting the Position Control Loop Monitor

Requirements for the setup of the position loop monitoring are

- Check the velocity and position control loops for their appropriate settings.
- The axis in question should be checked mechanically and should be in its final state.

The position control loop monitor settings are performed:

- Through the connected control, you should proceed in a typical operation cycle. In this mode, move at the maximum projected velocity.
- In parameter **P-0-0098, Max. Model Deviation**, the maximum deviation between the actual feedback value and the expected feedback value is always displayed. (Note: The contents of this parameter are not saved. After enabling the drive, this parameter equals zero.)
- This value can be used to help set the monitoring window. Parameter **S-0-0159, Monitoring Window** should be set to **P-0-0098, Max. Model Deviation** multiplied by a safety factor. A safety factor between 1.5 and 2.0 is recommended.

Example:

Content of P-0-0098, Maximum Model Deviation:

0.1 mm

⇒ Determination for the parameter S-0-159, Monitoring Window:

0.2 mm (= 2 x 0.1 mm)

Deactivation of the Position Control Loop Monitoring

It is strongly recommended to activate the position loop monitoring. However, there are exceptions for which the position loop monitoring must be deactivated. You can do that with the parameter **S-0-0159, Monitoring Window**, if it is set to very high values.

Setting the Acceleration Feed Forward

For Servo applications, where high precision at high speeds counts, you have the option to improve by far the precision of an axis during acceleration and brake phases through activation of the acceleration feed forward.

Typical applications for the use of the acceleration feed forward:

- Free form surface milling
- Grinding

To set the acceleration feed forward, use the parameter

- **S-0-0348, Proportional Gain Acceleration Feed Forward**

This value can be determined as follows.

Requirements for a Correct Setting of the Acceleration Feed Forward

- Velocity and position loop have to be set appropriately.
- For the Position Controller" a **lagless** operation mode must be selected.
- If frictional torque compensation should be activated, you must set this before setting the acceleration feed forward. A reversed procedure can limit the action of the acceleration feed forward.

Setting the Acceleration Feed Forward

Setting the correct acceleration feedforward can only be done by the user since it depends on the inertia.

The setting is done in two steps:

- Calculation of the preset value for the acceleration feedforward. For this purpose, you need the size of the complete inertia momentum translated to the motor shaft ($J_{Motor}+J_{Load}$) of the axis. This value is known approximately from projecting the axis. Additionally, you need the torque constant of the used motor. This data can be retrieved from the motor data sheet or the parameter **P-0-0051, Torque-/Force Constant** Kt. The preset value is calculated as:

$$\text{Acceleration Feedforward} = \frac{J_{Motor} + J_{Actuated}}{Kt} \times 1000$$

Acceleration Feedforward [mA/(rad\s²)]
J_{Motor}: Inertia momentum of the motor [kg m²]
J_{Load}: Inertia momentum of the load [kg m²]
Kt: Torque constant of the motor [Nm/A]

Fig.9-69: Value for the Acceleration Feedforward

The determined value is entered in parameter **S-0-0348, Acceleration Feedforward prop. Gain**.

Checking the effect of the acceleration feedforward and, if necessary, **fine tuning** of the parameter **S-0-0348, Acceleration Feedforward prop. Gain**:

The deviation of the actual feedback value to the position command can be displayed through the analog diagnostic output of the drive controller. To check the effect of the acceleration feed forward, you must oscilloscope the signal during movement of the axis along the desired operation cycle. In acceleration and brake phases, the feedforward must reduce the control deviation drastically.

Setting the Velocity Mix Factor

With the help of the velocity mix factor, you can combine the velocity feedback value, used for velocity control, from the motor and the external measurement system. This might be an advantage, when there is play or torsion between motor and load. To set the mixing ratio, use the parameter

- **P-0-0121, Velocity Mixfactor Feedback1 & 2**

Precondition: The function is only applicable when ther is an external measurement system. If this is not available, **P-0-0121** is automatically set to 0 % .

The mixture of the velocity feedback value can be continuously varied between:

- 100% Velocity feedback value of the motor encoder
  /
  0% actual value of the external encoder (P-0-0121 = 0)
  and
- 0% Velocity feedback value of the motor encoder
  /
  100% actual value of the external encoder (P-0-0121 = 100 %)

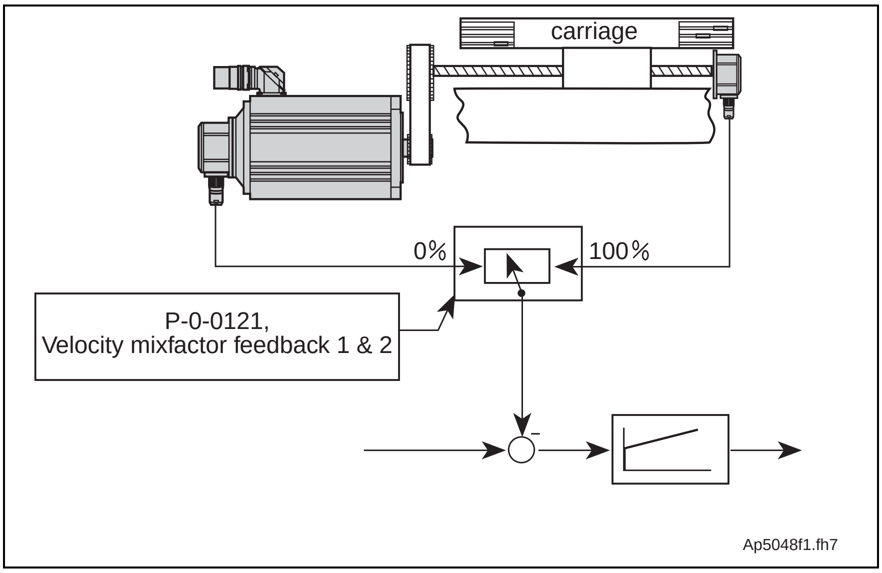


Fig. 9-70: Velocity Mixture Diagram

9.7 Automatic Control Loop Settings

General Preliminary Comments

To make parametrization of the drive easier, the firmware offers an automatic control loop setting with which the user need only specify, using a socalled damping factor, **the control loop dynamics**. Determining control parmeters to achieve these dynamics is set in the drive by starting **Command automatic control loop settings**.

Note hereby that the **drive must be moved** to execute an automatic control loop setting.

Prerequisites for Starting Automatic Control Loop Settings

WARNING

⇒ The emergency stop sequence function and the travel range limit switch operation must be checked and ascertained.

Also see **Section: Safety Instructions for Electrical Drives"**

⇒ During command D900, the drive moves itself without any external command value settings.

Travel range limits P-0-0166 and P-0-0167

Both travel range limits:

- **P-0-0166, Lower position limit for autom. control loop adjust**
- **P-0-0167, Upper position limit for autom. control loop adjust**

are only effective with command "Automatic control loop settings" and only prevent the command from becoming active until the drive moves out over the set limits.

When inputting both limits, it must be noted that:

- **upper limit P-0-0167 >** lower limit P-0-0166
- **def. travel path** = upper limit - lower limit **> 6 revolutions**

as the drive pendels during automatic control loop settings around the center position between upper and lower limits.

If one of the previously stated conditions is not met, then the command is completed with error **D905 Position range invalid, P-0-0166 & P-0-0167**.

Actual position at start

The actual position must be **within** the travel range defined by the two aforementioned limits.

Otherwise, command error **D906 Position range exceeded** will be generated immediately at command start.

Control loop settings

There must be a **stable cotrol loop setting.** This is generally achieved with the default parameters stored in the motor feedback.

If this is not the case, however, then a very undynamic control loop setting (small P-gain and large integral action time) in the velocity controller leads to a basic setting that the automatic control loop setting can use.

If necessary, the value of the actual velocity value filter is reduced to 500µs.

Drive enable or drive start

The oscillating motions and thus the automatic control loop settings are only executed if

- **drive enable** is available

and

- **drive start** is given.

If there is no drive enable at command start, command error **D901 Start requires drive enable** is generated.

Command Settings

All parameters involved in the commands must be set before the command is started to become effective with the automatic control loop setting.

- **P-0-0163, Damping factor for autom. control loop adjust** The desired control loop dynamics are selected herewith.
- **P-0-0164, Application for autom. control loop adjust**
- **P-0-0165, Selection for autom. control loop adjust**

If command error **D903 Inertia detection failed** is generated, then this means that one of the parameters listed on the right have been incorrectly parametrized. In other words, velocity, acceleratoin or torque for the automatic control loop settings are too small

Numeric value	Definition
0	Determining mass moment of inertia P-0-4020 and setting velocity and position control loops
1	Also determining accel precontrol S-0-0348

Fig. 9-71: Variants of automatic control loop settings

- **S-0-0092, Bipolar torque/force limit value**
  The maximum motor torque effective with automatic control loop settings can be effected via parameter S-0-0092, Bipolar torque vaue. This can limit the torque and prevent mechanical wear.
- **S-0-0108, Feedrate override**
  Feedrate override makes it possible to effect the velocity with automatic control loop settings via the analog channel (Poti). The function must be activated for this to be so, however.
- **S-0-0259, Positioning Velocity**
  This parameter sets the velocity effective with automatic control loop settings.
- **S-0-0260, Positioning Acceleration**
  With the maximum positioning velocity parameter the acceleration for the automatic control loop is set.
  If the value set is too small, then this can cause problems when determining the moment of inertia as the velocity changes and current values may be too small.

Executing Automatic Control Loop Settings

Note: **1)** The execution of the control loop settings goes in hand with **drive movement**. This means tht the drive pendels around the center position set in parameters P-0-0166 and P-0-0167.
2) The parameters needed to execute the command must be set before **command start**.

Determining travel range limits

First, the travel range must be set by fixing the travel range limits **P-0-0166** and **P-0-0167**.

This can occur by

- **defining the travel range** by **write accessing** both parameters.

Determining the control loop dynamics

The dynamics of the control loop can be optimized by changing **P-0-0163, Damping factor for autom. control loop adjust**.

Parameter **P-0-0164, Application for autom. control loop adjust** can also be used to adjust to specific mechanical situations.

Starting a command

- By writing into parameter **P-0-0162, D900 Command Automatic control loop adjust** the binary value of 3 (11b) (= command start).

Triggering a motion

An axis motion and thus the execution of an automatic control loop setting is only possible if the signal **drive halt** has not been set.

Otherwise, after start command **D900 Command automatic loop tuning** will appear in the display and the axis will not move.

Triggering a movement by starting command D900

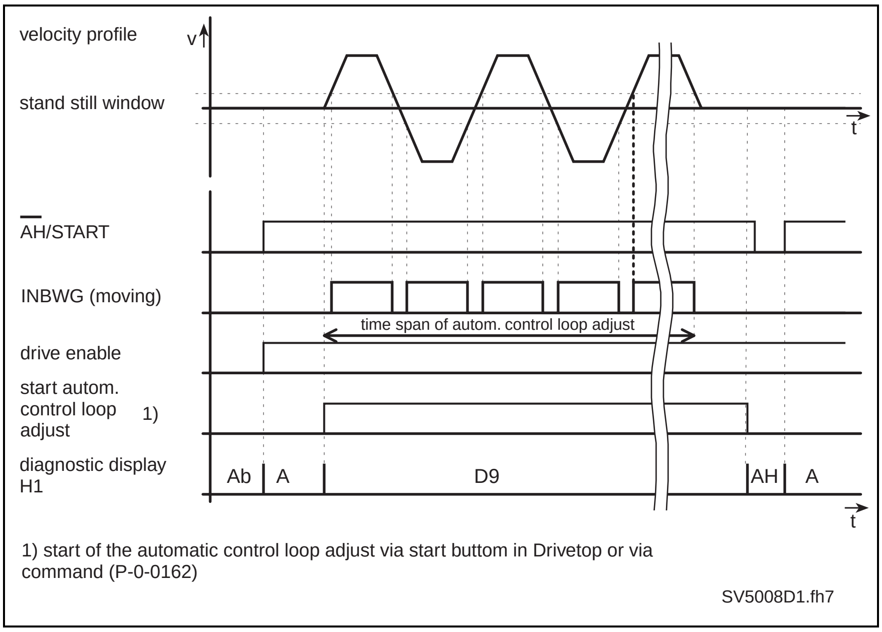


Fig. 9-72: Signal flow chart

Triggering a motion with AH

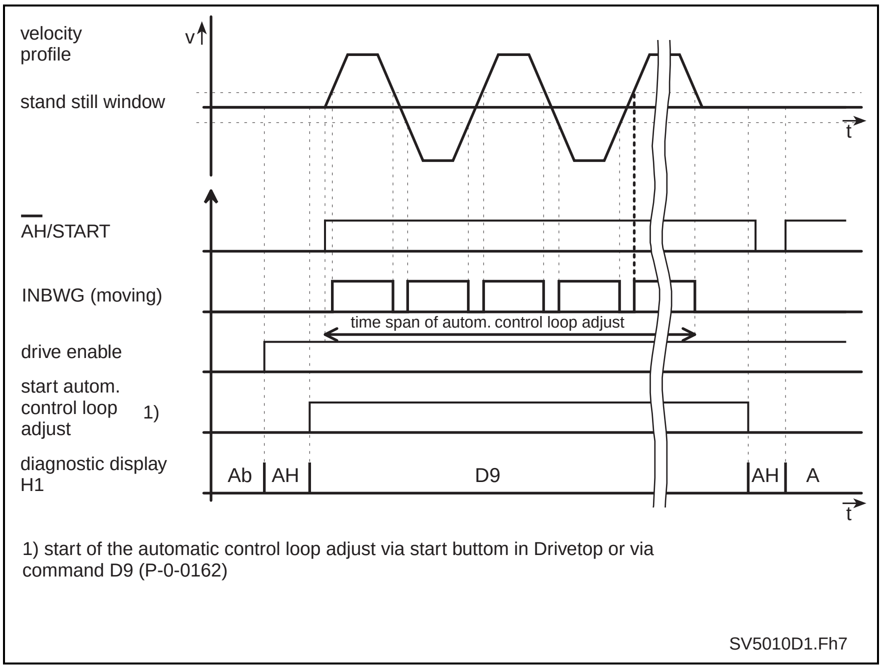


Fig. 9-73: Signal flow chart

Note: When completing the command, the drive always goes to drive halt (AH).

Interrupting the command with AH

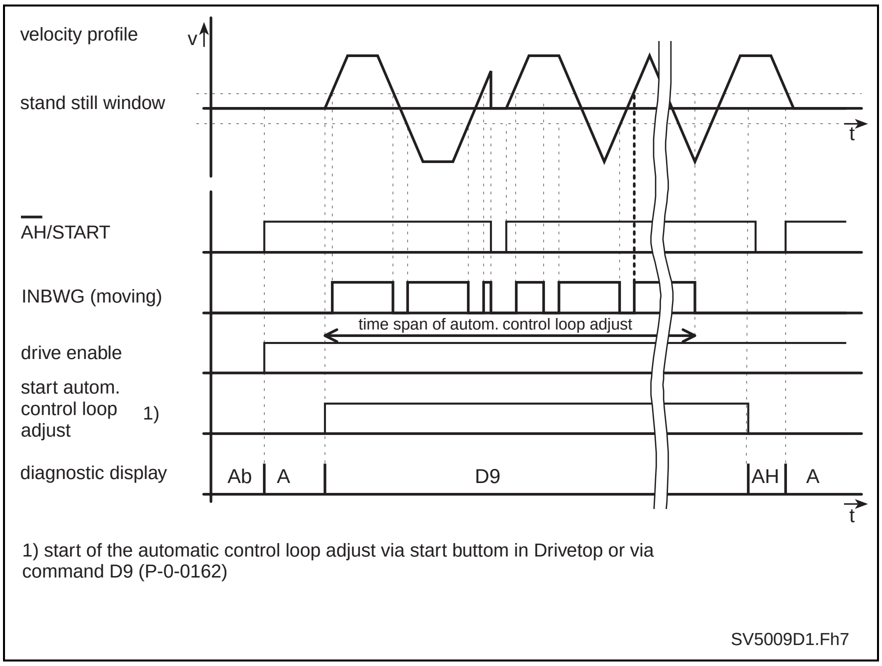


Fig. 9-74: Signal flow chart

Note: A renewed runthrough with altered settings can be conducted in one of the following two ways:
1) drive enable or start signal removed and reapplied (drive start)
2) by ending and restarting command D9

Chronological Sequence for Automatic Control Loop Settings

Steps describe:

1 step: Check for possible command errors at command start.

2 step: Independent **running to center position** between both fixed travel range limits (**P-0-0166** and **P-0-0167**) in position control.

3 step: **Determining the total and extraneous moment of inertia** with corresponding evaluation of accel and decel procedures.

The drive, in this case, moves within the fixed limits (**P-0-0166** and **P-0-0167**).

4 step **Compute** and set **control parameters** in the drive.

This takes parameters **P-0-0163, Damping factor for autom. control loop adjust** and **P-0-0164, Application for autom. control loop adjust** into account.

5 step **Checking the velocity control loop** and, if necessary, correcting the control parameters until the behavior wanted occur (depends on dynamics).

6 step **Checking the position control loop** and correcting the control parameters, if necessary, until the aperiodic behavior occurs in the control loop.

7 step END Wait for possible **new start** or the **end of the command**.

The drive is idle, in this case (velocity = 0) and D9 appears in the display.

Overview (Data flow chart)

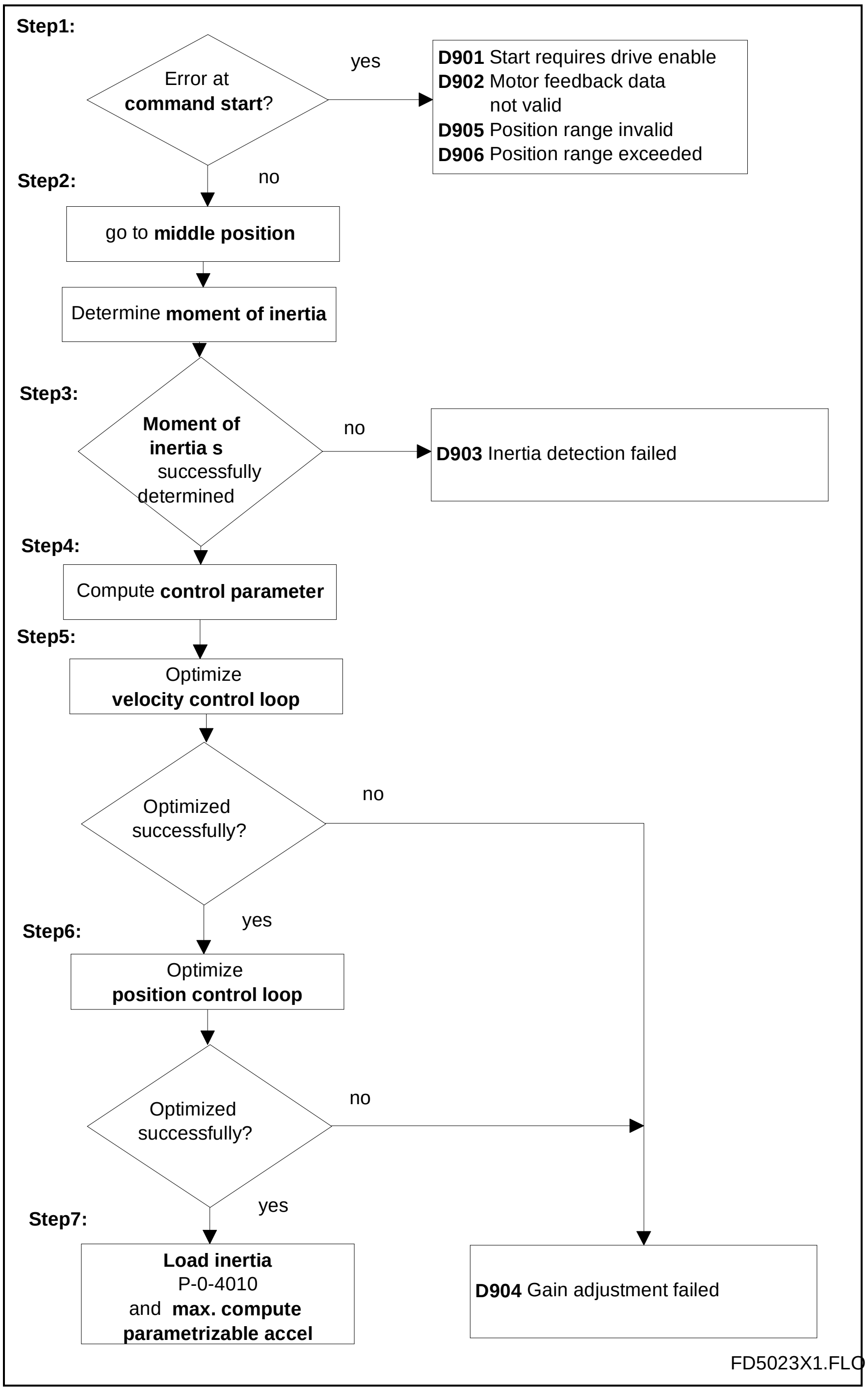


Fig. 9-75: Data flow chart atomatic control loop settings

The Results of the Automatic Control Loop Setting

Note: The **Current control loop** is **not effected** by the automatic control loop settings as this setting is load-independent and optimum current control loop settings are stored in the default values at the **factory.**

As a result of the automatic control loop settings the following can be obtained:

- stable settings for **velocity control loop**
- stable settings for **position control loop**

- variables for the **load moment of inertia** reduced to the motor
- **maximum** achievable **positioning acceleration**

P-0-4010, Load inertia

The load moment of inertia determined with automatic control loop settings is stored in this parameter. It can thus be read but not write accessed.

P-0-0168, Maximum acceleration

The maximum drive acceleration determined with automatic control loop settings is stored in this parameter.

9.8 Drive Halt

The drive halt function is used to bring an axis to a standstill with defined accel and defined jerk.

The function is activated:

- by clearing the drive halt bit (bit 13 in the master control word of command communication SERCOS, Profibus) or setting the drive halt input to zero

or

- by interrupting a drive control command (e.g., drive-guided referencing).

The following parameters are used for this purpose:

- **S-0-0138, Bipolar acceleration limit value**
- **S-0-0349, Jerk limit bipolar**
- **P-0-1201, Ramp 1 pitch**
- **P-0-1202, Final speed of ramp 1**
- **P-0-1203, Ramp 2 pitch**

The Functional Principle of Drive Halt

If the drive halt function is activated, then the drive does not follow the command values of the active mode but itself brings the drive to a halt while maintaining the parametrized accel. The manner in which the standstill takes place depends on the previously activate operating mode.

The following relationship applies:

- The standstill is in position control with the use of the previously active limit accel and limit jerk, if a mode with drive-internal position command generation was active. Operating modes with drive-internal position command generation are drive-internal interpolation, relative drive-internal interpolation, positioning block mode and jog mode.
- Standstill takes place in position control with the use of accel in **S-0-0138, Bipolar acceleration limit value** an the jerk in **S-0-0349, Jerk limit bipolar**, if previously a position-control mode without drive-internal position command generation was active. Operating modes without drive-internal position command generation are position control, angle synchronization, step motor mode, and so on.
- The standstill takes place in velocity control and uses parameter **P-0-1201, Ramp 1 pitch**, **P-0-1202, Final speed of ramp 1** and **P-0-1203, Ramp 2 pitch,** if modes velocity control or torque control were previously active.

In all cases, the SS display reads **AH**, the diagnosis in S-0-0095 reads **A010 Drive HALT**.

If the actual velocity falls below the value of the parameter **S-0-0124, Standstill window**, the bit "Drive Halt"will be set in **S-0-0182, Manufacturer class 3 diagnostics**.

If bit 13 in the master control word is reset to 1, the selected operation mode will be reactivated.

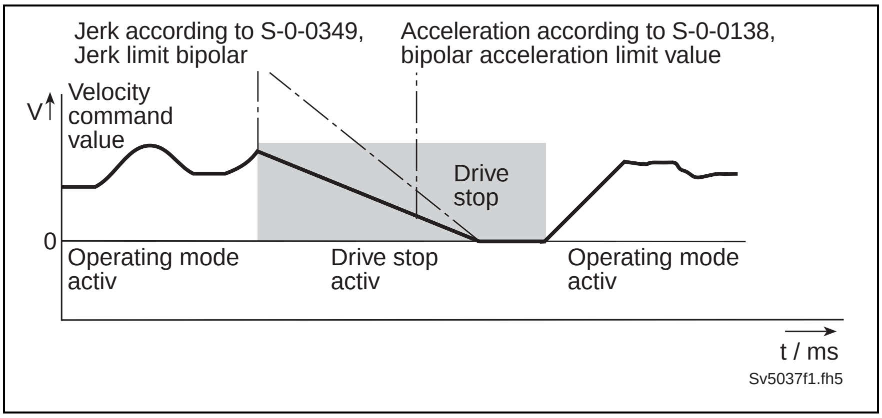


Fig. 9-76: Drive Halt Diagram

The position-controlled deceleration is done with lag, if the previous operating mode was with a lag. In the other case, this feature proceeds without lagless control.

Connecting the drive halt input

If command communication does not use a fieldbus, e.g., SERCOS interface or Profibus, the hardware controls the drive halt function.

For more information on this see the Project Planning Manual, sec.: Drive halt and drive enable.

9.9 Drive-Controlled Homing

The position feedback value of the measuring system to be referenced forms a coordinate system referencing the machine axis. This system does not comply with the machine coordinate system after the drive has been initialized, as long as no absolute encoders are used.

Command **S-0-0148, C600 Drive controlled homing procedure command** thus supports

- in non-absolute measuring systems, establishing agreement between drive (measuring system) and the machine coordinate system;
- in absolute measuring systems, the drive-controlled running to the reference point

Drive-controlled homing means that the drive independently creates the necessary motion, which corresponds to the homing velocity settings and homing acceleration settings.

This feature can be executed for either the motor encoder or the optional encoder.

To run this feature, use the following parameters:

- **S-0-0148, C600 Drive controlled homing procedure command**
- **S-0-0147, Homing parameter**
- **S-0-0298, Reference cam shift**
- **S-0-0299, Home switch offset**
- **S-0-0052, Reference distance 1**
- **S-0-0054, Reference distance 2**
- **S-0-0150, Reference offset 1**
- **S-0-0151, Reference offset 2**
- **S-0-0041, Homing velocity**
- **S-0-0042, Homing acceleration**
- **P-0-0153, Optimal distance home switch - reference mark**
- **S-0-0177, Absolute distance 1**
- **S-0-0178, Absolute distance 2**
- **S-0-0165, Distance coded reference offset 1**
- **S-0-0166, Distance coded reference offset 2**

The following parameters

- **S-0-0108, Feedrate override**
- **S-0-0057, Position window**
- **S-0-0349, Jerk limit bipolar**
- **S-0-0403, Position feedback value status**

also can be used.

Setting the referencing parameters

The basic sequence is dependent on how parameter **S-0-0147, Homing parameter** has been parametrized.

The following settings are performed:

- referencing direction positive/negative
- referencing with motor or optional encoder
- evaluation of the home switch yes/no
- evauation of the marker yes/no
- go to reference point yes/no

The parameter is structured as follows:

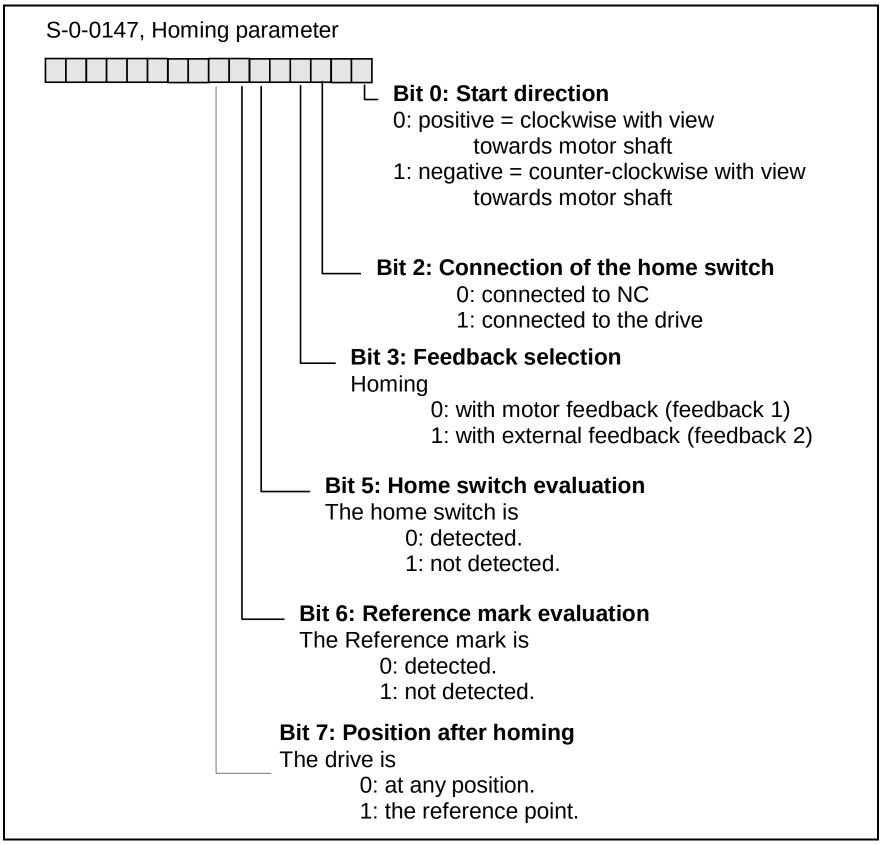


Fig. 9-77: Structure of parameter S-0-0147, Homing parameter

The sequence also depends on the type and arrangement of the reference markers in terms of the referenced encoder. For distance-coded reference marks (type 4), the reference switch is not evaluated, even if this is selected in S-0-0147.

Overview of the Type and Allocation of Reference Marks of Non-Absolute Measuring Systems

For better a understanding, you can divide the measurement systems into 4 groups according to the type and configuration of their reference marks.

- **Type 1**: Measurement systems with absolute singleturn range, such as the Singleturn DSF or Resolver. These measurement systems have an absolute range of one encoder revolution or fractions of it (resolver). Typical systems are the encoders for the MHD, MKD and MKE motors and the GDS measurement system.
- **Type 2**: Incremental rotational measurement systems with a reference mark for each encoder rotation, such as the ROD or RON types from the Heidenhain Company.
- **Type 3**: Incremental translation measurement systems with one or several reference marks, such as the LS linear scaling of the Heidenhain Company.
- **Type 4**: Incremental measurement systems with distance coded reference marks, such as the LSxxxC linear scaling of the Heidenhain Company.

The drive-internal detection for the configuration of the reference marks is done with the settings of the corresponding position encoder type parameter **S-0-0277, Position feedback 1 type** (for motor encoder) or **S-0-0115, Position feedback 2 type** (for optional encoder).

In these parameters, you set with bit 0 whether it’s a rotary or a linear measurement system, and bit 1 decides whether the measurement system has distance-coded reference markers.

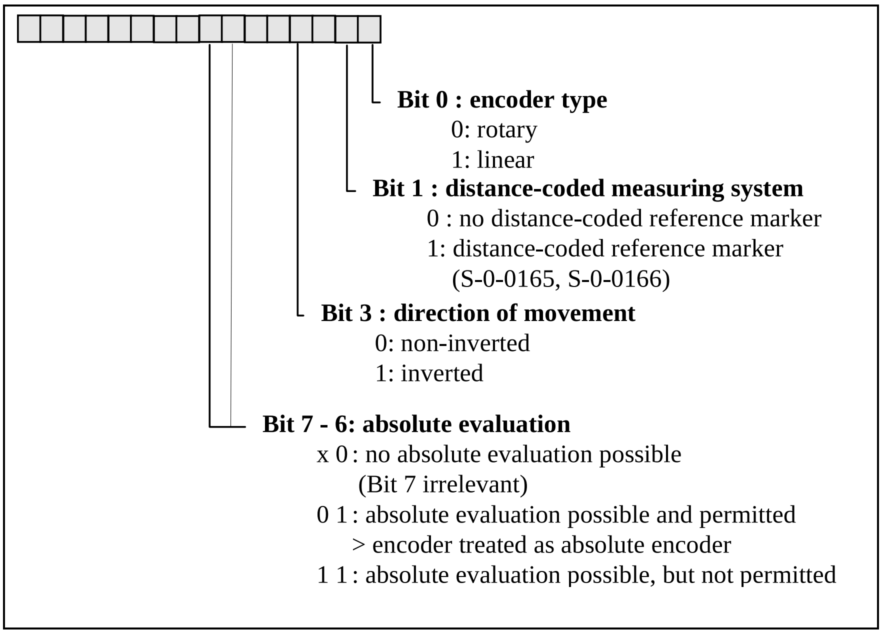


Fig. 9-78: Structure of the position feedback type parameters S-0-0115 / S-0-0277

For measurement systems with their own data memory (Type 1), this setting is done automatically.

See also chapter: "Setting the Measurement System"

Functional Principle of Drive-Controlled Referencing in Non-Absolute Measuring Systems

To establish congruency between drive (measuring system) and machine coordinate system it is necessary that the drive has precise information about its relative position within the machine coordinate system. The drive receives this information by detecting the home switch edge and/or the reference mark.

Note: To evaluate only the home switch is not recommended as the position of the home switch edge has a lesser precision compared to the detection of the reference mark!

Coordinate system compensation is achieved by comparing the desired feedback position at a specific point within the machine coordinate system with the actual feedback position ("old" drive coordinate system). A differentiation in this case is made between "Evaluation of a reference mark/home switch edge" (type 1 .. 3) and "Evaluation of distance-coded reference marks".

- With "Evaluation of a reference mark/home switch edge" the "specific" point within the coordinate system is the so-called reference point. The desired feedback position is set at this point via parameter **S-0-0052, Reference distance 1** (for motor encoders) or **S-0-0054, Reference distance 2** (for optional encoders). The physical position of the reference point derives from the position of the reference marker plus the value in **S-0-0150, Reference offset 1** or **S-0-0151, Reference offset 2**. Once the reference marker is detected, the drive knows the position of this marker and therefore also that of the reference point in the "old" drive coordinate system. The desired position is in parameter S-0-0052/ S-0-0054.
- With "Evaluation of distance-coded reference marks" the "specific" point is the zero point (position of the first reference mark) of the distance-coded measuring system. By detecting the position difference between two adjacent reference marks the position of the first reference marker in the "old" drive coordinate system can be determined. The desired feedback position at this point is defined by the position of the first reference mark in the machine coordinate system at this point plus the value in **S-0-0177, Absolute distance 1** (for motor encoders) or **S-0-0178, Absolute distance 2** (for optional encoders).

In both cases, the difference between both coordinate systems is added to the "old" drive coordinate system. The coordinate systems will then comply.

By switching the position command and feedback value, **S-0-0403, Position feedback value status** is set to 1. This means that the feedback position value now refers to the machine zero point.

Note: If the drive, once the reference command has been conducted, is in parameter mode again, then parameter **S-0-0403, Position feedback value status** is set to 0, because the feedback values in command **S-0-0128, C200 Communication phase 4 transition check** are re-initialized.

Functional Principle of Drive-Guided Referencing with Absolute Measuring Systems

If the referenced measuring systems (per bit 3 of S-0-0147) is to be evaluated as an absolute measuring system, i.e., in the relevant encoder type parameter (S-0-0277/S-0-0115) bit 6 is at "1“ and bit 7 on "0“, then command **S-0-0148, C600 Drive controlled homing procedure command** supports two different purposes**:**

- drive-guided traveling to the reference point
- resolution of the actual position value if absolute measurement is conducted with drive enable applied.

Drive-guided traveling to reference point

If the absolute encoder is referenced, i.e., parameter **S-0-0403, Position feedback value status** is set to "1", then the drive, after start of command **S-0-0148, C600 Drive controlled homing procedure command** itself runs to the reference point if "1" is set in bit 7 of parameter **S-0-0147, Homing parameter** for "Drive on reference point after drive-guided referencing". The reference point is defined in parameters **S-0-0052, Reference distance 1** or **S-0-0054, Reference distance 2**.

Triggering actual position value switch with absolute dimension set

If command **P-0-0012, C300 Command 'Set absolute measurement'** is conducted with drive enable applied, then the actual switching by the drive of the actual position value register (S-0-0051, **Position feedback 1 value** or S-0-0053, **Position feedback 2 value**) is not conducted until

- command **S-0-0148, C600 Drive controlled homing procedure command** is also conducted after the start of P-0-0012 or
- drive enable is switched off.

(See section: "Set Absolute Measuring"

Sequence control "Drive-Controlled Homing"

The command profile depends on the parameters

- **S-0-0041, Homing velocity,**
- **S-0-0108, Feedrate override and**
- **S-0-0042, Homing acceleration.**

To limit the acceleration changes, you can additionally activate a jerk limit. You can do this by entering the parameter **S-0-0349, Jerk limit bipolar**.

The following diagram explains this:

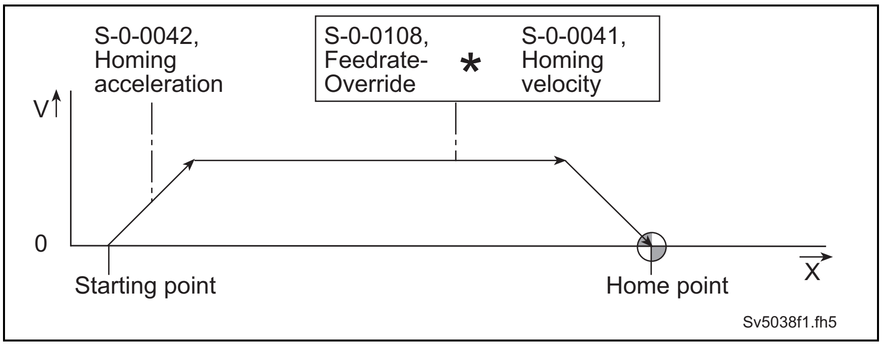


Fig. 9-79: Position command profile with homing velocity and homing acceleration

The maximum velocity is influenced, like with all drive-controlled functions, by the feedrate. The effective maximum velocity is the result of the product of **S-0-0041, Homing velocity** and **S-0-0108, Feedrate override**.

If the parameter **S-0-0108, Feedrate override** has been set to zero, the warning **E255 Feedrate-override S-0-0108 = 0** will be displayed.

The motional process during drive-controlled homing of non-absolute encoders can be made up of up to three processes:

- If the home switch evaluation process has been activated and there are no distance-coded reference markers, then the drive accelerates to the homing velocity in the selected homing direction until the positive home switch edge is detected. If the drive is already on the home switch at the start of drive-controlled referencing (**S-0-0400, Home switch** = 1), the drive at first accelerates in the opposite direction until the negative home switch edge is detected, and then reverses the direction.

WARNING

⇒ Make sure that the home switch edge is within the reachable travel range.

- If real reference markers are available (type 2 to 4, see above), and if the reference marker evaluation is activated, then the drive runs in homing direction until it detects a reference marker. In distance-coded measuring systems (type 4), two sequential reference markers must be passed. The reference markers are always evaluated there (independent of bit 6 in S-0-0147).
- The further action depends on how bit 7 has been set in **S-0-0147, Homing parameter**. If 0 is programmed there ("any position after homing"), then the drive brakes with the programmed homing acceleration up to standstill. If the value of the velocity feedback is less than the value set in **S-0-0124, Standstill window**, then the coordinate system of the referenced encoder is set, and the command is signalled as completed. If a 1 is set in bit 7, ("Drive travels to reference point“), then the drive positions to the reference point. The reference point in encoders of the types 1 to 3 is defined by the position of the reference mark plus the relevant reference offset (S-0-0150 / S-0-0151). In the case of distance-coded reference markers, the drive runs to the second detected mark. The coordinate system switch and the completion message of the command are generated as soon as the drive-internal position command has reached the target value and the difference between feedback and target value is less than the value set in **S-0-0057, Position window.**

The following illustrates the sequence for "Drive goes to reference point"

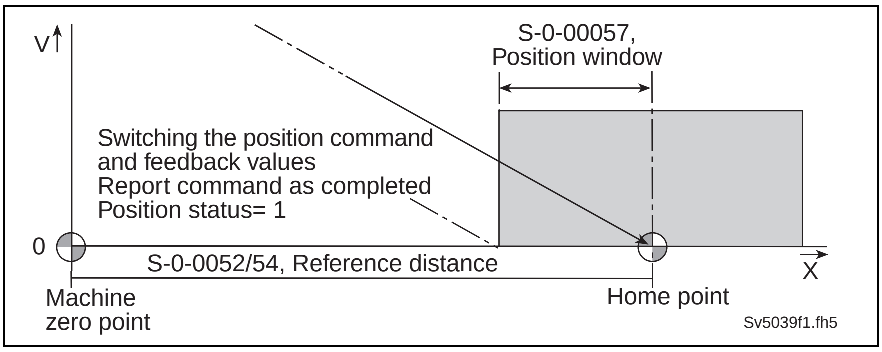


Fig. 9-80: Switching of position command and actual feedback values

Actual Feedback Values After the "Drive-Controlled Homing" Command

The position feedback values from the motor and optional encoders, after the drive-controlled homing command is processed, depend on bit 3 in **S-0-0147, Homing parameter** and on the availability of an absolute encoder as a motor or optional encoder.

Motor encoder:	Ext. encoder:	S-0-0147 Bit 3:	Actual feedback value 1:	Actual feedback value 2:
absolute	not absolute	1	unchanged	reference distance 2
not absolute	absolute	0	reference distance 1	unchanged
not absolute	not absolute	0	reference distance 1	reference distance 1
not absolute	not absolute	1	reference distance 2	reference distance 2

Fig. 9-81: Position feedback values after the drive-controlled homing command

Commissioning with "Evaluation of reference marker/home switch edge"

If the encoder does not have distance-coded reference marks (type 1 to 3), then select in **S-0-0147, Homing parameter** whether

- home switch evaluation is desired or not and/or
- reference mark evaluation is desired.

Additionally,

- in which direction the drive should move with the start of the command "Drive-controlled homing" as well as whether
- the drive should go to the reference point or not.

If a home switch evaluation becomes necessary, then the necessary settings must first be made (see "Evaluation of the Home Switch". All additional steps can then be conducted as follows:

⇒ Check the relevant position encoder type parameter (S-0-0277 / S-0-0115) to make sure it has been correctly set.

⇒ Parametrize **S-0-0052, Reference distance 1** or **S-0-0054, Reference distance 2** as well as parameter **S-0-0150, Reference offset 1** or **S-0-0151, Reference offset 2** with 0.

⇒ Set parameters **S-0-0041, Homing velocity** and **S-0-0042, Homing acceleration** to small values (e.g., S-0-0041 = 10 Rpm, S-0-0042 = 10 rad/s².

⇒ Conduct the drive-controlled homing command.

Note: If the command is cleared, then the original operating mode becomes active. If **drive-internal interpolation** is set, then the drive immediately runs to the value set in **S-0-0258, Target position**. This value relates to the new (machine zero point) coordinate system!

The command should be completed without error. The machine zero point is at the position of the home switch or the referencing point as the reference distances (S-0-0052/54) have been parametrized with 0. The position feedback value in **S-0-0051, Position feedback 1 value** or **S-0-0053, Position feedback 2 value** should now have absolute reference to this preliminary machine zero point.

To set the correct machine zero point, you can now conduct the following steps:

⇒ Run the axis to the desired machine zero point and set the feedback position value displayed there with opposite sign in **S-0-0052, Reference distance 1** or **S-0-0054, Reference distance 2.**

Or:

⇒ Run the axis to position feedback value = 0, measure the distance between the current position and the desired machine zero point. Enter the distance in **S-0-0052, Reference distance 1** or **S-0-0054, Reference distance 2.**

Once the drive-controlled reference command is again completed, the position feedback value should refer to the desired machine zero point.

The reference point can be shifted relatively to the reference mark (see "Consideration of the reference offset").

Parameter **S-0-0041, Homing velocity** and **S-0-0042, Homing acceleration** can now be set to their final values.

Consideration of the Reference Offset

If the evaluation of the reference mark is activated in the homing parameter, then the reference point is always set on the position of the selected reference mark. If a measurement system of type 1..3 is present (not distance-coded), you can shift the position of the reference point relatively to the reference marker. Doing so, you can select any position after homing.

The offset is set with the parameters

- **Reference Offset 1** (for motor encoder)
- **Reference Offset 2** (for optional encoder)

If the reference offset is positive, then its drive-internal direction is positive (see "Command Polarities and Actual Value Polarities". In other words, the reference point is moved in terms of the reference mark in a clockwise direction when looking towards the motor shaft. If the homing direction is also positive, then the drive does not reverse the direction after passing the reference marker.

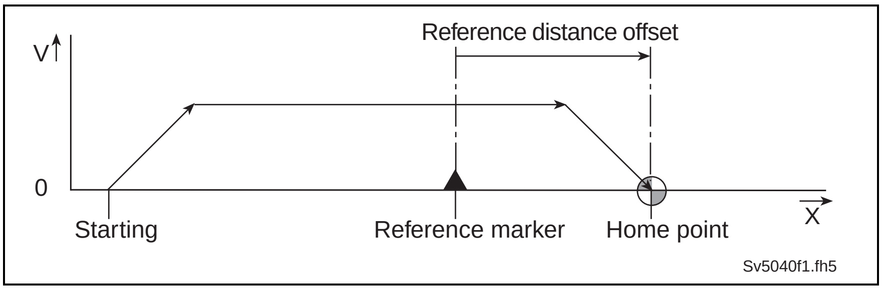


Fig. 9-82: Command value profile for positive reference offset and positive homing direction

If the reference direction is negative, then the drive can reverse the direction (with types 2 and 3) after passing the reference marker.

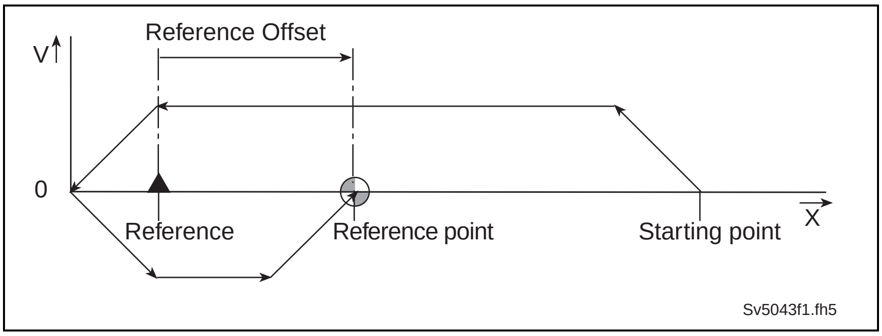


Fig. 9-83: Command profile for positive reference offset and negative homing direction

If the reference offset is negative, then its drive-internal direction is negative (see chapter: "Command Polarities and Actual Value Polarities". In other words, the reference point is shifted counterclockwise looking towards the motor shaft. If the reference direction is negative, then the drive does not reverse the travel direction once it has passed the reference marker.

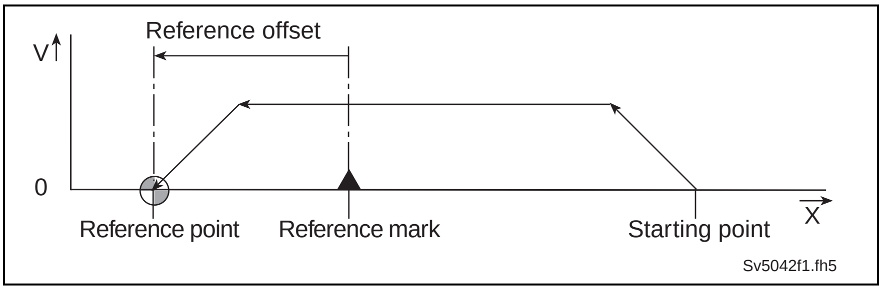


Fig. 9-84: Command profile with negative reference offset and negative homing direction

If the referencing direction is positive, then the drive can reverse the travel direction (with types 2 and 3) after passing the reference marker.

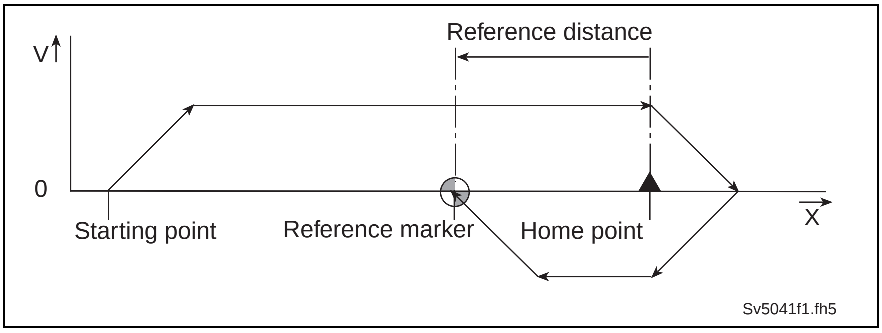


Fig. 9-85: Command profile with negative reference offset and positive homing direction

Evaluation of the Home Switch

A home switch can label a specific marker, if the configuration of several reference marks for the homing is ambiguous. If the home switch is evaluated (bit 5 in S-0-0147 = 0), then that reference mark will be evaluated, which follows the positive edge of the home switch (if the drive is moving towards the homing point).

The home switch input is pictured in parameter **S-0-0400, Home switch**.

Example: Homing of a motor encoder with 1 reference mark per revolution

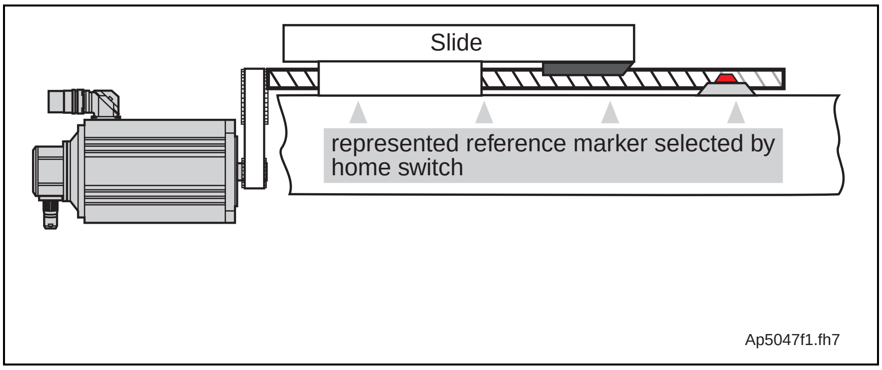


Fig. 9-86: Selection of a reference mark depending on the homing direction

If home switch evaluation is activated, the drive searches at first for the positive edge of the home switch. If the home switch is not actuated at the beginning of the command, the drive moves in the preset homing direction.

The homing direction must be set so that the positive edge can be found.

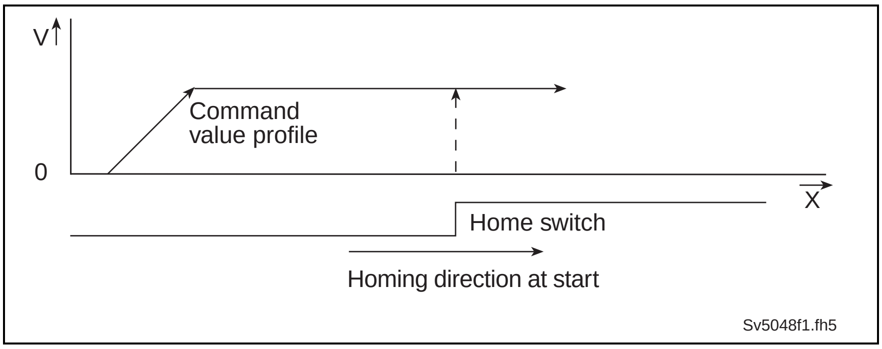


Fig. 9-87: Correct setting of homing direction

WARNING

If the homing direction setting is incorrect, the drive command value moves away from the positive home switch edge. In this case the danger exists that the drive reaches the travel range limits. This may result in damage to the system!

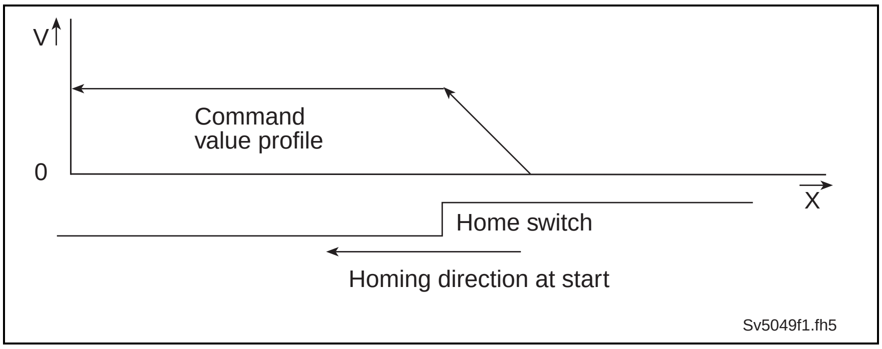


Fig. 9-88: Incorrectly set homing direction

Command value profile with actuated home switch at the start of the command

If the home switch is actuated already when the command is started, the drive generates command values in the opposite direction to move away from the home switch. As soon as a 1-0 edge from the home switch is detected, the drive reverses its direction and continues as if started outside the home switch range.

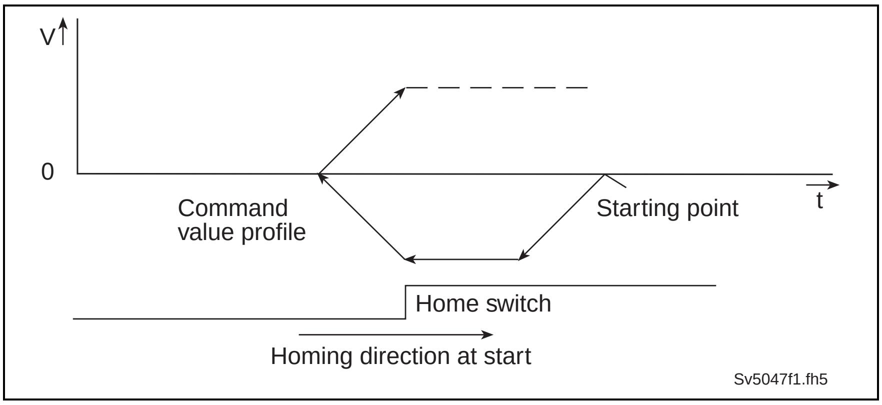


Fig. 9-89: Command profile with start position on the home switch

Monitoring the Distance Between Home switch and Homing Mark

If the distance becomes too small between the home switch edge and the reference mark, then it is possible that the home switch edge will only be detected after the reference mark has already passed. This leads to a detection of the following reference mark, and the reference mark detection becomes ambiguous.

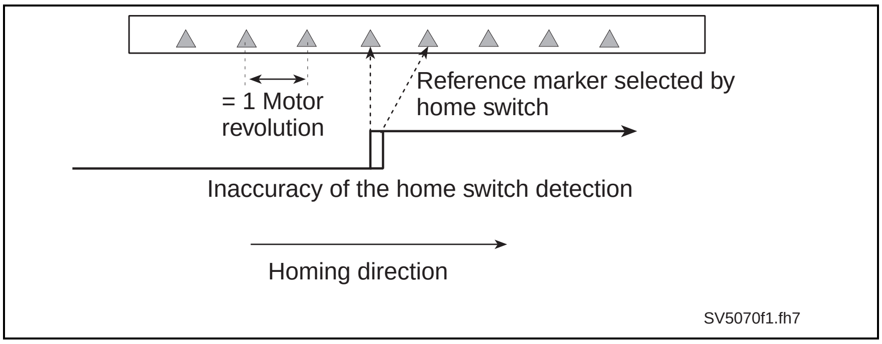


Fig. 9-90: Ambiguous detection of reference markers at small distances between home switch edge and reference mark

The distance between the home switch edge and the reference mark is monitored for this reason.

If the distance between the home switch edge and the reference mark becomes smaller than a certain value, the command error **C602 Distance home switch - reference mark erroneous** will be generated.

The Critical Range for the distance is:

0.25 • Distance between reference markers

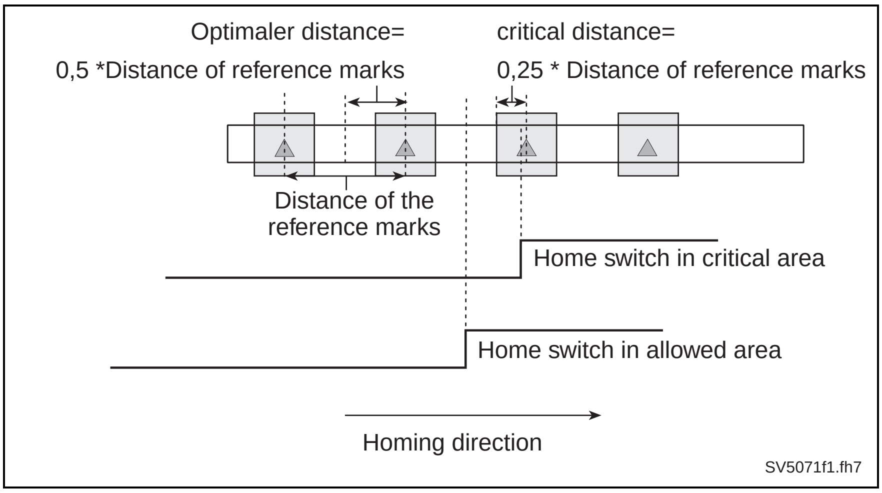


Fig. 9-91: Critical and optimal distance between home switch and reference mark

The optimal distance between the home switch edge and the reference marker is:

0.5 • Distance between reference markers

To monitor the distance between the home switch and the reference mark, the optimal distance is entered in **P-0-0153, Optimal distance home switch - reference mark**.

The following requirements apply:

Encoder type	P-0-0153, Optimal distance home switch - reference mark	Function
Rotary	0	The distance home switch - reference mark will be monitored. The optimal spacing will be calculated internally and amounts to a 1/2 encoder rotation for DSF or incrementally rotational encoders, or 1/2 encoder revolution / **S-0-0116, Feedback 1 Resolution** for resolvers.
Rotary	x	The distance home switch - reference mark will be monitored. Half the reference mark spacing must be entered in **P-0-0153, Optimal distance home switch - reference mark**.
Linear	0	The distance home switch - reference mark will not be monitored. The linear scale does not affect reference marks with consistent intervals. The real distance between the home switch and the reference mark must be big enough to achieve a sure recognition of the home switch edge when considering the maximum homing velocity and the cycle time for the home switch input polling.
Linear	x	The distance home switch - reference mark will be monitored. Half the reference mark spacing must be entered in **P-0-0153, Optimal distance home switch - reference mark**.

Fig. 9-92: Monitoring the distance Home switch-Reference Mark

For every homing with home switch evaluation, the difference between actual distance and optimal distance is monitored. The difference is saved in parameter **S-0-0298, Reference cam shift**. The home switch edge can be shifted mechanically for this value.

To avoid a mechanical shifting of the home switch edge, you can set this procedure in the software with the parameter **S-0-0299, Home switch offset**. The value in parameter **S-0-0298, Reference cam shift** is transferred to parameter **S-0-0299, Home switch offset**.

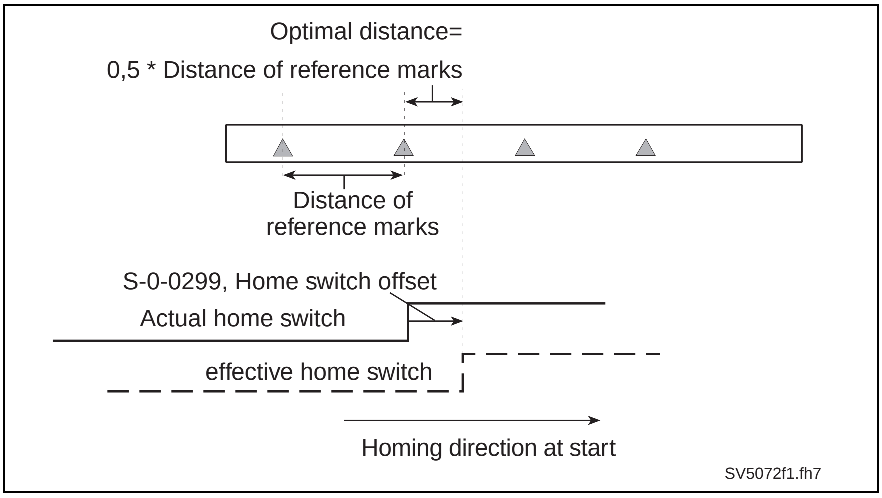


Fig. 9-93: Operation of parameter S-0-0299, Home Switch Offset

The parameter **S-0-0299, Home switch offset** can be set as follows:

- Running the homing command with **S-0-0299, Home switch offset** = 0.
- If the distance is not in the range between 0.5..1.5 * **P-0-0153, Optimal distance home switch - reference mark,** the error message **C602 Distance home switch - reference mark erroneous** will be generated. In this case, you have to enter the value **S-0-0298, Reference cam shift** into **S-0-0299, Home switch offset**.
- Check: You should see a 0 displayed in **S-0-0298, Reference cam shift** when homing is restarted.

Commissioning with "Evaluation of distance-coded reference marker"

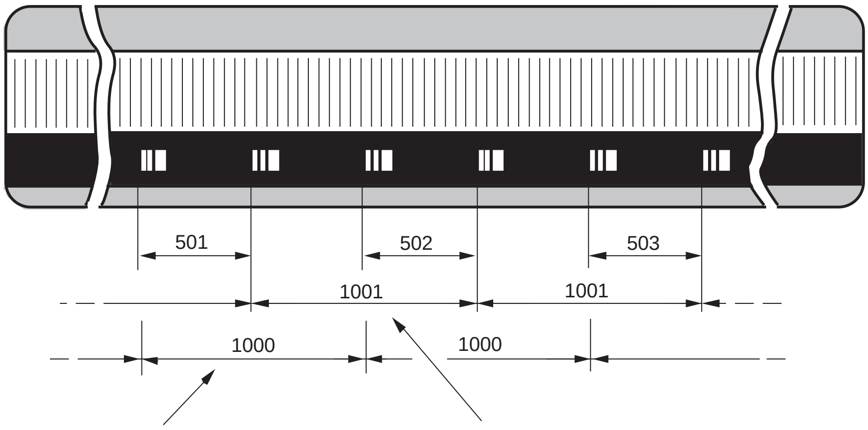
If the encoder has distance-coded reference markers (type 4), then set in **S-0-0147, Homing parameter**

- whether the home switch should be evaluated and/or
- in which direction the drive should move at the start of the command "Drive-controlled homing" ,
- whether the drive should to move to the second passed reference mark or not.

In the parameters

- **S-0-0165, Distance coded reference offset 1** and
- **S-0-0166, Distance coded reference offset 2**

the greater and smaller distance of the reference mark must be entered. These values can be retrieved from the encoder specification.



„Distance-coded reference dimension 2“
(smaller value) SERCOS-ID No.:S-0-0166;
Input unit: pitch

The manufacturer of the length measuring system indicates:
distance travelled up to the absolute position value: 20 mm
pitch unit: 20 µm (0-02 mm)

20 mm: 0.02 mm = 1000 pitch units

This value (1000 pitch units) is to be entered in parameter ID No. S-0-0166.

„Distance-coded reference dimension 1“
(larger value) SERCOS ID No. S-0-0165.
Input unit: pitch unit

For Heidenhein length measuring system the larger value is the product of:
(distance travelled + pitch unit):
pitch unit, therefore:
20.02 mm: 0.02 mm = 1001 pitch units

This value (1001 pitch units) is to be entered in parameter ID No. S-0-0165.

Setting up of distance-coded Heidenhain length measuring systems (taken from: Catalog for NC length measuring systems, September 1993):				
Length measuring system Type	Distance travelled: in mm	Pitch unit: in µm	Input in: ID No.: S-0-0166	Input in: ID No.: S-0-0165
LS 403C LS 406C LS 323C LS 623C LS 106C ULS 300C	20	20	1000	1001
LS 103C LS 405C ULS 300C	10	10	1000	1001
LID 311C LID351C	20	10	2000	2001

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Fig. 9-94: Distance-coded measuring system specified with greater and smaller distance

In **S-0-0165, Distance coded reference offset 1** the greater distance is entered, in **S-0-0166, Distance coded reference offset 2** the smaller distance. The unit of these two parameters is (division) periods. Typical vaues for a linear scale with distance-coded reference marks are 20.02 mm for the greater distance and 20.00 mm for the smaller distances with a resolution of 0.02mm. In parameter S-0-0165/166 enter the value 1001 or 1000.

The further steps are outlined below.

⇒Check the relevant position encoder type parameter (S-0-0277/S-0-0115) to the correct setting.

⇒The parameters **S-0-0177, Absolute distance 1** or **S-0-0178, Absolute distance 2** must be parametrized with 0.

⇒The parameters **S-0-0041, Homing velocity** and **S-0-0042, Homing acceleration** must be set to smaller values (e.g., S-0-0041 = 10 rpm, S-0-0042 = 10 rad/s².

⇒Execute command drive-controlled reference

Note:	If the command is cleared, then the original operating mode becomes active again. If drive-internal interpolation is set, then the drive immediately goes to the value set in **S-0-0258, Target position.** This value relates to the new (machine zero point related) coordinate system!

The command should be completed without error. The machine zero point is at the position of the first reference mark of the distance-coded measuring system as the absolute offset (S-0-0177/0178) was parametrized with 0. The relevant position feedback value in **S-0-0051, Position feedback 1 value** or **S-0-0053, Position feedback 2 value** should now have the absolute reference to this preliminary machine zero point. To set the correct machine zero point, the following steps can be conducted:

⇒ Move the axis to the desired machine zero point and enter the position feedback value displayed there with the opposite qualifying sign in **S-0-0177, Absolute distance 1** or **S-0-0178, Absolute distance 2.**

Or:

⇒ Run the axis to position feedback value = 0 and measure the distance between the current position and the desired machine zero point. Enter the distance in **S-0-0177, Absolute distance 1** or **S-0-0178, Absolute distance 2.**

Once the drive-controlled reference command is again completed, the position feedback value should refer to the desired machine zero point.

Parameters **S-0-0041, Homing velocity** and **S-0-0042, Homing acceleration** can now be set to their final values.

Home switch Evaluation with Distance coded Reference Markers

To evaluate a home switch together with homing of a distance coded measuring system is only for one purpose: staying within the allowed travel range.

Higher security with a home switch

If the home switch is not evaluated, the drive always covers with the selected homing direction the distance which is necessary to capture 2 adjacent marker positions. This distance is

$$s_{\mathrm{Re}\,f\,\max} = (\mathrm{S\text{-}0\text{-}0165} * \mathrm{S\text{-}0\text{-}0116} / 7) + \frac{v^2}{2 \times a}$$

S-0-0165: Distance coded reference offset 1 S-0-0165, Distance coded reference offset 1
v : value in S-0-0041, Homing velocity
a : value in S-0-0042, Homing acceleration

$s_{\mathrm{Re}\,f\,\max}$:	maximum travel distance for homing with distance coded reference markers
S-0-0116:	Feedback 1 Resolution
S-0-0117:	Feedback 2 Resolution

Fig. 9-95: Travel distance for homing with distance coded reference markers

If the drive is closer to the travel limit in homing direction than the necessary travel distance S_{Refmax}, it can leave the allowed travel range and do mechanical damage to the machine. To avoid this,

- make sure that the distance of the axis to the travel limit at start of the command **S-0-0148, C600 Drive controlled homing procedure command** is greater than the max. necessary travel distance S_{Refmax}, or
- evaluate the home switch.

If the home switch is evaluated, the drive automatically starts in the opposite homing direction, if at command start the home switch is actuated (**S-0-0400, Home switch** = 1).

Therefore, the home switch must be mounted in such a way that it covers at least the max. necessary travel distance S_{Refmax} until reaching the travel range limit in the homing direction.

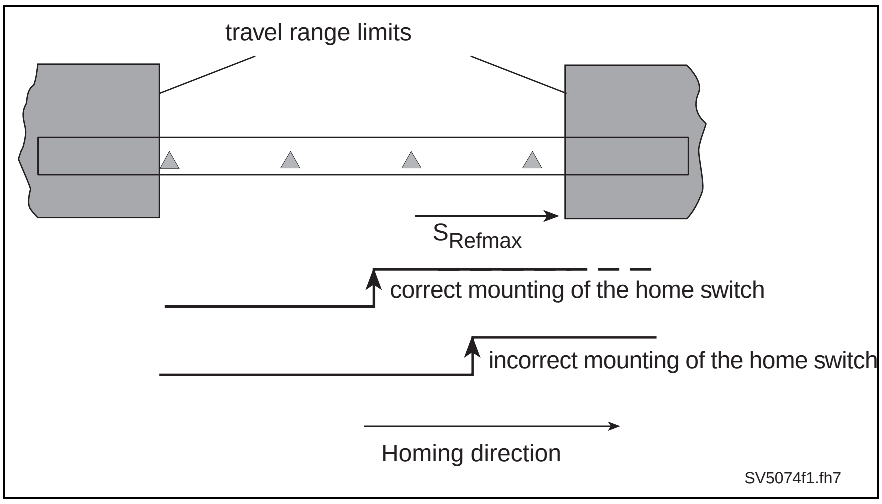


Fig. 9-96: Mounting the home switch with distance coded reference markers

Functions of the Control During "Drive-Controlled Homing"

The control's interpolator must be set to the position command value read from the drive.

During "drive-controlled homing", the drive independently generates its position command values. Preset command values of the control will be ignored. If the command is confirmed by the drive as completed, the position command value corresponding to the machine zero point will be made available in parameter **S-0-0047, Position command value**. This value must be read through the service channel by the control before ending the command, and the control interpolator must be set to this value. If this command is completed by the control and if the command values of the control for the drive become active again, these values should be added to the value read out of the drive.

Starting, interrupting and completing the command "Drive-Controlled Homing"

This feature is implemented as a command.

To start the feature, you must set and execute the Commands by writing to the parameter **S-0-0148, C600 Drive controlled homing procedure command** (Input = 3 = 11bin). The drive confirmation has to be received from the data status out of the same parameter. The command is finished when the command-change bit in the drive status word is set and the confirmation changes from *in process* (7) to *command executed* (3) or to *command error* (0xF).

If the command is interrupted (Input = 1) during processing (when confirmation = 7), the drive responds by activating the drive halt feature. The program continues if the interruption is canceled.

(See also chapter: "Drive Halt"

Possible Error Messages During "Drive-Controlled Homing"

During the execution of the command, the following command errors can occur:

- **C601 Homing only possible with drive enable** While starting the command, the controller enable was not set.
- **C602 Distance home switch - reference mark erroneous** The distance between home switch and reference mark is too small, see Monitoring the Distance Between Home switch and Homing Mark on page 9-85
- **C604 Homing of absolute encoder not possible** The homing encoder is an absolute encoder. The command "Drive-Controlled Homing" was started without first starting the command "Set Absolute Measuring"

Configuration of the Home switch

Note: The home switch should be set up far enough that the "actuated" range covers more than the permissible motion range. Otherwise, the travel range may be overrun at command start if the start position is in an unfavorable position. Damage to the system is possible !

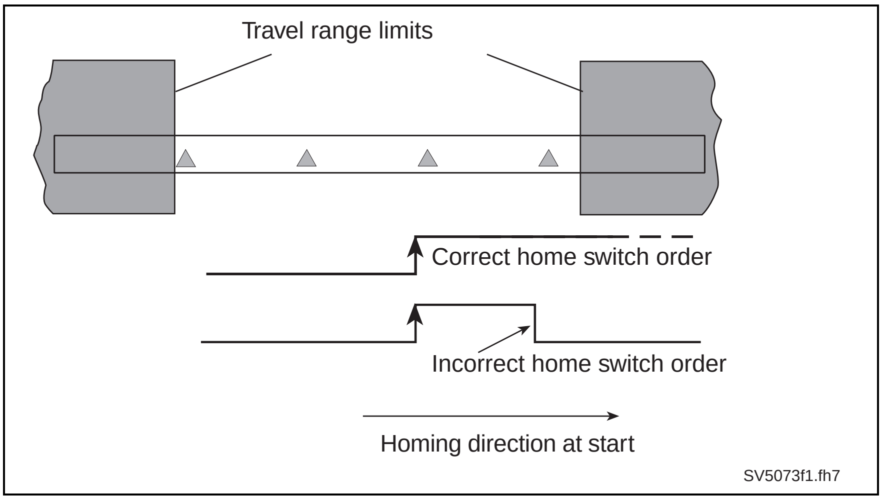


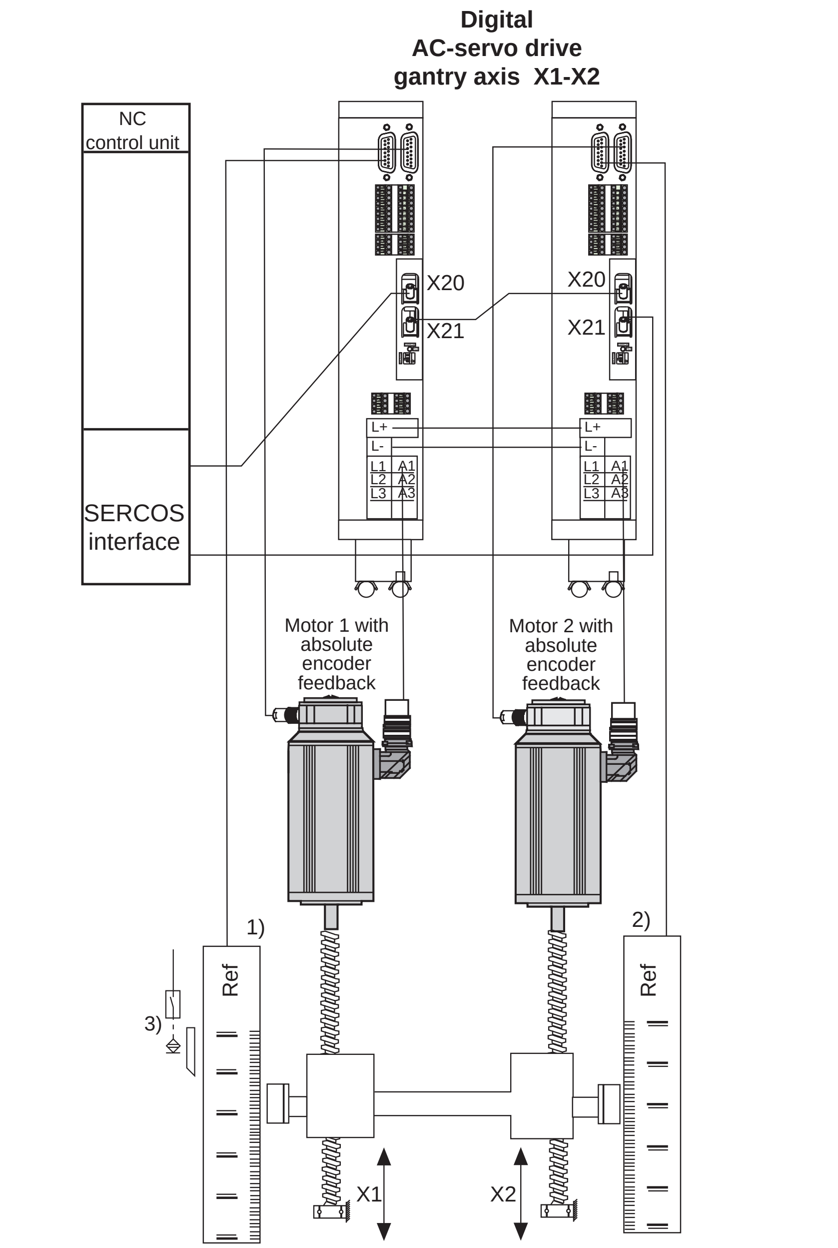
Fig. 9-97: Configuration of the home switch in reference to the travel range

Connection of the Home switch

see project planning manual.

Homing of Gantry axis

Gantries are used to process workpieces with large surfaces. The digital AC servo drive with SERCOS interface is equipped with a "Gantry Axis" function allowing gantries to be traversed without the danger of skewing.



1), 2) Optional direct position measurement using ternal measurement systems for high- precision positioning
3) Evalution of the reverence point switch

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Fig. 9-98:Schematics of a "Gantry" axis with digital intelligent INDRAMAT AC servo drives

"Gantry" axes have an inherent "skewing" problem. This skewing must always be tolerated by the mechanical structure of the machine in such a way that the machine will never under any circumstances be damaged.

Pre-requisites for operating "Gantry" axes

- Both "Gantry" axes are registered as a single axis in the NC control.
- The axis are identically parametrized.
- The "Gantry" drives are equipped with absolute encoders.
- The guide rails of the gantries (X1; X2) must be parallel.

Setting up "Gantry" axes

Procedure:

I. Align the gantry axis at right angles to the traversing direction. This can be done manually or by jogging the axis.

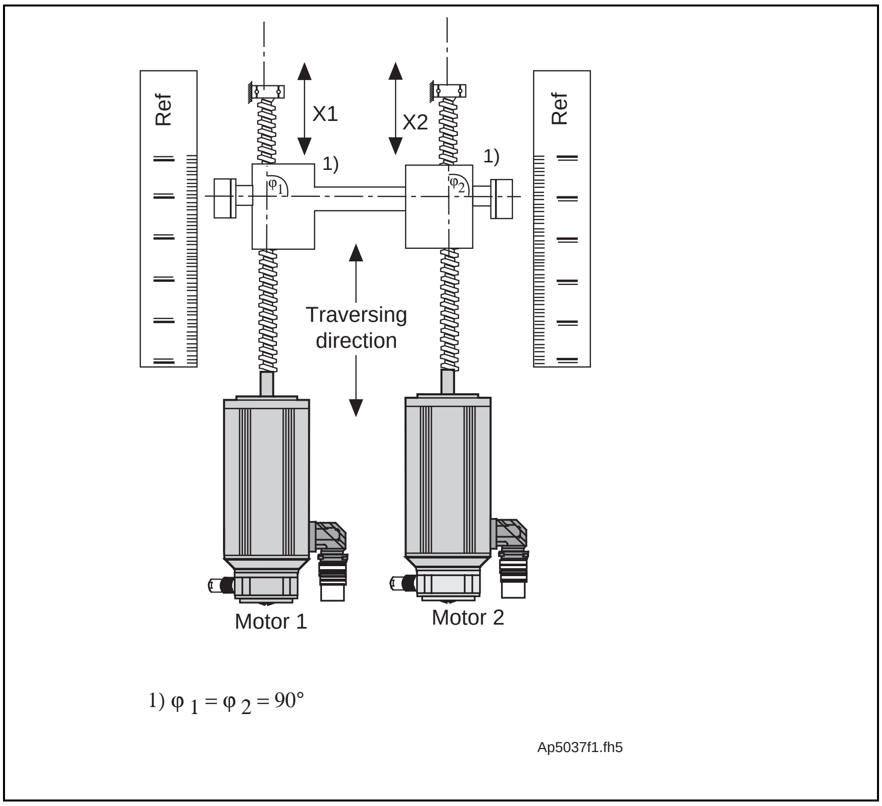


Fig. 9-99: Rectangular aligning of "Gantry" axis

II. Set absolute reference dimension

1. Record the distance from the gantry axis to the machine zero point.
2. Enter distance A to machine zero point in parameter **S-0-0052 Reference distance 1.**
3. Trigger command **P-0-0012 Set absolute Measurement.**
4. Cancel the drive enable signal.
   The value entered in parameter **"Reference distance 1"** is transferred to **S-0-0051 feedback value 1.**
5. Reset the command.

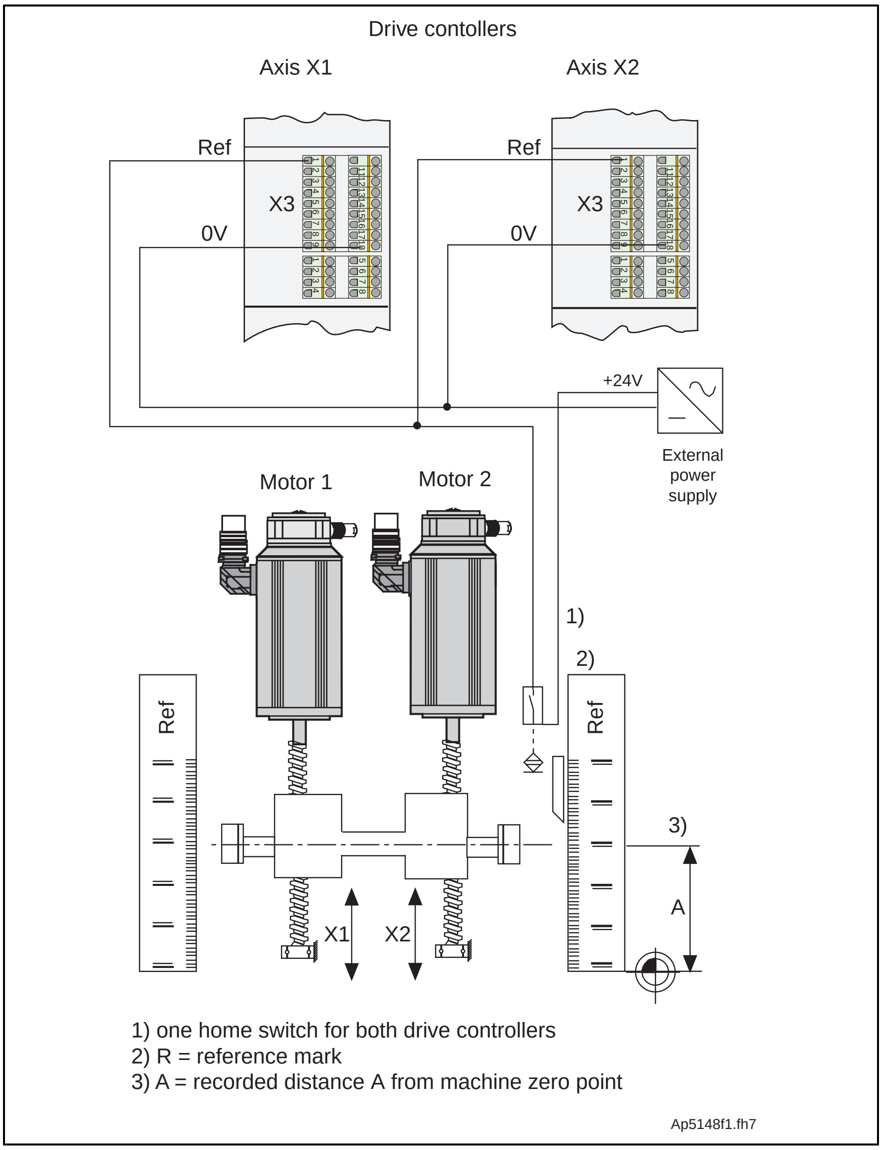


Fig. 9-100:Connecting the home switch to the drive controllers of gantry axis X1/X2

III. Setting the reference distance of the direct position measuring system (if installed).

Procedure:

- Set the homing procedure parameters
  S-0-0041 homing velocity
  S-0-0042 homing acceleration
  S-0-0147 homing parameter
  S-0-0108 feedrate override

  in both axis to the same values. Check the connection of the home switch as illustrated below.
- Check that the home switch works correctly.

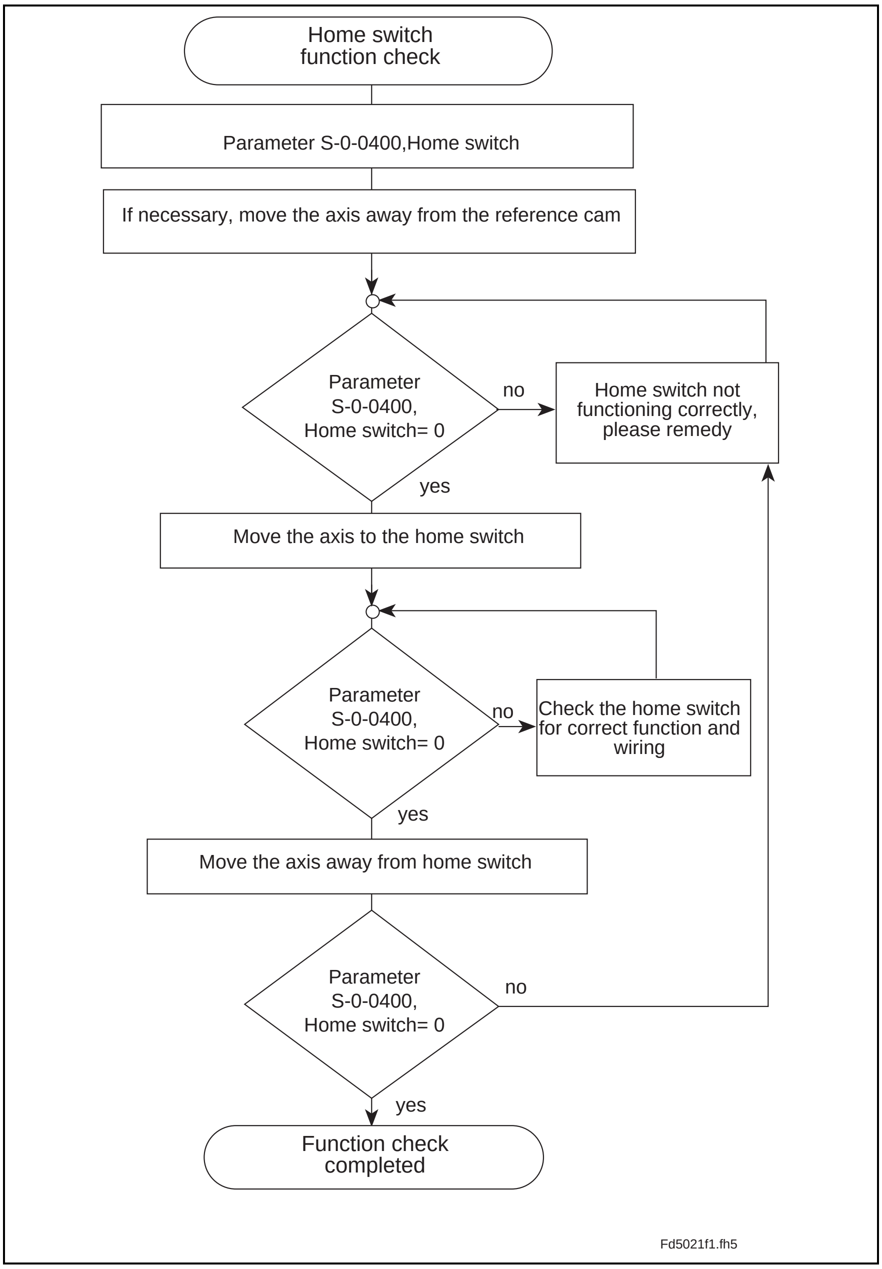


Fig. 9-101:Checking the function of the home switch

- Detecting the reference mark positions of external feedback systems

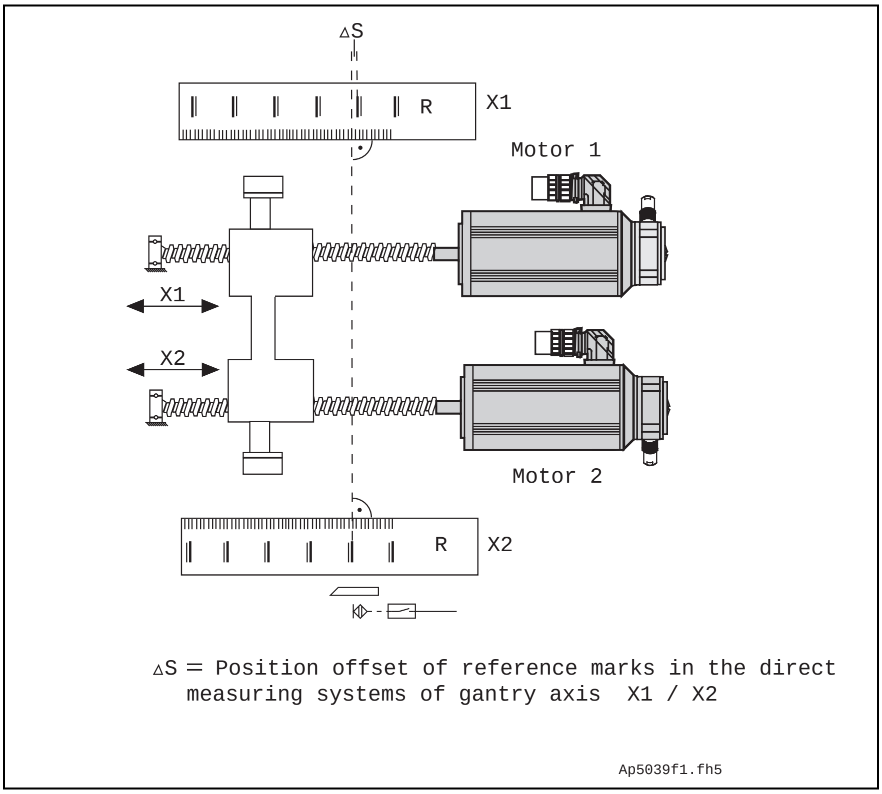


Fig. 9-102: Position offset of reference marks in the direct measuring system of gantry axes X1/X2

Procedure:

1.Trigger command **P-0-0014 Determine marker position** in both axis (see control manual).

2.Move both axis towards the reference marks by forwarding the same position command values through the NC control.

Note	The direction of travel must be the same as that of the subsequent homing cycle. (Bit 0, **S-0-0147 homing parameter**)

On reaching the relevant reference mark of the linear scale, each of the two drives stores the actual position feedback value 2 in the relevant corresponding marker position (**S-0-0173 Marker position A**). Once the reference marks have been acquired, the drive acknowledges the command "Determine marker position". When both gantry axes have acknowledged the command, the NC control must brake the drives to a standstill.

3.Determining the reference mark offset (ΔS):

ΔS = Markerposition axis X1	-	Marker position axis X2
(S-0-0173, Marker position A)		**(S-0-0173 Marker position A)**

- Compute and enter reference offset 2 of each axis.

For the axis whose reference mark occurs first, it applies:

$$\text{S-0-0151, Reference offset 2} \geq \frac{Vref^2}{2 \times a_{ref}} + \Delta S$$

ΔS reference mark spacing
V_{ref} S-0-0041, Homing velocity
a_{ref} S-0-0042, Homing acceleration

Fig. 9-103: Computing S-0-0151, reference offset 2 for the axis whose reference mark occurs first

For the axis whose reference mark occurs last, it applies:

$$\text{S-0-0151, Reference offset 2} \geq \frac{Vref^2}{2 \times a_{ref}}$$

V_{ref} S-0-0041, reference travel velocity
a_{ref} S-0-0042, reference travel acceleration

Fig. 9-104:Computing S-0-0151, reference offset 2 for the axis whose reference marks occurs last

Danger:
A reversal of direction of travel of one of the two drives may lead to accidents. This will happen when the values entered in Reference Offset 2 are lower than the computed ones.

The polarity of parameter S-0-0151 reference offset 2 must be selected so that the reference point shifts in the direction of the reference travel. That means, with negative homing direction in one or both axis, also the reference offset must be input with neg. sign. This avoids a direction reversal after passing the reference mark

(See "Consideration of the Reference Offset"

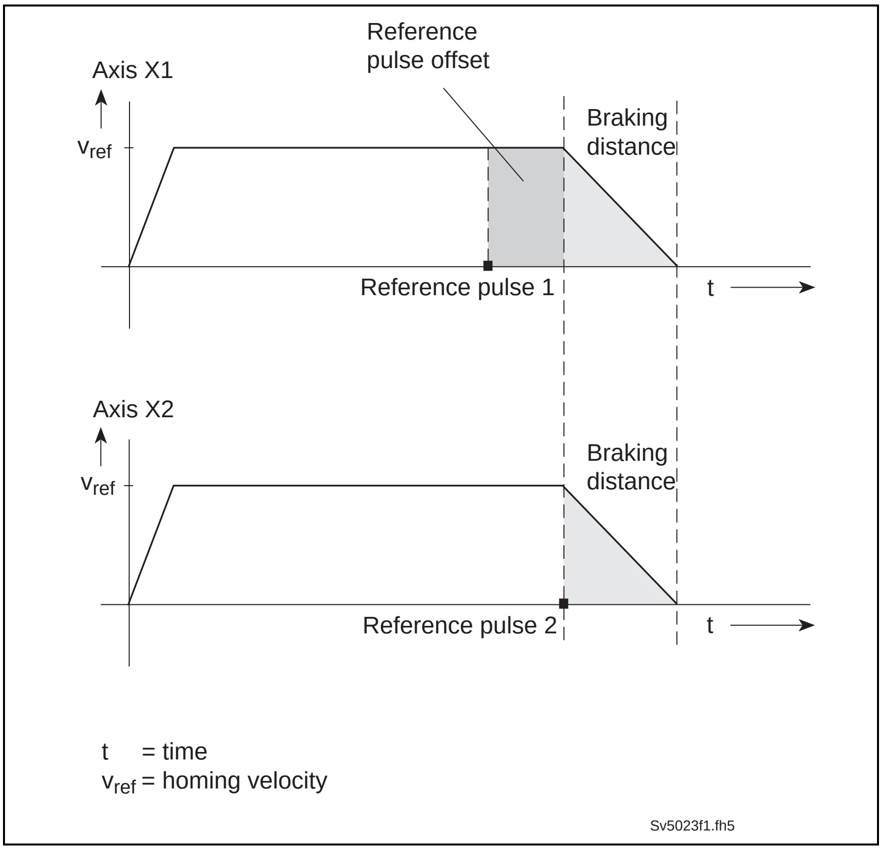


Fig. 9-105: Velocity paths of gantry axis during homing

9.10 Set Absolute Measuring

When an absolute measuring system is installed, its position feedback value displays a value that is arbitrary and has no relationship to the machine’s zero point. In this case, the value of the **S-0-0403, Position feedback value status** parameter is 0.

In contrast to non-absolute measuring systems, the absolute dimensions in absoute measuring systems are established only once at the initial start-up of an axis.

The position feedback value of this measurement system can be set to the desired value with the command "Set Absolute Measuring." After absolute measuring (dimension) is set, the position feedback value of the encoder has a defined relationship to the machine’s zero point.

All information will be available after reset because all necessary data from the absolute dimension system is stored in encoder data memory or in parameter data memory. The position feedback value retains its reference to the machine’s zero point.

The following parameter is available for executing the function:

- **P-0-0012, C300 Command ’Set absolute Measurement’**

In addition, the following parameters are needed or are affected by the function:

- **S-0-0147, Homing Parameter**
- **S-0-0052, Reference distance 1**
- **S-0-0054, Reference distance 2**
- **S-0-0403, Position feedback value status**

Function Principle Set Absolute Measuring

The feedback connected to the mechanical system is brought to an exactly measured position. The value desired for the position feedback value of the measurement system is entered in the parameter **S-0-0052, Reference distance 1** (for motor encoder) or **S-0-0054, Reference distance 2** (for optional encoder). Then the command **P-0-0012, C300 Command 'Set absolute Measurement'** is started. The position feedback value is set to the value in the respective reference distance and the position status becomes 1.

If only one absolute measurement system is available, the command automatically refers to this measurement system. If 2 absolute measurement systems are connected, the selection is conducted according to bit 3 of **S-0-0147, Homing Parameter**.

When the command is executed, 3 different cases can be distinguished :

1. Set absolute measuring without drive enable.
2. Set absolute measuring with drive enable, function executed by subsequently starting the command "Drive Controlled Homing Procedure".
3. Set absolute measuring with drive enable, function executed by subsequently clearing the drive enable.

Set absolute measuring without controller enable

When absolute measuring is set without drive enable, the axis is moved to the exactly measured position and, while the drive enable is turned off, the command **P-0-0012, C300 Command 'Set absolute Measurement'** is started, after the reference distance has been written with the desired position feedback value at this position.

The command immediately sets the position feedback value of the measurement system to the reference distance, and the position status becomes 1. The command is finished in the drive and can be cleared.

Normally, this simple method of executing the command is all you need. However, if the application is dealing with a "vertical axis" (vertical) or if the approached position cannot be held without drive enable for another reason, the command can also be done with drive enable under specific conditions.

(See 2. or 3. from: Set Absolute Measuring"

Setting Absolute Dimension Under Controller Enable and Subsequent "Drive-Controlled Homing"

Homing: Setting absolute dimension command, the position feedback value of a controlled axis can be changed. This may be necessary with "vertical axis," for example.

The procedure is as follows :

- Move the axis to the measured position.
- Enter the desired position feedback value in the appropriate reference distance parameter.
- Start the command **P-0-0012, C300 Command 'Set absolute Measurement'** The position data will not be switched yet.
- Start the command **S-0-0148, C600 Drive controlled homing procedure command** this feature recognizes that it is dealing with an

absolute measurement system and executes "Set Absolute Dimension" or, in other words, the position feedback value is set to the reference distance. The position command value (**S-0-0147, Homing Parameter**) is simultaneously set to the same value. As with each execution of "drive-controlled homing," the position command value is read via the service channel and the control system’s position command value is set to this value before the homing command is cleared.

Warning:
Make sure that the encoder to be set is selected in bit 3 of **S-0-0147, Homing Parameter**

- Clear the command **P-0-0012, C300 Command ’Set absolute Measurement’**

Set absolute dimension (measuring) during controller enable, then turn off the controller enable

Setting absolute measuring: with CE and subsequent CE switch off, the position feedback value of a controlled axis can be changed. Switching the position feedback value occurs after the drive enable is turned off.

The procedure is as follows :

- Move the axis to the measured position
- Enter the desired position feedback value in the appropriate reference distance parameter.
- Start the command **P-0-0012, C300 Command ’Set absolute Measurement’** (Measuring). The position data will not be switched yet.
- Turn off the drive enable, the position feedback value is set to the reference distance, the command is terminated in the drive.
- Clear the command **P-0-0012, C300 Command ’Set absolute Measurement’**

Set the actual feedback values according to the absolute dimension

The state of the position feedback values from the motor encoder and, if present, from the optional encoder after executing the set absolute dimension command, depends on bit 3 in **S-0-0147, Homing Parameter** and the availability of an absolute encoder as the motor encoder or optional encoder.

Motor encoder:	**Optional encoder:**	**S-0-0147 bit 3:**	**Position feedback value 1:**	**Position feedback value 2:**
Absolute	Non-absolute or not available	Any value	Reference distance 1	Reference distance 1
Non-absolute	Absolute	Any value	Reference distance 2	Reference distance 2
Absolute	Absolute	0	Reference distance 1	Unchanged
Absolute	Absolute	1	Unchanged	Reference distance 2

Fig. 9-106: Set position feedback values according to absolute measuring

Actual feedback values from absolute encoder after switching on

(See also "Position Feedback Values of Absolute Measurement Systems After Initialization"

Diagnostic messages

While the command is being executed, the following command error(s) can occur:

- **C302 Absolute measuring system not installed**. The command **P-0-0012, C300 Command 'Set absolute Measurement'** has been started without an absolute measurement system being available.

Notes

10 Optional Drive Functions

10.1 Configurable Signal Status Word

The configurable signal status word supports the acceptance of a maximum of 16 copies of bits from other drive parameters. This makes it possible for a user to put a bit list together himself which contains status information of the drive important to the control.

The bits in the signal status are put together in every command communication cycle at **S-0-0007, Feedback acquisition starting time (T4)**.

These parameters are used with this function:

- **S-0-0144, Signal status word**,
- **S-0-0026, Configuration list signal status word,**
- **S-0-0328, Assign list signal status word**

Parameters **S-0-0026, Configuration list signal status word** and **S-0-0328, Assign list signal status word** are used to configure the signal status word. These parameters have a variable length of two byte data elements.

The ID numbers of the parameters which contain the original bits (sources) are specified in parameter **S-0-0026, Configuration list signal status word.** The position of an ID number in the list determines the bit in the signal status word to which the ID number applies. So, e.g., the first list element informs as to what parameter bit 0 of the signal status word comes from.

Which bit of the parameters selected in **S-0-0026, Configuration list signal status word** is to be copied into the signal status word is determined in **S-0-0328, Assign list signal status word**. If this list remains empty, then bit 0 of the parameter is automatically copied. Otherwise, the bit taken out of the source parameter is specified here. Bit number 0 (LSB) to 31 (MSB) can be specified. For each bit number of this list there must be an ID number in the same list position in list S-0-0026. Otherwise, the drive, when writing the bit number list, will issue the error message "ID number not available". This is why list **S-0-0026, Configuration list signal status word** must be written into before **S-0-0328, Assign list signal status word**.

Example: A signal status word with the following configuration must be put together:

Bit no. in S-0-0144,Signal status word	ID number of original parameter	Bit no. of original parameter	Definition
0	S-0-0013	1	Vist = 0
1	S-0-0182	6	IZP
2	S-0-0403	0	position status
3	P-0-0016	4	P-0-0015 specifying memory address of a drive-internal counter. Transmission is from bit 4.

Fig. 10-1: Example of a configurable signal status word

Parameters **S-0-0026, Configuration list signal status word** and **S-0-0328, Assign list signal status word** have to be configured as follows:

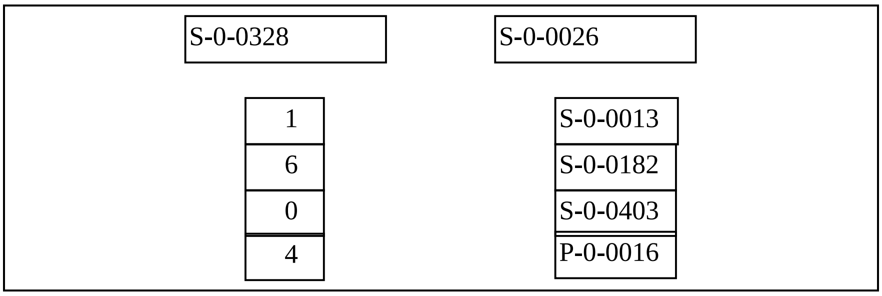


Fig. 10-2: How to configure parameters S-0-0328 and S-0-0026

Note: A maximum of 16 bits can be configured. Configuration is performed from the least-significant to most-significant bit. In other words, the position of the bit copy in the siganl status word is the result of the continuous configuration in S-0-0026.

Parameter Input Checks

The following checks are run when inputting parameters **S-0-0328, Assign list signal status word** or **S-0-0026, Configuration list signal status word**:

- If more elements are programmed in **S-0-0328, Assign list signal status word** than **S-0-0026, Configuration list signal status word** then error message "*0x1001, ID number not available*" is generated.
- If an ID number specified in **S-0-0026, Configuration list signal status word** does not exist, then error message "*0x1001, ID number not available*" is generated.
- Check whether the IDN variable data length (list parameters) specified in **S-0-0026, Configuration list signal status word** exists or a socalled online read function. Parameters with online read function are generally parameters with physical units (position, speed, acceleration and currents) as well as parameters **S-0-0135, Drive status word** and **S-0-0011, Class 1 diagnostics**. If yes, then service channel error message *0x7008, Data not correct* is generated.

Note: In each of these cases, only the inputs up until the faulty element is accepted!

10.2 Configurable Signal Control Word

With the signal control word it is possible to write access single control bits in the various parameters by using a freely-configurable collective parameter.

The configurable signal control word supports acceptance of a maximum of16 copies of bits from other drive parameters.

Application

This mechanism can be used, for example, for

- positioning block mode via parallel interface
- main spindle mode via parallel interface

Accessing signal control word

Depending on the **command communications** parameter **S-0-0145, Signal control word** is accessed in various ways:

- With parallel interface (DKC01.3) the 10 digital inputs on the lowest ten bits are copied into the signal control word!
- With SERCOS and fieldbus interface, parameter **S-0-0145, Signal control word** must be relevantly configured in cyclical data so that the mechanism can be used.

Note: The bits in the signal control word are effective in each interface cycle at **S-0-0007, Feedback acquisition starting time (T4).**

Pertinent Parameters

The following parameters are used for the funtions

- **S-0-0027, Configuration list signal control word**
- **S-0-0329, Assign list signal control word**
- **S-0-0145, Signal control word**
- **S-0-0399, IDN list of configurable data in the signal control word**

Configuring the Signal Control Word

Only those parameters in list **S-0-0399, IDN list of configurable data in the signal control word** can be allocated to configuration list **S-0-0027, Configuration list signal control word**.

The ID numbers of the parameters are specified in parameter **S-0-0027, Configuration list signal control word** which are to be configured with the help of the signal control word (=line).

The position of an ID number in the list determines which bit in the signal control word is allocated to which ID number (line). For example, the first list element fixes which parameter bit 0 of the signal control word is allocated to.

Which bit of the selected parameters (=line in **S-0-0027, Configuration list signal control word)** is set by the signal control word (or reset) is set in **S-0-0329, Assign list signal control word**.

If this list remains empty, then bit 0 is automatically affected in the specified parametrs. Otherwise, the bit is specified here which is allocated to the target parameters.

Bit numbers from **0 (LSB) to 31 (MSB)** are entered here.

Exceptions

- If the allocated parameter is a command, then the bit number in parameter **S-0-0329, Assign list signal control word** is not relevant.
- If the allocated parameter is parameter **S-0-0346, Setup flag for relative command values**, then a positive edge in the relevant bit of the control word effects a toggling of the parameter **S-0-0346, Setup flag for relative command values**.

ID number not available

For every bit number in list **S-0-0329, Assign list signal control word** there must be an ID number at the same list position in the list in **S-0-0027, Configuration list signal control word**. Otherwise, when writing the bit number list from the drive, error message "ID number not available" will be generated.

This is why list S-0-0027 must be written prior to list S-0-0329.

When the firmware is delivered (basic parameter block) the following values are defined for the parameters that are relevant to the configurable signal control word.

Example: Default firmware settings

Bit no. In S-0-0145	ID number of the target parameter	Bit no. of the arget parameter	Definition
0	P-0-4026	0	select positioning block
1	P-0-4026	1	select positioning block
2	P-0-4026	2	select positioning block
3	P-0-4026	3	select positioning block
4	P-0-4026	4	select positioning block
5	P-0-4026	5	select positioning block
6	S-0-0349	0	start (strobe)
7	S-0-0148	0	Start referencing command
8	P-0-4056	0	jog positive
9	P-0-4056	1	jog negative

Fig. 10-3: Example for config. signal control word (=default setting)

Parameters **S-0-0027, Configuration list signal control word** and **S-0-0329, Assign list signal control word** must be configured as follows to obtain the wanted assignment of the control word.

S-0-0027	S-0-0329
P-0-4026	0
P-0-4026	1
P-0-4026	2
P-0-4026	3
P-0-4026	4
P-0-4026	5
S-0-0349	0
S-0-0148	0
P-0-4056	0
P-0-4056	1

Fig. 10-4: Example for configuring parameters S-0-0329 and S-0-0027

Note: Up to **16 Bits** can be configured. Configuration takes place from the lowest to the highest value bit. In other words, The position of the bit copy in the signal control word is derived from the continuous configuration in S-0-0027.

Note: The illustrated assignment of the control word is the same as the assignment of the parameter interface in DKC01.3 Also see Project Planning Manuals:
Section: Terminal diagram of parallel interface

Diagnostic / Error Messages

When inputting one of the parameters (S-0-0027 or S-0-0329) the following checks are run:

- If more elements are programmed in **S-0-0329, Assign list signal control word** then in **S-0-0027, Configuration list signal control word**, then error message "*0x1001, ID number not available*" is generated.
- If an ID number specified in **S-0-0027, Configuration list signal control word** is not available, then error message "*0x1001, ID number not available*" is generated.
- If an ID number specified in **S-0-0027, Configuration list signal control word** is not on the list of the configured data S-0-0399 then error message "*0x7008, Data not correct"* is generated.

Note: In each of these cases, only that input prior to the faulty element will be accepted!

10.3 Analog Output

With the help of the function "Analog output" drive-internal signals and state variables can be generated as analog voltage signals. These can be examined with an oscilloscope connected to the analog outputs.

The conversion of the digital values from the drive is done via two 8 bit digital-to-analog converters. The maximum output voltage equals +/- 10 volts. There is an output every 500usec.

Possible output functions

1. Direct writing into the analog outputs

2. Assigning ID numbers to analog outputs

3. Output of pre-set signals

4. Byte output of RAM memory cell

5. Bit output of RAM memory cells

To parametrize the function, the following parameters are available:

- **P-0-0139, Analog output 1**
- **P-0-0140, Analog output 2**
- **P-0-0420, Analog output 1, signal selection**
- **P-0-0421, Analog output 1, expanded signal selection**
- **P-0-0422 Analog output 1, scaling**
- **P-0-0423, Analog output 2, signal selection**
- **P-0-0424, Analog output 2, expanded signal selection**
- **P-0-0425, Analog output 2, scaling**
- **P-0-0426 Analog outputs, IDN list of assignable parameters**

Direct analog outputs

With the parameters **P-0-0139, Analog output 1** and **P-0-0140, Analog output 2** it is possible for the control to use the two 8 bit digital/analog converters of the drive. Voltage values written into these parameters, ranging between -10.000 volts and +10.000 volts, are output by the drive to the analog outputs. The quantization equals 78 mV.

A precondition for the use of an analog output is that the signal selection (P-0-0420 or P-0-0423) and the expanded signal selection (P-0-0421 or P-0-0424) were deactivated by inputting 0 for the used channel.

Analog output of existing parameters

All parameters in the list **P-0-0426 Analog output, IDN list of assignable parameters** can be output analog.

This first requires that their ID number be input in the signal select for channel 1 (P-0-0420) or 2 (P-0-0423). The unit and the attribute (number of decimal places) of the relevant scaling (P-0-0422 or P-0-0425) is set as per the selected parameter. If the selected parameter depends on a scaling mode, then the settings there apply to the scaling as well.

With **P-0-0422 Analog output 1, scaling** or **P-0-0425, Analog output 2, scaling** is it then fixed at what value 10 volts are output.

For example, for rotary preferred position scaling and signal selection position command (S-0-0047), the unit of the scaling factor is set to degrees, and the number of decimal places is set to four. Inputting 90.0000 degrees in the evaluation factor means that 10 volts per 90 degrees at the load will be output .

If signals with a binary format are selected (e.g., **S-0-0134, Master control word)** then the display format of the scaling is set to decimal without fractional part. There is no unit. With this scaling, a bit number between 0 and 15 is selected. The state of this bit of the set parameter is then output in such a way that for 0 -10 volts are output and for 1 +10 volts (bit output).

See also Control loop structure in chapter General Information for Control Loop Settings"

Outputting pre-set signals

To be able to show such signals in an analog manner, which do not exist as a parameter, there a way to select these via predefined signal numbers and to output these via the expanded analog output. The parameters **P-0-0421, Analog output 1, expanded signal selection** and **P-0-0424, Analog output 2, expanded signal selection** do the selection.

The expanded output only functions if the signal select for the channel used (P-0-0420 or P-0-0423) is deactivated by inputting the ID number 0.

The following list shows which signal is output with which signal number.

Signal number P-0-0421/424	Output signal	Reference unit: Evaluation factor 1.0000
0x00000001	motor encoder sine signal	0.5V/10V
0x00000002	motor encoder cosine signal	0.5V/10V
0x00000003	Opt. enc. sine signal	0.5V/10V
0x00000004	Opt. enc. sine cosine	0.5V/10V
0x00000005	Position command difference on the pos. controler	rot. ⇒ 1000rpm/10V lin. ⇒ 100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	absolute DC bus power amount	1kW/10V
0x00000008	effective current	S-0-0110/10V
0x00000009	relative current	S-0-0110/10V
0x0000000a	thermal load	100 % / 10V
0x0000000b	motor temperature	150°C/10V
0x0000000c	magnetizing current	S-0-0110/10V
0x0000000d	velocity command at the velocity controller	rot. ⇒ 1000rpm/10V lin. ⇒ 100m/min/10V

Fig. 10-5: Signal selection list with pre-defined signal selection

See also Control loop structure in chapter General Information for Control Loop Settings"

This information is scaling independent and always relates to the motor shaft. The scaling of the signals is possible via the parameters **P-0-0422 Analog output 1, scaling** and **P-0-0425 Analog output 2, scaling.** These have been set as factors with 4 decimal places in the expanded signal selection. If the evaluation factors are 1.0000, then the standards specified in the table apply.

Example:

Output of the position command difference with a value of 150rpm/10V on channel 1.

Input:

P-0-0420, Analog output 1, signal selection = S-0-0000

P-0-0421, Analog output 1, expanded signal selection = 0x00000005

P-0-0422 Analog output 1, scaling = 0.1500

Bit and byte outputs of the data memory

Use of this feature is meaningful only with information about the structure of the internal data memory; therefore, this feature can be used effectively only by the corresponding developer.

The bit and byte output is only possible if the signal selection for the used channel (P-0-0420 or P-0-0423) is deactivated by inputting the ID number 0.

The selection of the function and the storage address takes place in the parameters **P-0-0421, Analog output 1, expanded signal selection** and **P-0-0424, Analog output 2, expanded signal selection**. In the high nibble (half byte with bits 28..31), byte output is activated with a 1 and bit output with a 2. The least significant 24 bit of the parameter inputs the storage address.

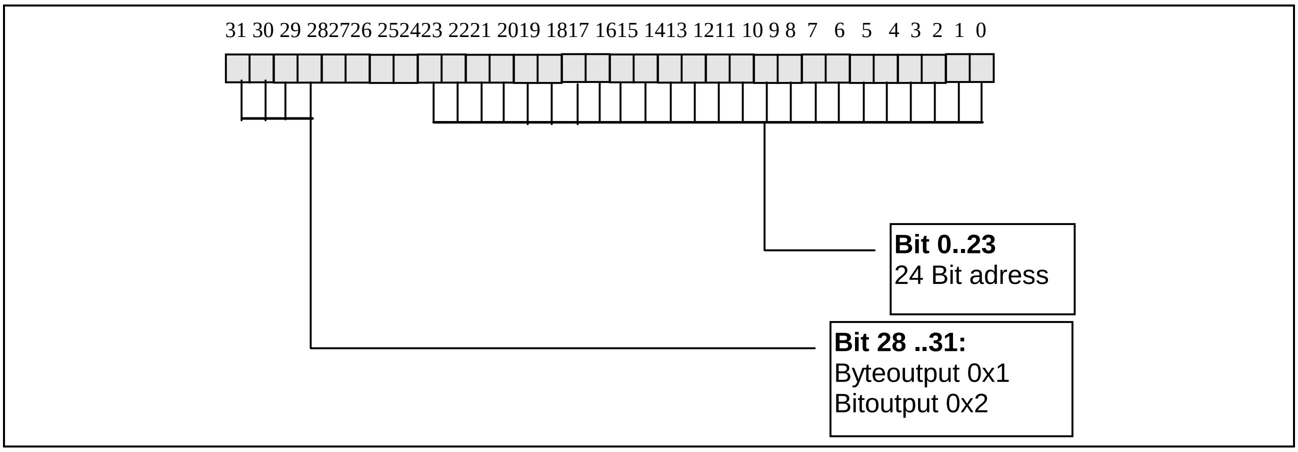


Fig. 10-6: Parametrizing bit or byte output

The parameters **P-0-0422 Analog output 1, scaling** and **P-0-0425 Analog output 2, scaling** either select the bit to be output or it can be determined from which (least signifiant) bit on the byte to be generated will start. When selecting the bit number, only values between 0 and 15 make sense. If greater values are entered, then only bits 0..3 are used.

When outputting bits, -10 volt (bit = 0) or +10 volt (bit = 1) is output.

With byte outputs, the MSB of the byte to be output is interpreted as sign bit. Voltages ranging from -10 to +10 volts are output.

Terminal assignment - analog output

see project planning manual.

10.4 Analog Inputs

Using the function "Analog inputs", two analog inputs can be shown via analog/digital converters in one parameter each. The analog voltages, in the form of both of these parameters, can then either be

- transmitted to the control and supports the control as an analog input function or
- it can be assigned in the drive to a different parameter taking a settable scaling and a settable offset into account.

Note: With the help of analog inputs it is also possible set specified command values for velocity control mode.

The following parmeters are available for the function:

- **P-0-0210, Analog input 1**
- **P-0-0211, Analog input 2**
- **P-0-0212, Analog inputs, IDN list of assignable parameters**
- **P-0-0213, Analog input 1, Assignment**

- **P-0-0214, Analog input 1, Scaling per 10V**
- **P-0-0215, Analog input 2, Assignment**
- **P-0-0216, Analog input 2, Scaling per 10V**
- **P-0-0217, Analog input 1, Offset**
- **P-0-0218, Analog input 2, Offset**

Functional principle of the analog inputs

The two analog inputs are connectet over two **differential inputs** E1+ / E1- and E2+ / E2- .

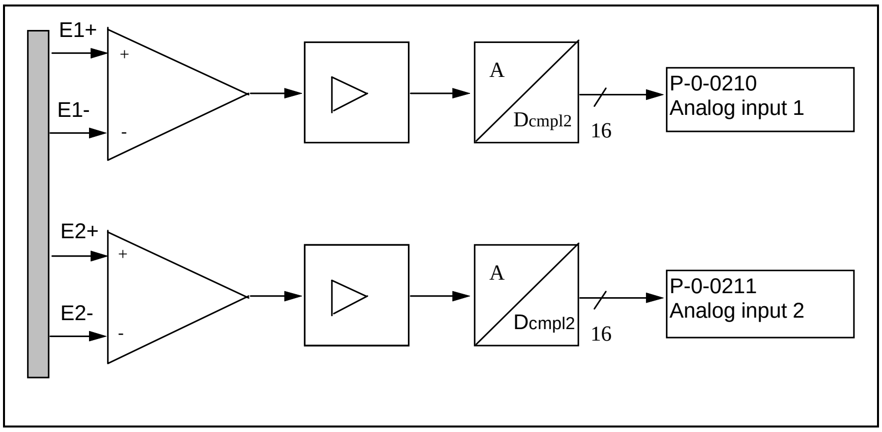


Fig. 10-7: Functinal principle of the analog inputs

The digitalized voltages of both differential inouts are displayed in the parameters **P-0-0210, Analog input 1** and **P-0-0211 Analog input 2.** The analog/digital conversion is performed via a two channel 14Bit ADC with fourfold oversampling.

Assignment of analog inputs to parameters

Both **P-0-0210, analog input 1** and **P-0-0211 analog input 2**, which depict the analog-to-digital converted voltages, can be assigned to other drive parameters, i.e., they can be cyclically copied while taking

- an offset and
- a selectable scaling

into account.

Note: Analog channel 1 is processed every 500 µs, channel 2 every 8 ms.

The assignment applies the following principle:

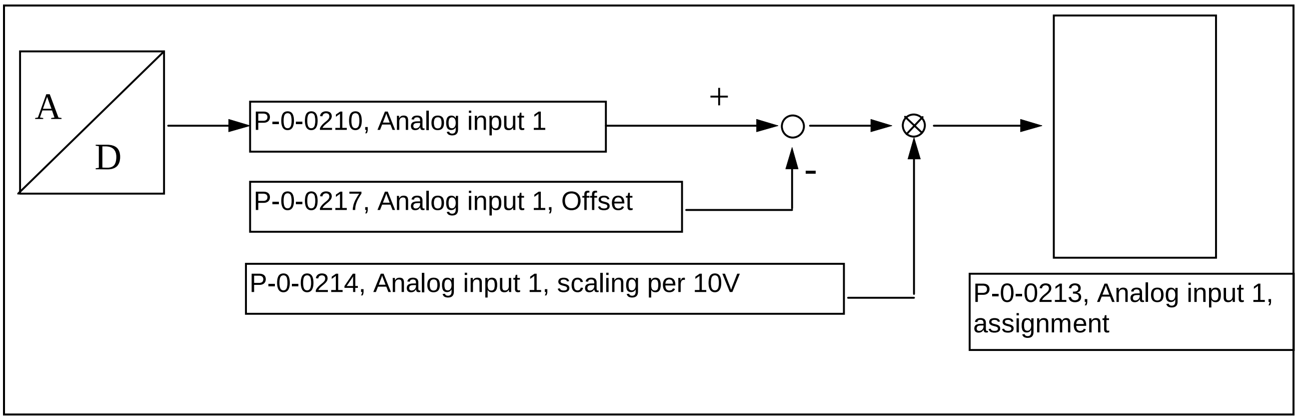


Fig. 10-8: Functional principle of assigning analog input 1 to a parameter

The converted voltage signals of both differential inputs are stored in parameter **P-0-0210, Analog input 1/P-0-0211, Analog input 2** respectively. An assignment of an analog input to a parameter is activated if in parameter **P-0-0213, Analog input 1, assignment/P-0-0215, Analog input 2, Assignment** a value not equal to S-0-0000 has been parametrized. The contents of **P-0-0210, Analog input 1/ P-0-0211, Analog input 2** minus the contents of **P-0-0217, Analog input 1, Offset/P-0-0218, Analog input 2, Offset** is scaled with the scaling factor set in **P-0-0214, Analog input 1, Scaling per 10V**/ **P-0-0216, Analog input 2, scaling per 10V** and then copied into the parameter with the ID number set for the assignment in **P-0-0213, Analog input 1, Assignment/P-0-0215, Analog input 2, Assignment**.

The **unit** of the parameter **P-0-0214, Analog input 1, Scaling per 10V/P-0-0216, Analog input 2, Scaling per 10V** complies with the unit of the assigned parameter.

Only those parameters can be assigned that are listed in **P-0-0212, Analog inputs, IDN list of assignable parameters**.

Example: Assignment of analog input 1 to **S-0-0036, velocity command value** with 10 V equal to 1000 rpm

Parameter setting:

P-0-0213, analog input 1 = S-0-0036

P-0-0214, analog input 1, evaluation per 10V = 1000.0000 rpm

Analog Inputs - Connection

See project planning manual.

10.5 Oscilloscope Feature

The oscilloscope feature is used to diagram internal and external signals and output variables. Its function is comparable to a 2-channel oscilloscope. The following parameters are available to set the oscilloscope feature:

- **P-0-0021, List of Scope Data 1** (always 4-byte data)
- **P-0-0022, List of Scope Data 2** (always 4-byte data)
- **P-0-0023, Signal Select Scope Channel 1**
- **P-0-0024, Signal Select Scope Channel 2**
- **P-0-0025, Trigger Source**
- **P-0-0026, Trigger Signal Selection**
- **P-0-0027, Trigger Level for Position Data**
- **P-0-0028, Trigger Level for Velocity Data**
- **P-0-0029, Trigger Level for Torque/Force Data**
- **P-0-0030, Trigger Edge**
- **P-0-0031, Timebase**
- **P-0-0032, Size of Memory**
- **P-0-0033, Number of Samples after Trigger**
- **P-0-0035, Delay from Trigger to Start** (cannot be written)
- **P-0-0036, Trigger Control Word**
- **P-0-0037, Trigger Status Word**
- **P-0-0145, Expanded Trigger Level**

- **P-0-0146, Expanded Trigger Address**
- **P-0-0147, Expanded Signal K1 Address**
- **P-0-0148, Expanded Signal K2 Address**
- **P-0-0149, List of selectable signals for oscilloscope function**
- **P-0-0150, Number of valid Samples for Oscilloscope Function**

Main Functions of the Oscilloscope Feature

The oscilloscope feature can be activated with the parameter **P-0-0036, Trigger Control Word** by setting bit 2. From then on, all data will be recorded that were selected through the parameters **P-0-0023, Signal Selection Channel 1** and **P-0-0024 Signal Selection Channel 2**. The selection will be defined with numbers that are assigned to various signals.

The triggering is activated by setting the bit 1 in the "Trigger Control Word" parameter. The trigger conditions can be set with the parameters **P-0-0025, Trigger Source, P-0-0026, Trigger Signal Selection** and **P-0-0030 Trigger Edge**. The signal amplitude that releases the trigger can be set with the parameters **P-0-0027 - P-0-0029 Trigger Level**.

If a trigger event is recognized, the number of values in the parameter **P-0-0033 Number of Samples after Trigger** will be recorded, and the function will end. Parameters **P-0-0031 Timebase** and **P-0-0032 Size of Memory** can define the recording duration and the time intervals for the measurement samples.

The sampled values are stored in the **P-0-0021 and P-0-0022 List of scope data** and can be read by the control.

Parameterizing the Oscilloscope Feature

Oscilloscope feature with defined recording signals

Preset signals and state variables can be selected through the **P-0-0023 and P-0-0024 Signal Selection** Parameters. The selection can be made by entering the signal number (hex format) in the corresponding signal selection parameter. The selected signal number defines the unit of data stored in the list of scope data. The following signals are predefined with numbers.

Number:	Signal selection:	Unit of the probe value list:
0x00	Channel not activated	--
0x01	Actual **position** feedback value dependent on operating mode S-0-0051 or S-0-0053	dependent on position scaling
0x02	**Velocity** feedback value Parameter (S-0-0040)	velocity scaling dependent
0x03	**Velocity control deviation** (S-0-0347)	velocity scaling dependent
0x04	**Following error** Parameter (S-0-0189)	dependent on position scaling
0x05	**Torque/Force command** value Parameter S-0-0080	Percent
0x06	not yet used	

Fig. 10-9: Selection of predefined signals

The parameter **P-0-0149, Signal Selection List for Oscilloscope Feature** was introduced so the control can recognize if the number of preset numbers changes. The parameter is structured as a list parameter and transmits the ID numbers of possible signals.

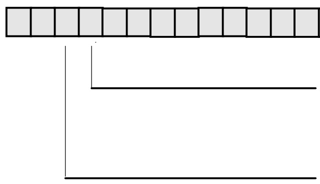
List entries:	ID number from:
1	S-0-0051 or S-0-0053
2	S-0-0040
3	S-0-0347
4	S-0-0189
5	S-0-0080
6	S-0-0051
7	S-0-0053
8	P-0-0147
9	P-0-0148

Fig. 10-10: Parameter P-0-0149 Occupancy

Expanded Oscilloscope Recording Function

In addition to the oscilloscope feature with preset signals, the drive also allows for recording of any desired internal signals. Use of this feature is meaningful only with information about the structure of the internal data memory; therefore, this feature can be used effectively only by the corresponding developer. The feature can be activated with the **Signal Selection P-0-0023 & P-0-0024** parameters by setting bit 12 = "1". The format for the data to be saved can be defined with bit 13.

P-0-0023 & P-0-0024, Oscilloscope Function Signal Selection



Bit 12: Expanded oscilloscope function "ON"

Bit 13: Data width of the measurement values
0 = 16 Bit
1 = 32 Bit

Fig. 10-11: Structure of Parameters P-0-0023 and P-0-0024

If the expanded signal selection is parameterized, then the desired signal address can be defined in the parameters **P-0-0147, Expanded signal K1 address** and **P-0-0148, Expanded signal K1 address**. During recording, the contents of the selected addresses are saved in the lists of scope data.

Note: If a 16-bit data width is selected, then the signal data will be stored as sign-extended 32-bit values.

Oscilloscope Feature Trigger Source

With the **P-0-0025 Trigger Source** parameter, you can choose between two trigger types.

External trigger (P-0-0025 = 0x01)

The trigger is activated by the control through bit 0 in the **Trigger Control Word**. This makes it possible to transmit a trigger event to several drives. This parameterization supports parameter P-0-0035, which is necessary to visualize the recording data.

Internal trigger: (P-0-0025 = 0x02)

Triggering occurs through the monitoring of the parameterized trigger signal. If the selected edge is recognized, then the trigger will be released. The "Delay from Trigger to Start" parameter will be set to zero.

Selection of Trigger Edges

Various trigger edges can be selected with the parameter **P-0-0030 Trigger Edge**. The following options are available:

Number:	Trigger Edge:
0x01	Triggering on the positive edge of the trigger signal
0x02	Triggering on the negative edge of the trigger signal
0x03	Triggering on both the positive and negative edge of the trigger signal
0x04	Triggering when the trigger signal equals the trigger level

Fig. 10-12: Trigger edge selection

Selection of Fixed Trigger Signals

The parameter **P-0-0026 Trigger Signal Selection** determines the signal that is monitored for the parameterized edge reversal. Just as for the signal selection, there are drive-internal fixed trigger signals for the trigger signal selection. These are activated by entering the corresponding number.

The following signal numbers are possible:

Trigger signal number:	Trigger signal:	Associated trigger edge:
0x00	no trigger signal	not defined
0x01	Actual **position** feedback according to active operating mode	Position data (P-0-0027)
0x02	**Velocity** feedback value Parameter S-0-0040	Velocity data (P-0-0028)
0x03	**Velocity deviation** Parameter S-0-0347	Velocity data (P-0-0028)
0x04	**Following error** Parameter S-0-0189	Position data (P-0-0027)
0x05	**Torque command** value Parameter S-0-0080	Torque data (P-0-0029)

Fig. 10-13: Selection of fixed trigger signals

Selection of Expanded Trigger Signals

In addition to a trigger signal selection with preset signals, the drive also allows for triggering on any desired internal signal. Use of this feature is meaningful only with information about the structure of the internal data memory; therefore, this feature can be used effectively only by the corresponding developer. This feature can be activated with the **P-0-0026 Trigger Signal Selection** parameter by setting bit 12 to 1.

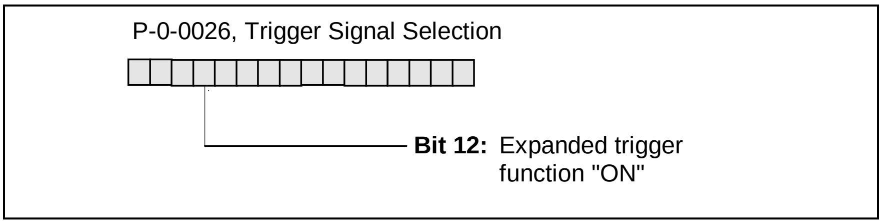


Fig. 10-14: Structure of parameter P-0-0026

If the expanded trigger feature is activated, then the trigger signal address must be defined via the parameter **P-0-00146 Expanded Trigger Address**. The associated trigger level is entered in the parameter **P-0-0145 Expanded Trigger Level**. This parameter is defined as follows:

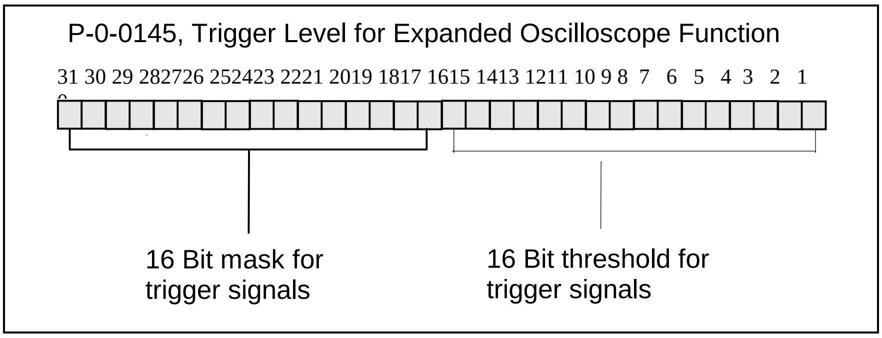


Fig. 10-15: Structure of parameter P-0-0145

The 16-bit value of the trigger edge is monitored, and the trigger signal will be ANDed with the trigger signal screen mask.

Setting the Time Resolution and the Memory Depth

The recording ranges for the oscilloscope feature can be defined with the parameters **P-0-0031 Timebase** and **P-0-0032 Size of Memory**. The maximum memory depth is 512 samples. If you need fewer samples, you can chang the value in the memory size parameter.

The time resolution can be set from 500 µs to 100 ms in steps of 500 µs. This determines the time intervals in which the samples are recorded. The minimum recording duration is 256 ms; the maximum recording duration is 51.2 s.

In general:

$$\text{Recording duration} = \text{Time resolution} \times \text{Size of Memory}\,[\mu s]$$

Fig. 10-16: Determining of the recording duration

Setting the Trigger Delays

By setting the parameter **P-0-0033 Number of Samples after Trigger**, it is possible to record probe values before the trigger event (trigger delay function of an oscilloscope). The setting occurs in units of the parameterized time resolution. The input value determines the number of probe values still recorded after a trigger event. By entering 0 • [time resolution], only data available before a trigger event will be recorded. If the value of the P-0-0032 Size of Memory parameter is entered, then only the probe values occurring after the trigger event will be recorded.

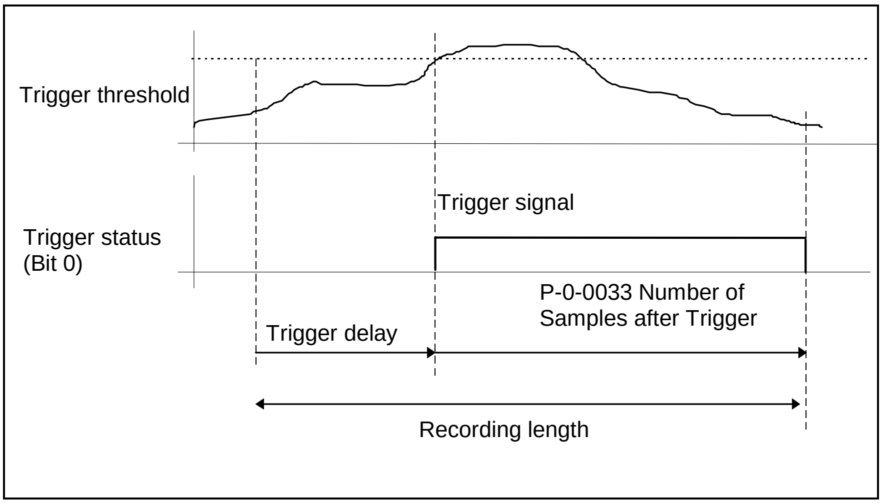


Fig. 10-17: Trigger delay - Number of samples after trigger

Activating the Oscilloscope Feature

The oscilloscope feature can be activated with the parameter **P-0-0036 Trigger Control Word**. The parameter is defined as follows:

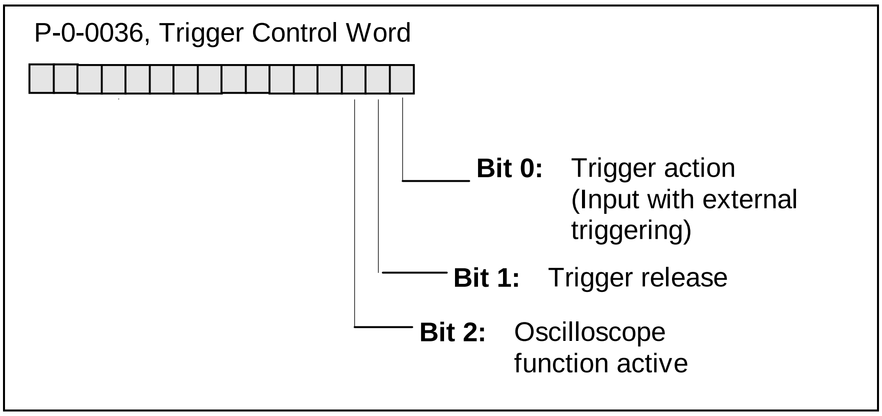


Fig. 10-18: Structure of Parameter P-0-0036

The oscilloscope feature is activated by writing bit 2 with "1"; i.e. the internal probe value memory is continually written with the selected measurement signals. If bit 1 is set, then the trigger monitor is activated, and the oscilloscope feature waits for the selected edge to occur. If a valid edge is recognized, then the probe value memory will be completed as set in parameter P-0-0033, and the oscilloscope feature will be deactivated by resetting bits 1 & 2 in the trigger control word.

Oscilloscope Feature With External Trigger and Internal Trigger Condition

If triggering is selected in parameter **P-0-0025 Trigger Source** with the control bit of the trigger control word, then the trigger will be initiated with the 0→1 (rising) edge of bit 0 in the trigger control word.

With this drive, it is also possible to monitor a trigger signal for the trigger condition. If the trigger condition is recognized, then bit 0 will be set in the trigger status, but it won't trigger. In this way, it is possible to signal the trigger event for several drives simultaneously with the real-time status and control bits via the control and to release the trigger .

Since there is a delay between the recognition of the trigger event and enabling the trigger, the delay is measured by the drive controller and stored in the parameter **P-0-0035, Delay from Trigger to Start**. A time-correct display of the signal can be guaranteed by using this parameter for the visualization of the probe values.

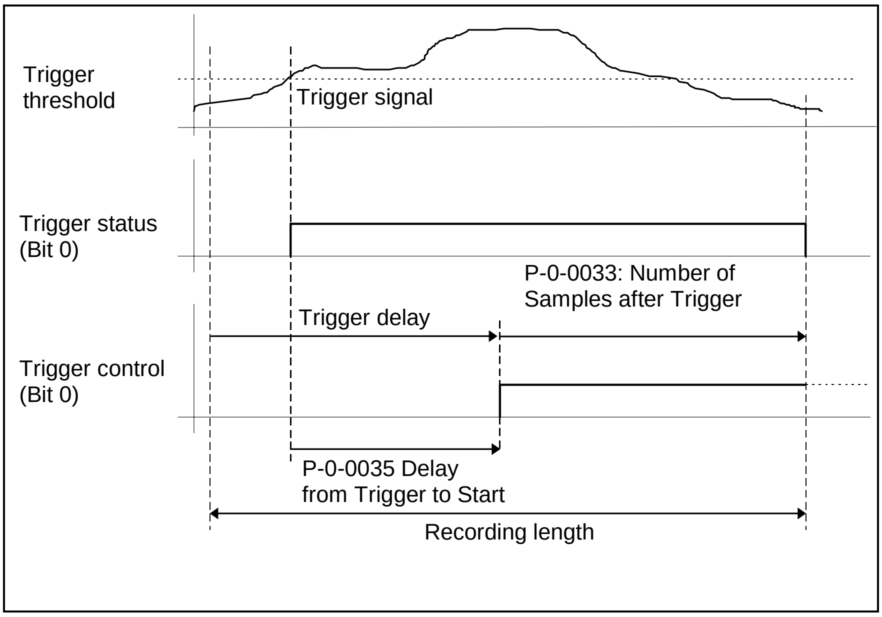


Fig. 10-19: Delay from trigger to start

Status Messages for the Oscilloscope Feature

Information about the status of the oscilloscope feature is shared with the control through the parameter **P-0-0037, Trigger Status Word**.

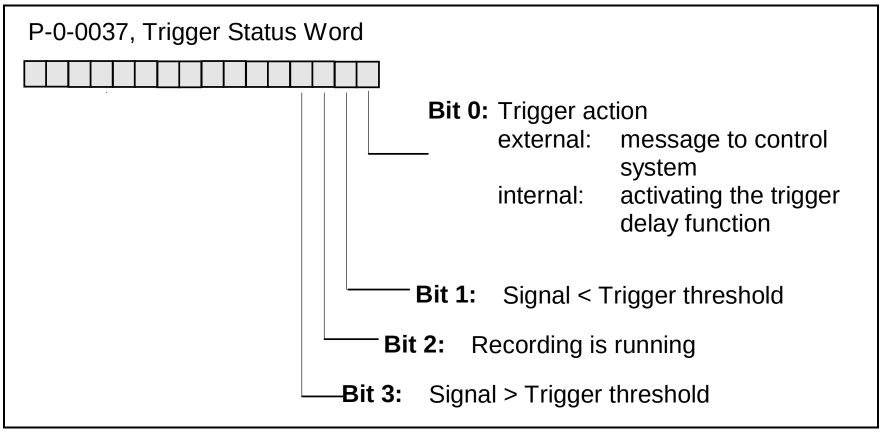


Fig. 10-20: Structure of Parameter P-0-0037

Number of Valid Probe Values

As soon as bit 2 is set by the **P-0-0036, Trigger Control Word**, the drive starts to record probe values.

If the trigger event is recognized after the bit is set, the oscilloscope feature records the number of samples after the trigger event and then stops recording.

The total probe value memory for the current measurement will not always be written, dependent on the memory size setting, the time resolution, the number of samples after trigger and the time when the trigger event occurs.

That means that the memory can contain samples which are not valid for the measurement.

The parameter **P-0-0150, Number of valid Samples** indicates the number of valid samples for the current recording.

10.6 Probe Input Feature

Two digital inputs are available for measuring positions and times. The measured values are determined at the time of the positive and negative edge.

The following measured values can be determined:

- actual position value 1
- actual position value 2
- relative internal time in [usec]

Note: The probe inputs are probed every 1 usec. The measured signals are generated every 500 usec. Linear interim interpolation takes place between these two steps with an accuracy of 1 usec.

You can read the absolute values of these signals at the time of a positive or negative edge as well as their difference by parameters.

The following parameters are available for the feature:

- **S-0-0170, Probing cycle procedure command**
- **S-0-0401, Probe 1**
- **S-0-0402, Probe 2**
- **S-0-0169, Probe control parameter**
- **P-0-0200, Signal select probe 1**
- **P-0-0201, Signal select probe 2**
- **S-0-0405, Probe 1 enable**
- **S-0-0406, Probe 2 enable**
- **S-0-0130, Probe value 1 positive edge**
- **S-0-0131, Probe value 1 negative edge**
- **S-0-0132, Probe value 2 positive edge**
- **S-0-0133, Probe value 2 negative edge**
- **P-0-0202, Difference Probe Values 1**
- **P-0-0203, Difference Probe Values 2**
- **S-0-0409, Probe 1 positive latched**

- **S-0-0410, Probe 1 negative latched**
- **S-0-0411, Probe 2 positive latched**
- **S-0-0412, Probe 2 negative latched**

Main Function of the Probe Analysis

S-0-0170, Probing cycle procedure command activates the feature. The feature is activated as a command, but does not send a command acknowledgment. The Command Change (KÄ) bit is not used.

To activate the feature, S-0-0170 must be written with 3 (decimal) = 11 binary.

From this point on, the status of the probe signals will be displayed in the parameters **S-0-401, Probe 1** and **S-0-402, Probe 2**.

A probe input is enabled with parameter **S-0-0405, Probe 1 enable** or **S-0-0406, Probe 2 enable**. With a 0-1 switch of the signal, the trigger mechanism is activated to evaluate the positive and/or negative edge of the probe signal.

From this point on, when a probe signal edge is recognized, the selected signal will be stored in the positive or negative probe value parameter. At the same time, the difference between the positive probe value and the negative probe value will be computed and saved in the probe value difference parameter. The following status messages will be set to 1: **S-0-0409, Probe 1 positive latched** and **S-0-0410, Probe 1 negative latched** or **S-0-0411, Probe 2 positive latched** and **S-0-0412, Probe 2 negative latched**.

When the probe enable is cancelled, the following status messages will be erased: **S-0-0409, Probe 1 positive latched** and **S-0-0410, Probe 1 negative latched** or **S-0-0411, Probe 2 positive latched** and **S-0-0412, Probe 2 negative latched**.

Note: Only the first positive and the first negative signal edge of the input will be evaluated after the 0→1 (rising) edge of the probe enable. For each new measurement, the probe enable must be reset to 0 and then to 1. When the probe enable is cancelled, the corresponding probe-value latched parameters are also cancelled.

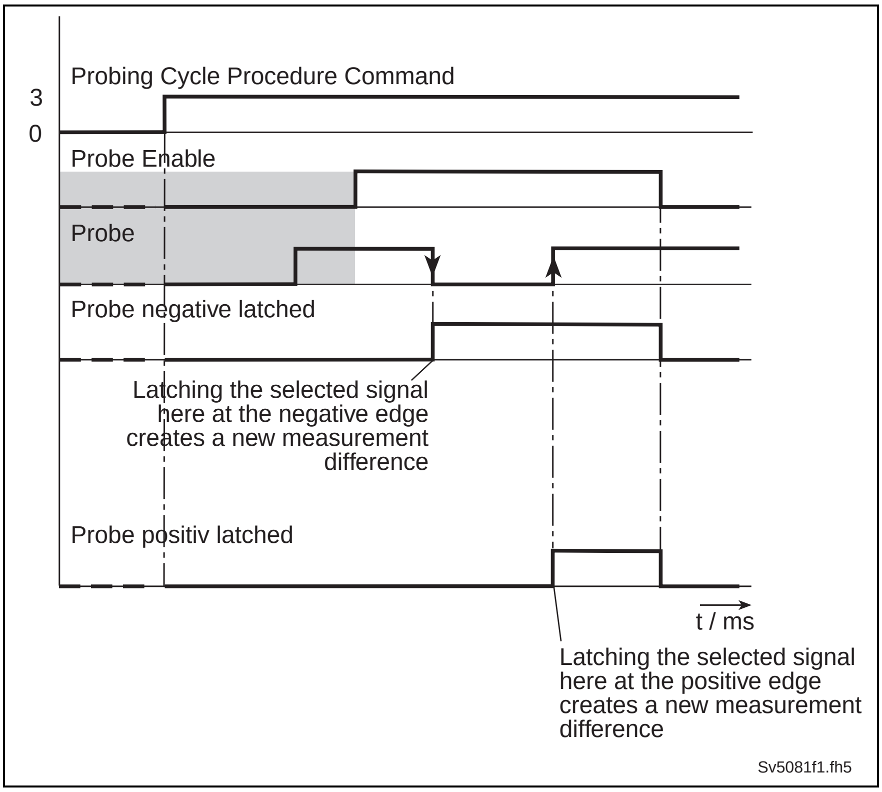


Fig. 10-21: Evaluation of probe signal edges, when positive and negative signal edge evaluation are set in the probe control parameter

Results of Writing "3" to the S-0-0170, Probing Cycle Procedure Command

The probe feature begins when 3 (decimal) = 11 binary is written into the parameter **S-0-0170, Probing cycle procedure command**. The following will happen:

- The **data status** will be set to **7** by **S-0-0170, Probing cycle procedure command**.
- All probe values and probe value differences will be set to 0.
- All "probe ... latched“ parameters will be cancelled.
- The external voltage monitor will be activated (if it has not yet been activated).

Signal Edge Selection for the Probe Inputs

A positive probe value and a negative probe value are available for every probe input. The positive probe value is assigned the 0→1 (rising) edge of the probe signal, and the negative probe value is assigned the 1→0 (falling) edge. The **S-0-0169, Probe control parameter** determines whether both occurring edges will be evaluated and will lead to the positive/negative probe values being saved.

The parameter should be set before activating this feature. The parameter is structured as follows:

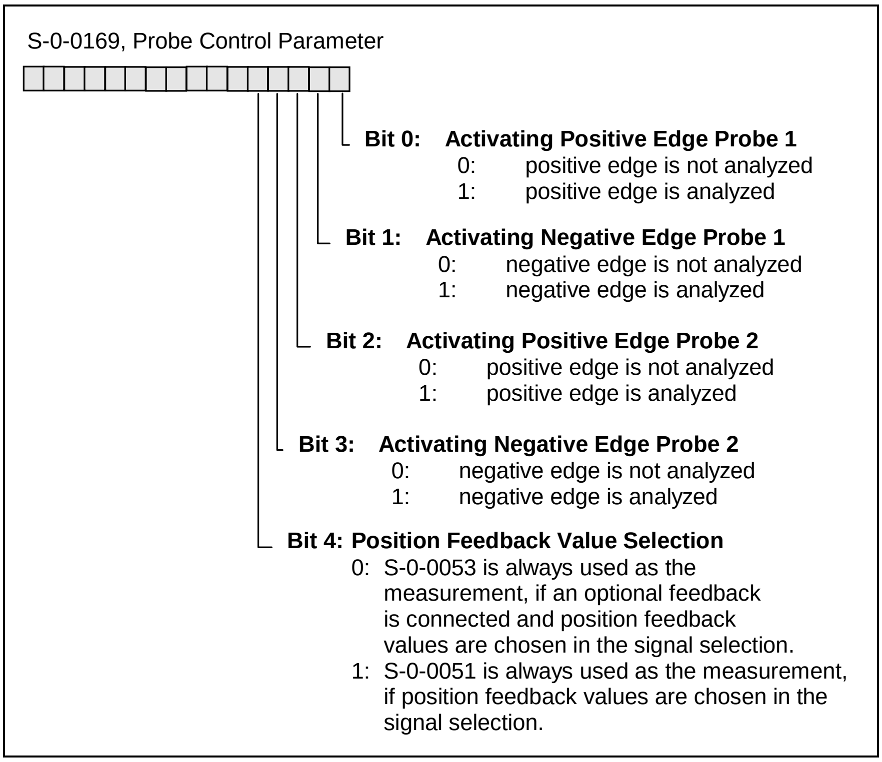


Fig. 10-22: Structure of Parameter S-0-0169, Probe Control

Signal Selection for the Probe Inputs

Values to be measured are:

- actual position value 1 (motor encoder)
- actual position value 2 (optional encoder, if mounted)
- internal time

The choice is made via parameters **P-0-0200, Signal select probe 1** and **P-0-0201, Signal select probe 2**, as well as in bit 4 of **S-0-0169, Probe control parameter**..

Using P-0-0200 or P-0-0201 it is possible to determine for both probe inputs whether an actual position value or an internal time is to be measured.

Value of P-0-0200/201:	Signal:
0	actual position value 1/2
1	time

Fig. 10-23: Probe function determining signals

Depending on this choice, the units, decimal places of parameter measured value positive and negative, Measured value difference, Start position probe function active and End position probe function active of the relevant probe are switched.

If the actual position value is selected in the signal select parameters, then bit 4 in **S-0-0169, Probe control parameter** decides whether **S-0-0051, Position feedback 1 value** or **S-0-0053, Position feedback 2 value** will be used as signal.

Connecting the Probe Inputs

see project planning manual

10.7 Positive stop drive procedure

The command **S-0-0149, d400 Positive stop drive procedure** turns off all controller monitors that would lead to an error message in Class 1 Diagnostics during the blocking of a drive during a fixed limit stop.

If the command is started, the drive generates the diagnostic message **D400 Positive stop drive procedure command**.

The controller monitors are switched off in all drive operating modes.

If there is a Class 1 Diagnostics error message at the start of the command, the error **D401 ZKL1-Error at command start** will be generated.

The drive will acknowledge the command as properly executed when:

- the controller monitors are switched off
- |Md| (S-0-0084) >= $|Md_{Limit}|$ (S-0-0092) and
- $n_{feedback} = 0$

Note: The message '$n_{feedback}$ = 0' is influenced by the parameter **S-0-0124, Standstill Window**.

If the command is cancelled by the control after execution, then all regular controller monitors are reactivated.

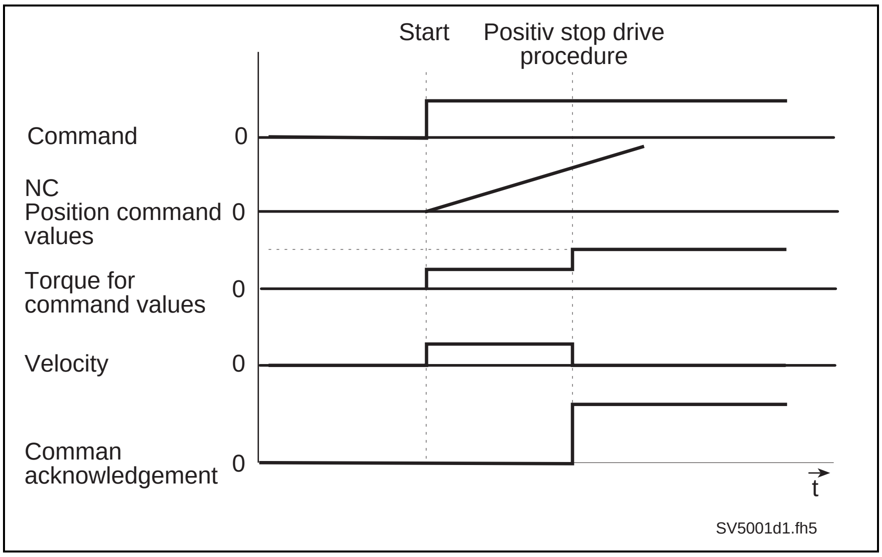


Fig. 10-24: Time sequence when activating the command: Positive stop drive procedure

10.8 Command - detect marker position

The command "Determine marker position" is used to check the correct detection of the reference markers of an incremental measuring system. This does not include an evaluation of the zero switch.

The following parameters are provided for this function:

- **S-0-0173, Marker position A**
- **P-0-0014, D500 Command determine marker position**

Functional principle of command detect marker position

Once the command **P-0-0014, D500 Command determine marker position** is activated, the following is done:

Only possible with incremental measuring systems

- The diagnosis **D500 detect marker position command** is generated.
- Check whether the encoder selected by bit 3 of **S-0-0147, Homing parameter** is an incremental measuring system. Incremental measuring systems are those connected via one of the encoder interfaces listed below. If this is not the case, then the command error message **D501 Incremental encoder required** is generated. The command cannot be executed any further.
- If an incremental measuring system is selected, then the detection of a reference marker is activated, and the drive waits for the next reference marker.
- If a reference marker is detected, then its position feedback value is stored in parameter **S-0-0173, Marker position A.** This command is now signalled as completed.

Note: No command values are generated. The mode active at command start remains unchanged. To override the reference marker, the control must generate command values, e.g., by jogging.

Possible encoder interfaces of incremental measuring systems:

Encoder interface	value in P-0-0074 or P-0-0075	Definition
2	2	Incremental measuring system with 1Vss sine signals
2	5	Incremental measuring system with TTL signals (square wave signals)
2	9	1Vss gearwheel encoder

Fig. 10-25: Possible encoder interfaces of incremental measuring systems

Additional uses of parameter "S-0-0173, Marker position A"

In parameter **S-0-0173, Marker position A**, the position of the reference marker is also stored during the command **S-0-0148, C600 Drive controlled homing procedure command**. This relates, however, to the "old" coordinate system (before the coordinate system was switched while performing a homing function).

10.9 Command Parking Axis

The command "Parking Axis" supports the operational decoupling of an axis. This may, for example, be necessary if an axis is temporarily brought to a standstill. The start of the command switches off all monitoring functions of the measuring system and the control loops.

The following parameter is available for this function:

- **S-0-0139, D700 Command parking axis**

The functional principle of the command parking axis

Command can only be executed in parameter mode

The command can only be started in parameter mode (communications phases 2 or 3). Once **S-0-0139, D700 command parking axis** is started, the following is executed:

- The measuring system monitors ,
- the control loop monitors and
- the temperature monitors

are deactivated. The measuring system initializations are not executed in command **S-0-0128, C200 communications phase 4 transition check**. "**PA**" appears at the 7-segment display. The drive no longer accepts the drive enable signal.

All active commands in the drive are cancelled when switching the communications phases back. If this command was activated, followed by a progression into communications phase 4 (operating mode), then there is no need to cancel the command, as the cancelling is only possible in communications phases 2 or 3, and any phase regression will also inevitably cancel all commands.

10.10 Programmable Limit Switch

The "Programmable Limit Switch" feature allows for 8 PLS points. An individual on- and off-switch position and a delay time are available for each PLS point.

The reference signal for the PLS can be selected

The reference signal can be either

S-0-0051, Position feedback 1 value or

S-0-0053, Position feedback 2 value.

The cycle time for evaluation is 2msec.

The corresponding PLS bit can be inverted depending on how the on- and off-switch level is set.

The following parameters are available for this feature:

- **P-0-0131, Signal Select Position Switch**
- **P-0-0132, Switch-On Treshold Position Switch**
- **P-0-0133, Switch Off-Treshold Position Switch**
- **P-0-0134, Position Switch Lead Time**
- **P-0-0135, Status Position Switch**

Function diagram for the Programmable Limit Switch

This feature shows whether the selected reference signal lies within the range between the on- and off-switch position.

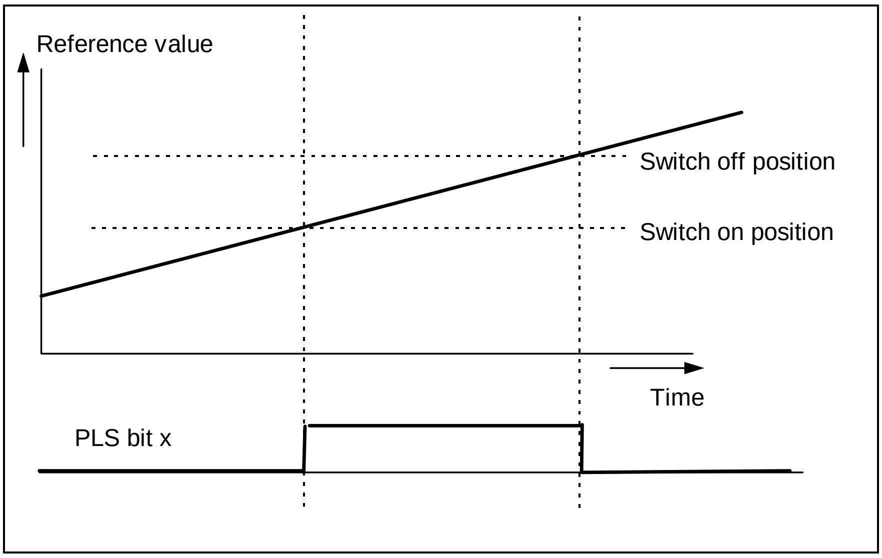


Fig. 10-26: General Function Diagram for the Programmable Limit Switch

Inverting occurs by exchanging the on- and off-switch level

The corresponding bit in the status position switch can be inverted by setting the on- and off-switch level.

There are two different situations that apply.

Switch-on position smaller than the switch-off position

If the switch-on position is programmed smaller than the switch-off position, then the following applies:

The position switch is "1" if:

- Reference signal > Xon

  AND

- Reference signal < Xoff

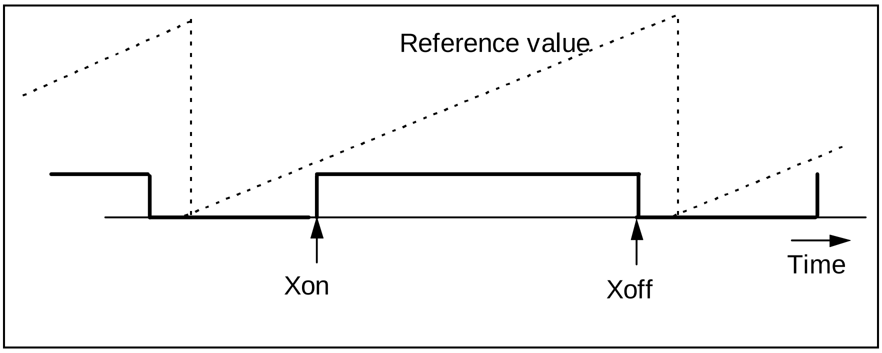


Fig. 10-27: Programmable Limit Switch With Xon < Xoff

Switch-on Position larger than the switch-off Position

The programmable limit switch is "1" if the following applies:

- Reference signal > Xon

OR

- Reference signal < Xoff

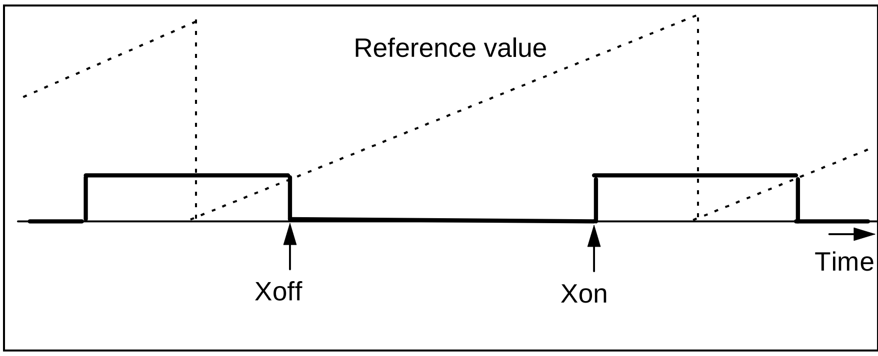


Fig. 10-28: Programmable Limit Switch With Xon > Xoff

A switch hysteresis is available to avoid position-switch flickering when the on- or off-switch level is reached.

Programmable Limit Switch Lead Time

The velocity of the drive should remain constant while using the lead time.

By setting a lead time, compensation can be made for the delay of an external switch element that is controlled by a PLS bit. In that way, a theoretical adjustment value can be calculated from the lead time and the current drive velocity for the on- and off-switch positions. The PLs bit switches by the lead time before reaching the corresponding position.

The assumption is that the velocity is constant in the range between the theoretical and real on- or off-switch position.

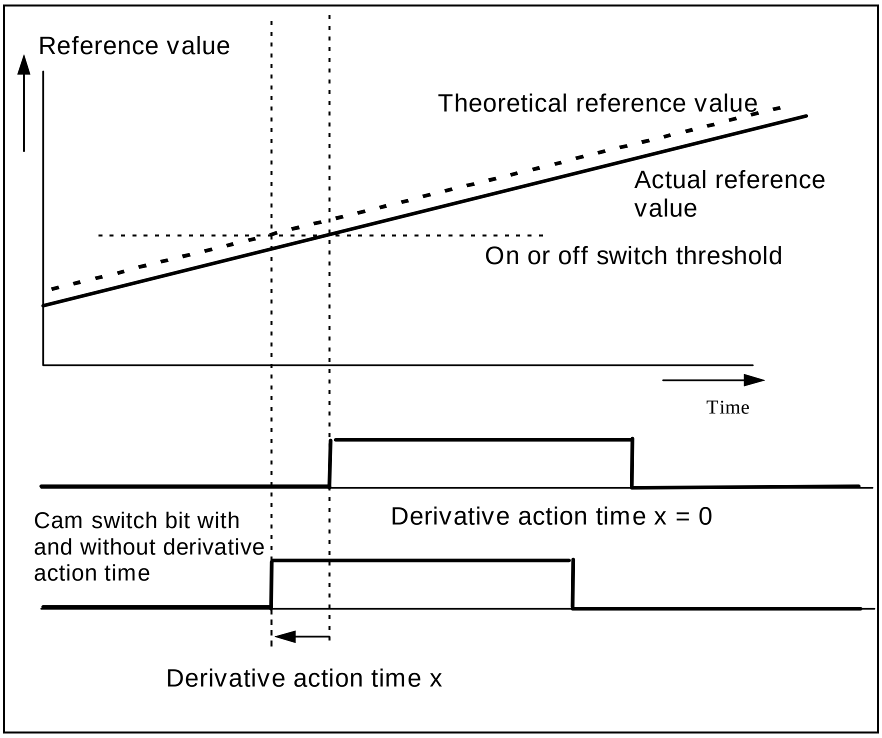


Fig. 10-29: Diagram for the Programmable Limit Switch Lead Time

Parameterizing the Programmable Limit Switch

The **P-0-0131, Signal Selection for Programmable Limit Switch** parameter is used to activate the programmable limit switch and to select a signal. The following values can be entered:

P-0-0131:	Feature:
0	The programmable limitswitch is not activated.
1	The programmable limit switch is activated; the reference signal is S-0-0051, Position feedback 1 value.
2	The programmable limit switch is activated; the reference signal is S-0-0053, Position feedback 2 value.

Fig 10-30: Programmable Limit Switch: Activation and Setting the ReferenceSignal

The P-0-0134Programmable Limit Switch Lead Time parameter always should be parameterized completely (i.e., with all 8 elements), even if not using the delay..

The programmable limit switch parameters P-0-0132, Switch-On position, P-0-0133, Switch-Off position and P-0-0134, Lead Time can be used to set the on- and off-switch thresholds as well as the lead time.

Each of these parameters contains 8 elements. Element 1 is assigned for position switch bit 1, element 2 for bit 2, and so forth.

If one or more switch bits are not given a delay, then "0" should be set for these elements in **P-0-0134, Programmable Limit Switch Lead Time**.

The status of the position switch bits are shown in parameter P-0-0135, Status Position Switch. The following diagram shows the structure of this parameter.

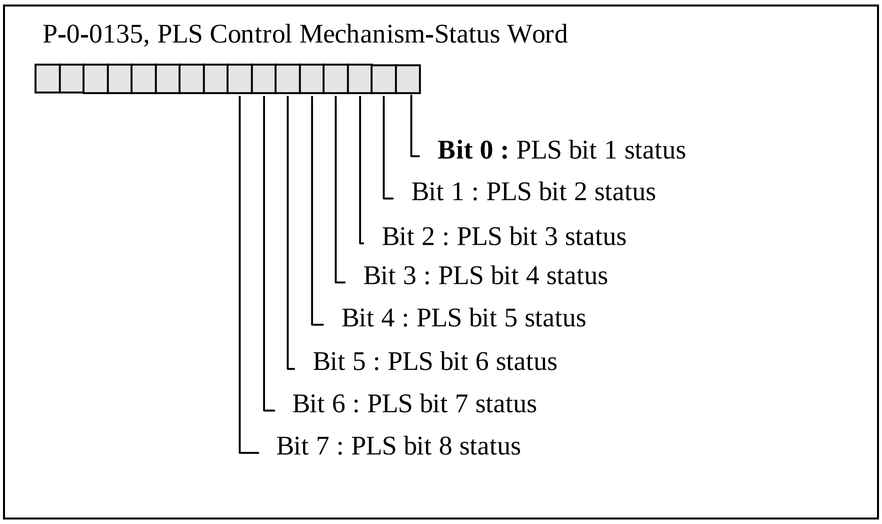


Fig 10-31: Position Switch Status

10.11 Encoder Emulation

It is possible, with the help of encoder emulation to generate positions in the usual formats

- **TTL format** with incremental encoder emulation
- **SSI format** with absolute encoder emulation.

This makes it possible for an external control to close the position control loop.

Incremental encoder emulation

Incremental encoder emulation is the reproduction of a real incremental encoder by a driver controller.

With the help of an incremental encoder signal signals are relayed via a higher-ranking numeric control (NC) entailing information about the motional speed of the motor mounted to the controller. By integrating this signal, the control generates information for itself about positions. It is thus able to close a higher-ranking position control loop.

Absolute encoder emulation

"Absolute encoder emulation" means that the drive controller has the option of emulating a real absolute encoder in **SSI data format**. The drive controller thus offers the possibility to transmit the position in SSI data format to the connected control (NC). The control is thus in a position to close the position control loop.

Pertinent Parameters

- **P-0-4020, Encoder emulation type**
- **P-0-0502, Encoder emulation, resolution**
- **P-0-0012, C300 Command 'Set absolute measurement'**

For **Incremental encoder emulation,** parameter

- **P-0-0503, Marker pulse offset**

is used.

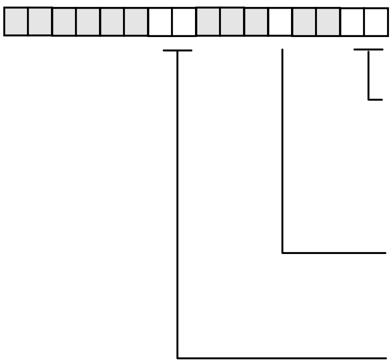
For **Absolute encoder emulation,** parameter

- **S-0-0052, Reference distance 1**

is used.

Activating Encoder Emulation

P-0-4020, Type of encoder emulation



Bit 1-0: Selecting the emulation type
0 0: - no output
0 1: - incremental encoder emulation
1 0: -absolute encoder emulation

Bit 4 : Deadtime compensation
0: - deadtime compensation is switched off
1: - deadtime compensation is active

Bit 9-8 : Selecting the emulated position
0 0: -output of the position of the motor encoder
0 1: -output of the position of the optional encoder
1 0: -output of the position command value (S-0-0047)

All other bit positions are always 0.

Fig. 10-32: Parameter encoder emulation type P-0-4020

Functional principle: Incremental Encoder Emulation

Number of lines

The **number of lines** of the emulated incremental encoder is fixed in parameter **P-0-0502, Encoder emulation, resolution**:

- **1 bis 65536 (=2^16) number of lines / revolution**

Note: If a motor with resolver feedback is mounted, then the emulator generates as many zero pulses as the resolver has pairs of poles. It must therefore be noted that the input for **P-0-0502**, **Encoder emulation, resolution** must be divisible by the number of resolver pole pairs without a remainder, otherwise the "zero pulse will run away".

Unit

The parameter unit depends on the motor type, i.e.,

- rotary motors: lines / revolution
- linear motors: linkes / mm or lines / inch

If the unit of **P-0-0502, Encoder emulation, resolution** "lines/revolution", then the zero pulse can be shifted within a revolution in a clockwise direction with the use of P-0-0503. The unit of P-0-0503 is then degrees and the input range equals 0..359.9999 degrees.

Position of the Zero Pulse as Relates to Motor Position

Absolute encoder

With motor encoders that achieve an absolute and clear position within one motor revolutions after initialization, or within one electrical revolution with resolvers, the zero pulse is always generated at the same motor position each time the unit is switched on.

Limiting Incremental Encoder Emulation

In contrast to the conventional incremental encoder with which the pulseoutput frequency is practically infinitely change in very fine increments (i.e., the pulse flanks are allocated to a fix position), emulated incremental encoder signals are subject to some restrictions. These are primarily the result of how the digital process work and the drive controller.

Maximum output frequency

The maximum pulse frequency is 512 kHz. If this frequency is exceeded, then pulses could go missing. The non-fatal error **F253 Incr. encoder emulator: pulse frequency too high** is generated. An emulated positioning offset then occurs in contrast to the real position.

$$l_{max} = \frac{f_{max} * 60}{n_{max}}$$

l_{max}: maximum line number
n_{max}: allowable maximum speed in 1/min

Fig. 10-33: Computing the maximum number of lines

Compensation of delay (deadtime) between real and emulated positions

Between position measurement and pulse output, there is a dead time (delay) of abt. 1ms. If in the parameter **P-0-4020, Encoder emulation type** bit 4 is set to 1, this time is compensated in the drive.

Pulse pauses at the end of every pulse output cycle

At the end of each interval the signal levels for a specific durtion can remain constant. During the interval of T_A the output frequency may not be changed. This effect particularly effects high frequencies, i.e., with a high number of lines and/or high speeds.

Diagnostic Messages with Incremental Encoder Emulation

The following diagnoses are generated with incremental encoder emulation:

- **F253 Incr. encoder emulator: pulse frequency too high**

Cause: The output frequency at the chosen number of lines exceeds the value of 512 kHz.

Remedy:

- Decrease input for **P-0-0502, Encoder emulation, resolution**
- Drop travel speed

Cause: The output of all lines are monitored in interval and was faulty in this case so that a positioning offset occurred. The error occurs only with extremely long interrupt running times.

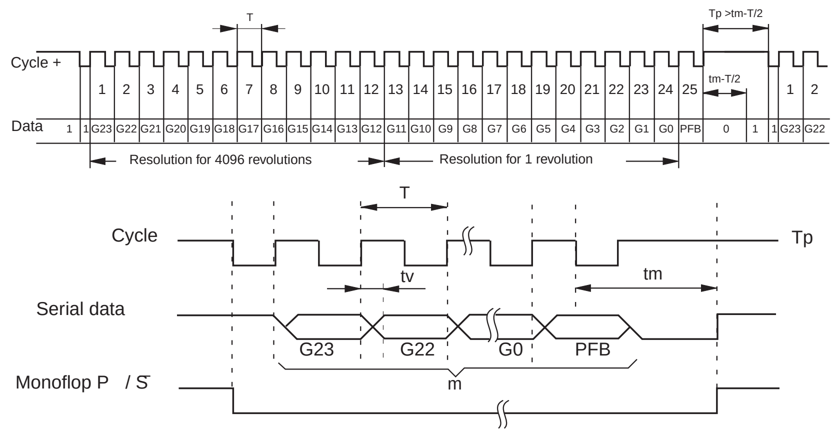
Remedy:

- All software options that are not absolute necessary are switched off, e.g., the procesing of the second analog input, signal output via both analog outputs and so on.

Functional Principle: Absolute Encoder Emulation

SSI Format

The following illustrates the format of SSI data transmission.



G0 = lowest value bit in the Gray-Code
G23 = highest value bit in the Gray-Code
m = saved parallel information
T = cycle signal period duration
tm = monoflop time 15µs to 25µs
Tp = cycle rest
tv = delay time for the first cycle max. 540ns, for all others max. 360ns
PFB = Power Failure Bit (is not used and is logically always... "0")

ap5002d1.fh7

Fig. 10-34: SSI-Format as pulse diagram

Note: **The Power Failure Bit** is not evaluated in the drive!

Resolution with Absolute Encoder Emulation

The increments per mechanical revolutions are entered in parameter **P-0-0502**, **Encoder emulation, resolution**.

Note: The **unit** of the parameter is **switched** when selecting SSI emulation via parameter **P-0-4020, Encoder emulation type.**

The input range and unit depends on **S-0-0076, Position data scaling type.** The following combinations are possible:

- 12 .. 24 bit / revolution
- 4 .. 24 bit / mm
- 8 .. 24 bit / inch.

The output direction is set in parameter **S-0-0055 Position polarities**.

Referencing with Absolute Encoder Emulation

Using parameter **P-0-0012, C300 Command 'Set absolute measurement'** it is posible to reference the absolute position output by the absolute encoder emulator .

With set absolute dimension, the value of parameter S-0-0052 Reference distance 1 is set.

Position jumps at the Display Limits of Absolute Encoder Emulation

Using SSI emulation, it is possible to illustrate 4096 revolutions absolutely. If when using SSI emulation the display limit has been reached, then small actual position fluctuations lead to large **jumps in the emulated SSI position**.

This is, e.g., the case with position 0 and 4096 revolutions.

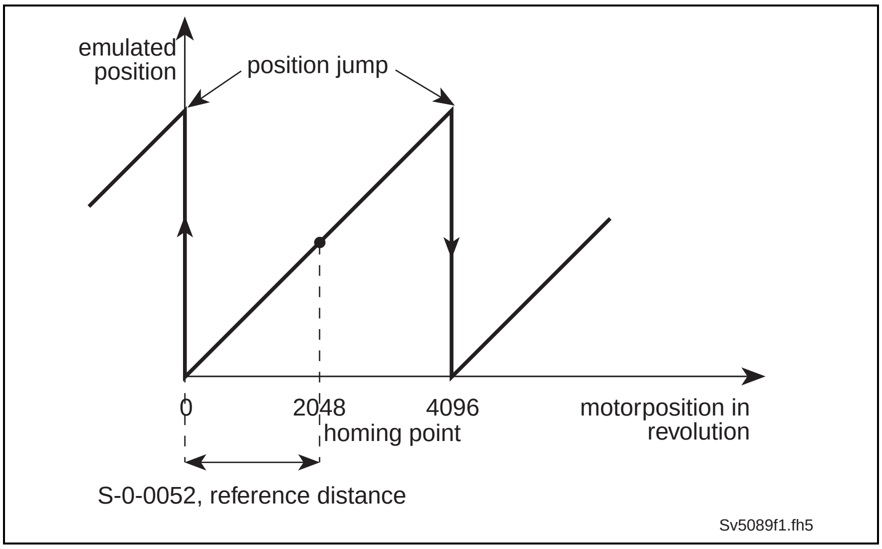


Fig. 10-35: SSI display limits

To avoid this, then use commando **P-0-0012, C300 Command 'Set absolute measurement'** to shift the SSI position value.

It is recommended to move the position into the center of the SSI display range by means of the reference actual position value 1. This offers the option of running 2048 revolutions to the left and right.

10.12 Spindle Positioning

Spindle positioning in milling and drilling spindles were used

- to prepare the change of the workpiece while the spindle remained a defined position.

Spindle positioning in lathe main spindles support the orientation of the spindle

- when changing the workpiece, if necessary,
- the putting into place of balancing drill holes in workpieces that are to be balanced,
- to index the workpiece for further machining.

In rotary tables, spindle positioning

- the relaying of the rotary table to bring the workpieces in the machining stations into a defined machining position.

A command from the control makes the drive move the spindle in terms of the zero position of the spindle. The command position can be set by means of parameters. It can be set as either an absolute or a relative position.

The spindle positioning command can, for example, position the spindle in velocity control mode in a position-controlled manner without having to switch from velocity to position control mode. The velocity command set by the control is ignored for the duration of the command.

Pertinent Parameters

The following parameters are needed for setting up spindle positioning and to execute the command:

- **S-0-0152, C900 Position spindle command**
- **S-0-0153, Spindle angle position**
- **S-0-0154, Spindle position parameter**
- **S-0-0180, Spindle relative offset**
- **S-0-0222, Spindle positioning speed**
- **S-0-0057, Position window**

Functional Principle of Command Spindle Positioning

The command spindle positioning entails two different cases:

Spindle positioning with drive already referenced

The turning spindle brakes at the velocity command value ramp set (or with active command value smoothing) to the spindle positioning velocity and runs to the specified command position with that absolute positioning which has been set.

The drive holds the position in a position controlled manner until the command is completed or a new command position is set.

Once the command is completed, the drive runs with the current velocity or torque command value.

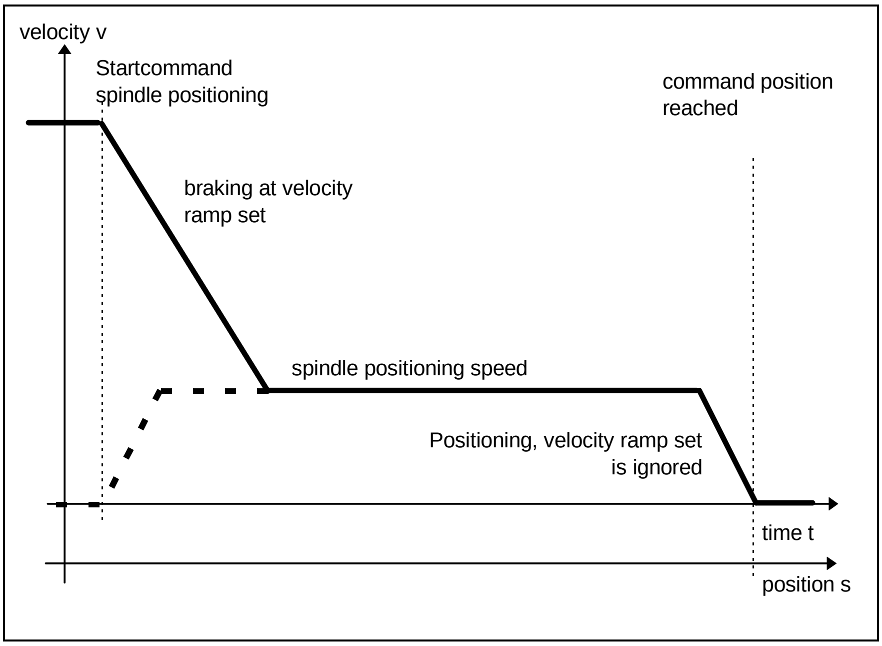


Fig. 10.36: Velocity/time diagram of spindle positioning

Various parameters are used to adapt spindle positioning to the demands of the machine:

- positioning command value, absolute or relative,
- spindle positioning speed,
- positioning rotational direction,
- selection of positioning process

If spindle speed is smaller or equal to positioning speed, then the drive goes into position control. The values set in parameters **S-0-0138, Bipolar acceleration limit value** and **S-0-0349, Jerk limit bipolar** are used for positioning acceleration and jerk.

Spindle positioning with non-referenced drive

If the drive is not in reference (**S-0-0403, Position feedback value status** bit 0 = 0) then referencing is automatically started prior to positioning.

The drive first brakes to referencing speed. At this speed, it searches for the reference pulse. As soon as it is located, the actual position values are displayed in terms of the reference pulse (also see the section: Drive-Controlled Referencing) and positioned to spindle angle position.

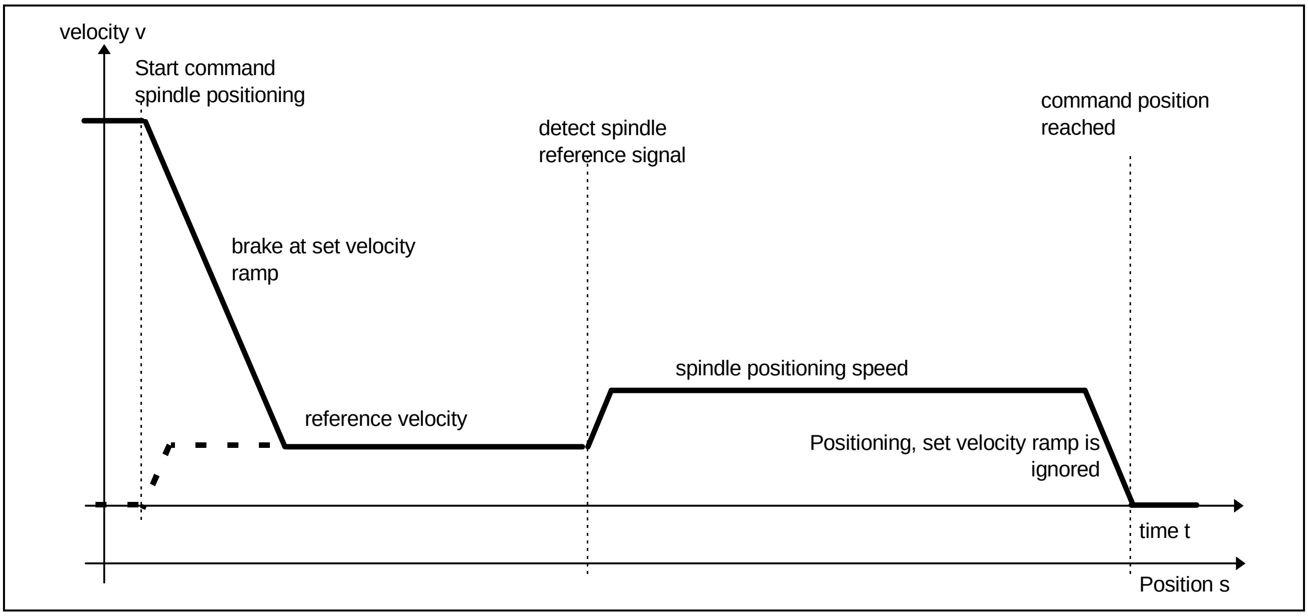


Fig. 10.37: Velocity/time diagram of spindle positioning with referencing

Positioning

With the command spindle positioning, it is possible to position the spindle via an encoder or a spindle reference switch.

Which positioning procedure is actually used depends on the way the motor is mechanically coupled to the spindle.

Spindle motor coupling	Positioning procedure: Spindle positioning via...		
rigid coupling, i = 1	motor feedback		
gearbox and indexing mechanical, non-slip, i≠1		spindle reference switch	spindle feedback
belt coupling, slip			spindle feedback

Fig. 10-38: Positioning procedure depends on spindle/motor coupling

Note: Spindle reference switch equals reference point switch

spindle feedback equals an optional encoder

Positioning to Feedback

If command spindle positioning is conducted with a feedback then the encoder used determines the degree of accuracy of the positioning procedure.

Positioning accuracy

Measuring system	Used as ..	Positioning accuracy
high-resolution motor feedback (with 2AD and ADF: type 3)	motor feedback	abs.:±0,02grd (±1,2') rel.: ±0,01'
digital servo feedback (with 2AD and ADF: type 6 u.7) (with MDD: type L u. M)	motor feedback	abs.:±0,009grd (±0,5') rel.: ±0,01'
high-resolution main spindle position encoder (with 1MB)	motor feedback	see doc. no. 209-0042-4119
high-resolution main spindle position encoder	spindle feedback	see doc. no. 209-0042-4119
incremental encoder with square-wave signals TTL	spindle feedback	abs.:see manuf. rel.: equals inc.
incremental encoder with sine signals $1V_{SS}$	spindle feedback	abs.: see manuf. rel.: 2^{-10}/Incr.
GDS, digital single turn encoder	spindle feedback	see doc. nol. 209-0069-4360

Fig. 10-39: For spindle positioning with measuring systems and their resolutions

The achievable positioning accuracy at the spindle depends on:

- the absolute accuracy of the measuring system used as feedback
- the accuracy of the mechanical transmission components

Data about the spindle reference switch

Positioning with a spindle reference switch

If the spindle is coupled to the motor via a slip free gearbox then positioning to an operating cam mounted to the spindle is possible.

Mounting the spindle reference switch

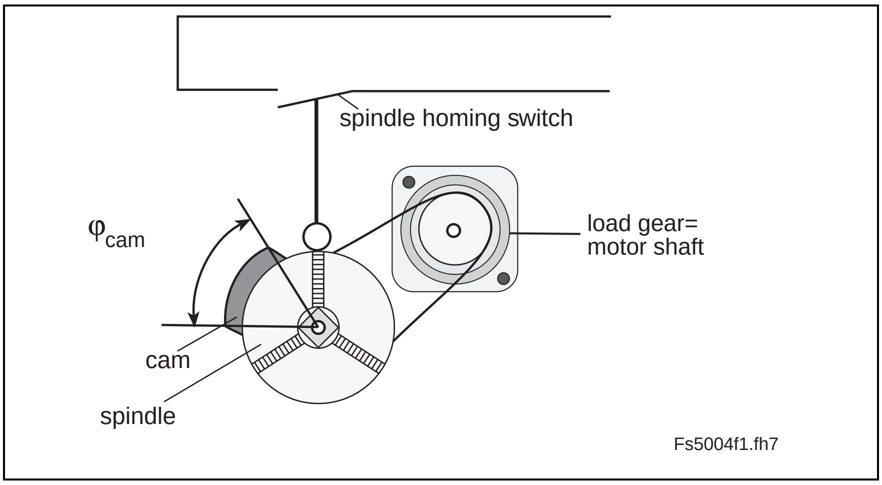


Fig. 10-40: Cam angle of the spindle reference switch

Accuracy of Spindle Reference Switch Detection

The accuracy of tis type of positioning is less than with positioning with a spindle encoder. The encoder-specific information about positioning accuracy also applies in this case!

The accuracy depends largely on the referencing velocity:

$$\Delta\varphi_{\max} = n_{ref} * 250\mu s * \frac{360° * \min}{60s}$$

$\Delta\varphi_{\max}$:	grteatest inaccuracy with the detection of the spindle reference signal
n_{ref}:	referencing velocity in $\min^{-1}$

Fig 10-41: Computing the systematic inaccuracy of spindle reference signals detection

To make sure that the spindle reference signal is correctly read in, the operating cam must cover a minimum angle:

$$\varphi_{Nocken} > n_{ref} * 250\mu s * \frac{360° * \min}{60s}$$

φ_{Nocken} :	angle of the operating cam
n_{ref}:	referencing velocity in $\min^{-1}$

Fig 10-42: Computing the cam angle

The minimum angle of the operating cam computed as above simultaneously represents the systematic inaccuracy of spindle reference switch detection.

Detecting the Spindle Reference Switch Signal

The spindle reference signal is detected before the command is executed and always at the same spot. The rotational direction of the spindle is irrelevant.

If a <u>clockwise</u> rotational direction has been set in **S-0-0147, Homing parameter**, then the clockwise turning of the spindle sets the position of the rising right switching edge as the reference position.

A counterclockwise rotation of the spindle sets the position of the falling right switching edge as the reference position.

If a <u>counterclockwise</u> rotational direction has been set in **S-0-0147, Homing parameter,** then the counterclockwise turning of the spindle sets the position of the rising left switching edge, and with a clockwise rotation of the spindle the position of the falling left switching edge as the reference position.

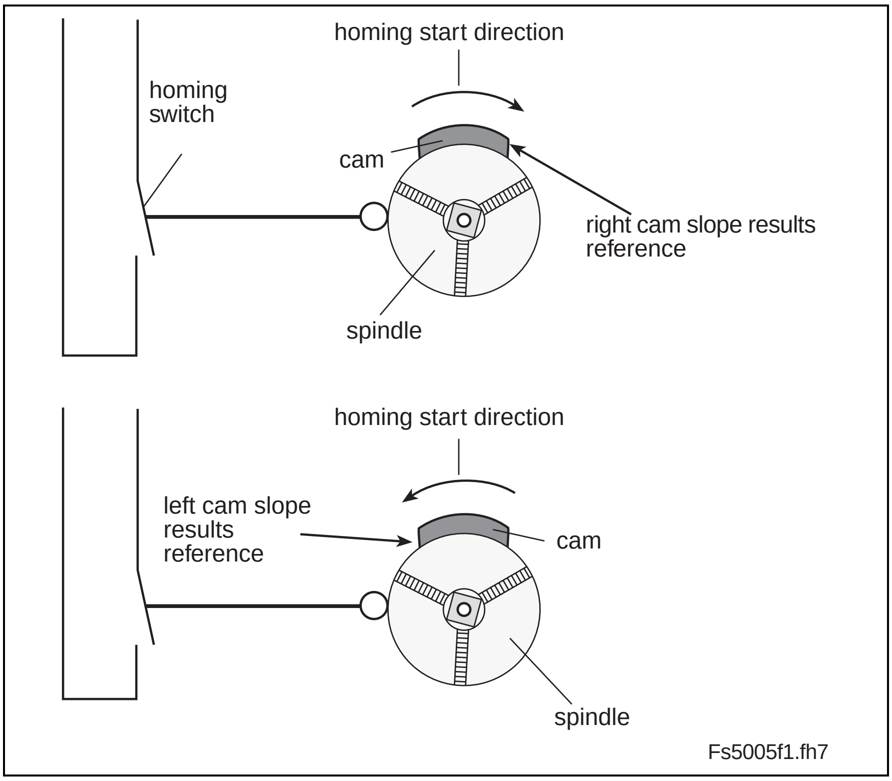


Fig. 10-43: Reference position with spindle positioning

The Affects of Control Hysteresis

If a referenced spindle is positioned to the reference switch out of differing rotational directions, then the degree of inaccuracy is increased in terms of the hysteresis of the control cam.

Reason: Inaccuracy is increased because the switching edge that is evaluated alternates between the positive and negative one.

Starting Up Spindle Positioning

Pre-programming

First, the basic configuration of the drive must be completed particulary

- the encoder system
- controller settings including position control
- all settings of the position data (the position reference to the reference point should be set or it should be possible to conduct the command drive-guided referencing)
- parameters **S-0-0124, Standstill window, S-0-0157, Velocity window** and **S-0-0057, Position window** must contain usable values.

Note:	Spindle positioning can be started if the spindle is standing still or turning.

Selecting the positioning procedure

With parameter **S-0-0147, Homing parameter** it is possible to select between:

- positioning with an encoder or
- positioning with a spindle reference switch

Bits 3, 5 and 6 are of the parameter are important for spindle positioning:

S-0-0147	Positioning procedure
Bit 3 = 0 Bit 5 = 0 Bit 6 = 1	Positioning with spindle reference switch
Bit 3 = 0 Bit 5 = 1 Bit 6 = 0	Positionining with motor encoder
Bit 3 = 1 Bit 5 = 1 Bit 6 = 0	Positionining with spindle encoder

Fig. 10-44: Selecting the positioning procedure

The type of spindle positioning can be set in **Parameter S-0-0154, Spindle position parameter**. It is possible to individually set:

- spindle moving clockwise
- spindle moving counterclockwise
- shortest path
- absolute positioning
- relative postioning

Spindle turning clockwise or counterclockwise / shortest path

The rotational direction of the drive is set in **Bits 0 and 1**.

Note: The positioning direction "clockwise" or "counterclockwise" is only noted if the spindle is standing still prior to start of the command or moving at a speed smaller than set in **S-0-0124, Standstill window**. If the spindle is already turning, then positioning takes place out of the current rotational direction.

Absolute/relative positioning

Bit 2 sets whether a spindle angle position is to be approached (absolute positioning) or whether the spindle path is to be run (relative positioning).

Note: It makes sense to have the spindle standing still before switching from absolute to relative positioning to start the traversing angle with a defined start position. The switch from absolute to relative positioning and vice versa is immediate even if the spindle positioning command is running.

Executing spindle positioning

Given a drive enable signal command **S-0-0152, C900 Position spindle command** is started. Upon completion the spindle is positioning-controlled on the command position (**S-0-0153, Spindle angle position**) or has turned to the relative position (**S-0-0180, Spindle relative offset**).

The successful completion of the command can be queried in parameter **S-0-0013, Class 3 diagnostics**.

S-0-0013, Class 3 diagnostics Bit 6 (message inPosition) is set as soon as the spindle position is within the programmable tolerance range around the command position (**S-0-0153, Spindle angle position, ± S-0-0057, Position window**).

The following graphic illustrates this.

Message InPosition

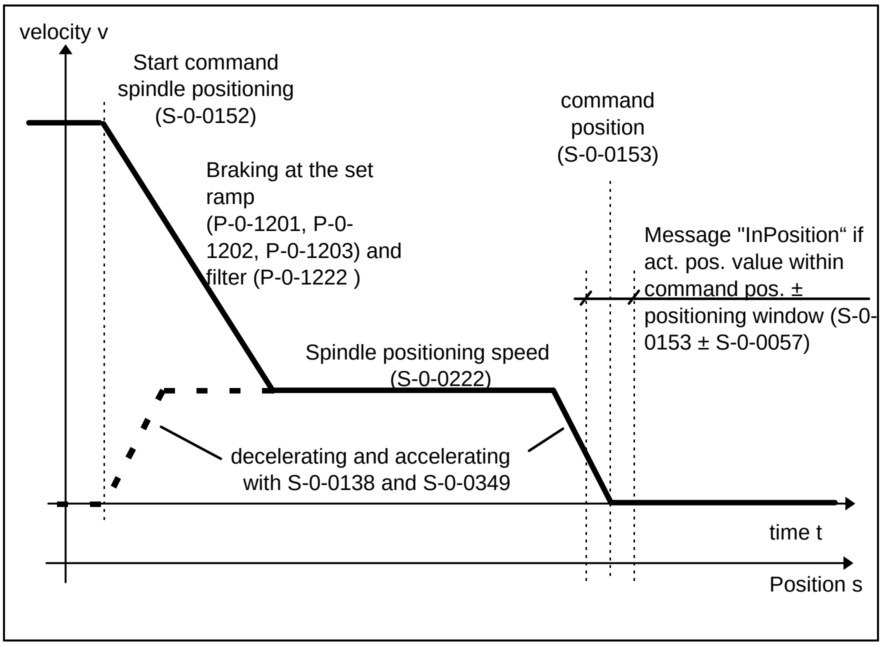


Fig. 10-45: Velocity/time diagram with in position message when spindle positioning

Diagnostic Messages

While executing command spindle positioning, the following diagnostic messages can occur.

Messages with error-free execution

While the command is being executed the H1 display of the controllers reads "C9“.

Messages with faults

C902 Spindle positioning requires drive enable:

Drive enable not set at the start of the command.

⇒ Set drive enable prior to command start!

C904 Encoder 2 not present:

The direct measuring system needed as per the homing parameter (spindle feedback or external encoder) is either missing or not connected.

⇒ Check spindle feedback connection.

C905 Positioning with non-init. absolute encoder impossible:

Motor or spindle feedback is an absolute encoder. The spindle, however, cannot position as command "Set absolute dimension" has not yet been executed.

⇒ Command **P-0-0012, C300 Command 'Set absolute measurement'** must be executed (see section: "Set Absolute Measuring"

Other fault causes

If the spindle turns after command start without positioning:

- The spindle reference switch is not recognized.

⇒ Check spindle reference switch and wiring functions!

- or -

- Value in parameter **S-0-0157, Velocity window** is at 0.

If the spindle runs to the wrong target position:

- The value in parameter **S-0-0103, Modulo value** is not equal to 360.
- Gear ratio not correct (with positioning via motor feedback with spindle reference switch).

⇒ Enter correct gear ratio in parameter **S-0-0121** and **S-0-0122**, **Output revolutions of load gear** and **-Input revolutions of load gear**.

- or -

- Motor or spindle feedback faulty or not synchronous

⇒ Motor or spindle feedback and its synchronization must be checked in the relevant parameters.

- or -

- Parameter **S-0-0076, Position data scaling type** for position data is incorrectly set.

If the drive shuts down with error message "F228 Excessive deviation":

The spindle cannot follow the internally set position command values.

⇒ Check whether the spindle is mechanically blocked.

⇒ Check whether the parameter value in **S-0-0159, Monitoring window**, is sufficiently high and increase, if necessary!

⇒ Reduce value in parameter **S-0-0138, Bipolar acceleration limit value**.

If the spindle is in the desired position, but "S-0-0336, Message In position" is not signalled:

The spindle position cannot be held by position control in the positioning window around the position command value

⇒ Check whether **S-0-0057, Position window** on 0, if yes, change

⇒ Check whether **S-0-0124, Standstill window** correctly parametrized

⇒ Stabilize an erratic actual position value by changng position and speed control parameters!

⇒ If actual position value cannot be stabilized, increase the value in parameter **S-0-0057, Position window**

⇒ Check configuration of **S-0-0144, Signal status word** and **S-0-0013, Class 3 diagnostics**

Connecting the reference switch

See the Project Planning Manual.

11 Glossary

Data status

Every parameter has at its disposal a data status. It can be read by the control via the required data channel. The information on the validity of the parameter or the command acknowledgment of the command are contained therein.

Error reaction or response

If an error is detected in the drive, then the drive reacts independently by executing an error reaction. At the end of each error reaction there is a deactivation of the drive. The error reaction type is dependent on the error class of the error that occurred as well as the setting in parameters P-0-0117..119.

E-Stop

E-Stop (Emergency Stop) is the determination for a hardware input at the drive controller. It is used to trigger the emergency stop function in the drive.

External encoder

An external measuring system is optional. It is generally mounted directly to the load. The actual feedback value of the encoder can be seen in S-0-0053, Actual feedback value 2. By activating the position control operating mode with encoder 2, the position control loop is closed with the help of the actual feedback value of the external encoder.

Ident Number

Every parameter is designated unambiguously by its ident number (IDN). It consists of these 3 components: S-Sercos/P-Product specific, parameter set (0..7) and a number (1..4096).

Load default or basic load

The control parameters are stored in the motor feedback data memory in both MDD and MKD motors. This makes it possible for the drive controller to work trouble-free with this motor. The control parameters have not been optimized for the application.

Modulo format

Both actual feedback and command values can be processed in modulo or absolute format. If modulo processing has been set, then the position data move within the range of 0..S-0-0103, modulo value. With this function, it is possible to realize an endlessly turning axis.

Motor encoder

The motor encoder is the measuring system that is used during commutation. A measuring system is absolutely necessary. The actual feedback value of the encoder can be seen in S-0-0051, Actual position value 1. By activating the position control operating mode with encoder 1, the position control loop is closed with the help of the actual position of the motor encoder.

Operating data

The operating data is data block element 7 of a parameter. The value of the parameter is stored there.

Operating mode

Operating mode is set in parameters S-0-0032..35. It determines in what way a command value is processed in the drive and eventually initiates an axis movement. The operating mode does not define how the command value reaches the drive.

Parameterization mode

The drive is in parameterization mode if communication phases 1..3 have been set. The drive cannot be activated (drive enable signal applied). Operating mode must first be switched into. Some parameters can only be written into during parameterization mode.

Programming module

The programming module contains the software and parameter memory. It is mounted in slot U5. When exchanging the controller, a simple insertion of the programming module out of the old into the new unit means that the features of the replaced unit have been transferred to the new one.

Home Switch

If during the command **S-0-0148, C600 Drive controlled homing** several reference marks can be reached within the travel range, it’s the home switch which must specify one singular mark. The home switch is connected to the respective input at the drive and activated by bit 5 in S-0-0147, Homing Parameter. This input is mirrored in the parameter **S-0-0400, Home switch**.

Scaling

The combination of unit and number of decimal places of a parameter are defined as scaling. It can be set for position, velocity and acceleration data.

SERCOS-INTERFACE

Digital interface for communication between control and drives in numerically controlled machines. One or multiple ring structures are implemented. The physical connection of the participants generally implements a fiber optic cable.

Service Channel

The non-cyclic reading and writing of parameters via the SERCOS-Interface is done in the service channel

12 Index

D

ECODRIVE03

Drive for Machine Tool Applications With SERCOS-, Analog- and Parallelinterface

Supplement A Parameter Description SMT 01VRS

DOK-ECODR3-SMT-01VRS**-FKB1-EN-P

Contents

Notes

1 General Information

Using This Manual

All standard and product specific parameters are listed in this chapter in a numerically ascending order.

This chapter supplements the feature description and represents a complete description of all parameters used in the DIAX software.
The description of the individual parameters is divided into two subsections.

1) General description
This section contains the feature or meaning of the parameter and tips for setting parameters.

2) Description of attributes

The characteristic values or features listed here help to classify the parameter. They are necessary for a complete description of the parameter. However, they are not required to get a general idea of the meaning of the parameter.

Definitions

The following abbreviations are used:

Data length:

2-byte - the data length for the operating data is 2 bytes.

4-byte - the data length for the operating data is 4 bytes.

1-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 1 byte.

2-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 2 bytes.

4-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 4 bytes.

Format:

BIN - the display format for the operating data should be binary.

HEX - the display format for the operating data should be hexadecimal.

DEC_OV - The display format for the operating data should be decimal without a sign.

DEC_MV - The display format for the operating data should be decimal with a sign.

ASCII - the operating data is an ASCII string.

IDN - the operating data is an ID number (IDN).

Editability:

No - the operating data cannot be edited.

P2 - The operating data can only be edited in communications phase 2.

P23 - The operating data can only be edited in communications phases 2 and 3.

P234 - The operating data can be edited in any communications phase.

P3 - The operating data can only be edited in communications phase 3.

P4 - The operating data can only be edited in communications phase 4.

Memory:

fixed - the operating data is programmed in the drive (fixed value).

no - The operating data is not buffered in the drive; the value is undefined after the drive controller is switched on.

Param. EE - The operating data is buffered in E²prom of the programming module (DSM).

Ampl. EE - The operating data is buffered in E²prom of the drive controller.

Feedb. EE - The operating data is buffered in the E²prom of the motor feedback data memory (only in MHD- and MKD motors).

Validity check:

no - the operating data is not checked for validity.

Phase2 - the operating data is checked in the "Communications phase 3 transition check" command.

Phase3 - the operating data is checked in the "Communications phase 4 transition check" command.

Extreme value check:

no - the operating data is not checked for its extreme values when it is written to.

yes - the operating data is checked for its extreme values when it is written to.

Combination check:

no - the operating data is not checked (bitwise) for a valid combination with other parameter values when it is written to.

yes - The operating data is checked (bitwise) for a valid combination with other parameter values when it is written to.

Cyc. transmittable:

no - The operating data cannot be configured as cyclical data in the master data telegram or in the drive telegram.

AT - The operating data can be configured as cyclical data in the drive telegram.

MDT - The operating data can be configured as cyclical data in the master data telegram.

Default Value:

The default value indicates the value of the parameter loaded into fixed memory with the current version of firmware installed on the drive following the PL program load command and prior to user edits or loading saved parameter files.

Notizen

2 Standard Parameters

S-0-0001, NC Cycle time (TNcyc)

The NC cycle time indicates the time intervals between new command values being made available by the NC. The NC cycle time must be transmitted in communications phase 2 from the master to the slave; from communications phase 3 on it must be considered in the slave.

The NC cycle time must be an integral multiple of **S-0-0002, SERCOS Cycle time (Tscyc)**.

$$T_{Ncyc} = T_{Scyc} \bullet j, \qquad \text{where } j = 1,2,3...$$

See also the functional description: "Position Command Value Monitoring"

S-0-0001 - Attributes

Para. Name:	**DE**	NC-Zykluszeit (TNcyc)		
	EN	NC Cycle time (TNcyc)		
	FR	Durée de cycle de la commande numérique (TNcyc)		
	ES	Tiempo de ciclo NC (TNcyc)		
	IT	Tempo Ciclo NC (TNcyc)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		500 / 65000		
Default value:		2000	**Cyc. transmittable:**	no

S-0-0002, SERCOS Cycle time (Tscyc)

The interface cycle time indicates the time intervals for cyclical data transfer. The interface cycle times are set to 500µs, 1ms, 2ms, ... to 65ms in increments of 1ms.

The SERCOS cycle time must be transmitted from master to slave in communications phase 2; and from communications phase 3 on it must be activated in both.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0002 - Attributes

Para. Name:	**DE**	SERCOS-Zykluszeit (TScyc)		
	EN	SERCOS Cycle time (Tscyc)		
	FR	Durée de cycle de transmission SERCOS (TScyc)		
	ES	Tiempo de ciclo SERCOS (TScyc)		
	IT	Tempo Ciclo SERCOS (TScyc)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		500 / 65000		
Default value:		4000	**Cyc. transmittable:**	no

S-0-0003, Minimum AT transmit starting time (T1min)

The slave uses this parameter value to indicate the minimum time requirement between the end of the received master synchronization telegram and the transmission of the drive telegram.

The time $T1_{min}$ is read in communications phase 2 by the master to calculate the time to send the drive telegram T1 **S-0-0006, AT Transmission starting time (T1)**.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0003 - Attributes

Para. Name:	**DE**	Sende-Reaktionszeit AT (T1min)		
	EN	Minimum AT transmit starting time (T1min)		
	FR	Temps de réaction à l'émission AT (T1min)		
	ES	Tiempo de reacción de emision AT (T1min)		
	IT	Tempo di Partenza Trasmissione mini. AT (T1min)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		400	**Cyc. transmittable:**	no

S-0-0004, Transmit/receive transition time (TATMT)

This parameter indicates the time required for the slave to switch to reception of the master data telegram after sending the drive telegram.

The transmission/reception transition time is read in communications phase 2 by the master to calculate the time to send the master data telegram T2 **S-0-0089, MDT Transmit starting time (T2)**.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0004 - Attributes

Para. Name:	**DE**	Umschaltzeit Senden-Empfangen (TATMT)		
	EN	Transmit/receive transition time (TATMT)		
	FR	Temps de transition entre transmission et réception (TATMT)		
	ES	Tiempo de conmutación emisión-recepción (TATMT)		
	IT	Tempo di Transizione Trasmis./Ricez. (TATMT)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0005, Minimum feedback acquisition time(T4min)

This is the minimum time requirement between feedback-value acquisition and the end of the master synchronization telegram. This value is indicated by the drive in such a manner that the current feedback values can be transmitted to the NC in the next drive telegram.

The master reads this value in communications phase 2 to set the acquisition starting time of the feedback values T4 **S-0-0007, Feedback acquisition starting time (T4)** for all drives.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0005 - Attributes

Para. Name:	**DE**	Mindestzeit Istwerterfassung(T4min)		
	EN	Minimum feedback acquisition time(T4min)		
	FR	Temps mini. d'acquisition des données retour (T4min)		
	ES	Tiempo mínimo registro de valor real (T4min)		
	IT	Tempo di Acquisizione Feedback minimo (T4min)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0006, AT Transmission starting time (T1)

The transmission starting time determines when the slave must send its drive telegram in communications phases 3 and 4, after the end of the master synchronization telegram.

This parameter is transmitted from the master to the slave in communications phase 2 and is active from communications phase 3 on.

The transmission time drive telegram must be set equal to or greater than the transmission reaction time **S-0-0003, Minimum AT transmit starting time (T1min)**.

The following must apply: $T1min \leq T1$

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0006 - Attributes

Para. Name:	**DE**	Sendezeitpunkt Antriebs-Telegramm (T1)		
	EN	AT Transmission starting time (T1)		
	FR	Temps de départ de transmission de l'AT (T1)		
	ES	Punto temporal de emision telegrama de accionamiento (T1)		
	IT	Tempo di Partenza Trasmissione AT (T1)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		12 / 65000		
Default value:		400	**Cyc. transmittable:**	no

S-0-0007, Feedback acquisition starting time (T4)

This is the feedback acquisition starting time set by the master after the end of the master synchronization telegram. Thus, the master can set the same feedback acquisition starting time for all drives that work together. This guarantees synchronized feedback-value acquisition among the affected drives. Also, the cyclically transferred command values are processed at time T4.

The master must set the feedback acquisition starting time equal to or less than the difference between the S-0-0002, SERCOS Cycle time (Tscyc) and the polled S-0-0005, Minimum feedback acquisition time (T4min).

The following must apply: $T4 \leq T_{Scyc} - T4min$

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0007 - Attributes

Para. Name:	**DE**	Messzeitpunkt Istwerte (T4)		
	EN	Feedback acquisition starting time (T4)		
	FR	Temps de départ d'acquisition des données retour (T4)		
	ES	Punto temporal de medición valores reales (T4)		
	IT	Tempo di Part. Acquisizione Feedback (T4)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		11 / 65000		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0008, Command valid time (T3)

The "command valid time" indicates the time after which the drive may access new command values.

Thus, the master can set the same "command valid time" for all drives that work together. The drive activates the "command valid time" beginning with communications phase 3.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0008 - Attributes

Para. Name:	**DE**	Zeitpunkt für Sollwert gültig (T3)		
	EN	Command valid time (T3)		
	FR	Temps pour consigne valide (T3)		
	ES	Punto temporal para valor nominal valido (T3)		
	IT	Tempo di Comando Valido (T3)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65000		
Default value:		1900	**Cyc. transmittable:**	no

S-0-0009, Beginning address in master data telegram

This parameter displays the start address of a drive's data record in the Master Data Telegram, expressed as a byte position. It begins with 1 for the first data byte after the address field in the MDT.

The start address of the drive's data record in the MDT is transmitted to each drive by the master in communications phase 2. The address is activated beginning with communications phase 3.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0009 - Attributes

Para. Name:	**DE**	Anfangsadresse im Master-Daten-Telegramm		
	EN	Beginning address in master data telegram		
	FR	Adresse de départ dans le MDT		
	ES	Dirección inicial en telegrama de datos maestro		
	IT	Indirizzo iniziale del Telegramma Dati Master		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65531		
Default value:		1	**Cyc. transmittable:**	no

S-0-0010, Length of master data telegram

The length in bytes of the Master Data Telegram contains the data records of all the drives. The MDT length is transmitted by the master to all drives in communications phase 2. It is activated by the master and slave beginning with communications phase 3.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0010 - Attributes

Para. Name:	**DE**	Länge Master-Daten-Telegramm		
	EN	Length of master data telegram		
	FR	Longueur du MDT		
	ES	Longitud telegrama de datos maestro		
	IT	Lunghezza del Telegramma Dati Master		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		4 / 65534		
Default value:		4	**Cyc. transmittable:**	no

S-0-0011, Class 1 diagnostics

Function: Drive lock.

A Class 1 diagnostic error situation discovered by the drive leads to:

1. The drive's error response, as described in the functional description under "Error".
2. Setting the static error bits to 1 for Class 1 diagnostic in the drive status. The error bit will not be set back to 0 by the drive until no Class 1 diagnostic error remains and command **S-0-0099, C500 Reset class 1 diagnostic** has been received by the drive via the service channel.

Parameter structure:

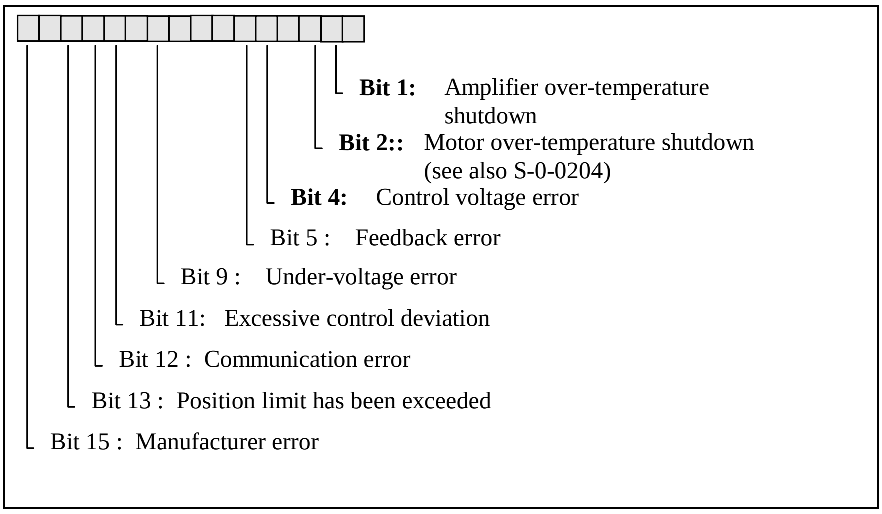


Fig. 2-1: S-0-0011, Class 1 diagnostics

Note: Only the bits indicated here are supported by the software.

See also the functional description: "S-0-0011, Class 1 diagnostics"

S-0-0011 - Attributes

Para. Name:	**DE**	Zustandsklasse 1
	EN	Class 1 diagnostics
	FR	Diagnostic de classe 1 (C1D)
	ES	Diagnosticos clase 1
	IT	Diagnostica Classe 1

Function:	Parameter	**Editability:**	no
Data length:	2Byte	**Memory:**	no
Format:	BIN	**Validity check:**	no
Unit:	--	**Extrem value check:**	no
Decimal places:	0	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	no

S-0-0012, Class 2 diagnostics

Function: Shutdown warning.

When a warning appears or disappears in Class 2 diagnostics, the change bit in the drive status word will be set to 1. When Class 2 diagnostics are read over the service channel, the change bit is reset to 0.

Parameter structure:

- Bit 0 : Overload warning **S-0-0310**
- Bit 1 : Amplifier over-temperature warning **S-0-0311**
- Bit 2 : Motor over-temperature warning **S-0-0312**
- Bit 3 : Cooling error warning **S-0-0313**
- Bit 4 : reserved
- Bit 5 : Positioning velocity > nlimit **S-0-0315**
- Bit 6: reserved
- Bit 7: reserved
- Bit 8: reserved
- Bit 9 : reserved
- Bit 10: reserved
- Bit 11: reserved
- Bit 12 : reserved
- Bit 13 : Target position outside of position limits **S-0-0323**
- Bit 14 : reserved
- Bit 15 : Manufacturer warning

Fig. 2-2: S-0-0012, Class 2 diagnostics

Note: Only the bits indicated here are supported by the software.

See also the functional description: "S-0-0012, Class 2 diagnostics"

S-0-0012 - Attributes

Para. Name:	**DE**	Zustandsklasse 2		
	EN	Class 2 diagnostics		
	FR	Diagnostic de classe 2 (C2D)		
	ES	Diagnosticos clase 2		
	IT	Diagnostica Classe 2		
Function:	Parameter		**Editability:**	no
Data length:	2Byte		**Memory:**	no
Format:	BIN		**Validity check:**	no
Unit:	--		**Extrem value check:**	no
Decimal places:	0		**Combination check:**	no
Input min/max:	--- / ---			
Default value:	---		**Cyc. transmittable:**	no

S-0-0013, Class 3 diagnostics

Function: **Operating status messages**.

When a message appears or disappears in Class 3 diagnostics, the change bit for Class 3 diagnostic in the drive status word will be set to 1. When Class 3 diagnostics are read via the service channel, the change bit is reset to 0.

Parameter structure:

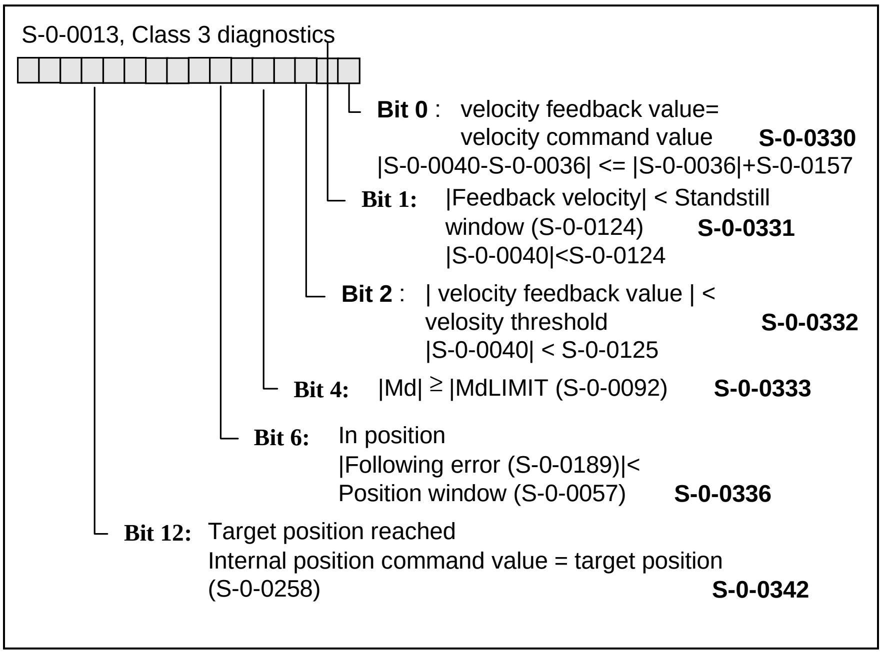


Fig. 2-3: S-0-0013, Class 3 Diagnostics

Note: Only the bits indicated here are supported by the software.

See also the functional description: "S-0-0013, Class 3 diagnostics"

S-0-0013 - Attributes

Para. Name:	**DE**	Zustandsklasse 3		
	EN	Class 3 diagnostics		
	FR	Diagnostic de classe 3 (C3D)		
	ES	Diagnosticos clase 3		
	IT	Diagnostica Classe 3		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0014, Interface status

In the least significant three bits (0, 1, 2), the current communication phase can be requested:

2: The drive is in parameter mode.

4: The drive is in operate mode.

In the bits 3-15, this parameter indicates whether a **Sercos communication error** occurred:

Note that: All bits 3 .. 15 = 0 ⇒ no error

One bit in 3 .. 15 = 1 ⇒ error pending

If a communications error occurs, then bit 12 will be set in the Class 1 diagnostic parameter (**S-0-0011**). The drive will not reset the communication error to 0 until no interface error remains and command **S-0-0099, C500 Reset class 1 diagnostic** has been received via the service channel.

Parameter structure:

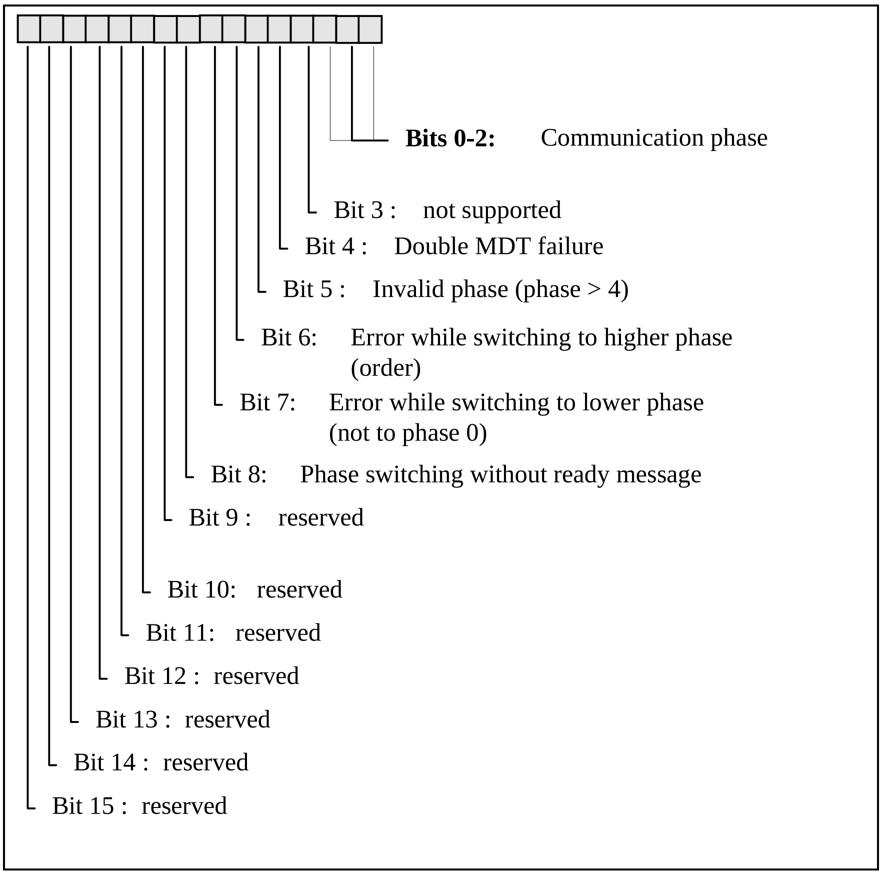


Fig. 2-4: S-0-0014, Interface status

See also the functional description: "Diagnostic of the interface Status"

S-0-0014 - Attributes

Para. Name:	**DE**	Schnittstellen-Status		
	EN	Interface status		
	FR	Etat d'interface		
	ES	Estado de interfaces		
	IT	Stato Interfaccia		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0015, Telegram type parameter

In this parameter, you can choose between priority telegrams and the configured telegram.

The telegram type that is selected will be activated in the master and slave only from communications phase 3 on.

Parameter structure:

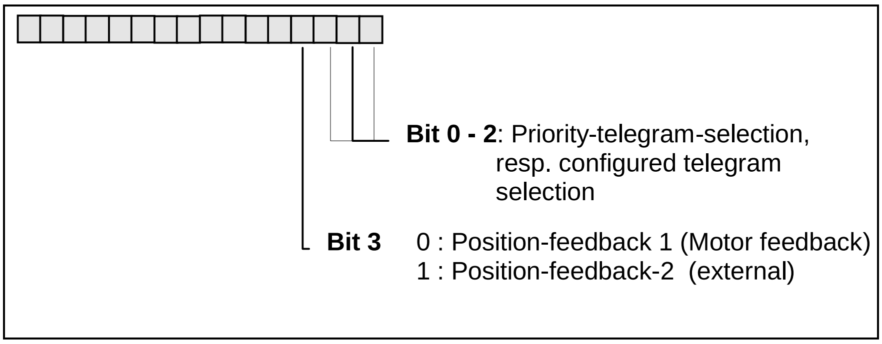


Fig. 2-5: S-0-0015, Telegram type parameter

Note: Only the bits indicated here are supported by the software.

Telegrams:

Bit 0-2:		MDT:	AT:
0	PT 0	No cyclical data	No cyclical data
1	PT 1	**DF1**: S-0-0080 Torque command	No cyclical data
2	PT 2	**DF1**: S-0-0036, Velocity command value	**DF1**: S-0-0040 Velocity feedback value
3	PT 3	**DF1**: S-0-0036, Velocity command value	**DF1**: S-0-0051/S-0-0053 Position feedback value 1
4	PT 4	**DF1**: S-0-0047, Position command value	**DF1**: S-0-0051/S-0-0053 Position feedback value 1
5	PT 5	**DF1**: S-0-0047, Position command value **DF2**: S-0-0036, Velocity command value	**DF1**: S-0-0051/S-0-0053 Position feedback value 1 **DF2**: S-0-0040 Velocity feedback value
6	PT 6	**DF1**: S-0-0036, Velocity command value	No cyclical data
7	Configurable telegram		

Fig. 2-6: Supported bits

where PT : Priority telegram
DF1/2: Data field 1/2

See also the functional description: "Configuration of Telegram Contents"

S-0-0015 - Attributes

Para. Name:	**DE**	Telegrammarten-Parameter		
	EN	Telegram type parameter		
	FR	Paramètre de type de télégramme		
	ES	Parámetros de tipo de telegrama		
	IT	Parametri Tipo Telegramma		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 15		
Default value:		0	**Cyc. transmittable:**	no

S-0-0016, Custom amplifier telegram configuration list

If a configured telegram is set in **S-0-0015, Telegram type parameter**, then this list will be used for application-specific configuration of the data record in the AT.

The list can contain only operating data that are listed in the parameter **S-0-0187, List of configurable data in the AT**.

See also the functional description: "Configuration of Telegram Contents"

S-0-0016 - Attributes

Para. Name:	**DE**	Konfig.-Liste Antriebs-Telegramm		
	EN	Custom amplifier telegram configuration list		
	FR	Liste de configuration d'AT		
	ES	Telegrama de accionamiento lista de config.		
	IT	Configurazione personalizzata Telegramma		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte var.	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0017, IDN-list of all operation data

The ID numbers for all parameters with operation data available in the drive are accessible in this IDN list.

See also the functional description: "Parameter"

S-0-0017 - Attributes

Para. Name:	**DE**	IDN-Liste aller Betriebsdaten		
	EN	IDN-list of all operation data		
	FR	Liste des IDN de toutes les données d'exploitation		
	ES	Lista IDN de todos los datos de servicio		
	IT	Lista IDN di tutti i Dati operativi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0018, IDN-list of operation data for CP2

The data of the IDN-list contains the ident-numbers of all parameters that the drive checks in the transition command for phase 3. Only when the data of the listed ident-numbers are correct, the transition command can be acquitted positive, and the transition to communications phase 3 can be allowed.

See also the functional description: "IDN List of Parameters"

S-0-0018 - Attributes

Para. Name:	**DE**	IDN-Liste Betriebsdaten Kommunikationsphase 2		
	EN	IDN-list of operation data for CP2		
	FR	Liste IDN des données d'exploitation relatives à CP2		
	ES	Lista IDN datos de servicio fase de comunicación 2		
	IT	Lista IDN di tutti i Dati per fase di comm. 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	constant
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0019, IDN-list of operation data for CP3

The data of the IDN-list contains the ident-numbers of all parameters that the drive checks in the transition command for phase 4. Only when the data of the listed ident-numbers are correct, the transition command can be acquitted positive, and the transition to communications phase 4 can be allowed.

See also the functional description: "IDN List of Parameters"

S-0-0019 - Attributes

Para. Name:	**DE**	IDN-Liste Betriebsdaten Kommunikationsphase 3		
	EN	IDN-list of operation data for CP3		
	FR	Liste IDN des données d'exploitation relatives à CP3		
	ES	Lista IDN datos de servicio fase de comunicación 3		
	IT	Lista IDN di tutti i Dati per fase di comm. 3		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	constant
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0021, IDN-list of invalid op. data for comm. Ph. 2

The drive checks whether all communications parameters are complete and correct before executing a delayed phase switch from 2 to **S-0-0127, C100 Communication phase 3 transition check** with the control system-driven transition check command.

If the drive identifies one or more IDNs as invalid, it will write the operating data that is still needed or is invalid to this ID No. list. This will be displayed to the drive by command error diagnostic message **C101 Invalid communication parameter (S-0-0021)**.

See also the functional description: "IDN List of Parameters"

S-0-0021 - Attributes

Para. Name:	**DE**	IDN-Liste ungültige Betriebsdaten Phase 2		
	EN	IDN-list of invalid op. data for comm. Ph. 2		
	FR	Liste des IDN-données d'exploitation invalides phase 2		
	ES	Lista IDN de datos de servicio no validos fase 2		
	IT	Lista IDN dei Dati oper. invalidi per Comm. in Fase 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0022, IDN-list of invalid op. data for comm. Ph. 3

Before the drive executes a delayed phase switch from 3 to **S-0-0128, C200 Communication phase 4 transition check** with the control system-driven transition check command, the drive will check parameters for the following conditions:

- Validity of the parameter
- The parameter value is found within the valid input range.
- Compatibility with other parameters.

If the result of a parameter check is negative, this operating data will be entered in the ID No. (IDN) list.

The drive then responds to the transition command with the communications error diagnostic messages

- **C201 Invalid Parameter(s) (->S-0-0022) or**
- **C202 Parameter limit error (->S-0-0022) or**
- **C203 Parameter calculation error (->S-0-0022)**

See also the functional description: "IDN List of Parameters"

S-0-0022 - Attributes

Para. Name:	**DE**	IDN-Liste ungültige Betriebsdaten Phase 3		
	EN	IDN-list of invalid op. data for comm. Ph. 3		
	FR	IDN-Liste données d'exploitation invalides phase 3		
	ES	Lista IDN de datos de servicio no validos fase 3		
	IT	Lista IDN dei Dati oper. invalidi per Comm. in Fase 3		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0024, Config. list of the master data telegram

If the configured telegram is set in **S-0-0015, Telegram type parameter**, then the configurable data record in the MDT will be configured application-specifically using this list.

The list can contain only operating data that are listed in the parameter **S-0-0188, List of configurable data in the MDT**.

See also the functional description: "Configuration of Telegram Contents"

S-0-0024 - Attributes

Para. Name:	**DE**	Konfig.-Liste Master-Daten-Telegramm		
	EN	Config. list of the master data telegram		
	FR	Liste de configuration du MDT		
	ES	Lista de configuración del MDT		
	IT	Lista Config. del Telegramma Dati Master		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte var.	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0025, IDN-list of all procedure commands

The data of the IDN-list contains the ident-numbers of all commands in the drive controller.

See also the functional description: "Commands"

S-0-0025 - Attributes

Para. Name:	**DE**	IDN-Liste aller Kommandos		
	EN	IDN-list of all procedure commands		
	FR	Liste des IDN de toutes les commandes		
	ES	Lista IDN de todos los comandos		
	IT	Lista IDN di tutti i Comandi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	constant
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		---	**Cyc. transmittable:**	no

S-0-0026, Configuration list signal status word

The data of the parameters stores the ident-numbers of the signals or bits which the signal status word (S-0-0144) contains.

The order of the ident-numbers in the configuration list determines the bit enumeration, beginning with the LSB in the signal status word.

That means, the first ident-number in S-0-0026 defines the bit 0, the second ident-number in S-0-0026 defines bit 1 in the parameter S-0-0144, Signal status word, and so on.

See also the functional description: "Configurable Signal Status Word"

S-0-0026 - Attributes

Para. Name:	**DE**	Konfigurations-Liste Signal-Statuswort		
	EN	Configuration list signal status word		
	FR	Liste de configuration pour mot d'état de signal		
	ES	Lista de configuración palabra de estado de señal		
	IT	Lista di Configurazione Parole di Stato Segnali		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

S-0-0027, Configuration list signal control word

This parameter keeps the ident numbers of the signals or bits contained in the signal control word (S-0-0145).

The order of the ident numbers in the configuration list determines the bit numbering, starting with the LSB in the signal control word. So, the first ident number in S-0-0027 defines the bit 0, the second ident number defines bit 1 in the parameter **S-0-0145, Signal control word**, and so on.

See also the functional description: "Configurable Signal Control Word"

S-0-0027 - Attributes

Para. Name:	**DE**	Konfigurations-Liste Signal-Steuerwort		
	EN	Configuration list signal control word		
	FR	Liste de configuration pour mot de contrôle de signal		
	ES	Lista de configuración palabra de mando de señal		
	IT	Lista di Configurazione Parole di Controllo Segnali		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	-
Format:		IDN	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0028, MST error counter

The MST error count counts all invalid Master Synchronization Telegrams in communications phases 3 and 4.

If two MSTs fail in direct succession, then error **F401 Double MST error shutdown** will be generated and the operation will return to phase 0.

The MST error count has a limit stop at (2^16) - 1. This means that during a highly distorted transfer the MST Error count will show the value 65535 after a long time.

See also the functional description: "Error Count for Telegram Interrupts"

S-0-0028 - Attributes

Para. Name:	**DE**	Fehlerzähler MST		
	EN	MST error counter		
	FR	Compteur de MST erronés		
	ES	Contador de errores MST		
	IT	Contatore errori MST		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_0V	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0029, MDT error counter

This parameter counts all invalid Master Data Telegrams in communications phases 3 and 4.

If two MDTs fail in direct succession, then error **F401 Double MST error shutdown** will be generated, and the operation will return to phase 0.

The MDT error counter has a limit stop at (2^16) - 1. This means that during a highly distorted transfer the MDT error count will show a value of 65535 after a long time.

See also the functional description: "Error Count for Telegram Interrupts"

S-0-0029 - Attributes

Para. Name:	**DE**	Fehlerzähler MDT		
	EN	MDT error counter		
	FR	Compteur de MDT erronés		
	ES	Contador de errores MDT		
	IT	Contatore errori MDT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0030, Manufacturer version

The **version of the drive firmware** can be read from this parameter as plain text. The **structure** of the manufacturer version is defined as follows:

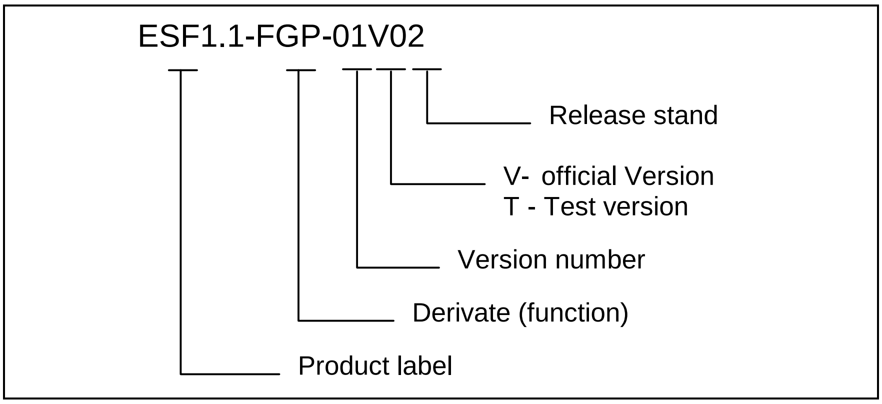


Fig. 2-7: Manufacturer Version

Examples:

HSM1.1-SSE-01V02

ESF1.1-FGP-01V02

See also the functional description: "ECODRIVE03 - a Drive Family"

S-0-0030 - Attributes

Para. Name:	**DE**	Hersteller-Version		
	EN	Manufacturer version		
	FR	Version du fabriquant		
	ES	Version de fabricante		
	IT	Versione Costruttore		
Function:		Parameter	**Editability:**	no
Data length:		1Byte var.	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0032, Primary mode of operation

The drive follows one out of four possible operation modes, as soon as the 7-segment display shows "AF". The four possible operation modes must be defined in the parameters

- **S-0-0032 Primary mode of operation**
- **S-0-0033 Secondary operation mode 1**
- **S-0-0034 Secondary operation mode 2**
- **S-0-0035 Secondary operation mode 3**

In devices without bus interface (SERCOS Interface, Profibus-DP, ...), only the primary mode of operation (S-0-0032) is possible. The secondary operation mode 1 is set to jog mode and cannot be altered; the jog mode is activated with the jog inputs.

In devices with bus interface, the control sets in the master control word, which of the 4 operation modes (S-0-0032..35) should be active.

The operating mode is selected by entering a bit list. In this bit list, certain positions have a fixed definition.

For example, bit 3 chooses whether the position control should work without lag or with a lag distance.

The following applies:

Bit 3 = 0: Position control with lag distance

Bit 3 = 1: Lagless position control

Bit list:	**Meaning:**
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive internal interpolation, encoder 1
0000,0000,0001,x100	Drive internal interpolation, encoder 2
0000,0010,0001,x011	Relative drive internal interpolation, encoder 1
0000,0010,0001,x100	Relative drive internal interpolation, encoder 2
0000,0010,0011,x011	Position control with process blocks, encoder 1
0000,0010,0011,x100	Position control with process blocks, encoder 2
1100,0000,0000,x011	Stepper motor Operations
1100,0000,0001,1011	Jog Mode (manual)

Fig. 2-1: Mode of Operation

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0032 - Attributes

Para. Name:	**DE**	Hauptbetriebsart		
	EN	Primary mode of operation		
	FR	Mode de fonctionnement primaire		
	ES	Tipo de servicio principal		
	IT	Modo operativo primario		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0033, Secondary operation mode 1

The mode of operation defined in this parameter will be activated in the drive if:

- The secondary operation mode 1 is selected in the master control word (bits 8 and 9 = 01)
- The control and power sections are ready for operation.
- The drive enable (RF) is set.

The operating mode can be selected by entering a bit list. Specific positions are defined in the bit list.

In bit 3, you can choose between working with position control without lag or with a lag distance.

Note: In devices without bus interface (SERCOS Interface, Profibus-DP, ...), only the primary mode of operation (S-0-0032) is possible. The secondary operation mode 1 is set to jog mode and cannot be altered; the jog mode is activated with the jog inputs.

The following applies:

Bit 3 = 0 position control with lag distance (following error)

Bit 3 = 1 position control without lag

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive internal interpolation, encoder 1
0000,0000,0001,x100	Drive internal interpolation, encoder 2
0000,0010,0001,x011	Relative drive internal interpolation, encoder 1
0000,0010,0001,x100	Relative drive internal interpolation, encoder 2
0000,0010,0011,x011	Position control with process blocks, encoder 1
0000,0010,0011,x100	Position control with process blocks, encoder 2
1100,0000,0000,x011	Stepper motor Operations
1100,0000,0001,1011	Jog Mode (manual)

Fig. 2-2: Mode of Operation

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0033 - Attributes

Para. Name:	**DE**	Nebenbetriebsart 1		
	EN	Secondary operation mode 1		
	FR	Mode de fonctionnement secondaire 1		
	ES	Tipo de servicio secundario 1		
	IT	Modo operativo secondario 1		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0034, Secondary operation mode 2

The mode of operation defined in this parameter will be activated in the drive if:

- The secondary operation mode 2 is selected in the master control word (bits 8 and 9 = 10)
- The control and power sections are ready for operation.
- The drive enable (RF) is set.

The operating mode can be selected by entering a bit list. Specific positions are defined in the bit list.

In bit 3, you can choose between working with position control without lag or with a lag distance.

Note: In devices without bus interface (SERCOS Interface, Profibus-DP, ...), only the primary mode of operation (S-0-0032) is possible. The secondary operation mode 1 is set to jog mode and cannot be altered; the jog mode is activated with the jog inputs.

The following applies:

Bit 3 = 0 position control with lag distance (following error)

Bit 3 = 1 position control without lag

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive internal interpolation, encoder 1
0000,0000,0001,x100	Drive internal interpolation, encoder 2
0000,0010,0001,x011	Relative drive internal interpolation, encoder 1
0000,0010,0001,x100	Relative drive internal interpolation, encoder 2
0000,0010,0011,x011	Position control with process blocks, encoder 1
0000,0010,0011,x100	Position control with process blocks, encoder 2
1100,0000,0000,x011	Stepper motor Operations
1100,0000,0001,1011	Jog Mode (manual)

Fig. 2-3: Mode of Operation

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0034 - Attributes

Para. Name:	**DE**	Nebenbetriebsart 2		
	EN	Secondary operation mode 2		
	FR	Mode de fonctionnement secondaire 2		
	ES	Tipo de servicio secundario 2		
	IT	Modo operativo secondario 2		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0035, Secondary operation mode 3

The mode of operation defined in this parameter will be activated in the drive if:

- The secondary operation mode 3 is selected in the master control word (bits 8 and 9 = 11)
- The control and power sections are ready for operation.
- The drive enable (RF) is set.

The operating mode can be selected by entering a bit list. Specific positions are defined in the bit list.

In bit 3, you can choose between working with position control without lag or with a lag distance.

Note: In devices without bus interface (SERCOS Interface, Profibus-DP, ...), only the primary mode of operation (S-0-0032) is possible. The secondary operation mode 1 is set to jog mode and cannot be altered; the jog mode is activated with the jog inputs.

The following applies:

Bit 3 = 0 position control with lag distance (following error)

Bit 3 = 1 position control without lag

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive internal interpolation, encoder 1
0000,0000,0001,x100	Drive internal interpolation, encoder 2
0000,0010,0001,x011	Relative drive internal interpolation, encoder 1
0000,0010,0001,x100	Relative drive internal interpolation, encoder 2
0000,0010,0011,x011	Position control with process blocks, encoder 1
0000,0010,0011,x100	Position control with process blocks, encoder 2
1100,0000,0000,x011	Stepper motor Operations
1100,0000,0001,1011	Jog Mode (manual)

Fig. 2-4: Mode of Operation

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0035 - Attributes

Para. Name:	**DE**	Nebenbetriebsart 3		
	EN	Secondary operation mode 3		
	FR	Mode de fonctionnement secondaire 3		
	ES	Tipo de servicio secundario 3		
	IT	Modo operativo secondario 2		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0036, Velocity command value

This parameter is used to set the velocity command value. This together with **S-0-0037, Additive velocity command value** determines the effective Velocity Command Value for the drive.

In the position control operating modes, this parameter displays the output error signal of the position controller.

See also the functional description: "Mode: Velocity Control"

S-0-0036 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Sollwert
	EN	Velocity command value
	FR	Valeur de commande de vitesse
	ES	Valor nominal de velocidad
	IT	Valore di Velocità comandato

Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	no
Format:	DEC_MV	**Validity check:**	no
Unit:	S-0-0044	**Extrem value check:**	yes
Decimal places:	S-0-0044	**Combination check:**	no
Input min/max:	S-0-0044 / S-0-0044		
Default value:	---	**Cyc. transmittable:**	MDT

S-0-0037, Additive velocity command value

The additional velocity command value is added to the **S-0-0036, Velocity command value** in the drive.

See also the functional description: "Mode: Velocity Control"

S-0-0037 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Sollwert additiv		
	EN	Additive velocity command value		
	FR	Valeur de commande de vitesse supplémentaire		
	ES	Valor nominal adicional de velocidad		
	IT	Comando di Velocità addizzionale		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0040, Velocity feedback value

The velocity feedback value can be transferred from the drive control device to the control system either cyclically or via the service channel.

See also the functional description: "Preparations for Setting the Velocity Controller"

S-0-0040 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Istwert		
	EN	Velocity feedback value		
	FR	Valeur de retour de vitesse		
	ES	Valor real de velocidad		
	IT	Feedback di Velocità		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0044	**Extrem value check:**	no
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0041, Homing velocity

The product of S-0-0041, Homing velocity and S-0-0108, Feedrate override determines the velocity for the **S-0-0148, Drive controlled homing procedure** command.

If, in the case of an absolute encoder, the **S-0-0148, Drive controlled homing** procedure is initiated, then the drive will proceed with this velocity to the reference point (home position) that was determined with the **set absolute measurement**, P-0-0012 command.

See also the functional description: "Drive-Controlled Homing"

S-0-0041 - Attributes

Para. Name:	**DE**	Referenzfahr-Geschwindigkeit		
	EN	Homing velocity		
	FR	Vitesse de prise d'origine		
	ES	Velocidad de puesta a cero		
	IT	Velocità per Azzeramento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0042, Homing acceleration

This parameter indicates the acceleration value at which the drive executes the command **S-0-0148, C600 Drive controlled homing procedure command**.

See also the functional description: "Drive-Controlled Homing"

S-0-0042 - Attributes

Para. Name:	**DE**	Referenzfahr-Beschleunigung		
	EN	Homing acceleration		
	FR	Accélération de prise d'origine		
	ES	Aceleración de puesta a cero		
	IT	Accellerazione per Azzeramento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / S-0-0160		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0043, Velocity polarity parameter

This parameter is used to switch the polarity of the velocity data in relation to the application.

Polarities are switched externally, at the input and output of a control system rather than inside the system.

The following applies to rotary motors:

Clockwise rotation when facing the motor shaft is the rule for a positive velocity command value and a positive polarity.

The following applies to linear motors:

The positive direction is used when the primary is moving toward the linear motor power cable side.

Parameter structure:

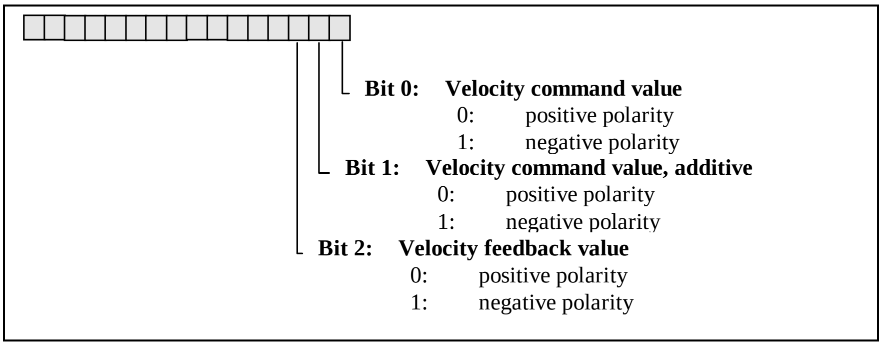


Fig. 2-8: S-0-0043, Velocity polarity parameter

Note: The bits 1 and 2 are copies of bit 0. Only changes of bit 0 have an effect. Different settings of the single bits are not possible!

See also the functional description: "Command Polarities and Actual Value Polarities"

S-0-0043 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Polaritäten-Parameter		
	EN	Velocity polarity parameter		
	FR	Paramètre de polarité de vitesse		
	ES	Parámetros de polaridad de velocidad		
	IT	Parametro Direzione Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 7		
Default value:		0	**Cyc. transmittable:**	no

S-0-0044, Velocity data scaling type

Various scaling types can be defined for the velocity data in the drive.

Examples: RPM → rotary

mm/min → linear

Structure of the parameter:

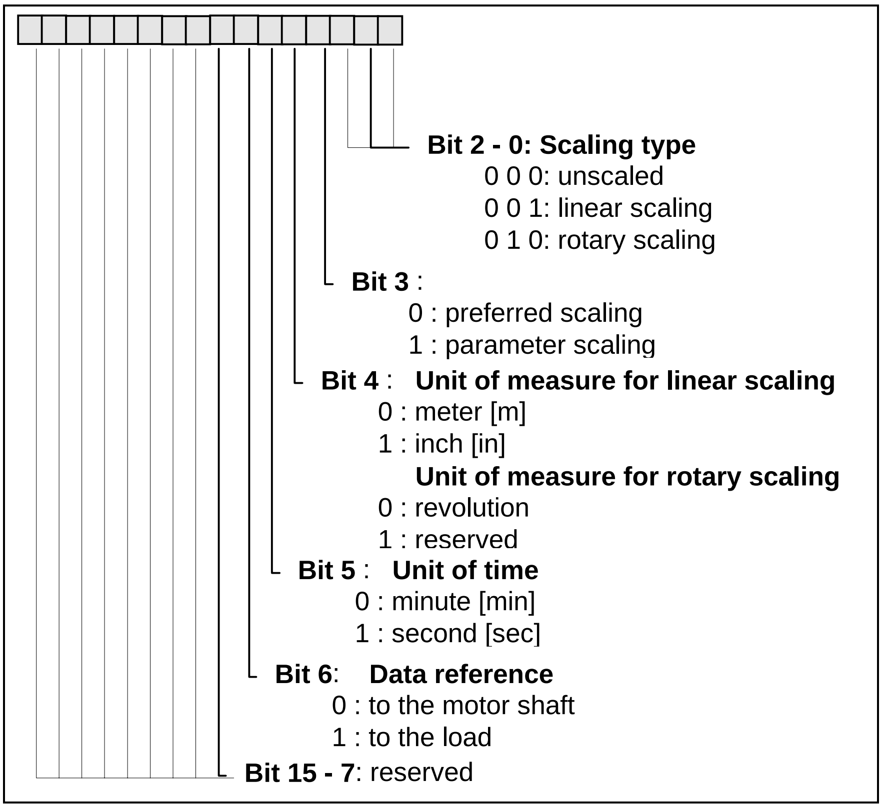


Fig. 2-5: S-0-0044, Velocity Data Scaling Type

See also example under **S-0-0045, Velocity Data Scaling Factor** and functional description: "Velocity Data Display Format"

S-0-0044 - Attributes

Para. Name:	**DE**	Wichtungsart für Geschwindigkeitsdaten		
	EN	Velocity data scaling type		
	FR	Type de calibrage pour données de vitesse		
	ES	Tipo de escala de datos de velocidad		
	IT	Tipo di Scala per Dati di Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		1010b	**Cyc. transmittable:**	no

S-0-0045, Velocity data scaling factor

This parameter defines the scaling factor for all velocity data in the drive.

If preferred scaling is set with **S-0-0044, Velocity data scaling type**, this parameter will be set to 1.

See also the functional description: "Velocity Data Display Format"

S-0-0045 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor für Geschwindigkeitsdaten		
	EN	Velocity data scaling factor		
	FR	Facteur de calibrage pour données de vitesse		
	ES	Factor de escala para datos de velocidad		
	IT	Fattore di Scala per Dati Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		1	**Cyc. transmittable:**	no

S-0-0046, Velocity data scaling exponent

The scaling exponent for all velocity data in the drive is determined in this parameter.

See also functional description: "Velocity Data Display Format"

S-0-0046 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent für Geschwindigkeitsdaten		
	EN	Velocity data scaling exponent		
	FR	Exposant de calibrage pour données de vitesse		
	ES	Exponente de escala para datos de velocidad		
	IT	Esponente per Dati Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-32 / 32		
Default value:		-4	**Cyc. transmittable:**	no

S-0-0047, Position command value

In the **position control** operation mode, this parameter is transferred from the control system to the drive every NC cycle time. In other operating modes, with the velocity loop closed in the drive, the active position command value of the position controller is displayed here. Then the position command is generated in the drive, depending on the active operation mode.

See also the functional description: "Mode: Position Control"

S-0-0047 - Attributes

Para. Name:	**DE** Lage-Sollwert		
	EN Position command value		
	FR Valeur de commande de position		
	ES Valor nominal de posición		
	IT Valore di Posizione comandato		
Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	no
Format:	DEC_MV	**Validity check:**	no
Unit:	S-0-0076	**Extrem value check:**	yes
Decimal places:	S-0-0076	**Combination check:**	no
Input min/max:	S-0-0076 / S-0-0076		
Default value:	---	**Cyc. transmittable:**	MDT

S-0-0049, Positive position limit value

The positive position limit value describes the maximum extent of travel in the positive direction.

The position limit value is active only when all position data refers to the homing point, i.e., the drive is **homed** (bit 0 is set to 1 in parameter **S-0-0403, Position feedback value status**). The position limit values can be switched off using bit 4 in **S-0-0055, Position polarity parameter**.

If a **Target position, S-0-0258** beyond the positive position limit value is set for the drive, then the drive sets warning bit 13 in **S-0-0012, Class 2 diagnostic** and generates the warning **E253 Target position out of travel range**.

If the positive position limit value is exceeded, the drive sets error bit 13 in **S-0-0011, Class 1 diagnostic**.

See also the functional description: "Axis Limit Values "

S-0-0049 - Attributes

Para. Name:	**DE** Lage-Grenzwert positiv		
	EN Positive position limit value		
	FR Limite de position positive		
	ES Valor limite de posición positivo		
	IT Limite positivo di Posizione		
Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	Param. EE
Format:	DEC_MV	**Validity check:**	Phase3
Unit:	S-0-0076	**Extrem value check:**	yes
Decimal places:	S-0-0076	**Combination check:**	no
Input min/max:	S-0-0076 / S-0-0076		
Default value:	1000000	**Cyc. transmittable:**	no

S-0-0050, Negative position limit value

The negative position limit value describes the maximum extent of travel in the negative direction.

The position limit value is active only when all position data refers to the homing point, i.e. the drive is **homed** (bit 0 is set to 1 in parameter **S-0-0403, Position feedback value status**). The position limit values can be switched off using bit 4 in **S-0-0055, Position polarity parameter**.

If a target position beyond the negative position limit value is set for the drive, then the drive sets warning bit 13 in **S-0-0012, Class 2 diagnostic** and generates the warning **E253 Target position out of travel range**.

If the negative position limit value is exceeded, the drive will set error bit 13 in **S-0-0011, Class 1 diagnostics**.

See also the functional description: "Axis Limit Values "

S-0-0050 - Attributes

Para. Name:	**DE**	Lage-Grenzwert negativ		
	EN	Negative position limit value		
	FR	Limite de position négative		
	ES	Valor limite de posición negativo		
	IT	Limite negativo di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		-1000000	**Cyc. transmittable:**	no

S-0-0051, Position feedback 1 value

Position feedback value 1 represents the current position of the motor encoder. The initialization of the position feedback happens during the execution of **S-0-0128, C200 Communication phase 4 transition check**; that means, the feedback positions are only initialized after successful execution of the command.

If an absolute encoder is present, the value in **S-0-0051, Position Feedback 1 Value** then shows the absolute position referred to the machine's zero-point, provided that during the first setup the command **P-0-0012, C300 Command 'Set absolute measurement'** has been executed once.

In the other case, the initialization value depends on whether the parameter **P-0-0019, Position start value** has been written to during the phase progression or whether the motor feedback is an absolute encoder.

See also the functional description: "Setting the Measurement System"

S-0-0051 - Attributes

Para. Name:	**DE** Lage-Istwert Geber 1		
	EN Position feedback 1 value		
	FR Valeur de retour de position codeur 1		
	ES Valor real de posición 1		
	IT Valore di Posizione di Feedback 1		
Function:	Parameter	**Editability:**	no
Data length:	4Byte	**Memory:**	no
Format:	DEC_MV	**Validity check:**	no
Unit:	S-0-0076	**Extrem value check:**	no
Decimal places:	S-0-0076	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	AT

S-0-0052, Reference distance 1

The parameter displays the distance between the machine zero-point and the homing point for the motor measurement system (Position feedback value 1). The parameter is used for the execution of the commands
S-0-0148, C600 Drive controlled homing procedure command and **P-0-0012, C300 Command 'Set absolute measurement'**.

During the command **S-0-0148, C600 Drive controlled homing procedure command**, the distance between the homing point and the machine zero-point is written there. If homing is done with run to the homing point, the drive goes to the homing point, and **S-0-0051, Position feedback 1 value** contains the value of **S-0-0052, Reference distance 1**.

For the command **P-0-0012, C300 Command 'Set absolute measurement'**, the desired value for **S-0-0051, Position feedback 1 value** is written there. After successful execution of ‘Setting absolute measurement’, **S-0-0051, Position feedback 1 value** shows the value of **S-0-0052, Reference distance 1**.

See also the functional description: "Drive-Controlled Homing"

S-0-0052 - Attributes

Para. Name:	**DE** Referenzmaß 1		
	EN Reference distance 1		
	FR Distance de référence 1		
	ES Medida de referencia valor de posición 1		
	IT Distanza di Riferimento 1		
Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	Param. EE
Format:	DEC_MV	**Validity check:**	Phase3
Unit:	S-0-0076	**Extrem value check:**	yes
Decimal places:	S-0-0076	**Combination check:**	no
Input min/max:	S-0-0076 / S-0-0076		
Default value:	0	**Cyc. transmittable:**	no

S-0-0053, Position feedback 2 value

Position feedback value 1 represents the current position of the **optional external encoder**. The initialization of the position feedback happens during the execution of **S-0-0128, C200 Communication phase 4 transition check**; that means, the feedback positions are only initialized after successful execution of the command.

If an absolute optional encoder is present, the value in **S-0-0053, Position Feedback Value 2** then shows the absolute position referred to the machine's zero-point, provided that during the first setup the command **P-0-0012, C300 Command 'Set absolute measurement'** has been executed once.

In the other case, the initialization value depends on whether the parameter **P-0-0019, Position start value** has been written to during the phase progression or whether an existing optional feedback is an absolute encoder.

See also the functional description: "Setting the Measurement System"

S-0-0053 - Attributes

Para. Name:	**DE**	Lage-Istwert Geber 2		
	EN	Position feedback 2 value		
	FR	Valeur de retour de position codeur 2		
	ES	Valor real de posición 2		
	IT	Valore di Posizione di Feedback 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0054, Reference distance 2

The parameter displays the distance between the machine zero-point and the homing point for the external measuring system (Position feedback value 2). The parameter is used for the execution of the commands
S-0-0148, C600 Drive controlled homing procedure command and **P-0-0012, C300 Command 'Set absolute measurement'**.

During the command **S-0-0148, C600 Drive controlled homing procedure command**, the distance between the homing point and the machine zero-point is written there. If homing is done with run to the homing point, the drive goes to the homing point, and **S-0-0053, Position feedback 2 value** contains the value of **S-0-0054, Reference distance 2**.

For the command **P-0-0012, C300 Command 'Set absolute measurement'**, the desired value for **S-0-0053, Position feedback 2 value** is written there. After successful execution of 'Setting absolute measurement'**, S-0-0053, Position feedback 2 value** shows the value of **S-0-0054, Reference distance 2**.

See also the functional description: "Drive-Controlled Homing"

S-0-0054 - Attributes

Para. Name:	**DE**	Referenzmaß 2		
	EN	Reference distance 2		
	FR	Distance de référence 2		
	ES	Medida de referencia valor de posición 2		
	IT	Distanza di Riferimento 2		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0055, Position polarities

This parameter can be used to invert the polarities of the given position data. These polarities are switched outside of the control system (i.e., at the input and output of the control system).

Note: The polarity of the position must be determined during the first setup of an axis *before* establishing a zero reference for the measurement systems, because changing the polarity results in different position values.

Note the following in reference to rotary motors:

"Motor-clockwise rotation" means the motor shaft turns in a clockwise direction (facing the motor shaft) if the position command value difference and the polarity are both positive.

The following applies to linear motors:

The positive direction is used when the primary is moving toward the linear motor power cable side

Bit 4 is used to activate or deactivate software position limits.

Parameter structure:

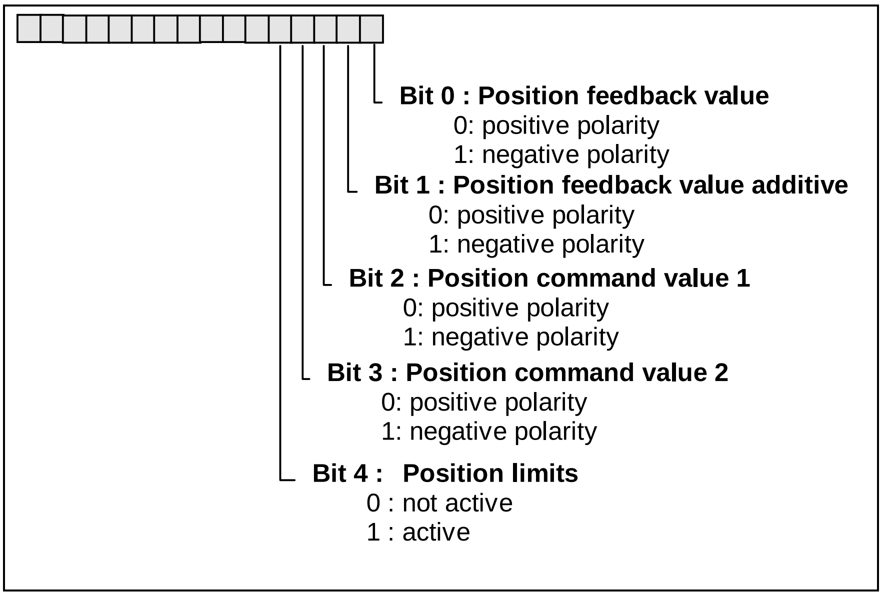


Fig. 2-9: S-0-0055, Position polarity parameter

Note: - Only the bits indicated here are supported by the software.
- If bit 0 is changed by the control system, bits 1 - 3 will also be set to the value of bit 0 by the drive!

See also the functional description: "Command Polarities and Actual Value Polarities"

S-0-0055 - Attributes

Para. Name:	**DE**	Lage-Polaritäten		
	EN	Position polarities		
	FR	Polarités de position		
	ES	Polaridades de posición		
	IT	Direzioni di Posizionamento		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 15		
Default value:		0	**Cyc. transmittable:**	no

S-0-0057, Position window

The parameter S-0-0057, Position window, is used for following functions:

- Status **In Position**, |Following error (S-0-0189)| < Position window (S-0-0057) sets bit 6 in **S-0-0013, Class 3 Diagnostics**
- Status **ITP**, |Target - act.pos.|< Position window (S-0-0057) &&
  |following error| < Position window &&
  |act. speed| < Standstill window (S-0-0124) → bit 6 in **S-0-0182, Manufacturer class 3 diagnostics**
- Status **In_Target_Position**, |Target - act.pos.| < Position window (S-0-0057) → Bit 10 in **S-0-0182, Manufacturer class 3 diagnostics**

- Status **Final position reached,** (|Target - act.pos-1/2| < S-0-0057, Position window) && **Last process block** done
- During the execution of the command **S-0-0148, C600 Drive controlled homing procedure command**, the drive reports completion of the command, when the internal command generator has reached its target value and the difference between this value and the actual position is smaller than the position window.
- As a **hysteresis** window for the position limits. I.e., when the drive has gone beyond the limit, the travel range is additionally limited by the position window.

See also the functional description: "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0057 - Attributes

Para. Name:	**DE**	Positionierfenster		
	EN	Position window		
	FR	Fenêtre de positionnement		
	ES	Ventana de posicionamiento		
	IT	Finestra di Posizionamento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0076, Position data scaling type

The position data scaling type determines, in which format position data are communicated between drive and control or display surface. When position parameters (e.g. **S-0-0051, Position feedback 1 value** are read, the drive displays them with the selected scaling. The scaling selection is usually preset by the PLC.

The following settings can be made:

Structure of the parameter:

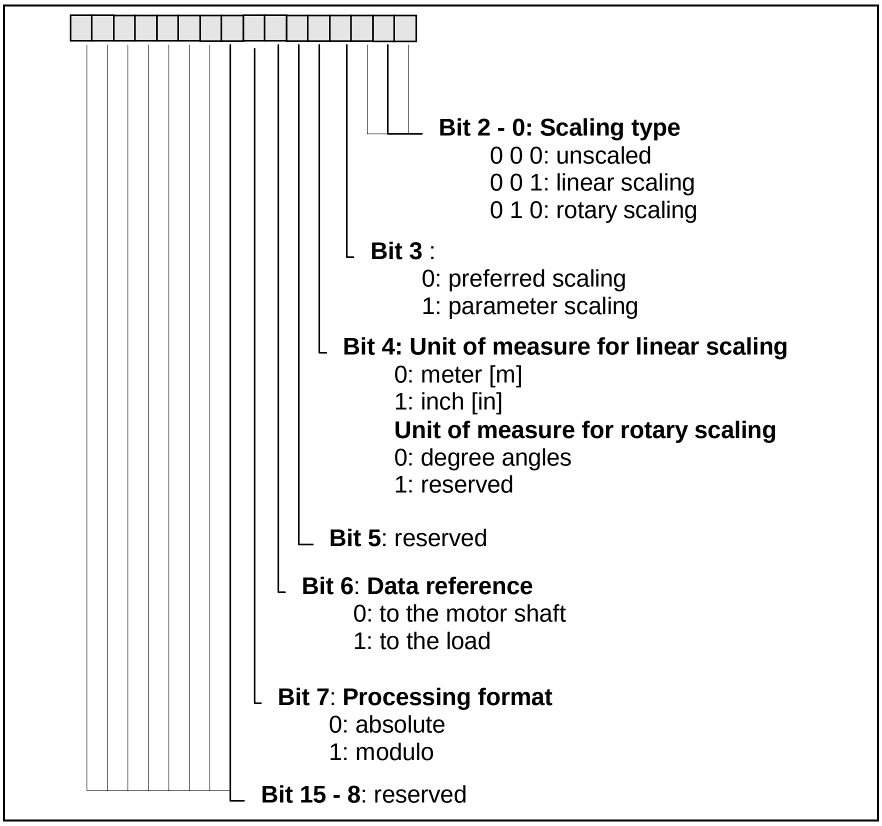


Fig. 2-10: S-0-0076, Position data scaling type

Note: Only the bits mentioned here are supported by the firmware.
1) See also S-0-0045, Scaling factor for velocity data.
2) See also the example S-0-0077, Scaling of position data.

See also the functional description: "Display Format of Position Data"

S-0-0076 - Attributes

Para. Name:	**DE**	Wichtungsart für Lagedaten		
	EN	Position data scaling type		
	FR	Type de calibrage pour données de position		
	ES	Tipo de escala para datos de posición		
	IT	Tipo di Scala per Dati Posizionamento		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		1010b	**Cyc. transmittable:**	no

S-0-0077, Linear position data scaling factor

The parameter S-0-0077, Linear position data scaling factor determines together with **S-0-0078, Linear position data scaling exponent** and the selection of the physical unit m (meters) or inch in S-0-0076, in which unit the present position parameters in the drive are displayed, when linear scaling is selected.

If "**preferred scaling**“ is chosen in **S-0-0076, Position data scaling type** (bit 3 = 0), the values in S-0-0077 and S-0-0078 are set by the drive.

If "**parameter scaling**“ is chosen in **S-0-0076, Position data scaling type** (bit 3 = 1), the settings in S-0-0077 and S-0-0078 are taken.

Example for the display of position data for linear scaling:

- Physical position of the motor feedback equals 0.12 m (meter).

A) Selected scaling = linear preferred scaling (S-0-0077 = 1, S-0-0078 = -7). This gives for **S-0-0051, Position feedback 1 value** a value of 1200000 with unit meters and 7 places after the decimal.

B) Selected scaling = linear parameter scaling (S-0-0077 = 3, S-0-0078 = -7). This gives for **S-0-0051, Position feedback 1 value** a value of 400000 with unit meters and 7 places after the decimal.

See also the functional description: "Display Format of Position Data"

S-0-0077 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor transl. Lagedaten		
	EN	Linear position data scaling factor		
	FR	Facteur de calibrage pour données de posit. lin.		
	ES	Factor de escala datos de posición lineales		
	IT	Fattore di Scala per Posizionamenti lineare		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		1	**Cyc. transmittable:**	no

S-0-0078, Linear position data scaling exponent

The parameter S-0-0078, Linear position data scaling exponent determines together with **S-0-0077, Linear position data scaling factor** and the selection of the physical unit m (meters) or inch in S-0-0076, in which unit the present position parameters in the drive are displayed, when linear scaling is selected.

If "**preferred scaling**“ is chosen in **S-0-0076, Position data scaling type** (bit 3 = 0), the values in S-0-0077 and S-0-0078 are set by the drive.

If "**parameter scaling**“ is chosen in **S-0-0076, Position data scaling type** (bit 3 = 1), the settings in S-0-0077 and S-0-0078 are taken.

Example for the display of position data for linear scaling:

- Physical position of the motor feedback equals 0.12 m (meter).

A) Selected scaling = linear preferred scaling (S-0-0077 = 1, S-0-0078 = -7). This gives for **S-0-0051, Position feedback 1 value** a value of 1200000 with unit meters and 7 places after the decimal.

B) Selected scaling = linear parameter scaling (S-0-0077 = 1, S-0-0078 = -6). This gives for **S-0-0051, Position feedback 1 value** a value of 120000 with unit meters and 6 places after the decimal.

See also the functional description: "Display Format of Position Data"

S-0-0078 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent transl. Lagedaten		
	EN	Linear position data scaling exponent		
	FR	Exposant de calibrage pour données de posit. lin.		
	ES	Exponente de escala datos de posición lineales		
	IT	Esponente per Dati Posizionamento lineare		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-32768 / 32768		
Default value:		-7	**Cyc. transmittable:**	no

S-0-0079, Rotational position resolution

If rotary position scaling is selected, the LSB valence for all position data will be set in this parameter. The valence of the LSB in the drive’s position data results in

$$\text{LSB valence} = \frac{1\,\text{Revolution}}{\text{Rotational position resolution}}$$

where bit 6 of **S-0-0076, Position data scaling type** selects whether the LSb valence refers to one motor revolution or one load revolution.

If you work with preferred rotary scaling, the value in S-0-0079, Rotational position resolution is fixed at 3 600 000. Thus, the LSB bit of all rotary position data is fixed at 0.0001 degrees of angle.

See also the functional description: "Display Format of Position Data"

S-0-0079 - Attributes

Para. Name:	**DE**	Rotations-Lageauflösung		
	EN	Rotational position resolution		
	FR	Résolution de position rotationnelle		
	ES	Resolución de posición de rotación		
	IT	Risoluzione per Posizionamenti circolari		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 4294967295		
Default value:		3600000	**Cyc. transmittable:**	no

S-0-0080, Torque/Force command

In the torque control operating mode, the torque command values are transferred by the control system to the drive.

If the velocity controller is active, the torque required for the corresponding velocity can be derived from this parameter.

The evaluation depends upon the scaling of the torque and force data. At present, only the **percentage-based scaling** is supported.

The date value corresponds to the current command value in respect to the motor current at standstill (S-0-0111).

100 % = Motor continous standstill torque, Mdn

The value can be converted to a torque or force value by multiplying the command current by the torque/force constant (P-0-0051).

See also the functional description: "Torque Control"

S-0-0080 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Sollwert		
	EN	Torque/Force command		
	FR	Valeur de commande de couple/force		
	ES	Valor nominal de par de giro/fuerza		
	IT	Comando Coppia/Forza		
Function:		Parameter	**Editability:**	P234
Data length:		S-0-0086	**Memory:**	no
Format:		S-0-0086	**Validity check:**	no
Unit:		S-0-0086	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		S-0-0109/110 / S-0-0109/110		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0084, Torque/Force feedback value

The current torque/force feedback value can be derived from this parameter.

The shown values depend from the torque/force scaling. At present, only the **percentage-based scaling** is supported.

The data value corresponds to the measured feedback current; 100% are equal to the motor current at standstill, S-0-0111.

The value can be converted to a torque or force value by multiplying the command current by the torque/force constant P-0-0051.

S-0-0084 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Istwert		
	EN	Torque/Force feedback value		
	FR	Valeur de retour de couple/force		
	ES	Par de giro/valor de retroalimentación de fuerza		
	IT	Valore di Feedback Coppia/Forza		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0086	**Extrem value check:**	no
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0085, Torque/Force polarity parameter

The polarities for the given torque data as related to the application can be switched in this parameter.

Polarities are switched externally, at the input and output of a control system rather than inside the system.

The following applies to rotary (turning) motors:

The motor will turn in a clockwise direction (facing the motor shaft) with a positive torque command value and positive polarity.

The following applies to linear motors:

The positive direction is used when the primary is moving toward the linear motor power cable side

Structure of the parameter:

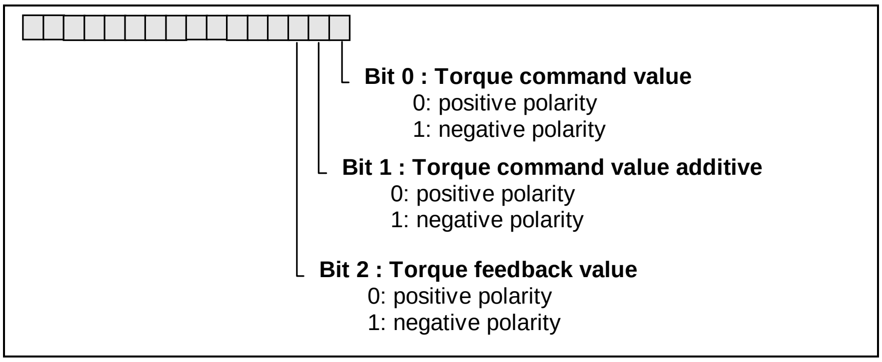


Fig. 2-11: S-0-0085, Torque/force polarity parameter

Note: If bit 0 of the control system is changed, then bits 1 - 2 of the drive will also be set to the value in bit 0.

See also the functional description: "Command Polarities and Actual Value Polarities"

S-0-0085 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Polaritäten-Parameter		
	EN	Torque/Force polarity parameter		
	FR	Paramètre de polarité de couple/force		
	ES	Par de giro/fuerza parámetro de polaridad		
	IT	Polarità Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 7		
Default value:		0	**Cyc. transmittable:**	no

S-0-0086, Torque/Force data scaling type

At present, only the **percentage** scaling for torque/force data is supported.

The following applies:

100 % = S-0-0111, Motor current at standstill

See also the functional description: "Adjustable Scaling for Position, Velocity, and Acceleration Data"

S-0-0086 - Attributes

Para. Name:	**DE**	Wichtungsart für Drehmoment/Kraftdaten		
	EN	Torque/Force data scaling type		
	FR	Type de calibrage pour données de couple/force		
	ES	Par de giro/fuerza tipo de escala de datos		
	IT	Tipo di Scala per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0088, Receive to receive recovery time (TMTSG)

This parameter defines the time needed for the slave to switch to readiness for the next master synchronization telegram after receiving a master data telegram.

The parameter is read by the control system in phase 2 to calculate the time slot parameters.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0088 - Attributes

Para. Name:	**DE**	TMTSY Erholzeit Empfangen-Empfangen		
	EN	Receive to receive recovery time (TMTSG)		
	FR	Temps de récupération entre deux réceptions (TMTSY)		
	ES	TMTSY Tiempo de recuperación recepción-recepción		
	IT	Tempo di Recupero Ricettore a Ricettore (TMTSG)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0089, MDT Transmit starting time (T2)

This is the transmit starting time for the master data telegram after the end of a master synchronization telegram. The value is transferred from the master to the slave in communications phase 2 and is activated in phase 3.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0089 - Attributes

Para. Name:	**DE**	T2 Sendezeitpunkt MDT		
	EN	MDT Transmit starting time (T2)		
	FR	Temps du départ de transmission du MDT (T2)		
	ES	T2 Punto temporal de emision MDT		
	IT	MDT Tempo Partenza Trasmissione (T2)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65000		
Default value:		1500	**Cyc. transmittable:**	no

S-0-0090, Command value transmit time (TMTSG)

This is the time required by the slave to prepare the command values for the drive after reception of the master data telegram.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0090 - Attributes

Para. Name:	**DE**	TMTSG Kopierzeit Sollwerte		
	EN	Command value transmit time (TMTSG)		
	FR	TMTSG Temps de recopie de consigne		
	ES	TMTSG Tiempo de copia valores nominales		
	IT	Tempo di Trasmissione Valore comandato (TMTSG)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0091, Bipolar velocity limit value

The "bipolar velocity limit value" describes the maximum permissible velocity, symmetrical in both directions. The max. input value is determined by the **S-0-0113, Maximum motor speed (nmax)**.

The entered value generates the maximum value for all other speed parameters.

See also the functional description: "Limiting Velocity"

S-0-0091 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Grenzwert bipolar		
	EN	Bipolar velocity limit value		
	FR	Limite de vitesse bipolaire		
	ES	Valor limite de velocidad bipolar		
	IT	Valore di Velocità Limite		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0113		
Default value:		1000000	**Cyc. transmittable:**	MDT

S-0-0092, Bipolar torque/force limit value

This parameter describes the maximum allowable torque symmetrical in both directions (accelerating, braking).

The evaluation refers to the percentage of the motor current at standstill:

100 % = Motor current at standstill

Note: The maximum torque is also influenced by
- P-0-0006, Overload factor
- P-0-4011, Switching frequency

See also the functional description: "Torque/Force Limiting"

S-0-0092 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Grenzwert bipolar		
	EN	Bipolar torque/force limit value		
	FR	Limite de couple/force bipolaire		
	ES	Valor limite par de giro/fuerza bipolar		
	IT	Valore di Coppia/Forza Limite		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0086	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		S-0-0109/110 / S-0-0109/110		
Default value:		4000	**Cyc. transmittable:**	MDT

S-0-0093, Torque/force data scaling factor

The scaling factor for all torque/force data in the drive is set in this parameter.

The parameter has no meaning at the present time, because only **percentage scaling** can be set for torque and force data. Therefore, only the value 1 is suitable.

See also the functional description: "Adjustable Scaling for Position, Velocity, and Acceleration Data"

S-0-0093 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor für Drehmoment/Kraftdaten		
	EN	Torque/force data scaling factor		
	FR	Facteur de calibrage pour données de couple/force		
	ES	Factor de escala para datos par de giro/fuerza		
	IT	Fattore di Scala per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 1		
Default value:		1	**Cyc. transmittable:**	no

S-0-0094, Torque/force data scaling exponent

The scaling exponent for all torque/force data in the drive is set in this parameter.

The parameter has no meaning at the present time, because only **percentage scaling** can be set for torque and force data.

See also the functional description: "Adjustable Scaling for Position, Velocity, and Acceleration Data"

S-0-0094 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent für Drehmoment/Kraftdaten		
	EN	Torque/force data scaling exponent		
	FR	Exposant de calibrage pour données de couple/force		
	ES	Exponente de escala para datos de par de giro/fuerza		
	IT	Esponente per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-1 / -1		
Default value:		-1	**Cyc. transmittable:**	no

S-0-0095, Diagnostic message

The operating status for the drive that is relevant at the moment can be read in **text** form in this parameter.

The respective diagnostic message number from **S-0-0390, Diagnostic Message Nummer** will appear in front of this parameter.

Example: **"A010 Drive Halt"**

See also the functional description: "Diagnostic Message"

S-0-0095 - Attributes

Para. Name:	**DE**	Diagnose		
	EN	Diagnostic message		
	FR	Message de diagnostic		
	ES	Diagnostico		
	IT	Messaggio di Diagnosi		
Function:		Parameter	**Editability:**	no
Data length:		1Byte var.	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0096, Slave arrangement (SLKN)

For Sercos: During initialization, the master must know which drives are available under which slave numbers in order to execute an optimal automatic time slot calculation.

The master uses this information to detect the **address** of the connected slave.

Example for address 3:

03	**03**

See also the functional description: "Setting the Drive Address of the SERCOS Interface"

S-0-0096 - Attributes

Para. Name:	**DE**	Slavekennung (SLKN)		
	EN	Slave arrangement (SLKN)		
	FR	Reconnaissance d'esclave (SLKN)		
	ES	Disposición de esclavo (SLKN)		
	IT	Preparazione Slave (SLKN)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0097, Mask class 2 diagnostic

This parameter is only used for drives with **Sercos** interface, like DKC02 and DDS.

This parameter can be used to mask pre-warnings in **S-0-0012, Class 2 diagnostics** in the drive status according to their effect on the change bit. When changes are made to the masked early warnings, the Class 2 diagnostic change bit will be set in the drive status.

The mask has no effect on the operating data of the Class 2 diagnostic.

See also the functional description: "Change bit of class 2 and 3 diagnostics in the drive status word"

S-0-0097 - Attributes

Para. Name:	**DE**	Maske Zustandsklasse 2		
	EN	Mask class 2 diagnostic		
	FR	Diagnostic de classe 2, masque		
	ES	Máscara diagnostico clase 2		
	IT	Maschera Diagnosi Classe 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0098, Mask class 3 diagnostic

This parameter is only used for drives with **Sercos** interface, like DKC02 and DDS.

This parameter can be used to mask pre-warnings in **S-0-0013, Class 3 diagnostics** in the drive status according to their effect on the change bit. When changes are made to the masked early warnings, the Class 3 diagnostic change bit will be set in the drive status.

The mask has no effect on the operating data of the Class 3 diagnostic.

See also the functional description: "Change bit of class 2 and 3 diagnostics in the drive status word"

S-0-0098 - Attributes

Para. Name:	**DE**	Maske Zustandsklasse 3		
	EN	Mask class 3 diagnostic		
	FR	Diagnostic de classe 3, masque		
	ES	Máscara diagnostico clase 3		
	IT	Maschera Diagnosi Classe 3		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0099, C500 Reset class 1 diagnostic

Command to **reset errors**, after the cause has been cleared.

This command can be started with the S1 key on the drive controller or by writing to the parameter S-0-0099, C5 Reset class 1 diagnostic. When starting the command via the parameter S-0-0099, all errors in the drive are cleared, and the drive will switch to the "ready for operation" status if no further error remains.

If the command is started with the S1 key, only one error is deleted at a time. If the drive has stored several errors (up to 4 errors), the diagnostic message that corresponds to each error will appear sequentially every time the S1 key is pressed again.

See also the function description: "Clearing Errors"

S-0-0099 - Attributes

Para. Name:	**DE** C500 Reset Zustandsklasse 1		
	EN C500 Reset class 1 diagnostic		
	FR C500 Remise à zéro pour diagnostic de classe 1		
	ES C500 Reset diagnostico clase 1		
	IT C500 Cancellare Errori Classe 1		
Function:	Command	**Editability:**	P234
Data length:	2Byte	**Memory:**	no
Format:	BIN	**Validity check:**	no
Unit:	--	**Extrem value check:**	no
Decimal places:	0	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	no

S-0-0100, Velocity loop proportional gain

This parameter contains the value for the velocity loop proportional gain.

The proportional gain **unit** depends on the contacted motor type.

Motor type:	**Unit:**
Rotary motor:	A•sec/rad
Linear motor:	A•min/m

Fig. 2-12: Units for the vel. loop prop. gain depending on the motor type

It is possible to load a default value for the parameter using the command "Basic load", as long as there is a motor with feedback memory (**P-0-4014, Motor type:** 1 or 5).

See also the functional description: "Setting the Velocity Controller"

S-0-0100 - Attributes

Para. Name:	**DE** Geschwindigkeitsregler-Proportionalverstärkung		
	EN Velocity loop proportional gain		
	FR Gain proportionnel de la boucle de vitesse		
	ES Amplificación proporcional de regulador de velocidad		
	IT Guadagno proporzionale Anello di Velocità		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	As/rad	**Extrem value check:**	yes
Decimal places:	1	**Combination check:**	no
Input min/max:	0 / 6553.5		
Default value:	10	**Cyc. transmittable:**	no

S-0-0101, Velocity loop integral action time

The velocity controller forms a current command value from the difference between the velocity command value and the velocity feedback value

(= speed regulation deviation).

This current command value consists of a proportional component and an integral component. The Velocity Loop Integral Action Time corresponds to the time in which the integral component of the current command value is growing on the value of the proportional component.

Definition of the Integral Action Time

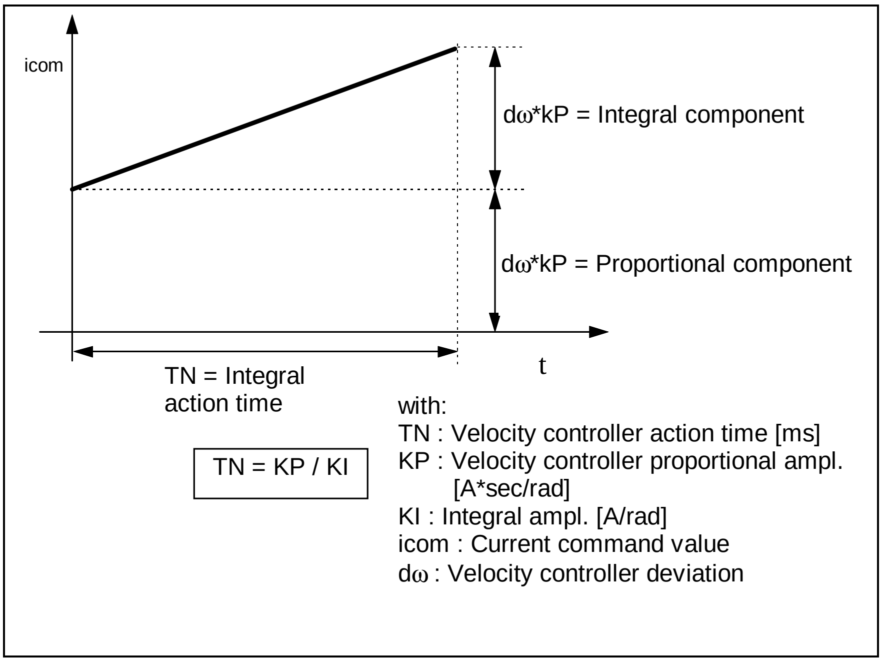


Fig. 2-13: Integral Action Time

The value of the time axis for which the integral component is equal to the proportional component is described as integral action time. This represents the time that a pure I-controller would need until the controller output variable is equal to the output variable of a P-controller at time t=0.

The integral gain component is disabled with an input value of 0.

See also the functional description: "Setting the Velocity Controller"

S-0-0101 - Attributes

Para. Name:	**DE**	Geschwindigkeitsregler-Nachstellzeit		
	EN	Velocity loop integral action time		
	FR	Temps d'action intégral de la boucle de vitesse		
	ES	Tiempo de reajuste de regulador de velocidad		
	IT	Tempo Integrazione Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 6553.5		
Default value:		100	**Cyc. transmittable:**	no

S-0-0103, Modulo value

When the modulo format is set (parameter **S-0-0076, Position data scaling type** bit 7), the modulo value determines at which numeric value the position data roll over (overflow) to 0.

See also parameter "**S-0-0393, Command value mode**"
See also the functional description: "Modulo Feature"
and "Modulo Processing-Limiting Conditions"

S-0-0103 - Attributes

Para. Name:	**DE**	Modulowert		
	EN	Modulo value		
	FR	Valeur modulo		
	ES	Valor de modulo		
	IT	Valore Modulo		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		3600000	**Cyc. transmittable:**	no

S-0-0104, Position loop Kv-factor

This parameter contains the value for the proportional gain of the position controller.

It is possible to load a default value for the controller parameters using the command "Basic load".

Motors with feedback memory (**P-0-4014, Motor type** 1 or 5), e.g. MKD, have appropriate values for all controller settings in their feedback. These are loaded after the initial connection (display UL) or with the command "Basic load“.

See also the functional description: "Setting the position controller"

S-0-0104 - Attributes

Para. Name:	**DE**	Lageregler Kv-Faktor		
	EN	Position loop Kv-factor		
	FR	Gain proportionnel de la boucle de position, Kv		
	ES	Regulador de posición factor Kv		
	IT	Fattore Kv Anello di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		1000/min	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		100	**Cyc. transmittable:**	no

S-0-0106, Current loop proportional gain 1

The current controller proportional gain is determined for every motor-drive combination. It depends on the type of the motor and may not be changed. It is loaded from the motor feedback after the initial connection (display UL) or using the command "Basic load".

Note: The values set at the factory should not be altered!

See also function description: "Setting the Current Controller"

S-0-0106 - Attributes

Para. Name:	**DE**	Stromregler-Proportionalverstärkung 1		
	EN	Current loop proportional gain 1		
	FR	Gain proportionnel de la boucle de courant 1		
	ES	Amplificación proporcional 1 regulador de corriente		
	IT	Guadagno proporzionale 1 Regolatore di Corrente		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		V/A	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		100	**Cyc. transmittable:**	no

S-0-0107, Current loop integral action time 1

The current loop integral action time is fixed for every motor-drive combination. It depends on the type of the motor. The factory setting may not be changed.

The basic setup for all controllers is loaded after the initial connection (display UL) or with the command "Basic load“. For motors without feedback memory, you can take the value from the motor’s data sheet.

See also function description: "Setting the Current Controller"

S-0-0107 - Attributes

Para. Name:	**DE**	Stromregler-Nachstellzeit 1		
	EN	Current loop integral action time 1		
	FR	Temps d'action intégral de la boucle de courant 1		
	ES	Tiempo de reajuste de regulador de corriente 1		
	IT	Tempo Integrazione 1 Anello di Corrente		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 6553.5		
Default value:		100	**Cyc. transmittable:**	no

S-0-0108, Feedrate override

The feedrate override acts on drive controlled operation modes and motion commands, like

- **S-0-0148, C600 Drive controlled homing procedure command**
- operating modes **Drive internal interpolation** and **Relative drive internal interpolation**
- Programmed **positioning block** operating mode
- **Jogging** operation
- automatic control loop setting

The versions have not implemented all operating modes and commands at the same time.

The feedrate override has a **multiplying** effect on the parameters

- **S-0-0041, Homing velocity**
- **S-0-0259, Positioning velocity**
- Positioning block velocities
- Jog velocity

Note: In devices with analog interface, an analog input can be configured for the feedrate override, see also the project manual.

See also the functional description: "Drive-Controlled Homing"

S-0-0108 - Attributes

Para. Name:	**DE**	Feedrate-Override		
	EN	Feedrate override		
	FR	Atténuateur d'avance		
	ES	Override de alimentación		
	IT	Riduzione Velocità Avanzamento		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		%	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		---	**Cyc. transmittable:**	no

S-0-0109, Motor peak current

Specifies the maximum current which may flow through the motor for a short period without damaging it.

If the motor's peak current is less than the amplifier's peak current, the maximum output current will be automatically limited to the motor's peak current.

This value is stored in the motor feedback for MHD, MKD and MKE motors and will be uploaded from there when the amplifier is turned on for the first time. For other motor types, the value must be taken from the data sheet.

See also the functional description: "Setting the Active Peak Current"

S-0-0109 - Attributes

Para. Name:	**DE**	Spitzenstrom Motor		
	EN	Motor peak current		
	FR	Courant crête du moteur		
	ES	Corriente punta de motor		
	IT	Corrente di Picco Motore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0110, Amplifier peak current

Peak current available from the drive controller. The value will be set by the drive itself. This current is only available for short durations.

See also the functional description: "Current Limit"

S-0-0110 - Attributes

Para. Name:	**DE**	Spitzenstrom Verstärker		
	EN	Amplifier peak current		
	FR	Courant crête du variateur		
	ES	Corriente punta amplificador		
	IT	Corrente di Picco Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		---	**Cyc. transmittable:**	no

S-0-0111, Motor current at standstill

The motor current at standstill is the current from which the motor continuously generates the standstill torque according to the motor data sheet.

This value is stored in motor feedback for MHD, MKD and MKE motors and will be loaded from there when the drive controller is turned on for the first time. For other types of motors, this value must be taken from the data sheet.

All **torque/force data** refer to this **motor current at standstill = 100 %** .

See also the functional description: "Motor Feedback-Data Memory"

S-0-0111 - Attributes

Para. Name:	**DE**	Stillstandsstrom Motor		
	EN	Motor current at standstill		
	FR	Courant du moteur à l'arrêt		
	ES	Corriente de parada motor		
	IT	Corrente Motore con Asse fermo		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0112, Amplifier nominal current

Allowable continuous current output for the drive controller. The value will be set by the drive itself.

See also the functional description: "Setting the Active Continuous Current"

S-0-0112 - Attributes

Para. Name:	**DE**	Nennstrom Verstärker		
	EN	Amplifier nominal current		
	FR	Courant nominal variateur		
	ES	Corriente nominal amplificador		
	IT	Corrente nominale Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		---	**Cyc. transmittable:**	no

S-0-0113, Maximum motor speed (nmax)

The maximum velocity for the motor cannot be exceeded. It also limits the **S-0-0091, Bipolar velocity limit** parameter.

This value is stored in the motor feedback of MHD, MKD and MKE motors and will be loaded from there when the drive controller is turned on for the first time. For other motor types, the value must be taken from the data sheet.

In torque regulation, if the maximum motor speed is exceeded by more than 12.5%, the drive will be switched into a torque free state and the error message **F879 Velocity limit S-0-0091 exceeded** will result.

See also the functional description: "Limiting Velocity"

S-0-0113 - Attributes

Para. Name:	**DE**	Maximal-Geschwindigkeit des Motors		
	EN	Maximum motor speed (nmax)		
	FR	Vitesse maximale du moteur		
	ES	Velocidad máxima del motor		
	IT	Velocità massima Motore (nmax)		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / 214738.3647		
Default value:		1000000	**Cyc. transmittable:**	no

S-0-0115, Position feedback 2 type

Essential characteristics of the optional encoder (position encoder 2) are established is this parameter.

Parameter structure:

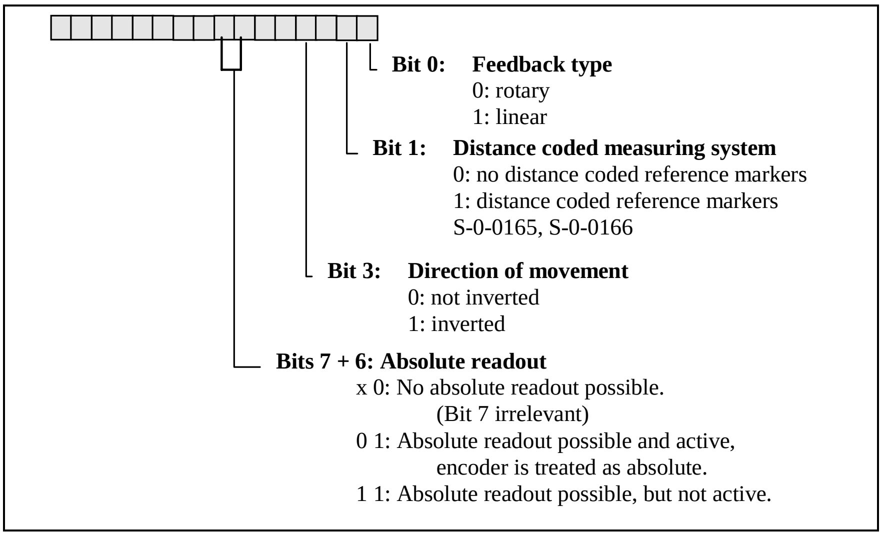


Fig. 2-14: S-0-0115, Position feedback 2 type parameter

Remark:

For absolute measurement systems with data memory, bit 6 is set automatically.

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Other Optional Encoder Characteristics"

S-0-0115 - Attributes

Para. Name:	**DE**	Lagegeberart 2		
	EN	Position feedback 2 type		
	FR	Type codeur 2		
	ES	Tipo de encoder de posición 2		
	IT	Tipo di Feedback di Posizione 2		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0116, Feedback 1 Resolution

Depending on parameter **P-0-4014, Motor type** (rotary or linear motors), the resolution of the motor encoder is indicated by **S-0-0116, Resolution of motor feedback**.

This value contains the number of lines or cycles per motor revolution for rotary motors, or the segment spacing per mm for linear motors. For motors with resolver feedback, the number of the resolver pole pairs is stored here.

See also the functional description: "Motor Encoder Resolution"

S-0-0116 - Attributes

Para. Name:	**DE**	Geber 1 Auflösung		
	EN	Feedback 1 Resolution		
	FR	Résolution codeur 1		
	ES	Resolución encoder 1		
	IT	Risoluzione Feedback 1		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Cycles/Rev	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		256	**Cyc. transmittable:**	no

S-0-0117, Feedback 2 Resolution

The resolution of the optional encoder contains the cycles per external encoder revolution for rotational encoders. For linear optional encoders, the segment spacing is given, in mm.

See also the functional description: "Optional Encoder Resolution"

S-0-0117 - Attributes

Para. Name:	**DE**	Geber 2 Auflösung		
	EN	Feedback 2 Resolution		
	FR	Résolution codeur 2		
	ES	Resolución encoder 2		
	IT	Risoluzione Feedback 2		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Cycles/Rev	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		256	**Cyc. transmittable:**	no

S-0-0121, Input revolutions of load gear

A mechanical gear is often employed between the motor and the load.

The **gear ratio** is defined by:

$$\frac{\text{S-0-0122, Output Revolutions of load Gear}}{\text{S-0-0121, Input Revolutions of load Gear}}$$

Fig. 2-15: Gear Ratio

See also function description: "Transmission Ratio" and "Modulo Processing-Limiting Conditions"

Example:

5 motor rotations result in 2 output gear rotations.

⇒ S-0-0121 : 5

S-0-0122 : 2

S-0-0121 - Attributes

Para. Name:	**DE**	Lastgetriebe-Eingangsumdrehungen		
	EN	Input revolutions of load gear		
	FR	Nombre de tours d'entrée d'engrenages de charge		
	ES	Giros de entrada de engranaje de carga		
	IT	N di Giri in Ingresso al Riduttore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Rev	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 4294967295		
Default value:		1	**Cyc. transmittable:**	no

S-0-0122, Output revolutions of load gear

A mechanical gear is often employed between the motor and the load.

The **gear ratio** is defined by:

$$\frac{\text{S-0-0122, Output Revolutions of load Gear}}{\text{S-0-0121, Input Revolutions of load Gear}}$$

Fig. 2-16: Gear Ratio

See also function description: "Transmission Ratio" and "Modulo Processing-Limiting Conditions"

Example:

5 motor rotations result in 2 output gear rotations.

⇒ S-0-0121 : 5

S-0-0122 : 2

S-0-0122 - Attributes

Para. Name:	**DE**	Lastgetriebe-Ausgangsumdrehungen		
	EN	Output revolutions of load gear		
	FR	Nombre de tours de sortie d'engrenages de charge		
	ES	Giros de salida de engranaje de carga		
	IT	N di Giri in Uscita del Riduttore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Rev	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 4294967295		
Default value:		1	**Cyc. transmittable:**	no

S-0-0123, Feed constant

This parameter describes the conversion from rotary to linear motion. It is defined as the linear displacement of the load during one revolution of the gear drive shaft.

Characteristic value:

Ball screw spindle:	Rack and pinion:
Feed constant = pitch of screw (typical value 10.00 mm)	Feed constant = effective pitch diameter of the pinion • π = effective circumference of the pinion

Fig. 2-17: Characteristic values of the feed constant

Note: The unit is dependent on bit 4 in S-0-0076, Position data scaling type.

Note that: S-0-0076 bit 4 = 0 → mm/rev

S-0-0076 bit 4 = 1 → inch/rev

See also the functional description: "Feed Constant"

S-0-0123 - Attributes

Para. Name:	**DE**	Vorschubkonstante		
	EN	Feed constant		
	FR	Constante d'avance		
	ES	Constante de avance		
	IT	Costante di Avanzamento		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		5	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0124, Standstill window

The motors standstill is an indication that the **velocity feedback value, (S-0-0040)** has reached below the pre-define threshold level in S-0-0125.

Bit 1 of the **S-0-0013, Class 3 diagnostics** is set during standstill.

See also the functional description: "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0124 - Attributes

Para. Name:	**DE**	Stillstandsfenster		
	EN	Standstill window		
	FR	Fenêtre d'arrêt		
	ES	Ventana de parada		
	IT	Finestra di monitorizzazione Asse fermo		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0125, Velocity threshold nx

If the **S-0-0040, Velocity feedback value** falls below the value of the parameter **S-0-0125, Velocity threshold nx**, the drive sets the message n_actual < nx (Bit 2 in **S-0-0013, Class 3 Diagnostics**).

See also the functional description: "S-0-0013, Class 3 diagnostics"

S-0-0125 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Schwelle nx		
	EN	Velocity threshold nx		
	FR	Seuil de vitesse nx		
	ES	Umbral de velocidad nx		
	IT	Finestra di Controllo Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		10000000	**Cyc. transmittable:**	no

S-0-0126, Torque threshold Tx

The parameter Torque threshold Mdx sets the torque from which on the drive generates the message Md >= Mdx (S-0-0333).

See also the functional description: "S-0-0013, Class 3 diagnostics"

S-0-0126 - Attributes

Para. Name:	**DE**	Drehmoment-Schwelle Mdx		
	EN	Torque threshold Tx		
	FR	Seuil de couple Mdx		
	ES	Umbral de par de giro Mdx		
	IT	Finestra di Controllo Coppia		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	-
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0086	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		0 / var		
Default value:		5000	**Cyc. transmittable:**	-

S-0-0127, C100 Communication phase 3 transition check

The commands "S-0-0127, C1 Communication phase 3 transition check and "**S-0-0128, C2 Communication phase 4 transition check**" are used to switch form the parameteri mode to the operating mode.

When the "**S-0-0127, C1 Communication phase 3 transition check**" command is used, the validity of all of the interface parameters will be checked. If any of the parameters are found invalid, the drive ends the command with an error message.

See also Function description: "Position Command Value Monitoring"

S-0-0127 - Attributes

Para. Name:	**DE**	C100 Umschaltvorbereitung auf Komm.-Phase 3		
	EN	C100 Communication phase 3 transition check		
	FR	C100 Préparation transition phase de comm. 3		
	ES	C100 Comprobación de conmutación a fase 3		
	IT	C100 Check Transizione Fase di Comunicazione 3		
Function:		Command	**Editability:**	P2
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0128, C200 Communication phase 4 transition check

The commands **S-0-0127, C1 Communication phase 3 transition check** and S-0-0128, C2 Communication phase 4 transition check" are used to switch form the parametermode to the operatemode.

When the **S-0-0128, C2 Communication phase 4 transition check** command is executed , all parameters will be checked for validity and limit value encroachments. If any invalid parameters or any limit values have been encroached upon, the drive would end the command with an error message.

See also Function description: "Position Command Value Monitoring"

S-0-0128 - Attributes

Para. Name:	**DE**	C200 Umschaltvorbereitung auf Komm.-Phase 4		
	EN	C200 Communication phase 4 transition check		
	FR	C200 Préparation transition phase de comm. 4		
	ES	C200 comprobación de conmutación a fase 4		
	IT	C200 Check Transizione Fase di Comunicazione 4		
Function:		Command	**Editability:**	P3
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0130, Probe value 1 positive edge

The drive uses the positive edge of the input signal from **S-0-0130, Probe value 1 positive edge**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0200, Signal select probe 1** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature"

S-0-0130 - Attributes

Para. Name:	**DE**	Messwert 1 positiv		
	EN	Probe value 1 positive edge		
	FR	Mesure sonde 1 front montant		
	ES	Valor de medición 1 positivo		
	IT	Misura Valore con Probe 1 positivo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0131, Probe value 1 negative edge

The drive uses the negative edge of the input signal from **S-0-0401, Probe 1**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0200, Signal select probe 1** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature"

S-0-0131 - Attributes

Para. Name:	**DE**	Messwert 1 negativ		
	EN	Probe value 1 negative edge		
	FR	Mesure sonde 1 front descendant		
	ES	Valor de medición 1 negativo		
	IT	Misura Valore con Probe 1 negativo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0132, Probe value 2 positive edge

The drive uses the positive edge of the input signal from **S-0-0402, Probe 2**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0201, Signal select probe 2** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature"

S-0-0132 - Attributes

Para. Name:	**DE**	Messwert 2 positiv		
	EN	Probe value 2 positive edge		
	FR	Mesure sonde 2 front montant		
	ES	Valor de medición 2 positivo		
	IT	Misura Valore con Probe 2 positivo		
Function:		Parameter	**Editability:**	-
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0201	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0201	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0133, Probe value 2 negative edge

The drive uses the negative edge of the input signal from **S-0-0402, Probe 2**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0201, Signal select probe 2** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature"

S-0-0133 - Attributes

Para. Name:	**DE**	Messwert 2 negativ		
	EN	Probe value 2 negative edge		
	FR	Mesure sonde 2 front descendant		
	ES	Valor de medición 2 negativo		
	IT	Misura Valore con Probe 2 negativo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0201	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0201	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0134, Master control word

If a **bus interface** is present (SERCOS-Interface, Profibus-DP, Interbus, CAN, ...), the master control word is transmitted cyclically from the master (control) to the drive. It defines important control informations, like

- drive enable
- /drive halt
- Selection of the operation mode

The exact composition is explained in the functional description of the respective bus interface.

If there is no bus interface, the information of the master control word is given by **digital inputs**. In any case, the parameter S-0-0134, Master control word is only for diagnostic purposes.

See also the functional description: "Master Control Word"

S-0-0134 - Attributes

Para. Name:	**DE**	Master-Steuerwort		
	EN	Master control word		
	FR	Mot de contrôle maître		
	ES	Palabra de mando maestro		
	IT	Word di Controllo Master		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0135, Drive status word

If a **bus interface** is present (SERCOS-Interface, Profibus-DP, Interbus, CAN, ...), the drive status word is transmitted cyclically from the slave (drive) to the control. It defines important status informations, like

- class 1 errors, drive lock
- operation readiness
- active actual operation mode

The exact composition is described in the functional description of the respective bus interface. In any case, the parameter S-0-0135, Drive status word is only for diagnostic purposes.

See also the functional description: "Drive Status Word"

S-0-0135 - Attributes

Para. Name:	**DE**	Antriebs-Status		
	EN	Drive status word		
	FR	Etat entraînement		
	ES	Estado de accionamiento		
	IT	Stato Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0138, Bipolar acceleration limit value

The Bipolar acceleration limit value describes the maximum permissible acceleration, symmetrical in both directions (acceleration and deceleration).

The drive decelerates at this deceleration to the velocity = 0 when the function "Drive stop" is executed, if the previously active operation mode was without drive internal command generation. Operation modes without drive internal command generation are

- Position control
- Angular synchronization
- Stepper motor operation

and others.

See also the functional description: "Drive Halt"

S-0-0138 - Attributes

Para. Name:	**DE**	Beschleunigung bipolar		
	EN	Bipolar acceleration limit value		
	FR	Accélération bipolaire		
	ES	Aceleración bipolar		
	IT	Valore di Accellerazione Limite		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / S-0-0160/278		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0139, D700 Command Parking axis

Setting and enabling the command Parking Axis switches off all the monitoring functions related to the measurement system.

This affects position control, feedback monitoring and the monitoring of the position window (S-0-0057).

When the command is active, the drive does not report any errors of class 1 diagnostics.

The Position feedback value status (S-0-0403) is cleared by the drive.

The command is acknowledged positive, when the mentionend surveillances are switched off.

Clearing the command switches all the mentioned surveillances on again. To refer the position feedback values to the reference point again, the drive must go to the reference again.

Structure of the parameter:

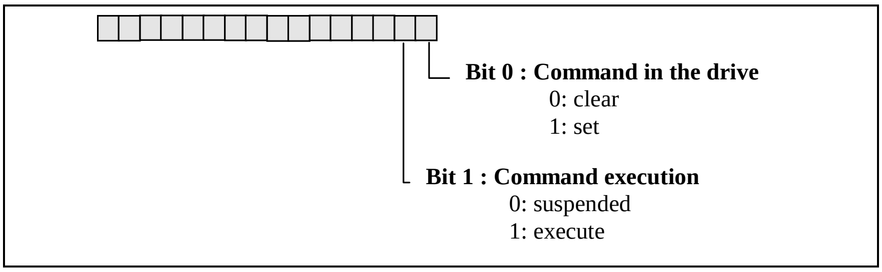


Fig. 2-18: S-0-0139, D700 Command Parking axis

See also the functional description: "Command Parking Axis"

S-0-0139 - Attributes

Para. Name:	**DE**	D700 Kommando Parkende Achse		
	EN	D700 Command Parking axis		
	FR	D700 Commande stationnement axe		
	ES	D700 Comando eje de estacionamiento		
	IT	D700 Comando Stazionamento Asse		
Function:		Command	**Editability:**	P2
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0140, Controller type

The device type of the manufacturer can be found in **text** form in the operating data for the controller type.

Examples:

HDS02.1-W100-D

DKC01.1-040-7

See also the functional description: "Drive Controllers and Motors"

S-0-0140 - Attributes

Para. Name:	**DE**	Regelgerätetyp		
	EN	Controller type		
	FR	Type de variateur		
	ES	Tipo de regulador		
	IT	Tipo Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		1Byte var.	**Memory:**	Verst. EE
Format:		ASCII	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0141, Motor type

Here is the motor type of the connected motor in **text** form.

For MHD, MKD and MKE motors, this value is stored in the motor feedback and will be loaded from there when the drive is started for the first time.

Example:

MKD 071B-061-KP1-BN

MKE 096B-047-GG0-KN

See also the functional description: "Drive Controllers and Motors"

S-0-0141 - Attributes

Para. Name:	**DE**	Motor-Typ		
	EN	Motor type		
	FR	Type de moteur		
	ES	Tipo de motor		
	IT	Tipo Motore		
Function:		Parameter	**Editability:**	P23
Data length:		1Byte var.	**Memory:**	Param. EE
Format:		ASCII	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		Default_Motor	**Cyc. transmittable:**	no

S-0-0142, Application type

A descriptive name text for the drive can be stored in this parameter (e.g., swivel axis). It has no functional significance.

See also the functional description: "ECODRIVE03 - the Universal Drive Solution for Automation"

S-0-0142 - Attributes

Para. Name:	**DE**	Anwendungsart		
	EN	Application type		
	FR	Type d'application		
	ES	Tipo de aplicación		
	IT	Tipo applicazione		
Function:		Parameter	**Editability:**	P234
Data length:		1Byte var.	**Memory:**	Param. EE
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		Default	**Cyc. transmittable:**	no

S-0-0143, System interface version

The version of the SERCOS interface specifications is found in the operating data.

Current valid settings:

V	V 01.01:	V 01.02:
SERCOS specification German 01.00:	SERCOS English specification	SERCOS update German/English
Version 5/90	Version 4/91	Version 9/91

Fig. 2-19: S-0-0143, Version of the SERCOS interface specification

See also the functional description: "Overview of SERCOS Communication"

S-0-0143 - Attributes

Para. Name:	**DE**	Sercos Interface Version		
	EN	System interface version		
	FR	Version d'interface SERCOS		
	ES	Version de Interface Sercos		
	IT	Versione del Interfaccia Sercos		
Function:		Parameter	**Editability:**	no
Data length:		1Byte var.	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0144, Signal status word

With the help of the signal status word, real time signals can be transferred from the drive to the PLC.

To do so, the signal status word must be configured as cyclic data in the Drive Telegram.

The bits in the signal status word can be defined freely with the parameters

- **S-0-0026, Configuration list signal status word** and
- **S-0-0328, Config. list for signal status word, bit number**.

See also the functional description: "Configurable Signal Status Word"

S-0-0144 - Attributes

Para. Name:	**DE**	Signal-Statuswort		
	EN	Signal status word		
	FR	Mot d'état de signal		
	ES	Palabra de estado de señal		
	IT	Parole di Stato Segnali		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0145, Signal control word

With the help of the signal control word, signals can be transmitted in real time from control to drive.

The signal control word must, in this case, be built in as cyclical data into the drive telegram.

The bits in signal control word can be freely defined via parameter **S-0-0027, Configuration list signal control word** and **S-0-0329, Assign list signal control word.**

With parallel interface, bits 0 to 9 are directly write accessed at the digital inputs. This means that the digital inputs can be allocated to different parameters.

Also see function description: "Configurable Signal Control Word"

S-0-0145 - Attributes

Para. Name:	**DE**	Signal-Steuerwort		
	EN	Signal control word		
	FR	Mot de contrôle de signal		
	ES	Palabra de mando de señal		
	IT	Parole di Controllo Segnali		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0147, Homing parameter

The processes for the **Drive controlled homing procedure, S-0-0148** in relation to the machine layout, NC and drive installation are set in this parameter.

Structure of the parameter:

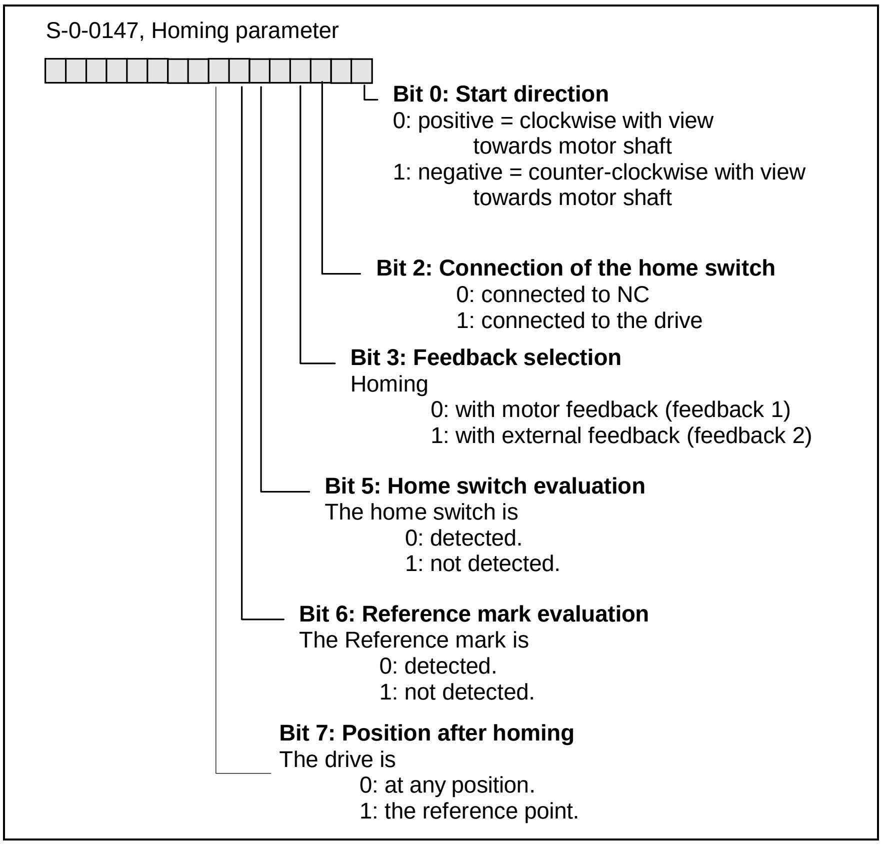


Fig. 2-20: S-0-0147, Homing Parameter

Note: Only the bits named here are supported by the firmware. In addition, for DIAX drives, bit 5 activates the monitoring of the external 24V.

See also the functional description: "Drive-Controlled Homing"

S-0-0147 - Attributes

Para. Name:	**DE**	Referenzfahr-Parameter		
	EN	Homing parameter		
	FR	Paramètre de prise d'origine		
	ES	Parámetro de puesta a cero		
	IT	Parametro Azzeramento		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010 0000b	**Cyc. transmittable:**	no

S-0-0148, C600 Drive controlled homing procedure command

When this command is set and enabled, the drive switches automatically into internal position control and accelerates using the **S-0-0042, Homing acceleration** to the **Homing velocity, S-0-0042** as long as it is in operating status AF. Bit 0 in **S-0-0403, Position feedback value status** will be deleted at first. As long as the command is active, changes in the cyclic position command values will be ignored.

The process for the homing procedure can be specified with **S-0-0147, Homing parameter**. After the command has been properly executed (drive is at standstill and position feedback value is related to the homing position), the drive sets bit 0 = 1 in parameter **S-0-0403, Position feedback value status**.

The parameter "Position feedback value status“ reflects the signal "In_Reference“.

See also the functional description: "Drive-Controlled Homing"

S-0-0148 - Attributes

Para. Name:	**DE**	C600 Kommando Antriebsgeführtes Referenzieren		
	EN	C600 Drive controlled homing procedure command		
	FR	C600 Commande prise origine pilotée par entraînement		
	ES	C600 Comando puesta a cero por accionamiento		
	IT	C600 Asse controllato durante la Procedura di Azzer.		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0149, D400 Positive stop drive procedure command

When this command is set and enabled, all controller monitoring which would otherwise result in an class 1 diagnostic error message when the drive is blocked by a positive stop will be turned off.

Parameter structure:

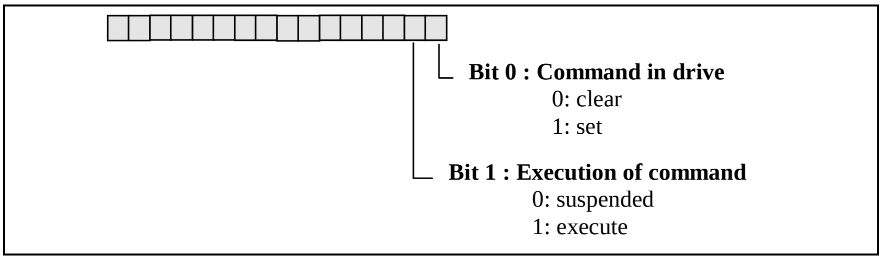


Fig. 2-21: S-0-0149, D400 Positive stop drive procedure command

See also the functional description: "Positive stop drive procedure"

S-0-0149 - Attributes

Para. Name:	**DE**	D400 Kommando Fahren auf Festanschlag		
	EN	D400 Positive stop drive procedure command		
	FR	D400 Commande déplacement contre obstacle fixe		
	ES	D400 Comando Desplazamiento a tope		
	IT	D400 Comando Movimento contro un Ostacolo fisso		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0150, Reference offset 1

This parameter describes the distance between the position encoder home reference marker 1 and **S-0-0052, Reference distance 1**.

The parameter makes it possible to shift the reference point in relation to the reference marker to be detected. If bit 7 in **S-0-0147, Homing parameter** is set to 1, then, during execution of the command **S-0-0148, C600 Drive controlled homing procedure command**, the drive goes to the reference point shifted from the reference mark by the value S-0-0150, Reference Offset 1.

See also the functional description: "Drive-Controlled Homing"

S-0-0150 - Attributes

Para. Name:	**DE**	Referenzmaß Offset 1		
	EN	Reference offset 1		
	FR	Décalage d'origine 1		
	ES	Medición de referencia offset 1		
	IT	Azzeramento Offset 1 (Feedback Motore)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0151, Reference offset 2

This parameter describes the distance between the position encoder home reference marker 2 and **S-0-0054, Reference distance 2**.

The parameter makes it possible to shift the reference point in relation to the reference marker to be detected. If bit 7 in **S-0-0147, Homing parameter** is set to 1, then, during execution of the command **S-0-0148, C600 Drive controlled homing procedure command**, the drive goes to the reference point shifted from the reference mark by the value **S-0-0151, Reference offset 2**.

See also the functional description: "Drive-Controlled Homing"

S-0-0151 - Attributes

Para. Name:	**DE**	Referenzmaß Offset 2		
	EN	Reference offset 2		
	FR	Décalage d'origine 2		
	ES	Medición de referencia offset 2		
	IT	Azzeramento Offset 2 (Feedback esterno)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0152, C900 Position spindle command

When setting and enabling this command in the drive, the spindle positioning function is activated, as far as the drive delivers torque (drive enable on).

Doing this, the cyclical command values are ignored, and, taking into account the parameters

- **S-0-0138, Acceleration bipolar**
- **S-0-0154, Spindle position parameter**
- **S-0-0222, Spindle positioning speed**
- **S-0-0349, Jerk limit bipolar**

it moves to the position in **S-0-0152, C900 Position spindle command**, or it performs the distance set in **S-0-0180, Spindle relative offset**.

After execution of the spindle positioning, the message **S-0-0336, Message In position** is set, the command is **not** reported as terminated in the command acknowledge.

See also the functional description: "Spindle Positioning"

S-0-0152 - Attributes

Para. Name:	**DE**	C900 Kommando Spindel positionieren		
	EN	C900 Position spindle command		
	FR	C900 Commande positionnement de broche		
	ES	C900 Comando posicionar husillo		
	IT	C900 Comando Posizionamento Mandrino		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	-
Unit:		--	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	-
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0153, Spindle angle position

This parameter contains the absolute position command value for the Position spindle command (for absolute positioning).

See also the functional description: "Spindle Positioning"

S-0-0153 - Attributes

Para. Name:	**DE**	Spindel-Winkelposition		
	EN	Spindle angle position		
	FR	Position angulaire de broche		
	ES	Angulo de husillo		
	IT	Angulo del Mandrino		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param.-E²prom
Format:		DEC_MV	**Validity check:**	P3-4
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	-
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0154, Spindle position parameter

This parameter sets options for the function "Spindle positioning".

The following are selectable in detail:

- Spindle turning right (CW)
- Spindel turning left (CCW)
- Shortest way
- absolute positioning
- relative positioning

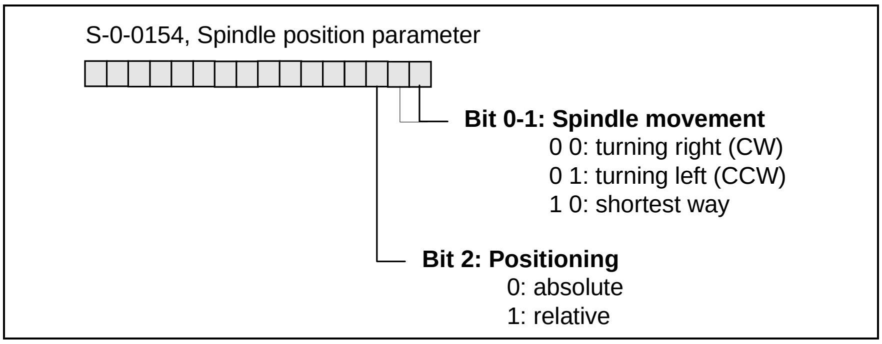


Fig. 2-22: The meaning of the bits in S-0-0154 Spindle position parameter

Spindle turning right or left / shortest way:

In **bit 0 and 1** of the parameter, the turning direction of the drive is set.

Note: The positioning direction "turning right“ or "turning left“ is only obeyed, when the spindle stands still. This is the case when it turns at a speed less than S-0-0124, Standstill window. When the Spindle moves already, the positioning is done with the actual turning direction.

Absolute / relative positioning

Bit 2 sets whether the axis goes to an angular spindle position (absolute positioning) or whether the spindle distance is performend (relative positioning).

Note: To get a reasonable result, the spindle should stay still before switching from absolute to relative positioning, in order to count the angle to move from a defined start position on. Switching over between absolute and relative positioning has an immediate effect, even during a running spindle positioning command.

The choice whether to position with motor encoder or spindle encoder is done in **S-0-0147, Homing parameter**.

See also the functional description: "Spindle Positioning"

S-0-0154 - Attributes

Para. Name:	**DE**	Spindelpositionier-Parameter		
	EN	Spindle position parameter		
	FR	Paramètre de positionnement de broche		
	ES	Parámetro de posizionamiento de husillo		
	IT	Parametro Posizionamento Mandrino		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param.-E²prom
Format:		BIN	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	yes
Input min/max:		0 / -		
Default value:		0	**Cyc. transmittable:**	no

S-0-0157, Velocity window

The Velocity window refers to the absolute value of the **S-0-0036, Velocity Command Value**.

If the velocity command value is whithin the calculated velocity window, then the drive sets the bit 0 in **S-0-0013, Class 3 diagnostics** (Message 'n_actual = n_command').

See also the functional description: "S-0-0013, Class 3 diagnostics"

S-0-0157 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Fenster		
	EN	Velocity window		
	FR	Fenêtre de vitesse		
	ES	Ventana de velocidad		
	IT	Finestra Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		1000000	**Cyc. transmittable:**	no

S-0-0158, Power threshold Px

The parameter Power threshold Px sets the DC bus circuit power from which on the drive generates the message P >= Px (S-0-0337).

See also the functional description: "S-0-0013, Class 3 diagnostics"

S-0-0158 - Attributes

Para. Name:	**DE**	Leistungs-Schwelle Px		
	EN	Power threshold Px		
	FR	Seuil de puissance Px		
	ES	Umbral de potencia Px		
	IT	Soglia di Potenza Px		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param.-E²prom
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		KW	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0159, Monitoring window

When an operating mode with internal position control is activated in the drive, the position loop is monitored. Therefore, a **model value for the actual position** is calculated and compared with the real actual position.

The maximum tolerated deviation between the measured and calculated actual feedback value is set with the help of the parameter S-0-0159, Monitoring window. If the position deviation exceeds the monitoring window, then the drive sets the error **F228 Excessive deviation** in the class 1 diagnostics.

The greatest deviation that occurs will always be stored in parameter **P-0-0098, Max. model deviation**.

See also the functional description: "Position Control Loop Monitoring"

S-0-0159 - Attributes

Para. Name:	**DE**	Überwachungsfenster		
	EN	Monitoring window		
	FR	Fenêtre de contrôle		
	ES	Ventana de control		
	IT	Finestra di Monitoraggio		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		1000000	**Cyc. transmittable:**	no

S-0-0160, Acceleration data scaling type

Various scaling types can be set as described below for the acceleration data in the drive as defined by the bit values of this parameter.

Structure of the parameter:

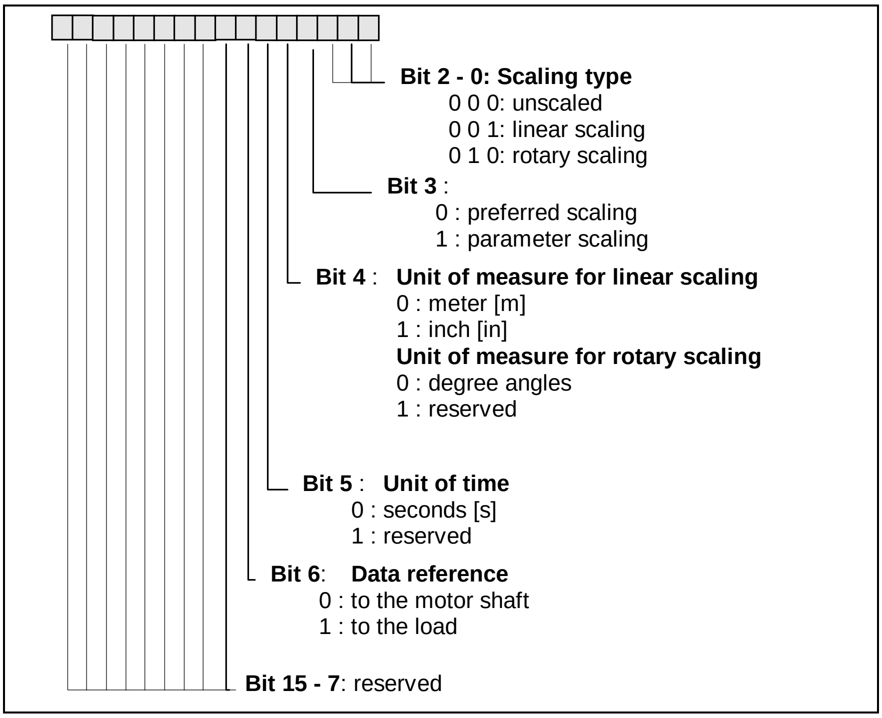


Fig. 2-1: S-0-0160, Acceleration Data Scaling Type

Note: Only the bits named here are supported by the product.
1) Same as S-0-0044 Note 1
2) Same as S-0-0044 Notes 2

Example: (Acceleration data scaling)

Suppose that loadside, linear scaling as desired with acceleration units in M/s². The scaling on the drive will result as follows:

Parameter	Value
S-0-0159, Acceleration data scaling type	1001001
Bit 2-0 001 linear scaling	
Bit 3: 1 (Preferred) parameter scaling	
Bit 4: 0 Dimensional unit in meters (m)	
Bit 5: 0 Time unit in seconds (s)	
Bit 6: 1 Data referenced at load	
S-0-0161, Acceleration data scaling factor	1
S-0-0162, Acceleration data scaling exponent	-6

Now suppose that the decimal value +1234567 is stored in the relevant acceleration data register. The datum value will be interpreted and displayed as:

or +1234.567X10^{-3} mm/s^2

or, as the value would be displayed in the IDN lists, +1234.467 mm/s^2 with respect to the load. Note that the least significant decimal value is determined by the scaling exponent, in this exaple, as 10^{-6} m/s^2 or 10^{-3} mm/s^2.

See also functional description: "Velocity Data Display Format"

S-0-0160 - Attributes

Para. Name:	**DE**	Wichtungsart für Beschleunigungsdaten		
	EN	Acceleration data scaling type		
	FR	Type de calibrage pour données d'accélération		
	ES	Tipo de escala para datos de aceleración		
	IT	Tipo di Scala per Dati Accellerazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0100 0010b	**Cyc. transmittable:**	no

S-0-0161, Acceleration data scaling factor

When parameter scaling is set in **S-0-0160, Acceleration data scaling type**, the scaling factor for all of the acceleration data in the drive is determined by this parameter.

See also the functional description: "Velocity Data Display Format"

S-0-0161 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor für Beschleunigungsdaten		
	EN	Acceleration data scaling factor		
	FR	Facteur de calibrage pour données d'accélération		
	ES	Factor de escala para datos de aceleración		
	IT	Fattore di Scala per Dati Accellerazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		1	**Cyc. transmittable:**	no

S-0-0162, Acceleration data scaling exponent

If parameter scaling is set in **S-0-0160, Acceleration data scaling type** the scaling exponent with sign for all acceleration data in the drive is determined in this parameter.

See also the functional description: "Velocity Data Display Format"

S-0-0162 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent für Beschleunigungsdaten		
	EN	Acceleration data scaling exponent		
	FR	Exposant de calibrage pour données d'accélération		
	ES	Exponente de escala para datos de aceleración		
	IT	Esponente per Dati Accellerazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-32768 / 32768		
Default value:		-3	**Cyc. transmittable:**	no

S-0-0165, Distance coded reference offset 1

With the help of this parameter, the **greater distance** between two reference markers is programmed, if a measurement system with **distance coded reference markers** is used.

See also the functional description: "Drive-Controlled Homing"

S-0-0165 - Attributes

Para. Name:	**DE**	Abstandskodiertes Referenzmaß 1		
	EN	Distance coded reference offset 1		
	FR	Marques de référence de distance codée 1		
	ES	Marcas de referencia de distancia codificada 1		
	IT			
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Periods	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4294967295		
Default value:		1001	**Cyc. transmittable:**	no

S-0-0166, Distance coded reference offset 2

With the help of this parameter, the **smaller distance** between two reference markers is programmed, if a measurement system with **distance coded reference markers** is used.

See also the functional description: "Drive-Controlled Homing"

S-0-0166 - Attributes

Para. Name:	**DE**	Abstandskodiertes Referenzmaß 2		
	EN	Distance coded reference offset 2		
	FR	Marques de référence de distance codée 2		
	ES	Marcas de referencia de distancia codificada 2		
	IT			
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Periods	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4294967295		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0169, Probe control parameter

This parameter is used to specify whether one or both of the probe inputs "probe 1" (DSS: X12-E4) and "probe 2" (DSS: X12-E5) are activated, and which edge (positive/negative) should trigger the probe data acquisition.

Parameter structure:

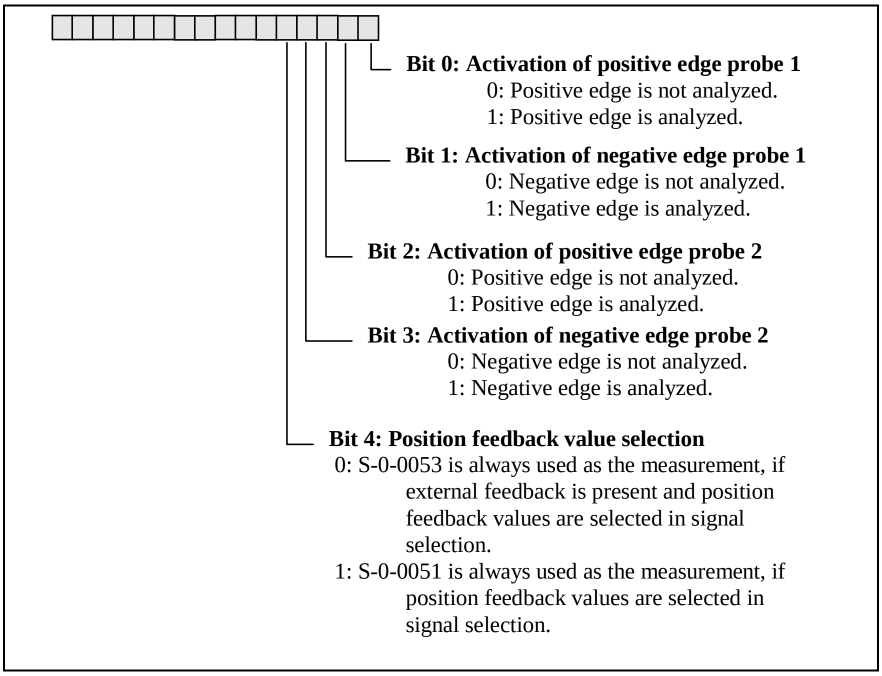


Fig. 2-23: S-0-0169, Probe control parameter

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Probe Input Feature"

S-0-0169 - Attributes

Para. Name:	**DE**	Messtaster-Steuerparameter		
	EN	Probe control parameter		
	FR	Paramètre de commande de la sonde		
	ES	Parámetros de mando de control de muestra		
	IT	Parametro di Controllo Probe		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0170, Probing cycle procedure command

By setting and enabling the command "probing cycle procedure," the drive reacts to the following:

- **S-0-0405, Probe 1 enable / S-0-0406, Probe 2 enable** and
- **S-0-0401, Probe 1, / S-0-0402, Probe 2.**

as is programmed in **S-0-0169, Probe control parameter**.

The NC can perform multiple measurements while this command is active. If the NC no longer wants new measurements, it clears the command.

Parameter structure:

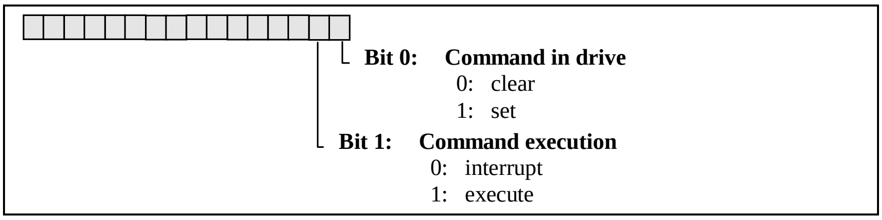


Fig. 2-24: S-0-0170, Probing cycle procedure command

Note: Only the bits indicated here are supported by the software. With bit 0, moreover, the monitoring of the external 24V is activated.

See also the functional description: "Probe Input Feature"

S-0-0170 - Attributes

Para. Name:	**DE**	Kommando Messtasterzyklus		
	EN	Probing cycle procedure command		
	FR	Commande cycle mesure de sonde		
	ES	Comando ciclo de teclas de medición		
	IT	Comando per Procedura di Probe		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0173, Marker position A

During the **drive controlled homing** with an incremental measuring system, the **position of the reference marker (zero pulse)** is stored in this parameter. This position feedback value still refers to the "old“ coordinate system (before switching the coordinate system with the homing procedure).

Furthermore, the recognition of the reference mark can be activated by the command **P-0-0014, D500 Command determine marker position**. Then, as soon as the next reference pulse comes from the feedback, the appropriate position value is stored in this parameter, and the command gets a positive acknowledge.

See also the functional description: "Command - detect marker position"

S-0-0173 - Attributes

Para. Name:	**DE**	Markerposition A		
	EN	Marker position A		
	FR	Position du marqueur A		
	ES	Posición de marcador A		
	IT	Posizione Marca A		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0177, Absolute distance 1

The parameter is used for the **homing** procedure **of a distance coded motor feedback**. It describes the offset between the zero point of the motor feedback (position of the 1st reference marker of the motor encoder) and the machine's zero-point.

Determining the right value for this parameter can be done in 2 steps. First, write the value 0 into S-0-0177 and proceed the command **S-0-0148, C600 Drive controlled homing procedure command**. The position feedback value 1 in S-0-0051 then shows the actual position refered to the machine’s zero point.

Then, when you jog the axis to the machine’s zero point, input the value of S-0-0051 indicated there into S-0-0177 with inverted sign (+ ↔ -). After another homing, the value in S-0-0051 displays the position in reference to the machine’s zero point.

See also the functional description: "Drive-Controlled Homing"

S-0-0177 - Attributes

Para. Name:	**DE**	Absolutmaß-Offset 1		
	EN	Absolute distance 1		
	FR	Décalage absolu 1		
	ES	Distancia absoluta 1		
	IT	Offset 1 per Dimensionamenti assoluti (Feedback Motore)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0178, Absolute distance 2

The parameter is used for the **homing** procedure **of a distance coded external feedback**. It describes the offset between the zero point of the optional feedback (position of the 1st reference marker) and the machine's zero-point.

Determining the right value for this parameter can be done in 2 steps. First, write the value 0 into S-0-0178 and proceed the command **S-0-0148, C600 Drive controlled homing procedure command**. The position feedback value 2 in S-0-0053 then shows the actual position refered to the machine’s zero point.

Then, when you jog the axis to the machine’s zero point, input the value of S-0-0053 indicated there into S-0-0178 with inverted sign (+ ↔ -). After another homing, the value in S-0-0053 displays the position in reference to the machine’s zero point.

See also the functional description: "Drive-Controlled Homing"

S-0-0178 - Attributes

Para. Name:	**DE**	Absolutmaß-Offset 2		
	EN	Absolute distance 2		
	FR	Décalage absolu 2		
	ES	Distancia absoluta 2		
	IT	Offset 2 per Dimensionamenti assoluti (Feedback esterno)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0179, Measurement value status

If the drive stores one or more measured values during the active **Command probe cycle** (**IDN 00170**) then it simultaneously sets the relevant bit in the measured value cycle.

If **Probe 1 enable** (**IDN 00405**) is cleared by the control, then the drive clears bits 0 and 1 in the probe status.

If **Probe 2 enable**(**IDN 00406**) is cleared by the control, then the drive clears bits 2 and 3 in the probe status.

The drive clears all bits if the command probe cycle (**IDN 00170**) is cleared by the control.

Parameter structure:

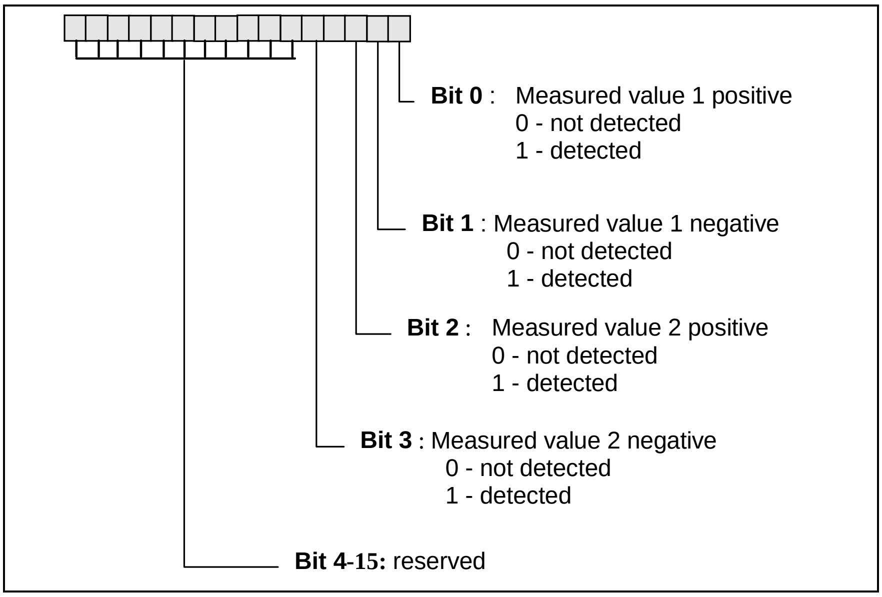


Fig. 2-25: Probe status structure

S-0-0179 - Attributes

Para. Name:	**DE**	Messwert-Status		
	EN	Measurement value status		
	FR	Etat de valeurs mesurées		
	ES	Estado de valores de medición		
	IT	Stato di Valori misurati		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0180, Spindle relative offset

This parameter contains the relative position command value for the spindle positioning (for relative positioning).

See also the functional description: "Spindle Positioning"

S-0-0180 - Attributes

Para. Name:	**DE**	Spindelweg		
	EN	Spindle relative offset		
	FR	Distance relative de la broche		
	ES	Recorrido de husillo		
	IT	Distanza Mandrino		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param.-E²prom
Format:		DEC_MV	**Validity check:**	P3-4
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	-
Input min/max:		-2147483647 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

S-0-0182, Manufacturer class 3 diagnostics

Different messages regarding operating status will be stored here every 8ms. If the status of a message were to change, this would not be signalled by an editing bit.

Structure of the parameter:

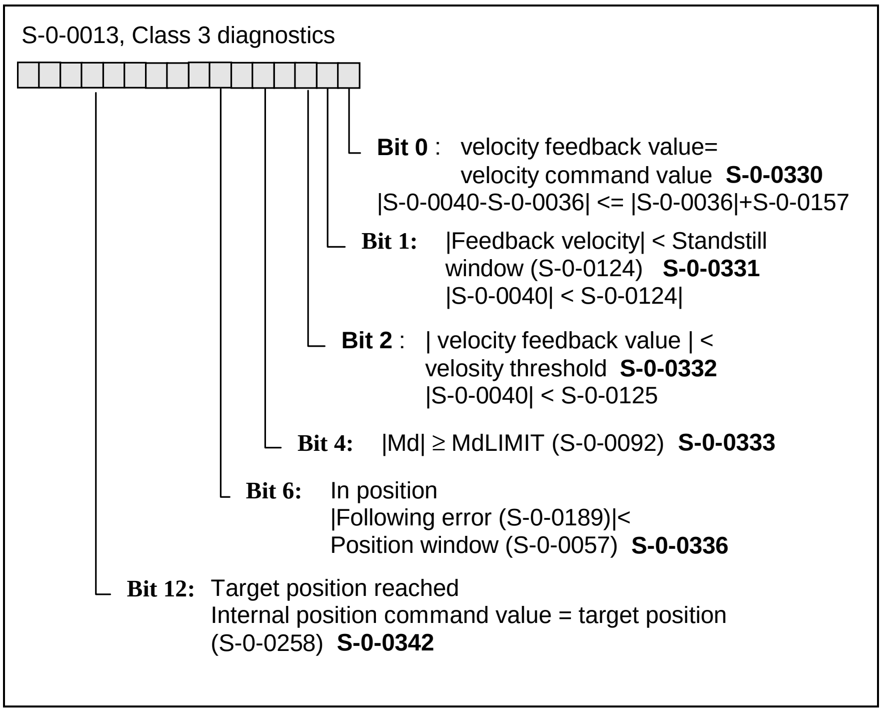


Fig. 2-26: Structure of S-0-0013, Class 3 diagnostics

Note: Only the bits named here are supported by the product.

See also the functional description: "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0182 - Attributes

Para. Name:	**DE**	Hersteller-Zustandsklasse 3		
	EN	Manufacturer class 3 diagnostics		
	FR	Diagnostic de classe 3 spéc. au fabriquant		
	ES	Diagnostico fabricante clase 3		
	IT	Diagnostica Classe 3 definita dal Costruttore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0185, Length of the configurable data record in the AT

In the operating data of the parameter with this ID number, the drive indicates the maximum length in bytes which it can process in the configurable data record of the drive telegram (AT).

Note: In the actual version of the firmware, the number of data in the AT equals 16 bytes.

See also the functional description: "Configuration of Telegram Contents"

S-0-0185 - Attributes

Para. Name:	**DE**	Länge des konfigurierbaren Datensatzes im AT		
	EN	Length of the configurable data record in the AT		
	FR	Longueur du registre de données configurables dans l'AT		
	ES	Longitud del bloque de datos configurable en el AT		
	IT	Lunghezza del Registro Dati in AT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0186, Length of the configurable data record in the MDT

In the operating data of the parameter with this ID number, the drive indicates the maximum length in bytes which it can process in the configurable data record of the Master Data Telegram.

Note: In the actual version of the firmware, the number of data in the AT equals 16 bytes.

See also the functional description: "Configuration of Telegram Contents"

S-0-0186 - Attributes

Para. Name:	**DE**	Länge des konfig. Datensatzes im MDT		
	EN	Length of the configurable data record in the MDT		
	FR	Longueur du registre de données configurables dans le MDT		
	ES	Longitud del bloque de datos configurable en el MDT		
	IT	Lunghezza del Registro Dati in MDT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0187, List of configurable data in the AT

This list contains the ID numbers of the operating data which can be configured in the drive telegram (AT).

- **S-0-0040, Velocity feedback value**
- **S-0-0051, Position feedback value 1 (motor feedback)**
- **S-0-0053, Position feedback value 2 (ext. feedback)**
- **S-0-0084, Torque/Force feedback value**
- **S-0-0130, Probe value 1 positive edge**
- **S-0-0131, Probe value 1 negative edge**
- **S-0-0132, Probe value 2 positive edge**
- **S-0-0133, Probe value 2 negative edge**
- **S-0-0182, Manufacturer class 3 diagnostics**
- **S-0-0189, Following error**
- **P-0-0082, Parallel I/O input 1**
- **P-0-0111, Parallel I/O input 2**
- **P-0-0113, Parallel I/O input 3**
- **P-0-0171, Parallel I/O input 4**
- **P-0-0173, Parallel I/O input 5**
- **P-0-0175, Parallel I/O input 6**
- **P-0-0202, Difference probe values 1**
- **P-0-0203, Difference probe values 2**
- **P-0-0210, Analog input 1**
- **P-0-0211, Analog input 2**

See also the functional description: "Configuration of Telegram Contents"

S-0-0187 - Attributes

Para. Name:	**DE**	Liste der konfigurierbaren Daten im AT		
	EN	List of configurable data in the AT		
	FR	Liste des IDN de données configurables dans l'AT		
	ES	Lista de los datos configurables en el AT		
	IT	Lista dei Dati configurabili in AT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0188, List of configurable data in the MDT

This list contains the ID numbers of the operating data which can be configured in the Master Data Telegram.

- **S-0-0036, Velocity command value**
- **S-0-0037, Additive velocity command value**
- **S-0-0047, Position command value**
- **S-0-0080, Torque/force command**
- **S-0-0091, Bipolar velocity limit value**
- **S-0-0092, Bipolar torque/force limit value**
- **S-0-0138, Bipolar acceleration limit value**
- **S-0-0193, Positioning Jerk**
- **S-0-0258, Target position**
- **S-0-0259, Positioning Velocity**
- **S-0-0260, Positioning Acceleration**
- **S-0-0349, Jerk limit bipolar**
- **P-0-0081, Parallel I/O output 1**
- **P-0-0110, Parallel I/O output 2**
- **P-0-0112, Parallel I/O output 3**
- **P-0-0170, Parallel I/O output 4**
- **P-0-0172, Parallel I/O output 5**
- **P-0-0174, Parallel I/O output 6**
- **P-0-0400, Pos. corr., external correction value**
- **P-0-0405, Pos. corr., actual temperature, position independent**

See also the functional description: "Configuration of Telegram Contents"

S-0-0188 - Attributes

Para. Name:	**DE**	Liste der konfigurierbaren Daten im MDT		
	EN	List of configurable data in the MDT		
	FR	Liste des IDN de données configurables dans le MDT		
	ES	Lista de los datos configurables en el MDT		
	IT	Lista dei Dati configurabili in MDT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0189, Following error

To this parameter, the drive writes the current **difference between the position command and the feedback position** value (**S-0-0051, Position feedback 1 value** or **S-0-0053, Position feedback 2 value**).

See also the functional description: "Determining the Position Controller Setting"

S-0-0189 - Attributes

Para. Name:	**DE**	Schleppabstand		
	EN	Following error		
	FR	Ecart de poursuite		
	ES	Error de seguimiento		
	IT	Errore di Inseguimento		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0191, D600 Cancel reference point procedure command

Setting and enabling the command Cancel reference point clears the bit **S-0-0403, Position feedback value status** in the drive.

The command correctly completed in the drive, when the bit "Position feedback value status“ has been set to 0 and the position value of the active feedback does not refer any more to the machine’s zero point (= **no longer referenced**).

Parameter structure:

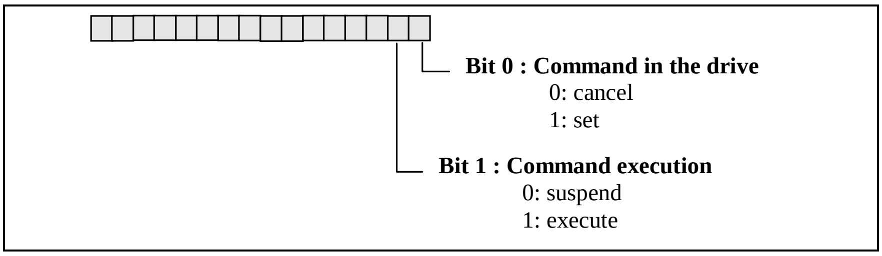


Fig. 2-27: S-0-0191, D600 Cancel reference point procedure command

See also the functional description: "Drive-Controlled Homing"

S-0-0191 - Attributes

Para. Name:	**DE**	D600 Kommando Referenzbezug löschen		
	EN	D600 Cancel reference point procedure command		
	FR	D600 Commande Annullation de l'origine		
	ES	D600 Comando Borrar referencia		
	IT	D600 Comando Anullazione Azzeramento		
Function:		Command	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0192, IDN-list of backup operation data

The ID numbers for all operating data that must be loaded in the drive for proper operation are kept in this IDN list. Generally these are the parameters which are stored in the programming module.

The control system should use this IDN list to create a **backup** copy of the drive parameters.

If a customer password has been activated with the parameter **S-0-0267, Password**, all parameters contained in S-0-0192, IDN List of backup operation data are write protected.

See also the functional description: "IDN List of Parameters"

S-0-0192 - Attributes

Para. Name:	**DE**	IDN-Liste der zu sichernden Betriebsdaten		
	EN	IDN-list of backup operation data		
	FR	Liste des IDN des données d'exploitation de sauvegarde		
	ES	Lista IDN de los datos de servicio de seguridad		
	IT	Lista IDN dei Dati operativi salvati		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0193, Positioning Jerk

The positioning jerk limits the **acceleration change per time** in the operating modes with

- Drive internal interpolation and
- Relative drive internal interpolation.

Note: With the value 0, the jerk filter is off.

See also the functional description: "Function principle: Drive Internal Interpolation"

S-0-0193 - Attributes

Para. Name:	**DE**	Positionier-Ruck		
	EN	Positioning Jerk		
	FR	Jerk de positionnement		
	ES	Posicionamiento agitación		
	IT	Jerk per Posizionamento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / 4000000.000		
Default value:		0	**Cyc. transmittable:**	MDT

S-0-0201, Motor warning temperature

If the motor temperature exceeds the motor warning temperature, then the motor warning high temperature bit will be set by the drive in **S-0-0012, Class 2 diagnostics**.

This parameter will be set by the drive at 145° for MHD, MKD and MKE motors.

See also the functional description: "Temperature Monitoring"

S-0-0201 - Attributes

Para. Name:	**DE**	Motor-Warntemperatur		
	EN	Motor warning temperature		
	FR	Température de préalerte du moteur		
	ES	Temperatura de aviso de motor		
	IT	Preallarme Temperatura Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		C	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		45.0 / S-0-0204		
Default value:		1400	**Cyc. transmittable:**	no

S-0-0204, Motor shutdown temperature

If the motor temperature exceeds the motor shutdown temperature, then the motor overtemperature bit in **S-0-0011, Class 1 diagnostics** will be set by the drive and the error **F219 Motor overtemp. shutdown** will be generated.

In MHD, MKD and MKE motors, the drive sets this parameter at 155°.

See also the functional description: "Temperature Monitoring"

S-0-0204 - Attributes

Para. Name:	**DE**	Motor-Abschalttemperatur		
	EN	Motor shutdown temperature		
	FR	Température d'arrêt du moteur		
	ES	Temperatura de desconexion de motor		
	IT	Spegnimento per Sovratemp. Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		C	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		S-0-0201 / 155.0		
Default value:		1500	**Cyc. transmittable:**	no

S-0-0208, Temperature data scaling type

In this scaling mode, temperature can be set to either **°C (Celsius) or F (Fahrenheit)**.

Scaling of temperature equals 0.1°C or 0.1 F.

Data length for temperature data is set to **2 bytes**.

Parameter structure:

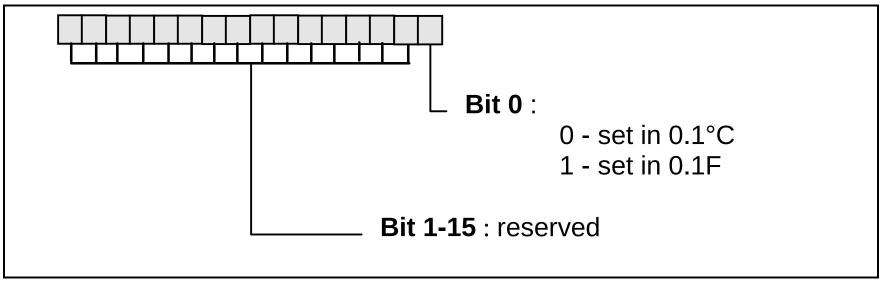


Fig. 2-28: Scaling mode structure for temperature data

S-0-0208 - Attributes

Para. Name:	**DE**	Wichtungsart für Temperaturdaten		
	EN	Temperature data scaling type		
	FR	Type de calibrage pour données de température		
	ES	Tipo de escala de datos de temperatura		
	IT	Tipo de Scala per Dati di Temperatura		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		-	**Cyc. transmittable:**	-

S-0-0222, Spindle positioning speed

When the command for spindle positioning is executed, a moving drive decelerates down to this speed, and a standing drive can accelerate up to this max. speed, to go finally to the command position.

See also the functional description: "Spindle Positioning"

S-0-0222 - Attributes

Para. Name:	**DE** Spindel-Positionierdrehzahl		
	EN Spindle positioning speed		
	FR Vitesse de positionnement de broche		
	ES Numero de revoluciones de posicionamiento de husillo		
	IT Velocità di Posizionamento Mandrino		
Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	Param.-E²prom
Format:	DEC_OV	**Validity check:**	P3-4
Unit:	S-0-0044	**Extrem value check:**	yes
Decimal places:	S-0-0044	**Combination check:**	-
Input min/max:	0 / S-0-0044		
Default value:	1500000	**Cyc. transmittable:**	no

S-0-0256, Multiplication 1

The parameter S-0-0256, Multiplication 1 determines, with which factor the signals of the motor feedback are multiplied in the drive.

The internal **resolution** for the motor encoder in the drive is calculated as follows:

S-0-0116 Resolution of motor feedback • S-0-0256 Multiplication 1

The multiplication 1 depends at first from the parameters **S-0-0278, Maximum travel range** and **S-0-0116, Resolution of motor feedback**. If there is an optional encoder, the **S-0-0257, Multiplication 2** is taken into account as well.

See also the functional description: "Setting the drive-internal position data format"

S-0-0256 - Attributes

Para. Name:	**DE** Vervielfachung 1		
	EN Multiplication 1		
	FR Multiplication 1		
	ES Multiplicación 1		
	IT Multiplicazione 1		
Function:	Parameter	**Editability:**	no
Data length:	4Byte	**Memory:**	no
Format:	DEC_OV	**Validity check:**	no
Unit:	--	**Extrem value check:**	no
Decimal places:	1	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	no

S-0-0257, Multiplication 2

The parameter S-0-0257, Multiplication 2 determines, with which factor the signals of the optional feedback are multiplied in the drive.

The internal **resolution** for the optional encoder in the drive is calculated as follows:

S-0-0117 Resolution of optional feedback • S-0-0257 Multiplication 2

The multiplication 2 depends on the parameters **S-0-0278, Maximum travel range** and **S-0-0117, Resolution of optional feedback**.

See also the functional description: "Setting the drive-internal position data format"

S-0-0257 - Attributes

Para. Name:	**DE**	Vervielfachung 2		
	EN	Multiplication 2		
	FR	Multiplication 2		
	ES	Multiplicación 2		
	IT	Multiplicazione 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0258, Target position

The target position is assigned to the drive as a command value by the controller in the operating modes with **drive-controlled interpolation**. The drive moves to the target position taking into account the following values:

- **S-0-0259, Positioning Velocity**
- **S-0-0260, Positioning Acceleration**
- **S-0-0193, Positioning Jerk**

In the operating mode "Position control with positioning interface" (process blocks), the target position of the current position block will be copied to parameter S-0-0258, target position.

See also the functional description: "Function principle: Drive Internal Interpolation"

S-0-0258 - Attributes

Para. Name:	**DE**	Zielposition		
	EN	Target position		
	FR	Position à atteindre		
	ES	Posición objeto		
	IT	Posizione da raggiungere		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0259, Positioning Velocity

In the "Drive internal interpolation" operating mode, the **S-0-0258, Target position** is approached with the positioning velocity. In the "Block controlled" operating mode, the positioning velocity of the current Positioning block is copied to the parameter **"S-0-0259, Positioning velocity"**.

The speed effective with automatic control loop settings is also set with this parameter.

See also the functional description: "Function principle: Drive Internal Interpolation"

S-0-0259 - Attributes

Para. Name:	**DE**	Positionier-Geschwindigkeit		
	EN	Positioning Velocity		
	FR	Vitesse de positionnement		
	ES	Velocidad de posicionamiento		
	IT	Velocità di Posizionamento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		100000	**Cyc. transmittable:**	MDT

S-0-0260, Positioning Acceleration

Positioning acceleration is used in the "Drive internal interpolation" operating mode to accelerate up to the **S-0-0259, Positioning velocity**.

In the "Block controlled operation" operating mode, the positioning acceleration of the current Positioning block is copied to the parameter **S-0-0260, Positioning acceleration**. The positioning acceleration is also active with automatic control loop settings.

The acceleration active in control loop settings is also set with this parameter.

See also the functional description: "Function principle: Drive Internal Interpolation"

S-0-0260 - Attributes

Para. Name:	**DE**	Positionier-Beschleunigung		
	EN	Positioning Acceleration		
	FR	Accélération de positionnement		
	ES	Aceleración de posicionamiento		
	IT	Accellerazione per Posizionamento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / S-0-0160/278		
Default value:		100000	**Cyc. transmittable:**	MDT

S-0-0262, C700 Command basic load

When this command is set and enabled, the default parameters in the motor feedback for current, velocity and position **control loop settings** will be loaded and activated. These default parameters are **not** optimized for the specific application. They establish a stable control loop status.

ATTENTION

⇒ When this command is executed, parameters that have already been optimized may be overwritten.

See also Function description: "Load Default Feature"

S-0-0262 - Attributes

Para. Name:	**DE**	C700 Kommando Urladen		
	EN	C700 Command basic load		
	FR	C700 Commande chargement initial		
	ES	C700 Comando carga base		
	IT	C700 Comando Caricamento Base		
Function:		Command	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0265, Language selection

All parameter names, units and diagnostic warning messages within the drive controller are stored in several languages. This parameter determines the output language for the text.

- 0: German
- 1: English
- 2: French
- 3: Spanish
- 4: Italian

See also the functional description: "Language Selection"

S-0-0265 - Attributes

Para. Name:	**DE**	Sprach-Umschaltung		
	EN	Language selection		
	FR	Sélection de langue		
	ES	Cambio de idioma		
	IT	Selezione di Lingua		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4		
Default value:		0	**Cyc. transmittable:**	no

S-0-0267, Password

With this parameter, a customer password can be activated. This is used to lock the writability of all important parameters specific for the axis. The parameters which are locked by activating the customer password, can be seen in the parameter **S-0-0192, IDN-List of backup operation data**.

The password "007" is set at the factory. This password permits write access to the parameters.

Moreover, the parameter can unlock service capabilities.

See also the functional description: "Password"

S-0-0267 - Attributes

Para. Name:	**DE**	Passwort		
	EN	Password		
	FR	Mot de passe		
	ES	Contraseña		
	IT	Parola Chiave		
Function:		Parameter	**Editability:**	P234
Data length:		1Byte	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0269, Parameter buffer mode

The Parameter buffer mode is used to determine whether the data transmitted through the service cannel (or serial interface) will be stored temporarily (in RAM) or permanently (in EEPROM).

1: Data will not be stored permanently. (Data are volatile.)

0: Data will be stored permanently. (Data are resident.)

After the control voltage supply has been switched on, the drive will initialize bit 0 to 0. To activate temporary storage mode, bit 0 must be forced to 1 after switching on.

Note: For applications that write cylic or frequent updates to buffered parameters: Parameter buffer mode = 1 (temporary) should be activated by the initialization procedure in the machine control. This mode ensures that the write cycle life of the EEPROM is not exceeded. Must be re-programmed after complete power shut down.

See also the functional description: "Parameters Stored in DSM Programming Module"

S-0-0269 - Attributes

Para. Name:	**DE** Speicherungsmodus		
	EN Parameter buffer mode		
	FR Mode d'enregistrement		
	ES Modo de buffer		
	IT Buffer Modo Parametri		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	no
Format:	DEC_OV	**Validity check:**	no
Unit:	--	**Extrem value check:**	yes
Decimal places:	0	**Combination check:**	no
Input min/max:	0 / 1		
Default value:	---	**Cyc. transmittable:**	no

S-0-0277, Position feedback 1 type

This parameter is used to determine the significant properties of the encoder 1.

Parameter structure:

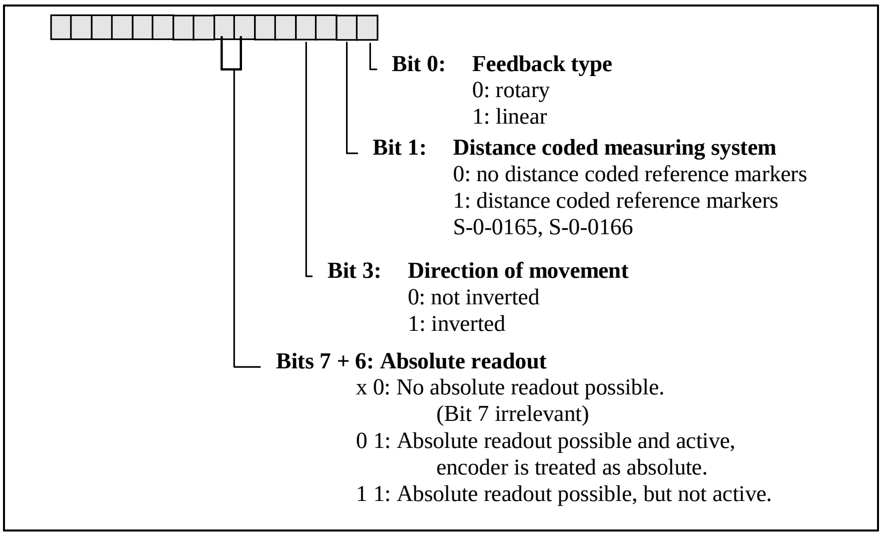


Fig. 2-29: S-0-0277, Position feedback 1 type parameter

Remark:

For absolute measurement systems with data memory, bit 6 is set automatically.

When MHD-, MKD and MKE motors are used, bits 0, 1, and 3 are set and write-protected by the drive.

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Other Motor Encoder Characteristics"

S-0-0277 - Attributes

Para. Name:	**DE**	Lagegeberart 1		
	EN	Position feedback 1 type		
	FR	Type codeur 1		
	ES	Tipo de encoder de posición 1		
	IT	Tipo di Feedback Posizione 1		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0278, Maximum travel range

The parameter S-0-0278, Maximum travel range defines the maximum possible mechanical move of the machine. Depending on the selected scaling, modulo or absolute format (see also **S-0-0076, Position data scaling type**), the input is unipolar (positive only) or bipolar (with sign).

The parameter S-0-0278, Maximum travel range affects the parameters **S-0-0256, Multiplication 1** and **S-0-0257, Multiplication 2** and therefore the internal position resolution in the drive.

Moreover, the limits for velocity and acceleration of the drive internal position command generator are influenced by the maximum travel range. Among others, the max. input values for **S-0-0259, Positioning Velocity** and **S-0-0260, Positioning Acceleration** depend from the value in S-0-0278 !

Note: The greater the parametrized maximum travel range, the smaller is the multiplication and the drive internal position resolution and the higher are the limits of the acceleration and velocity data.

Additionally, the parameter S-0-0278, Maximum travel range affects the bit 6 "Absolute readout possible“ in the respective **Position feedback type parameter (S-0-0277 or S-0-0115**). If the parametrized maximum travel range is greater than the absolute numerical range of the used encoder, then the bit 6 for "Absolute readout possible“ is reset to 0. Vice versa, the bit 6 is set as soon as a travel range less than the absolute numerical range of the encoder is recognized.

See also the functional description: "Setting the drive-internal position data format"

S-0-0278 - Attributes

Para. Name:	**DE**	Maximaler Verfahrbereich		
	EN	Maximum travel range		
	FR	Champs de déplacement maxi.		
	ES	Campo máximo de desplazamiento		
	IT	Campo di Movimento mass.		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / 214748.3647		
Default value:		2147483647	**Cyc. transmittable:**	no

S-0-0282, Travel distance

The control gives to the drive the travel distance in the operating mode **Relative internal Interpolation** as a **relative command value**.

When the parameter **S-0-0346, Setup flag for relative command values** is toggled (= changed), the drive adds the travel distance to the target position. The resulting absolute target position is displayed in in the parameter **S-0-0258, Target position**. Then, the drive performs the travel distance, with regard to

- **S-0-0259, Positioning Velocity**
- **S-0-0260, Positioning Acceleration**
- **S-0-0193, Positioning Jerk**

See also the functional description: "Mode: Relative drive-internal interpolation"

S-0-0282 - Attributes

Para. Name:	**DE**	Verfahrweg		
	EN	Travel distance		
	FR	Distance à parcourir		
	ES	Recorrido de desplazamiento		
	IT	Distanza movimento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0292, List of all operating modes

In this list, all operation modes are named, which the drive supports. The operation modes are listed by their codings, as they are input in the parameters **S-0-0032..35** (primary and secondary operation modes).

See also the functional description: "Possible Operating Modes"

S-0-0292 - Attributes

Para. Name:	**DE**	Liste der unterstützten Betriebsarten		
	EN	List of all operating modes		
	FR	Liste de tous les modes de fonctionnement		
	ES	Lista de todos los modos de operación		
	IT	Lista di tutti i Modi operativi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	constant
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

S-0-0298, Reference cam shift

For the drive controlled homing, if there is more than one reference marker in the travel range of the axis during homing, it is necessary to evaluate a reference switch. In this case, the 0->1 rising edge of the zero switch specifies the relevant reference marker.

To do this, the distance between zero switch and reference marker may not be below a certain value, because otherwise the reference marker is ambiguous. Therefore, the drive monitors the distance. If the distance is outside the allowed range, the command **S-0-0148, C600 Drive controlled homing procedure command** ends up with the error **C602 Distance zero switch - reference marker wrong**.

In this case, this parameter shows the distance, by which the zero switch must be shifted, to get the optimal distance.

You can either

- input the value in the parameter **S-0-0299, Home switch offset** to shift the active zero switch (virtually) referred to the real one, or
- shift the zero switch mechanically by the value displayed in S-0-0298.

If the distance between zero switch and reference marker is good, then S-0-0298, Reference cam shift by.. displays a 0.

See also the functional description: "Drive-Controlled Homing"

S-0-0298 - Attributes

Para. Name:	**DE**	Verschiebung des Referenznockens		
	EN	Reference cam shift		
	FR	Décalage de la came d'origine		
	ES	Desplazamiento de la leva de origen		
	IT	Posizione Camma di Azzeramento		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		4	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0299, Home switch offset

For the drive controlled homing, if there is more than one reference marker in the travel range of the axis during homing, it is necessary to evaluate a reference switch. In this case, the 0->1 rising edge of the zero switch specifies the relevant reference marker.

To do this, the distance between zero switch and reference marker may not be below a certain value, because otherwise the reference marker is ambiguous. Therefore, the drive monitors the distance. If the distance is outside the allowed range, the command **S-0-0148, C600 Drive controlled homing procedure command** ends up with the error **C602 Distance zero switch - reference marker wrong**.

In this case, this parameter shows the distance, by which the zero switch must be shifted, to get the optimal distance.

You can either

- input the value in the parameter **S-0-0299, Home switch offset** to shift the active zero switch (virtually) referred to the real one, or
- shift the zero switch mechanically by the value displayed in S-0-0298.

If the distance between zero switch and reference marker is good, then S-0-0298, Reference cam shift by.. displays a 0.

See also the functional description: "Drive-Controlled Homing"

S-0-0299 - Attributes

Para. Name:	**DE**	Referenzschalter-Offset		
	EN	Home switch offset		
	FR	Décalage contact origine		
	ES	Offset de interruptor de referencia		
	IT	Offset FC di Zero		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0301, Allocation of real-time control Bit 1

In order to assign a signal to the real-time control bit 1, the ID number of the signal is written to the operating data of the assignment for the real-time control bit 1.

If such an assignment is made, the assigned signal (bit 0) will be controlled by the real-time control bit 1 (= component of the master control word).

If the selected IDN is not available, the drive responds with the service channel error message "IDN not available"

If the programmed IDN is available but is not editable in phase 4, then the drive responds with the error message "Data not correct"

See also the functional description: "Real-Time Control and Status Bits"

S-0-0301 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitsteuerbit 1		
	EN	Allocation of real-time control Bit 1		
	FR	Allocation bit contrôle temps réel 1		
	ES	Asignación bit de mando tiempo real 1		
	IT	Allocazione del Real Time Control Bit 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0303, Allocation of real-time control Bit 2

In order to assign a signal the real-time control bit 2, the ID number of the signal is written to the operating data of the assignment for the real-time control bit 2.

If such an assignment is made, the assigned signal (bit 0) will be controlled by the real-time control bit 2 (= component of the master control word).

See also the functional description: "Real-Time Control and Status Bits"

S-0-0303 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitsteuerbit 2		
	EN	Allocation of real-time control Bit 2		
	FR	Allocation bit contrôle temps réel 2		
	ES	Asignación bit de mando tiempo real 2		
	IT	Allocazione del Real Time Control Bit 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0305, Allocation of real-time status Bit 1

In order to assign a signal to the real-time status bit 1, the ID number of the signal is written to the operating data of the assignment for the real-time status bit 1.

If such an assignment is made, the assigned signal (bit 0) thereafter appears in the real-time status bit 1 (= component of the drive status word).

If the programmed IDN is not available, the drive responds with the service channel error message "IDN not available".

see also the functional description: "Real-Time Control and Status Bits"

S-0-0305 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitstatusbit 1		
	EN	Allocation of real-time status Bit 1		
	FR	Allocation bit état temps réel 1		
	ES	Asignación bit de estado tiempo real 1		
	IT	Allocazione del Real Time Status Bit 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0307, Allocation of real-time status Bit 2

In order to assign a signal to the real-time status bit 2, the ID number of the signal is written to the operating data of the assignment for the real-time status bit 2.

If such an assignment is made, the assigned signal (bit 0) thereafter appears in the real-time status bit 2 (component of the drive status word).

See also the functional description: "Real-Time Control and Status Bits"

S-0-0307 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitstatusbit 2		
	EN	Allocation of real-time status Bit 2		
	FR	Allocation bit état temps réel 2		
	ES	Asignación bit de estado tiempo real 2		
	IT	Allocazione del Real Time Status Bit 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0310, Overload warning

This parameter defines an ident number for the overload warning. The purpose is to be able to assign the overload warning to a real time status bit. The overload warning is defined as a bit in the Class 2 diagnostics and is set dependent from the load integral limit. Only the bit 0 is defined.

Structure of the parameter:

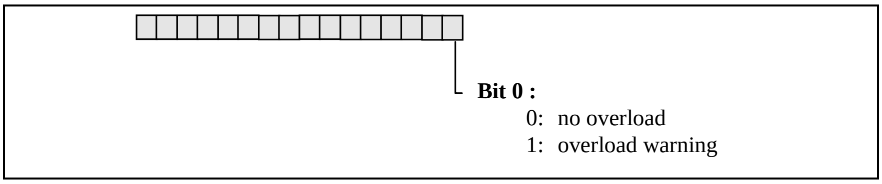


Fig. 2-30: S-0-0310, Overload Warning

S-0-0310 - Attributes

Para. Name:	**DE**	Überlast Warnung		
	EN	Overload warning		
	FR	Alerte surcharge		
	ES	Aviso sobrecarga		
	IT	Preallarme Sovracarica		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0311, Amplifier overtemperature warning

This parameter defines an ident number for the amplifier overtemperature warning. The purpose is to be able to assign the amplifier overtemperature warning to a real time status bit. The amplifier overtemperature warning is defined as a bit in the Class 2 diagnostics and is set dependent from the amplifier temperature warning threshold. Only the bit 0 is defined.

Structure of the parameter:

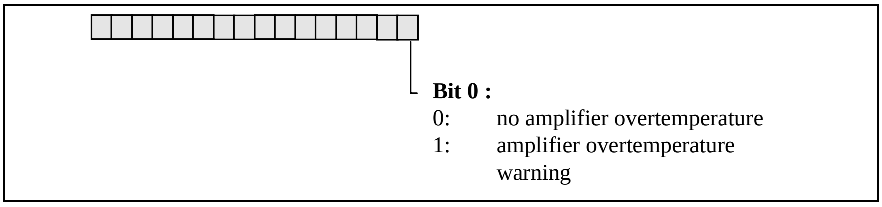


Fig. 2-31: S-0-0311 Amplifier overtemperature warning

S-0-0311 - Attributes

Para. Name:	**DE**	Verstärker-Übertemperatur-Warnung		
	EN	Amplifier overtemperature warning		
	FR	Alerte surchauffe ampli		
	ES	Aviso sobretemperatura amplif.		
	IT	Preallarme Sovratemperatura Drive		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0312, Motor overtemperature warning

This parameter defines an ident number for the motor overtemperature warning. The purpose is to be able to assign the motor overtemperature warning to a real time status bit. The motor overtemperature warning is defined as a bit in the Class 2 diagnostics and is set dependent from the motor temperature warning threshold. Only the bit 0 is defined.

Structure of the parameter:

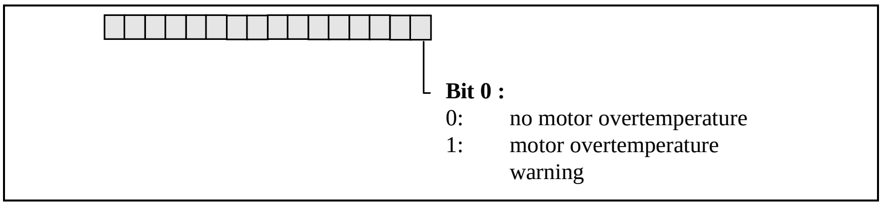


Fig. 2-32: S-0-0312 Motor overtemperature warning

S-0-0312 - Attributes

Para. Name:	**DE**	Motor-Übertemperatur-Warnung		
	EN	Motor overtemperature warning		
	FR	Alerte surchauffe moteur		
	ES	Aviso sobretemperatura motor		
	IT	Preallarme Sovratemperature Motore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0315, Positioning speed > n_limit

This parameter defines an ident number for the warning "Positioning speed > n_limit". The purpose is to be able to assign the warning to a real time status bit. The warning "Positioning speed > n_limit" is defined as a bit in the Class 2 diagnostics and is set, when the positioning velocity is outside the velocity limits. Only the bit 0 is defined.

Structure of the parameter:

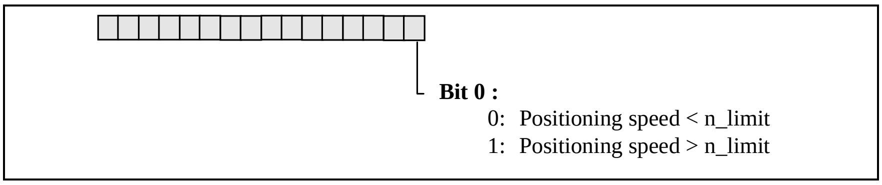


Fig. 2-33: S-0-0315 Positioning speed > n_limit

S-0-0315 - Attributes

Para. Name:	**DE**	Positioniergeschwindigkeit > n_Grenz		
	EN	Positioning speed > n_limit		
	FR	Vitesse de positionnement > n_limite		
	ES	Velocidad posicionamiento > n_limit		
	IT	Velocità Posizionamento > n_limite		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0323, Target position beyond position limits

This parameter defines an ident number for the warning "Target position beyond position limits". The purpose is to be able to assign the warning to a real time status bit. The warning "Target position beyond position limits" is defined as a bit in the Class 2 diagnostics and is set, when the given target position is outside the position limits, positive or negative.

Note: If the actual position value exceeds a position limit, the bit for "Position limit exceeded" in the Class 1 diagnostics is set.

Structure of the parameter:

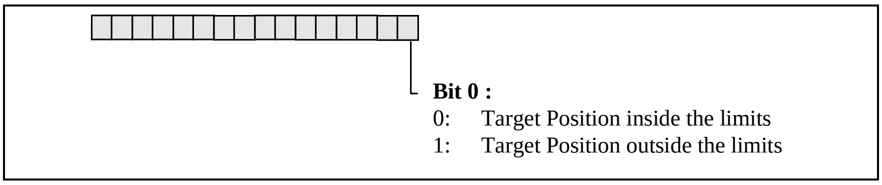


Fig. 2-34: S-0-0323 Target position beyond position limits

S-0-0323 - Attributes

Para. Name:	**DE**	Zielposition außerhalb der Lagegrenzwerte		
	EN	Target position beyond position limits		
	FR	Position à atteindre hors limites de pos.		
	ES	Posición objeto fuera de limites		
	IT	Posizione da raggiungere fuori dai Limiti		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0328, Assign list signal status word

The signal status word (S-0-0144) is configured with the parameters **S-0-0026, Configuration list signal status word** and **S-0-0328, Assign list signal status word**. These parameters have variable length with data elements of 16 bits. In the parameter **S-0-0026, Configuration list signal status word**, the **ident number** of the parameters is set, which contains the original bit (source). The parameter **S-0-0026, Configuration list signal status** determines, which **bit** in the data is copied into the signal status word.

The position in the respective configuration list determines, to which position in the signal status word the chosen bit is copied.

See also the functional description: "Configurable Signal Status Word"

S-0-0328 - Attributes

Para. Name:	**DE**	Zuweisungsliste Signal-Statuswort		
	EN	Assign list signal status word		
	FR	Liste d'assignations pour mot de statut des signaux		
	ES	Lista de assignaciones palabra de estado de señal		
	IT	Lista di Assignazioni Parole di Stato Segnali		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		0	**Cyc. transmittable:**	no

S-0-0329, Assign list signal control word

The signal control word (S-0-0145) is configured with the parameters **S-0-0027, Configuration list signal control word** and **S-0-0329, Assign list signal control word**. These parameters have variable length with data elements of 16 bits.

In the Parameter **S-0-0027, Configuration list signal control word**, the **ident number** of the parameter is set which contains the bit to manupulate (target). In the Parameter **S-0-0329, Assign list signal control word**, it is set which **bit** in the data of that ident number is manipulated by the signal control word.

The position in the respective configuration list determines the bit assignment in the signal control word.

See also the functional description: "Configurable Signal Control Word"

S-0-0329 - Attributes

Para. Name:	**DE**	Zuweisungsliste Signal-Steuerwort		
	EN	Assign list signal control word		
	FR	Liste d'assignations pour mot de contrôle des signaux		
	ES	Lista de assignaciones palabra de mando de señal		
	IT	Lista di Assignazioni Parole di Controllo Segnali		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	-
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0330, Message 'n_actual = n_command'

This parameter defines an ident number for the message 'n_actual = n_command'. This message is defined as a bit in the class 3 diagnostics. It is set when the actual velocity S-0-0040 is within the velocity window S-0-0157 around the velocity command value S-0-0036.

Only the bit 0 is defined in the operation data.

See also the functional description: "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0330 - Attributes

Para. Name:	**DE**	Meldung n_ist = n_soll		
	EN	Message 'n_actual = n_command'		
	FR	Message vitesse atteinte		
	ES	Mensaje n_real = n_nominal		
	IT	Velocità raggiunta		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0331, Status 'n_feedback = 0'

This parameter sets an ident number for the status 'n_feedback = 0'. The status 'feedback = 0' is defined as a bit in the class 3 diagnostics and is set when the velocity feedback value is found **within the standstill window** (S-0-0124).

Only bit 0 is defined in the operating data.

The output signal "Standstill" corresponds to this bit.

See also the functional description "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0331 - Attributes

Para. Name:	**DE**	Meldung n_ist = 0		
	EN	Status 'n_feedback = 0'		
	FR	Etat 'vitesse réelle = 0'		
	ES	Mensaje n_real = 0		
	IT	Asse fermo (S-0-00124)		
Function:		Parameter	**Editability:**	-
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	nicht
Unit:		--	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	-
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0332, Message 'nactual < nx'

This parameter defines an ident number for the message 'nactual < nx'. This message is defined as a bit in the Manufacturer class 3 diagnostics. It is set when the actual velocity S-0-0040 is below the velocity threshold nx S-0-0125.

Only bit 0 is defined in the operating data.

S-0-0332 - Attributes

Para. Name:	**DE**	Meldung n_ist < nx		
	EN	Message 'nactual < nx'		
	FR	Etat vitesse réelle < nx		
	ES	Mensaje n_real < nx		
	IT	Stato Velocità attuale < nx		
Function:		Parameter	**Editability:**	-
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	nicht
Unit:		--	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	-
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0333, Message 'T >= Tx'

An ID number is set for message ‘Md >= Mdx’ with this parameter. Message ‘Md >= Mdx’ is defined as a bit for status class 3 and is set if **S-0-0084, Torque/Force feedback value** exceeds **S-0-0126, Torque threshold Tx**.

Only bit 0 is defined in the operating data.

See also function description: "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0333 - Attributes

Para. Name:	**DE**	Meldung Md >= Mdx		
	EN	Message 'T >= Tx'		
	FR	Etat 'couple >= couple_x'		
	ES	Mensaje 'par >= par_x'		
	IT	Stato 'Coppia >= Coppia_x'		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0334, Message 'T >= Tlimit'

This parameter defines an ident number for the message 'T >= Tlimit'. This message is defined as a bit in the class 3 diagnostics. It is set when the torque S-0-0084 is greater than the bipolar torque limit S-0-0092.

Only bit 0 is defined in the operating data.

S-0-0334 - Attributes

Para. Name:	**DE**	Meldung Md >= Mdgrenz		
	EN	Message 'T >= Tlimit'		
	FR	Etat 'couple >= couple_lim'		
	ES	Mensaje 'par >= par limit'		
	IT	Stato 'Coppia >= Coppia limite'		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0336, Message In position

This parameter defines an ident number for the message ‘In position’. The message ‘In Position’ is defined as a bit in the class 3 diagnostics. It is set when the actual position is within the **positioning window S-0-0057** within the position **command value S-0-0047**.

During the spindle positioning command, the message is set as soon as the spindle is in position.

Only bit 0 is defined in the operating data.

See also the functional description: "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0336 - Attributes

Para. Name:	**DE**	Meldung In-Position		
	EN	Message In position		
	FR	Message 'en position'		
	ES	Mensaje en posición		
	IT	In Posizione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0337, Message 'P >= Px'

This parameter sets an ident number for the message ‘P >= Px’. The message ‘P >= Px’ is defined as a bit in the class 3 diagnostics and is set if **S-0-0382, Intermediate power** exceeds **S-0-0158, Power threshold Px**.

Only bit 0 is defined in the operating data.

S-0-0337 - Attributes

Para. Name:	**DE**	Meldung P > Px		
	EN	Message 'P >= Px'		
	FR	Etat 'P >= Px'		
	ES	Mensaje 'P >= Px'		
	IT	Stato 'P > Px'		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0342, Target position reached

This parameter defines an ident number for the message ‘target position reached’. The message ‘target position reached’ is defined as a bit in the class 3 diagnostics. It is set when the position command value S-0-0047 given by the drive internal interpolator is equal to the target position S-0-0258.

Only bit 0 is defined in the operating data.

See also the functional description: "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0342 - Attributes

Para. Name:	**DE**	Zielposition erreicht		
	EN	Target position reached		
	FR	Position atteinte		
	ES	Posición objeta conseguido		
	IT	Posizione raggiunta		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0346, Setup flag for relative command values

When the operation mode **Relative drive-internal interpolation** is active, the drive performs the distance parametrized in **S-0-0282, Travel distance**, as soon as the bit 0 in S-0-0346, Setup flag for relative command values toggles (changes).

See also the functional description: "Mode: Relative drive-internal interpolation"

S-0-0346 - Attributes

Para. Name:	**DE**	Übernahme relative Sollwerte		
	EN	Setup flag for relative command values		
	FR	Drapeau pour ajouter la distance relative		
	ES	Indicador de ajuste para valores nominales relativos		
	IT	Indicatore per cambiare la Distanza relativa		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0347, Speed deviation

Parameter S-0-0347 indicates the difference between the velocity command value and the velocity feedback value in the velocity controller.

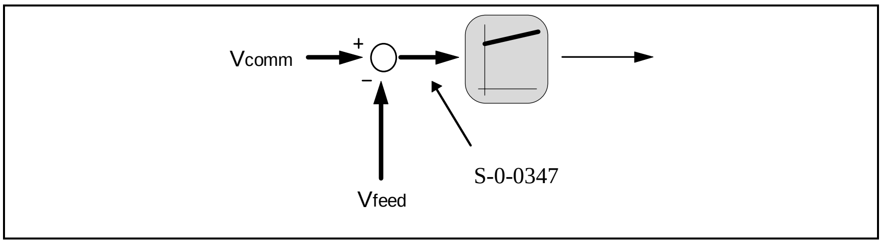


Fig. 2-35: S-0-0347, Speed deviation

See also the functional description: "Velocity Controller"

S-0-0347 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Regelabweichung		
	EN	Speed deviation		
	FR	Ecart de vitesse		
	ES	Desviación de velocidad		
	IT	E.I. di Velocità		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0044	**Extrem value check:**	no
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0348, Acceleration feedforward gain

The acceleration feedforward helps to reduce the following error during the acceleration in operation modes without following error. To do this, the current acceleration command value is multiplied by the "acceleration feedforward gain" and added to the current command value of the velocity controller.

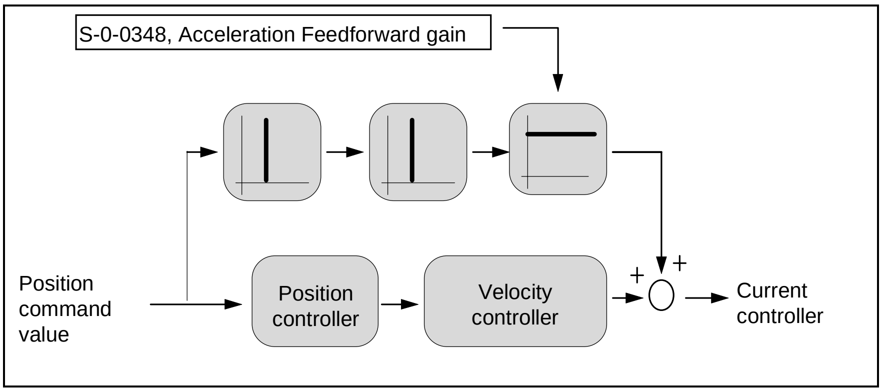


Fig. 2-36: Acceleration feedforward

Activation:

Writing a value greater than 0 to the parameter activates the acceleration feedforward.

Note: The controller functions as well without feedforward! (The standard value equals 0.) Acceleration feedforward is only possible in lagless modes (without following error).

Comparison between the different types of feedforward

The **velocity feedforward** is activated by selecting an operating mode without **lag** (following error). This creates (from the point of view of the position controller) a **feedforward of 1st order** (prop. to velocity). This means that at constant speed, the position deviation is 0. A lag results, nevertheless, during acceleration and deceleration.

The **acceleration feedforward** is activated by entering more than 0 for this parameter. It creates (from the point of view of the position controller), a **feedforward of 2nd order** (prop. to acceleration). The position deviation is 0 as long as the correct gain is set and the acceleration is constant.

Correct input value:

$$S-0-0348 = \frac{\text{moment of inertia}\left(\text{kgm}^2\right)}{\text{torque constant }(\text{Nm / A})} * 1000$$

The moment of inertia is the total sum of the rotor and the reflected load inertia.

The factor 1000 is needed for unit mA.

Fig. 2-37: Acceleration feedforward prop. gain

See also the functional description: "Setting the Acceleration Feed Forward"

S-0-0348 - Attributes

Para. Name:	**DE** Verstärkung Beschleunigungsvorsteuerung		
	EN Acceleration feedforward gain		
	FR Anticipation d'accélération, gain		
	ES Ajuste mando adelante de aceleración		
	IT Guadagno Accellerazione		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	mA/(rad/s²)	**Extrem value check:**	yes
Decimal places:	1	**Combination check:**	no
Input min/max:	0 / 6553.5		
Default value:	0	**Cyc. transmittable:**	no

S-0-0349, Jerk limit bipolar

The Jerk limit bipolar limits the **acceleration change per time** during "Drive Halt"

See also the functional description: "Drive Halt"

S-0-0349 - Attributes

Para. Name:	**DE** Ruck-Grenzwert bipolar		
	EN Jerk limit bipolar		
	FR Limite de Jerk bipolaire		
	ES Límite sacudida bipolar		
	IT Limite di Jerk bipol.		
Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	S-0-0160	**Extrem value check:**	yes
Decimal places:	1	**Combination check:**	no
Input min/max:	0 / 4000000.000		
Default value:	0	**Cyc. transmittable:**	MDT

S-0-0360, MDT Data container A

In the parameter **S-0-0360, MDT Data container A**, the master transfers the data that is written on the target parameter in the drive. The target is addressed with the "Addressing for data container A" (S-0-0368 with S-0-0371).

If a target parameter with 2 byte data is addressed, only the low word of **S-0-0360, MDT Data container A** is used.

To be able to use the data container, you must enter the parameter S-0-0360 in the list of cyclical data S-0-0024 during phase 2.

Note: The parameter S-0-0360 ist not writable via the asynchronous data channel.

See also the functional description: "Multiplex Channel"

S-0-0360 - Attributes

Para. Name:	**DE**	MDT-Datencontainer A		
	EN	MDT Data container A		
	FR	Récipient de dates A pour MDT		
	ES	Contenedor de datos A para MDT		
	IT	Contenitore di Dati A per MDT		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0362, List index, MDT data container A

The parameter **S-0-0362, List index, MDT data container A** contains the list index, which gives access to singular list elements configured in **S-0-0370, Configuration list MDT data container**.

This gives the possibility in the multiplex channel to write single elements in a list with the index as a pointer.

The parameter **S-0-0362, List index, MDT data container A** can, as required, be configured in the Master data telegram (**MDT**) or written to via the **asynchronous data channel** or another interface.

Note: The parameter becomes only active when a list parameter is addressed in S-0-0368, Addressing Data container A.

See also the functional description: "Multiplex Channel"

S-0-0362 - Attributes

Para. Name:	**DE**	Listenindex, MDT-Datencontainer A		
	EN	List index, MDT data container A		
	FR	Index de liste, récipient de dates A pour MDT		
	ES	Indice lista, contenedor de datos A para MDT		
	IT	Index Lista, Contenitore di Dati A per MDT		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	-
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0364, AT Data container A

In the parameter **S-0-0364, AT Data container A**, the drive copies the data of the source parameter which has been addressed via the "Addressing for data container A" (S-0-0368 with S-0-0371).

If a source parameter with 2 byte data is addressed, only the low word is copied into **S-0-0360, AT Data container A**.

To be able to use the data container, you must enter the parameter S-0-0364 in the list of cyclical data S-0-0016 during phase 2.

Note: The parameter S-0-0364 ist not writable via the asynchronous data channel.

See also the functional description: "Multiplex Channel"

S-0-0364 - Attributes

Para. Name:	**DE**	AT-Datencontainer A		
	EN	AT Data container A		
	FR	Récipient de dates A pour AT		
	ES	Contenedor de datos A para AT		
	IT	Contenitore di Dati A per AT		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		-	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0366, List index, AT data container A

The parameter **S-0-0366, List index, AT data container A** contains the list index, which gives access to singular list elements configured in **S-0-0371, Configuration list AT data container**.

This gives the possibility in the multiplex channel to write single elements in a list with the index as a pointer.

The parameter **S-0-0366, List index, AT data container A** can, as required, be configured in the Master data telegram (**MDT**) or written to via the **asynchronous data channel** or another interface.

Note: The parameter becomes only active when a list parameter is addressed in S-0-0368, Addressing Data container A.

See also the functional description: "Multiplex Channel"

S-0-0366 - Attributes

Para. Name:	**DE**	Listenindex, AT-Datencontainer A		
	EN	List index, AT data container A		
	FR	Index de liste, récipient de dates A pour AT		
	ES	Indice lista, contenedor de datos A para AT		
	IT	Index Lista, Contenitore di Dati A per AT		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	-
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0368, Addressing for data container A

The parameter **S-0-0368, Addressing for data container A** contains the indices for the access to the two parameter lists **S-0-0370, Configuration list MDT data container** and **S-0-0371, Configuration list AT-data container**. Herewith, the content of the two data containers **S-0-0360** and **S-0-0364** is defined.

Only the **bits 0..5** (for **MDT**) and **8..13** (for **AT**) are used for the addressing; the other bits are truncated.

Note: If an index greater than the number of elements in the respective list is set, the warning E4/08 Invalid Addressing MDT-data container A or, respectively, E4/09, Invalid Addressing AT-data container A is generated.

Note: The parameter S-0-0368, Addressing data container A can, as needed, be configured in the Master data telegram (MDT) or written to via the asynchronous data channel or another interface.

See also the functional description: "Multiplex Channel"

S-0-0368 - Attributes

Para. Name:	**DE**	Adressierung Daten-Container A		
	EN	Addressing for data container A		
	FR	Index pour récipient de dates A		
	ES	Dirección para contenedor de datos A		
	IT	Indirizzo per Contenitore di Dati A		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	-
Format:		HEX	**Validity check:**	-
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0370, Configuration list for MDT data container

In the parameter **S-0-0370, Configuration list MDT-data container**, those ident numbers (IDN) are entered, which are transferred, depending from the index in **S-0-0368, Addressing for data container A**, low byte, in the **S-0-0360, MDT Data container A**.

In this procedure, the following **checks** are done :

- Check, whether the input IDN exists; if not, the async. channel error message "0x1001, Ident number inexistant“ is generated.
- Check, whether the input IDN is present in the parameter **S-0-0188, IDN list of configurable data in the MDT**; if not, the async. channel error message "0x7008, data not correct“ is generated.

Note: A maximum of 32 ident numbers is configurable in S-0-0370.

See also the functional description: "Multiplex Channel"

S-0-0370 - Attributes

Para. Name:	**DE**	Konfigurationsliste MDT-Daten-Container		
	EN	Configuration list for MDT data container		
	FR	Liste de config. pour récipient de dates MDT		
	ES	Lista de config. para contenedor de datos MDT		
	IT	Config. per Recipiente di Dati MDT		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	-
Format:		IDN	**Validity check:**	-
Unit:		--	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	-
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0371, Configuration list for the AT data container

In the parameter **S-0-0371, Configuration list AT-data container**, those ident numbers (IDN) are entered, which are transferred, depending from the index in **S-0-0368, Addressing for data container A**, high byte, in the **S-0-0364, AT Data container A**. Writing to S-0-0371 is only possible in communication phase 2.

In this procedure, the following **checks** are done :

- Check, whether the input IDN exists; if not, the async. channel error message "0x1001, Ident number inexistant“ is generated.
- Check, whether the input IDN is present in the parameter **S-0-0187, IDN list of configurable data in the AT**; if not, the async. channel error message "0x7008, data not correct“ is generated.

Note: A maximum of 32 ident numbers is configurable in S-0-0371.

See also the functional description: "Multiplex Channel"

S-0-0371 - Attributes

Para. Name:	**DE**	Konfigurationsliste AT-Daten-Container		
	EN	Configuration list for the AT data container		
	FR	Liste de config. pour le récipient de dates AT		
	ES	Lista de config. para contenedor de datos AT		
	IT	Config. per il Recipiente di Dati AT		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	-
Format:		IDN	**Validity check:**	-
Unit:		--	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	-
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0375, List of diagnostic numbers

The drive enters every change of the parameter **S-0-0390 Diagnostic number** in this list. The list is organized as a circular buffer; there is place for 50 numbers. When the list is read, the 1st element of the parameter shows the last displayed diagnostic number.

See also the functional description: "List of diagnostic numbers"

S-0-0375 - Attributes

Para. Name:	**DE**	Liste Diagnosenummern		
	EN	List of diagnostic numbers		
	FR	Liste des numéros de diagnostic		
	ES	Lista de numeros de diagnostico		
	IT	Lista di Numeri Diagnosi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

S-0-0378, Encoder 1, absolute range

Parameter **S-0-0378 Absolute encoder 1, range** defines the range in which the encoder selected in **P-0-0074, Feedback type 1** can generate the position information absolutely.

See also Function Description: "Absolute encoder range and absolute encoder evaluation"

S-0-0378 - Attributes

Para. Name:	**DE**	Absolutbereich Geber 1		
	EN	Encoder 1, absolute range		
	FR	Codeur absolu 1, champs		
	ES	Encoder absoluto 1, campo		
	IT	Encoder assoluto 1, campo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		---	**Cyc. transmittable:**	no

S-0-0379, Encoder 2, absolute range

Description:

Parameter **S-0-0379, Absolute encoder 2, range**defines the range in which the encoder selected in **P-0-0075, Feedback type 2**can generate the position information absolutely.

See also the functional description: "Absolute encoder range and absolute encoder evaluation"

S-0-0379 - Attributes

Para. Name:	**DE**	Absolutbereich Geber 2		
	EN	Encoder 2, absolute range		
	FR	Codeur absolu 2, champs		
	ES	Encoder absoluto 2, campo		
	IT	Encoder assoluto 2, campo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		---	**Cyc. transmittable:**	no

S-0-0382, Intermediate bus power

Display of the DC-bus power.

S-0-0382 - Attributes

Para. Name:	**DE**	Zwischenkreisleistung		
	EN	Intermediate bus power		
	FR	Puissance circuit interméd.		
	ES	Potencia de circuito intermedio		
	IT	Potenza sul Bus DC		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		KW	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0383, Motor temperature

This parameter contains the measured motor temperature.

Remark:

For all motors except 2AD motors, a PTC resistor is used as the temperature sensor .

As the temperature curve in this case shows a considerable tolerance and in higher temperature ranges a considerable progression, the value in
S-0-0383, Motor temperature is not usable for these motor types.

See also the functional description: "Temperature Monitoring"

S-0-0383 - Attributes

Para. Name:	**DE**	Motor-Temperatur		
	EN	Motor temperature		
	FR	Température moteur		
	ES	Temperatura de motor		
	IT	Temperatura Motore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		C	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0390, Diagnostic message number

In the parameter Diagnostic message number, the same number is stored as it can be seen in the seven segment display. This makes it possible for the control to generate its own diagnostics according to the diagnostic message number (for example in languages which are not stored as diagnostics in the drive).

Example:

Diagnostic Message: "F822 Motor encoder failure: signal too small" in parameter S-0-0095

Seven Segment Display: changing "F8" <=> "22"

Diagnostic message number: "F822(hex)" in parameter S-0-0390

See also the functional description: "Diagnostic Message Number"

S-0-0390 - Attributes

Para. Name:	**DE**	Diagnose-Nummer		
	EN	Diagnostic message number		
	FR	Numéro message diagnostique		
	ES	Numero de diagnostico		
	IT	Numero Messaggio Diagnosi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0391, Monitoring window feedback 2

Description:

This parameter defines the maximum allowable deviation of the **S-0-0051, Actual feedback 1 value** and **S-0-0053, Actual feedback 2 value** .

If this value is exceeded for longer than 20ms, then the error **F236, Excessive position feedback difference** will be generated.

The monitoring can be turned off by writing 0 to this parameter.

See also the functional description: "Actual Feedback Value Monitoring"

S-0-0391 - Attributes

Para. Name:	**DE**	Überwachungsfenster Geber 2		
	EN	Monitoring window feedback 2		
	FR	Fenêtre de surveillance du codeur 2		
	ES	Ventana de control de encoder 2		
	IT	Finestra di Controllo del Encoder 2		
Function:		Parameter	**Editability:**	P234
Data length:			**Memory:**	Param. EE
Format:			**Validity check:**	Phase3
Unit:			**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0393, Command value mode

Structure of the parameter:

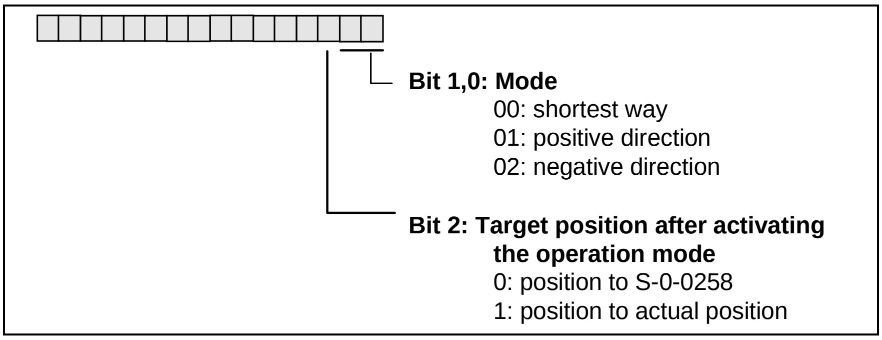


Fig. 2-38: Structure of the parameter S-0-0393

Description of Bit 1:

The interpretation of position command values such as **S-0-0047, Position command value** and **S-0-0258, Target position** with activated modulo function is dependent on the selected mode. To adjust the mode, there is the parameter S-0-0393.

This parameter has an effect only if **S-0-0076, Position data scaling type** has been activated in the **modulo format**.

Description of Bit 2:

Parameter S-0-0393, Command value mode, Bit 2 = 0

After activation, the drive positions to the value in the parameter S-0-0258 Target position. So, after an interruption of the operation mode (e.g. on error), the drive can go to the same target position as it should have done before the error. That means, the **remaining path** is performed.

Parameter S-0-0393, Command value mode, Bit 2 = 1

After acivating the operation mode, the drive refers the distance to move always to the actual position. To do this, the parameter S-0-0258, Target position is set to the actual position. That means, after an accidental interruption, the drive stays at the actual position at first.

In the operation mode Relative drive internal interpolation, the distance to move refers to the actual position after toggling the parameter S-0-0346 Setup flag for relative command values.

See also the functional description: "Processing Command Values in Modulo Format, Shortest Path - Direction Selection"

S-0-0393 - Attributes

Para. Name:	**DE**	Sollwertmodus		
	EN	Command value mode		
	FR	Mode de consigne		
	ES	Modo de valor nominal		
	IT	Modo per Valori comandati		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 2		
Default value:		0	**Cyc. transmittable:**	no

S-0-0399, IDN list of configurable data in the signal control word

To configure the signal control word, you must enter the ident numbers of the parameters in the "Assign list signal control word". In the parameter S-0-0399, IDN list of configurable data in the signal control word, you can read which parameters can be entered there.

See also the functional description: "Configuring the Signal Control Word"

S-0-0399 - Attributes

Para. Name:	**DE**	IDN-Liste der konfigurierbaren Daten im Signal-Steuerwort		
	EN	IDN list of configurable data in the signal control word		
	FR	Liste IDN des dates configurables dans mot de contr. signaux		
	ES	Lista IDN de datos configurables en palabra de mando señales		
	IT	Lista IDN Dati configurabili nella Parole di Contr. Segnali		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	-
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		-	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-0-0400, Home switch

This parameter is used to assign an ID number to the home switch (external signal).

Application:

The IDN (and thus the feedback status of the home switch) can be assigned to a real-time status bit.

Structure of the parameter:

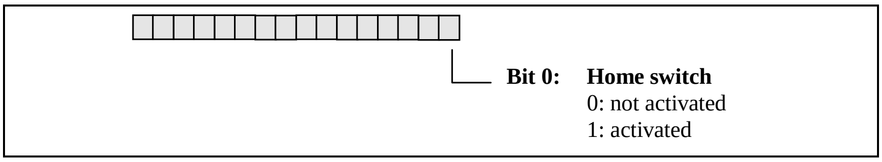


Fig. 2-39: S-0-0400, Home switch

See also the functional description: "Evaluation of the Home Switch"

S-0-0400 - Attributes

Para. Name:	**DE**	Referenzschalter		
	EN	Home switch		
	FR	Contact d'origine		
	ES	Interruptor de referencia		
	IT	FC di Zero		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0401, Probe 1

This parameter is used to assign an ID number to Probe 1 (external signal). This makes it possible to assign Probe 1 to a real-time status bit, for example.

The signal Probe 1 is only polled by the drive and considered valid if the **S-0-0170, Probing cycle procedure command** is active and **S-0-0405, Probe 1 enable** is present.

Parameter structure:

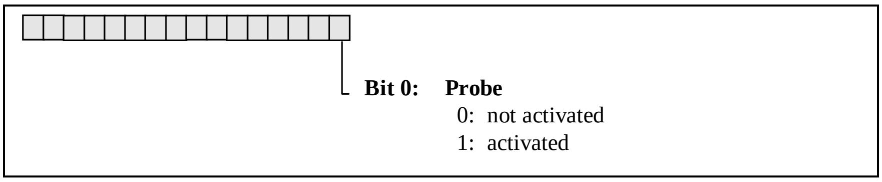


Fig. 2-40: S-0-0401, Probe 1

See also the functional description: "Probe Input Feature"

S-0-0401 - Attributes

Para. Name:	**DE**	Messtaster 1		
	EN	Probe 1		
	FR	Sonde 1		
	ES	Teclas de medición 1		
	IT	Probe 1		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0402, Probe 2

This parameter is used to assign an ID number to Probe 2 (external signal). This makes it possible to assign Probe 2 to a real-time status bit, for example.

The signal Probe 2 is only polled by the drive and considered valid if the **S-0-0170, Probing cycle procedure command** is active and **S-0-0406, Probe 2 enable** is present.

Parameter structure:

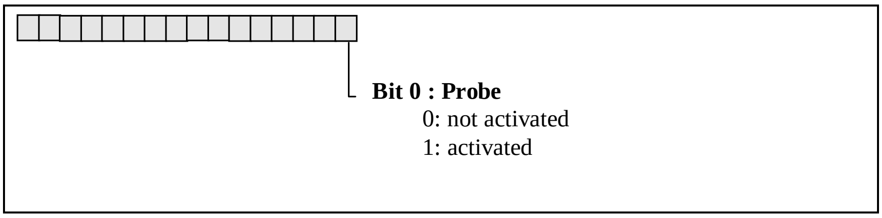


Fig. 2-41: S-0-0402, Probe 2

See also the functional description: "Probe Input Feature"

S-0-0402 - Attributes

Para. Name:	**DE**	Messtaster 2		
	EN	Probe 2		
	FR	Sonde 2		
	ES	Teclas de medición 2		
	IT	Probe 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0403, Position feedback value status

When the bit 3 of **S-0-0147, Homing parameter** is set high, bit 0 of this parameter will be set high when the position feedback value is fixed in feference to the machine’s zero point.

When the drive performs the commands **S-0-0148, C600 Drive controlled homing** procedure or **P-0-0012, C300 Command 'Set absolute measurement'**, the bit will be reset when they are started and then set 1 again once the command has been successfully completed.

The bit position feedback value status corresponds to the output signal "In reference".

In drives with Sercos interface, the position feedback value status can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Structure of the parameter:

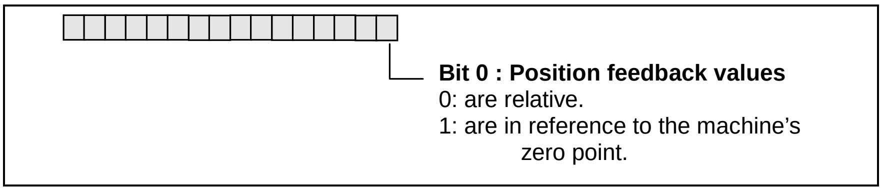


Fig. 2-42: S-0-0403, Position feedback value status

See also the functional description: "Drive-Controlled Homing"

S-0-0403 - Attributes

Para. Name:	**DE**	Status Lageistwerte		
	EN	Position feedback value status		
	FR	Etat de la valeur de retour de position		
	ES	Estado valores reales de posición		
	IT	Stato del Feedback di Posizione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0405, Probe 1 enable

This parameter is used to enable a probe input.

Changing this signal from 0 to 1 activates the trigger mechanism for evaluating the positive and/or negative slope of the probe signal.

The probe 1 enable can be assigned to a real-time control bit and thus be communicated to the master control word in the drive.

Parameter structure:

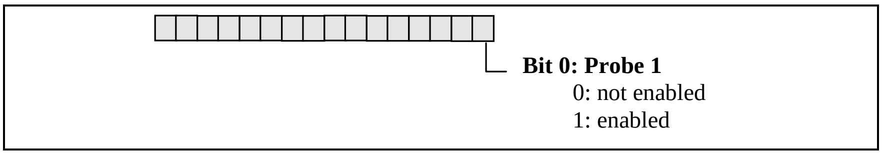


Fig. 2-43: S-0-0405, Probe 1 enable

See also the functional description: "Probe Input Feature"

S-0-0405 - Attributes

Para. Name:	**DE**	Messtaster 1 Freigabe		
	EN	Probe 1 enable		
	FR	Validation de la sonde 1		
	ES	Desbloqueo de teclas de medición 1		
	IT	Probe 1 abilitato		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0406, Probe 2 enable

This parameter is used to enable a probe input.

Changing this signal from 0 to 1 activates the trigger mechanism for evaluating the positive and/or negative slope of the probe signal.

The probe 2 enable can be assigned to a real-time control bit and thus be communicated to the drive in the master control word.

Parameter structure:

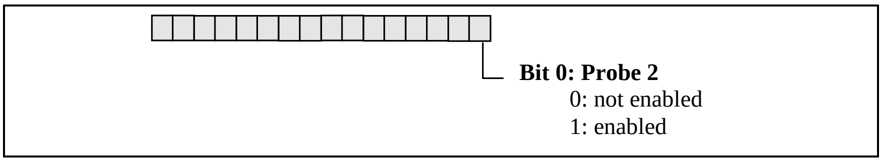


Fig. 2-44: S-0-0406, Probe 2 enable

See also the functional description: "Probe Input Feature"

S-0-0406 - Attributes

Para. Name:	**DE**	Messtaster 2 Freigabe		
	EN	Probe 2 enable		
	FR	Validation de la sonde 2		
	ES	Desbloqueo de teclas de medición 2		
	IT	Probe 2 abilitato		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0409, Probe 1 positive latched

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 0 in **S-0-0169, Probe control parameter** is set,
- **S-0-0405, Probe 1 enable** is present and
- the positive edge of **S-0-0401, Probe 1** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0130, Probe value 1 positive edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0405, Probe 1 enable** has been set from 1 to 0.

The parameter "Probe 1 positive latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

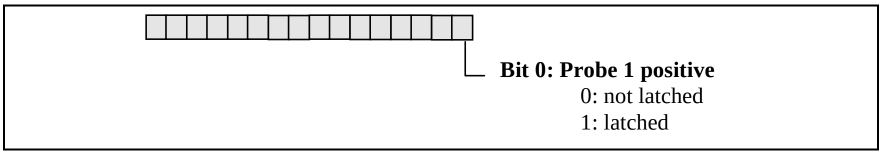


Fig. 2-45: S-0-0409, Probe 1 positive latched

See also the functional description: "Probe Input Feature"

S-0-0409 - Attributes

Para. Name:	**DE**	Messtaster 1 positiv gelatcht		
	EN	Probe 1 positive latched		
	FR	Sonde 1 déclenchée sur front montant		
	ES	Teclas de medición 1 bloqueado positivo		
	IT	Probe 1 positivo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0410, Probe 1 negative latched

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 1 in **S-0-0169, Probe control parameter** is set,
- **S-0-0405, Probe 1 enable** is present and
- the negative edge of **S-0-0401, Probe 1** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0131, Probe value 1 negative edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0405, Probe 1 enable** has been set from 1 to 0.

The parameter "probe 1 negative latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

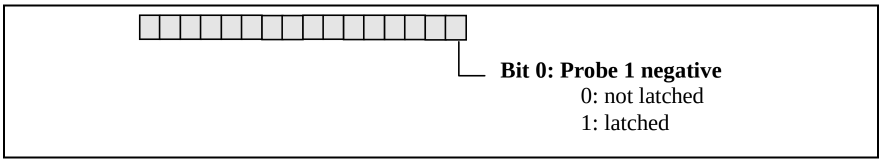


Fig. 2-46: S-0-0410, Probe 1 negative latched

See also the functional description: "Probe Input Feature"

S-0-0410 - Attributes

Para. Name:	**DE**	Messtaster 1 negativ gelatcht		
	EN	Probe 1 negative latched		
	FR	Sonde 1 déclenchée sur front descendant		
	ES	Teclas de medición 1 bloqueado negativo		
	IT	Probe 1 negativo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0411, Probe 2 positive latched

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 3 in **S-0-0169, Probe control parameter** is set,
- **S-0-0406, Probe 2 enable** is present, and
- the positive edge of **S-0-0402, Probe 2** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0132, Probe value 2 positive edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0406, Probe 2 enable** has been set from 1 to 0.

The parameter "Probe 2 positive latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

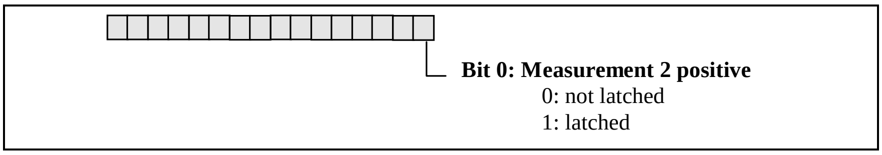


Fig. 2-47: S-0-0411, Probe 2 positive latched

See also the functional description: "Probe Input Feature"

S-0-0411 - Attributes

Para. Name:	**DE**	Messtaster 2 positiv gelatcht		
	EN	Probe 2 positive latched		
	FR	Sonde 2 déclenchée sur front montant		
	ES	Teclas de medición 2 bloqueado positivo		
	IT	Probe 2 positivo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0412, Probe 2 negative latched

Description:

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 3 in **S-0-0169, Probe control parameter** is set,
- **S-0-0406, Probe 2 enable** is present, and
- the negative edge of **S-0-0402, Probe 2** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0133, Probe value 2 negative edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0406, Probe 2 enable** is set from 1 to 0.

The parameter "probe 2 negative latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

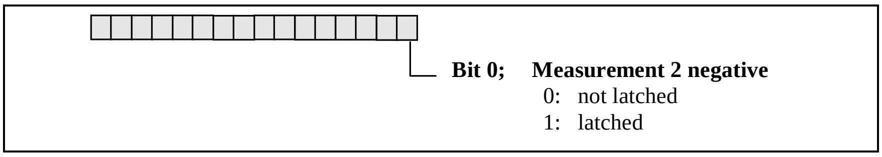


Fig. 2-48: S-0-0412, Probe 2 negative latched

See also the functional description: "Probe Input Feature"

S-0-0412 - Attributes

Para. Name:	**DE**	Messtaster 2 negativ gelatcht		
	EN	Probe 2 negative latched		
	FR	Sonde 2 déclenchée sur front descendant		
	ES	Teclas de medición 2 bloqueado negativo		
	IT	Probe 2 negativo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-7-0100, Velocity loop proportional gain

This parameter contains the default value for the velocity loop proportional gain.

This value comes from the feedback data memory. With the Basic Load procedure, the S-7-xxxx parameters are copied into the S-0-xxxx parameters.

Note: S-0-0100 and S-7-0100 have different units/dimensions, e.g. for rotatory action As/rad vs. mAs/rad. The number of places after the decimal also differs.

See also the functional description: "Setting the Velocity Controller"

S-7-0100 - Attributes

Para. Name:	**DE**	Geschwindigkeitsregler-Proportionalverstärkung		
	EN	Velocity loop proportional gain		
	FR	Gain proportionnel de la boucle de vitesse		
	ES	Amplificación proporcional de regulador de velocidad		
	IT	Guadagno proporzionale Anello di Velocità		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		mAs/rad	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-7-0101, Velocity loop integral action time

This parameter contains the default value for the integral action time of the integrator in the velocity loop controller.

This value comes from the feedback data memory. With the Basic Load procedure, the S-7-parameters are copied into the S-0-parameters.

See also the functional description: "Setting the Velocity Controller"

S-7-0101 - Attributes

Para. Name:	**DE**	Geschwindigkeitsregler-Nachstellzeit		
	EN	Velocity loop integral action time		
	FR	Temps d'action intégral de la boucle de vitesse		
	ES	Tiempo de reajuste de regulador de velocidad		
	IT	Tempo Integrazione Anello di Velocità		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-7-0104, Position loop Kv-factor

This parameter contains the default value for the proportional gain of the position controller.

This value comes from the feedback data memory. With the Basic Load procedure, the S-7-parameters are copied into the S-0-parameters.

See also the functional description: "Setting the position controller"

S-7-0104 - Attributes

Para. Name:	**DE** Lageregler Kv-Faktor		
	EN Position loop Kv-factor		
	FR Gain proportionnel de la boucle de position, Kv		
	ES Regulador de posición factor Kv		
	IT Fattore Kv Anello di Posizione		
Function:	Parameter	**Editability:**	no
Data length:	2Byte	**Memory:**	-
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	1000/min	**Extrem value check:**	yes
Decimal places:	2	**Combination check:**	no
Input min/max:	- / -		
Default value:	-	**Cyc. transmittable:**	-

S-7-0106, Current loop proportional gain 1

This parameter contains the appropriate value for the proportional gain of the current controller with the connected motor.

This value comes from the feedback data memory. With the Basic Load procedure, the S-7-parameters are copied into the S-0-parameters.

Note: Do not alter the values for the current controller set at the factory.

See also function description: "Setting the Current Controller"

S-7-0106 - Attributes

Para. Name:	**DE** Stromregler-Proportionalverstärkung 1		
	EN Current loop proportional gain 1		
	FR Gain proportionnel de la boucle de courant 1		
	ES Amplificación proporcional 1 regulador de corriente		
	IT Guadagno proporzionale 1 Regolatore di Corrente		
Function:	Parameter	**Editability:**	no
Data length:	2Byte	**Memory:**	-
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	V/A	**Extrem value check:**	yes
Decimal places:	2	**Combination check:**	no
Input min/max:	- / -		
Default value:	-	**Cyc. transmittable:**	-

S-7-0107, Current loop integral action time 1

This parameter contains the appropriate value for the integral action time of the integrator in the current controller with the connected motor.

This value comes from the feedback data memory. With the Basic Load procedure, the S-7-parameters are copied into the S-0-parameters.

Note: Do not alter the values for the current controller set at the factory.

See also function description: "Setting the Current Controller"

S-7-0107 - Attributes

Para. Name:	**DE**	Stromregler-Nachstellzeit 1		
	EN	Current loop integral action time 1		
	FR	Temps d'action intégral de la boucle de courant 1		
	ES	Tiempo de reajuste de regulador de corriente 1		
	IT	Tempo Integrazione 1 Anello di Corrente		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

S-7-0109, Motor peak current

Value in the feedback memory which specifies the maximum current which may flow in the motor for a short period without damaging it.

For MHD, MKD and MKE motors, the value will be copied into the active parameter S-0-0109, Motor peak current when the amplifier is turned on.

See also the functional description: "Setting the Active Peak Current"

S-7-0109 - Attributes

Para. Name:	**DE**	Spitzenstrom Motor		
	EN	Motor peak current		
	FR	Courant crête du moteur		
	ES	Corriente punta de motor		
	IT	Corrente di Picco Motore		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		A	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		---	**Cyc. transmittable:**	no

S-7-0111, Motor current at standstill

Value in the feedback memory for the current which can continuously flow in the motor without damaging it.

For MHD, MKD and MKE motors, the value will be copied into the active parameter S-0-0111, Motor current at standstill when the amplifier is turned on.

See also the functional description: "Motor Feedback-Data Memory"

S-7-0111 - Attributes

Para. Name:	**DE** Stillstandsstrom Motor		
	EN Motor current at standstill		
	FR Courant du moteur à l'arrêt		
	ES Corriente de parada motor		
	IT Corrente Motore con Asse fermo		
Function:	Parameter	**Editability:**	no
Data length:	4Byte	**Memory:**	Feedb. EE
Format:	DEC_OV	**Validity check:**	no
Unit:	A	**Extrem value check:**	no
Decimal places:	3	**Combination check:**	no
Input min/max:	0.001 / 500.000		
Default value:	---	**Cyc. transmittable:**	no

S-7-0113, Maximum motor speed (nmax)

Value in the feedback memory for the maximum possible motor speed.

For MHD, MKD and MKE motors, the value will be copied into the active parameter S-0-0113, Maximum motor speed (nmax) when the amplifier is turned on.

See also the functional description: "Limiting Velocity"

S-7-0113 - Attributes

Para. Name:	**DE** Maximalgeschwindigkeit des Motors		
	EN Maximum motor speed (nmax)		
	FR Vitesse maximale du moteur		
	ES Velocidad máxima del motor		
	IT Velocità massima Motore (nmax)		
Function:	Parameter	**Editability:**	no
Data length:	4Byte	**Memory:**	Feedb. EE
Format:	DEC_OV	**Validity check:**	no
Unit:	S-0-0044	**Extrem value check:**	yes
Decimal places:	S-0-0044	**Combination check:**	no
Input min/max:	0 / 214738.3647		
Default value:	---	**Cyc. transmittable:**	no

S-7-0116, Resolution of feedback 1

Value in the feedback memory for resolution of the motor encoder.

For MHD, MKD and MKE motors, the value will be copied into the active parameter **S-0-0116, Feedback 1 Resolution** when the amplifier is turned on.

See also the functional description: "Motor Encoder Resolution"

S-7-0116 - Attributes

Para. Name:	**DE**	Auflösung Geber 1		
	EN	Resolution of feedback 1		
	FR	Résolution du codeur 1		
	ES	Resolución encoder 1		
	IT	Risoluzione Feedback 1		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Cycles/Rev	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-7-0117, Resolution of feedback 2

The resolution of the optional encoder contains the cycles per external encoder revolution for rotational encoders. For linear optional encoders, the segment spacing is given, in mm.

See also the functional description: "Optional Encoder Resolution"

S-7-0117 - Attributes

Para. Name:	**DE**	Auflösung Geber 2		
	EN	Resolution of feedback 2		
	FR	Résolution du codeur 2		
	ES	Resolución encoder 2		
	IT	Risoluzione Feedback 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedback-E²prom
Format:		DEC_OV	**Validity check:**	no
Unit:		Cycles/Rev	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-7-0141, Motor type

Text in the feedback memory for the motor type.

For MHD, MKD and MKE motors, the value will be copied into the active parameter S-0-0141, Motor type when the amplifier is turned on.

Examples:

MKD 071B-061-KP1-BN

MKE 096B-047-GG0-KN

See also the functional description: "Drive Controllers and Motors"

S-7-0141 - Attributes

Para. Name:	**DE**	Motor-Typ		
	EN	Motor type		
	FR	Type de moteur		
	ES	Tipo de motor		
	IT	Tipo Motore		
Function:		Parameter	**Editability:**	no
Data length:		1Byte var.	**Memory:**	Feedb. EE
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		-	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

3 Product-specific parameters

P-0-0004, Velocity loop smoothing time constant

The time constant that can be activated in this parameter affects the output of the velocity loop controller. It can be used to suppress quantization effects and limit the bandwidth of the velocity loop controller.The limit frequency is derived from smoothing time constant T resulting from the relationship

$$\boxed{f_g = \frac{1}{2 \cdot \pi \cdot \mathrm{T}}}$$

Inputting the minimum input value turns the filter off.

See also the functional description: "Setting the Velocity Controller".

P-0-0004 - Attributes

Para. Name:	**DE**	Drehzahlregler-Glättungszeitkonstante		
	EN	Velocity loop smoothing time constant		
	FR	Temps de filtrage boucle de vitesse		
	ES	Tiempo de alisamiento n.d.r.		
	IT	Tempo di Smorzamento nell'Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		500 / 65500		
Default value:		500	**Cyc. transmittable:**	no

P-0-0008, Activation E-Stop function

Parameter P-0-0008 can be used to activate the E-Stop input and to select a response for bringing the drive to standstill.

Parameter structure:

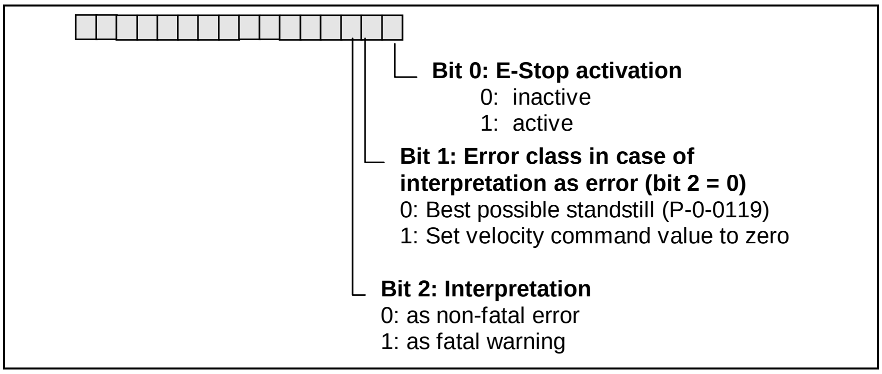


Fig. 3-1: P-0-0008, Activation of E-Stop function

The input polarity cannot be selected. It is always 0-active.

Note: In addition, for DIAX devices, bit 0 activates monitoring of the external 24V supply.

See also the functional description: "Activation and Polarity of the E-Stop Input".

P-0-0008 - Attributes

Para. Name:	**DE**	Aktivierung E-Stop-Funktion		
	EN	Activation E-Stop function		
	FR	Activation fonction Arrêt d'urgence		
	ES	Activación función parada de emergencia		
	IT	Attivazione della Funzione E-Stop		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0009, Error message number

If the drive diagnosis a class 1 diagnostic error, then a bit gets in parameter **S-0-0011, Class 1 diagnostics**. Bit 13 is set in the operation status word for ''Error in class 1 diagnostic''.

Additionally, for a precise diagnosis,

- the diagnosis number is displayed in the 7-segment display and stored in parameter **S-0-0390, Diagnostic message number,**
- the plain text diagnosis is stored in parameter **S-0-0095, Diagnostic message**
- and the relevant error number is stored in **paramter P-0-0009, Error message number**.

If no error is pending, then the value of parameter **P-0-0009 Error message number** is 0.

Example for a diagnostic:

S-0-0390 F822 (hex)

P-0-0009: 822 (decimal)

S-0-0095: F822 Motor encoder failure: signal too small

7-segment display: Changing between F8 and 22

See also the functional description: "Error Number".

P-0-0009 - Attributes

Para. Name:	**DE**	Fehler-Nummer		
	EN	Error message number		
	FR	Numéro erreur		
	ES	Error numero		
	IT	Numero Messaggio Errore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0010, Excessive position command value

In position control mode (S-0-0032..35 = 0x0003, 0x0004, 0x000B or 0x000C), the NC sets position commands at constant intervals (all **S-0-0001, NC Cycle time (TNcyc)**). Within the drive, the difference of two sequential position commands are monitored for excessive values, i.e., the position commands must satisfy:

$$\frac{X_{Soll}(k) - X_{Soll}(k-1)}{S-0-0001} \leq S-0-0091$$

whereby:
Xsoll(k) = NC position command in current cycle
Xsoll(k-1) = NC position command in previous cycle
S-0-0091, Bipolar velocity limit value
S-0-0001, NC Cycle time (TNcyc)

Fig. 3-1: Monitoring of the position command for excessive values for in the position control mode

If the above condition is violated, then error **F237, Excessive position command difference** is triggered and the drive decelerantes as set in parameter **P-0-0119, Best possible decleration**.

The error triggering excessive position command value (X_{soll}(k))is stored in parameter **P-0-0010, Excessive position command value**, the last valid position command (X_{soll}(k-1)) in parameter **P-0-0011, Last valid position command value**.

See also the functional description: "Position Command Value Monitoring".

P-0-0010 - Attributes

Para. Name:	**DE**	Exzessiver Lagesollwert		
	EN	Excessive position command value		
	FR	Consigne de position excessive		
	ES	Valor nominal de posición excesivo		
	IT	Posizione comandata eccessiva		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0011, Last valid position command value

In position control mode (S-0-0032...35 = 0x0003, 0x0004, 0x000B or 0x000C), the NC sets position commands at constant intervals (**all S-0-0001, NC Cycle time (TNcyc)**). The difference of two sequential position commands is monitored for excessive value. The positions command values must satisfy.

$$\frac{X_{Soll}(k) - X_{Soll}(k-1)}{S-0-0001} \leq S-0-0091$$

whereby:

Xsoll(k) = NC-position command in current cycle

Xsoll(k-1) = NC-position command in previous cycle

S-0-0091, Bipolar velocity limit value

S-0-0001, NC Cycle time (TNcyc)

Fig. 3-2: Monitoring of the position command for excessive values in the position control mode

If the above condition is violated, then error **F237, Excessive position command difference** is triggered and the drive decelerantes as set in parameter **P-0-0119, Best possible decleration**.

The error triggering excessive position command value (X_{soll}(k))is stored in parameter **P-0-0010, Excessive position command value**, the last valid position command (X_{soll}(k-1)) in parameter **P-0-0011, Last valid position command value**.

See also the functional description: "Position Command Value Monitoring".

P-0-0011 - Attributes

Para. Name:	**DE**	Letzter gültiger Lagesollwert		
	EN	Last valid position command value		
	FR	Dernière consigne de position valable		
	ES	Valor nominal de posición ultimo valido		
	IT	Ultima Posizione comandata valida		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0012, C300 Command 'Set absolute measurement'

When an absolute measuring system is started for the first time, the drive will indicate a random feedback value that is not referenced to the machine zero-point.

The position feedback of this measuring system can be set to the desired value with the command "Set absolute measurement". After the "Set absolute measurement" command is executed, the position feedback value of the measurement-supplied encoder will contain a defined reference to the machine zero-point. Thereafter, the value of parameter **S-0-0403, Position feedback value status** is 1.

All information will be available after reset because all necessary data from the absolute measurement system is buffered in feedback data memory or in parameter data memory. The position feedback value permanently retains its reference to the machine zero-point.

Parameter P-0-0012 can be used to execute this function.

See also the functional description: "Set Absolute Measuring".

P-0-0012 - Attributes

Para. Name:	**DE**	C300 Kommando Absolutmaß setzen		
	EN	C300 Command 'Set absolute measurement'		
	FR	C300 Commande du chargement de valeur absolue		
	ES	C300 Comando Poner medición absoluta		
	IT	C300 Comando Azzeramento Encoder assoluto		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0014, D500 Command determine marker position

The command **P-0-0014, D500 Command determine marker position** is used to check the detection of the reference marker of an incremental measuring system. If there is an incremental measuring system and the command has been activated, then the actual position of the measuring system, once detected is stored in parameter **S-0-0173, Marker position A**. It is then signalled that the command is completed. Given 2 measuring systems,the bit 3 in **S-0-0147, Homing parameter** determines which measuring system is used.

See also the functional description: "Command - detect marker position"

P-0-0014 - Attributes

Para. Name:	**DE**	D500 Kommando Markerposition ermitteln		
	EN	D500 Command determine marker position		
	FR	D500 Commande évaluation position marqueur		
	ES	D500 Comando calcular posición de marcador		
	IT	D500 Comando prendere posizione marca		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 3		
Default value:		0	**Cyc. transmittable:**	no

P-0-0015, Memory address

This parameter can be used to select a memory address in the drive for operation-internal test purposes. The contents will be displayed in the parameter **P-0-0016, Content of memory address**.

P-0-0015 - Attributes

Para. Name:	**DE**	Speicheradresse		
	EN	Memory address		
	FR	Adresse mémoire		
	ES	Dirección de memoria		
	IT	Indirizzo Memoria		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 0x1000000		
Default value:		0x8000	**Cyc. transmittable:**	no

P-0-0016, Content of memory address

This parameter displays the contents of the memory address set in parameter **P-0-0015, Memory address** (only for test purposes).

P-0-0016 - Attributes

Para. Name:	**DE**	Inhalt der Speicheradresse		
	EN	Content of memory address		
	FR	Contenu de l'adresse mémoire		
	ES	Contenido de la dirección de memoria		
	IT	Contesto degli Indirizzi di Memoria		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0018, Number of pole pairs/pole pair distance

This indicates the **number of pole pairs** per motor revolution **for rotating motors**.

For **linear motors**, the **length of a pole pair** must be indicated here.

This value does not need to be indicated here for motors with motor feedback data memory, like MKD.

See also the functional description: "Motor Feedback-Data Memory".

P-0-0018 - Attributes

Para. Name:	**DE**	Polpaarzahl/Polpaarweite		
	EN	Number of pole pairs/pole pair distance		
	FR	Nombre de paires de pôles/distance polaire		
	ES	Numero de par de polo/espacio de par de polo		
	IT	Numero di Coppie Poli		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		pairs of poles/mm	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		3	**Cyc. transmittable:**	no

P-0-0019, Position start value

The position start value sets a defined initialization value for position feedback values 1 and 2 in non-absolute measurement systems.

During initialization of the position feedback value with command **S-0-0128, C200 Communication phase 4 transition check**, the drive checks whether the position start value has been written in communications phase 2 or 3. Only then will position feedback values 1 and 2 be set to that value. The position start value is used only for non-absolute encoders.

To preset the actual position value of the drive, the parameter P-0-0019, Position start value is used.

See also the functional description: "Actual Feedback Values of Non-Absolute Measurement Systems After Initialization".

P-0-0019 - Attributes

Para. Name:	**DE**	Lageanfangswert		
	EN	Position start value		
	FR	Position à la mise sous tension		
	ES	Valor inicial de posición		
	IT	Valore di Posizione di Partenza		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

P-0-0021, List of scope data 1

The measured values of channel 1 of the oscilloscope function are stored in chronological sequence in parameter **P-0-0022, List of scope data 2**. (The oldest scope value is the first element of the list.)

See also the functional description: "Oscilloscope Feature".

P-0-0021 - Attributes

Para. Name:	**DE**	Messwertliste 1		
	EN	List of scope data 1		
	FR	Liste des valeurs mesurées 1		
	ES	Lista de valor de medición 1		
	IT	Lista Misure 1		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		P-0-0023	**Validity check:**	no
Unit:		P-0-0023	**Extrem value check:**	no
Decimal places:		P-0-0023	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0022, List of scope data 2

The measured values of channel 2 of the oscilloscope function are stored in chronological sequence in parameter **P-0-0022, List of scope data 2**. (The oldest scope value is the first element of the list.)

See also the functional description: "Oscilloscope Feature".

P-0-0022 - Attributes

Para. Name:	**DE**	Messwertliste 2		
	EN	List of scope data 2		
	FR	Liste des valeurs mesurées 2		
	ES	Lista de valor de medición 2		
	IT	Lista Misure 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		P-0-0024	**Validity check:**	no
Unit:		P-0-0024	**Extrem value check:**	no
Decimal places:		P-0-0024	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0023, Signal select scope channel 1

Parameter P-0-0023 determines the signal that will be recorded. The following fixed, defined signals are available:

Number	Signal selection	Unit of the scope data list
0 x 00	Channel not activated	--
0 x 01	Actual feedback value dependent on operating mode S-0-0051 or S-0-0053	Dependent on position scaling
0 x 02	Velocity value parameter (S-0-0040)	Dependent on velocity scaling
0 x 03	Velocity control deviation (-S-0-0347)	Dependent on velocity scaling
0 x 04	Following error parameter (S-0-0189)	Dependent on position scaling
0 x 05	Torque/force command value parameter S-0-0080	Percent
0 x 06	Not in use	--

Fig. 3-2: P-0-0023, Signal numbers

Expanded oscilloscope recording feature:

In addition to fixed, defined signal selection, it is also possible to record any memory addresses of the drive. To do this, bit 12 = 1 must be set. Bit 13 defines the data length of the memory signal in question.

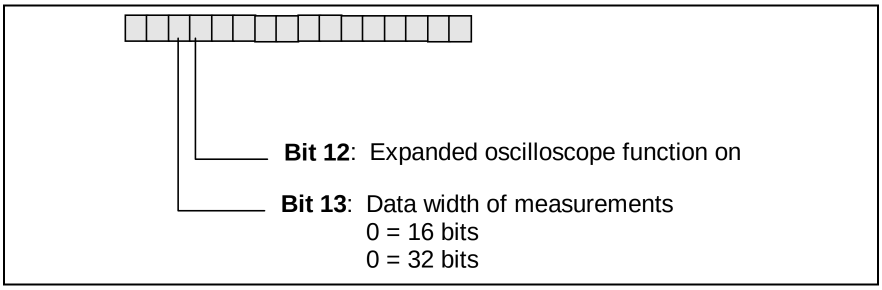


Fig. 3-3: P-0-0023, & P-0-0024, Oscilloscope function signal selection

See also the functional description: "Oscilloscope Feature".

P-0-0023 - Attributes

Para. Name:	**DE** Signalauswahl 1 Oszilloskopfunktion		
	EN Signal select scope channel 1		
	FR Fonction oscilloscope, sélection signal 1		
	ES Selección de señal 1 función de osciloscopio		
	IT Segnale Selezionato Canale 1		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	HEX	**Validity check:**	Phase3
Unit:	--	**Extrem value check:**	no
Decimal places:	--	**Combination check:**	no
Input min/max:	0 / 0xffff		
Default value:	0	**Cyc. transmittable:**	no

P-0-0024, Signal select scope channel 2

Parameter P-0-0024 determines the signal that will be recorded. The following fixed, defined signals are available:

Number	Signal selection	Unit of the scope data (probe value) list
0 x 00	Channel not activated	--
0 x 01	Actual feedback value dependent on operating mode S-0-0051 or S-0-0053	Dependent on position scaling
0 x 02	Velocity value parameter (S-0-0040)	Dependent on velocity scaling
0 x 03	Velocity control deviation (-S-0-0347)	Dependent on velocity scaling
0 x 04	Following error parameter (S-0-0189)	Dependent on position scaling
0 x 05	Torque/force command value parameter S-0-0080	Percent
0 x 06	Not in use	--

Fig. 3-4: P-0-0024, Signal numbers

Expanded oscilloscope recording feature:

In addition to fixed, defined signal selection, it is also possible to record any memory addresses of the drive. To do this, bit 12 = 1 must be set. Bit 13 defines the data length of the memory signal in question.

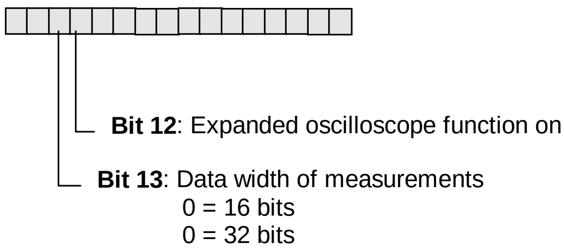


Fig. 3-5: P-0-0023, and P-0-0024, Oscilloscope function signal selection

See also the functional description: "Oscilloscope Feature".

P-0-0024 - Attributes

Para. Name:	**DE**	Signalauswahl 2 Oszilloskopfunktion		
	EN	Signal select scope channel 2		
	FR	Fonction oscilloscope, sélection signal 2		
	ES	Selección de señal 2 función de osciloscopio		
	IT	Segnale Selezionato Canale 2		

Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	HEX	**Validity check:**	Phase3
Unit:	--	**Extrem value check:**	no
Decimal places:	--	**Combination check:**	no
Input min/max:	0 / 0xffff		
Default value:	0	**Cyc. transmittable:**	no

P-0-0025, Trigger source

Parameter P-0-0025 defines the source that initiates the trigger signal. There is a choice between

- External trigger
- Internal trigger

External trigger (P-0-0025 = 0x01)

If the external trigger is chosen, then the trigger will be initiated by bit 0 of the trigger command word.

Internal trigger (P-0-0025 = 0x02)

If the internal trigger is selected, then the trigger signal set by parameter will be monitored for the trigger condition, and the trigger will be initiated as soon as the condition is met.

See also the functional description: "Oscilloscope Feature".

P-0-0025 - Attributes

Para. Name:	**DE**	Triggerquelle Oszilloskopfunktion		
	EN	Trigger source		
	FR	Source de déclenchement pour fonction oscilloscope		
	ES	Origen de trigger osciloscopio		
	IT	Sorgente Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 2		
Default value:		2	**Cyc. transmittable:**	no

P-0-0026, Trigger signal selection

For internal trigger sources, parameter P-0-0026 defines the signal that is monitored for the trigger condition that was set by parameter. The following fixed, defined signals are available:

Trigger signal numbers	Trigger signal	Corresponding trigger threshold
0 x 00	Not defined	Not defined
0 x 01	Actual feedback value based on mode of operation	Position data (P-0-0027)
0 x 02	Velocity feedback value Parameter S-0-0040	Velocity data (P-0-0028)
0 x 03	Velocity deviation parameter --	Velocity data (P-0-0028)
0 x 04	Following error parameter S-0-0189	Position data (P-0-0027)
0 x 05	Torque command value parameter S-0-0080	Torque data (P-0-0029)

Fig. 3-6: P-0-0026, Trigger signal selection

Additional trigger signals can also be defined by setting bit 12.

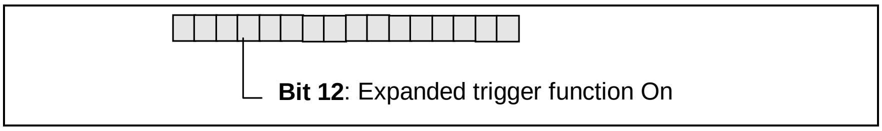


Fig. 3-7: P-0-0026, Trigger signal selection

See also the functional description: "Oscilloscope Feature".

P-0-0026 - Attributes

Para. Name:	**DE**	Triggersignalauswahl Oszilloskopfunktion		
	EN	Trigger signal selection		
	FR	Fonction oscilloscope, sélection signal de déclenc.		
	ES	Selección de señal de trigger función osciloscopio		
	IT	Segnale di Trigger selezionato		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0x5		
Default value:		1	**Cyc. transmittable:**	no

P-0-0027, Trigger level for position data

Parameter P-0-0027 determines with given **P-0-0026, Trigger signal selection** oscilloscope function = “1“or “4“, the position value at which the trigger will be released as long as the correct edge has been recognized.

See also the functional description: "Oscilloscope Feature".

P-0-0027 - Attributes

Para. Name:	**DE**	Triggerschwelle für Lagedaten		
	EN	Trigger level for position data		
	FR	Seuil de déclenchement données de position		
	ES	Umbral de trigger para datos de posición		
	IT	Livello di Trigger per Dati di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

P-0-0028, Trigger level for velocity data

Parameter P-0-0028 determines with given **P-0-0026, Trigger signal selection** oscilloscope function = “2“ or “3“, the actual speed value at which the trigger will be released as long as the correct edge has been recognized.

See also the functional description: "Oscilloscope Feature".

P-0-0028 - Attributes

Para. Name:	**DE**	Triggerschwelle für Geschwindigkeitsdaten		
	EN	Trigger level for velocity data		
	FR	Seuil de déclenchement données de vitesse		
	ES	Umbral de trigger para datos de velocidad		
	IT	Livello di Trigger per Dati di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		0	**Cyc. transmittable:**	no

P-0-0029, Trigger level for torque/force data

Parameter P-0-0029 determines with given **P-0-0026, Trigger signal selection** oscilloscope function = “5“, the torque force value at which the trigger will be released as long as the correct edge has been recognized.

See also the functional description: "Oscilloscope Feature".

P-0-0029 - Attributes

Para. Name:	**DE**	Triggerschwelle für Drehmoment/Kraftdaten		
	EN	Trigger level for torque/force data		
	FR	Seuil de déclenchement données de couple/force		
	ES	Umbral de trigger para datos de par/fuerza		
	IT	Livello di Trigger per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		S-0-0086 / S-0-0086		
Default value:		0	**Cyc. transmittable:**	no

P-0-0030, Trigger edge

Parameter P-0-0030 Trigger edge defines the signal change at which a trigger event can be initiated.

Number:	Trigger edge:
1	Triggering on the positive edge of the trigger signal
2	Triggering on the negative edge of the trigger signal
3	Triggering on both the positive edge and negative edge of the trigger signal
4	Triggering if the trigger signal equals the trigger level

Fig. 3-8: Selection of trigger edges

See also the functional description: "Oscilloscope Feature".

P-0-0030 - Attributes

Para. Name:	**DE** Triggerflanke		
	EN Trigger edge		
	FR Front de déclenchement		
	ES Lado de trigger		
	IT Fronte di Trigger		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	--	**Extrem value check:**	yes
Decimal places:	0	**Combination check:**	no
Input min/max:	1 / 4		
Default value:	3	**Cyc. transmittable:**	no

P-0-0031, Timebase

Timebase defines the time intervals within which the probe values of the selected signals are defined. Possible time intervals range from 250 µs to 100 ms.

Note that in general:

Recording duration = Time resolution • Size of memory [µs]

See also the functional description: "Oscilloscope Feature".

P-0-0031 - Attributes

Para. Name:	**DE** Zeitauflösung		
	EN Timebase		
	FR Base de temps		
	ES Resolución de tiempo		
	IT Base dei Tempi		
Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	us	**Extrem value check:**	yes
Decimal places:	0	**Combination check:**	no
Input min/max:	500 / 100000		
Default value:	500	**Cyc. transmittable:**	no

P-0-0032, Size of memory

The size of memory determines the number of recorded probe values per measurement. A maximum of 512 probe values can be recorded per channel.

The memory size and time resolution together determine the recording duration. The minimum recording duration is 128 ms, and the maximum duration is 51.2 s.

Note that in general:

Recording duration = Time resolution • Size of memory [us]

See also the functional description: "Oscilloscope Feature".

P-0-0032 - Attributes

Para. Name:	**DE**	Speichertiefe		
	EN	Size of memory		
	FR	Taille mémoire		
	ES	Tamaño de memoria		
	IT	Dimensione Memoria		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		2 / 512		
Default value:		512	**Cyc. transmittable:**	no

P-0-0033, Number of samples after trigger

Parameter P-0-0033 defines the number of probe values, or samples, that will be entered in the probe value list after the trigger event. In this way it is possible to set a parameter to define a trigger delay. Parameter P-0-0033 is used for this.

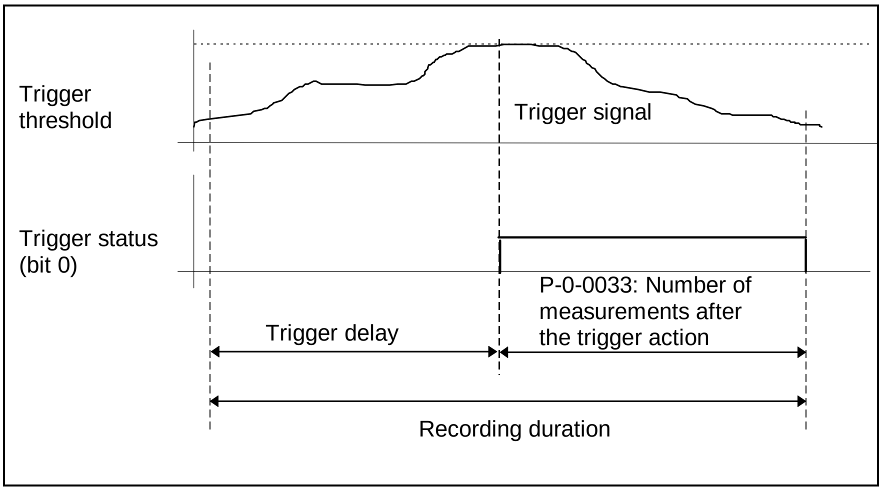


Fig. 3-9: Triggering

See also the functional description: "Oscilloscope Feature".

P-0-0033 - Attributes

Para. Name:	**DE**	Anzahl der Messwerte nach Triggerereignis		
	EN	Number of samples after trigger		
	FR	Nombre de mesures après déclenchement		
	ES	Numero de muestras despues de trigger		
	IT	Numero di Campionamenti dopo Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 512		
Default value:		0	**Cyc. transmittable:**	no

P-0-0035, Delay from trigger to start

Parameter P-0-0035 indicates the number of cycles between the trigger event (internal) and the release of the trigger (bit 0 trigger control word) in external triggering.

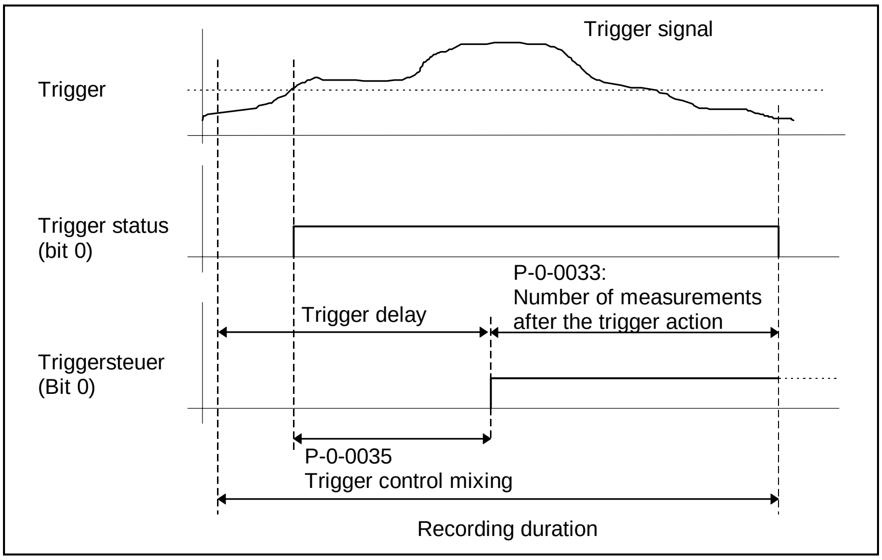


Fig. 3-10: Triggering

Since there is a delay between transmission of the trigger event by the control system and release of the trigger, the delay is measured by the drive controller and stored in parameter **P-0-0035, Delay from trigger to start**. A time-correct display of signals is ensured by using this parameter for visualizing the probe values.

See also the functional description: "Oscilloscope Feature".

P-0-0035 - Attributes

Para. Name:	**DE**	Triggersteuerversatz		
	EN	Delay from trigger to start		
	FR	Délai de déclenchement		
	ES	Retardo de mando de trigger		
	IT	Ritardo del Trigger dopo Start		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0036, Trigger control word

Parameter P-0-0036 controls the oscilloscope function.

- Bit 2 activates the function, i.e., the lists of scope data are filled with the selected data.
- Bit 1 activates trigger monitoring.
- Bit 0 can initiate a trigger event. If a valid edge is recognized, the probe-value memory will be completed as specified by parameter **P-0-0033, Number of samples after the trigger**, and the oscilloscope function will be deactivated by resetting bits 1 and 2 in the trigger control word.

Parameter structure:

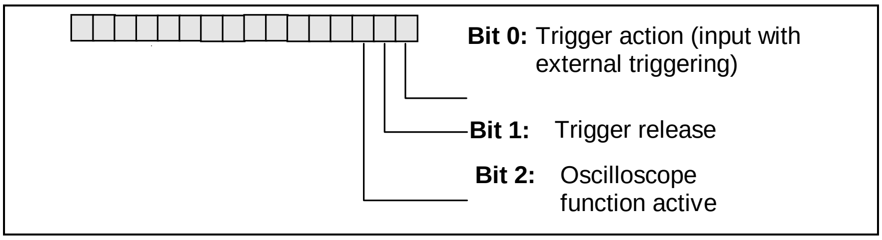


Fig. 3-11: P-0-0036, Trigger control word

See also the functional description: "Oscilloscope Feature".

P-0-0036 - Attributes

Para. Name:	**DE**	Triggersteuerwort		
	EN	Trigger control word		
	FR	Mot de commande déclenchement		
	ES	Palabra de mando de trigger		
	IT	Controllo Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0037, Trigger status word

Status messages for the oscilloscope function.

Parameter P-0-0037 offers various pieces of information about the current status of the oscilloscope function.

Parameter structure:

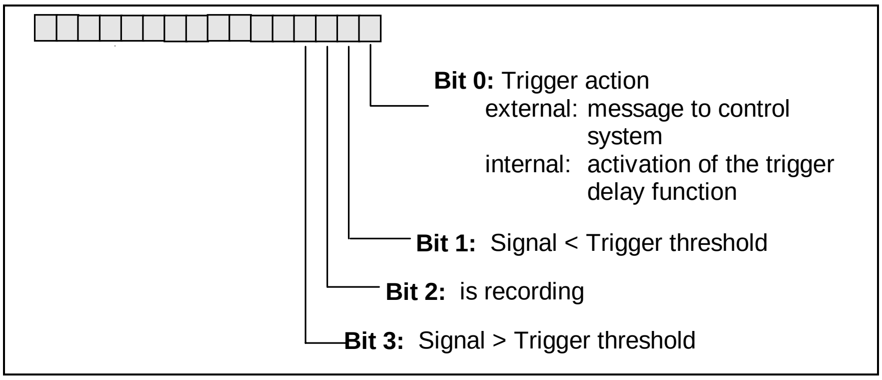


Fig. 3-12: P-0-0037, Trigger status word

See also the functional description: "Oscilloscope Feature".

P-0-0037 - Attributes

Para. Name:	**DE**	Triggerstatuswort		
	EN	Trigger status word		
	FR	Mot d'état déclenchement		
	ES	Palabra de estado de trigger		
	IT	Stato Trigger		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0051, Torque/force constant

The torque/force constant determines what drive torque or force the motor will deliver at a specific effective current.

For synchronous motors, this value depends entirely on the design of the motor.

In asynchronous motors, this value is valid only when the motor is not operated in the field-weakening range.

For MHD, MKD and MKE motors, this parameter is stored in feedback data memory and cannot be changed.

$$\mathrm{Ma}[\mathrm{Nm};\mathrm{N}] = (\mathrm{P}-0-0051)\cdot(\mathrm{S}-0-0111)\cdot(\mathrm{S}-0-0080)$$

where:

Ma	= Drive torque
P-0-0051	= Torque/force constant [N/A]
S-0-0111	= Motor current at standstill [A]
S-0-0080	= Torque/force command [%]

Fig. 3-13: Drive torque

See also the functional description: "Motor Feedback-Data Memory".

P-0-0051 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Konstante		
	EN	Torque/force constant		
	FR	Constante de couple/force		
	ES	Constante de par/fuerza		
	IT	Costante di Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Nm/A	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		0.01 / 655.35		
Default value:		0	**Cyc. transmittable:**	no

P-0-0074, Feedback 1 type

This parameter determines the encoder interface to which the motor encoder is connected. The number of the corresponding interface module should be entered in this parameter.

Interface:	P-0-0074:	Measurement system:
-	0	None (only with rotary asynchronous motors)
2	2	Incremental encoder with sine signals from the Heidenhain company, 1V signals
	3	Indramat gear-type encoder
2	5	Incremental encoder with square-wave signals from the Heidenhain company
2	8	Encoder with EnDat interface from the Heidenhain company
2	9	Gearwheel with 1Vpp signals
1	10	Resolver without feedback data memory
1 + 2	11	Resolver without feedback data memory plus incremental encoder with sine signals
1+2	12	Hall-Feedback + Square-wave signals
1	13	ECI Feedback

Fig. 3-14: Measurement system:

See also the functional description: "Determining the Feedback Interface of the Motor Feedback".

P-0-0074 - Attributes

Para. Name:	**DE**	Geber-Typ 1		
	EN	Feedback 1 type		
	FR	Type de codeur 1		
	ES	Tipo de encoder 1		
	IT	Tipo di Feedback 1		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / --		
Default value:		1	**Cyc. transmittable:**	no

P-0-0075, Feedback 2 type

This parameter determines the encoder interface to which the optional encoder is connected. The number of the corresponding interface module should be entered in this parameter.

Interface:	P-0-0075:	Measurement system:
-	0	None (only with rotary asynchronous motors)
2	2	Incremental encoder with sine signals from the Heidenhain company, 1V signals
	3	Indramat gear-type encoder
2	5	Incremental encoder with square-wave signals from the Heidenhain company
2	8	Encoder with EnDat interface from the Heidenhain company
2	9	Gearwheel with 1Vpp signals
1	10	Resolver without feedback data memory
1 + 2	11	Resolver without feedback data memory plus incremental encoder with sine signals
1+2	12	Hall-Feedback + Square-wave signals
1	13	ECI Feedback

Fig. 3-15: P-0-0075, Feedback type 2

See also the functional description: "Determining the Feedback Interface of the Motor Feedback"

P-0-0075 - Attributes

Para. Name:	**DE** Geber-Typ 2		
	EN Feedback 2 type		
	FR Type de codeur 2		
	ES Tipo de encoder 2		
	IT Tipo di Feedback 2		
Function:	Parameter	**Editability:**	P23
Data length:	2Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	no
Unit:	--	**Extrem value check:**	no
Decimal places:	0	**Combination check:**	no
Input min/max:	0 / 9		
Default value:	0	**Cyc. transmittable:**	no

P-0-0090, Travel limit parameter

Parameter P-0-0090 activates the travel limit switches. In addition, the inputs can be inverted (0V on input Limit+/- ⇨ Travel limit exceeded).

Parameter structure:

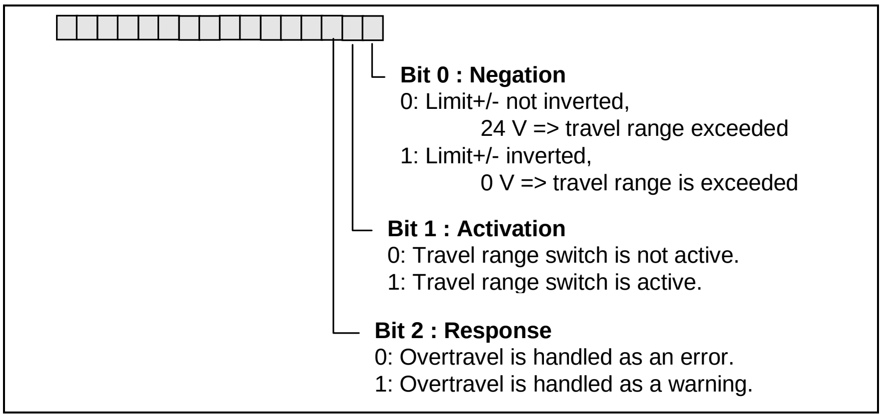


Fig. 3-16: P-0-0090, Travel limit parameter

Note: In addition, for DIAX drives, bit 1 activates the monitoring of the external 24V supply.

See also the functional description: "Travel Range Limits".

P-0-0090 - Attributes

Para. Name:	**DE**	Fahrbereichsgrenzschalter-Parameter		
	EN	Travel limit parameter		
	FR	Paramètres de butées hardware		
	ES	Parámetro limite de desplazamiento		
	IT	Parametro Limite Percorso		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 7		
Default value:		0	**Cyc. transmittable:**	no

P-0-0096, Distance to move in error situation

By inputting a 3 in parameter **P-0-0119, Best possible declaration**, the reaction "return motion“ can be set.

A switch into best possible standstill takes place and the path parametrized here starting with the current feedback position value is traversed (the qualifying sign is noted). The **S-0-0091, Bipolar velocity limit value**, **S-0-0138, Bipolar acceleration limit value** and **S-0-0349, Jerk limit bipolar** hereby not exceeded.

It is necessary to parametrize a sufficiently sized value in **P-0-0126, Maximum braking time** to give the drive enough time to traverse the spezified path.

If the position limit values are active, then the drive keeps the return motion from traversing them. The drive then stops at the **S-0-0057, Position window** at the respective position limit value.

See also the functional description: "Return motion".

P-0-0096 - Attributes

Para. Name:	**DE**	Verfahrweg im Fehlerfall		
	EN	Distance to move in error situation		
	FR	Déplacement en cas de défaut		
	ES	Recorrido de desplazamiento en caso de error		
	IT	Distanza Movimento in Caso di Errore		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

P-0-0097, Absolute encoder monitoring window

The absolute encoder monitoring compares during **S-0-0128, C200 Communication phase 4 transition check** the position saved during the last powering down with the current absolute feedback.

If the difference is greater than what is set in parameter P-0-0097, Absolute encoder monotoring window, the error message **C224 Absolute encoder error** will be generated. This can happen, when the axis has been **moved with the power off**, or after changing the motor.

If a 0 is parametrized in P-0-0097, Absolute encoder monotoring window, the absolute encoder monitor this is deactivated.

As a standard value, 0.1 motor rotation (= 36 degrees in reference to the motor shaft) can be programmed if the axis has an electrically released brake or a self braking mechanic.

See also the functional description: "Absolute Encoder Monitoring".

P-0-0097 - Attributes

Para. Name:	**DE**	Absolutgeber-Überwachungsfenster		
	EN	Absolute encoder monitoring window		
	FR	Fenêtre de surveillance du codeur absolu		
	ES	Ventana de control de encoder absoluto		
	IT	Finestra di Controllo del Encoder assoluto		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		3000	**Cyc. transmittable:**	no

P-0-0098, Max. model deviation

The maximum model deviation is the maximum deviation between the real position feedback value and the model position feedback value calculated by the drive.

This parameter can be read out by the user to help set parameters for **S-0-0159, Monitoring window**.

Two cases must be distinguished for determining the model position feedback value:

1) Position control with following (lag) error

In this operating mode, the controlled system is simulated by a model.

The maximum deviation between the calculated position feedback module value and the real position feedback value is stored in parameter P-0-0098.

2) Position control without following (lag) error

In this operating mode, the position command value is compared to the position feedback value. The maximum deviation encountered is stored in P-0-0098.

Note: This parameter can be write accessed so that it can be set back to 0, for example.

See also the functional description: "Position Control Loop Monitoring".

P-0-0098 - Attributes

Para. Name:	**DE**	Max. Modellabweichung		
	EN	Max. model deviation		
	FR	Ecart maxi. au modèle		
	ES	Desviación máx. del modelo		
	IT	Deviazione mass. da Modello		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		---	**Cyc. transmittable:**	no

P-0-0099, Position command smoothing time constant

The position command smoothing time constant determines the maximum jerk possible in operation modes with closed loop position control.

The maximum jerk is determined by:

$$\text{max. jerk} = \frac{\text{2nd derivative of the position command values}}{\textbf{P-0-0099 Position command value smoothing filter time constant}}$$

Fig. 3-17: Max. jerk

If S-0-0001, NC Cycle time (TNcyc), is equal or greater than P-0-0099 then no filter is active.

See also the functional description: "Command value processing : Position Control".

P-0-0099 - Attributes

Para. Name:	**DE**	Lagesollwert-Glättungsfilter-Zeitkonstante		
	EN	Position command smoothing time constant		
	FR	Temps de filtrage consigne de pos.		
	ES	Tiempo de alisamiento posición comando		
	IT	Tempo per Smorzamento Comandi Posiz.		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		0	**Cyc. transmittable:**	no

P-0-0109, Torque/force peak limit

The maximum peak torque of a drive can be limited in a manner suitable to an application with the use of parameter P-0-0109, Torque/ force peak limit. In other words, the parameter ensures that the max. torque specific to the application is not exceeded even if **S-0-0092, Bipolar torque/force limit value** is set exceedingly high.

See function description: "Torque/Force Limiting".

P-0-0109 - Attributes

Para. Name:	**DE**	Spitzendrehmoment/-Kraft-Begrenzung		
	EN	Torque/force peak limit		
	FR	Limitation couple/force crête		
	ES	Limite par/fuerza punta		
	IT	Limitazione Picco Coppia/Forza		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0086	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		0 / S-0-0086		
Default value:		5000	**Cyc. transmittable:**	no

P-0-0117, NC reaction on error

This parameter allows the NC 30 seconds to bring the drive controller to a coordinated deceleration in an error situation if the parameter is set with a "1“. The drive follows the command for this period. The drive reacts with the preset **P-0-0119, Best possible deceleration**.

This feature works for non-fatal errors.

Parameter structure:

Bit 0: Activation
0: instant control drive reaction to non-fatal errors with "best possible standstill"
1: reaction to non-fatal errors delayed 30 sec

Fig. 3-18: P-0-0117, NC reaction on error

See also the functional description: "NC Response in Error Situation"

P-0-0117 - Attributes

Para. Name:	**DE**	Aktivierung NC-Reaktion im Fehlerfall		
	EN	NC reaction on error		
	FR	Activation réaction CN en cas de défaut		
	ES	Activación reaccion NC en caso de error		
	IT	Reazione in Presenza Errore NC		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		0	**Cyc. transmittable:**	no

P-0-0118, Power off on error

If a Class 1 Diagnostic error is recognized, the drive reacts either with the preset **P-0-0119, Best possible deceleration** or, in the case of a fatal error, with an immediate switch to torque-free state. If this parameter is set to 1, then the Bb (ready) signal for the supply module will be removed. As a result, the signal and the DC bus voltage will be switched off on all other drives connected to the same supply module. These drives react with their **P-0-0119** preset **Best possible deceleration**.

If power off is set with bit 0 in the event of an error, the bit 2 should be set to 1 in the DKR compact machines. The drive error message causes a mains disconnect and thus the option of feeding the deceleration energy back into the mains.The drives coast without a bleeder.

With bit 1 it is possible to set when the error message can be removed by the drive from power supply unit for the first time. If this bit is a 1, then the error message is immediataly removed after the basic initialization of the drive making a powering up possible already in communications phase 0. If the bit 1 = 0, then the drive must be in communications phase 4 without an error before the error message to the power supply unit can be removed for the first time.

Bits 3, 4 and 5 offer options for handling undervoltage. There is undervoltage if the drive is enabled (with torque) and the DC bus voltage signal disappears.

Undervoltage can be handled as a "fatal warning“ if bit 3 = 1.The drive does not signal a C1D error and **P-0-0119, Best possible decleration** is not executed. The motor is switched off and the DC bus voltage slowly drops. Thus, asynchronous motors can still have a magnetic field when the control starts bringing the drives to an synchronized stand still. Acceleration takes place in generator mode.

If undervoltage is treated as an error, then bit 4 can be used to set an automatic reset of error once the control removes the drive enable. This can be used if the error occurs with normal shutdowns as well, and this is because the control does not remove the drive enable quickly enough.

Parameter structure:

Bit 0 : Packet reaction or power cutoff on error
0: For modular devices: No packet reaction (do not cutoff the common DC bus voltage) on error
For compact devices: no power cutoff on error
1: Packet reaction and power cutoff on error

Bit 1 : Condition for power on
0: Power on allowed, if no error and operation mode (comm. phase 4)
1: Power on allowed, if no error ("passive axis“)

Bit 2 : At what time power cutoff happens in case of an error
(only if bit 0 = 1)
0: Modular devices: The message is output immediately when the error happens. (packet response of all drive controllers mounted to the same supply module, prefered setting for modular devices)
Compact devices: The power is switched off immediately when the error happens.
1: Modular devices: The message is only output after the end of the error reaction.
Compact devices: The Power is only switched off after the end of the error reaction. (preferred setting for compact devices)

Bit 3 : Reaction to DC bus undervoltage
0: Undervoltage is treated as an error or a non-fatal warning.
1: Undervoltage is treated as a fatal warning with suppression of driving operation.

Bit 4 : Automatic reset of the undervoltage error
0: Undervoltage error is stored.
1: Undervoltage error is reset by the drive upon dropping drive enable (RF) to 0.

Bit 5 : Undervoltage as warning
0: Undervoltage with reaction as non-fatal error
1: Undervoltage is treated as non-fatal warning.

Fig. 3-19: P-0-0118, Power off on error

See also the functional description: "Power off on error".

P-0-0118 - Attributes

Para. Name:	**DE**	Leistungsabschaltung im Fehlerfall		
	EN	Power off on error		
	FR	Mise hors tension en cas de défaut		
	ES	Desconexion de potencia en caso de error		
	IT	Spegnimento Potenza in Caso di Errore		
Function:		Parameter	**Editability:**	P23
Data length:		--	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 31		
Default value:		10001b	**Cyc. transmittable:**	no

P-0-0119, Best possible deceleration

This parameter specifies the type of braking to a standstill for the drive in the event of

- a non-fatal error
- an interface error
- a phase regression
- switching off the drive enable signal

P-0-0119:	Reaction type:
0	**Velocity command value set to zero** The motor brakes in regard to the torque limit value. The **Braking time** is set in parameter **P-0-0126**. 100 milliseconds before the brake time elapses, the blocking brake is activated. If the velocity has previously fallen below 10 rpm (rotational motors) or below 10 mm/min (linear motors), then the blocking brake will be engaged immediately. 100 milliseconds after the mechanical brake is set, the motor is torque free.
1	**Switch to torque-free state**
2	**Velocity command to zero** with command ramp and filter. The ramp, i.e. the maximum accel., is set via **P-0-1201 Ramp 1 pitch**, the jerk filter via **P-0.1222, Velocity command filter**.
3	**Return motion** The drive generates a position command profile for traversing the set "path on error“ in which case a relative path is activated which is defined with **P-0-0096, Distance to move in error situation**, **S-0-0091, Bipolar Velocity Limit Value**, **S-0-0138, Bipolar acceleration limit value** and **S-0-0349, Jerk Limit bipolar**.

Fig. 3-20: Deceleration mode for the drive

The drive enable can be set again, at the earliest, after the operation of the error reaction.

See also the functional description: "Best Possible Deceleration".

P-0-0119 - Attributes

Para. Name:	**DE**	Bestmögliche Stillsetzung		
	EN	Best possible deceleration		
	FR	Arrêt au plus vite		
	ES	La mejor parada posible		
	IT	Decellerazione massima		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 3		
Default value:		0	**Cyc. transmittable:**	no

P-0-0121, Velocity mix factor feedback 1 & 2

The Velocity mix factor parameter determines the relation of the velocity feedback values between the motor encoder and the optional encoder.

The input is percentage-based. Note the following:

0 % : The velocity controller works solely with the velocity of the motor encoder (= encoder 1).

100 % : The velocity controller works solely with the velocity of the opt. encoder (= encoder 2).

If no optional encoder is available, then the parameter is set to 0 % .

See also the functional description: "Setting the Velocity Mix Factor".

P-0-0121 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Mischfaktor Geber 1 & Geber 2		
	EN	Velocity mix factor feedback 1 & 2		
	FR	Facteur de mixage vitesse codeur 1 & codeur 2		
	ES	Factor mixto de velocidad encoder 1 & 2		
	IT	Fattore di Correzione Feedback 1 & 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 100.0		
Default value:		0	**Cyc. transmittable:**	no

P-0-0123, Absolute encoder buffer

All the data that the absolute encoder needs for position initialization is stored in this parameter.

See also the functional description: "Other Settings for Absolute Measurement Systems".

P-0-0123 - Attributes

Para. Name:	**DE**	Absolutgeber-Puffer		
	EN	Absolute encoder buffer		
	FR	Tampon codeur absolu		
	ES	Buffer de encoder absoluto		
	IT	Buffer Encoder assoluto		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0126, Maximum braking time

The maximum braking time for the drive is set in this parameter.

The value should always be set higher then the time needed, considering the maximum possible velocity, to decelerate the shaft using velocity command value zero-switching.

The velocity command value is switched to zero if **P-0-0119, Best possible deceleration** is set to 0 and either

- The drive enable (RF) is removed
- The drive is switched to Set parameter mode with RF switched on
- A drive error is recognized that still allows a reaction from the drive (all non-fatal errors)
- In the case of separately supplied devices (HDS), a drive connected to the same supply module reports an error to that module, so that the intermediate voltage is switched off.

See also the functional description: "Velocity Command Value Reset"“.

P-0-0126 - Attributes

Para. Name:	**DE**	Maximale Bremszeit		
	EN	Maximum braking time		
	FR	Temps de freinage max.		
	ES	Tiempo máx. de frenado		
	IT	Tempo massimo di Frenata		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		500 / 100000		
Default value:		5000	**Cyc. transmittable:**	no

P-0-0127, Overload warning

To protect the power stage, the temperature is calculated with a temperature model for the transistor final stage. If the temperature exceeds 125°C, then the torque-producing command current will be limited.

To avoid an unexpected disruption of the torque from the drive, a warning threshold can be set in this parameter.

If the thermal load rises above the set value, warning **E261 Continuous current limiting prewarning** will be generated.

If 100% is entered, this warning will be deactivated since then the message **E257 Continuous current limit active** will be generated.

See also the functional description: "Monitoring the Thermal Load of the drive controller".

P-0-0127 - Attributes

Para. Name:	**DE**	Überlastwarnung		
	EN	Overload warning		
	FR	Alerte surcharge		
	ES	Aviso de sobrecarga		
	IT	Preallarme Sovracarico		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		00000 / 100		
Default value:		90	**Cyc. transmittable:**	no

P-0-0131, Signal select position switch

This parameter can be used to activate and to select the signal for the programmable limit switch.

The following values can be entered:

P-0-0131:	Function:
0	The programable limit switch is not activated.
1	The programable limit switch is activated; the reference signal is **S-0-0051, Position feedback value 1**
2	The programable limit switch is activated; the reference signal is **S-0-0053, Position feedback value 2**

Fig. 3-21: Activation and Signal Selection for the programmable Limit Switch

See also the functional description: "Programmable Limit Switch"

P-0-0131 - Attributes

Para. Name:	**DE**	Nockenschaltwerk-Signalauswahl		
	EN	Signal select position switch		
	FR	Boîte à cames, Sélection de signal		
	ES	Señal seleccionar interruptor de posición		
	IT	Selezione Segnale Interr. di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 2		
Default value:		0	**Cyc. transmittable:**	no

P-0-0132, Switch on threshold position switch

This parameter list can be used to set the switch-on positions for the programmable limit switch.

It consists of 8 elements: Element 1 is allocated for position switch bit 1, element 2 is allocated for bit 2, and so forth.

See also the functional description: "Programmable Limit Switch"

P-0-0132 - Attributes

Para. Name:	**DE**	Nockenschaltwerk-Einschaltschwelle		
	EN	Switch on threshold position switch		
	FR	Boîte à cames, seuil d'enclenchement		
	ES	Conectar en umbral interruptor de posición		
	IT	Attivazione Interr. Mantenimento Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte var.	**Memory:**	-
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		- / 214748.3647		
Default value:		-	**Cyc. transmittable:**	-

P-0-0133, Switch off threshold position switch

This parameter list can be used to set the switch-off position for the programmable limit switch.

It consists of 8 elements: Element 1 is allocated for position switch bit 1, element 2 is allocated for bit 2, and so forth.

See also the functional description: "Programmable Limit Switch"

P-0-0133 - Attributes

Para. Name:	**DE**	Nockenschaltwerk-Ausschaltschwelle		
	EN	Switch off threshold position switch		
	FR	Boîte à cames, seuil de déclenchement		
	ES	Desconectar en umbral interruptor de posición		
	IT	Disattivazione Interr. Mantenimento Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte var.	**Memory:**	-
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		- / 214748.3647		
Default value:		-	**Cyc. transmittable:**	-

P-0-0134, Position switch lead times

By parameterizing a rate time, a time delay can be compensated for an external, position-driven switch element. In that way, a theoretical adjustment value can be calculated from the rate time and the current drive velocity for the on- and off-switch Positions.

The programmable limit switch switches by the rate time before reaching the trigger position.

Note: The velocity must remain constant in the range between the theoretical and actual on-switch or off-switch threshold.

See also the functional description: "Programmable Limit Switch"

P-0-0134 - Attributes

Para. Name:	**DE**	Nockenschaltwerk-Vorhaltezeiten		
	EN	Position switch lead times		
	FR	Boîte à cames, temps d'anticipation		
	ES	Interruptor de posición tiempo avanzado		
	IT	Interr. di Posiz. Tempo principale		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	-
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		- / 32767		
Default value:		-	**Cyc. transmittable:**	-

P-0-0135, Status position switch

The status of the programmable limit switch bits is displayed in this parameter.

Parameter structure:

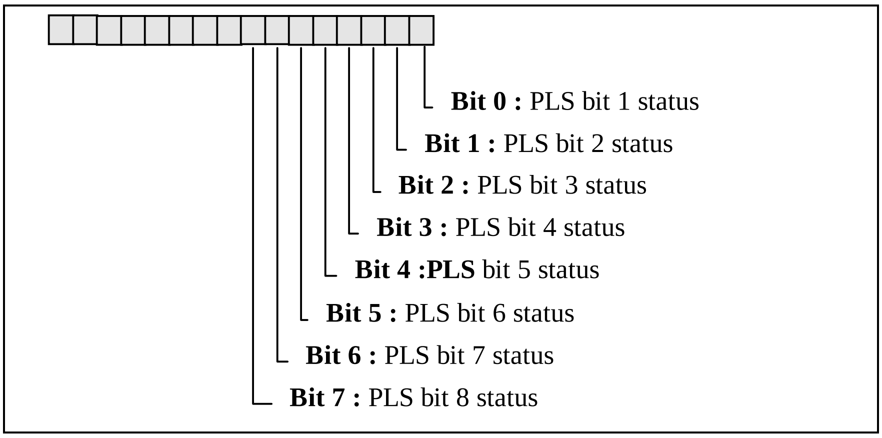


Fig. 3-22: P-0-0135, Position Switch Status

See also the functional description: "Programmable Limit Switch"

P-0-0135 - Attributes

Para. Name:	**DE**	Nockenschaltwerk-Statuswort		
	EN	Status position switch		
	FR	Boîte à cames, message d'état		
	ES	Interruptor de posición, palabra de estado		
	IT	Stato Interr. di Posizione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	AT

P-0-0139, Analog output 1

Parameter **P-0-0139, Analog output 1** sets the voltage value given to the drive controller via analog output 1. It can be directly write accessed internally by selecting a signal via **P-0-0420, Analog output 1 signal selectior** and **P-0-0421, Analog output 1, expanded signal selection** or by the control. The voltage value output is quantized with 78mV.

See also the functional description: "Analog Output".

P-0-0139 - Attributes

Para. Name:	**DE**	Analogausgang 1		
	EN	Analog output 1		
	FR	Sortie analogique 1		
	ES	Salida analogica 1		
	IT	Uscita analogica 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0140, Analog output 2

Parameter **P-0-0140, Analog output 2** sets the voltage value given to the drive controller via analog output 2. It can be directly write accessed internally by selecting a signal via **P-0-0423, Analog output 2 signal selectior** and **P-0-0424, Analog output 2, expanded signal selection** or by the control. The voltage value output is quantizied with 78mV.

See also the functional description: "Analog Output".

P-0-0140 - Attributes

Para. Name:	**DE**	Analogausgang 2		
	EN	Analog output 2		
	FR	Sortie analogique 2		
	ES	Salida analogica 2		
	IT	Uscita analogica 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0141, Thermal drive load

The parameter P-0-0141, Thermal drive load is for diagnostic purposes. In this parameter, 0% corresponds to a chip over-temperature of 0 Kelvin, 100% corresponds to the maximum chip over-temperature. The thermal load should not exceed a value of 80% for the applied operating cycles if the drive is set up correctly.

It typically takes about 10 minutes to warm up a drive controller end stage to its final temperature. To check the thermal load of a drive during installation without having to run operating cycles during this period of time, the drive controller load can be preset with 80%. This can happen by writing an arbitrary value to the parameter **P-0-0141, Thermal drive load**.

See also the functional description: "Checking the Thermal Load of the drive controller".

P-0-0141 - Attributes

Para. Name:	**DE**	Thermische Regelgeräte-Auslastung		
	EN	Thermal drive load		
	FR	Charge thermique variateur		
	ES	Descarga termica de reguladores		
	IT	Carico termico Azionamento		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		%	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		00000 / 100		
Default value:		---	**Cyc. transmittable:**	no

P-0-0145, Expanded trigger level

This parameter is for service purposes only.

If bit 12, Expanded trigger level is selected using parameter **P-0-0026, Trigger signal selection**, then an address can be selected with parameter P-0-0145 that is monitored for the threshold parameter value.

Parameter structure:

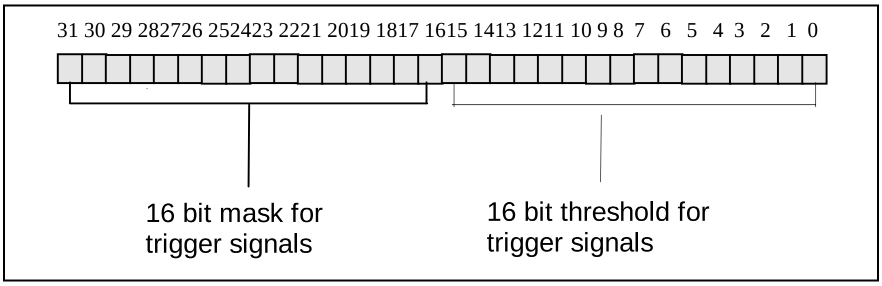


Fig. 3-23: P-0-0145, Expanded trigger level (oscilloscope function)

See also the functional description: "Oscilloscope Feature".

P-0-0145 - Attributes

Para. Name:	**DE**	Triggerschwelle erw.Oszilloskopfunktion		
	EN	Expanded trigger level		
	FR	Seuil de déclenchement fonction oscill. élargie		
	ES	Umbral de trigger función ampliada de osciloscopio		
	IT	Superamento Soglia Fronte di Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0146, Expanded trigger address

This parameter is for service purposes only.

If bit 12 Expanded trigger level is selected in using parameter **P-0-0026, Trigger signal selection**, then an address can be selected with parameter P-0-0146 that is monitored for the threshold parameter value.

Parameter structure:

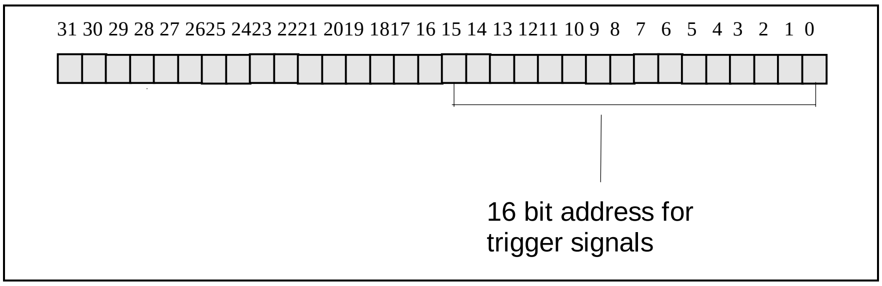


Fig. 3-24: P-0-0146, Expanded trigger address

The 16-bit value of the trigger edge is monitored. Before, the trigger signal is ANDed with the mask for trigger signals.

See also the functional description: "Oscilloscope Feature".

P-0-0146 - Attributes

Para. Name:	**DE**	Triggersignaladresse erw. Oszilloskopfunktion		
	EN	Expanded trigger address		
	FR	Adresse déclenchement fonction ocill. élargie		
	ES	Dirección de trigger función de osciloscopio ampliada		
	IT	Superamento Indirizzo del Segnale di Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0147, Expanded signal K1 address

If an expanded signal selection is made with parameters **P-0-0023, Signal select scope channel 1** and **P-0-0024, Signal select scope channel 2**, then an address to be recorded can be chosen in the drive with parameter P-0-0147.

See also the functional description: "Oscilloscope Feature".

P-0-0147 - Attributes

Para. Name:	**DE**	Signaladresse K1 erw. Oszilloskopfunktion		
	EN	Expanded signal K1 address		
	FR	Adresse signal K1 fonction oscill. élargie		
	ES	Dirección de señal K1 función de osciloscopio ampliada		
	IT	Indirizzo Segnale K1		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0148, Expanded signal K2 address

If an expanded signal selection is chosen with parameters **P-0-0023, Signal select scope channel 1** and **P-0-0024, Signal select scope channel 2**, then an address to be recorded can be chosen in the drive with parameter P-0-0148.

See also the functional description: "Oscilloscope Feature".

P-0-0148 - Attributes

Para. Name:	**DE**	Signaladresse K2 erw. Oszilloskopfunktion		
	EN	Expanded signal K2 address		
	FR	Adresse signal K2 fonction oscill. élargie		
	ES	Dirección de señal K2 función de osciloscopio ampliada		
	IT	Indirizzo Segnale K2		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0149, List of selectable signals for oscilloscope function

The control system can read drive-supported, defined signals with parameter P-0-0149.This permits a user interface to prepare a signal select menu using the information in the listed parameters in the drive.

List entries:	ID number of:
1	S-0-0051 or S-0-0053
2	S-0-0040
3	S-0-0347
4	S-0-0189
5	S-0-0080
6	P-0-0147
7	P-0-0148

Fig. 3-25: P-0-0149, List of selectable signals for oscilloscope function

See also the functional description: "Oscilloscope Feature".

P-0-0149 - Attributes

Para. Name:	**DE**	Signalauswahlliste für Oszilloskopfunktion		
	EN	List of selectable signals for oscilloscope function		
	FR	Liste sélection signaux pour fonction oscilloscope		
	ES	Lista de selección de señal para función de osciloscopio		
	IT	Lista dei Segnali validi per Funzione Oscilloscopio		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0150, Number of valid samples for oscilloscope function

If the oscilloscope function is activated then the signal to be recorded is continously fed to a value memory. If triggering occurs, then the recording procedure is stored and the value list can be read out. The oldest measured value is the first element of this list, the newest value the last.

If triggering occurs before the memory is completely filled, then a number of values at the start of the list are invalid.The number of valid values before triggering is available in parameter **P-0-0150, Number of valid samples for oscilloscope function**.

See also the functional description: "Oscilloscope Feature".

P-0-0150 - Attributes

Para. Name:	**DE**	Anzahl gültiger Messwerte für Oszilloskopfunktion		
	EN	Number of valid samples for oscilloscope function		
	FR	Nombre de mesures valides pour fonction oscilloscope		
	ES	Numero valores de medición validos para función osciloscopio		
	IT	Numero dei Campionamenti validi per Funz. Oscill.		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0153, Optimal distance home switch - reference mark

During command "**Drive-controlled homing**" when the zero-switch and homing mark evaluation are activated, the distance between the zero-switch edge and the homing mark is monitored. For reference marks (home reference) with equal intervals, the optimal distance is half the home-reference interval. The optimal distance can be entered in parameter P-0-0153, Optimal distance home switch - reference mark as per the following table:

Encoder type	P-0-0153	Function
Rotational	0	The zero-switch - reference mark interval is monitored. The optimal distance will be calculated internally, and is equal to 1/2 of an encoder revolution for DSF or incr. rotary encoders, or 1/2 of an encoder revolution / **S-0-0116, Rotary encoder resolution - 1** for resolvers.
Rotational	x	The zero-switch - reference mark interval is monitored. Half the reference mark distance must be entered in **P-0-0153, Optimal distance home switch - reference mark**.
Linear	0	The zero-switch - reference mark interval is not monitored. The linear encoder does not affect reference marks with constant intervals. The real distance between the zero-switch and the reference mark must be large enough to ensure recognition of the zero-switch edge, taking into account the maximum homing velocity and the cycle time for the zero-switch input request.
Linear	x	The zero-switch - reference mark interval is monitored. Half the reference mark distance must be entered in **P-0-0153, Optimal distance home switch - reference mark**.

Fig. 3-26: Interval monitoring, home switch - reference mark

See also the functional description: "Drive-Controlled Homing".

P-0-0153 - Attributes

Para. Name:	**DE**	Optimaler Abstand Referenzschalter-Referenzmarke		
	EN	Optimal distance home switch - reference mark		
	FR	Distance optimale entre contact d'origine et marque de réf.		
	ES	Distancia optima marca de puesta a cero		
	IT	Distanza ottimale Camma di Zero		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		S-0-0076	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

P-0-0162, D900 Command Automatic control loop adjust

Starting this command executes an automatic control loop setting in the drive as soon as the drive is in the loop with command start.

WARNING

⇒ This can effect an immediate motion if **drive enable** and **drive start** are applied to the drive.

⇒ The drive now conducts autonomous motions within the traversing range defined by both limits.

The two traverse range limits (P-0-0166 and P-0-0167), within which the drive may move during autoatic control loop settings, must be set first.

All pre-settings affecting the command, such as **P-0-0163**, damping factor for automatic control loop settings, **P-0-0164, application for autom. control loop setting, S-0-0092, bipolar torque/force limit value** and **S-0-0259, positioning speed** must also first be set.

Note: Errors can occur during the execution of a command. These must be signalled with pertinent messages.

D901 Start only possible with drive enable

D902 Motor feedback data does not make sense

D903 Faulty determination of moment of inertia

D904 Automatic control loop setting failed

D905 Traverse range limit not valid

D906 Traverse range limit exceeded

See also the functional description: "Automatic Control Loop Settings".

P-0-0162 - Attributes

Para. Name:	**DE**	D900 Kommando Automatische Regelkreiseinstellung		
	EN	D900 Command Automatic control loop adjust		
	FR	D900 Commande reglage automatique de l'asservissement		
	ES	D900 Ajuste automatico del regulador		
	IT	D900 Regolazione automatica Regolatore		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	-
Decimal places:		--	**Combination check:**	-
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-0163, Damping factor for autom. control loop adjust

At this point, the user has the option to influence the automatic control loop dynamics. The slide switch in DriveTop dialog "**Automatic control loop setting"** is intended for this purpose.

A dynamics = 100% achieves the maximum possible drive dynamics.

A dynamics = 0% results in a highly non-dynamic control loop setting.

Note: It applies: large damping factor P-0-0163 = 20 ⇒ 0% dynamics
small damping factor P-0-0163 = 0.5 ⇒ 100% dynamics

Function Description

If dynamics are selected greater than that which the drive can achieve as a result of its mechanical construction, then a weakly damped control loop will result and the drive will begin to oscillated.

This drive itself, in a case like this, detects and influences the control parameters **automatically** until a **sufficiently damped** control loop setting is achieved.

Note: Generally speaking, presetting a default value of 88% (P-0-0163 = 3.0) produces satisfactory results.

See also the functional description: "Automatic Control Loop Settings".

P-0-0163 - Attributes

Para. Name:	**DE**	Dämpfungsfaktor für autom. Reglereinstellung		
	EN	Damping factor for autom. control loop adjust		
	FR	Facteur dynamique pour reglage autom. de l'asservissement		
	ES	Factor dinamico para ajuste automatico del regulador		
	IT	Fattore dinamico per Regolazione automatica		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	-
Unit:		--	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-0164, Application for autom. control loop adjust

In order to take control strategies related to an application into consideration with the automatic control loop settings, the user receives a **selection list** from which the desired application can be selected.

This offers, e.g., the option to completely switch the I-gain off, for example, and so on.

The information below relates to the speed controller

Value (P-0-0164)	Application	I-gain	P-gain
0	machine tools --> good load rigidity	with	normal
1	nippel machine --> short settling times	w/o Tn=0ms	big
2	simultaneously running separation device -> rel. undynam. control loop setting	w/o Tn=0ms	normal

Fig. 3-27: Speed controller data

Note: This table is constantly expanded and is presently incomplete.

The **default value** is set for a **machine tool**.

See also the functional description: "Automatic Control Loop Settings"

P-0-0164 - Attributes

Para. Name:	**DE**	Applikation für autom. Reglereinstellung		
	EN	Application for autom. control loop adjust		
	FR	Application pour reglage autom. de l'asservissement		
	ES	Aplicación ajuste automatico del regulador		
	IT	Applicazione per Regolazione automatica		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEV_OV	**Validity check:**	nicht
Unit:			**Extrem value check:**	-
Decimal places:		0	**Combination check:**	-
Input min/max:		0 / 3		
Default value:		-	**Cyc. transmittable:**	no

P-0-0165, Selection for autom. control loop adjust

Note: Parameter is required with later versions.

See also the functional description: "Automatic Control Loop Settings".

P-0-0165 - Attributes

Para. Name:	**DE**	Wahlparameter für autom. Reglereinstellung		
	EN	Selection for autom. control loop adjust		
	FR	Paramètre de sélection pour reglage autom. asservissement		
	ES	Parámetro de selección para ajuste de regulador automatico		
	IT	Parametro di Scelta per Regolazione automatica		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	-
Input min/max:		0 / 100		
Default value:		-	**Cyc. transmittable:**	no

P-0-0166, Lower position limit for autom. control loop adjust

The lower traversing limit for the automatic control loop setting **P-0-0162** is stored here. A **Teach-In function** in DriveTop is used to approach the limit position in either a speed controlled fashion or in jog mode. Pressing the Teach-In key copies the **current actual position** as **lower limit** into the operating data of parameter P-0-0166.

Note:

At the start of command D9, a check is run of the traversing range defined by both parameters (P-0-0166 and P-0-0167).

See also the functional description: "Automatic Control Loop Settings".

See also **D905 wrong position range**

See also **D906 position range exceeded**

P-0-0166 - Attributes

Para. Name:	**DE**	Untere Grenze für autom. Regelkreiseinstellung		
	EN	Lower position limit for autom. control loop adjust		
	FR	Position lim. inférieure pour reglage autom. asservissement		
	ES	Posición limite inferior para ajuste de regulador automatico		
	IT	Posizione limite inferiore per Regolazione automatica		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		-	**Cyc. transmittable:**	no

P-0-0167, Upper position limit for autom. control loop adjust

The upper traversing limit for the automatic control loop setting **P-0-0162** is stored here. A **Teach-In function** in DriveTop is used to approach the limit position in either a speed controlled fashion or in jog mode. Pressing the Teach-In key copies the **current actual position** as **lower limit** into the operating data of parameter P-0-0167.

Note:

At the start of command D9, a check is run of the traversing range defined by both parameters (P-0-0166 and P-0-0167).

See also the functional description: "Automatic Control Loop Settings".

See also **D905 wrong position range**

See also **D906 position range exceeded**

P-0-0167 - Attributes

Para. Name:	**DE**	Obere Grenze für autom. Regelkreiseinstellung		
	EN	Upper position limit for autom. control loop adjust		
	FR	Position lim. supérieure pour reglage autom. asservissement		
	ES	Posición limite superior para ajuste de regulador automatico		
	IT	Posizione limite superiore per Regolazione automatica		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		-	**Cyc. transmittable:**	no

P-0-0168, Maximum acceleration

The maximum possible acceleration for the drive in use is displayed in this parameter's data field.

The value is closely approximate to being indirectly proportional to the drive's total moment of inertia (motor plus load) and directly proportional to the peak torque of the drive.

This maximum value is determined when controller values are automatically set, **P-0-0162** and is used as a **default value** for determining the **positioning commands.**

The numeric value 0 is entered as a **default value** to make it obvious that the parameter has not yet been set to a valid value.

See also the functional description: "Automatic Control Loop Settings".

P-0-0168 - Attributes

Para. Name:	**DE**	Max. parametrierbare Beschleunigung		
	EN	Maximum acceleration		
	FR	Accélération maxi. parametrable		
	ES	Máx. Aceleración		
	IT	Max. Accelerazione parametri		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0160	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-0176, Torque/Force command smoothing time constant

The parameter P-0-0176, Torque/force command smoothing time constant is active during the operation mode "Torque control".

The time constant input here filters during torque control the command value given by S-0-0080, Torque/Force command via a low pass filter. This smoothens acceleration jumps in successive command values.

See also the functional description: "Operating Mode: Torque Control".

P-0-0176 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Sollwert Glättungszeitkonstante		
	EN	Torque/Force command smoothing time constant		
	FR	Temps de filtrage pour consigne de couple/force		
	ES	Tiempo de alisamiento para comando par/fuerza		
	IT	Tempo di Smorzamento per Coppia/Forza comandata		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0180, Rejection frequency velocity loop

To supress the mechanical resonance frequency, a band filter can be activated at the output of the velocity controller .It is parametrized with parameters **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop**.

P-0-0180, Rejection frequency velocity loop indicates the most attenuated frequency.

See also the functional description: "Filtering oscillations from mechanical resonance".

P-0-0180 - Attributes

Para. Name:	**DE**	Sperrfrequenz Geschwindigkeitsregler		
	EN	Rejection frequency velocity loop		
	FR	Fréquence á supprimer, boucle de vitesse		
	ES	Frecuencia a eliminar Regulador de velocidad		
	IT	Frequenza da sopprimere, Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Hz	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		50 / 950		
Default value:		900	**Cyc. transmittable:**	no

P-0-0181, Rejection bandwidth velocity loop

To supress the mechanical resonance frequency, a band filter can be activated at the output of the velocity controller. It is parametrized with parameters **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop**.

P-0-0181, Rejection bandwidth velocity loop sets the frequency range for the locking frequency with an attenuation smaller than -3dB.

Example:

P-0-0180 = 500 Hz,

P-0-0181 = 200 Hz;

then: attenuation < -3dB in range of 400..600 Hz.

Parameter content	Effect of P-0-0181
-1	low pass filter with time constant P-0-0004
0	filter is off
>0	bandwidth of suppression (notch) filter

Fig. 3-28: P-0-0181, Rejection bandwidth velocity loop

See also the functional description: "Filtering oscillations from mechanical resonance".

P-0-0181 - Attributes

Para. Name:	**DE**	Bandbreite Sperrfilter Geschwindigkeitsregler		
	EN	Rejection bandwidth velocity loop		
	FR	Gamme de bande à supprimer, boucle de vitesse		
	ES	Ancho de banda a eliminar regulador de velocidad		
	IT	Larghezza Banda da sopprimere, Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Hz	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		-1 / 900		
Default value:		0	**Cyc. transmittable:**	no

P-0-0185, Function of encoder 2

Parameter P-0-0185 can be used to allocate a specific function to an optional encoder. The following functions are defined:

Value in P-0-0185, Function of encoder 2	Meaning
0	Optional encoder as additional loadside control feedback for position and/or velocity loop. The signal frequency is monitored whether it exceeds the max. possible frequency for the interface. In case of excess, the error **F246 Max. signal frequency for encoder 2 exceeded** is generated, and the position status S-0-0403 is cleared.
2	Optional encoder as singular loadside control feedback (only with rotary asynchronous motor). In this case, there is no motor encoder (P-0-0074 = 0). The parameter **P-0-0121, Velocity mix factor encoder 1 & 2** must be set to 100 % .
4	Optional encoder as spindle encoder. Usage like "optional encoder as additional loadside control feedback for position and/or velocity loop". But if the max. signal frequency is exceeded, no error is generated, but the position status is cleared.

Fig. 3-29: Function of optional encoder

Explanation:

- If the optional encoder is used as a **control encoder**, it can be used to close the control loop. All modes are possible with ext. enc. The position value is set in **S-0-0053, Position feedback value 2 (opt. feedback)**
- If the optional encoder is used as a **motor encoder**, the control loop and commutation are generated from this encoder. Only **S-0-0053, Position feedback value 2 (opt. feedback)** is supported.

See also the functional description: "Optional encoder".

P-0-0185 - Attributes

Para. Name:	**DE**	Funktion Geber 2		
	EN	Function of encoder 2		
	FR	Fonction du codeur 2		
	ES	Función del encoder 2		
	IT	Funzione del Encoder 2		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0190, Operating hours control section

The operating hours of the control section are displayed here. With this parameter, the entire on time of control electronics since installation of the unit can be displayed. If a class 1 error occurs, the contents of this parameter at that time is first stored in **P-0-0193, Error recorder, operating hours control section**.

See also the functional description: "Error memory and operating hour counter".

P-0-0190 - Attributes

Para. Name:	**DE**	Betriebsstunden Steuerteil		
	EN	Operating hours control section		
	FR	Heures de fonctionnement contrôle		
	ES	Horas de servicio sesión de control		
	IT	Ore d'Operazione Sezione Controllo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		h	**Extrem value check:**	no
Decimal places:		4	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0191, Operating hours power section

With this parameter, the entire on time of control electronics since installation of the unit can be displayed. This is the time over which the drive was operated with drive enable on.

See also the functional description: "Error memory and operating hour counter".

P-0-0191 - Attributes

Para. Name:	**DE**	Betriebsstunden Leistungsteil		
	EN	Operating hours power section		
	FR	Heures de fonctionnnement puissance		
	ES	Horas de servicio parte de potencia		
	IT	Ore d'Operazione Sezione Potenza		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		h	**Extrem value check:**	no
Decimal places:		4	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0192, Error recorder, diagnosis number

If the drive reports a class 1 error (C1D), a bit is set in **S-0-0011, Class 1 diagnostics** C1D. Bit 13 for "Error C1D“ is set in the drive status word.

Additionally, for a precise diagnosis,

- the diagnosis number is shown in the 7- segment display and stored in **S-0-0390, Diagnostic message number**,
- the plain text diagnosis is stored in **S-0-0095, Diagnostic message**,
- and the relevant error number in **P-0-0009, Error message number**.

When the error is reset, then the diagnosis number of the error displayed **in S-0-0390, Diagnostic message number** is stored in **P-0-0192, Error recorder diagnosis number**. This parameter shows the diagnosis numbers of the last 19 errors in chronological order. The last occured error is on top.

The status of **P-0-0190, Operating hours control section** at the time the error was deleted is stored in **P-0-0193, Error recorder, operating hours control section**.

See also the functional description: "Error memory and operating hour counter".

P-0-0192 - Attributes

Para. Name:	**DE**	Fehlerspeicher Diagnosenummer		
	EN	Error recorder, diagnosis number		
	FR	Enregistrement d'erreurs, numéros de diagnostique		
	ES	Memoria de errores número de diagnóstico		
	IT	Memoria dei Guasti, Numeri Diagnosi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	Verst. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0193, Error recorder, operating hours control section

If the drive reports a class 1 error (C1D), then a bit is set in **S-0-0011, Class 1 diagnostics** C1D. Bit 13 for "Error C1D“ is set in the drive status word.

Additionally, for a precise diagnosis,

- the diagnosis number is shown in the 7-segment display and stored in **S-0-0390, Diagnostic message number**,
- the clear text diagnosis is stored in **S-0-0095, Diagnostic message**,
- and the relevant error number in **P-0-0009, Error message number**.

When the error is reset, then the status of **P-0-0190, Operating hours control section** at the time the error was detected is stored in **P-0-0193, Error recorder, operating hours control section**. This parameter shows the diagnosis numbers of the last 19 errors in chronological order. On the topmost position, there is the counter value of the last occured error.

The status of **P-0-0192, Error recorder diagnosis number** at the time the error was deleted in the order in **S-0-0390, Diagnostic message number**.

See also the functional description: "Error memory and operating hour counter".

P-0-0193 - Attributes

Para. Name:	**DE**	Fehlerspeicher Betriebstunden Steuerteil		
	EN	Error recorder, operating hours control section		
	FR	Enregistrement d'erreurs, heures de fonctionnement cont.		
	ES	Memoria de errores horas de servicio parte de control		
	IT	Memoria dei Guasti, Ore d'Operazione		
Function:		Parameter	**Editability:**	no
Data length:		4Byte var.	**Memory:**	Verst. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0200, Signal select probe 1

This parameter is used to select what measured quantity will be used for probe input 2.

The following signals can be selected:

P-0-0200:	Selected signal:
0	Position feedback value 1 or 2, dependent on **S-0-0169, Probe control parameter** bit 4
1	Time measurement in µs

Fig. 3-30: P-0-0200, Signal select probe 1

See also the functional description: "Probe Input Feature".

P-0-0200 - Attributes

Para. Name:	**DE**	Signal-Auswahl Messtaster 1		
	EN	Signal select probe 1		
	FR	Sélection signal pour sonde 1		
	ES	Selección de señal muestra 1		
	IT	Selezione Segnale Probe 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4		
Default value:		0	**Cyc. transmittable:**	no

P-0-0201, Signal select probe 2

This parameter is used to select what measured quantity will be used for probe input 2.

The following signals can be selected:

P-0-0201:	Selected signal:
0	Position feedback value 1 or 2, dependent on **S-0-0169, Probe control parameter** bit 4
1	Time measurement in µs

Fig. 3-31: P-0-0201, Signal select probe 2

See also the functional description: "Probe Input Feature".

P-0-0201 - Attributes

Para. Name:	**DE**	Signal-Auswahl Messtaster 2		
	EN	Signal select probe 2		
	FR	Sélection signal pour sonde 2		
	ES	Selección de señal muestra 2		
	IT	Selezione Segnale Probe 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 2		
Default value:		0	**Cyc. transmittable:**	no

P-0-0202, Difference probe values 1

The difference between the **S-0-0130, Probe value 1 positive** and the **S-0-0131, Probe value 1 negative** of probe 1 is stored in this parameter. The value is always recalculated when a new positive or negative probe value is latched.

See also the functional description: "Probe Input Feature".

P-0-0202 - Attributes

Para. Name:	**DE**	Differenz Messwerte 1		
	EN	Difference probe values 1		
	FR	Différence mesure 1		
	ES	Diferencia valores de medición 1		
	IT	Differenza Valore Misurato 1		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0203, Difference probe values 2

The difference between the **S-0-0130, Probe value 2 positive** and the **S-0-0131, Probe value 2 negative** of probe 2 is stored in this parameter. The value is always recalculated when a new positive or negative probe value is latched.

See also the functional description: "Probe Input Feature".

P-0-0203 - Attributes

Para. Name:	**DE**	Differenz Messwerte 2		
	EN	Difference probe values 2		
	FR	Différence mesure 2		
	ES	Diferencia valores de medición 2		
	IT	Differenza Valore Misurato 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0210, Analog input 1

This parameter displays the analog voltage applied at the analog channel 1 in volts with 3 decimal places.

See also the functional description: "Analog Inputs".

P-0-0210 - Attributes

Para. Name:	**DE**	Analog-Eingang 1		
	EN	Analog input 1		
	FR	Entrée analogique 1		
	ES	Entrada analogica 1		
	IT	Ingresso analogico 1		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

P-0-0211, Analog input 2

This parameter displays the analog voltage applied at the analog channel 2 in volts with 3 decimal places.

See also the functional description: "Analog Inputs".

P-0-0211 - Attributes

Para. Name:	**DE**	Analog-Eingang 2		
	EN	Analog input 2		
	FR	Entrée analogique 2		
	ES	Entrada analogica 2		
	IT	Ingresso analogico 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

P-0-0212, Analog inputs, IDN list of assignable parameters

The digitalized values of both analog inputs are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be allocated via settable scaling to other drive parameters or cyclically copied. The allowed parameters for allocation are listed in **P-0-0212, Analog inputs, IDN list of assignable parameters**.

See also the functional description: "Analog Inputs".

P-0-0212 - Attributes

Para. Name:	**DE**	Analog-Eingänge, IDN-Liste der zuweisbaren Parameter		
	EN	Analog inputs, IDN list of assignable parameters		
	FR	Entrées analogiques, liste des param.s pouvant être assignés		
	ES	Entradas analógicas, lista IDN de parámetros asignables		
	IT	Ingressi analogichi, Lista dei Parametri assignabili		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	--
Decimal places:		--	**Combination check:**	--
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

P-0-0213, Analog input 1, assignment

The digitalized values of both analog inputs are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be allocated via settable scaling to other drive parameters or cyclically copied.

To copy cyclically the analog input 1 to a drive parameter, the ID no. of this parameter must be entered.

If the ID no. Entered in **P-0-0213, Analog input 1, assignment** not in **P-0-0212, Analog inputs, IDN list of assignable parameters**, then the service channel error message "data not correct“ is generated.

If the allocation is to be deleted, enter the ID no. S-0-0000.

See also the functional description: "Analog Inputs".

P-0-0213 - Attributes

Para. Name:	**DE**	Analog-Eingang 1, Zuweisung		
	EN	Analog input 1, assignment		
	FR	Entrée analogique 1, assignation		
	ES	Entrada analógica 1, asignación		
	IT	Ingresso analogico 1, Assignazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0214, Analog input 1, scaling per 10V full scale

The digitalized values of both analog inputs module are stored in the parameters **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be assigned to other drive parameters via settable scalings, i.e., copied.

If analog input 1 is cyclically copied to a drive parameter, i.e., an ID no. Has been entered in **P-0-0213, Analog input 1, assignment**, then avalue of 10V of the analog voltage in terms of the assigned parameter is entered.

The unit and the number of decimal places of **P-0-0214, Analog input 1, scaling per 10V full scale** correspond to those of **P-0-0213, Analog input 1, assignment**.When inputting **P-0-0213, Analog input 1, assignment**, both unit and decimal places of **P-0-0214, Analog input 1, scaling per 10V full scale** are switched appropriately.

See also the functional description: "Analog Inputs".

P-0-0214 - Attributes

Para. Name:	**DE**	Analog-Eingang 1, Bewertung pro 10V		
	EN	Analog input 1, scaling per 10V full scale		
	FR	Entrée analogique 1, calibrage pour 10V		
	ES	Entrada analógica 1, calibrado		
	IT	Ingresso analogico 1, Scala per 10V		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		---	**Validity check:**	no
Unit:		---	**Extrem value check:**	no
Decimal places:		---	**Combination check:**	no
Input min/max:		0 / P-0-0213		
Default value:		3000	**Cyc. transmittable:**	no

P-0-0215, Analog input 2, assignment

The digitalized values of both analog inputs are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be allocated via settable scaling to other drive parameters or cyclically copied.

To copy cyclically the analog input 2 to a drive parameter, the ID no. of this parameter must be entered.

If the ID no. Entered in **P-0-0213, Analog input 2, assignment** not in **P-0-0212, Analog inputs, IDN list of assignable parameters**, then the service channel error message "data not correct“ is generated.

If the allocation is to be deleted, enter the ID no. S-0-0000.

See also the functional description: "Analog Inputs".

P-0-0215 - Attributes

Para. Name:	**DE**	Analog-Eingang 2, Zuweisung		
	EN	Analog input 2, assignment		
	FR	Entrée analogique 2, assignation		
	ES	Entrada analógica 2, asignación		
	IT	Ingresso analogico 1, Assignazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		---	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0216, Analog input 2, scaling per 10V full scale

The digitalized values of both analog inputs are stored in the parameters **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be assigned to other drive parameters via settable scalings, i.e., copied.

If analog input 1 is cyclically copied to a drive parameter, i.e., an ID no. Has been entered in **P-0-0215, Analog input 2, assignment**, then avalue of 10V of the analog voltage in terms of the assigned parameter is entered.

The unit and the number of decimal places of **P-0-0216, Analog input 2, scaling per 10V full scale** correspond to those of **P-0-0215, Analog input 2, assignment**. When inputting **P-0-0215, Analog input 2, assignment**, both unit and decimal places of **P-0-0216, Analog input 2, scaling per 10V full scale** are switched appropriately.

See also the functional description: "Analog Inputs".

P-0-0216 - Attributes

Para. Name:	**DE**	Analog-Eingang 2, Bewertung pro 10V		
	EN	Analog input 2, scaling per 10V full scale		
	FR	Entrée analogique 2, calibrage pour 10V		
	ES	Entrada analógica 2, calibrado		
	IT	Ingresso analogico 1, Scala per 10V		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		---	**Validity check:**	no
Unit:		---	**Extrem value check:**	no
Decimal places:		---	**Combination check:**	no
Input min/max:		0 / P-0-0215		
Default value:		3000	**Cyc. transmittable:**	no

P-0-0217, Analog input 1, offset

The analog channels can be processed with a DC offset. It has the unit millivolt, and this value is subtracted from the analog value.

See also the functional description: "Analog Inputs".

P-0-0217 - Attributes

Para. Name:	**DE**	Analog-Eingang 1, Offset		
	EN	Analog input 1, offset		
	FR	Entrée analogique 1, offset		
	ES	Entrada analogica 1, offset		
	IT	Ingresso analogico 1, Offset		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0218, Analog input 2, offset

The analog channels can be processed with a DC offset. It has the unit millivolt, and this value is subtracted from the analog value.

See also the functional description: "Analog Inputs".

P-0-0218 - Attributes

Para. Name:	**DE**	Analog-Eingang 2, Offset		
	EN	Analog input 2, offset		
	FR	Entrée analogique 2, offset		
	ES	Entrada analogica 2, offset		
	IT	Ingresso analogico 2, Offset		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0222, State of Travel range limit inputs

This parameter displays the inputs of the travel range limit switches. The parameter is used for diagnostic purposes of the limit switches. The structure is as follows :

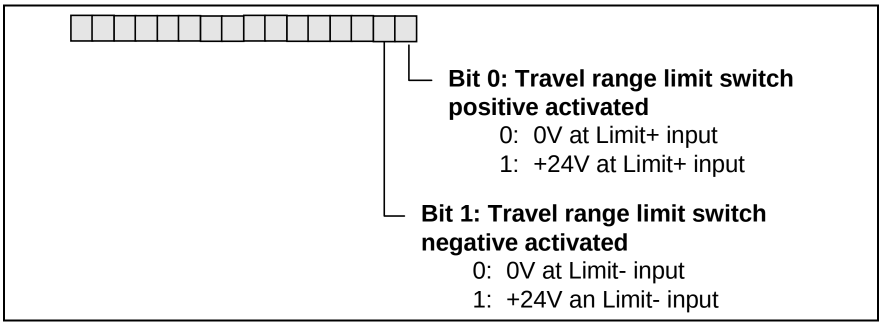


Fig. 3-32: Structure P-0-0222, Travel range limit inputs

See also the functional description: "Travel Zone Limit Switch Monitoring"

P-0-0222 - Attributes

Para. Name:	**DE**	Status Fahrbereichsgrenzschalter-Eingänge		
	EN	State of Travel range limit inputs		
	FR	Etat entrées fin de course		
	ES	Estado entradas fin de curso		
	IT	Stato Ingressi Finecorsa		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	AT

P-0-0223, Status Input E-Stop function

This Parameter shows the state of the emergency stop input. The parameter can be used to read back the E-Stop input oder for display in a setup program.

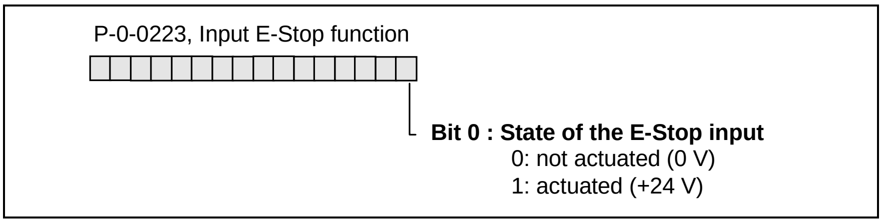


Fig. 3-33: Structure of the parameter P-0-0223, Input E-Stop function

For normal operation of the drive, the hardware input must be actuated with 24V.

See also the functional description: "Emergency stop feature"

P-0-0223 - Attributes

Para. Name:	**DE**	Status E-Stop-Eingang		
	EN	Status Input E-Stop function		
	FR	Etat entrée Arrêt d'urgence		
	ES	Estado entrada parada de emergencia		
	IT	Stato Ingresso E-Stop		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

P-0-0420, Analog output 1 signal selection

Using **P-0-0420, Analog output 1 signal selection**, an ID no. can be assigned to the analog AK1 output channel of the drive controller. The parameter with the assigned ID no. can be visualized with an oscilloscope in the form of an analog voltage. Only those ID no. which figure in the list **P-0-0426, Analog outputs, IDN list of assignable parameters** can be used.

See also the functional description: "Analog Output".

P-0-0420 - Attributes

Para. Name:	**DE**	Analog-Ausgang 1, Signalauswahl		
	EN	Analog output 1 signal selection		
	FR	Sortie analogique 1, sélection de signal		
	ES	Salida analógica 1, selección de señal		
	IT	Uscita analogica 1, Scelta del Segnale		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0421, Analog output 1, expanded signal selection

To be able to show signals as analog voltages, but which are not in **P-0-0426, Analog outputs, IDN list of assignable parameters**, then the option of an expanded signal select is possible. This becomes active as long as no parameter is assigned via **P-0-0420, Analog output 1 signal selection**.

The following expended signal select options are available:

- expanded signal select with permanently defind signals
- byte output
- bit output

1) Expanded signal selection with fixed signals

Internal signal numbers are assigned which are not in the drive in the form of ID numbers. These signals have permanent units making an evaluation via **P-0-0422, Analog output 1, scaling per 10V full scale** possible. The evaluation factor 1.0 equals the permanent unit. The following permanently defined signals are possible:

Signal number P-0-0421	Output signal	Ref. Unit: scaling factor = 1.0
0x00000001	motor encoder sine signal	0.5V/10V
0x00000002	motor encoder cosine signal	0.5V/10V
0x00000003	Opt. enc. sine signal	0.5V/10V
0x00000004	Opt. enc. sine cosine	0.5V/10V
0x00000005	Position command difference on the pos. controler	rot. =>1000rpm/10V lin. =>100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	absolute DC bus power amount	1kW/10V
0x00000008	effective current	S-0-0110/10V
0x00000009	relative current	S-0-0110/10V
0x0000000a	thermal load	100%/10V, no scaling possible
0x0000000b	motor temperature	150°C/10V
0x0000000c	magnetizing current	S-0-0110/10V
0x0000000d	velocity command at the velocity controller	rot. => 1000rpm/10V lin. => 100m/min/10V

Fig. 3-34: Signal select list with predefined signal selection

The outputs are scaling dependent and always relate to the motor shaft given position and velocity data.

2) Byte output

It is possible herewith to output memory cells of the data memory as analog voltage. It can only be practically applied if the data storage structure is known. As this is, however, different from version to version, the the function can only be used by the respective developer. The function is activated by setting bit 28 in **P-0-0421, Analog output 1, expanded signal selection**. The adress of the memory cell is defined in the least significant 24 bit of the expanded signal selection.

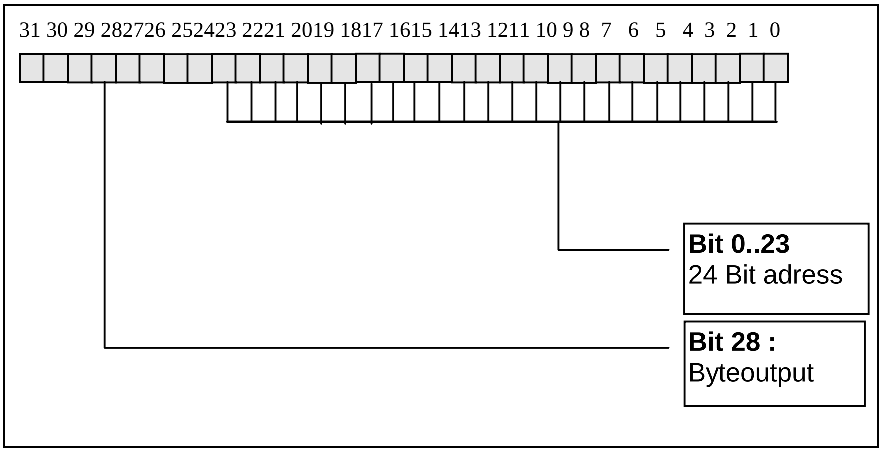


Fig. 3-35: Definition **P-0-0421, Analog output 1, expanded signal selection** with byte output

3) Bit output

Individual bits of the data memory can be shown as analog voltage herewith. If the respective bit is set, then 10V voltage is output at the analog output. A cleared bit outputs -10V. The function is activated by setting bit 29 and inputting the desired memory address in **P-0-0421, Analog output 1, expanded signal selection**.

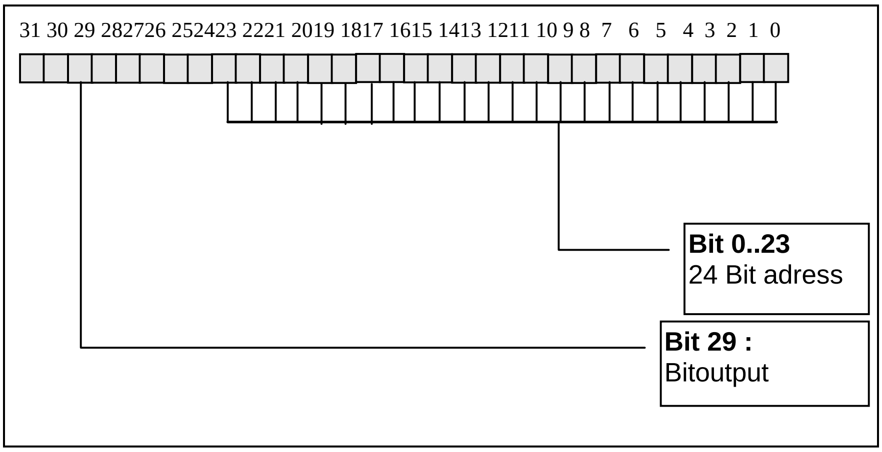


Fig. 3-36: Definition **P-0-0421, Analog output 1, expanded signal selection** with bit output

See also the functional description: "Analog Output".

P-0-0421 - Attributes

Para. Name:	**DE**	Analog-Ausgang 1, erweiterte Signalauswahl		
	EN	Analog output 1, expanded signal selection		
	FR	Sortie analogique 1, sélection de signal élargie		
	ES	Salida analógica 1, selección de señal ampliada		
	IT	Uscita analogica 1, Superamento Scelta		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0422, Analog output 1, scaling per 10V full scale

The resolution of the selected signal can be varied with parameter **P-0-0422, Analog output 1 scaling per 10V full scale**. If an ID no. is assigned via **P-0-0420, Analog output 1, signal selection**, the evalution is assigned the same unit as the parameter with the assigned ID number.

The output of pre-defined signals means that the scaling has a decimal factor of 4 decimal places. It has a permanent reference with fixed unit.

The scaling defines the least significant bit for bit and byte outputs. The input is decimal without decimal places.

See also the functional description: "Analog Output".

P-0-0422 - Attributes

Para. Name:	**DE**	Analog-Ausgang 1, Bewertung [1/10V]		
	EN	Analog output 1, scaling per 10V full scale		
	FR	Sortie analogique 1, calibrage [1/10V]		
	ES	Salida analógica 1, calibrado [1/10V]		
	IT	Uscita analogica 1, Scala per 10V fondo scala		
Function:		Parameter	**Editability:**	P234
Data length:		---	**Memory:**	Param. EE
Format:		P-0-0420/P-0-0421	**Validity check:**	no
Unit:		P-0-0420/P-0-0421	**Extrem value check:**	no
Decimal places:		P-0-0420/P-0-0421	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0423, Analog output 2, signal selection

Using **P-0-0423, Analog output 2, signal selection**, an ID no. can be assigned to the analog AK2 output channel of the drive controller. The parameter with the assigned ID no. can be visualized with an oscilloscope in the form of an analog voltage. Only those ID no. which figure in the list **P-0-0426, Analog outputs, IDN list of assignable parameters** can be used.

See also the functional description: "Analog Output".

P-0-0423 - Attributes

Para. Name:	**DE**	Analog-Ausgang 2, Signalauswahl		
	EN	Analog output 2, signal selection		
	FR	Sortie analogique 2, sélection de signal		
	ES	Salida analógica 2, selección de señal		
	IT	Uscita analogica 2, Scelta del Segnale		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0424, Analog output 2, expanded signal selection

To be able to show signals as analog voltages, but which are not in **P-0-0426, Analog outputs, IDN list of assignable parameters**, then the option of an expanded signal select is possible. This becomes active as long as no parameter is assigned via **P-0-0423, Analog output 2 signal selection**.

The following expended signal select options are available:

- expanded signal select with permanently defind signals
- byte output
- bit output

1) Expanded signal selection with fixed signals

Internal signal numbers are assigned which are not in the drive in the form of ID numbers. These signals have permanent units making an evaluation via **P-0-0425, Analog output 2, scalling per 10V full scale** possible. The evaluation factor 1.0 equals the permanent unit. The following permanently defined signals are possible:

Signal number P-0-0424	Output signal	Ref. Unit: scaling factor = 1.0
0x00000001	motor encoder sine signal	0.5V/10V
0x00000002	motor encoder cosine signal	0.5V/10V
0x00000003	Opt. enc. sine signal	0.5V/10V
0x00000004	Opt. enc. sine cosine	0.5V/10V
0x00000005	Position command difference on the pos. controler	rot. =>1000rpm/10V lin. =>100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	absolute DC bus power amount	1kW/10V
0x00000008	effective current	S-0-0110/10V
0x00000009	relative current	S-0-0110/10V
0x0000000a	thermal load	100%/10V no scaling possible
0x0000000b	motor temperature	150°C/10V
0x0000000c	magnetizing current	S-0-0110/10V
0x0000000d	velocity command at the velocity controller	rot. =>1000rpm/10V lin. => 100m/min/10V

Fig. 3-37: Signal select list with predefined signal selection

The outputs are scaling dependent and always relate to the motor shaft given position and velocity data.

2) Byte output

It is possible herewith to output memory cells of the data memory as analog voltage. It can only be practically applied if the data storage structure is known. As this is, however, different from version to version, the the function can only be used by the respective developer. The function is activated by setting bit 28 in **P-0-0424, Analog output 2, expanded signal selection**. The adress of the memory cell is defined in the least significant 24 bit of the expanded signal selection.

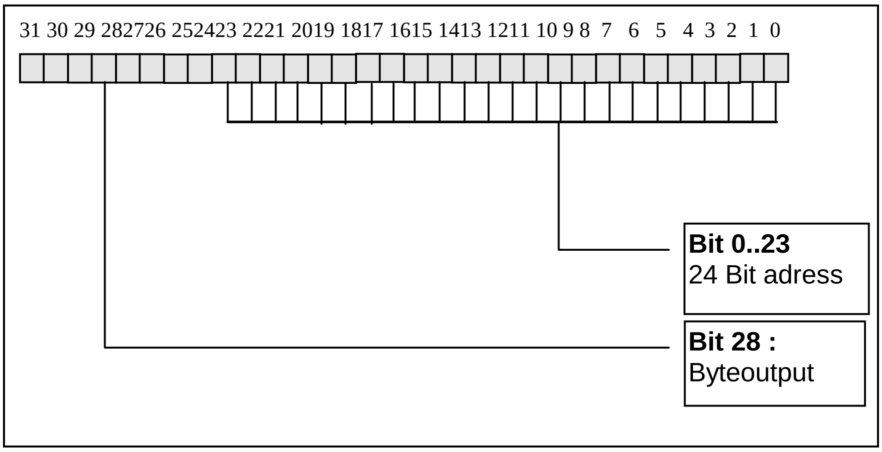


Fig. 3-38: Definition **P-0-0424, Analog output 2, expanded signal selection** with byte output

3) Bit output

Individual bits of the data memory can be shown as analog voltage herewith.If the respective bit is set, then 10V voltage is output at the analog output. A cleared bit outputs -10V. The function is activated by setting bit 29 and inputting the desired memory address in **P-0-0424, Analog output 2, expanded signal selection**.

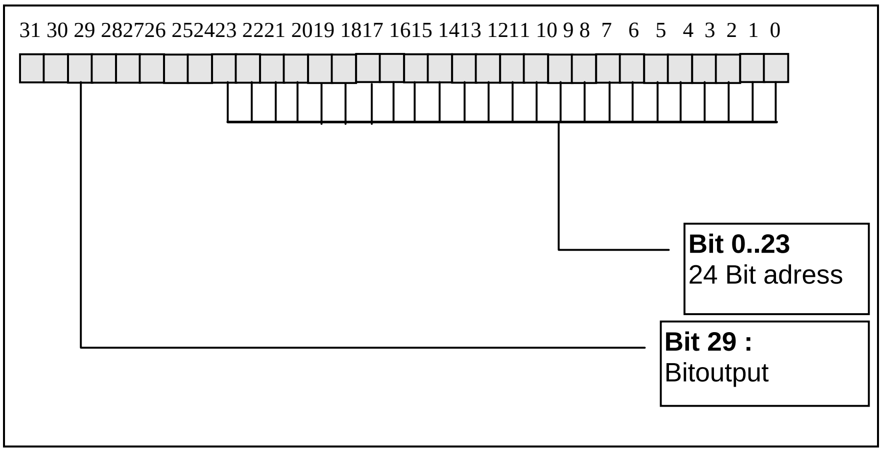


Fig. 3-39: Definition **P-0-0424, Analog output 2, expanded signal selection** with bit output

See also the functional description: "Analog Output".

P-0-0424 - Attributes

Para. Name:	**DE**	Analog-Ausgang 2, erweiterte Signalauswahl		
	EN	Analog output 2, expanded signal selection		
	FR	Sortie analogique 2, sélection de signal élargie		
	ES	Salida analógica 2, selección de señal ampliada		
	IT	Uscita analogica 2, Superamento Scelta		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0425, Analog output 2, scaling per 10V full scale

The resolution of the selected signal can be varied with parameter **P-0-0425, Analog output 2 scaling per 10V full scale**. If an ID no. is assigned via **P-0-0423, Analog output 2, signal selection**, the evalution is assigned the same unit as the parameter with the assigned ID number.

The output of pre-defined signals means that the scaling has a decimal factor of 4 decimal places. It has a permanent reference with fixed unit.

The scaling defines the least significant bit for bit and byte outputs. The input is decimal without decimal places.

See also the functional description: "Analog Output".

P-0-0425 - Attributes

Para. Name:	**DE**	Analog-Ausgang 2, Bewertung [1/10V]		
	EN	Analog output 2, scaling per 10V full scale		
	FR	Sortie analogique 2, calibrage [1/10V]		
	ES	Salida analógica 2, calibrado [1/10V]		
	IT	Uscita analogica 2, Scala per 10V fondo scala		
Function:		Parameter	**Editability:**	P234
Data length:			**Memory:**	Param. EE
Format:		P-0-0420/P-0-0421	**Validity check:**	no
Unit:		P-0-0420/P-0-0421	**Extrem value check:**	no
Decimal places:		P-0-0420/P-0-0421	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0426, Analog outputs, IDN list of assignable parameters

The parameter **P-0-0426, Analog outputs, IDN list of assignable parameters** contains a list of all parameters assignable via **P-0-0420, Analog output 1 signal selection** and **P-0-0423, Analog output 2, signal selection**.

See also the functional description: "Analog Output".

P-0-0426 - Attributes

Para. Name:	**DE**	Analog-Ausgabe, IDN-Liste der zuweisbaren Parameter		
	EN	Analog outputs, IDN list of assignable parameters		
	FR	Sorties analog., liste des paramètres pouvant être assignés		
	ES	Salida analógica, lista IDN de los números ID asignables		
	IT	Uscite analogiche, Lista IDN dei Parametri assignabili		
Function:		Parameter	**Editability:**	no
Data length:		2Byte var.	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		---	**Cyc. transmittable:**	no

P-0-0502, Encoder emulation, resolution

If the actual position value output is selected for incremental encoder emulation, then the line count of the incremental encoder must be set.

See also functional description: "Encoder Emulation"

P-0-0502 - Attributes

Para. Name:	**DE**	Geber-Emulation Auflösung		
	EN	Encoder emulation, resolution		
	FR	Emulation codeur, résolution		
	ES	Emulación de encoder, resolución		
	IT	Emulazione Encoder, Risoluzione		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Cycles/Rev	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65536		
Default value:		12	**Cyc. transmittable:**	no

P-0-0503, Marker pulse offset

With this parameter, the position of the reference pulse of the emulated incremental encoder output can be shifted within one turn.

See also functional description: "Encoder Emulation"

P-0-0503 - Attributes

Para. Name:	**DE**	Referenzimpuls-Offset		
	EN	Marker pulse offset		
	FR	Décalage du top 0 pour emul. codeur incr.		
	ES	Desviación impulso de referencia		
	IT	Offset Impulso di Zero		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Deg	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / 359.9999		
Default value:		0	**Cyc. transmittable:**	no

P-0-0508, Commutation offset

For synchronous motors, this parameter indicates the offset between the raw value of the motor encoder and the resulting absolute electrical angle between the stator current vector and the rotor flux vector.

For motors with motor feedback data memory, like MKD, the commutation offset is stored in the feedback and therefore does not need to be entered.

For linear synchronous motors, this value must always be redetermined, if

- the motor probe system encounters a change in its mechanical structure,
- A mechanical restructuring of primary and secondary portions takes place.

See also the functional description: "Synchronous-Asynchronous".

P-0-0508 - Attributes

Para. Name:	**DE**	Kommutierungs-Offset		
	EN	Commutation offset		
	FR	Offset de commutation		
	ES	Offset de conmutación		
	IT	Offset di Commutazione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

P-0-0510, Moment of inertia of the rotor

This parameter indicates the moment of inertia of the rotor without load. For motors with feedback memory (e.g. MKD), it is saved in the feedback.

See also the functional description: "Motor Feedback-Data Memory".

P-0-0510 - Attributes

Para. Name:	**DE**	Rotor-Trägheitsmoment		
	EN	Moment of inertia of the rotor		
	FR	Couple d'inertie du rotor		
	ES	Par de inercia de rotor		
	IT	Coppia di Inerzia del Rotore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		kgm^2	**Extrem value check:**	no
Decimal places:		5	**Combination check:**	no
Input min/max:		1 / 10000000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0511, Brake current

This parameter shows, how much current the brake in the connected motor needs.

P-0-0511 - Attributes

Para. Name:	**DE**	Haltebremsenstrom		
	EN	Brake current		
	FR	Courant frein		
	ES	Corriente de frenado de parada		
	IT	Corrente Freno		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0 / 500000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0520, Hardware code

Parameter for identification of the hardware.

The parameter is determined during the manufacturing stage and cannot be changed.

P-0-0520 - Attributes

Para. Name:	**DE**	Hardware-Kennung		
	EN	Hardware code		
	FR	Code hardware		
	ES	Numero de hardware		
	IT	Numero Hardware		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst.-E²prom
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-0523, Commutation, probe value

If the commutation offset for linear synchronous motors is to be set with the **P-0-0524, Commutation adjustment command**, then the setting probe value should be entered in the **P-0-0523, Commutation, probe value** parameter.

See also the functional description: "Determining the commutation offset".

P-0-0523 - Attributes

Para. Name:	**DE**	Kommutierungseinstellung Messwert		
	EN	Commutation, probe value		
	FR	Mesure reglage de commutation		
	ES	Ajuste de conmutación, valor de medición		
	IT	Commutazione, Valore di Probe		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		---	**Cyc. transmittable:**	no

P-0-0524, D300 Commutation adjustment command

For synchronous kit motors and linear motors it is necessary to adjust for the commutation during the initial setup. The appropriate command can be started under following **conditions**:

- Operation mode = Torque Control
- Command Torque = 0
- Drive Enable = 1

After starting the command, the drive moves by itself a short distance forward and backward, thereby determining the commutation offset.

The command is cancelled by dropping the drive enable to 0.

For other synchronous motors with intrinsic feedback, e.g. MKD, the commutation offset is determined at the INDRAMAT works, and the customer cannot execute the command any more.

See also the functional description: "Determining the commutation offset".

P-0-0524 - Attributes

Para. Name:	**DE**	D300 Kommutierungseinstellung Kommando		
	EN	D300 Commutation adjustment command		
	FR	D300 Commande reglage de commutation		
	ES	D300 Comando ajuste de conmutación		
	IT	D300 Commutazione - Comando		
Function:		Command	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0525, Type of motor brake

This parameter specifies whether an electrically released or electrically engaged brake is being used. If an **MHD** or **MDK** motor is used, then the brake will be electrically released, if there is one. The bit 0 will be set automatically to 0. If other motor types are used, this bit must be entered during the startup procedure.

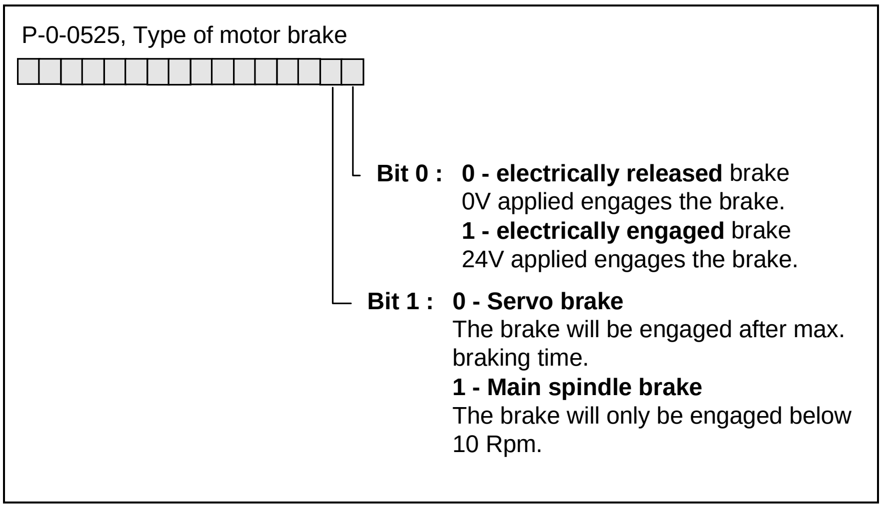


Fig. 3-40: Setting the type of motor brake

See also the functional description: "Motor Holding Brake".

P-0-0525 - Attributes

Para. Name:	**DE**	Haltebremsentyp		
	EN	Type of motor brake		
	FR	Type de frein		
	ES	Tipo de freno de motor		
	IT	Tipo di Freno		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		0	**Cyc. transmittable:**	no

P-0-0526, Brake control delay

If a holding brake is being used, the time delay between the start of the brake and when it becomes effective must be set in this parameter. This value is entered automatically when MHD, MKD or MKE motors are used. If Indramat brakes are used in conjunction with asynchronous motors, then the standard value to be entered is 100 ms.

See also the functional description: "Motor Holding Brake".

P-0-0526 - Attributes

Para. Name:	**DE**	Haltebremsen-Verzugszeit		
	EN	Brake control delay		
	FR	Délai frein		
	ES	Retardo de freno		
	IT	Ritardo Freno		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 100000		
Default value:		100	**Cyc. transmittable:**	no

P-0-0530, Slip increase

In an asynchronous motor, the rotor resistance and consequently the rotor time constant changes with the temperature. The slip increase compensates for this change.

The slip increase per 100K(elvin) is motor-specific and is specified by Indramat for each individual motor.

See also the functional description: "Asynchronous Motors".

P-0-0530 - Attributes

Para. Name:	**DE**	Schlupfanhebung		
	EN	Slip increase		
	FR	Accroissement de glissement par température		
	ES	Aumento de deslizamiento		
	IT	Incremento Slip		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		1/100K	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		100 / 300		
Default value:		150	**Cyc. transmittable:**	no

P-0-0531, Stall current limit

The stall current limit is used to limit the peak current of the motor to reasonable values when operating at high velocities. Higher currents lead only to higher losses, not to more wave power.

This limit value is set by Indramat. If 0 is entered, the limit is inactive.

See also the functional description: "Asynchronous Motors".

P-0-0531 - Attributes

Para. Name:	**DE**	Kippstromgrenze		
	EN	Stall current limit		
	FR	Limite du courant bascule		
	ES	Limite de corriente de volcado		
	IT	Limite di Corrente di Inversione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A/Vmin	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

P-0-0532, Premagnetization factor

The pre-magnetization factor is used for application-dependent decreases in the Servo magnetization current. Together with parameter **P-0-4004, Magnetizing current**, it specifies the motor's magnetization current.

Effective magnetization current =

magnetization current • pre-magnetization scaling factor

With a pre-magnetizing factor of 100%, the Servo magnetization current in the motor will flow so that a torque proportional to the momentum-producing current will result in the basic rotation range.

See also the functional description: "Scaling Factor Pre-Magnetizing".

P-0-0532 - Attributes

Para. Name:	**DE** Vormagnetisierungsfaktor		
	EN Premagnetization factor		
	FR Facteur de pré-magnétisation		
	ES Factor de magnetización previa		
	IT Fattore di Premagnetizzazione		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	%	**Extrem value check:**	yes
Decimal places:	0	**Combination check:**	no
Input min/max:	25 / 100		
Default value:	100	**Cyc. transmittable:**	no

P-0-0533, Flux loop prop. gain

The flux loop controls the magnetization current in the field-weakening range. The parameter value is set by Indramat.

See also the functional description: "Asynchronous Motors".

P-0-0533 - Attributes

Para. Name:	**DE** Feldregler Prop.verst.		
	EN Flux loop prop. gain		
	FR Gain prop. de l'asservissement de flux		
	ES Regulador de campo amplificación proporcional		
	IT Guadagno prop. Anello di Flusso		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	A/V	**Extrem value check:**	yes
Decimal places:	3	**Combination check:**	no
Input min/max:	100 / 65535		
Default value:	500	**Cyc. transmittable:**	no

P-0-0534, Flux loop integral action time

The flux loop controls the magnetization current in the field-weakening range. The parameter value is set by Indramat.

See also the functional description: "Asynchronous Motors".

P-0-0534 - Attributes

Para. Name:	**DE** Feldregler Nachstellzeit		
	EN Flux loop integral action time		
	FR Part intégrale de l'asservissement de flux		
	ES Regulador de campo tiempo de reajuste		
	IT Tempo Integrazione Anello di Flusso		
Function:	Parameter	**Editability:**	P234
Data length:	2Byte	**Memory:**	Param. EE
Format:	DEC_OV	**Validity check:**	Phase3
Unit:	ms	**Extrem value check:**	yes
Decimal places:	1	**Combination check:**	no
Input min/max:	0 / 65535		
Default value:	6000	**Cyc. transmittable:**	no

P-0-0535, Motor voltage at no load

The motor voltage in the field-weakening range is set so that it reaches a value lower than or equal to the DC bus voltage.

Under load, the motor voltage will be raised to the maximum motor voltage.

See also the functional description: "Asynchronous Motors".

P-0-0535 - Attributes

Para. Name:	**DE**	Motorleerlaufspannung		
	EN	Motor voltage at no load		
	FR	Tension moteur á vide		
	ES	Tension de marcha en vacio de motor		
	IT	No Carico Tensione Motore		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%Uzwk	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		500 / 1000		
Default value:		800	**Cyc. transmittable:**	no

P-0-0536, Motor voltage max.

The motor voltage in the field-weakening range is set so that it reaches a value lower than or equal to the DC bus voltage.

At full load, the motor voltage will rise to the maximum motor voltage. The output voltage will be sinusoidal up to a value of 90% .

See also the functional description: "Asynchronous Motors".

P-0-0536 - Attributes

Para. Name:	**DE**	Motormaximalspannung		
	EN	Motor voltage max.		
	FR	Tension max. moteur		
	ES	Tensión máxima de motor		
	IT	Tensione Motore massima		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%Uzwk	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		500 / 1000		
Default value:		900	**Cyc. transmittable:**	no

P-0-0538, Motor function parameter 1

Bit 8 = 1 means velocity loop monitor switched off.

WARNING

Attention, danger for life! Danger of runaway axis!

If you switch off the velocity loop monitor, the drive does not survey any more whether the axis follows the velocity command values. E.g. with wrong parameters it can happen that the axis moves inadvertently.

See also the functional description: "Setting the Velocity Controller".

P-0-0538 - Attributes

Para. Name:	**DE**	Motorfunktionsparameter 1		
	EN	Motor function parameter 1		
	FR	Paramètre de fonctions 1 moteur		
	ES	Parámetro de funciones 1 de motor		
	IT	Parametro Funzioni 1 Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		---	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-1201, Ramp 1 pitch

Parameter **P-0-1201, Ramp 1 pitch**, takes effect in "Velocity control" operating mode and during the error response "Velocity command value zero-switch with pitch and filter".

The acceleration and delay entered here are used to create a pitch starting from the last effective command value to the new command value.

In the Velocity control operating mode, the resulting velocity command value is derived from the sum of the value resulting from the pitch function in **S-0-0036, Velocity command value** and the direct value in **S-0-0037, Additive velocity command value**.

During the error response "Velocity command value, zero-switch with pitch and filter", velocity proceeds from the current feedback velocity to 0, using the effective velocity command value with the delay specified by the parameter in **P-0-1201, Ramp 1 pitch**.

With the value in the parameter **P-0-1201, Ramp 1 pitch** = 0, the ramp is not active.

See also the functional description: "Velocity command value to zero with filter and ramp".

P-0-1201 - Attributes

Para. Name:	**DE**	Steigung Rampe 1		
	EN	Ramp 1 pitch		
	FR	Montée Rampe 1		
	ES	Rampa de velocidad 1		
	IT	Velocità Rampa 1		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

P-0-1202, Final speed of ramp 1

At the speed in the parameter **P-0-1202 Final speed of ramp1**, the slope of the drive internal speed command ramp changes from **Ramp 1 pitch (P- 0-1201)** to **Ramp 2 pitch (P-0-1203)**.

See also the functional description: "Velocity command value to zero with filter and ramp".

P-0-1202 - Attributes

Para. Name:	**DE**	Endgeschwindigkeit Rampe 1		
	EN	Final speed of ramp 1		
	FR	Rampe 1, vitesse finale		
	ES	Velocidad final rampa 1		
	IT	Velocità di Transizione Rampa 1		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		0	**Cyc. transmittable:**	no

P-0-1203, Ramp 2 pitch

Parameter **P-0-1203, Ramp 2 pitch**, takes effect in "Velocity control" operating mode and during the error response "Velocity command value zero-switch with pitch and filter".

The acceleration and deceleration entered here are used to create a pitch starting from the last effective command value to the new command value, as long as the speed at the ramp output is higher than the value in the parameter **P-0-1202, Final speed of ramp 1**.

In the Velocity control operating mode, the resulting velocity command value is derived from the sum of the value resulting from the pitch function in **S-0-0036, Velocity command value** and the direct value in **S-0-0037, Additive velocity command value**.

During the error response "Velocity command value, zero-switch with pitch and filter", velocity proceeds from the current feedback velocity to 0, using the effective velocity command value with the delay specified by the parameter in **P-0-1203, Ramp 2 pitch**.

With the value in the parameter **P-0-1201, Ramp 1 pitch** = 0, the ramp is not active.

See also the functional description: "Velocity command value to zero with filter and ramp".

P-0-1203 - Attributes

Para. Name:	**DE**	Steigung Rampe 2		
	EN	Ramp 2 pitch		
	FR	Montée Rampe 2		
	ES	Rampa de velocidad 2		
	IT	Velocità Rampa 2		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

P-0-1222, Velocity command filter

Parameter **P-0-1222, Velocity command filter** works in the Velocity control operating mode and during the error response "Velocity command value zero-switch with slope and filter."

The time constant entered here is used in velocity control operating mode to pass the value in **S-0-0036, Velocity command value** which has been pitched by **P-0-1201, Ramp 1 pitch**, through a deep-pass filter. This serves to diminish surges in acceleration over the course of command values.

The resulting velocity command value results from the sum of the sloped and filtered value in **S-0-0036, Velocity command value** and the direct value in **S-0-0037, Additive velocity command value**.

When error response "Velocity command value, zero-switch with pitch and filter" is executed, velocity proceeds from the current feedback velocity to 0, using the effective velocity command value with the delay specified by the parameter in **P-0-1201, Ramp 1 pitch**. It is also passes through the deep pass filter specified by **P-0-1222, Velocity command filter**.

See also the functional description: "Velocity command value to zero with filter and ramp".

P-0-1222 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Sollwert-Filter		
	EN	Velocity command filter		
	FR	Filtrage de consigne vitesse		
	ES	Filtro para valor nominal de velocidad		
	IT	Filtro su Velocità comandata		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 32767		
Default value:		0	**Cyc. transmittable:**	no

P-0-4000, Current-zero-trim phase U

This parameter serves to display the determined result of the zero-trim procedure for the current feedback sensor of phase U.

P-0-4000 - Attributes

Para. Name:	**DE**	Strommess-Nullabgleich Phase U		
	EN	Current-zero-trim phase U		
	FR	Reglage courant nul phase U		
	ES	Compensación cero de medición de corriente fase U		
	IT	Regolazione Corrente 0 Fase U		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		%	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 10000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4001, Current-zero-trim phase V

This parameter serves to display the determined result of the zero-trim procedure for the current feedback sensor of phase V.

P-0-4001 - Attributes

Para. Name:	**DE**	Strommess-Nullabgleich Phase V		
	EN	Current-zero-trim phase V		
	FR	Reglage courant nul phase V		
	ES	Compensación cero de medición de corriente fase V		
	IT	Regolazione Corrente 0 Fase V		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		%	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 10000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4002, Current-amplify-trim phase U

For trimming of the current sensor regarding its gain error, this parameter is determined in the test area for the Indramat drive controllers.

P-0-4002 - Attributes

Para. Name:	**DE**	Strommess-Verst.abgleich Phase U		
	EN	Current-amplify-trim phase U		
	FR	Reglage amplification courant phase U		
	ES	Compensación de amplif. de medición de corriente fase U		
	IT	Regolaz. Aplif. Corrente Fase U		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-0-4003, Current-amplify-trim phase V

For trimming of the current sensor regarding its gain error, this parameter is determined in the test area for the Indramat drive controllers.

P-0-4003 - Attributes

Para. Name:	**DE**	Strommess-Verst.abgleich Phase V		
	EN	Current-amplify-trim phase V		
	FR	Reglage amplification courant phase V		
	ES	Compensación de amplif. de medición de corriente fase V		
	IT	Regolaz. Amplif. Corrente Fase V		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-0-4004, Magnetizing current

This parameter indicates the nominal or servo-magnetization current set by Indramat **for asynchronous motors**. The magnetizing current actually flowing is also dependent on the premagnetization scaling factor.

For synchronous motors, e.g. MKD, this parameter is automatically set to 0.

See also the functional description: "Asynchronous Motors".

P-0-4004 - Attributes

Para. Name:	**DE**	Magnetisierungsstrom		
	EN	Magnetizing current		
	FR	Courant de magnétisation		
	ES	Corriente de magnetización		
	IT	Corrente di Magnetizzazione		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / S-0-0110		
Default value:		7500	**Cyc. transmittable:**	no

P-0-4006, Process block target position

List of the target positions for the block operated function (positioning interface). You can input a maximum of 64 position values, whereby the first elemet specifies the target position of the process block 0, the second position specifies the target position of the process block 1, and so on.

The number of the target positions must always be greater or equal to the number of the operational process blocks. If a process block is selected for which there is no target position, then the warning „non-programmed process block" will be given.

See also the function description: "Positioning Block Mode".

P-0-4006 - Attributes

Para. Name:	**DE**	Positioniersatz Zielposition		
	EN	Process block target position		
	FR	Bloc de déplacement, Position à atteindre		
	ES	Bloque de posicionamiento, posición objeto		
	IT	Blocco Posizionamento, Posizione da raggiungere		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte var.	**Memory:**	Prog.-Modul
Format:		DEC_MV	**Validity check:**	P3-4
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		Defaultliste	**Cyc. transmittable:**	no

P-0-4007, Process block velocity

List of the process block velocities for the block operated function (positioning interface). You can input a maximum of 64 velocities, whereby the first element specifies the maximum velocity of the process block 0, the second element specifies the maximum velocity of the process block 1, and so on.

The number of the process block velocities must always be greater or equal to the number of operational process blocks. If a process block is selected of which there is no process block velocity, then the warning "non-programmed process block" will be given.

See also the function description: "Positioning Block Mode".

P-0-4007 - Attributes

Para. Name:	**DE**	Positioniersatz Geschwindigkeit		
	EN	Process block velocity		
	FR	Bloc de déplacement, Vitesse		
	ES	Bloque de posicionamiento, velocidad		
	IT	Blocco Posizionamento, Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte var.	**Memory:**	Prog.-Modul
Format:		DEC_MV	**Validity check:**	P3-4
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		Defaultliste	**Cyc. transmittable:**	no

P-0-4008, Process block acceleration

List of the accelerations for the block operated function (positioning interface). You can input a maximum of 64 acceleration values, whereby the first element specifies the maximum acceleration of the process block 0, the second element specifies the maximum acceleration of the process block 1, and so on.

The number of acceleration values must always be greater or equal to the number of operation process blocks. If a process block is selected of which there is no acceleration, then the warning „unprogrammed Process block" will be given.

See also the function description: "Positioning Block Mode".

P-0-4008 - Attributes

Para. Name:	**DE**	Positioniersatz Beschleunigung		
	EN	Process block acceleration		
	FR	Bloc de déplacement, Accélération		
	ES	Bloque de posicionamiento, aceleración		
	IT	Blocco Posizionamento, Accellerazione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte var.	**Memory:**	Prog.-Modul
Format:		DEC_MV	**Validity check:**	P3-4
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		S-0-0160 / S-0-0160		
Default value:		Defaultliste	**Cyc. transmittable:**	no

P-0-4009, Process block jerk

List of the jerk limit values for the block operated function (positioning interface). You can input a maximum of 64 jerk limit values, whereby the first element specifies the jerk limit value of the process block 0, the second element specifies the jerk value of the process block 1, and so on.

The number of the jerk limit values must be greater or equal to the number of operation process blocks. If a process block is selected of which there is no jerk value, then the warning „non-programmed process block" will be given.

With an input of **0**, the jerk limit can be turned **off**.

See also the function description: "Positioning Block Mode".

P-0-4009 - Attributes

Para. Name:	**DE**	Positioniersatz Ruck		
	EN	Process block jerk		
	FR	Bloc de déplacement, Jerk		
	ES	Bloque de posicionamiento, sacudida		
	IT	Blocco Posizionamento, Jerk		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte var.	**Memory:**	Prog.-Modul
Format:		DEC_MV	**Validity check:**	P3-4
Unit:		S-0-0160	**Extrem value check:**	no
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		- / -		
Default value:		Defaultliste	**Cyc. transmittable:**	no

P-0-4010, Load inertia

The load moment of inertia determined with the automatic control loop setting is entered in this parameter, without **P-0-0510, rotor moment of inertia.** This is important when optimizing the speed control loop. The inertia relates to the motor and is **rotary** in nature.

See also functional description:"Automatic Control Loop Settings"

P-0-4010 - Attributes

Para. Name:	**DE**	Last-Trägheitsmoment		
	EN	Load inertia		
	FR	Couple d'inertie de la charge		
	ES	Par de inercia de carga		
	IT	Inerzia Carico		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		kgm^2	**Extrem value check:**	yes
Decimal places:		5	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4011, Switching frequency

This parameter is used to set the switching frequency of the pulse with modulation controller to **4 kHz or 8 kHz**.

See also the functional description: "Setting the Active Continuous Current".

P-0-4011 - Attributes

Para. Name:	**DE**	Schaltfrequenz		
	EN	Switching frequency		
	FR	Fréquence de coupure		
	ES	Frecuencia de conexión		
	IT	Frequenza di Commutazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		kHz	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	yes
Input min/max:		4 / 8		
Default value:		4	**Cyc. transmittable:**	no

P-0-4012, Slip factor

The slip factor is the most important parameter for asynchronous motors. It indicates the rotor frequency in relation to the torque-producing current. The lower the rotor time constant is, the higher the slip factor.

This parameter is set motor-specifically by Indramat.

See also the functional description: "Asynchronous Motors".

P-0-4012 - Attributes

Para. Name:	**DE**	Schlupffaktor		
	EN	Slip factor		
	FR	Facteur de glissement		
	ES	Factor de deslizamiento		
	IT	Fattore di Slip		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Hz/100A	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		1 / 50000		
Default value:		600	**Cyc. transmittable:**	no

P-0-4014, Motor type

The motor type can be selected with this parameter. The following motor types are supported:

- 1: MHD
- 2: 2AD / 1MB with NTC sensor
- 3: LSF
- 4: LAR / LAF
- 5: MKD / MKE
- 6: 2AD /1MB with PTC sensor
- 7: synchronous kit motor

See also the functional description: "Setting of the Motor Type through P-0-4014, Motor Type".

P-0-4014 - Attributes

Para. Name:	**DE**	Motorart		
	EN	Motor type		
	FR	Type de moteur		
	ES	Tipo de motor		
	IT	Tipo Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 7		
Default value:		1	**Cyc. transmittable:**	no

P-0-4015, Intermediate DC bus voltage

The intermediate voltage of the DC bus is stored in the amplifier as a parameter.

The parameter cannot be edited and is only for display and for internal calculations (PWM).

P-0-4015 - Attributes

Para. Name:	**DE**	Zwischenkreisspannung		
	EN	Intermediate DC bus voltage		
	FR	Tension du circuit intermédiaire CD		
	ES	Tensión de circuito intermedio		
	IT	Tensione sul Bus DC		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		V	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4019, Process block mode

Setup of the process block mode („relative process block", „absolute process block", „movement in positive direction" or „movement in negative direction") for each separate process block.The first element of this list specifies the mode of the process block 0, the second specifies the mode of the process block 1, and so on.

process block mode	**Setup value**
Absolute process block	**1** h
relative process block without res. path storage	**2** h
relative process block with res. path storage	102 h
Movement in positive direction	4 h
Movement in negative direction	8 h
following block at target position without halt (mode 1)	10 h
following block at target position without halt (mode 2)	20 h
following block at target position with halt	40 h
following block with transition at switching signal	80 h

Fig. 3-1: Selectable process block modes

The number of process block modes must always be greater or equal to the number of operation process blocks. If a process block is selected of which there is no process mode, then the warning „non-programmed process block" will be given.

see also functional description:"Positioning Block Mode"

P-0-4019 - Attributes

Para. Name:	**DE**	Positioniersatz Modus		
	EN	Process block mode		
	FR	Bloc de déplacement, Mode		
	ES	Bloque de posicionamiento, Modo		
	IT	Blocco Posizionamento, Modo		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte var.	**Memory:**	Prog.-Modul
Format:		HEX	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	-
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		Defaultliste	**Cyc. transmittable:**	no

P-0-4020, Encoder emulation type

Setup, whether **incremental or absolute** feedback position output should be done.

Choose the source of the emulating signal.

The following table shows the possible combinations:

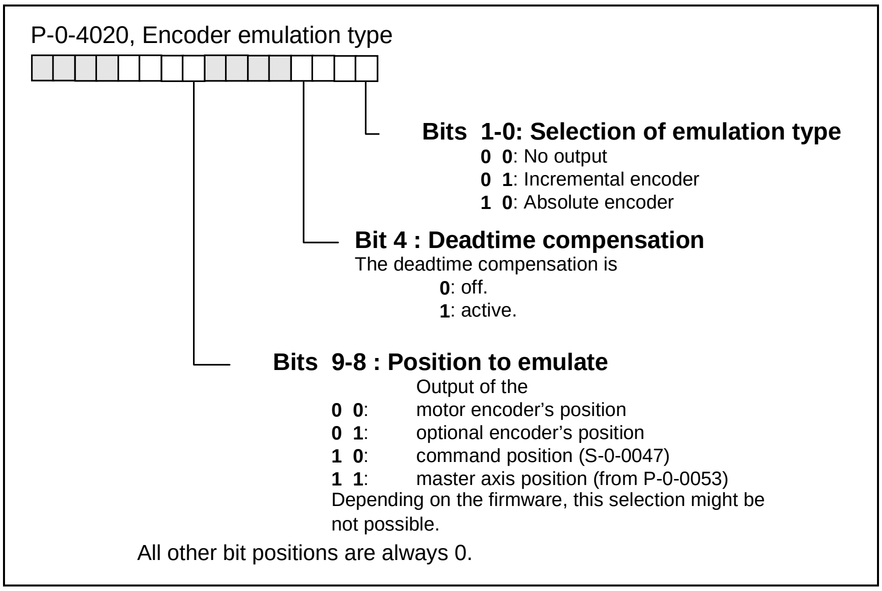


Fig. 3-41: Parameter P-0-4020, Encoder Emulation Type

See also the functional description:"Encoder Emulation".

P-0-4020 - Attributes

Para. Name:	**DE**	Geberemulationsart		
	EN	Encoder emulation type		
	FR	Type d'émulation codeur		
	ES	Tipo de emulación de encoder		
	IT	Tipo di Emulazione Encoder		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	-
Input min/max:		0 / 5		
Default value:		0	**Cyc. transmittable:**	no

P-0-4021, Baud rate RS-232/485

Various baud rates (transmission speeds) can be set for communications via the serial interfaces.

Baud rate [Baud]	Setting in parameter P-0-4021
9600	0
19200	1

Fig. 3-42: Settable baud rates

Note: If you connect another slave to an already running bus with SIS protocol, an automatic baud rate recognition is activated. Therefore, the setting with Parameter P-0-4021 is no more necessary.

ATTENTION

⇒ All participants on the bus must be set to the same baud rate.

Note: Do not change the baud rate in the list of all parameters in DriveTop. Doing so would lock out all further communications in DriveTop versions < 3.

See also Supplement C: "Serial communications".

P-0-4021 - Attributes

Para. Name:	**DE**	Baud-Rate RS-232/485		
	EN	Baud rate RS-232/485		
	FR	Baud-Rate RS-232/485		
	ES	Frecuencia de baudios RS-232/485		
	IT	Baud Rate RS-232/485		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 3		
Default value:		0	**Cyc. transmittable:**	no

P-0-4022, Drive address

When communicating via RS485-interface with more than one drive, every drive must have a different address, so that only the addressed drive responds.

Addresses can be set from 0 to 99.

In a terminal program, the selection of the drive with the desired address is done through BCD: *Drive_Address*.

Note: If you enter the into the communication parameter P-0-4022 the value 256, it's the address switches which determine the device address for the serial communication and not the value 256.

When using the RS-232 interface (point-to-point connection), an explicit setting of the drive address is not necessary, because in this case only one drive can be connected.

ATTENTION

If you set the **address via the serial interface** instead of the switches, **only one drive** may be connected at a time.

Only as soon as the addresses are set, you can connect the entire bus.

See also Supplement C: "Serial communications".

P-0-4022 - Attributes

Para. Name:	**DE**	Antriebsadresse		
	EN	Drive address		
	FR	Adresse entraînement		
	ES	Dirección de accionamiento		
	IT	Indirizzo Azionamento		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 256		
Default value:		256	**Cyc. transmittable:**	no

P-0-4023, C400 Communication phase 2 transition

Switching command **from drive mode** or from phase 3 (P3) **to parameter mode**, Phase 2 (P2).

The command can only be processed when the **drive enable** is **off**.

See also the functional description: "Parametrization Mode - Operating Mode".

P-0-4023 - Attributes

Para. Name:	**DE**	C400 Umschaltung auf Komm.-Phase 2		
	EN	C400 Communication phase 2 transition		
	FR	C400 Passage en phase 2		
	ES	C400 Conmutación a fase 2		
	IT	C400 Comando Selezione Modo Parametri		
Function:		Command	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-4024, Test status

Gives information about the product advancement in the factory.

P-0-4024 - Attributes

Para. Name:	**DE**	Prüfstatus		
	EN	Test status		
	FR	Etat de test		
	ES	Estado de prueba		
	IT	Stato Test		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst.-E²prom
Format:		HEX	**Validity check:**	nicht
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4026, Process block selection

With this parameter, you can read during "drive stop", which process block is selected with the input signals Pos1 to Pos5. During the motion (display AF), you can read here the number of the process block currently being processed. If bit 5 is set in parameter **P-0-4027, function parameter,** then the process block can be pre-selected in this parameter via the serial interface.

See also the functional description: "Positioning Block Mode".

P-0-4026 - Attributes

Para. Name:	**DE**	Positioniersatz Auswahl		
	EN	Process block selection		
	FR	Sélection du bloc de déplacement		
	ES	Selección de bloque de posicionamiento		
	IT	Selezione Blocco Posizionamento		
Function:		Parameter	**Editability:**	ja
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 63		
Default value:		-	**Cyc. transmittable:**	MDT

P-0-4030, Jog velocity

Limit value for the velocity during movement via the jog input. The value must be smaller than that in parameter **S-0-0091, Bipolar Velocity Limit** value.

The velocity of the motion will also be controlled by **S-0-0108, feed rate override** and - during motion with limited velocity - the maximum **Positioning speed (S-0-0259)**.

See also the functional description: "Operating Mode: Jogging".

P-0-4030 - Attributes

Para. Name:	**DE**	Tipp-Geschwindigkeit		
	EN	Jog velocity		
	FR	Vitesse de Jog		
	ES	Velocidad de pulsaciones		
	IT	Velocità Manuale		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Prog.-Modul
Format:		DEC_MV	**Validity check:**	P3-4
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		100000	**Cyc. transmittable:**	no

P-0-4033, Stepper motor resolution

The number of steps required to go one mechanical revolution of the motor with the **stepper motor interface**.

See also the functional description: "Operating Mode: Stepper motor Operations"

P-0-4033 - Attributes

Para. Name:	**DE**	Schrittmotor-Auflösung		
	EN	Stepper motor resolution		
	FR	Moteur pas à pas, résolution		
	ES	Motor de pasos, resolución		
	IT	Motore Passo-Passo, Risoluzione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		Incr/rev	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		16 / 65536		
Default value:		-	**Cyc. transmittable:**	no

P-0-4034, Stepper motor interface mode

Setup of the mode of the stepper motor control signals.

Stepper motor signals	Setting
Quadrature signals	1
Forward/backward signals	2
Step and direction signals	3

Fig. 3-2: Stepper motor modes

See also the functional description: "Operating Mode: Stepper motor Operations"

P-0-4034 - Attributes

Para. Name:	**DE**	Modus Schrittmotor-Schnittstelle		
	EN	Stepper motor interface mode		
	FR	Mode interface moteur pas à pas		
	ES	Modo interface de motor de pasos		
	IT	Interfaccia Motore Passo-Passo		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	-
Input min/max:		1 / 3		
Default value:		-	**Cyc. transmittable:**	no

P-0-4035, Trim-current

In this parameter, the current value is stored with which the **current measurement** of the drive control is precisely adjusted in the factory. This eliminates systematical errors in the current measurement. The value has no meaning to the user and **cannot be changed.**

P-0-4035 - Attributes

Para. Name:	**DE**	Abgleichstrom		
	EN	Trim-current		
	FR	Courant pour le calibrage		
	ES	Corriente para calibrar		
	IT	Corrente per calibrare		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		1 / 500000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4044, Braking resistor load

With this parameter, you can read the average power dissipated in the braking resistance.

100% means here that the damping resistance is charged with its **continuous rated power**. For a safe operation, the load should be less than 80% . The value is very much smoothened (filtered).

In order to ensure if a processing cycle does not overload the braking resistance, the analog signal „bleeder load" must be considered.

P-0-4044 - Attributes

Para. Name:	**DE**	Bleeder-Auslastung		
	EN	Braking resistor load		
	FR	Résistance de freinage, charge		
	ES	Resistencia de frenado, carga		
	IT	Resistenza di Freno, Carico		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		%	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4045, Active permanent current

This parameter shows how much current the drive can supply in the actual cmbination in continual operation. Multiplying with the **P-0-0051, torque constant** of the motor yields the continual operational torque.

This value is used to display the continuous current that has been set. The device is not overloaded with this current. It is also the current to which the current limit reduces.

This parameter is calculated by the drive control during switching to the operating mode and is not changeable. Determining this limit is influenced by the following **current and torque limitations and settings**:

ID Number	Name	Unit
S-0-0111	Still stand active current motor 1)	A
S-0-0112	Amplifier active current 1	A
P-0-0518	Amplifier nominal current 2	A
S-0-0092	Torque limit bipolar 2)	%
P-0-0006	Overload factor 3)	%

Fig. 3-3: Active duration current, Dependence

1) The standstill active current of the motor is that value of which the percentage specifications pocess: it corresponds to 100%.

2) Shrinks if less than 100%

3) The dependence on the overload factor is not linear. It is observeable in connection with the active current 1 and the nominal current 2.

See also the functional description: "Setting the Active Continuous Current".

P-0-4045 - Attributes

Para. Name: **DE** Wirksamer Dauerstrom
EN Active permanent current
FR Courant permanent actuel
ES Corriente continua activa
IT Corrente continuativa attiva

Function:	Parameter	**Editability:**	no
Data length:	4Byte	**Memory:**	no
Format:	DEC_OV	**Validity check:**	no
Unit:	A	**Extrem value check:**	no
Decimal places:	3	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	no

P-0-4046, Active peak current

This parameter show how much current the drive can supply in the actual combination **momentarily** (0.4 s) of operation. Multiplied with the **P-0-0051, torque constant** of the motor yields the momentary operation torque (i.e. for acceleration operations).

This parameter is calculated by the drive control during switching to the operating mode and is not changeable. Determining this limit is influenced by the following **current and torque limitations and settings**:

ID Number	Name	Unit
S-0-0109	Motor peak current	A
S-0-0110	Amplifier peak current 1	A
P-0-0519	Amplifier peak current 2	A
S-0-0092	Torque limit bipolar	%
P-0-0006	Overload factor 3)	%

Fig. 3-4: Active peak current, dependence

3) The dependence on the overload factor is not linear. It can be seen in connection with peak current 1 and peak current 2.

See also the functional description: "Setting the Active Peak Current".

P-0-4046 - Attributes

Para. Name: **DE** Wirksamer Spitzenstrom
EN Active peak current
FR Courant crête actuel
ES Corriente punta activa
IT Corrente di Picco Attiva

Function:	Parameter	**Editability:**	no
Data length:	4Byte	**Memory:**	no
Format:	DEC_OV	**Validity check:**	no
Unit:	A	**Extrem value check:**	no
Decimal places:	3	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	no

P-0-4047, Motor inductance

Inductance of the motor, measured between two clamps.

The parameter is set at the factory and cannot be changed.

P-0-4047 - Attributes

Para. Name:	**DE**	Motor-Induktivität		
	EN	Motor inductance		
	FR	Inductance moteur		
	ES	Inductividad de motor		
	IT	Induttanza Motore		
Function:		Parameter	**Editability:**	-
Data length:		2Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	-
Unit:		mH	**Extrem value check:**	-
Decimal places:		2	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

P-0-4048, Stator resistance

Stator resistance of the motor, measured between two connection clamps.

The parameter is set at the factory and cannot be changed.

P-0-4048 - Attributes

Para. Name:	**DE**	Motor-Wicklungs-Widerstand		
	EN	Stator resistance		
	FR	Résistance bobine moteur		
	ES	Resistencia de estator		
	IT	Resistenza Statore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedback-E²prom
Format:		DEC_OV	**Validity check:**	-
Unit:		Ohm	**Extrem value check:**	-
Decimal places:		3	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4050, Delay answer RS-232/485

The **RS-485** interface (bus capable) works in **half duplex** mode. The same pair of wires is used for both directions. The transmission direction must be switched during the data exchange. In oder to allow the connected devices (PC or PLC) a sufficient **time to switch between transmitting and receiving** on their side, the answer time of the drive can be set via this parameter.

P-0-4050 defines the minimal **time in milliseconds** that must pass after the last symbol of a telegram is received over the serial interface and before the first symbol of the response may be sent. For RS-232 operation, this parameter is not necessary.

The required response delay time is dependent on the Master/PC used. At shipping, the value for the answer delay is set to a value which satisfies most **PCs**.

Note: If communication problems arise, for example "TIMEOUT" message in *DriveTop*, then set the answer delay gradually to higher values, until the problems are gone. For safety, multiply the found limit value with the factor 1.5 and input it as answer delay.

See also Supplement C: "Serial communications".

P-0-4050 - Attributes

Para. Name:	**DE**	Antwortverzögerung RS-232/485		
	EN	Delay answer RS-232/485		
	FR	Délai de réponse RS-232/485		
	ES	Retardo de respuesta RS-232/485		
	IT	Ritardo su Risposta RS-232/485		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 200		
Default value:		1	**Cyc. transmittable:**	no

P-0-4051, Process block acquittance

This parameter reflects the positioning command selection acquittance. It is also accessible in the hardware signals provided for this purpose.

At **Drive_Start = 0** (Drive Halt) the acquittance displays the preselected positioning command, **inverted** (complement), if controller enable = 1.

At **Drive_Start = 1** acquittance displays the current positioning command, and is **not inverted**, if it was accepted.

See also functional description "Positioning Block Mode".

P-0-4051 - Attributes

Para. Name:	**DE**	Positioniersatz Quittung		
	EN	Process block acquittance		
	FR	Acquittement bloc de déplacement		
	ES	Confirmación de bloque de posicionamiento		
	IT	Riconoscimento Blocco Posizionamento		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	AT

P-0-4052, Positioning block, last accepted

This parameter contains the number of the last accepted positioning process block. This last process block number is also available after switching off and back on as the positioning block selection acquittance, as long as the drive enable has not been given.

See also functional description "Positioning Block Mode".

P-0-4052 - Attributes

Para. Name:	**DE**	Positioniersatz, letzter angenommener		
	EN	Positioning block, last accepted		
	FR	Dernier bloc de déplacement accepté		
	ES	Ultimo bloque de posicionamiento		
	IT	Ultimo Blocco processato		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4053, Intermediate DC bus voltage gain adjust

The **measurement of the DC bus voltage** must be adjusted during the fabrication.

The correction factor found during the adjustment process is stored permanently in the parameter P-0-4053.

P-0-4053 - Attributes

Para. Name:	**DE**	Zwischenkreisspannung Verstärkungsabgleich		
	EN	Intermediate DC bus voltage gain adjust		
	FR	Tension bus, calibrage amplification		
	ES	Tensión del bus, ajuste amplificación		
	IT	Tensione bus DC, Calibrazione Guadagno		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst.-E²prom
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		1 / 20000		
Default value:		-	**Cyc. transmittable:**	no

P-0-4054, Resolver input offset

The signal path for the resolver signals has an offset error. It is measured in the INDRAMAT test field, stored in this parameter and taken into account for the evaluation of the actual position in order not to influence the actual value.

The offset error of the encoder track 1 is stored in the low word, the offset error of the encoder track 2 is stored in the high word.

P-0-4054 - Attributes

Para. Name:	**DE**	Resolvereingang Offset		
	EN	Resolver input offset		
	FR	Entrée resolveur, offset		
	ES	Entrada resolver offset		
	IT	Entrée resolveur, offset		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst.-E²prom
Format:		HEX	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	yes
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4055, Resolver input, amplitude adjust

The signal path for the resolver signals has a gain error. This error deviates the actual position value. The gain error is measured in the test field.

By compensating the gain error, the amplitudes of the resolver signals are matched together.

The value 0x4000H refers to a correction factor of 1.000 .

P-0-4055 - Attributes

Para. Name:	**DE**	Resolvereingang Amplitudenabgleich		
	EN	Resolver input, amplitude adjust		
	FR	Entrée resolveur, compensation d'amplitude		
	ES	Entrada resolver compensación de amplitud		
	IT	Ingresso Resolver, Comp. Guadagno		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst.-E²prom
Format:		HEX	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4056, Jog inputs

This parameter shows the hardware inputs for jogging.

Bit 0 reflects the state of the Jog+ input. 24V at the input means 1 in the bit 0.

Bit 1 reflects the state of the Jog- input. 24V at the input means 1 in the bit 1.

Parameter P-0-4056	Inputs	Effect
00	Jog+ and Jog- = 0V	no Jog direction selected
01	Jog+ = 24V, Jog- = 0V	positive Jog direction selected
10 binary	Jog+ = 0V, Jog- = 24V	negative Jog direction selected
11 binary	Jog+ and Jog- = 24V	not allowed

Fig. 3-43: Meaning of the Jog inputs

See also functional description "Operating Mode: Jogging".

P-0-4056 - Attributes

Para. Name:	**DE**	Tipp-Eingänge		
	EN	Jog inputs		
	FR	Entrées de jog		
	ES	Entradas de pulsaciones		
	IT	Ingressi per Jog manuale		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 3		
Default value:		-	**Cyc. transmittable:**	MDT

P-0-4057, Positioning block, input linked blocks

This parameter shows the hardware inputs for the operation with linked positioning process blocks.

Bit 0 reflects the state of the link block cam 1. 24V at the input means 1 in the bit 0.

Bit 1 reflects the state of the link block cam 2. 24V at the input means 1 in the bit 1.

Parameter P-0-4056	Bedeutung
0000000000000000	link block cam 1 and link block cam 2 = 0V
0000000000000001	link block cam 1 = 24V link block cam 2 = 0V
0000000000000010	link block cam 1 = 0V link block cam 2 = 24V
0000000000000011	link block cam 1 = 24V link block cam 2 = 24V

Fig. 3-44: Meaning of the Input for linked blocks

see also functional description:"Positioning Block Mode"

P-0-4057 - Attributes

Para. Name:	**DE**	Positioniersatz Folge-Eingänge		
	EN	Positioning block, input linked blocks		
	FR	Entrées pour blocs de déplacement enchaînés		
	ES	Bloques de posicionam., entradas para bloques secuenciales		
	IT	Blocchi di Posiz., Entrati per Blocchi concatenati		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4058, Amplifier type data

In order to be ble to determined amplifier load the firmware must know the physical features of the amplifier.

Characteristics:

- transient thermal resistance
- continuous amplifier load
- thermal capacity

P-0-4058 - Attributes

Para. Name:	**DE**	Verstärker-Kenndaten		
	EN	Amplifier type data		
	FR	Données du type d'ampli		
	ES	Datos del tipo de amplificador		
	IT	Dati per Tipo di Drive		
Function:		Parameter	**Editability:**	Passw.
Data length:		4Byte var.	**Memory:**	Verst.-E²prom
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4059, Braking resistor data

To make the evaluation of the braking resistor (bleeder) load possibel, the firmware must know the physical properties of the braking resistor.

Technical data:

- Braking resistor peak power
- Braking resistor continuous power
- Max. allowed energy pulse, assuming that the pulse duration is so short, that no energy can be cooled down.

P-0-4059 - Attributes

Para. Name:	**DE**	Bleeder Kenndaten		
	EN	Braking resistor data		
	FR	Résistance de freinage, dates		
	ES	Resistencia de frenado, datos		
	IT	Resistenza di Freno, Dati		
Function:		Parameter	**Editability:**	Passw.
Data length:		4Byte var.	**Memory:**	Verst.-E²prom
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		-	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4060, Process block control word

This parameter contains relevant settings for the operation mode with process blocks. The parameter has the following structure :

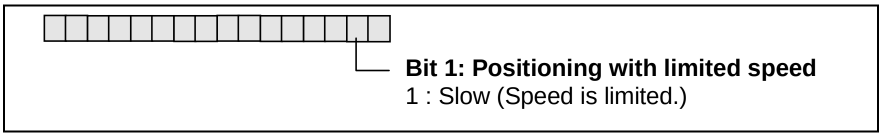


Fig. 3-45: Structure P-0-4060, Process block control word

See also the functional description:"Positioning Block Mode".

P-0-4060 - Attributes

Para. Name:	**DE**	Positioniersatz Steuerwort		
	EN	Process block control word		
	FR	Blocs de déplacement, mot de contrôle		
	ES	Bloque de posicionamiento, palabra de mando		
	IT	Blocco Posizionamento, Controllo		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Prog.-Modul
Format:		BIN	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		0 / 3		
Default value:		1	**Cyc. transmittable:**	no

P-0-4061, Mains voltage gain adjust

Using this parameter, the command communications (SERCOS, Profibus, ..) informs the drive about important control information on handling communication phase transitions as well as when releasing hardware inputs for -the drive enable and drive halt. Users cannot write access this parameter. It only supports diagnostics.

Parameter Structure:

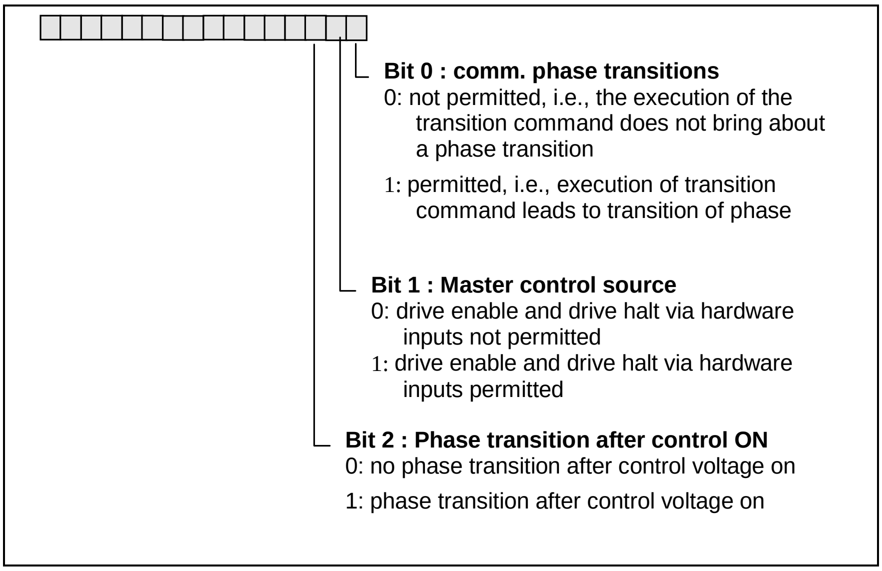


Fig. 3-46: P-0-4061, Mains voltage gain adjust

P-0-4061 - Attributes

Para. Name:	**DE**	Netzspannungs-Verstärkungsabgleich		
	EN	Mains voltage gain adjust		
	FR	Tension réseau, calibrage amplification		
	ES	Tensión de red, ajuste amplificación		
	IT	Tensione Rete, Calibrazione Guadagno		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst.-E²prom
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		--	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	-
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4062, Switch on threshold of braking resistor

This parameter indicates the value of that DC bus voltage, above which the braking resistor (bleeder) in the amplifier is switched on.

CAUTION

Error in the control of motors and moving parts

⇒ The value of the parameter should not be changed unless you use motors of third party manufacturers. In this case, the value in the parameter may not exceed the max. clamp voltage of the motor. For INDRAMAT motors, you need not care about it! Make sure that the max. clamp voltage of the used motor is higher than the peak value of the mains input voltage.

P-0-4062 - Attributes

Para. Name:	**DE**	Einschaltschwelle des Bremswiderstands		
	EN	Switch on threshold of braking resistor		
	FR	Résistance de freinage, seuil d'enclenchement		
	ES	Resistencia de frenado, umbral de inserción		
	IT	Resistenza di Freno, Soglia d'Inserzione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param.-E²prom
Format:		DEC_OV	**Validity check:**	P3-4
Unit:		V	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		350 / 830		
Default value:		830	**Cyc. transmittable:**	no

P-0-4086, Command communication status

Command communications (SERCOS, Profibus, ..) uses this parameter to inform the drive about important control information on handling communication phase transitions and for enabling hardware inputs for drive enable and drive halt.

Note: The user cannot write access this parameter. It only supports diagnostics.

Parameter structure:

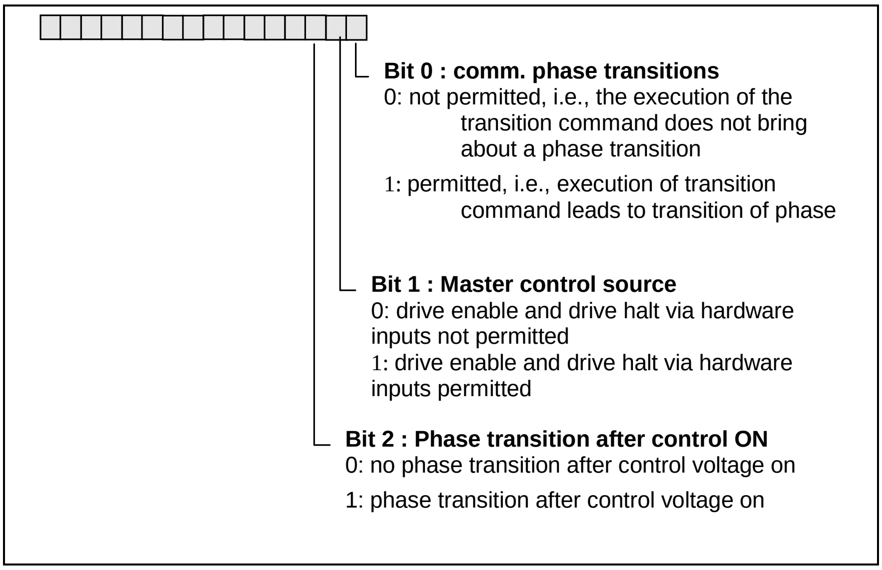


Fig. 3-47: P-0-4086, Command communication status

P-0-4086 - Attributes

Para. Name:	**DE**	Führungskommunikation Status		
	EN	Command communication status		
	FR	Etat communication maître		
	ES	Estado de comunicación master		
	IT	Stato di Communicazione Master		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4088, Serial number

Description:

The unit's serial number is stored in this parameter. The serial number is made up of a combination of material and continuous serial numbers.

In the event servicing is necessary, then material and serial numbers can be read here.

Serial number structure:

SN <6 place material number>-<6 place serial number>

Example: SN 276813-10021

P-0-4088 - Attributes

Para. Name:	**DE**	Seriennummer		
	EN	Serial number		
	FR	Numéro de serie		
	ES	Número serial		
	IT	Numero di Seria		
Function:		Parameter	**Editability:**	Passw.
Data length:		1Byte var.	**Memory:**	Verst.-E²prom
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4089, Production index

Description:

The finishing index of the drive controller is stored here. In the event servicing becomes necessary, the serial number can be read out for diagnostic purposes.

Example: **A01**

P-0-4089 - Attributes

Para. Name:	**DE**	Fertigungsindex		
	EN	Production index		
	FR	Index de production		
	ES	Número de fabricación		
	IT	Index di Fabricazione		
Function:		Parameter	**Editability:**	Passw.
Data length:		1Byte var.	**Memory:**	Verst.-E²prom
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		-	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	no

P-0-4094, C800 Command Base-parameter load

With the execution of this command, all parameters in **S-0-0192, IDN list of backup operation data** are set to their base values.

If the firmware in the prog. module is replaced with another version and the parameter memory is incompatible, then error **F209 PL Load parameter default values** is generated. “**PL**“ appears on the display. (At this time, the ser. interface is not yet active.)

Afterwards, execute the command by pressing the S1 button.

See also the functional description: "Basic parameter block".

P-0-4094 - Attributes

Para. Name:	**DE**	C800 Kommando Basisparameter laden		
	EN	C800 Command Base-parameter load		
	FR	C800 Commande chargement des paramètres de base		
	ES	C800 Comando cargar parámetros base		
	IT	C800 Comando Caricare Parametri di Base		
Function:		Command	**Editability:**	P23
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0004, Velocity loop smoothing time constant

The time constant that can be activated in this parameter acts on the velocity loop controller.

This is the default value from the feedback data memory. With the Basic Load procedure, the P-7-parameters are copied into the P-0-parameters.

See also the parameter description for **P-0-0004, Velocity loop smoothing time constant**

P-7-0004 - Attributes

Para. Name:	**DE**	Drehzahlregler-Glättungszeitkonstante		
	EN	Velocity loop smoothing time constant		
	FR	Temps de filtrage boucle de vitesse		
	ES	Tiempo de alisamiento n.d.r.		
	IT	Tempo di Smorzamento nell'Anello di Velocità		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

P-7-0018, Number of pole pairs/pole pair distance

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the number of pole pairs of the motor.

P-7-0018 - Attributes

Para. Name:	**DE**	Polpaarzahl/Polpaarweite		
	EN	Number of pole pairs/pole pair distance		
	FR	Nombre de paires de pôles/distance polaire		
	ES	Numero de par de polo/espacio de par de polo		
	IT	Numero di Coppie Poli		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	-
Unit:		pairs of poles/mm	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0051, Torque/force constant

The Torque/Force constant indicates, how much torque or force the motor delivers at a certain real current.

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the torque constant of the motor.

P-7-0051 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Konstante		
	EN	Torque/force constant		
	FR	Constante de couple/force		
	ES	Constante de par/fuerza		
	IT	Costante di Coppia/Forza		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Nm/A	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-0508, Commutation offset

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the commutation offset of the motor. The commutation offset contains the angle of the rotor in relation to the motor encoder.

P-7-0508 - Attributes

Para. Name:	**DE**	Kommutierungs-Offset		
	EN	Commutation offset		
	FR	Offset de commutation		
	ES	Offset de conmutación		
	IT	Offset di Commutazione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-0510, Moment of inertia of the rotor

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the moment of inertia of the motor's rotor.

P-7-0510 - Attributes

Para. Name:	**DE**	Rotor-Trägheitsmoment		
	EN	Moment of inertia of the rotor		
	FR	Couple d'inertie du rotor		
	ES	Par de inercia de rotor		
	IT	Coppia di Inerzia del Rotore		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		kgm^2	**Extrem value check:**	no
Decimal places:		5	**Combination check:**	no
Input min/max:		1 / 10000000		
Default value:		---	**Cyc. transmittable:**	no

P-7-0511, Brake current

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the brake current of the motor.

P-7-0511 - Attributes

Para. Name:	**DE**	Haltebremsenstrom		
	EN	Brake current		
	FR	Courant frein		
	ES	Corriente de frenado de parada		
	IT	Corrente Freno		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0 / 500000		
Default value:		---	**Cyc. transmittable:**	no

P-7-0513, Feedback type 1

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the kind and type of the feedback.

P-7-0513 - Attributes

Para. Name:	**DE**	Feedback-Typ 1		
	EN	Feedback type 1		
	FR	Type de feedback 1		
	ES	Tipo de retroalimentación 1		
	IT	Tipo di Feedback 1		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0514, Absolute encoder offset

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the absolute encoder offset. This value is changed by the command **P-0-0012, C300 Command 'Set absolute measurement.**

P-7-0514 - Attributes

Para. Name:	**DE**	Absolutgeber-Offset		
	EN	Absolute encoder offset		
	FR	Offset du codeur absolu		
	ES	Offset de encoder absoluto		
	IT	Offset Encoder assoluto		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Incr	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0515, Feedback type 2

For optional encoder with feedback data memory, this parameter shows the value stored there for the kind and type of the feedback.

P-7-0515 - Attributes

Para. Name:	**DE**	Feedback-Typ 2		
	EN	Feedback type 2		
	FR	Type de feedback 2		
	ES	Tipo de retroalimentación 2		
	IT	Tipo di Feedback 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedback-E²prom
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-4028, Impulse wire feedback - offset

The offset of the impulse wires referred to the resolver is saved in this parameter. It is messured in the factory and stored in the feedback memory.

P-7-4028 - Attributes

Para. Name:	**DE**	Impulsdrahtgeber-Offset		
	EN	Impulse wire feedback - offset		
	FR	Offset codeur impulsionnel câblé		
	ES	Offset de encoder de cable de impulsos		
	IT	Offset Impulso di Zero		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-4029, Impulse wire feedback - PIC counter value

This parameter contains the information of the absolute position of the encoder.

The value is updated at every position initialization. The value is read-only and cannot be edited by the user.

P-7-4029 - Attributes

Para. Name:	**DE**	Impulsdrahtgeber-Zählerstand		
	EN	Impulse wire feedback - PIC counter value		
	FR	Valeur du compteur codeur impulsionnel câblé		
	ES	Nivel de contador encoder de cable de impulsos		
	IT	Contatore impulsi di Zero		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-4047, Motor inductance

Inductance of the motor, measured between two clamps.

This is the value from the feedback data memory. During Basic Load, the P-7 parameters are copied into the P-0 parameters.

The parameter is set at the factory and cannot be changed.

P-7-4047 - Attributes

Para. Name:	**DE**	Motor-Induktivität		
	EN	Motor inductance		
	FR	Inductance moteur		
	ES	Inductividad de motor		
	IT	Induttanza Motore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		mH	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		---	**Cyc. transmittable:**	no

P-7-4048, Stator resistance

Stator resistance of the motor, measured between two connection clamps.

This is the value from the feedback data memory. During Basic Load, the P-7 parameters are copied into the P-0 parameters.

The parameter is set at the factory and cannot be changed.

P-7-4048 - Attributes

Para. Name:	**DE**	Motor-Wicklungs-Widerstand		
	EN	Stator resistance		
	FR	Résistance bobine moteur		
	ES	Resistencia de estator		
	IT	Resistenza Statore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	-
Format:		DEC_OV	**Validity check:**	-
Unit:		Ohm	**Extrem value check:**	-
Decimal places:		3	**Combination check:**	no
Input min/max:		- / -		
Default value:		-	**Cyc. transmittable:**	-

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ECODRIVE03

Drive for Machine Tool Applications With SERCOS-, Analog- and Parallelinterface

Supplement B
Diagnostic Message Description
SMT 01VRS

DOK-ECODR3-SMT-01VRS**-FKB1-EN-P

Contents

Notes

1 Diagnostic Message Descriptions

1.1 Overview of the diagnostic message descriptions

Diagnostic Message Types

Each operational state of the drive will be characterized with a diagnostic message.

Differentiations will be made between:

- **Error diagnostic messages**
- **Warning diagnostic messages**
- **Command diagnostic messages**
- **Drive Mode diagnostic messages**
- **Operation status**

Construction of a diagnostic message

A diagnostic message consists of:

- **A diagnostic number** and a
- **diagnostic text**

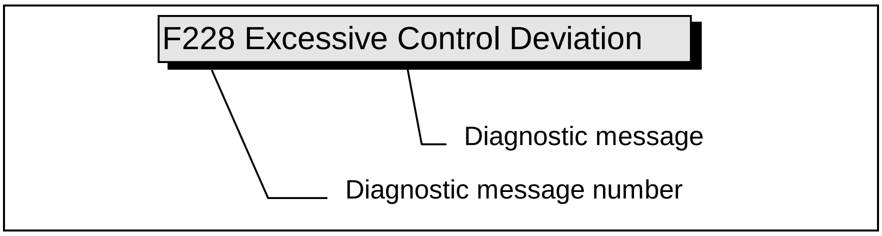

Fig. 1-1: Diagnostic message with a diagnostic number and text.

For the example in the graphic, "F2" and "28" are shown alternately on the H1-Display.

The control system can read out the diagnostic number in hexadecimal form with the **S-0-0390, Diagnostic message number** parameter.

In addition, the drive allocates to the control system the diagnostic number and diagnostic text as a string **F228 Excessive deviation** with the **S-0-0095, Diagnostic message** parameter.

H1-Display

The H1-Display serves as an optical display of the diagnostic message on the drive.

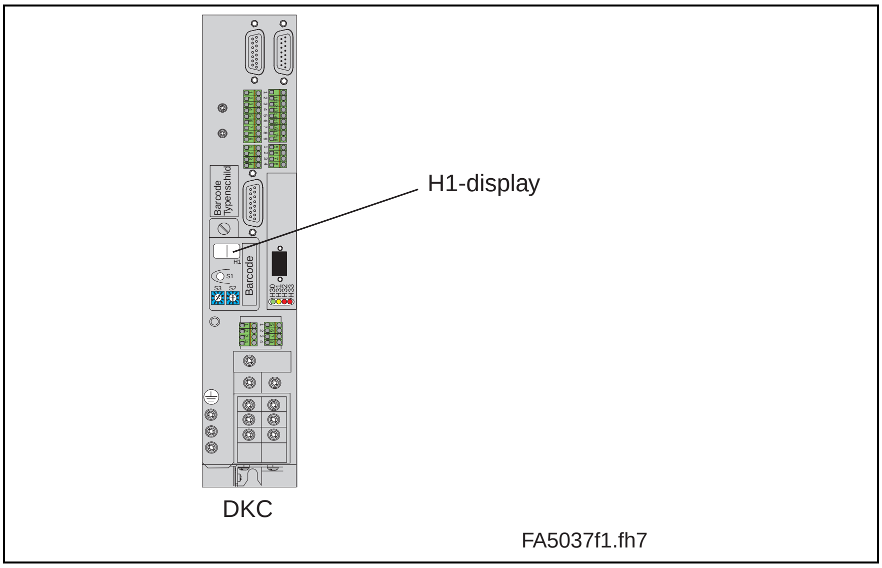

Fig. 1-2: H1-/Display

The diagnostic number appears on this two-positional seven-segment display. The image can be seen on the "Diagnostic Message Priority Display".

This display quickly shows the current operation status without the use of a communications interface.

The operating mode cannot be seen from the H1-Display. If the drive follows the operating mode and no command was activated, then the symbol "AF" appears on the display.

Diagnostic Message Output Priority

If more than one diagnostic message is waiting, then the message with the highest priority will be displayed.

The following graphic classifies operation status in order of importance.

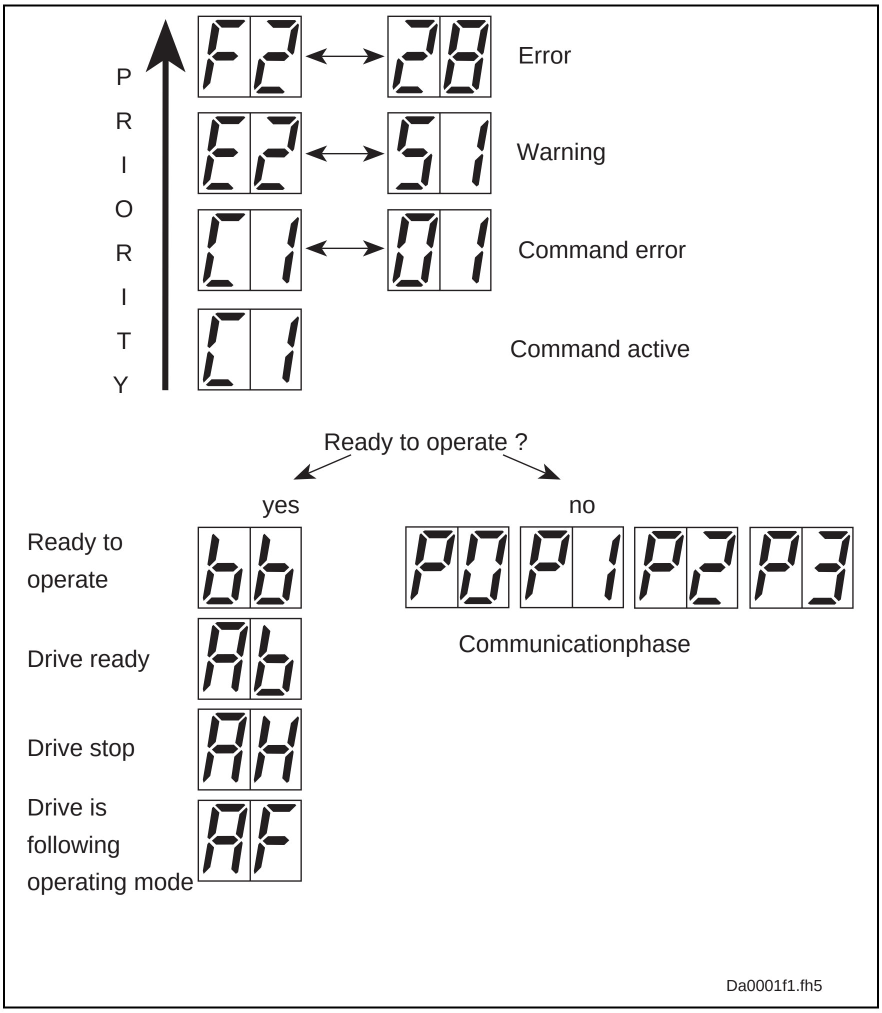

Fig. 1-3: Diagnostic message priority diagram

Clear Coded Diagnostic Message

The clear coded diagnostic message contains the diagnostic number followed by the diagnostic text, as shown in the example, "Excessive Output Error" (Fig. 1-1). It can be read out with the **S-0-0095, Diagnostic message** parameter and directly displays the operation status on an operator surface.

The clear coded diagnostic message will be switched to the current language.

Notes

1.2 Error diagnostic messages

F207 Switching to uninitialized operation mode

Cause:

0 has been selected in at least one of the four mode parameters **S-0-0032..35**. This mode has been selected by the bits 8 and 9 in the master control word while the drive controller was on.

Remedy:

Enter the desired mode in the activated mode parameter.

Examples for possible modes are:

Meaning:	Bit list of the mode parameters:
Torque control	0000 0000 0000 0001
Velocity control	0000 0000 0000 0010
Position control with act. feedback val. 1	0000 0000 0000 x011
Position control with act. feedback val. 2	0000 0000 0000 x100
Drive-internal interpolation with actual feedback value 1	0000 0000 0001 x011
Drive-internal interpolation with actual feedback value 2	0000 0000 0001 x100
Relative drive-internal interpolation with actual feedback value 1	0000 0010 0001 x011
Relative drive-internal interpolation with actual feedback value 2	0000 0010 0001 x100

Fig. 1-1: Operation Modes

Which operation modes can be selected in a certain device is written in the description for the operation mode parameters:

Parameter:	Primary mode of operation	S-0-0032
	Secondary operation mode 1	S-0-0033
	Secondary operation mode 2	S-0-0034
	Secondary operation mode 3	S-0-0035

Check for input of the permissible interpolation method.

See also the functional description: "Setting the Operating Mode Parameters"

F207 - Attributes

H1 Display : F2/07

Diag. mess.:
DE F207 Umschaltung auf nicht initialisierte Betriebsart
EN F207 Switching to uninitialized operation mode
FR F207 Changement à un mode de fonctionnement non initialisé
ES F207 Conmutación a modo de servicio no inicializado
IT F207 Selezione di un Modo Operativo non inizializzato

Mess. no.: F207 (hex)

Error no: 207

Class: Not fatal

F208 UL The motor type has changed.

This indication happens when you power up for the first time with a new motor.

The regulator settings for the current, velocity and position loops are stored in the feedback on the motor. After powering up, the drive compares the motor type stored in the parameter with the connected motor type. If the two do not match, basic control loop settings must be adapted, too.

With the Basic Load command, the default control loop settings are loaded from the feedback memory into the drive. The previous loop settings are overwritten. By pressing the S1 key, the command Basic Load is started.

Causes:

- The motor has been exchanged.
- A parameter file has been loaded, but the parameter **P-0-4036, Contacted motor type** contained a motor type different from the present one.

Remedy:

Command **C700 Basic Load** or press the S1 button.

See also the functional description: "Automatic Execution of the Load Default Feature".

F208 - Attributes

H1 Display :		UL
Diag. mess.:	**DE**	F208 UL Der Motortyp hat sich geändert.
	EN	F208 UL The motor type has changed.
	FR	F208 UL Le type de moteur a changé.
	ES	F208 UL El tipo de motor ha cambiado.
	IT	F208 UL Cambiato Tipo di Motore
Mess. no.:		F208 (hex)
Error no:		208
Class:		Not fatal

F209 PL Load parameter default values

After replacing the firmware version, the drive displays “**PL**”, if the parameters have been changed in regards to the old product. By pressing the S1 button on the drive controller or by starting the command “load basic parameters”, all the parameters will be erased and restored with the default (initial) values.

Cause:

The firmware has been exchanged; the number of parameters in comparison to the old product has changed.

Remedy:

Press S1 button on the drive controller, and all the parameters will be erased and restored with the factory preset default values

WARNING

⇒ This overwrites all parameters and positioning blocks.

See also the functional description: "Basic parameter block".

F209 - Attributes

H1 Display :		PL
Diag. mess.:	**DE**	F209 PL Defaultwerte der Parameter laden
	EN	F209 PL Load parameter default values
	FR	F209 PL Charger les valeurs init. des paramètres
	ES	F209 PL Cargar valores init.
	IT	F209 PL Caricare le Valori init. dei Parametri
Mess. no.:		F209 (hex)
Error no:		209
Class:		Not fatal

F218 Amplifier overtemp. shutdown

The temperature of the amplifier's heatsink is monitored. If the heatsink is too hot, the drive will power down in order to protect against damage.

Cause:

1. Ambient temperature too high. The specified performance data are valid up to an ambient temperature of 45°C.
2. The amplifier's heatsink is dirty.
3. Air flow is prevented by other assembly parts or the control cabinet assembly.
4. Blower defective

Remedy:

For 1. Reduce the ambient temperature, e.g. through cooling of the control cabinet.

For 2. Remove obstructions or dirt from the heatsink.

For 3. Install the device vertically and clear a large enough area for proper heatsink ventilation.

For 4. Exchange drive.

F218 - Attributes

H1 Display :		F2/18
Diag. mess.:	**DE**	F218 Verstärker-Übertemp.-Abschaltung
	EN	F218 Amplifier overtemp. shutdown
	FR	F218 Surchauffe ampli
	ES	F218 Desconexión por exceso de temperatura de amplificador
	IT	F218 Spegnimento per Sovratemp. Dissapatore
Mess. no.:		F218 (hex)
Error no:		218
Class:		Not fatal

F219 Motor overtemp. shutdown

The motor temperature has risen to an unacceptable level.

As soon as the **temperature error threshold** of 155°C is exceeded, the drive will immediately be brought to a standstill as set in the error reaction (P-0-0119, best possible standstill).

It applies:

temperature warning threshold < temperature error threshold

See also **E251 Motor overtemperature warning**.

Cause:

1. The motor is **overloaded**. The effective torque demanded from the motor has been above its allowable continuous torque level for too long.
2. **Wire break**, ground short or short circuit in the motor temperature monitor line
3. **Instability** in the velocity loop

Remedy:

For 1. Check the installation of the motor. If the system has been in operation for a long time, check to see if the the operating conditions have changed. (in regards to pollution, friction, moved components, etc.)

For 2. Check wires and cables to the motor temperature monitor for wire breaks, earth short and short circuits.

For 3. Check velocity loop parameters.

See also the functional descripton: "Temperature Monitoring"

F219 - Attributes

H1 Display :		F2/19
Diag. mess.:	**DE**	F219 Motor-Übertemp.-Abschaltung
	EN	F219 Motor overtemp. shutdown
	FR	F219 Surchauffe moteur
	ES	F219 Desconexión por exceso de temperatura de motor
	IT	F219 Spegnimento per Sovratemp. Motore
Mess. no.:		F219 (hex)
Error no:		219
Class:		Not fatal

F220 Bleeder overload shutdown

The regenerated energy from the mechanism of the machine via the motor has exceeded the capability of the braking resistor (bleeder). By exceeding the maximum energy of the resistor, the drive will shutdown according to the set error reaction, thereby protecting the bleeder from temperature damage.

Cause:

The reflected energy from the machine's mechanism over the motor is too great.

Remedy:

With too much power → reduce the acceleration value.

With too much energy → reduce the velocity.

Check the drive installation.

May require installation of an additional bleeder module.

F220 - Attributes

H1 Display :		F2/20
Diag. mess.:	**DE**	F220 Abschaltung wegen Bleederüberlast
	EN	F220 Bleeder overload shutdown
	FR	F220 Surcharge bleeder
	ES	F220 Desconexión por sobrecarga de bleeder
	IT	F220 Spegnimento per Sovratemp. Bleeder
Mess. no.:		F220 (hex)
Error no:		220
Class:		Not fatal

F221 Motor temp. surveillance defective

Cause:

Wire break or interruption in the wires for the motor temperature monitoring.

Remedy:

Check the wiring for the motor temperature monitoring (signals MT(emp)+ and MT(emp)-) for interruption and short circuit.

See also the functional description: "Temperature Monitoring".

F221 - Attributes

H1 Display :		F2/21
Diag. mess.:	**DE**	F221 Motor-Temp.überwachung defekt
	EN	F221 Motor temp. surveillance defective
	FR	F221 Erreur dans la surveillance température moteur
	ES	F221 Control de temperatura de motor defectuoso
	IT	F221 Errore nel Controllo della Temperatura Motore
Mess. no.:		F221 (hex)
Error no:		221
Class:		Not fatal

F226 Undervoltage in power section

The level of the DC bus voltage is monitored by the drive controller. If the DC bus voltage falls below a minimal threshold, the drive independently shuts down according to the set error reaction.

Cause:

1. The power source has been interrupted without first switching off the drive enable (RF).
2. Disturbance in the power supply

Remedy:

For 1. Check the logic regarding the activation of the drive within the connected control.

For 2. Check the power supply.

The error can be cleared by removing the drive enable signal.

See also the functional description:"Drive enable"

F226 - Attributes

H1 Display :		F2/26
Diag. mess.:	**DE**	F226 Unterspannung im Leistungsteil
	EN	F226 Undervoltage in power section
	FR	F226 Sous-tension puissance
	ES	F226 Tensión baja en parte de potencia
	IT	F226 Errore Alimentazione bassa nello Stadio di Potenza
Mess. no.:		F226 (hex)
Error no:		226
Class:		Not fatal

F228 Excessive deviation

When the position loop is closed, the drive monitors whether it is able to follow the specified command value. This is done by calculating a model position value in the drive and comparing that value with the actual feedback value. If the difference between theoretical and actual position value permanently exceeds the value of the **S-0-0159, Monitoring window** parameter, the drive oviously cannot follow the given command value. Then this error is generated.

Cause:

1. The drive's **acceleration** capacity has been exceeded.
2. The axis is **blocked**.
3. Incorrect parameter values set in the drive parameters.
4. Incorrect parameter values in **S-0-0159, Monitoring window**.

Remedy:

Ref. 1. Check the **S-0-0092, Bipolar torque/force limit value** parameter and set it to the maximum permissible value of the application. Reduce the specified acceleration value from the controller (see controller Manual).

Ref. 2. Check the mechanical system and eliminate jamming of the axis.

Ref. 3. Check the drive parameters (control loop tuning).

Ref. 4. Set the parameter values of **S-0-0159, Monitoring window**.

See also the functional description "Position Control Loop Monitoring".

F228 - Attributes

H1 Display :		F2/28
Diag. mess.:	**DE**	F228 Exzessive Regelabweichung
	EN	F228 Excessive deviation
	FR	F228 Déviation de posit. excessive
	ES	F228 Desviación de regulación excesiva
	IT	F228 Deviazione eccessiva
Mess. no.:		F228 (hex)
Error no:		228
Class:		Not fatal

F229 Encoder 1 failure: quadrant error

With wrong signals in the encoder evaluation, a hardware error has been discovered in the encoder interface 1 being used.

Cause:

1. Defective encoder cable
2. Disruptive electro-magnetic interference on the encoder cable
3. Defective encoder interface
4. Defective drive controller

Remedy:

For 1. Exchange the encoder cable.

For 2. Keep the encoder cable well away from the power cables.

For 3. Exchange the encoder interface.

For 4. Exchange the drive controller.

F229 - Attributes

H1 Display :		F2/29
Diag. mess.:	**DE**	F229 Fehler Geber 1: Quadrantenfehler
	EN	F229 Encoder 1 failure: quadrant error
	FR	F229 Erreur codeur 1: erreur de quadrant
	ES	F229 Error de encoder 1: error de cuadrante
	IT	F229 Errore Encoder 1: Errore Quadrante
Mess. no.:		F229 (hex)
Error no:		229
Class:		Not fatal

F230 Max. signal frequency of encoder 1 exceeded

The signal frequency of the encoder 1 (motor encoder) is checked whether the allowed max. frequency of the encoder interface is exceeded.

If the frequency is higher than allowed, the error **F230, Max. signal frequency of encoder 1 exceeded** is generated. The position status of the encoder 1 is cleared to 0.

F230 - Attributes

H1 Display : F2/30

Diag. mess.:
DE F230 Max. Signalfrequenz Geber 1 überschritten
EN F230 Max. signal frequency of encoder 1 exceeded
FR F230 Fréquence maxi. du codeur 1 dépassée
ES F230 Frecuencia max. encoder 1 excedida
IT F230 Frequenza massi. del Encoder 1 superata

Mess. no.: F230 (hex)

Error no: 230

Class: Not fatal

F236 Excessive position feedback difference

Cause:

In the communication phase 4 transition check command, position feedback value 1 and position feedback value 2 are set to the same value, and the cyclic evaluation of both encoders is started. In cyclic operation (phase 4), the position feedback difference of both encoders is compared with **S-0-0391, Monitoring window feedback 2**. If the amount of the difference exceeds the monitoring window, the error F236 Excessive position feedback difference is diagnosed, the parameter-selected error response is performed, and the reference bits of both encoders are cleared.

The monitoring is off, when the parameter S-0-0391, Monitoring window feedback 2 is set to the value 0.

Possible Causes :

1. Incorrect parameter for the encoder 2 (**S-0-0115, Position feedback 2 type parameter, S-0-0117, Resolution of feedback 2**)
2. Incorrect parameter setting of mechanical system between motor shaft and encoder 2: (S-0-0121, Input revolutions of load gear, S-0-0122, Output revolutions of load gear, S-0-0123, Feed constant)
3. The mechanical system between motor shaft and encoder 2 is not rigid (e.g. gear play).
4. Defective encoder cable
5. Maximum input frequency of the encoder interface exceeded
6. Encoder 2 (optional) is not mounted to the driven axis.
7. Incorrect reference measure of an absolute encoder

Remedy:

Ref. 1. Check **S-0-0115, Position feedback 2 type parameter** and **S-0-0117, Resolution of feedback 2**.

Ref. 2. Check **S-0-0121, S-0-0122, Input/Output revolutions of load gear** and **S-0-0123, Feed constant**.

Ref. 3. Increase **S-0-0391, Monitoring window feedback 2**.

Ref. 4. Replace encoder cable.

Ref. 5. Reduce the velocity.

Ref. 6. Set **S-0-0391, Monitoring window feedback 2** to 0 (de-activate monitoring function).

Ref. 7. Perform **P-0-0012, C300 Command 'Set absolute measurement'**.

See also the functional description "Actual Feedback Value Monitoring".

F236 - Attributes

H1 Display : F2/36

Diag. mess.: **DE** F236 Exzessive Lageistwertdifferenz
EN F236 Excessive position feedback difference
FR F236 Différence excessive en position réelle
ES F236 Diferencia excesiva de valor real de posición
IT F236 Eccessiva diff. nel Feedback di Posizione

Mess. no.: F236 (hex)

Error no: 236

Class: Not fatal

F237 Excessive position command difference

Cause:

When the drive is operating in position control, incoming position command values are monitored. If the velocity required of the drive by two successive position command values is greater than or equal to the value in **S-0-0091, Bipolar velocity limit value**, position command value monitoring is initiated. The **Excessive position command value** is stored in parameter **P-0-0010**. The **last valid position command value** is stored in parameter **P-0-0011**.

If position data are to be processed in modulo format, then the interpretation of the command is also dependent on the value set in **S-0-0393, Command value mode for modulo format.** The parameter should be set for the "shortest path" (0).

Remedy:

Compare S-0-0091, Bipolar velocity limit value with the velocity in the program and adjust to match it, if necessary.

See also the functional description: "Position Command Value Monitoring".

F237 - Attributes

H1 Display : F2/37

Diag. mess.: **DE** F237 Exzessive Lagesollwertdifferenz
EN F237 Excessive position command difference
FR F237 Différence excessive en position consigne
ES F237 Diferencia excesiva de valor nominal de posición
IT F237 Eccessiva diff. nella Posizione comandata

Mess. no.: F237 (hex)

Error no: 237

Class: Not fatal

F242 Encoder 2 failure: signal too small

Cause:

The analog signals of an external measurement system are used for high resolution analysis of that measurement system. These are monitored according to two criteria:

1. The pointer length, which is calculated from the sine and cosine signals, must be at least 1 V.
2. The maximum pointer length resulting from the sine and cosine signals must not exceed 11.8 V.

$$\text{pointer length} = \sqrt{\sin^2 + \cos^2}$$

Fig. 1-2: Pointer length

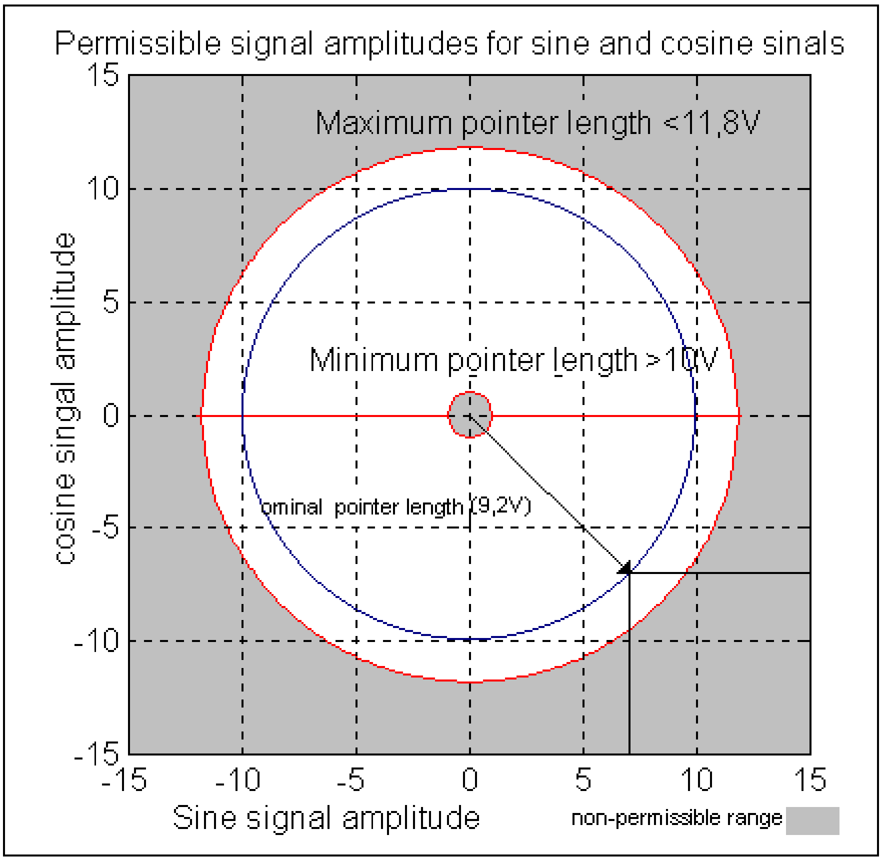

Fig. 1-3: Correct signal amplitude

Example:

Ucos = -6.5V

Usin = 6.5V

$$\text{pointer length} = \sqrt{(-6.5V)^2 + 6.5V^2} \approx 9.2V$$

Remedy:

1. Check the measurement system cable.
2. Check the measurement system.

F242 - Attributes

H1 Display : F2/42

Diag. mess.: **DE** F242 Fehler Geber 2: Signalamplitude fehlerhaft
EN F242 Encoder 2 failure: signal too small
FR F242 Erreur codeur 2: signal trop faible
ES F242 Error encoder 2: señal pequeña
IT F242 Errore Encoder 2: Ampiezza troppo bassa

Mess. no.: F242 (hex)

Error no: 242

Class: Not fatal

F245 Encoder 2 failure: quadrant error

The evaluation of the additional optional encoder (encoder 2) is active. In the evaluation of the sinusoidal input signals of the optional encoder, a plausibility check is performed between these signals and the counter fed by these signals. Doing this, an error has been encountered.

Cause:

1. Defective encoder cable
2. Disruptive electro-magnetic interference on the encoder cable
3. Defective encoder interface

Remedy:

For 1. Exchange the encoder cable.

For 2. Keep the encoder cable well away from power cables.

For 3. Exchange the encoder interface (DIAX) or the device (Ecodrive).

F245 - Attributes

H1 Display : F2/45

Diag. mess.: **DE** F245 Fehler Geber 2: Quadrantenfehler
EN F245 Encoder 2 failure: quadrant error
FR F245 Erreur codeur 2: erreur de quadrant
ES F245 Error encoder 2: error de cuadrante
IT F245 Errore Encoder 2: Errore di Quadrante

Mess. no.: F245 (hex)

Error no: 245

Class: Not fatal

F246 Max signal frequency of encoder 2 exceeded

The signal frequency of the encoder 2 (optional encoder) is checked whether the allowed max. frequency of the encoder interface is exceeded.

Whether, in the case of an excessive frequency, the error F246, Max signal frequency for encoder 2 exceeded is generated or not, depends on the setting in the parameter **P-0-0185, Function of encoder 2**. If the number 4 for spindle encoder is set there, only the position status of the optional encoder is cleared to 0. In the other case, the warning **F246** is generated and the position status is cleared to 0.

F246 - Attributes

H1 Display :		F2/46
Diag. mess.:	**DE**	F246 Max. Signalfrequenz Geber 2 überschritten
	EN	F246 Max signal frequency of encoder 2 exceeded
	FR	F246 Fréquence maxi. du codeur 2 dépassée
	ES	F246 Frecuencia max. encoder 2 excedida
	IT	F246 Frequenza massi. del Encoder 2 superata
Mess. no.:		F246 (hex)
Error no:		246
Class:		Not fatal

F248 Low battery voltage

Cause:

For motors of series MKD and MKE, the absolute position information is stored by a battery-powered electronic in the motor feedback. The battery is designed for a 10-year life span. If the battery voltage falls below 2.8 V, this message appears. The absolute encoder function will still be preserved for about 2 weeks.

CAUTION

Malfunction in the control of motors and moving elements

Possible damages: Mechanical injuries

⇒ Replace the battery as soon as possible.

Instructions for Exchanging Batteries

Have the following tools and accessories ready:

- Torx screwdriver size 10
- Needle-nose pliers, torque wrench
- New packaged battery (Part No. 257101)

CAUTION

Malfunction in the control of motors and moving elements

Possible damages: Mechanical injuries

⇒ Turn off the power supply. Make sure it will not be turned back on. Exchange the battery while the control voltage (24V) is turned on.

If the control voltage is turned off while the battery is taken out, the absolute **reference** point will be lost. Then, the reference point must be reestablished with the command "**Set absolute measuring**“.

Removing the Battery

- Unscrew torx screws (1) with size 10 screwdriver.
- Pull out the resolver feedback (RSF) lid by hand.
- Pull off the battery connector (2).
- Loosen battery clamp (3) and remove the battery.
- Place the prepared battery in the housing and screw on the clamp. **Attention!** Do not kink or clamp the battery cable.
- Attach the connector (2) of the battery.

Close the resolver feedback lid, screw in 4 torx screws (1) and tighten to 1.8 Nm with the torque wrench.

F248 - Attributes

H1 Display :		F2/48
Diag. mess.:	**DE**	F248 Batterie-Unterspannung
	EN	F248 Low battery voltage
	FR	F248 Sous-tension batterie
	ES	F248 Batería baja
	IT	F248 Tensione Batteria bassa
Mess. no.:		F248 (hex)
Error no:		248
Class:		Not fatal

F253 Incr. encoder emulator: pulse frequency too high

Cause:

The incremental encoder emulator can process a maximum of 1023 lines per sample period (250 µs); this value has been exceeded.

Remedial action:

1. Reduce the **number of lines** of the incremental encoder emulator (P-0-0502).

or

2. Reduce the travel **velocity**.

See also the functional description: "Encoder Emulation".

F253 - Attributes

H1 Display :		F2/53
Diag. mess.:	**DE**	F253 Inkrementalgeberemulator: Frequenz zu hoch
	EN	F253 Incr. encoder emulator: pulse frequency too high
	FR	F253 Erreur émulation de codeur incr.: fréquence trop haute
	ES	F253 Emulador encoder incr.: frecuencia demasiado alta
	IT	F253 Encoder incrementale: Frequenza troppo alta
Mess. no.:		F253 (hex)
Error no:		253
Class:		Not fatal

F262 External short at status outputs

Status outputs are monitored for short circuits and thermal overload.

- If output current exceeds 350mA for about 1µs, then this is acknowledged as a short circuit and the pertinent channel is shut off. The output remains off unti the error is cleared.
- With thermal overload, the error is set and the output(s) shut off. After the driver has cooled off, the outputs are switched back on and so on. The error, however, remains until it is cleared. Thermal overload can occur if several outputs are overloaded in excess of 80 mA.

Note: Light bulbs, for example, cannot be controlled as their inrush current causes a short-circuit.

Cause:

1. Short circuited outputs (X2/6, X2/7, X2/8, X2/9, X2/10, X2/20, X2/21, X2/22)
2. One or more outputs are overloaded.

Remedy:

For 1. Eliminate short circuit or limit switching current (< 350 mA)

For 2. Drop current, depending on output, to < 80 mA.

See also the functional description: "Setting the Operating Mode Parameters".

F262 - Attributes

H1 Display : F2/62

Diag. mess.: **DE** F262 Statusausgänge kurzgeschlossen
EN F262 External short at status outputs
FR F262 Court circuit aux sorties d'état
ES F262 Cortocircuito en salida de estado
IT F262 Corto Circuito sulle Uscite di Stato

Mess. no.: F262 (hex)

Error no: 262

Class: Not fatal

F267 Erroneous internal hardware synchronization

Cause:

The drive control is synchronized on the bus interface (SERCOS, Profibus, Interbus, ...). The correct fuction of the synchronization is monitored. If the average value of the deviation exceeds 5 µs, this error is generated.

Remedy:

Replace drive controller.

F267 - Attributes

H1 Display : F2/67

Diag. mess.: **DE** F267 Hardware-Synchronisation fehlerhaft
EN F267 Erroneous internal hardware synchronization
FR F267 Faute de synchronisation du matériel interne
ES F267 Sincronización de hardware interno defectuosa
IT F267 Sincronizz. Hardware interna errata

Mess. no.: F267 (hex)

Error no: 267

Class: Not fatal

F276 Absolute encoder out of allowed window

When turning off the drive controller with an absolute encoder (multiturn), the actual feedback position will be stored. When powered up, the absolute position given by the encoder is compared with the stored position. If the deviation is greater than the paramaterized **P-0-0097, Absolute Encoder Monitoring Window**, the error **F276** will appear and be given to the control system.

Cause:

1. Turning on for the first time (invalid stored position)
2. The motor has been moved further than allowed by the parameter in the absolute encoder monitoring window, P-0-0097, while it was turned off.
3. Incorrect position initialization

Remedy:

For 1. Press S1 to reset the error and set the absolute position.

For 2. The motor was moved while turned off and sits outside of its permissible position. Check to see if the displayed position is correct in relation to the machine zero point. Reset subsequent errors.

For 3. **An accident may occur by accidental shaft movement.** Check absolute position information. The feedback is defective if the absolute position information is wrong. The motor should be exchanged and sent to the INDRAMAT Customer Service.

See also Function Description "Absolute Encoder Monitoring".

F276 - Attributes

H1 Display :		F2/76
Diag. mess.:	**DE**	F276 Absolutgeber außerhalb des Überwachungsfensters
	EN	F276 Absolute encoder out of allowed window
	FR	F276 Codeur absolu hors du fenêtre de surveillance
	ES	F276 Encoder absoluto fuera de la ventana de control
	IT	F276 Encoder Assoluto fuori Finestra
Mess. no.:		F276 (hex)
Error no:		276
Class:		Not fatal

F277 Current measurement trim wrong

This error can only happen during the test of the drive controller at the INDRAMAT factory.

The current measurement in the drive controller is calibrated precisely with a test current in the INDRAMAT test department. During this test, correction values outside the projected tolerances have come out.

Cause:

1. Hardware defective in the drive controller
2. The correct current for the calibraton does not flow.

Remedy:

1. Repair the control board.
2. Check the calibration current.

F277 - Attributes

H1 Display : F2/77

Diag. mess.:
DE F277 Strommessabgleich fehlerhaft
EN F277 Current measurement trim wrong
FR F277 Justage de la mesure du courant faux
ES F277 Compensación de medición de corriente defectuosa
IT F277 Errore nella Misura di Corrente offset

Mess. no.: F277 (hex)

Error no: 277

Class: Nr. 1

F281 Mains fault

Cause:

The power supply voltage was not present during operation for at least 3 power periods. As a result, the drive controller was brought to a standstill according to the set error response.

Remedy:

Check the power supply connection according to the project planning specifications.

F281 - Attributes

H1 Display : F2/81

Diag. mess.:
DE F281 Netzausfall
EN F281 Mains fault
FR F281 Alimentation puissance manque
ES F281 Fallo de red
IT F281 Errore Alimentazione Potenza

Mess. no.: F281 (hex)

Error no: 281

Class: Not fatal

F386 No ready signal from supply module

Cause:

The input BbN "operation readiness from supply unit“ at the drive controller is at 24V, that means the connected mains supply unit does not report ready for operation.

F386 - Attributes

H1 Display : F3/86

Diag. mess.:
DE F386 Kein Betriebsbereit vom Versorgungsmodul
EN F386 No ready signal from supply module
FR F386 Pas de signal prêt de l'alim. puissance
ES F386 Falta señal de listo del módulo de alim.
IT F386 Manca Segnale di Pronto de l'Alimentatore

Mess. no.: F386 (hex)

Error no: 386

Class: Not fatal

F401 Double MST failure shutdown

The master sync telegram was not received in the drive controller in two successive SERCOS cycles.

Cause:

1. Disruption in the LWL transmission line.
2. Too much attenuation in the light signal.
3. Malfunction in the SERCOS interface (general).

Remedy:

For 1. Check all LWL connections in the SERCOS ring.

For 2. Measure the attenuation in the LWL cable.

The maximum attenuation between TX and RX must not fall below 12.5 dB.

For 3. Exchange the SERCOS interface module in the drive controller.

See also the functional description: "SERCOS Interface Error"

F401 - Attributes

H1 Display :		F4/01
Diag. mess.:	**DE**	F401 Abschaltung zweifacher MST-Ausfall
	EN	F401 Double MST failure shutdown
	FR	F401 MST manqué 2 fois
	ES	F401 Desconexión por error doble MST
	IT	F401 Spegnimento per doppia mancanza MST
Mess. no.:		F401 (hex)
Error no:		401
Class:		Interface

F402 Double MDT failure shutdown

The Master Data Telegram (MDT) has not been received in two successive SERCOS or field bus cycles of the drive.

Cause:

1. Optic fibre-bus: Optical link corrupted.
2. Optic fibre bus: Too high damping of the light signals
3. SERCOS: Error in the SERCOS Interface (general)
4. Field bus: Bus connection interrupted/locked up for longer than watchdog time.
5. The bus-master does not send cyclical telegrams any more to the drive. However, these are mandatory in phase 4.

Remedy:

For 1. Check all the fibre optic connections in the SERCOS ring.

For 2. Measure the damping/absorption of the optical cables.
The max. loss between TX and RX may not exceed 12,5 dB!

For 3. Replace the SERCOS Interface module in the drive.

For 4. Check the field bus connectors and wiring, signal levels.

For 5. Switch on the master and get the cyclical communication going, see manual for your control.

See also the functional description: "SERCOS Interface Error"

F402 - Attributes

H1 Display :		F4/02
Diag. mess.:	**DE**	F402 Abschaltung zweifacher MDT-Ausfall
	EN	F402 Double MDT failure shutdown
	FR	F402 MDT manqué 2 fois
	ES	F402 Desconexión por error doble MDT
	IT	F402 Spegnimento per doppia mancanza MDT
Mess. no.:		F402 (hex)
Error no:		402
Class:		Interface

F403 Invalid communication phase shutdown

An invalid communications phase was given by the SERCOS master module (phase > 4).

Cause:

Error in the SERCOS master module of the control system.

Remedy:

Consult the control system manufacturer.

See also the functional description: "SERCOS Interface Error"

F403 - Attributes

H1 Display :		F4/03
Diag. mess.:	**DE**	F403 Abschaltung ungültige Komm.-Phase
	EN	F403 Invalid communication phase shutdown
	FR	F403 Phase de communication fausse
	ES	F403 Desconexión por fase de comunicación no válida
	IT	F403 Spegnimento per Fase di Comunicazione invalide
Mess. no.:		F403 (hex)
Error no:		403
Class:		Interface

F404 Error during phase progression

The prescribed order was not maintained during phase progression.

Cause:

Error in the SERCOS master module of the control system.

Remedy:

Consult the control system manufacturer.

See also the functional description: "SERCOS Interface Error"

F404 - Attributes

H1 Display :		F4/04
Diag. mess.:	**DE**	F404 Fehler bei Phasenhochschaltung
	EN	F404 Error during phase progression
	FR	F404 Erreur pendant progression de phase comm.
	ES	F404 Error durante progresión de fase
	IT	F404 Errore durante la Progressione delle Fasi
Mess. no.:		F404 (hex)
Error no:		404
Class:		Interface

F405 Error during phase regression

Switching back from a communication phase did not switch to phase 0.

Cause:

Malfunction in the SERCOS master module of the controller.

Remedy:

Contact the controller manufacturer.

See also the functional description: "SERCOS Interface Error"

F405 - Attributes

H1 Display :		F4/05
Diag. mess.:	**DE**	F405 Fehler bei Phasenrückschaltung
	EN	F405 Error during phase regression
	FR	F405 Erreur pendant regression de phase comm.
	ES	F405 Error en regresión de fase
	IT	F405 Errore durante la Regressione delle Fasi
Mess. no.:		F405 (hex)
Error no:		405
Class:		Interface

F406 Phase switching without ready signal

The SERCOS master attempted a phase switch without waiting for the drive controller's ready signal.

Cause:

Error in the SERCOS master module of the control system.

Remedy:

Consult the control system manufacturer.

See also the functional description: "SERCOS Interface Error"

F406 - Attributes

H1 Display :		F4/06
Diag. mess.:	**DE**	F406 Phasenumschaltung ohne Bereitmeldung
	EN	F406 Phase switching without ready signal
	FR	F406 Changement de phase sans signal prêt
	ES	F406 Conmutación de fase sin señal de listo
	IT	F406 Cambio Fasi senza Segnale di Pronto
Mess. no.:		F406 (hex)
Error no:		406
Class:		Interface

F434 Emergency-Stop

Pressing the emergency stop switch (E-Stop) has caused the drive to perform the emergency stop function that was selected in the **P-0-0119, Best possible deceleration** parameter. Setting bit 15 of **S-0-0011, Class 1 diagnostics** causes an error message to be issued to the controller.

Cause:

The emergency stop switch has been pressed.

Remedy:

Eliminate the malfunction that has caused the emergency switch to be actuated, and clear the error.

See also the functional description: "Emergency stop feature".

F434 - Attributes

H1 Display :		F4/34
Diag. mess.:	**DE**	F434 E-Stop aktiviert
	EN	F434 Emergency-Stop
	FR	F434 Arrêt d'urgence
	ES	F434 Parada de emergencia activada
	IT	F434 Stop per Emergenza
Mess. no.:		F434 (hex)
Error no:		434
Class:		Interface

F629 Positive travel limit exceeded

The drive has received a command value which has led to an axis position outside the positive travel range. The axis has been brought to a standstill with the error response "Set velocity command value to zero".

Bit 2 of paramater **P-0-0090, Travel limit parameter** is set for "Exceeding travel range is an error", or after exceeding the position limit a drive control command has been started (such as the drive-controlled homing procedure).

Cause:

S-0-0049, Positive position limit value exceeded.

Remedy:

1. Check **S-0-0049, Positive position limit value**
2. Check the software limits of the control system
3. Activate the axis after the error response

Procedure:

- Clear the error.
- If the power supply was turned off, turn it back on.
- Move the axis into the permissible working range.

Note: Only such command values will be accepted which lead back into the allowed working range. With other command values, the drive will stop again. - The parameter S-0-0057, Position window defines a hysteresis for the travel limits.

See also the functional description: "Axis Limit Values ".

F629 - Attributes

H1 Display :		F6/29
Diag. mess.:	**DE**	F629 Lagegrenzwert positiv überschritten
	EN	F629 Positive travel limit exceeded
	FR	F629 Limite de position positive dépassée
	ES	F629 Valor límite de posición positiva excedido
	IT	F629 Limite positiva massimo superato
Mess. no.:		F629 (hex)
Error no:		629
Class:		Nr. 1

F630 Negative travel limit exceeded

The drive has received a command value which has led to an axis position outside the negative travel range. The axis has been brought to a standstill with the error response "Set velocity command value to zero".

Bit 2 of paramater **P-0-0090, Travel limit parameter** is set for "Exceeding travel range is an error", or after exceeding the position limit a drive control command has been started (such as the drive-controlled homing procedure).

Cause:

S-0-0050, Negative travel limit value exceeded.

Remedy:

1. Check **S-0-0050, Negative travel limit value**.
2. Check the software limits of the control system.
3. Activate the axis after the error response.

Procedure:

- Clear the error.
- If the power supply was turned off, turn it back on.
- Move the axis into the permissible working range.

Note: Only such command values will be accepted which lead back into the allowed working range. With other command values, the drive will stop again. - The parameter S-0-0057, Position window defines a hysteresis for the travel limits.

See also the functional description: "Travel Range Limits".

F630 - Attributes

H1 Display : F6/30

Diag. mess.: **DE** F630 Lagegrenzwert negativ überschritten
EN F630 Negative travel limit exceeded
FR F630 Limite de position négative dépassée
ES F630 Valor límite de posición negativa excedido
IT F630 Limite negativa massimo superato

Mess. no.: F630 (hex)

Error no: 630

Class: Travel range

F634 Emergency-Stop

Pressing the emergency stop (E-Stop) switch has caused the drive to stop by setting the velocity command value to zero. An error is reported in the **S-0-0011, Class 1 diagnostics** parameter.

Cause:

The emergency stop switch has been pressed.

Remedy:

Eliminate the malfunction that has caused the emergency switch to be actuated, and clear the error.

See also the functional description: "Emergency stop feature".

F634 - Attributes

H1 Display : F6/34

Diag. mess.: **DE** F634 E-Stop aktiviert
EN F634 Emergency-Stop
FR F634 Arrêt d'urgence
ES F634 Parada de emergencia activada
IT F634 Stop per Emergenza

Mess. no.: F634 (hex)

Error no: 634

Class: Travel range

F643 Positive travel limit switch detected

The positive travel limit switch has been encountered. The axis has been brought to a standstill with the "Set velocity command value to zero" error response.

Bit 2 of parameter **P-0-0090, Travel limit parameter** is set for "Exceeding travel range as error", or a drive control command has been started (such as the drive-controlled homing procedure) with the limit switch already actuated.

Cause:

The positive travel limit switch is detected.

Remedy:

1. Reset the error.
2. Turn the power supply on again.
3. Move the axis into the permissible travel range.

Note: The drive will not accept command values which lead out of the permissible travel range. Entering these command values in the drive controller will result in this error.

See also the functional description: "Travel Range Limits"

F643 - Attributes

H1 Display : F6/43

Diag. mess.: **DE** F643 Fahrbereichsendschalter positiv betätigt
EN F643 Positive travel limit switch detected
FR F643 Fin de course positive
ES F643 Interruptor de fin de desplazamiento positivo activado
IT F643 Rilevati Finecorsa positivo

Mess. no.: F643 (hex)

Error no: 643

Class: Nr. 1

F644 Negative travel limit switch detected

The negative travel limit switch has been encountered. The axis has been brought to a standstill with the "Set velocity command value to zero" error response.

Bit 2 of parameter **P-0-0090, Travel limit parameter** is set for "Exceeding travel range as error", or a drive control command has been started (such as the drive-controlled homing procedure). with the limit switch already actuated.

Cause:

The negative travel limit switch is detected.

Remedy:

1. Reset the error.
2. Turn the power supply on again.
3. Move the axis into the permissible travel range.

Note: The drive will not accept command values which lead out of the permissible travel range. Entering these command values in the drive controller will result in this error.

See also the functional description: "Travel Range Limits".

F644 - Attributes

H1 Display :		F6/44
Diag. mess.:	**DE**	F644 Fahrbereichsendschalter negativ betätigt
	EN	F644 Negative travel limit switch detected
	FR	F644 Fin de course négative
	ES	F644 Interruptor de fin de desplazamiento negativo activado
	IT	F644 Rilevati Fine Corsa negativo
Mess. no.:		F644 (hex)
Error no:		644
Class:		Travel range

F822 Encoder 1 failure: signal too small

For the high resolution evaluation of a position encoder, the analog signals of the transducer are used. These are monitored for 2 criteria:

1. The pointer length resulting from sine and cosine signal must be **> 1 V**.
2. The max. pointer length from sine and cosine signal must not exceed 11.8 V.

$$Pointerlength = \sqrt{\sin^2 + \cos^2}$$

Fig. 1-4: Pointer length

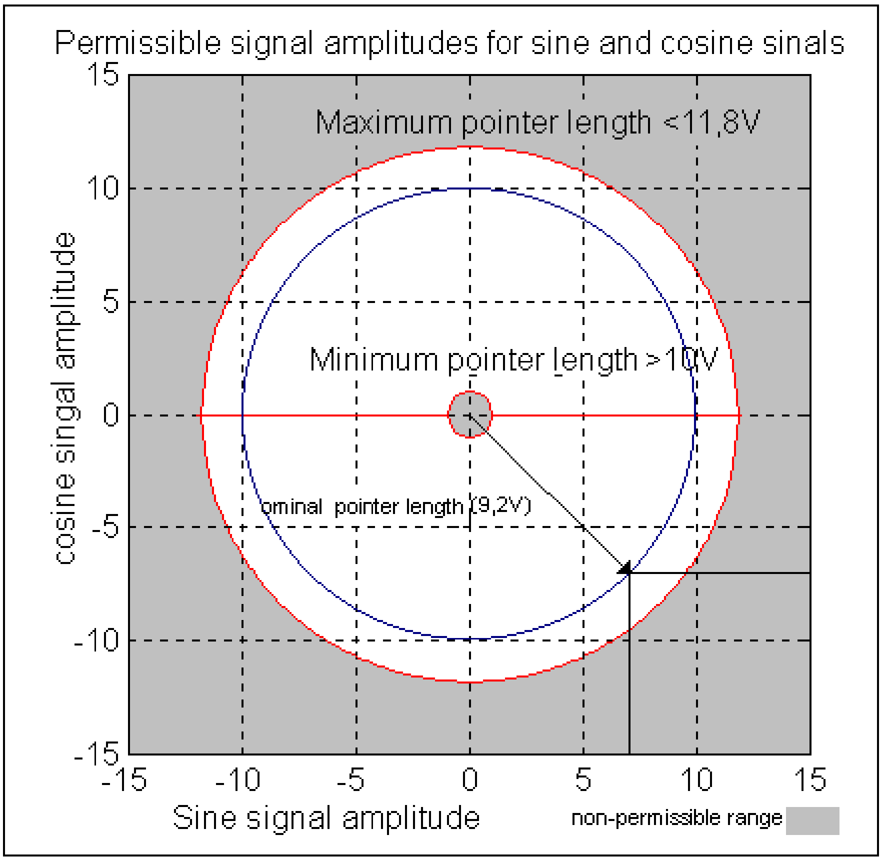

Fig. 1-5: Correct signal amplitude

Example:

Ucos = -6,5V

Usin = 6,5V

$$Pointerlength = \sqrt{(-6{,}5V)^2 + (6{,}5V)^2} = 9{,}2V$$

Note: The error cannot be cleared in communication phase 4 (operating mode). Before clearing the error, you are obliged to switch to communication phase 2 (parameter mode).

Causes:

1. Feedback **Cable** defective
2. Transmission of the feedback signals **disturbed**
3. **Feedback** defective

Remedies:

1. Check the cable to the measuring system
2. Place the cable apart from the motor power cable. The screen must be connected to the housing of the drive controller.
3. Check the measuring system; replace it, if necessary.

F822 - Attributes

H1 Display : F8/22

Diag. mess.: **DE** F822 Fehler Geber 1: Signalamplitude fehlerhaft
EN F822 Encoder 1 failure: signal too small
FR F822 Erreur codeur 1: signal trop faible
ES F822 Error de encoder 1: señal pequeña
IT F822 Errore Encoder 1: Ampiezza troppo bassa

Mess. no.: F822 (hex)

Error no: 822

Class: Fatal

F860 Overcurrent: short in power stage

The current in the power transistor bridge has exceeded twice the peak current of the drive. As a result, the drive will immediately switched to a torque-free state. An optional brake is immediately activated.

Cause:

1. Short circuit in the motor cable.
2. Defective power section of the drive controller
3. The current regulator was parameterized with wrong values.

Remedy:

For 1. Check the motor cable for a short.

For 2. Exchange the drive controller.

For 3. The current regulator parameters should not deviate from the default values of the feedback.

F860 - Attributes

H1 Display : F8/60

Diag. mess.: **DE** F860 Brückensicherung
EN F860 Overcurrent: short in power stage
FR F860 Courant excessif: Court circuit à l'étage puissance
ES F860 Seguro en puente
IT F860 Sovracorr.: Corto Circuito nello Stadio di Potenza

Mess. no.: F860 (hex)

Error no: 860

Class: Fatal

F870 +24Volt DC error

The drive controller requires a 24-V control voltage. The drive's torque is released immediately when the maximum permissible tolerance of +-20% is exceeded. An optional blocking brake is activated.

Cause:

1. Defective **cable** for the control voltages.
2. 24-V power supply **overload**.
3. Defective power **supply unit**.
4. **Short-circuit** in the emergency stop circuit.

Remedy:

Ref. 1. Check and, if necessary, replace the cable and connections of the control voltages.

Ref. 2. Check the 24-V power at the power supply unit.

Ref. 3. Check the power supply unit.

Ref. 4. Check the emergency stop circuit for a short-circuit.

Note: This error can only be cleared in parametrization mode (phase 2). As a result of this error, the encoder emulation is switched off.

F870 - Attributes

H1 Display :		F8/70
Diag. mess.:	**DE**	F870 +24Volt-Fehler
	EN	F870 +24Volt DC error
	FR	F870 Erreur +24V
	ES	F870 +24Volt Error
	IT	F870 Guasto +24Volt
Mess. no.:		F870 (hex)
Error no:		870
Class:		Fatal

F873 Power supply driver stages fault

The voltage supply of the driver stage is monitored, and if the voltage is too low, the drive is turned off.

Cause:

The voltage supply of the driver stage is too low.

Remedy:

Exchange drive controller.

F873 - Attributes

H1 Display :		F8/73
Diag. mess.:	**DE**	F873 Spannung der Treiberstufen gestört
	EN	F873 Power supply driver stages fault
	FR	F873 Erreur dans les étages driver
	ES	F873 Fallo en niveles de driver
	IT	F873 Guasto nello Stadio Driver
Mess. no.:		F873 (hex)
Error no:		873
Class:		Fatal

F878 Velocity loop error

The velocity loop monitor will appear when the following conditions occur simultaneously:

- The current command value is at the peak current limit.
- The difference between the actual velocity and the command velocity is greater than 10 % of the maximum motor velocity.
- actual speed > 1.25 % of maximum speed
- Command and actual acceleration have different qualifying signs.

Cause:

1. Motor cable is connected incorrectly.
2. Defective controller section of the drive
3. Defective feedback
4. Velocity loop paramaterized incorrectly
5. Incorrect commutation offset

Remedy:

For 1. Check the motor cable connection.

For 2. Exchange the drive controller.

For 3. Exchange the motor.

For 4. Check the velocity controller to see whether it is within operational parameters.

For 5. Exchange the motor.

See also the functional description: "Emergency stop feature".

F878 - Attributes

H1 Display :		F8/78
Diag. mess.:	**DE**	F878 Fehler im Drehzahlregelkreis
	EN	F878 Velocity loop error
	FR	F878 Erreur dans la boucle de vitesse
	ES	F878 Error en el círculo de regulación de velocidad
	IT	F878 Errore nell'Anello di Velocità
Mess. no.:		F878 (hex)
Error no:		878
Class:		Fatal

F879 Velocity limit S-0-0091 exceeded

In torque control, the actual velocity is monitored. This error is generated if the programmed velocity in the **S-0-0091, Bipolar velocity limit value** parameter is exceeded by the 1.125-fold value or a minimum of 100 rpm (rotary motor) or by 100 mm/min (linear motor).

Cause:

The torque command value was for too long a time greater than the load torque. This causes the actual speed to increase up to the maximum possible motor speed.

Remedy:

Assign the correct torque command value for the required task. Reduce the **S-0-0092, Bipolar torque/force limit value** parameter value.

See also the functional description "Limiting to Bipolar Velocity Limit Value".

F879 - Attributes

H1 Display :		F8/79
Diag. mess.:	**DE**	F879 Geschwindigkeits-Grenzwert S-0-0091 überschritten
	EN	F879 Velocity limit S-0-0091 exceeded
	FR	F879 Limite de vitesse S-0-0091 dépassée
	ES	F879 Valor límite de velocidad S-0-0091 excedido
	IT	F879 Valore di Massimo di Velocità S-0-0091 superato
Mess. no.:		F879 (hex)
Error no:		879
Class:		Fatal

1.3 Warning diagnostic messages

E221 Warning Motor temp. surveillance defective

Temperature monitoring checks to see if the measured motor temperature is within reasonable bounds. If it determines that it is lower than -10°C, then it is assumed the measuring unit is defective. Warning **E221 Warning Motor temp. surveillance defective** will appear for 30 seconds. Afterwards the drive controller will be brought to a standstill according to the selected error response and message **F221 Error Motor temp. surveillance defective** will be generated.

Cause:

1. Motor temperature sensor not connected.
2. Broken cable.
3. Defective sensor.
4. Broken cable in drive controller.

Remedy:

For 1. Connect the sensor to the drive controller and to the motor (see project planning specifications for the motor).

For 2. Exchange the wiring between the drive controller and the motor.

For 3. Exchange the motor.

For 4. Exchange the drive controller.

See also the functional description: "Temperature Monitoring".

E221 - Attributes

H1 Display :		E2/21
Diag. mess.:	**DE**	E221 Warnung Motor-Temp.überwachung defekt
	EN	E221 Warning Motor temp. surveillance defective
	FR	E221 Alerte erreur dans la surveillance température moteur
	ES	E221 Aviso control de temperatura de motor defectuoso
	IT	E221 Preallarme Difetto nel Sovratemp. Motore
Mess. no.:		E221 (hex)
Class:		Not fatal

E225 Motor overload

The maximum possible motor current is reduced in order to protect the motor from being destroyed.

If a current flows in the that is greater than 2.2 times the motor current at standstill S-0-0111, the maximum possible motor current (motor peak current S-0-0109) is reduced. With 4-fold motor current at standstill, the reduction starts after 400 ms. With 5-fold current it starts earlier, and with 3-fold current later.

The **E225 Motor overload** warning is issued when the motor peak current is reduced by the limitation.

The reduction also has an effect on the active permanent current P-0-4045.

See also the functional description: "Monitoring of the thermal Motor Load"

E225 - Attributes

H1 Display :		E2/25
Diag. mess.:	**DE**	E225 Motor-Überlast
	EN	E225 Motor overload
	FR	E225 Surcharge Moteur
	ES	E225 Sobrecarga de motor
	IT	E225 Sovracarico Motore
Mess. no.:		E225 (hex)
Class:		Not fatal

E226 Undervoltage in power section

If bit 5 of the **P-0-0118, Power off on error** parameter has been set, an undervoltage condition will be handled as a nonfatal warning. The drive issues this warning if the drive enabling signal is present and the DC bus voltage message disappears.

Cause:

Power supply unit is switched off or mains failure occurs while the drive enabling signal is set.

Remedy:

Switch off the drive enabling signal before you switch off the power supply unit.

E226 - Attributes

H1 Display :		E2/26
Diag. mess.:	**DE**	E226 Unterspannung im Leistungsteil
	EN	E226 Undervoltage in power section
	FR	E226 Sous-tension puissance
	ES	E226 Tensión baja en parte de potencia
	IT	E226 Errore Alimentazione bassa nello Stadio di Potenza
Mess. no.:		E226 (hex)
Class:		Not fatal

E231 No jogging direction selected

During jog operation to the position limit, this warning is generated, when no unambiguous direction for jogging is selected. This happens, when the parameter P-0-4056 Jog inputs contains the value 00b or 11b.

Remedy:

Select an unambiguous jogging direction, either positive or negative, in P-0-4056 or, with parallel interface, via the hardware inputs.

See also the functional description: "Operating Mode: Jogging".

E231 - Attributes

H1 Display :		E2/31
Diag. mess.:	**DE**	E231 Keine Tipprichtung vorgewählt
	EN	E231 No jogging direction selected
	FR	E231 Direction jog non déterminée
	ES	E231 Dirección no seleccionado para modo impulsos
	IT	E231 Direzione in Manuale non selezionata
Mess. no.:		E231 (hex)
Class:		Not fatal

E247 Interpolation velocity = 0

The drive-internal position command value interpolator is active if

- the "drive-internal interpolation" mode,
- the "relative drive-internal interpolation" mode,
- drive-controlled homing,
- drive halt

is active.

The E247 warning is issued if the employed velocity specification is 0. Possible velocity specifications are:

- **S-0-0259, Positioning velocity**
- **S-0-0041, Homing velocity**
- **S-0-0091, Bipolar velocity limit value**

See also the functional description: "Mode: Drive Internal Interpolation"

E247 - Attributes

H1 Display :		E2/47
Diag. mess.:	**DE**	E247 Interpolationsgeschwindigkeit = 0
	EN	E247 Interpolation velocity = 0
	FR	E247 Vitesse d'interpolation = 0
	ES	E247 Velocidad de interpolación = 0
	IT	E247 Velocità per Interpolazione = 0
Mess. no.:		E247 (hex)

E248 Interpolation acceleration = 0

Cause:

The drive internal position command interpolator (profile generator) is active. It has been given the acceleration = 0. Without acceleration, it can never reach a given speed.

Operation modes with drive internal position command generation:

1. Drive-internal interpolation
2. Relative drive-internal interpolation
3. Drive-controlled homing
4. Drive Halt
5. Process block mode

Remedy:

Input a reasonable value > 0 for the employed acceleration. Possible acceleration specifications, depending from the operation mode, are:

For 1. and 2.:	**S-0-0260**, **Positioning acceleration**	**>0**
For 3.:	**S-0-0042, Homing acceleration**	**>0**
For 4.:	**S-0-0138, Bipolar acceleration limit value**	**>0**
For 5.:	**P-0-4008, Process block Acceleration**	**>0**

See also the functional description: "Mode: Drive Internal Interpolation"

E248 - Attributes

H1 Display : E2/48

Diag. mess.: **DE** E248 Interpolationsbeschleunigung = 0

EN E248 Interpolation acceleration = 0

FR E248 Accélération d'interpolation = 0

ES E248 Aceleración de interpolaciòn = 0

IT E248 Accelerazione per Interpolazione = 0

Mess. no.: E248 (hex)

E249 Positioning velocity S-0-0259 > S-0-0091

Cause:

In the operation modes "Drive-internal interpolation" and "Relative drive-internal interpolation", the velocity specified in the **S-0-0259, Positioning velocity** parameter is used for positioning. In the "process block“ operation mode, this velocity is taken for positioning with limited speed.

If velocity specified there is greater than value in **S-0-0091, Bipolar velocity limit value**, the message E249 is generated. Then, bit 5 is set in **S-0-0012, Class 2 diagnostics**.

Note: The warning E249 is only generated when the parameter S-0-0259 is transferred cyclically via the command communication (SERCOS, Profibus-DP, Interbus, ...).

Remedy:

Reduce **S-0-0259, Positioning speed** or, for process block mode, **S-0-4007, Process block Velocity**.

See also the functional description: "Mode: Drive Internal Interpolation"

E249 - Attributes

H1 Display : E2/49

Diag. mess.: **DE** E249 Positioniergeschw. S-0-0259 > S-0-0091

EN E249 Positioning velocity S-0-0259 > S-0-0091

FR E249 Vitesse de positionnement S-0-0259 > S-0-0091

ES E249 Velocidad de posicionamiento S-0-0259 > S-0-0091

IT E249 Velocità Posiz. S-0-0259 > S-0-0091

Mess. no.: E249 (hex)

Class: Not fatal

E250 Drive overtemp. prewarning

The temperature of the heatsink in the drive controller has reached the maximum permissible temperature. The drive controller follows the command value input for a period of 30 seconds. This makes it possible to bring the axis to a standstill with the control system while keeping true to the process (for example, close the operation, leave the collision area, etc.).

After 30 seconds, the response set in parameter **P-0-0119, Best possible deceleration** will be performed by the drive controller.

Cause:

1. Failure of the drive's internal blower.
2. Failure of the control cabinet's climate control.
3. Incorrect control cabinet dimensioning in regards to heat dissipation.

Remedy:

For 1. If the blower fails, exchange the drive controller.

For 2. Install climatization feature in the cabinet.

For 3. Check the dimensions of the control cabinet.

See also the functional description:"Monitoring the Thermal Load of the drive controller"

E250 - Attributes

H1 Display :		E2/50
Diag. mess.:	**DE**	E250 Verstärker Übertemp.-Vorwarnung
	EN	E250 Drive overtemp. prewarning
	FR	E250 Préalerte surchauffe ampli
	ES	E250 Aviso exceso de temperatura de accionamiento
	IT	E250 Preallarme Sovratemp. Azionam.
Mess. no.:		E250 (hex)
Class:		Not fatal

E251 Motor overtemp. prewarning

As soon as the temperature **warning threshold** (145°C) is exceeded, the warning E251 is output, and the drive keeps on following the command value.

This state can last for a long time without powering down. Only when the temperature **error threshold** is exceeded, an immediate powering down will take place.

See also **F219 Motor Overtemperature Shutdown**.

Cause:

The motor is overloaded. The effective torque required from the motor was above the allowable standstill continuous torque for too long.

Remedy:

Check the installation of the motor. For systems which have been in use for a long time, check to see if the drive conditions have changed (in regards to pollution, friction, moving components, etc).

See also the functional description: "Temperature Monitoring".

E251 - Attributes

H1 Display : E2/51

Diag. mess.: **DE** E251 Motor Übertemp.-Vorwarnung
EN E251 Motor overtemp. prewarning
FR E251 Préalerte surchauffe moteur
ES E251 Aviso exceso de temperatura de motor
IT E251 Preallarme Sovratemp. Motore

Mess. no.: E251 (hex)

Class: Not fatal

E252 Bleeder overload prewarning

Cause:

The braking resistance (bleeder) in the amplifier is charged with the reflected energy from the motor by about 90%. The bleeder overtemperature warning shows that an overload of the bleeder is expected if the feedback energy increases on and on.

Remedy:

Reduce the acceleration value or velocity. Check the drive installation.

E252 - Attributes

H1 Display : E2/52

Diag. mess.: **DE** E252 Bleeder-Vorwarnung
EN E252 Bleeder overload prewarning
FR E252 Préalerte surcharge bleeder
ES E252 Preaviso bleeder
IT E252 Preallarme Sovratemp. Bleeder

Mess. no.: E252 (hex)

Class: Not fatal

E253 Target position out of travel range

In operation modes with drive ontrolled interpolation, the drive checks **before the move** whether the specified **S-0-0258, Target position**, is within the possible travel range of the drive. This range is defined by the parameters **S-0-0049, Positive position limit value** and **S-0-0050, Negative position limit value**. The position limit check is activated in the parameter **S-0-0055, Position polarities** with bit 4.

Cause:

The target position lies beyond the position limits, and the position limit check is activated.

Results:

- This warning message, E253, appears.
- The **drive stops**.
- The drive does not accept the target position or the process block.
- In **S-0-0012, Class 2 diagnostic** warning bit 13 is set.

Remedy:

1. For the Drive controlled interpolation mode, input the **S-0-0258, Target position** only within the position limits.
2. For the Relative drive controlled interpolation mode, do the same, outgoing from the actual position.
3. For the Process block mode, input the **S-0-4006 Process block target position** only within the position limits.
4. For relative process blocks, do the same, outgoing from the actual position.
5. Check the **position limit values**. Moreover, the positive position limit value must be greater than the negative position limit value.
6. If you don't need the position limit check, de-activate it, e.g. in modulo mode.

See also the functional description: "Mode: Drive Internal Interpolation".

E253 - Attributes

H1 Display :		E2/53
Diag. mess.:	**DE**	E253 Zielposition außerhalb des Verfahrbereichs
	EN	E253 Target position out of travel range
	FR	E253 Position à atteindre hors limites
	ES	E253 Posición objeto fuera campo de desplazamiento
	IT	E253 Posizione inpostata fuori dai Limiti
Mess. no.:		E253 (hex)
Class:		Not fatal

E254 Not homed

If absolute positions are selected while in a positioning operation mode, the control drive must be homed to a reference position. If this is not the case, an absolute position cannot be reached. The drive rejects this positioning command and stops. The warning E254 will be given.

Cause:

Absolute positioning was selected without the drive being referenced.

Remedies:

1. Do the **homing** (referencing) command with the drive or
2. do only **relative** positioning.

See also the function description "Drive-Controlled Homing".

E254 - Attributes

H1 Display :		E2/54
Diag. mess.:	**DE**	E254 Referenz fehlt
	EN	E254 Not homed
	FR	E254 Référence manque
	ES	E254 Falta referenciado
	IT	E254 Non Azzerato
Mess. no.:		E254 (hex)
Class:		Not fatal

E255 Feedrate-override S-0-0108 = 0

With the parameter **S-0-0108, Feedrate override**, the travel velocity of all in drive-controlled travel commands can be changed proportionally (in %).

If the value of this parameter is 0, the travel velocity is also 0. With velocity = 0, however, the drive can never go anywhere. It cannot follow the applied command values.

Causes:

1. The parameter **S-0-0108, Feedrate override** is **0**.
2. **S-0-0259, Positioning Velocity** is **0**.
3. The **P-0-4007, Process block velocity** is **0** with the selected process block.
4. For devices with analog inputs: Feedrate override via analog input is activated, and the voltage there is 0.
5. The **feed potentiometer** of the connected control system is at 0 or is being evaluated incorrectly. Like 4.

Remedies:

For 1.: Set **Feedrate override > 0**, so that the drive moves. Full speed is attained with 100% .

For 2.: Set **S-0-0259** to the suitable value > 0 for your application.

For 3.: Set **P-0-4007** to the suitable value > 0 for your application.

For 4.: Apply a voltage > 0 proportional to the desired speed,
+10V corresponds to 100 % (full) speed.
Alternative: De-activate Feedrate override.

For 5.: Turn the feed potentiometer cautiously, check the analog signal and the evaluation for it.

See also the functional description: "Sequence control Drive-Controlled Homing".

E255 - Attributes

H1 Display :		E2/55
Diag. mess.:	**DE**	E255 Feedrate-Override S-0-0108 = 0
	EN	E255 Feedrate-override S-0-0108 = 0
	FR	E255 Atténuation d'avance S-0-0108 = 0
	ES	E255 Override de alimentación S-0-0108 = 0
	IT	E255 Riduzione Velocità Avanz. S-0-0108 = 0
Mess. no.:		E255 (hex)
Class:		Not fatal

E256 Torque limit = 0

Cause:

1. For protection against mechanical overload, the maximum torque can be limited by the **S-0-0092, Bipolar Torque Limit** parameter. If the actual value of this parameter is equal to 0, the motor does not develop torque and does not follow the given command values.
2. Torque reduction is set via an analog channel, and the applied voltage amounts to 10 V.

Remedy:

For 1. Set the torque limit to a value greater than 0.

For 2. Establish an analog voltage smaller than 10 V.

See also the functional description:" Current Limit"

E256 - Attributes

H1 Display :		E2/56
Diag. mess.:	**DE**	E256 Momenten-Grenzwert = 0
	EN	E256 Torque limit = 0
	FR	E256 Limite de couple = 0
	ES	E256 Valor límite de par = 0
	IT	E256 Limite di Coppia = 0
Mess. no.:		E256 (hex)
Class:		Not fatal

E257 Continuous current limit active

The drive controller sets the peak current available for 400 ms. Thereafter, the continuous current limit becomes active and dynamically limits the peak current to the continuous current.

Cause:

More continuous torque was required than was available.

Remedy:

1. Check the drive installation.
2. Check the installation of the motor. For systems which have been in use for a long time, check to see whether the drive conditions have changed in regards to
    - pollution
    - friction
    - moved masses

See also the functional description: "Monitoring the Thermal Load of the drive controller".

E257 - Attributes

H1 Display :		E2/57
Diag. mess.:	**DE**	E257 Dauerstrombegrenzung aktiv
	EN	E257 Continuous current limit active
	FR	E257 Courant permanent limité
	ES	E257 Límite de corriente continua activo
	IT	E257 Limitazione Corr. continuativa attiva
Mess. no.:		E257 (hex)
Class:		Not fatal

E258 Selected process block is not programmed.

Cause:

A positioning block was selected for which there is no set target position or positioning velocity, etc.

Remedy:

Select another positioning block or enter the required data.

See also the functional description: "Positioning Block Mode"

E258 - Attributes

H1 Display :		E2/58
Diag. mess.:	**DE**	E258 Nicht programmierter Positioniersatz angewählt
	EN	E258 Selected process block is not programmed.
	FR	E258 Le bloc de pos. choisi n'est pas programmé.
	ES	E258 No está programado el bloque de proceso seleccionado
	IT	E258 Blocco selezionato non programmato
Mess. no.:		E258 (hex)
Class:		Not fatal

E259 Command velocity limit active

In the position control and velocity control operating modes, the effective velocity command value is limited to the value in parameter **S-0-0091, Bipolar velocity limit value**. The warning is given if the resulting velocity command value reaches this limit.

Cause:

Parameter **S-0-0091, Bipolar velocity limit value** was set too low.

Remedy:

In normal operating conditions, set parameter **S-0-0091, Bipolar velocity limit value** to a value 10% greater than the NC effective velocity.

See also the functional description: "Limiting to Bipolar Velocity Limit Value".

E259 - Attributes

H1 Display :		E2/59
Diag. mess.:	**DE**	E259 Geschwindigkeitssollwertbegrenzung aktiv
	EN	E259 Command velocity limit active
	FR	E259 Vitesse de consigne limitée
	ES	E259 Límite de valor nominal de velocidad activo
	IT	E259 Limitazione Velocità comandata attiva
Mess. no.:		E259 (hex)
Class:		Not fatal

E261 Continuous current limit prewarning

Digital drives are monitored by a continually operating temperature model. If the thermal load reaches 100%, the continuous current limit will be activated shortly thereafter.
Before the torque is reduced, a continuous current limit early warning is given via a switching threshold, which is determined by parameter **P-0-0127, Overload warning**.
To deactivate the warning, enter **P-0-0127** = 100% into the parameter.

Cause:

The drive controller was overloaded.

Remedy:

1. Check the drive layout.
2. Reduce acceleration.
3. Increase the switching threshold in parameter **P-0-0127, Overload warning**
4. With systems which have been used for longer periods of time, check to see if drive controller conditions have changed in regards to:
   - Friction
   - Components which have been moved
   - Feed during processing.

See also the functional description: "Monitoring the Thermal Load of the drive controller"

E261 - Attributes

H1 Display :		E2/61
Diag. mess.:	**DE**	E261 Dauerstrombegrenzung Vorwarnung
	EN	E261 Continuous current limit prewarning
	FR	E261 Préalerte limite de courant perm.
	ES	E261 Preaviso límite corriente continua
	IT	E261 Preallarme Limitazione Corrente contin.
Mess. no.:		E261 (hex)
Class:		Not fatal

E263 Velocity command value > limit S-0-0091

Cause:

The value given to the drive for **S-0-0036, Velocity command value** was greater than permissible.

Remedy:

It is limited to **S-0-0091, Bipolar velocity limit value**.

See also the functional description: "Mode: Velocity Control"

E263 - Attributes

H1 Display : E2/63

Diag. mess.: **DE** E263 Geschwindigkeitssollwert > Grenzwert S-0-0091

EN E263 Velocity command value > limit S-0-0091

FR E263 Vitesse consigne > limite S-0-0091

ES E263 Velocidad nominal mayor que S-0-0091

IT E263 Velocità comandata > S-0-0091

Mess. no.: E263 (hex)

Class: Not fatal

E264 Target position out of num. range

Cause:

When using the operating mode "position control with process blocks", the target position of the selected additive process block will be verified to see whether it lies within the numerical range. This was not the case.

Remedy:

1. Check the target position and correct if necessary.
2. Select the position data display in modulo format.

See also the functional description: "Positioning Block Mode"

E264 - Attributes

H1 Display : E2/64

Diag. mess.: **DE** E264 Zielposition nicht darstellbar

EN E264 Target position out of num. range

FR E264 Position à atteindre hors des limites numériques

ES E264 Posición objeto fuera de límites

IT E264 Posizione selezionata fuori dai Limiti

Mess. no.: E264 (hex)

Class: Not fatal

E408 Invalid addressing of MDT-data container A

This warning indicates an error during the **index check in the multiplex channel**. During the cyclical data exchange, the index for the access to the **list S-0-0370** is surveyed, whether it points to a non-initialised field in the list. If it does, this warning is generated.

See also the functional description: "Checking the Indices"

E408 - Attributes

H1 Display : E4/08

Diag. mess.: **DE** E408 Ungültige Adressierung MDT-Datencontainer A

EN E408 Invalid addressing of MDT-data container A

FR E408 Adresse non valide récipient de dates MDT A

ES E408 Dirección no válida MDT data container

IT E408 Indirizzo non valido Contenitore MDT

Mess. no.: E408 (hex)

Class: Interface

E409 Invalid addressing of AT-data container A

This warning indicates an error during the **index check in the multiplex channel**. During the cyclical data exchange, the index for the access to the **list S-0-0371** is surveyed, whether it points to a non-initialised field in the list. If it does, this warning is generated.

See also the functional description: "Checking the Indices"

E409 - Attributes

H1 Display : E4/09

Diag. mess.: **DE** E409 Ungültige Adressierung AT-Datencontainer A
EN E409 Invalid addressing of AT-data container A
FR E409 Adresse non valide récipient de dates AT A
ES E409 Dirección no válida AT data container
IT E409 Indirizzo non valido Contenitore MDT

Mess. no.: E409 (hex)

Class: Interface

E410 Slave not scanned or address 0

While the SERCOS ring is being initialized in communications phase 1, each slave which is to participate in the additional phase uptake must be addressed by the SERCOS master. Slaves which are not addressed or which have been set to drive address "0" indicate this by generating warning E410. Communication with these slaves in higher communications phases is not possible. They work only in the repeater mode.

Cause:

The slave was not scanned in phase 1, or address 0 is set.

Remedy:

- Set the correct slave address.
- Check the SERCOS master configuration.

See also the functional description: "Adjustments of the SERCOS Interface"

E410 - Attributes

H1 Display : E4/10

Diag. mess.: **DE** E410 Slave nicht gescannt oder Adresse 0
EN E410 Slave not scanned or address 0
FR E410 Esclave non reconnu ou adresse 0
ES E410 Esclavo no scaneado o dirección 0
IT E410 Drive non trovato o Indirizzo 0

Mess. no.: E410 (hex)

E825 Overvoltage in power stage

The **DC bus voltage** is too high.

Cause:

1. During **braking** (decelerating): the energy reflected from the mechanical system via the motor was so high for a moment that it could not be sufficiently dissipated to heat by the braking resistor (bleeder). The regenerated current could not be drained and therefore charged the DC bus, so that the voltage there has become too high.
2. The **mains voltage** (AC input) is too high.

Result:

In case of overvoltage, the motor is switched to **torque-free** operation. As soon as the DC Bus voltage falls again below the maximum allowable value, the controller will be turned on again.

Remedy:

For 1. Reduce the **acceleration** values.
Check the drive controller layout, if necessary.
Install an auxiliary bleeder, if necessary.

For 2. Check the **mains supply voltage** (AC/3phase).

WARNING

⇒ Danger of high-voltage shock!
Care for protection against accidental touch.

E825 - Attributes

H1 Display :		E8/25
Diag. mess.:	**DE**	E825 Überspannung im Leistungsteil
	EN	E825 Overvoltage in power stage
	FR	E825 Tension excessive à l'étage puissance
	ES	E825 Sobretensión en la parte de potencia
	IT	E825 Sovratensione nello Stadio di Potenza
Mess. no.:		E825 (hex)
Class:		Fatal

E826 Undervoltage in power section

If the bit 3 is set in the parameter **P-0-0118, Power off on error**, the undervoltage is treated as "fatal warning“ with shutdown of the drive operation. If the drive enable is on at the same time, and the DC bus voltage indication goes down, the drive displays this warning.

Cause:

Switching off the power supply or mains failure while the drive enable is on.

Remedy:

Switch off the drive enable before switching off the supply unit.

E826 - Attributes

H1 Display : E8/26

Diag. mess.:
DE E826 Unterspannung im Leistungsteil
EN E826 Undervoltage in power section
FR E826 Sous-tension puissance
ES E826 Tensión baja en potencia
IT E826 Errore Alimentazione Bassa

Mess. no.: E826 (hex)

Class: Fatal

E829 Positive position limit exceeded

The drive has received a command value which resulted in an axis position outside the positive travel range. The axis has been brought to a standstill by setting the velocity command to zero. A class 1 diagnostic error is not generated. The drive will automatically follow command values that lead back into the allowed range. "Handle travel range exceeded as warning" is set in bit 2 of parameter **P-0-0090, Command value transmit time (TMTSG)**.

Cause:

S-0-0049, Positive position limit value exceeded.

Remedy:

Enter command values which lead back into the allowed range.

Note: Only such command values will be accepted that lead back into the allowed working range. With other command values, the drive will stop again. - The parameter S-0-0057, Position window defines a hysteresis for the travel limits.

See also the functional description: "Travel Range Limits".

E829 - Attributes

H1 Display : E8/29

Diag. mess.:
DE E829 Lagegrenzwert positiv überschritten
EN E829 Positive position limit exceeded
FR E829 Limite de position positive dépassée
ES E829 Valor límite de posición positiva excedido
IT E829 Limite di Posizione positiva superato

Mess. no.: E829 (hex)

Class: Fatal

E830 Negative position limit exceeded

The drive has received a command value which resulted in an axis position outside the negative travel range. The axis has been brought to a standstill by setting the velocity command to zero. A class 1 diagnostic error is not generated. The drive will automatically follow command values which lead into the allowed range. "Handle travel range exceeded as warning" is set in bit 2 of parameter **P-0-0090, Travel limit parameter**.

Cause:

S-0-0050, Negative travel limit value exceeded.

Remedy:

Enter command values which lead back into the allowed range.

Note:	Only such command values will be accepted that lead back into the allowed working range. With other command values, the drive will stop again. - The parameter S-0-0057, Position window defines a hysteresis for the travel limits.

See also the functional description: "Travel Range Limits".

E830 - Attributes

H1 Display :		E8/30
Diag. mess.:	**DE**	E830 Lagegrenzwert negativ überschritten
	EN	E830 Negative position limit exceeded
	FR	E830 Limite de position négative dépassée
	ES	E830 Valor límite de posición negativa excedido
	IT	E830 Limite di Posizione negativa superato
Mess. no.:		E830 (hex)
Class:		Fatal

E831 Position limit reached during jog

If the position limit monitor is activated and the drive is “IN REFERENCE", then it will be positioned on the position limit during movement by jogging. If the drive is positioned on the position limit or beyond the position limit, the drive stops and signals "Position limit value reached during jog".

Remedies:

1. Move the motor back within the allowed travel area with the jog function or
2. Turn off the position limit monitor.

See also the functional description: "Operating Mode: Jogging".

E831 - Attributes

H1 Display :		E8/31
Diag. mess.:	**DE**	E831 Beim Tippen Lagegrenzwert erreicht
	EN	E831 Position limit reached during jog
	FR	E831 Limite de position atteint pendant mode jog
	ES	E831 En el avance por impulsos valor límite excedido
	IT	E831 Superato Limite di Posizione in Manuale
Mess. no.:		E831 (hex)
Class:		Fatal

E834 Emergency-Stop

Pressing the emergency stop switch has caused the drive to perform the emergency stop function that had been selected via the **P-0-0119, Best possible deceleration** parameter. There is no error message issued to the controller.

Cause:

The emergency stop switch was pressed.

Remedy:

Eliminate the malfunction that led to the activation of the emergency stop switch. The warning will then disappear.

See also the functional description: "Emergency stop feature".

E834 - Attributes

H1 Display :		E8/34
Diag. mess.:	**DE**	E834 E-Stop aktiviert
	EN	E834 Emergency-Stop
	FR	E834 Arrêt d´urgence
	ES	E834 Parada de emergencia activada
	IT	E834 Stop per Emergenza
Mess. no.:		E834 (hex)

E843 Positive limit switch activated

The drive has received a command value which resulted in an axis position outside the positive travel range. The axis has been brought to a standstill by setting the velocity command to zero. A class 1 diagnostic error is not generated. The drive will automatically follow command values that lead back into the allowed range. Bit 2 of **P-0-0090, Travel limit parameter** is set to "Overtravelling is handled as a warning".

Cause:

The positive limit switch has been actuated.

Remedy:

Enter command values that lead back into the allowed range.

See also the functional description: "Travel Zone Limit Switch Monitoring".

E843 - Attributes

H1 Display :		E8/43
Diag. mess.:	**DE**	E843 Fahrbereichsendschalter positiv betätigt
	EN	E843 Positive limit switch activated
	FR	E843 Fin de course positive
	ES	E843 Interruptor de fin de desplazamiento positivo activado
	IT	E843 Finecorsa positivo attivato
Mess. no.:		E843 (hex)
Class:		Fatal

E844 Negative limit switch activated

The drive has received a command value which resulted in an axis position outside the negative travel range. The axis has been brought to a standstill by setting the velocity command to zero. A class 1 diagnostic error is not generated. The drive will automatically follow command values that lead back into the allowed range. Bit 2 of **P-0-0090, Travel limit parameter** is set to "Overtravelling is handled as a warning".

Cause:

The negative limit switch has been actuated.

Remedy:

Enter command values which lead back into the allowed range.

See also the functional description: "Travel Zone Limit Switch Monitoring".

E844 - Attributes

H1 Display :		E8/44
Diag. mess.:	**DE**	E844 Fahrbereichsendschalter negativ betätigt
	EN	E844 Negative limit switch activated
	FR	E844 Fin de course négative
	ES	E844 Interruptor de fin de desplazamiento negativo activado
	IT	E844 Finecorsa negativo attivato
Mess. no.:		E844 (hex)
Class:		Fatal

Notes

1.4 Command diagnostic messages

C100 Communication phase 3 transition check

The command **S-0-0127, C1 Communication phase 3 transition check** has been activated.

See also the functional description: "S-0-0127, C100 Communication phase 3 transition check"

C100 - Attributes

H1 Display : C1

Diag. mess.: **DE** C100 Umschaltvorbereitung Phase 2 nach 3
EN C100 Communication phase 3 transition check
FR C100 Préparation commutation phase 2 vers 3
ES C100 Comprobación conmutación fase 2 a 3
IT C100 Fase di Comunicazione 3 test di Transizione

Mess. no.: C100 (hex)

C101 Invalid communication parameter (S-0-0021)

Cause:

Communications parameters which are needed to operate the drive in communication phase 3 are invalid.

Remedy:

A list of the invalid parameters can be seen in parameter **S-0-0021, List of invalid op. data for comm. ph. 2**. The invalid parameters must be rewritten so they are correct.

See also the functional description: "S-0-0127, C100 Communication phase 3 transition check"

C101 - Attributes

H1 Display : C1/01

Diag. mess.: **DE** C101 Kommunikations-Parameter unvollständig (S-0-0021)
EN C101 Invalid communication parameter (S-0-0021)
FR C101 Paramètres de communication invalides (S-0-0021)
ES C101 Parámetro de comunicación incompleto (S-0-0021)
IT C101 Parametro di Comunicazione invalido (S-0-0021)

Mess. no.: C101 (hex)

Class: Command

C102 Limit error communication parameter (S-0-0021)

Cause:

Communications parameters, which are needed to operate the drive in communication phase 3, are outside their limit values.

Remedy:

A list of the invalid parameters can be seen in parameter **S-0-0021, List of invalid op. data for comm. ph. 2**. The invalid parameters must be rewritten with values **between** the respective **min. and the max. value** to be correct.

See also the functional description: "S-0-0127, C100 Communication phase 3 transition check".

C102 - Attributes

H1 Display :		C1/02
Diag. mess.:	**DE**	C102 Kommunikations-Parameter Grenzwertfehler (S-0-0021)
	EN	C102 Limit error communication parameter (S-0-0021)
	FR	C102 Erreur valeur limite paramètres de com. (S-0-0021)
	ES	C102 Error límite en parámetro de comunicación (S-0-0021)
	IT	C102 Limite nel Parametro di Comunicazione (S-0-0021)
Mess. no.:		C102 (hex)
Class:		Command

C104 Config. IDN for MDT not configurable

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. Parameters which are missing in **S-0-0188, List of configurable data in MDT** are kept in **S-0-0024**, **Configuration list for the master data telegram**.

Remedy:

You must either set a priority telegram (Telegram type = 0..6) or provide **S-0-0024, Config. list of master data telegram** with parameters. These parameters are also contained in **S-0-0188, List of configurable data in the MDT**.

See also the functional description: "Configuration of Telegram Contents"

C104 - Attributes

H1 Display :		C1/04
Diag. mess.:	**DE**	C104 Konfig. Identnummern für MDT nicht konfigurierbar
	EN	C104 Config. IDN for MDT not configurable
	FR	C104 config. IDN pour MDT non configurable
	ES	C104 Nº ident. de configuración para MDT no configurable
	IT	C104 IDN per MDT non configurabile
Mess. no.:		C104 (hex)
Class:		Command

C105 Configurated length > max. length for MDT

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. The length of the configured record in MDT, which is determined by **S-0-0024, Configurations list of the master data telegram**, exceeds the maximum permissible length **S-0-0186, Length of the configurable data record in the MDT.**

Remedy:

You must either set a priority telegram in **S-0-0015, Telegram type parameter** (telegram type = 0..6) or reduce the number of configurable parameters in MDT.

See also the functional description: "Configuration of Telegram Contents"

C105 - Attributes

H1 Display :		C1/05
Diag. mess.:	**DE**	C105 Maximallänge für MDT überschritten
	EN	C105 Configurated length > max. length for MDT
	FR	C105 Longueur configurée > longueur. max. du MDT
	ES	C105 Superada la longitud máx. para MDT
	IT	C105 Lung. configurata > Lung. mass. per MDT
Mess. no.:		C105 (hex)
Class:		Command

C106 Config. IDN for AT not configurable

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. Parameters which are not contained in **S-0-0187, List of configurable data in AT** can be seen in **S-0-0016, Custom amplifier telegram configuration list**.

Remedy:

You must either set a priority telegram in parameter **S-0-0015, Telegram type parameter** (telegram type = 0..6) or you must provide **S-0-0016, Custom amplifier telegram configuration list** with parameters that are contained in **S-0-0187, List of configurable data in the AT.**

See also the functional description: "Configuration of Telegram Contents"

C106 - Attributes

H1 Display :		C1/06
Diag. mess.:	**DE**	C106 Konfig. Identnummern für AT nicht konfigurierbar
	EN	C106 Config. IDN for AT not configurable
	FR	C106 config. IDN pour AT non configurable
	ES	C106 Nº ident. de config. para AT no configurable
	IT	C106 IDN per AT non configurabile
Mess. no.:		C106 (hex)
Class:		Command

C107 Configurated length > max. length for AT

Cause:

Message frame type 7 has been selected in **S-0-0015, Telegram Type Parameter**. The length of the configured data record in the AT, that is defined via **S-0-0016, Custom amplifier telegram configuration list**, exceeds the maximum permissible **S-0-0185, Length of the configurable data record in the AT**.

Remedy:

Either select the priority message frame via **S-0-0015, Telegram Type Parameter** (message frame type = 0...6) or reduce the number of configured parameters in the AT (**S-0-0016**).

See also the functional description: "Configuration of Telegram Contents"

C107 - Attributes

H1 Display :		C1/07
Diag. mess.:	**DE**	C107 Maximallänge für AT überschritten
	EN	C107 Configurated length > max. length for AT
	FR	C107 long. configurée > long. max de l' AT
	ES	C107 Superada la longitud máxima para AT
	IT	C107 Lung. config. > Lung. mass. per AT
Mess. no.:		C107 (hex)
Class:		Command

C108 Time slot parameter > Sercos cycle time

Cause:

One of the time slot parameters:

- **S-0-0006, AT transmission starting time (T1)**
- **S-0-0089, MDT transmission starting time (T2)**
- **S-0-0007, Feedback acquisition starting time (T4)**
- **S-0-0008, Command valid time (T3)**

exceeds **S-0-0002, SERCOS Cycle time (Tscyc).**

Remedy:

Correct the appropriate parameter(s). These times are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C108 - Attributes

H1 Display :		C1/08
Diag. mess.:	**DE**	C108 Zeitschlitzparameter > Sercos-Zykluszeit
	EN	C108 Time slot parameter > Sercos cycle time
	FR	C108 Time Slot Parameter > Sercos Cycle Time
	ES	C108 Parámetro de ranura temporal > Tiempo ciclo Sercos
	IT	C108 Parametro Slot Time > Tempo Ciclo Sercos
Mess. no.:		C108 (hex)
Class:		Command

C109 Position of data record in MDT (S-0-0009) even

Cause:

Parameter **S-0-0009, Beginning address in master data telegram** contains an even value. This is not permitted.

Remedy:

Parameter **S-0-0009, Beginning address in master data telegram** must be set to an odd value. These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C109 - Attributes

H1 Display :		C1/09
Diag. mess.:	**DE**	C109 Anfangsadresse MDT (S-0-0009) gerade
	EN	C109 Position of data record in MDT (S-0-0009) even
	FR	C109 Adresse début du MDT (S-0-0009) paire
	ES	C109 Dirección inicial MDT (S-0-0009) plano
	IT	C109 Posizione del Data Record in MDT S-0-0009 pari
Mess. no.:		C109 (hex)
Class:		Command

C110 Length of MDT (S-0-0010) odd

Cause:

Parameter **S-0-0010, Length of master data telegram** contains an odd value. This is not permitted.

Remedy:

Parameter **S-0-0010, Length of master data telegram** must be set to an even value. These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C110 - Attributes

H1 Display :		C1/10
Diag. mess.:	**DE**	C110 Länge MDT (S-0-0010) ungerade
	EN	C110 Length of MDT (S-0-0010) odd
	FR	C110 Longueur du MDT (S-0-0010) impaire
	ES	C110 Longitud MDT (S-0-0010) irregular
	IT	C110 Lunghezza di MDT (S-0-0010) dispari
Mess. no.:		C110 (hex)
Class:		Command

C111 ID9 + Record length - 1 > length MDT (S-0-0010)

Cause:

Parameter(s) are set incorrectly for **S-0-0009, Beginning address in master data telegram** and **S-0-0010, Length of master data telegram**. The length of the record in MDT for the drive plus the starting address in MDT is greater than the total length of the MDT.

Remedy:

The parameters for **S-0-0009, Beginning address in master data telegram** and **S-0-0010, Length of master data telegram** must be corrected. Those parameters are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C111 - Attributes

H1 Display :		C1/11
Diag. mess.:	**DE**	C111 ID9 + Datensatzlänge - 1 > Länge MDT (S-0-0010)
	EN	C111 ID9 + Record length - 1 > length MDT (S-0-0010)
	FR	C111 ID9 + long. bloc données - 1 > Long. MDT (S-0-0010)
	ES	C111 ID9 + Longitud bloque datos - 1 > Long. MDT (S-0-0010)
	IT	C111 ID9 + Lung. Record - 1 > Lung. MDT (S-0-0010)
Mess. no.:		C111 (hex)
Class:		Command

C112 TNcyc (S-0-0001) or TScyc (S-0-0002) error

Cause:

Only 500 us or even multiples of 1ms are permitted as valid values for **S-0-0001, NC Cycle time (TNcyc)** and **S-0-0002, SERCOS Cycle time (Tscyc)**. Here, this is not the case.

Remedy:

S-0-0001, NC Cycle time (TNcyc) and **S-0-0002, SERCOS Cycle time (Tscyc)** must be corrected. These parameters are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C112 - Attributes

H1 Display :		C1/12
Diag. mess.:	**DE**	C112 TNcyc (S-0-0001) oder TScyc (S-0-0002) fehlerhaft
	EN	C112 TNcyc (S-0-0001) or TScyc (S-0-0002) error
	FR	C112 Erreur TNcyc (S-0-0001) ou TScyc (S-0-0002)
	ES	C112 Error en TNcyc (S-0-0001) o TScyc (S-0-0002)
	IT	C112 Errore in TNCyc S-0-0001 o in TSync S-0-0002
Mess. no.:		C112 (hex)
Class:		Command

C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) error

Cause:

The value of **S-0-0001, NC Cycle time (TNcyc)** can only be equal to or be a multiple of **S-0-0002, SERCOS Cycle time (Tscyc)**. Here this is not the case.

Remedy:

S-0-0001, NC Cycle time (Tncyc) and **S-0-0002, SERCOS Cycle time (Tscyc)** must be corrected. These parameters are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C113 - Attributes

H1 Display :		C1/13
Diag. mess.:	**DE**	C113 Verhält. TNcyc (S-0-0001) zu TScyc (S-0-0002) Fehler
	EN	C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) error
	FR	C113 Erreur relation TNcyc (S-0-0001) p/r TScyc (S-0-0002)
	ES	C113 Error en relación TNcyc (S-0-0001) a TScyc (S-0-0002)
	IT	C113 Errore Rel. tra TNCyc S-0-0001 e TScyc S-0-0002
Mess. no.:		C113 (hex)
Class:		Command

C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)

Cause:

The maximum permissible value for **S-0-0007, Feedback acquisition starting time (T4)** is

S-0-0002, SERCOS Cycle time (Tscyc) -
S-0-0005, Minimum feedback acquisition time(T4min)

The value for **S-0-0007, Feedback acquisition starting time (T4)** is incorrect.

Remedy:

Correct S-0-0007, Feedback acquisition starting time (T4). These parameters are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C114 - Attributes

H1 Display :		C1/14
Diag. mess.:	**DE**	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	EN	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	FR	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	ES	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	IT	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
Mess. no.:		C114 (hex)
Class:		Command

C115 T2 too small

Cause:

The value set for **S-0-0089, MDT Transmit starting time (T2)** is incorrect. The drive cannot work with this value.

Remedy:

****Correct S-0-0089, MDT Transmit starting time (T2)**.

These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

C115 - Attributes

H1 Display :		C1/15
Diag. mess.:	**DE**	C115 T2 zu klein
	EN	C115 T2 too small
	FR	C115 T2 trop petit
	ES	C115 T2 pequeño
	IT	C115 T2 troppo piccolo
Mess. no.:		C115 (hex)
Class:		Command

C118 Order of MDT configuration wrong

The chronological order of processing the cyclical MDT data in the drive is the same order in which the configurated ident numbers (IDN) are placed in the parameter **S-0-0024, Config. list of the master-data-telegram**.

If both parameters **S-0-0360, MDT Data container A** and **S-0-0368, Addressing for data container A** as well are configured in the MDT, then the processing of the MDT data container is only correct if the addressing has been processed before. To maintain the correct order for the configuration of the MDT, the drive checks in the command S-0-0127, C100 Communication phase 3 transition check, whether the **IDN S-0-0368** is configured **before S-0-0360**.

If this is not the case, the drive generates the command error **C118 Order of MDT configuration wrong**.

C118 - Attributes

H1 Display :		C1/18
Diag. mess.:	**DE**	C118 Reihenfolge MDT-Konfiguration fehlerhaft
	EN	C118 Order of MDT configuration wrong
	FR	C118 Ordre de configuration MDT mauvais
	ES	C118 Orden configuración MDT falso
	IT	C118 Ordo della Config. MDT sbagliato
Mess. no.:		C118 (hex)
Class:		Command

C200 Communication phase 4 transition check

Meaning:

The command **S-0-0128, C200 Communication phase 4 transition check** has been activated.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C200 - Attributes

H1 Display :		C2
Diag. mess.:	**DE**	C200 Umschaltvorbereitung Phase 3 nach 4
	EN	C200 Communication phase 4 transition check
	FR	C200 Préparation commutation phase 3 vers 4
	ES	C200 Comprobación comunicación fase 3 a 4
	IT	C200 Fase di Comunicazione 4 Test di Transizione
Mess. no.:		C200 (hex)

C201 Invalid parameter(s) (->S-0-0022)

Cause:

Parameters which will be necessary to operate the drive in communications phase 4 are invalid. The invalid parameters can be seen in **S-0-0022, IDN list of invalid op. data for comm. ph. 3**.

Remedy:

The parameters of **S-0-0022, IDN list of invalid op. data for comm. ph. 3** must be rewritten so they are correct.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C201 - Attributes

H1 Display :		C2/01
Diag. mess.:	**DE**	C201 Parametersatz unvollständig (->S-0-0022)
	EN	C201 Invalid parameter(s) (->S-0-0022)
	FR	C201 Paramètre(s) invalide(s) (->S-0-0022)
	ES	C201 Bloque de parámetro inválido (->S-0-0022)
	IT	C201 Parametro invalido (->S-0-0022)
Mess. no.:		C201 (hex)
Class:		Command

C202 Parameter limit error (->S-0-0022)

Cause:

Parameters which are necessary to operate the drive in communications phase 4 are outside of their minimum or maximum input values, or the entered value can't be processed (for bit bars). The incorrect parameters are listed in **S-0-0022, IDN list of invalid op. data for comm. ph. 3**.

Remedy:

The parameters of **S-0-0022, IDN list of invalid op. data for comm. ph. 3** must be rewritten with correct values.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C202 - Attributes

H1 Display :		C2/02
Diag. mess.:	**DE**	C202 Parameter Grenzwertfehler (->S-0-0022)
	EN	C202 Parameter limit error (->S-0-0022)
	FR	C202 Erreur valeur limite paramètres (->S-0-0022)
	ES	C202 Error límite en parámetro (->S-0-0022)
	IT	C202 Errore Limite Parametro (->S-0-0022)
Mess. no.:		C202 (hex)
Class:		Command

C203 Parameter calculation error (->S-0-0022)

Cause:

Parameters that are required for phase-4 operation (operating mode) cannot be processed in that way. The incorrect parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

Remedy:

Write correct values to the parameters in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C203 - Attributes

H1 Display :		C2/03
Diag. mess.:	**DE**	C203 Parameter Umrechnungsfehler (->S-0-0022)
	EN	C203 Parameter calculation error (->S-0-0022)
	FR	C203 Erreur de calcul de paramètre (->S-0-0022)
	ES	C203 Error de cálculo en parámetro (->S-0-0022)
	IT	C203 Errore di Calcolo nel Parametro (->S-0-0022)
Mess. no.:		C203 (hex)
Class:		Command

C204 Motor type P-0-4014 incorrect

An MHD-, MKD or MKE motor (value 1 or 5) is entered into parameter **P-0-4014, Motor type**. The appropriate abbreviation "MHD", "MKD", or "MKE" however, was not found in parameter **S-0-0141, Motor type** in the motor feedback data memory.

Cause:

1. Incorrect parameter set for type of motor.
2. The motor feedback memory cannot be read.

Remedy:

For 1. Enter the type of motor used in parameter **P-0-4014, Motor type**

For 2. Check feedback connection.
If feedback is defective, exchange motor.

See also the functional description: "Automatic Setting of the Motor Type for Motors with Feedback Memory".

C204 - Attributes

H1 Display : C2/04

Diag. mess.: **DE** C204 Motorart P-0-4014 fehlerhaft
EN C204 Motor type P-0-4014 incorrect
FR C204 Type de moteur P-0-4014 faux
ES C204 Tipo de motor P-0-4014 incorrecto
IT C204 Tipo di Motore P-0-4014 falso

Mess. no.: C204 (hex)

Class: Command

C210 Feedback 2 required (->S-0-0022)

Cause:

Values that require an optional encoder have been entered in **S-0-0147, Homing parameter** or in the **S-0-0032...35, Mode of Operation** parameters. However, 0 (not available) has been entered in the **P-0-0075, Interface Feedback 2, optional** parameter.

The ident number of the parameter that requires the optional encoder is entered in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

Remedy:

Modify **S-0-0147, Homing parameter** or the **S-0-0032...35, Mode of Operation** parameters to utilization of the motor encoder instead of optional encoder.

Set **P-0-0075, Interface Feedback 2, optional** to a value different from 0 to activate the optional measuring system.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C210 - Attributes

H1 Display : C2/10

Diag. mess.: **DE** C210 Geber 2 erforderlich (->S-0-0022)
EN C210 Feedback 2 required (->S-0-0022)
FR C210 Feedback 2 nécessaire (->S-0-0022)
ES C210 Requerida retroalimentación 2 (->S-0-0022)
IT C210 Richiesto Feedback 2 (->S-0-0022)

Mess. no.: C210 (hex)

Class: Command

C211 Invalid feedback data (->S-0-0022)

Invalid data has been encountered when the parameters stored in the motor feedback were read, or an error has occurred when the data was read.

Causes:

1. Motor feedback cable not connected or defective
2. Motor feedback defective
3. Drive controller defective

Remedy:

Ref. 1. Check motor feedback cable; connect both sides

Ref. 2. Replace motor

Ref. 3. Replace amplifier

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C211 - Attributes

H1 Display :		C2/11
Diag. mess.:	**DE**	C211 Ungültige Feedbackdaten (->S-0-0022)
	EN	C211 Invalid feedback data (->S-0-0022)
	FR	C211 Données feedback incorrectes (->S-0-0022)
	ES	C211 Datos de retroalimentación inválidos (->S-0-0022)
	IT	C211 Dati di Feedback invalidi (->S-0-0022)
Mess. no.:		C211 (hex)
Class:		Command

C212 Invalid amplifier data (->S-0-0022)

During drive initialization, the operating software fetches data from an EEPROM in the drive controller. This error message is generated after that access has failed.

Causes:

Defective hardware in the drive controller.

Remedy:

Replace drive controller.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C212 - Attributes

H1 Display :		C2/12
Diag. mess.:	**DE**	C212 Ungültige Verstärkerdaten (->S-0-0022)
	EN	C212 Invalid amplifier data (->S-0-0022)
	FR	C212 Données variateur incorrectes (->S-0-0022)
	ES	C212 Datos de amplificador inválidos (->S-0-0022)
	IT	C212 Dati Azionamento invalidi (->S-0-0022)
Mess. no.:		C212 (hex)
Class:		Command

C213 Position data scaling error

Cause:

The scaling parameters for position data permit the position data display format to be selected. The drive-internal position data format depends on the employed motor encoder and the encoder resolution. The factor used for converting the position data from the drive-internal format into the display format or vice versa is outside the processable range, because either

- linear motor and rotary position scaling with motor reference, or
- rotary motor and linear position scaling with motor reference, or
- linear motor with modulo scaling has been selected; or
- the determined factor used for converting the position data from the display format to the internal format, and vice versa, cannot be represented.

Remedy:

Checking and correcting the relevant parameters, such as

- **S-0-0076, Position data scaling type**
- **S-0-0077, Linear position data scaling factor**
- **S-0-0078, Linear position data scaling exponent**
- **S-0-0079, Rotational position resolution**
- **S-0-0116, Resolution of motor feedback**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **P-0-0074, Interface feedback 1**
- **S-0-0277, Position feedback 1 type parameter**

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C213 - Attributes

H1 Display :		C2/13
Diag. mess.:	**DE**	C213 Wichtung der Lagedaten fehlerhaft
	EN	C213 Position data scaling error
	FR	C213 Erreur calibrage données de position
	ES	C213 Error de escala de datos de posición
	IT	C213 Errore Taratura Dati Posizione
Mess. no.:		C213 (hex)
Class:		Command

C214 Velocity data scaling error

Cause:

The scaling parameters for velocity data permit the velocity data display format to be selected. The drive-internal velocity data format depends on the employed motor encoder and the encoder resolution. The factor used for converting the velocity data from the drive-internal format into the display format or vice versa is outside the processable range.

Remedy:

Checking and correcting the relevant parameters, such as

- **S-0-0044, Velocity data scaling type**
- **S-0-0045, Velocity data scaling factor**
- **S-0-0046, Velocity data scaling exponent**
- **S-0-0116, Resolution of motor feedback**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **P-0-0074, Interface feedback 1**
- **S-0-0277, Position feedback 1 type parameter**

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C214 - Attributes

H1 Display :		C2/14
Diag. mess.:	**DE**	C214 Wichtung der Geschwindigkeitsdaten fehlerhaft
	EN	C214 Velocity data scaling error
	FR	C214 Erreur calibrage données de vitesse
	ES	C214 Error de escala de datos de velocidad
	IT	C214 Errore Taratura Dati di Velocità
Mess. no.:		C214 (hex)
Class:		Command

C215 Acceleration data scaling error

Cause:

The display format of the acceleration data can be set using acceleration scaling parameters. The drive-controlled format of the acceleration data is dependent on what motor encoder and encoder resolution are used. The factor for converting acceleration data from internal drive format to display format (or vice-versa) is outside the workable range.

Remedy:

Check and set the relevant parameters correctly as follows:

- **S-0-0160, Acceleration data scaling type**
- **S-0-0161, Acceleration data scaling factor**
- **S-0-0162, Acceleration data scaling exponent**
- **S-0-0116, Resolution of motor feedback**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **P-0-0074, Interface feedback 1**
- **S-0-0277, Position feedback 1 type parameter**

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C215 - Attributes

H1 Display : C2/15

Diag. mess.:
DE C215 Wichtung der Beschleunigungsdaten fehlerhaft
EN C215 Acceleration data scaling error
FR C215 Erreur calibrage données d'accélération
ES C215 Error de escala de datos de aceleración
IT C215 Errore Taratura Dati Accelerazione

Mess. no.: C215 (hex)

Class: Command

C216 Torque/force data scaling error

Cause:

The display format of the torque/force data can be set using torque/force scaling parameters. The factor for converting torque data from drive-controlled format to display format (or vice-versa) is outside the workable area.

Remedy:

Check and set the relevant parameters correctly as follows:

- **S-0-0086, Torque/force data scaling type**
- **S-0-0093, Torque/force data scaling factor**
- **S-0-0094, Torque/force data scaling exponent**
- **S-0-0110, Amplifier peak current**
- **S-0-0111, Motor current at standstill**

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C216 - Attributes

H1 Display : C2/16

Diag. mess.:
DE C216 Wichtung der Drehmoment/Kraftdaten fehlerhaft
EN C216 Torque/force data scaling error
FR C216 Erreur calibrage données de couple/force
ES C216 Error de escala de datos de par/fuerza
IT C216 Errore Taratura Dati Coppia/Forza

Mess. no.: C216 (hex)

Class: Command

C217 Feedback1 data reading error

All MKD und MHD motors have a data memory in the feedback unit. From there, settings for the encoder are read.

Cause:

During reading of the values from the feedback, an error has occurred.

Remedy:

Check feedback cable.

Change motor.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C217 - Attributes

H1 Display :		C2/17
Diag. mess.:	**DE**	C217 Fehler beim Lesen der Daten Geber 1
	EN	C217 Feedback1 data reading error
	FR	C217 Erreur lecture données feedback 1
	ES	C217 Error en lectura de datos encoder 1
	IT	C217 Errore nella Lettura dei Dati di Feedback 1
Mess. no.:		C217 (hex)
Class:		Command

C218 Feedback 2 data reading error

The initializatin of the measuring systems is done in the command **S-0-0128, C200 Communication phase 4 transition check**. If the measuring system to initialize has an intrinsic data memory, this memory is read.

The error C218 Feedback 2 data reading error is generated, if an additional optional encoder (encoder 2) is present and being evaluated (**P-0-0075 Feedback 2 type** other than 0) and if an error is discovered while reading the data.

Measuring systems with intrinsic data memory are :

- DSF/HSF/LSF and resolver, as well as
- measuring systems with Endat interface (from Heidenhain)

Cause:

1. Defective measurement system cable
2. Defective measurement system

Remedy:

For 1. Check the measurement system cable.

For 2. Exchange the measurement system.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C218 - Attributes

H1 Display :		C2/18
Diag. mess.:	**DE**	C218 Fehler beim Lesen der Daten Geber 2
	EN	C218 Feedback 2 data reading error
	FR	C218 Erreur lecture données feedback 2
	ES	C218 Error en lectura de datos de retroalimentación 2
	IT	C218 Errore nella Lettura dati Feedback 2
Mess. no.:		C218 (hex)
Class:		Command

C220 Feedback 1 initializing error

A number of tests are performed when the motor encoder is initialized. An error was detected during this process. This error may be:

- Error while reading the angle rectification data
- Error while copying the angle rectification data
- Interruption of communication with the encoder
- Assembly error with the position of an initialization track
- Error while reading the analog signal of an initialization track
- Error in the pointer length of the analog signal of an initialization track
- Invalid offset between the high and low resolution track
- Error in the measuring system micro-controller

Cause:

1. Defective motor feedback **cable**
2. Defective motor **feedback**
3. Defective measurement system **interface**

Remedy:

For 1. Check the motor feedback cable.

For 2. Exchange the motor.

For 3. Exchange the measuring system interface, if it is a module, or the complete drive controller.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C220 - Attributes

H1 Display :		C2/20
Diag. mess.:	**DE**	C220 Fehler bei Initialisierung Geber 1
	EN	C220 Feedback 1 initializing error
	FR	C220 Erreur initialisation feedback 1
	ES	C220 Error al inicializar encoder 1
	IT	C220 Errore nell' Inizializz. del Feedback 1
Mess. no.:		C220 (hex)
Class:		Command

C221 Feedback 2 initializing error

Several checks are performed during the initialization of an optional encoder. An error has been detected during this process. This error may be:

- Error while reading the angle rectification data
- Error while copying the angle rectification data
- Interruption of communication with the encoder
- Assembly error with the position of an initialization track
- Error while reading the analog signal of an initialization track
- Error in the pointer length of the analog signal of an initialization track
- Invalid offset between the high and low resolution track
- Error in the measuring system micro-controller
- With DAG 1.2: external 24V set for SSI interface

Cause:

1. External encoder cable defective.
2. Defective feedback.
3. Defective measurement system interface.

Remedy:

For 1. Check the optional feedback cable.

For 2. Exchange feedback.

For 3. Exchange the measuring system interface (module).

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C221 - Attributes

H1 Display : C2/21

Diag. mess.: **DE** C221 Fehler bei Initialisierung Geber 2

EN C221 Feedback 2 initializing error

FR C221 Erreur initialisation feedback 2

ES C221 Error al inicializar retroalim. 2

IT C221 Errore nell' Inizializz. del Feedback 2

Mess. no.: C221 (hex)

Class: Command

C223 Input value for max. range too high

Cause:

An internal position resolution has been selected via the **S-0-0278, Maximum travel range** parameter that no longer guarantees a correct commutation of the motor.

Remedy:

Select a smaller value for the **S-0-0278, Maximum travel range** parameter.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C223 - Attributes

H1 Display : C2/23

Diag. mess.: **DE** C223 Eingabewert max. Verfahrbereich zu groß

EN C223 Input value for max. range too high

FR C223 Entrée excessive pour champs de course

ES C223 Valor de entrada máx. campo desplazamiento excesivo

IT C223 Valore troppo alta per Campo mass.

Mess. no.: C223 (hex)

Class: Command

C227 Modulo range error

Cause:

The selected modulo value is greater than half the numerical position range of the drive.

Remedy:

Decrease the modulo value.

See also the functional description: "Modulo Processing-Limiting Conditions"

C227 - Attributes

H1 Display :		C2/27
Diag. mess.:	**DE**	C227 Modulo-Bereichs-Fehler
	EN	C227 Modulo range error
	FR	C227 Erreur plage module
	ES	C227 Error de campo de módulo
	IT	C227 Errore nel Range del Modulo
Mess. no.:		C227 (hex)
Class:		Command

C234 Encoder combination not possible

Cause:

The encoder interface that has been selected in the **P-0-0075, Interface Feedback 2, optional** parameter cannot be supported by the drive; it has already been allocated to the motor encoder.

Remedy:

Select another **optional** encoder.

See also the functional description: "Determining the Encoder Interface of the Optional Encoder"

C234 - Attributes

H1 Display :		C2/34
Diag. mess.:	**DE**	C234 Geberkombination nicht möglich
	EN	C234 Encoder combination not possible
	FR	C234 Combinaison des capteurs impossible
	ES	C234 Combinación de encoderes imposible
	IT	C234 Combinazione Encoder non possibile
Mess. no.:		C234 (hex)
Class:		Command

C235 Load-side motor encoder with inductance motor only

Cause:

The functionality of the optional encoder can be defined in the **P-0-0185, Function of opt. encoder** parameter. If 'load-side motor encoder' has been selected as the function of the optional encoder, that function will only be supported for asynchronous motors.

Remedy:

Set the **P-0-4014, Motor type** parameter according to the employed motor type.

Check the **P-0-0185, Function of opt. encoder** parameter.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C235 - Attributes

H1 Display :		C2/35
Diag. mess.:	**DE**	C235 Lastseitiger Motorgeber nur bei Asynchronmotor
	EN	C235 Load-side motor encoder with inductance motor only
	FR	C235 Codeur moteur coté charge seulement pour moteur async.
	ES	C235 Encoder de motor lado de carga sólo con motor asíncrono
	IT	C235 Encoder Lato Carica solo con Motore asincrono
Mess. no.:		C235 (hex)
Class:		Command

C236 Feedback 1 required (P-0-0074)

Cause:

A motor encoder is not required (P-0-0074 = 0) if a load-sided motor encoder has been selected via the **P-0-0185, Function of opt. encoder** parameter. However, **S-0-0147, Homing parameter** or the **S-0-0032...35, Mode of Operation** parameters contain values that require a motor encoder.

Remedy:

Change **S-0-0147, Homing parameter** or the **S-0-0032...35, Mode of Operation** parameters such that they are suitable for using an optional encoder.

Enter a value ≠ 0 in the **P-0-0074, Interface feedback 1** parameter to activate the motor encoder.

See also the functional description "S-0-0128, C200 Communication phase 4 transition check".

C236 - Attributes

H1 Display :		C2/36
Diag. mess.:	**DE**	C236 Geber 1 erforderlich (P-0-0074)
	EN	C236 Feedback 1 required (P-0-0074)
	FR	C236 Feedback 1 nécessaire (P-0-0074)
	ES	C236 Requerida encoder 1 (P-0-0074)
	IT	C236 Richiesto Feedback 1 (P-0-0074)
Mess. no.:		C236 (hex)
Class:		Command

C300 Set absolute measuring

Command **P-0-0012, C300 Command 'Set absolute measurement'** was activated by the control system in use.

See also the functional description: "Set Absolute Measuring"

C300 - Attributes

H1 Display : C3

Diag. mess.: **DE** C300 Absolutmaß setzen
EN C300 Set absolute measuring
FR C300 Calage origine absolue
ES C300 Ajustar medición absoluta
IT C300 Set Misura Assoluta

Mess. no.: C300 (hex)

C302 Absolute measuring system not installed

Command **P-0-0012, C300 Command 'Set absolute measurement'** was started without an absolute measuring system being present.

The command cannot be processed because no absolute measuring system is available.

Cause:

1. The command should not have been activated.
2. The contacted motor or the external measurement system was not executed as an absolute encoder.

Remedy:

For 1. Stop execution of the command.

For 2. Equip the motor or external measurement system with an absolute encoder function.

See also the functional description: "Set Absolute Measuring"

C302 - Attributes

H1 Display : C3/02

Diag. mess.: **DE** C302 Kein absolutes Meßsystem vorhanden
EN C302 Absolute measuring system not installed
FR C302 Système de mesure absolue non disponible
ES C302 No existe sistema de medición absoluta
IT C302 Sistema di Misura assoluta non installato

Mess. no.: C302 (hex)

Class: Command

C400 Command: switch to parameter mode

The command for transition into parameter mode. Before editing parameters that can be edited only in parameter mode, this command must be processed.

See also the functional description: "Parametrization Mode - Operating Mode"

C400 - Attributes

H1 Display : C4

Diag. mess.: **DE** C400 Umschalten auf Phase 2
EN C400 Command: switch to parameter mode
FR C400 Passage en phase 2
ES C400 Conmutación a fase 2
IT C400 Comando: commutazione in Modo Parametri

Mess. no.: C400 (hex)

C401 Drive active, switching not allowed

Cause:

The command **C400 Command: Switch to parameter mode** has been started, although the drive enable is on.

Remedy:

End the command and turn off the drive enable, then the command can be started again.

See also the functional description: "Parametrization Mode - Operating Mode"

C401 - Attributes

H1 Display :		C4/01
Diag. mess.:	**DE**	C401 Antrieb aktiv, Umschalten nicht zulässig
	EN	C401 Drive active, switching not allowed
	FR	C401 Entraînement validé, passage impossible
	ES	C401 Accionamiento activo, conmutación no permitida
	IT	C401 Azionamento abilitato, Commut. non consentita
Mess. no.:		C401 (hex)
Class:		Command

C402 Only allowed without master

Cause:

The command **P-0-4023, C400 Communication phase 2 transition** was started via the serial interface. The command is not executed and terminated with this error message because the active SERCOS interface is of a higher priority and would be disturbed.

The command can only be done if the SERCOS interface is inactive (i.e. there are no signals applied to the receiver of the SERCOS interface).

Remedy:

Perform phase selection via SERCOS interface or de-activate SERCOS interface before the command is started.

C402 - Attributes

H1 Display :		C4/02
Diag. mess.:	**DE**	C402 Nur ohne Master zulässig
	EN	C402 Only allowed without master
	FR	C402 Autorisé seulement sans maître
	ES	C402 Sólo permitido sin master
	IT	C402 Permesso solo senza Master
Mess. no.:		C402 (hex)
Class:		Command

C500 Reset class 1 diagnostic, error reset

The command for clearing errors, **S-0-0099, C500 Reset class 1 diagnostic** was activated by the control system in use. All drive internal errors are cleared. But before, the cause of the error must have been cleared.

See also the functional description: "Clearing Errors"

C500 - Attributes

H1 Display : C5

Diag. mess.: **DE** C500 Reset Zustandsklasse 1, Fehler rücksetzen
EN C500 Reset class 1 diagnostic, error reset
FR C500 RAZ classe d'état 1
ES C500 Reset diagnóstico clase 1, reset de error
IT C500 Cancellazione Errori Classe 1

Mess. no.: C500 (hex)

C600 Drive controlled homing procedure command

Command **S-0-0148, C600 Drive controlled homing procedure command** has been activated by the control system in use.

See also the functional description: "Drive-Controlled Homing"

C600 - Attributes

H1 Display : C6

Diag. mess.: **DE** C600 Kommando Antriebsgeführtes Referenzieren
EN C600 Drive controlled homing procedure command
FR C600 Commande d'origine sous contrôle entraînement
ES C600 Comando referenciado controlado por accionamiento
IT C600 Procedura di Azzeramento Asse

Mess. no.: C600 (hex)

C601 Homing only possible with drive enable

Cause:

The controller enabling signal was not active when the program was started. This is not permitted.

Remedy:

1. Switch on the controller enable signal.
2. Start the command again.

See also the functional description: "Functions of the Control During Drive-Controlled Homing"

C601 - Attributes

H1 Display : C6/01

Diag. mess.: **DE** C601 Referenzieren nur mit Reglerfreigabe möglich
EN C601 Homing only possible with drive enable
FR C601 Prise d'origine seulement avec entraînement validé
ES C601 Referenciado no posible sin desbloque de accionamiento
IT C601 Azzeramento solo possibile con Azion. Abilit.

Mess. no.: C601 (hex)

Class: Command

C602 Distance home switch - reference mark erroneous

Cause:

The evaluation of the homing switch has been activated. The distance between the positive homing switch edge and the reference mark that shall be interpreted is outside the valid range.

Remedy:

Read the value from the **S-0-0298, Reference cam shift by ...** parameter and enter it in the **S-0-0299, Home switch offset** parameter.

See also the functional description: "Connection of the Home switch"

C602 - Attributes

H1 Display :		C6/02
Diag. mess.:	**DE**	C602 Abstand Referenzschalter-Referenzmarke fehlerhaft
	EN	C602 Distance home switch - reference mark erroneous
	FR	C602 Erreur distance came origine top 0
	ES	C602 Error Distancia marca refer. de interr. puesta a cero
	IT	C602 Distanza errata tra camma di zero e Imp. Encod.
Mess. no.:		C602 (hex)
Class:		Command

C604 Homing of absolute encoder not possible

Cause:

If, with absolute encoder, the homing command was called without having done the command **P-0-0012, Set absolute measuring** before, the homing command is cancelled with this error.

If the encoder had been referenced with the "**Set absolute measuring**“, then the homing command would give you a possibility to trigger a positioning move to the reference point.

Remedy:

Home the absolute encoder with the command "**Set absolute measuring**“.

See also the functional description: "Possible Error Messages During Drive-Controlled Homing".

C604 - Attributes

H1 Display :		C6/04
Diag. mess.:	**DE**	C604 Referenzieren mit Absolutmaßgeber nicht möglich
	EN	C604 Homing of absolute encoder not possible
	FR	C604 Prise d'origine avec codeur absolu impossible
	ES	C604 Referenciado de encoder absoluto no posible
	IT	C604 Azzer. dell' Encoder Assoluto non permesso
Mess. no.:		C604 (hex)
Class:		Command

C700 Basic load

With motors of the MHD, MKD and MKE series, the controller parameters for the connected motor that are stored in the controller are set to their default values by activating the controller parameters that are stored in the motor feedback. The drive controller issues the C7 message to indicate that the **C700 Basic load** command has been activated via the command parameter **S-0-0262, C700 Command basic load**.

Cause:

The command **C700 Basic load** has been activated.

See also the functional description "Load Default"

C700 - Attributes

H1 Display : C7

Diag. mess.: **DE** C700 Urladen
EN C700 Basic load
FR C700 Chargement initial
ES C700 Carga básica
IT C700 Caricamento iniziale

Mess. no.: C700 (hex)

C702 Default parameters not available

With motors of the MHD, MKD and MKE series, adapting the control loops to the connected digital drive is done by activating the speed controller parameters that are stored in the motor feedback. The drive controller employs the C702 message to signal that the **S-0-0262, C700 Command basic load** command has been activated, but that there is **no data memory** at the connected motor.

Remedy:

Order the parameter sheet of the employed motor from the INDRAMAT Service, and enter the parameters.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C702 - Attributes

H1 Display : C7/02

Diag. mess.: **DE** C702 Keine Defaultparameter vorhanden
EN C702 Default parameters not available
FR C702 Paramètres par défaut non disponibles
ES C702 Parámetros iniciales no disponibles
IT C702 Parametri Standard non disponibili

Mess. no.: C702 (hex)

Class: Command

C703 Default parameters invalid

Cause:

The default parameters are read from the motor feedback data memory. At least one of these parameters is invalid.

Remedy:

Check the connection to the motor feedback. Exchange the motor if necessary.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C703 - Attributes

H1 Display : C7/03

Diag. mess.: **DE** C703 Default-Parameter ungültig
EN C703 Default parameters invalid
FR C703 Paramètres par défaut invalides
ES C703 Parámetro inicial no válido
IT C703 Parametri Standard non validi

Mess. no.: C703 (hex)

Class: Command

C704 Parameters not copyable

Cause:

The default parameters in use are not compatible with this software version.

Remedy:

Please contact Indramat. Explain, which software version, which device and which motor type you have.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C704 - Attributes

H1 Display : C7/04

Diag. mess.: **DE** C704 Parameter nicht kopierbar
EN C704 Parameters not copyable
FR C704 Les paramètres ne peuvent pas être copiés.
ES C704 Parametros no se pueden copiar.
IT C704 Parametri non copiabili

Mess. no.: C704 (hex)

Class: Command

C705 Locked with password

The parameter **S-0-0267, Password** offers the possibility to set a **write protection** for the drive parameters. The diagnostic message **C705 Locked with password** indicates, that the command **C700 Basic Load** has been started, although the drive parameters are protected with the customer password.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C705 - Attributes

H1 Display : C7/05

Diag. mess.: **DE** C705 Verriegelt mit Passwort
EN C705 Locked with password
FR C705 Bloqué avec mot de passe
ES C705 Bloqueado con contraseña
IT C705 Bloccato con parola chiave

Mess. no.: C705 (hex)

Class: Command

C800 Default parameter load

How to start the command:

This command can be started in 2 ways:

1. When "PL" is displayed on the drive controller (appears after a change in firmware version), by pressing the S1 button beneath the display.
2. By starting the **P-0-4094, C8 Default parameter load**

What the command does:

All the **parameters are** cleared and preset with their default (initial) value. Process blocks and control loop settings are **overwritten**, too.

Default parameters:

Default values are stored in the drive for all parameters which figure in the list **S-0-0192, IDN-list of backup operation data**. They define a **basic state** of the drive that permits the drive to be switched "ready for operation" (display "bb“). Mechanical components like gear and load as well as the control loop settings therefore are <u>not</u> taken into consideration.

See also the functional description: "Basic parameter block".

C800 - Attributes

H1 Display :		C8
Diag. mess.:	**DE**	C800 Default-Parameter laden
	EN	C800 Default parameter load
	FR	C800 Chargement des paramètres par défaut
	ES	C800 Cargar parámetros iniciales
	IT	C800 Caricamento Parametri di Default
Mess. no.:		C800 (hex)

C801 Parameter default value erroneous (-> S-0-0021)

Cause:

During the execution of **P-0-4094, C800 Command Base-parameter load,** a default value that has been stored in the drive was recognized as incorrect. The related parameter is entered in the **S-0-0021, IDN-list of invalid op. data for comm. Ph. 2**.

See also the functional description: "Basic parameter block"

C801 - Attributes

H1 Display :		C8/01
Diag. mess.:	**DE**	C801 Parameter-Defaultwert fehlerhaft (-> S-0-0021)
	EN	C801 Parameter default value erroneous (-> S-0-0021)
	FR	C801 Valeur de défaut pour paramètre faux (voir S-0-0021)
	ES	C801 Valor inicial para parámetro falso
	IT	C801 Parametro di Default falso (-> S-0-0021)
Mess. no.:		C801 (hex)
Class:		Command

C802 Locked with password

The parameter **S-0-0267, Password** offers the possibility to set a **write protection** for the drive parameters. The diagnostic message **C705 Locked with password** indicates, that the command **P-0-4094, C800 Command Base-parameter load** has been started, although the drive parameters are protected with the customer password.

See also the functional description: "Basic parameter block"

C802 - Attributes

H1 Display : C8/02

Diag. mess.: **DE** C802 Verriegelt mit Passwort
EN C802 Locked with password
FR C802 Bloqué avec mot de passe
ES C802 Bloqueado con contraseña
IT C802 Bloccato con parola chiave

Mess. no.: C802 (hex)

Class: Command

C900 Position spindle command

The command **S-0-0152, C900 Position spindle command** has been activated via the applied control.

See also the functional descriprion: "Spindle Positioning".

C900 - Attributes

H1 Display : C9

Diag. mess.: **DE** C900 Kommando Spindel positionieren
EN C900 Position spindle command
FR C900 Commande Positionnement de broche
ES C900 Comando posicionar husillo
IT C900 Comando Posizionamento Mandrino

Mess. no.: C900 (hex)

C902 Spindle positioning requires drive enable

Cause:

When starting the **S-0-0152, C900 Position spindle command**, the drive enable was not yet set.

Remedy:

Set the drive enable before starting the command.

C902 - Attributes

H1 Display : C9/02

Diag. mess.: **DE** C902 Spindelpositionieren nur mit Reglerfreigabe möglich
EN C902 Spindle positioning requires drive enable
FR C902 Posit. de broche nécéssite RF
ES C902 Requiere desbloqueo regulador
IT C902 RF scomparso per Posizionamento Mandrino

Mess. no.: C902 (hex)

Class: Command

C905 Positioning with non-init. absolute encoder impossible

When using an absolute encoder as motor or spindle feedback, the command "set absolute measure" must be performed in order to set the position reference between spindle and measurement system.

Cause:

The absolute encoder used as motor or spindle feedback is not in reference with the spindle. The command S-0-0152 Drive controlled spindle positioning cannot be executed, because the measuring system doesn't have a reference position.

Remedy:

- If an absolute encoder is not desired: switch off the absolute encoder evaluation in parameter **S-0-0277, Position feedback 1 type** or **S-0-0115, Position feedback 2 type**.
- Do the **P-0-0012, C300 Command 'Set absolute measurement'**.

See also the functional description: "Drive-Controlled Homing" and "Set Absolute Measuring".

C905 - Attributes

H1 Display :		C9/05
Diag. mess.:	**DE**	C905 Spindelpos. mit nichtinit. Absolutwertgeber unmöglich
	EN	C905 Positioning with non-init. absolute encoder impossible
	FR	C905 Posit. impossible avec codeur abs. non init.
	ES	C905 Posicionamiento con encoder absoluto no inic. imposible
	IT	C905 Posiz. Mandrino solo con Encoder ass. inizializzato
Mess. no.:		C905 (hex)
Class:		Command

C906 Error during search for zero pulse

Cause:

The homing procedure within the spindle positioning has not been executed successfully. The encoder zero pulse has not been found or could not be assigned properly.

Remedy:

- Check the parametrization of spindle positioning, especially the used combination of encoder and reference (home) switch.
- Check the encoder parametrization.
- Check the distance between zero pulse and reference switch.
- Do the drive controlled homing to check the homing procedure.

C906 - Attributes

H1 Display :		C9/06
Diag. mess.:	**DE**	C906 Fehler Nullimpuls-Erfassung
	EN	C906 Error during search for zero pulse
	FR	C906 Erreur en cherchant l'origine
	ES	C906 Error durante búsqueda de punto cero
	IT	C906 Errore nel Azzeramento
Mess. no.:		C906 (hex)
Class:		Command

D300 Command adjust commutation

A correctly adjusted commutation offset is mandatory for the operation of synchronous motors. The "D3“ message indicates that the command has been activated, that is used for determining the commutation offset.

Cause:

The commutation setting command has been activated.

See also the functional description: "Determining the commutation offset"

D300 - Attributes

H1 Display :		d3
Diag. mess.:	**DE**	D300 Kommando Kommutierungseinstellung
	EN	D300 Command adjust commutation
	FR	D300 Commande Justage de commutation
	ES	D300 Conmutación comando
	IT	D300 Comando di commutazione
Mess. no.:		D300 (hex)

D301 Drive not ready for commutation command

Cause with linear motor:

There must not be a controller enable signal when the command is started. However, it must be in communication phase 4 ("bb“ or "Ab“ displayed).

Cause with rotary synchronous motor:

The drive must be in torque control mode when the "D3“ command is started.

This error message is generated if those conditions are not satisfied.

Remedial action with linear motor:

Depending on the motor type, switch off the controller enable signal and start the command again.

Remedial action with rotary synchronous motor:

Activate torque control and start the command again.

See also the functional description: "Determining the commutation offset in rotary synchronous motors (MBS)"

D301 - Attributes

H1 Display :		d3/01
Diag. mess.:	**DE**	D301 Antrieb für Komm.einstellung nicht bereit
	EN	D301 Drive not ready for commutation command
	FR	D301 Entraînement pas prêt pour justage de commutation
	ES	D301 Accionamiento no listo para comando conmutación
	IT	D301 Azionamento non Pronto per Com. di Commutazione
Mess. no.:		D301 (hex)
Class:		Command

D302 Torque/Force too small to move

The command D3 Command adjust commutation has been started. To perform this, the **motor must move**. But it doesn’t move.

Cause:

1. The torque is too small to overcome mechanical resistances (friction or weight).
2. The motor is **blocked** mechanically.

Remedy:

1. Increase the **S-0-0092, Torque/Force limit** bipolar so that the motor overcomes the mechanical resistances and can turn. Check also P-0-0109, Torque/Force peak limit; this parameter value should be at least as great as S-0-0092.
2. Clear the jamming. Check also the brake.

Note: For devices with analog inputs, the torque can be limited via an analog torque reduction.

See also the functional description: "Determining the commutation offset"

D302 - Attributes

H1 Display :		d3/02
Diag. mess.:	**DE**	D302 Drehmoment/Kraft zu klein für Bewegung
	EN	D302 Torque/Force too small to move
	FR	D302 Couple/Force trop petit pour mouvement
	ES	D302 Par/fuerza demasiado pequeño para movimiento
	IT	D302 Coppia/Forza troppo piccolo per movimento
Mess. no.:		D302 (hex)
Class:		Command

D400 Positive stop drive procedure command

When the positive stop drive procedure command is activated, all controller monitoring which would result in an error message for class 1 diagnostic while blocking the drive with a positive stop is turned off.

Cause:

Command **D400 Positive stop drive procedure command** was activated.

See also the functional description: "Positive stop drive procedure"

D400 - Attributes

H1 Display :		d4
Diag. mess.:	**DE**	D400 Kommando Fahren auf Festanschlag
	EN	D400 Positive stop drive procedure command
	FR	D400 Commande Mouvement contre obstacle fixe
	ES	D400 Comando Desplazamiento hasta tope
	IT	D400 Comando Movimento contro Ostacolo fisso
Mess. no.:		D400 (hex)

D401 ZKL1-Error at command start

Cause:

A class 1 diagnostic error was discovered while starting the command "Positive stop drive procedure" As a result, the command could not be executed.

Remedy:

Eliminate the cause of the error, clear the error, and start the command again.

See also the functional description: "Positive stop drive procedure"

D401 - Attributes

H1 Display :		d4/01
Diag. mess.:	**DE**	D401 ZKL1-Fehler beim Kommandostart
	EN	D401 ZKL1-Error at command start
	FR	D401 Erreur classe d'état 1 au démarrage de la commande
	ES	D401 Error ZKL1 en inicio de comando
	IT	D401 Errore Classe 1 al inizio del Comando
Mess. no.:		D401 (hex)
Class:		Command

D500 Command 'get mark position'

The **P-0-0014, D500 Command determine marker position** command can be used for checking the correct acquisition and position of the reference marker of an incremental measuring system. The "d5“ display shows that the command has been activated.

Cause:

The **Determine marker position** command has been activated.

See also the functional description: "Functional principle of command detect marker position"

D500 - Attributes

H1 Display :		d5
Diag. mess.:	**DE**	D500 Kommando Markerposition erfassen
	EN	D500 Command 'get mark position'
	FR	D500 Commande Obtenir la position du marqueur
	ES	D500 Comando 'Registrar posición de marcador'
	IT	D500 Comando prendere la Positione della Marca
Mess. no.:		D500 (hex)

D501 Incremental encoder required

Cause:

The command has been started for a measuring system that does not possess real reference markers. These include measuring systems such as DSF, EnDat, SSI or resolver measuring systems.

Remedy:

Check whether the correct encoder has been selected in **S-0-0147, Homing parameter**.

Employ an encoder system with real reference markers.

See also the functional description: "Functional principle of command detect marker position"

D501 - Attributes

H1 Display :		d5/01
Diag. mess.:	**DE**	D501 Kein inkrementelles Meßsystem
	EN	D501 Incremental encoder required
	FR	D501 Un codeur incremental est nécessaire.
	ES	D501 Falta encoder incremental
	IT	D501 Encoder incrementale manca
Mess. no.:		D501 (hex)
Class:		Command

D600 Cancel reference point procedure command

Meaning:

The reference of the encoder that has been selected via **S-0-0147, Homing parameter** is canceled.

Cause:

The **D600 Cancel reference point procedure command** has been activated.

See also the functional description: "Drive-Controlled Homing"

D600 - Attributes

H1 Display :		d6
Diag. mess.:	**DE**	D600 Kommando Referenzbezug löschen
	EN	D600 Cancel reference point procedure command
	FR	D600 Commande Annulation de l'origine
	ES	D600 Comando cancelar proceso de punto de referencia
	IT	D600 Comando Annullazione Azzeramento
Mess. no.:		D600 (hex)

D700 Parking axis command

The command permits one or more drives of a drive package to be stopped without error messages being issued to the controller and/or the power supply module. The remaining drives of the package can be handled without any restrictions.

Cause:

The **S-0-0139, D700 Command parking axis** command has been activated.

See also the functional description: "Command Parking Axis"

D700 - Attributes

H1 Display : PA

Diag. mess.:
DE D700 Kommando Parkende Achse
EN D700 Parking axis command
FR D700 Commande Axe stationnée
ES D700 Comando eje estacionado
IT D700 Comando Stazionamento Asse

Mess. no.: D700 (hex)

D900 Command automatic loop tuning

Description:

The start of this command means that an automatic control loop setting is executed in the drive if the drive is in the loop at command start, i.e., the drive enable signal is applied.

See also Function description "Automatic Control Loop Settings"

WARNING

⇒ The start of this command can trigger a movement if drive enable and drive start are at the drive.

⇒ The drive conducts autonomous movements within the range defined by both limits.

⇒ The E-stop sequence function and the travel range limit switch must be guaranteed and checked.

See also Function description:
"Safety Instructions"

⇒ During command D9, the drive autonomously conducts motions, i.e., without external command value.

Note: Under some circumstances, errors can also occur while the command is being executed. These are then signalled with pertinent messages.
D901 start only with RF
D902 motor feedback not valid
D903 inertia detection failed
D904 gain adjustment failed
D905 wrong position range
D906 position range exceeded

D900 - Attributes

H1 Display : d9

Diag. mess.: **DE** D900 Kommando Automatische Regelkreiseinstellung
EN D900 Command automatic loop tuning
FR D900 Commande réglage automatique des boucles
ES D900 Comando Ajuste automático del circuito de regulación
IT D900 Comando Regolazione automatica Circuito Regolazione

Mess. no.: D900 (hex)

D901 Start requires drive enable

Description:

To ensure that the drive is in the loop when starting the command **P-0-0162, D9 automatic control loop setting,** such is queried at command start.

Cause:

Drive enable not set at command start (NO-RF)

Remedy:

Set drive enable and restart command.

See also the functional description: "Automatic Control Loop Settings"

D901 - Attributes

H1 Display : d9/01

Diag. mess.: **DE** D901 Start nur bei Reglerfreigabe möglich
EN D901 Start requires drive enable
FR D901 RF nécéssaire pour mouvement
ES D901 Falta desbloqueo regulador al arrancar el comando
IT D901 Manca Sblocco Regolatore all'Avvio del Comando

Mess. no.: D901 (hex)

Class: Command

D902 Motor feedback data not valid

Description:

At the start of the automatic control loop setting (**P-0-0162),** the motor parameters

- torque constant
- rated current of unit are read out of the feedback.

Cause:

One of the above feedback data has a value smaller than or equal to zero (<=0). This means that the controller parameter is incorrectly calculated.

Remedy:

If known, write the correct values back into the parameter or contact Indramat Customer Service to obtain the feedback data valid for your motor.

In the worst case, it may be necessary to replace the motor.

See also the functional description:"Automatic Control Loop Settings"

D902 - Attributes

H1 Display : d9/02

Diag. mess.: **DE** D902 Keine sinnvollen Motorfeedbackdaten
EN D902 Motor feedback data not valid
FR D902 Pas de données logiques du capteur moteur
ES D902 Ningún dato de retroalimentación de motor razonable
IT D902 Mancano Dati affidabili Feedback Motore

Mess. no.: D902 (hex)

Class: Command

D903 Inertia detection failed

Description:

At the start of the automatic control loop setting, the load moment of inertia is determined with an "oscillation attempt".

This means that the speed change and the motor current must exceed a minimum value during acceleration or deceleration to guarantee a sensible and sufficiently precise calculation of the moment of inertia.

Cause:

- drive acceleration too low
- number of measured value too small for automatic control loop setting
- motor speed too low
- load moment of inertia too big

Remedy:

- increase bipolar torque/force value **S-0-0092**
- increase pos. accel S-0-0260
- increase pos. speed S-0-0259
- increase feedrate override S-0-0108

See also Function description: "Prerequisites for Starting Automatic Control Loop Settings"

D903 - Attributes

H1 Display : d9/03

Diag. mess.: **DE** D903 Ermittlung des Massenträgheitsmoments fehlerhaft
EN D903 Inertia detection failed
FR D903 Détermination du moment d'inertie de masse erronée
ES D903 Determinación del momento de inercia errónea
IT D903 Errore Determinazione Coppia d'Inerzia di Massa

Mess. no.: D903 (hex)

Class: Command

D904 Gain adjustment failed

Description:

In exceptional cases, difficulties in the automatic control loop setting may arise. This means that an automatic setting is not possible. Standard or default values must therefore be loaded into the drive.

Cause:

- oscillating mechanical systems (resonance)
- high level of interference in the encoder signal

Remedy:

Satisfactory results can sometimes be achieved by starting the command **P-0-0162, D9 automatic control loop setting** with a large **P-0-0163, damping factor for automatic control loop setting**, i.e., low dynamics.

This value can be reduced until the control loop behaves as needed.

If even then control loop settings remain unsuccessful, then the setting must be manual.

Note: A manual setting should only be necessary in exceptional cases!

See also the functional description:"Automatic Control Loop Settings"

D904 - Attributes

H1 Display :		d9/04
Diag. mess.:	**DE**	D904 Automatische Reglereinstellung fehlgeschlagen
	EN	D904 Gain adjustment failed
	FR	D904 Echec du réglage automatique du variateur
	ES	D904 Fallo en el ajuste automático del regulador
	IT	D904 Errore Regolazione automatica Regolatore
Mess. no.:		D904 (hex)
Class:		Command

D905 Position range invalid, P-0-0166 & P-0-0167

Description:

Before starting an automatic control loop setting, both travel range limits, i.e., upper and lower, must be defined.

When starting command **P-0-0162, D9 automatic control loop setting** the number values are automatically checked for validity. It is checked if the traversing path is large enough and if sensible values have been entered.

Possible fault causes:

- **P-0-0167, upper traversing range** smaller than **P-0-0166, lower traversing range**
- Maximum traversing path (= upper - lower limits) is less than 6 motor rotations and thus too small to start the automatic control loop setting.

Remedy:

- clear command error by ending the command
- a) input new limits whereby:upper > lower limits
  b) redefine limits to define a larger traversing range
- restart command with sensible traversing range

See also Function description: "Prerequisites for Starting Automatic Control Loop Settings"

D905 - Attributes

H1 Display : d9/05

Diag. mess.: **DE** D905 Verfahrbereich ungültig

EN D905 Position range invalid, P-0-0166 & P-0-0167

FR D905 Limites de champs fausses P-0-0166 & -0167

ES D905 Campo de desplazamiento no válido

IT D905 Limiti falsi per Regolazione automatica

Mess. no.: D905 (hex)

Class: Command

D906 Position range exceeded

Description:

During automatic control loop setting, there is a constant monitoring of the valid traversing range **P-0-0166** and **P-0-0167**.

Cause:

If only one of these limits is exceeded, then command error **D906** is generated and the drive brought to standstill speed controlled.

Possible causes:

- actual position outside of defined traversing range
- limits redefined after command start

Remedy:

- clear command error and end command
- redefine limits so that the actual position is within defined traversing range
- retart command using sensible traversing range

See also Function description: "Prerequisites for Starting Automatic Control Loop Settings"

D906 - Attributes

H1 Display : d9/06

Diag. mess.: **DE** D906 Verfahrbereich überschritten

EN D906 Position range exceeded

FR D906 Champs dépassé

ES D906 Campo de desplazamiento superado

IT D906 Fuori Campo

Mess. no.: D906 (hex)

Class: Command

1.5 Status diagnostic messages

A000 Communication phase 0

The communication process is divided into four communication phases: Phases 0 and 1 are used to recognize the participants. Phase 2 is used to prepare the time and data protocols for communication phases 3 and 4.

Initialization is performed in ascending order of the sequence. The defaults of the communication phase are set by the control system. When the switch to communication phase 4 takes place, initialization is completed and input power is enabled.

If the delayed phase switch is interrupted, the status display in the communications phase which has already been reached freezes.

If diagnostic message **A000 Communication phase 0** is active, the drive is in phase 0 and is waiting for a phase transfer to 1 by the control system.

See also the functional description: "Parametrization Mode - Operating Mode".

A000 - Attributes

H1 Display :		P0
Diag. mess.:	**DE**	A000 Kommunikationsphase 0
	EN	A000 Communication phase 0
	FR	A000 Phase de communication 0
	ES	A000 Fase de comunicación 0
	IT	A000 Fase di Comunicazione 0
Mess. no.:		A000 (hex)

A001 Communication phase 1

The communication process is divided into four communication phases: Phases 0 and 1 are used to recognize the participants. Phase 2 is used to prepare the time and data protocols for communication phases 3 and 4.

Initialization is performed in ascending order of the sequence. The defaults of the communications phase are set by the control system. When the switch to communications phase 4 takes place, initialization is completed and input power is enabled.

If the delayed phase switch is interrupted, the status display in the communications phase which has already been reached freezes.

If diagnostic message **A001 Communication phase 1** is active, the drive is in phase 1, and transfer from phase 1 to 2 has not yet been initiated by the control system.

See also the functional description: "Parametrization Mode - Operating Mode".

A001 - Attributes

H1 Display : P1

Diag. mess.: **DE** A001 Kommunikationsphase 1
EN A001 Communication phase 1
FR A001 Phase de communication 1
ES A001 Fase de comunicación 1
IT A001 Fase di Comunicazione 1

Mess. no.: A001 (hex)

A002 Communication phase 2

For field bus and SERCOS devices, the control demands via the master communication "communication phase 2", or the drive has been switched to phase 2 by the command **P-0-4023, C400 Communication phase 2 transition**. Therefore, the drive is in the "parameter mode". In this mode, many parameters are editable, which can no more be edited in "communication phase 4" ("operation mode").

In this phase, usually

- for field bus and SERCOS devices, the communication parameters are transferred from the control to the drive and
- the functions Load and Save parameters ("file services“) are performed when needed.

Before switching to communication phase 3 is possible, the command **S-0-0127, C100 Communication phase 3 transition check** must be done. In this command, the drive checks e.g. the validity of the parameters needed for the communication phase 3.

After successful execution of the command, the control switches the drive to comm. phase 3 (with field bus and SERCOS devices), or the drive switches by itself to phase 3 at the end of the command.

See also the functional description: "Parametrization Mode - Operating Mode".

A002 - Attributes

H1 Display : P2

Diag. mess.: **DE** A002 Kommunikationsphase 2
EN A002 Communication phase 2
FR A002 Phase de communication 2
ES A002 Fase de comunicación 2
IT A002 Fase di Comunicazione 2

Mess. no.: A002 (hex)

A003 Communication phase 3

For field bus and SERCOS devices, the control demands via the master communication "communication phase 3", or the drive has been switched to phase 3 by the command **S-0-0127, C100 Communication phase 3 transition check**. The drive is in the "restricted parameter mode". In this mode, still many parameters are editable too, which can no more be edited in "communication phase 4" ("operation mode").

Before switching to communication phase 4 is possible, the command **S-0-0128, C200 Communication phase 4 transition check** must be done. In this command, the drive checks e.g. the validity of the parameters needed for the communication phase 4 ("operation mode").

After successful execution of the command, the control switches the drive to comm. phase 4 (with field bus and SERCOS devices), or the drive switches by itself to phase 4 at the end of the command.

See also the functional description: "Parametrization Mode - Operating Mode".

A003 - Attributes

H1 Display : P3

Diag. mess.: **DE** A003 Kommunikationsphase 3
EN A003 Communication phase 3
FR A003 Phase de communication 3
ES A003 Fase de comunicación 3
IT A003 Fase di Comunicazione 3

Mess. no.: A003 (hex)

A010 Drive HALT

The feature Drive-Halt (= contrary of Drive-Start) is activated by the applied control via the used interface through clearing the /Drive-Halt bit (bit 13) in the master control word or by interrupting a drive control command (i.e. drive-controlled homing).

The Drive-Halt feature is for decelerating the axis to standstill at defined **acceleration and** defined **jerk**.

In **process block mode**, the acceleration and the jerk value of the previous process block are active.

In **Jog mode** and in stepper position mode,
for **acceleration, S-0-0260**, Positioning acceleration is taken, and
for **jerk,** **S-0-0193**, Positioning jerk is taken.

In **Velocity control** and in Torque control mode, the drive is decelerated to standstill by setting the velocity command to 0 and with the max. torque.

See also the functional description: "The Functional Principle of Drive Halt".

A010 - Attributes

H1 Display : AH

Diag. mess.: **DE** A010 Antrieb HALT
EN A010 Drive HALT
FR A010 Arrêt entraînement
ES A010 Accionamiento parada
IT A010 Stop Azionamento

Mess. no.: A010 (hex)

A012 Control and power sections ready for operation

The drive is supplied with control voltage, and the power is switched on. The drive is ready to deliver power.

A012 - Attributes

H1 Display : Ab

Diag. mess.: **DE** A012 Steuer- und Leistungsteil betriebsbereit

EN A012 Control and power sections ready for operation

FR A012 Commande et puissance prêts à fonctionner

ES A012 Secciones de mando y potencia listos para el servicio

IT A012 Azionamento pronto

Mess. no.: A012 (hex)

A013 Ready for power on

The drive is supplied with a control voltage, and there are no errors in the drive controller. The drive is ready to be turned on with power.

See also the functional description: "Parametrization Mode - Operating Mode".

A013 - Attributes

H1 Display : bb

Diag. mess.: **DE** A013 Bereit zur Leistungszuschaltung

EN A013 Ready for power on

FR A013 Prêt pour mise sous puissance

ES A013 Listo para conexión de potencia

IT A013 Sistema pronto per Inserzione Potenza

Mess. no.: A013 (hex)

A100 Drive in TORQUE control

The drive is in the torque control operating mode. It follows the torque command value sequence which was set by the control system.

See also the functional description: "Operating Mode: Torque Control".

A100 - Attributes

H1 Display : AF

Diag. mess.: **DE** A100 Antrieb in Momentenregelung

EN A100 Drive in TORQUE control

FR A100 Entraînement en asservissement de COUPLE

ES A100 Accionamiento en regulación de PAR

IT A100 Azionamento in Regolazione di COPPIA

Mess. no.: A100 (hex)

A101 Drive in VELOCITY control

The drive is in the velocity control operating mode. It follows the velocity command value sequence set by the control system. The velocity control loop is closed in the drive.

See also the functional description: "Mode: Velocity Control".

A101 - Attributes

H1 Display : AF

Diag. mess.: **DE** A101 Antrieb in Geschwindigkeitsregelung
EN A101 Drive in VELOCITY control
FR A101 Entraînement en asservissement de VITESSE
ES A101 Accionamiento en regulación de VELOCIDAD
IT A101 Azionamento in Regolazione di VELOCITA

Mess. no.: A101 (hex)

A102 Position mode with encoder 1

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value with a systematical **lag** (following error).

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

See also the functional description: "Mode: Position Control".

A102 - Attributes

H1 Display : AF

Diag. mess.: **DE** A102 Lageregelung mit Geber 1
EN A102 Position mode with encoder 1
FR A102 Asservissement de position, codeur 1
ES A102 Regulación de posición, encoder 1
IT A102 Posizionamento con Encoder 1

Mess. no.: A102 (hex)

A103 Position mode with encoder 2

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value with a systematical **lag** (following error).

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Mode: Position Control".

A103 - Attributes

H1 Display : AF

Diag. mess.: **DE** A103 Lageregelung mit Geber 2
EN A103 Position mode with encoder 2
FR A103 Asservissement de position, codeur 2
ES A103 Regulación de posición, encoder 2
IT A103 Posizionamento con Encoder 2

Mess. no.: A103 (hex)

A104 Position mode lagless, encoder 1

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value **without following (lag) error**.

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of axis position).

See also the functional description: "Mode: Position Control".

A104 - Attributes

H1 Display : AF

Diag. mess.:
DE A104 Lageregelung schleppabstandsfrei, Geber 1
EN A104 Position mode lagless, encoder 1
FR A104 Asserv. de pos., codeur 1, sans erreur poursuite
ES A104 Regulación de posición, encoder 1, sin retardo
IT A104 Posizionamento con Encoder 1, senza E.I.

Mess. no.: A104 (hex)

A105 Position control lagless, feedback 2

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value **without following (lag) error**.

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Mode: Position Control".

A105 - Attributes

H1 Display : AF

Diag. mess.:
DE A105 Lageregelung schleppabstandsfrei, Geber 2
EN A105 Position control lagless, feedback 2
FR A105 Asserv. de pos., codeur 2, sans erreur poursuite
ES A105 Regulación de posición, encoder 2, sin retardo
IT A105 Posizionamento con Encoder 2, senza E.I.

Mess. no.: A105 (hex)

A106 Drive controlled interpolation, encoder 1

The drive receives a position command value from the control system which is identical to the **target position** of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.

The drive moves with a systematical **lag** (following error) to the target position.

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

See also the functional description: "Mode: Drive Internal Interpolation".

A106 - Attributes

H1 Display : AF

Diag. mess.: **DE** A106 Antriebsinterne Interpolation, Geber 1
EN A106 Drive controlled interpolation, encoder 1
FR A106 Interpolation interne, codeur 1
ES A106 Interpolación contr. por accionamiento, encoder 1
IT A106 Azionamento contr. in Interpolazione, Encoder 1

Mess. no.: A106 (hex)

A107 Drive controlled interpolation, encoder 2

The drive receives a position command value from the control system which is identical to the **target position** of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.

The drive moves with a systematical **lag** (following error) to the target position.

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Mode: Drive Internal Interpolation"

A107 - Attributes

H1 Display : AF

Diag. mess.: **DE** A107 Antriebsinterne Interpolation, Geber 2
EN A107 Drive controlled interpolation, encoder 2
FR A107 Interpolation interne, codeur 2
ES A107 Interpolación contr. por accionamiento, encoder 2
IT A107 Azionamento contr. in Interpolazione, Encoder 2

Mess. no.: A107 (hex)

A108 Drive controlled interpolation, lagless, encoder 1

The drive receives a position command value from the control system which is identical to the **target position** of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.

The drive moves **without following error** to the target position.

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

See also the functional description: "Mode: Drive Internal Interpolation".

A108 - Attributes

H1 Display : AF

Diag. mess.: **DE** A108 Antriebsinterne Interpol. schleppfrei, Geber 1
EN A108 Drive controlled interpolation, lagless, encoder 1
FR A108 Interpolation interne, codeur 1, sans erreur poursuite
ES A108 Interpol. por accion. int., enc. 1, sin retardo
IT A108 Azionamento contr. in Interp., Enc. 1, senza E.I.

Mess. no.: A108 (hex)

A109 Drive controlled interpolation, lagless, encoder 2

The drive receives a position command value from the control system which is identical to the **target position** of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.

The drive moves **without following error** to the target position.

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Mode: Drive Internal Interpolation".

A109 - Attributes

H1 Display : AF

Diag. mess.: **DE** A109 Antriebsinterne Interpol. schleppfrei, Geber 2
EN A109 Drive controlled interpolation, lagless, encoder 2
FR A109 Interpolation interne, codeur 2, sans erreur poursuite
ES A109 Interpol. por accion. int., enc. 2, sin retardo
IT A109 Azionamento contr. in Interp., Enc. 2, senza E.I.

Mess. no.: A109 (hex)

A146 Relative drive controlled interpolation, encoder 1

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

into account.

The drive approaches the target position with a position lag that is proportional to the velocity.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also the functional description: "Mode: Relative drive-internal interpolation".

A146 - Attributes

H1 Display : AF

Diag. mess.: **DE** A146 Relative antriebsinterne Interpolation, Geber 1
EN A146 Relative drive controlled interpolation, encoder 1
FR A146 Interpolation interne relative, codeur 1
ES A146 Interpol. relativa contr. por accion., enc. 1
IT A146 Azionam. contr. in Interp. relativa, Enc. 1

Mess. no.: A146 (hex)

A147 Relative drive controlled interpolation, encoder 2

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

into account.

The drive approaches the target position with a position lag that is proportional to the velocity.

Encoder 2 means that the position encoder that is attached to the load is used for closing the position control loop (direct axis position measurement).

See also the functional description: "Mode: Relative drive-internal interpolation".

A147 - Attributes

H1 Display :		AF
Diag. mess.:	**DE**	A147 Relative antriebsinterne Interpolation, Geber 2
	EN	A147 Relative drive controlled interpolation, encoder 2
	FR	A147 Interpolation interne relative, codeur 2
	ES	A147 Interpol. relativa contr. por accion., enc. 2
	IT	A147 Azionam. contr. in Interp. relativa, Enc. 2
Mess. no.:		A147 (hex)

A148 Relative drive contr. interpolation, enc. 1, lagless

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

into account.

The drive approaches the target position of the travel path without a position lag.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also the functional description: "Mode: Relative drive-internal interpolation".

A148 - Attributes

H1 Display : AF

Diag. mess.: **DE** A148 Relative antriebsint. Interpol. Geber 1, schleppfrei
EN A148 Relative drive contr. interpolation, enc. 1, lagless
FR A148 Interpol. interne relative, cod. 1, sans err. pste.
ES A148 Interpol. rel. por accion. int., enc. 1, sin retardo
IT A148 Azionam. contr. in Interp. relat., Enc. 1, senza E.I.

Mess. no.: A148 (hex)

A149 Relative drive contr. interpolation, enc. 2, lagless

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

into account.

The drive approaches the target position of the travel path without a position lag.

Encoder 2 means that the position encoder that is attached to the load is used for closing the position control loop (direct axis position measurement).

See also the functional description: "Mode: Relative drive-internal interpolation".

A149 - Attributes

H1 Display : AF

Diag. mess.: **DE** A149 Relative antriebsint. Interpol. Geber 2, schleppfrei
EN A149 Relative drive contr. interpolation, enc. 2, lagless
FR A149 Interpol. interne relative, cod. 1, sans err. pste.
ES A149 Interpol. rel. por accion. int., enc. 2, sin retardo
IT A149 Azionam. contr. in Interp. relat., Enc. 2, senza E.I.

Mess. no.: A149 (hex)

A203 Stepper position mode

Description:

The drive is functioning in position control with Stepper interface. The device follows the position command which will be developed out of the stepper motor signals.

A203 - Attributes

H1 Display : AF

Diag. mess.: **DE** A203 Schrittmotor-Betrieb
EN A203 Stepper position mode
FR A203 Asservissement de position pas à pas
ES A203 Modo posicionamiento paso a paso
IT A203 Modo Posizionamento Passo-Passo

Mess. no.: A203 (hex)

A204 Stepper position mode, lagless

Description:

The drive is functioning in position regulation without lag/Stepper Drive interface. The device follows the position command which will be developed out of the stepper motor signals.

A204 - Attributes

H1 Display : AF

Diag. mess.: **DE** A204 Schrittmotor-Betrieb schleppabstandsfrei
EN A204 Stepper position mode, lagless
FR A204 Asserv. de position pas à pas, sans err. pste
ES A204 Modo posicionamiento paso a paso sin retardo
IT A204 Modo Posizionamento Passo-Passo senza E.I.

Mess. no.: A204 (hex)

A206 Process block mode, encoder 1

The drive performs a closed loop position control with systematical lag. The actual value comes from the encoder 1 (motor encoder). The command value profile is generated in the drive.

Target position, velocity, acceleration and jerk are determined by a pre-programmed process block. Depending on **P-0-4019, Process block mode**, the target position is interpreted as an absolute value or as a relative distance to move.

See also the functional description: "Positioning Block Mode"

A206 - Attributes

H1 Display : AF

Diag. mess.: **DE** A206 Positioniersatz-Betrieb, Geber 1
EN A206 Process block mode, encoder 1
FR A206 Blocs de déplacement, codeur 1
ES A206 Bloques de posicionamiento, encoder 1
IT A206 Blocchi di posizionamento, Encoder 1

Mess. no.: A206 (hex)

A207 Process block mode lagless, encoder 1

The drive performs a closed loop position control without lag. The actual value comes from the encoder 1 (motor encoder). The command value profile is generated in the drive.

Target position, velocity, acceleration and jerk are determined by a pre-programmed process block. Depending on **P-0-4019, Process block mode**, the target position is interpreted as an absolute value or as a relative distance to move.

See also the functional description: "Positioning Block Mode"

A207 - Attributes

H1 Display : AF

Diag. mess.: **DE** A207 Positioniersatz-Betrieb schleppfrei, Geber 1
EN A207 Process block mode lagless, encoder 1
FR A207 Blocs de déplacement, sans err. pste, cod. 1
ES A207 Bloques de posicionamiento, sin retardo, enc. 1
IT A207 Blocchi di posizionamento, senza E.I., Enc. 1

Mess. no.: A207 (hex)

A208 JOG mode positive

The drive moves with a jogging velocity (P-0-4030) in the positive direction. The motor is turning clockwise, when viewing the motor shaft.

See also the functional description:"Operating Mode: Jogging"

A208 - Attributes

H1 Display : JF

Diag. mess.: **DE** A208 Tipp-Betrieb positiv
EN A208 JOG mode positive
FR A208 Mode JOG positif
ES A208 Modo impulsos positivo
IT A208 Movimento manuale positivo

Mess. no.: A208 (hex)

A210 Process block mode, encoder 2

The drive performs a closed loop position control with systematical lag. The actual value comes from the encoder 2 (ext. encoder). The command value profile is generated in the drive.

Target position, velocity, acceleration and jerk are determined by a pre-programmed process block. Depending on **P-0-4019, Process block mode**, the target position is interpreted as an absolute value or as a relative distance to move.

See also the functional description: "Positioning Block Mode"

A210 - Attributes

H1 Display : AF

Diag. mess.: **DE** A210 Positioniersatz-Betrieb, Geber 2
EN A210 Process block mode, encoder 2
FR A210 Blocs de déplacement, codeur 2
ES A210 Bloques de posicionamiento, encoder 2
IT A210 Blocchi di posizionamento, Encoder 2

Mess. no.: A210 (hex)

A211 Process block mode lagless, encoder 2

The drive performs a closed loop position control without lag. The actual value comes from the encoder 2 (ext. encoder). The command value profile is generated in the drive.

Target position, velocity, acceleration and jerk are determined by a pre-programmed process block. Depending on **P-0-4019, Process block mode**, the target position is interpreted as an absolute value or as a relative distance to move.

See also the functional description: "Positioning Block Mode"

A211 - Attributes

H1 Display : AF

Diag. mess.: **DE** A211 Positioniersatz-Betrieb schleppfrei, Geber 2

EN A211 Process block mode lagless, encoder 2

FR A211 Blocs de déplacement, cod. 2, sans err. pste

ES A211 Bloques de posicionamiento, sin retardo, encoder 2

IT A211 Blocchi di posizionamento, senza E.I. con Enc. 2

Mess. no.: A211 (hex)

A218 JOG mode negative

The drive moves with a jogging velocity (P-0-4030) in the negative direction. The motor is turning counter clockwise, when viewing the motor shaft.

See also the functional description:"Operating Mode: Jogging"

A218 - Attributes

H1 Display : Jb

Diag. mess.: **DE** A218 Tipp-Betrieb negativ

EN A218 JOG mode negative

FR A218 Mode JOG négatif

ES A218 Modo impulsos negativo

IT A218 Movimento manuale negativo

Mess. no.: A218 (hex)

A800 Unknown operation mode

There is no diagnosis for the activated operation mode.

A800 - Attributes

H1 Display : AF

Diag. mess.: **DE** A800 Unbekannte Betriebsart

EN A800 Unknown operation mode

FR A800 Mode de fonctionnement inconnu

ES A800 Modo de operación desconocido

IT A800 Modo operativo non conosciuto

Mess. no.: A800 (hex)

1.6 Diagnostic messages for basic initialization and after fatal System errors

Diagnostic Message Display: -0

The writable **data storage** of the drive controller is tested for its functional capability.

If an error is detected, this display will remain.

Diagnostic Message Display: -1

The hardware of the amplifier is beig initialized.

Diagnostic Message Display: -2

Cause:

The control **supply voltage of the encoder** is missing.

Remedy:

Exchange the hardware.

Diagnostic Message Display: -3

Initializing the parameters from the NovRam and calculating the respective data depending from the parameter contents.

Diagnostic Message Display: -5

Initializing and checking the **command communication**.

Diagnostic Message Display: -5

Initializing the system control.

Diagnostic Message Display: -6

Starting the system control.

Diagnostic Message Display: ●● (2 dots)

Cause:

1. Programming mode
2. The prozessor does not run at all because of hardware fault.

Remedy:

For 1. Reload firmware program by Indramat customer service.

For 2. Exchange the hardware.

Diagnostic Message Display: E1

Cause:

Processor fault, caused by static discharge, program error or hardware fault. More information is available via a terminal connected to the RS-232 interface.

Remedy:

Switch the amplifier off and on again; if the fault is still present, exchange the hardware. In any case inform the customer service.

Diagnostic Message Display: E2

Cause:

Test of the **RAM** on the programming module has shown an error. RAM defective or not plugged properly.

Remedy:

Switch off, check the plug connection and switch on again; if the error happens agains, exchange the firmware module.

Diagnostic Message Display: E3

Cause:

Caused by a hardware fault or by a static discharge, the 1st **watchdog** of the amplifier has triggered.

Remedy:

Switch the amplifier off and on again; if E3 appears again, exchange the amplifier. In any case inform the customer service. Please explain the exact circumstances under which the error occurred.

Diagnostic Message Display: E4

Cause:

Caused by a hardware fault or by a static discharge, the 2nd **watchdog** of the amplifier has triggered.

Remedy:

Switch the amplifier off and on again; if E4 appears again, exchange the amplifier. In any case inform the customer service.

Diagnostic Message Display: E5

Cause:

Test of the **dual-port-RAM** for command communication failed. Maybe the hardware for command communication is not plugged on properly.

Remedy:

Check the plug connection; if OK, exchange the amplifier.

1.7 Operation Status

Hereafter, the possible states of operation are listed alphabetically. These are shown with the display H1 on the device.

bb

"Ready for operation"

Refer to description **A013 Ready for power on**.

Ab

"Drive is ready"

Refer to description **A012 Control and power sections ready for operation**.

AF

"Drive enable"

According to the operation mode in use, you will find a more exact description of the display "AF" under the respective state diagnosis A101..A800.

AH

"Drive Halt"

Refer to description **A010 Drive HALT**.

Jb

"Jog backward"

Refer to description **A218 Jog negative**.

JF

"Jog Forward"

Refer to description **A208 Jog positive**.

P0

"Phase 0" (only with SERCOS communication)

Refer to description **A000 Communication phase 0**.

P1

"Phase 1"

Refer to description **A001 Communication phase 1**.

P2

"Phase 2"

Refer to description **A002 Communication phase 2**.

P3

"Phase 3"

Refer to description **A003 Communication phase 3**.

PL

"Basic Parameter Load"

See also: **F209 PL Load parameter default values**.

UL

"Basic Load"

See also: **F208 UL The motor type has changed.**

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ECODRIVE03

Drive for Machine Tool Applications
with SERCOS-, Analog- and Parallelinterface

Supplement C
Serial Communications
SMT 01VRS

DOK-ECODR3-SMT-01VRS**-FKB1-EN-P

Contents

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1 Serial Communications

1.1 An Overview

The drive controller is equipped with a serial interface. It supports the parametrization of the drive. Using this interface, it is possible to alter:

- **Parameters**
- **Commands and**
- **Diagnoses**

Interface mode

The interface can be operated in either

- **RS232 mode** or
- **RS485 mode**

Interface protocol

Two (2) different protocols are supported:

- the Indramat **SIS protocol**
  The usable data are transmitted in INTEL format.
- and an **ASCII protocol**

Its precise structure is outlined in the following section.

Note: If an ASCII protocol is used, then the number of bytes differs from the data length in the parameter description (internal number format).

1.2 Parameters Involved

The data exchange which implements the serial interface is controlled by means of the following parameters:

- **P-0-4021, Baud rate RS-232/485**
- **P-0-4022, Drive address**
- **P-0-4050, Delay answer RS-232/485**

1.3 Function Principle

Basic State once the Control Voltage is Switched On

After the control voltage is switched on, serial communications in the drive is in "**Passive mode**“. Communications is not possible in passive mode.

Selecting a Protocol

To be able to take up serial communications with the drive it is necessary to set the communications mode (protocol)

- with a "**Change Drive“ command** (with **ASCII protocol**)
- or a valid **Start telegram** (with **SIS protocol**).

Note: Internally, the first detected protocol that is valid (SIS or ASCII) is switched into. If a different protocol is to be used at some later point in time, then this is only possible by switching the 24 volt power supply off.

Note: The two listed options for establishing a connection, are extensively described in the section on Communications procedures.

Setting the Drive Address

The drive address is set via the serial interface by write accessing communications parameter **P-0-4022, Drive address.** DriveTop or a PLC can be used for this purpose.

If value "**256**“ is entered into communication parameter **P-0-4022,** then the unit address set via the address switch will be used for serial communications and not the "256“.

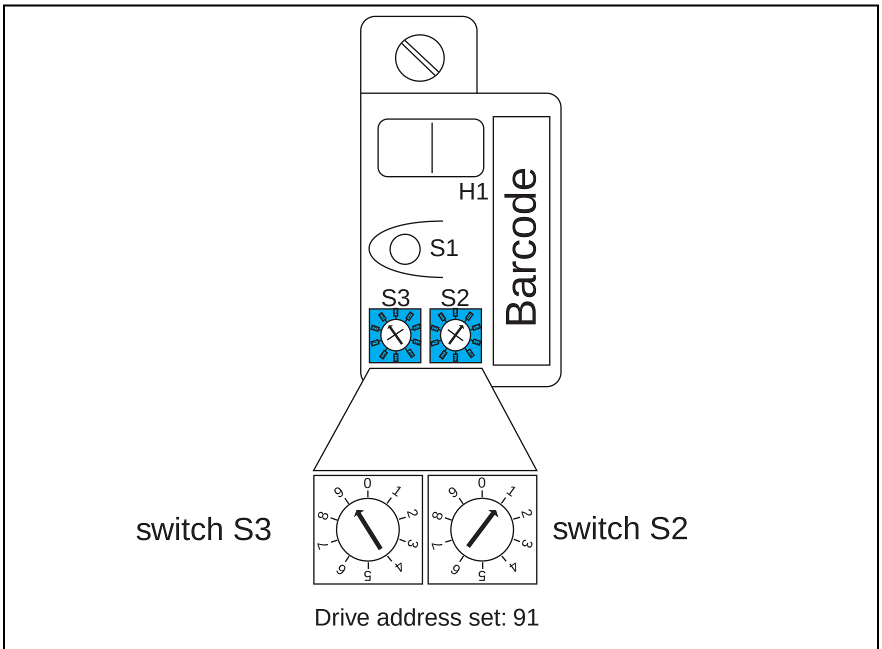

Fig. 1-1: Setting the address via the address switch on the programming module

RS485 mode

It is only absolutely necessary to set the drive address if communications uses the **RS485 bus** because each bus participant will be addressed at a specific bus address.

Note: To avoid accessing conflicts, assign each drive address only once.

RS232 mode

This mode does not necessitate the setting of drive address because only one participant is connected (peer-to-peer connection).

Communications via RS232 Interface

The RS232 interface is intended for use when connecting a PC with the **DriveTop** startup program.

Note:	A maximum transmission distance of 15 meters is possible.

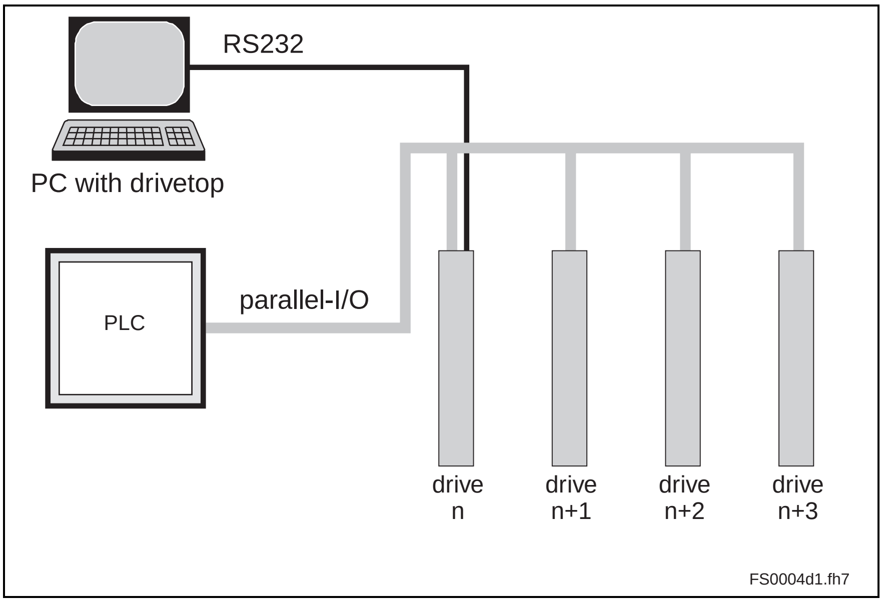

Fig. 1-2: Communications via RS 232 interface

Communications via RS485 Interface

Features

. Communications via RS485 interface helps implement a **serial bus** with the following data:

- Up to **31 drives** can be connected to one bus master.
- Transmission rates of: **9600** and **19200** baud
- Maximum transmission path: **500m**
- **Half duplex** mode over a **2-wire** line
- 8-bit **ASCII** protocol or 8-bit **SIS** protocol
- no **parity bit**
- a stop bit

Note: To avoid accessing conflicts, every drive address is assigned only once in RS485 mode.

Operting Several Drives with DriveTop

Application advantages:

- Starting up several drives without replugging an interface cable (central parametrization and diagnostics connection).
- Implementing a central PC-supported visualization unit.

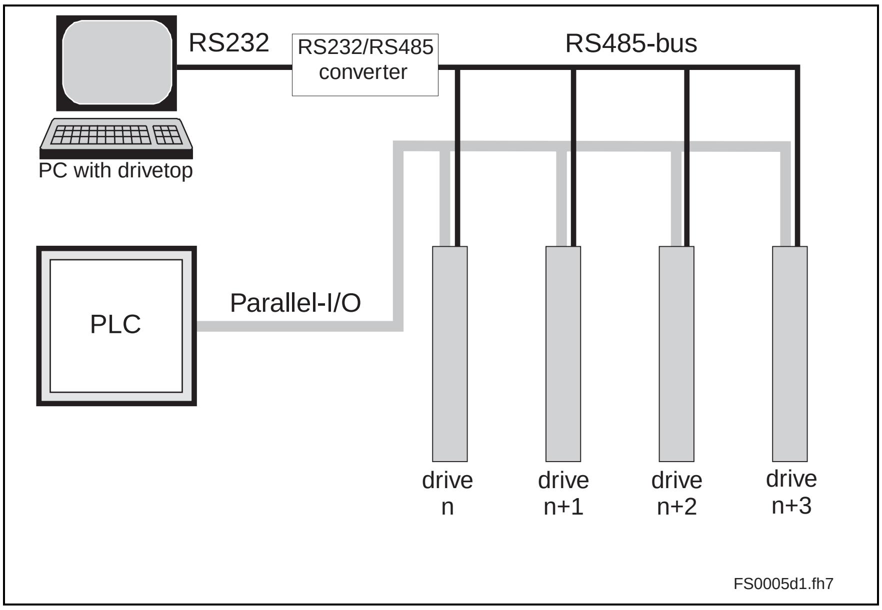

Fig. 1-3: Operating several drives with DRIVETOP

Parametrization and Diagnosing with a PLC

Application advantages:

- Parameters can be changed with a PLC (e.g., adjuting positioning blocks).
- Expanded diagnostics options for the PLC by reading in error codes.

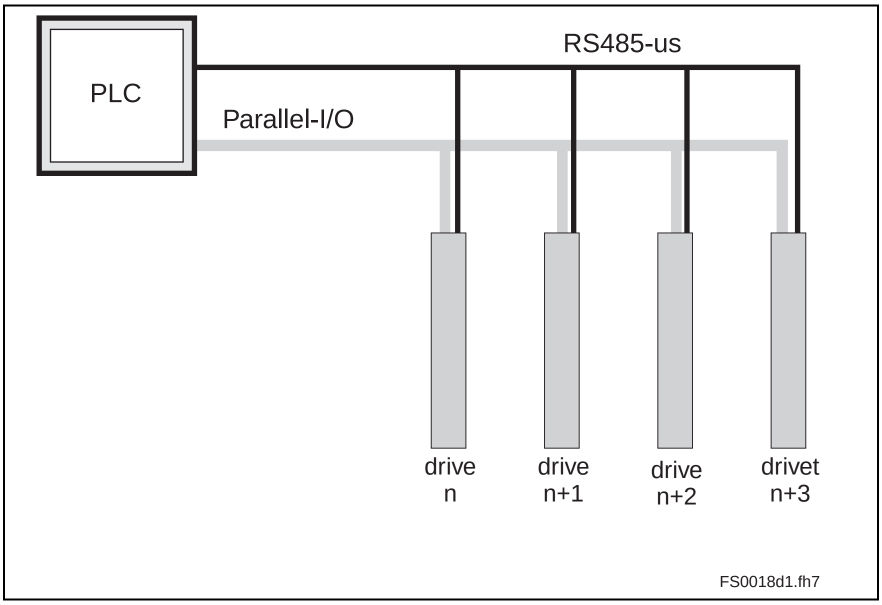

Fig. 1-4: Parametrizing and diagnosing with a PLC

Parametrization and Diagnosing Drive Groups Using a Control Unit

Application advantages:

- Using a central visualization unit.

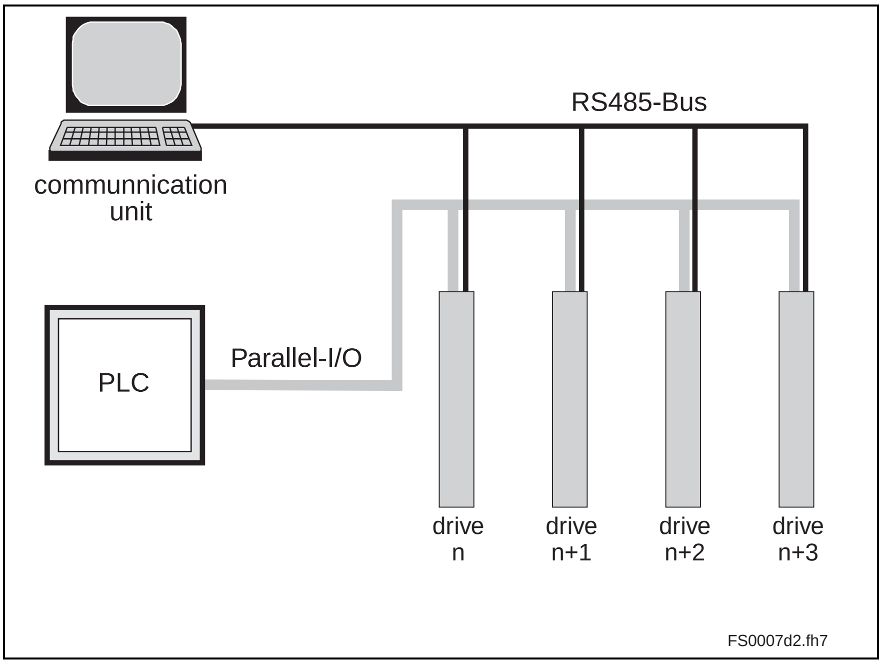

Fig. 1-5: Parametrization and diagnoses of drive groups using a control unit

1.4 Transmission Protocols

When switching on the 24V power voltage, an automatic protocol and baud rate detection is activated upon receipt of a symbol from the serial interface.

As soon as either:

- a valid SIS start telegram
- or a valid ASCII start sequence ("bcd:address")

has been received, there is an internal switching to the relevant protocol and baud rate.

The drive supports two different protocols:

- ASCII protocol
- SIS protocol

These are explained below in greater detail.

ASCII Protocol

Features:

- Transmission rate: 9600 and 19200 baud
- Maximum transmission path: 15m
- 8 bit **ASCII protocol**
- no parity bit
- a stop bit

Structure, Telegram frame:

In this case, **no telegram frame** is used, but instead the transmitted ASCII symbol is converted and interpreted. It is only necessary to maintain a specified order.

SIS protocol

Features:

- This is a **binary protocol.**
- A checksum test is conducted (higher Hamming distance D).
- All telegrams are identified by an unequivocal start symbol.
- There is a defined telegram frame structure.
- It is possible to trigger movements via an SIS telegram (e.g., jogging).

Structure, Telegram frame:

An SIS telegram is basically broken down into three blocks:

- Telegram head
- user data head
- user data head

Telegram head	User data head	User data

Fig. 1-6: The structure of an SIS telegram

Telegram Head Structure

Byte	name	Definition of the individual telegram bytes
1	StZ	Start symbol: STX (0x02)
2	CS	This is the checksum byte. It is generated by adding all subsequential telegram symbols as well as the start symbol StZ and concluding negation. In other words, the sum of all telgram symbols always equals 0 if the transmission was successful.
3	DatL	The length of the subsequential user data and the variable part are in the frame protocol. Up to at least **247 bytes** (255 - 7 {subaddresses} - 1 {running telegram number}) user data can be transmitted in one telegram.
4	DatLW	The repetition of DatL takes place here. The telegram length is generated from the DatLW and the fixed part of the frame protocol (byte 1 - 8), i.e., telegram length = DatLW + 8.
5	Cntrl	Bit 0 - 2: Number of subaddresses in the address block (0 - 7), Bit 3: 'running telegram number' : 0 => not supported, 1 => additional byte Bit 4: 0 => command telegram, 1 => reaction telegram Bit 5 - 7: Status data for the reaction telegram: 000 no error, request was processed 001 transmission request being processed 010 transmission cannot presently be processed 100 warning 110 error
6	Service	This specifies the service that the sender is requesting of the receiver or which the receiver is conducting. 0x00 ... 0x0F general services 0x00 participant ID 0x01 terminate a data transmission 0x02 Flash operation 0x03 Initialization of SIS communication 0x0F Token Passing 0x10 ... 0x7F presently reserved 0x80 ... 0x8F special services for ECODRIVE 0x90 ... 0x9F special services for SYNAX 0xA0 ... 0xAF special services for MT-CNC or MTC200 0xB0 ... 0xBF special services for ISP200 0xC0 ... 0xCF special services for CLC-GPS 0xD0 ... 0xDF special services for HMI system 0xE0 ... 0xFF presently reserved
7	AdrS	Address of the sender: station number (0 - 127)
8	AdrE	Adress of the receiver: AdrE = 0 - 127 ==> specifies a single station, AdrE = 128 - 254 ==> addresses logical groups, AdrE = 255 ==> fixes a broadcast Telegrams with AdrE = 128 - 255 are **not** answered with a reaction telegram.
9	AdrES1	Subaddress 1 of the receiver, **if for Bit 0 - 2 if for byte control it applies that: > 000**
10	AdrES2	Subaddress 2 of the receiver, **if for Bit 0 - 2 if for byte control it applies that: > 001**
11	AdrES3	Subaddress 3 of the receiver, **if for Bit 0 - 2 if for byte control it applies that: > 010**
12	AdrES4	Subaddress 4 of the receiver, **if for Bit 0 - 2 if for byte control it applies that: > 011**
13	AdrES5	Subaddress 5 of the receiver, **if for Bit 0 - 2 if for byte control it applies that: > 100**
14	AdrES6	Subaddress 6 of the receiver, **if for Bit 0 - 2 if for byte control it applies that: > 101**
15	AdrES7	Subaddress 7 of the receiver, **if for Bit 0 - 2 if for byte control it applies that: > 110**
16	PaketN	running telegram number (package number), **if bit 3 in byte cntrl has been set**

Fig. 1-7: SIS-Telgram head

Structure of the User Data Head

Note: The structure of the user data head depends on the transmission direction.

It is differentiated between:

- **Command telegram** (Master --> Slave):

This is the telegram that the master sends to the slave (drive)!

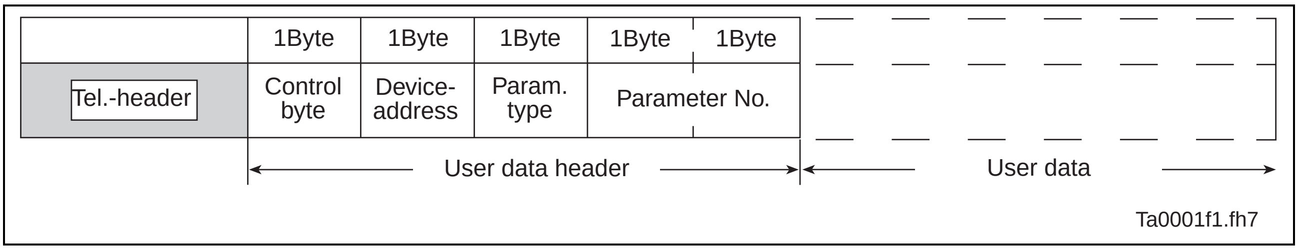

Fig. 1-8: User data head structure in the command telegram

- **Reaction telegram** (Slave--> Master):

This is the telegram that the slave sends to the master (Drive)!

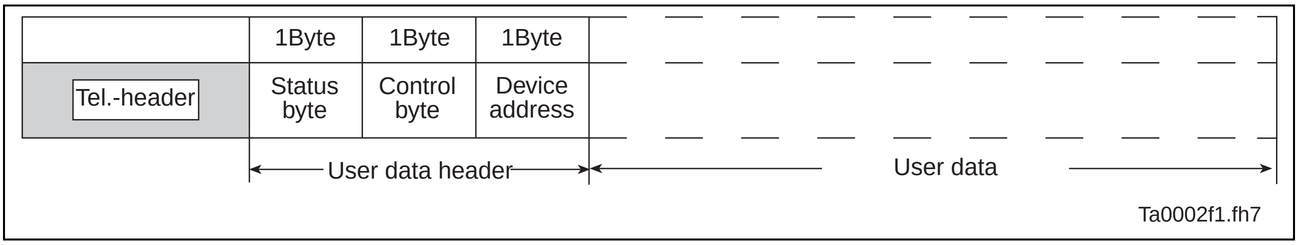

Fig. 1-9: User data head structure in reaction telegram

The definition of the user data head

The user data head describes the mode of transmission in the command telegram.

Control byte

The data block element of a parameter which is being accessed is described in the control byte. Bit 2 is used to control the transmission of following telegrams (the writing of lists in several increments).

Unit address

The unit address set at the address switch must be entered here.

Parameter Number and Type

The parameter number has the format set in the SERCOS interface specification. To be able to address control parameters as well, 1 byte is set in front of the address to identify the parameter type.

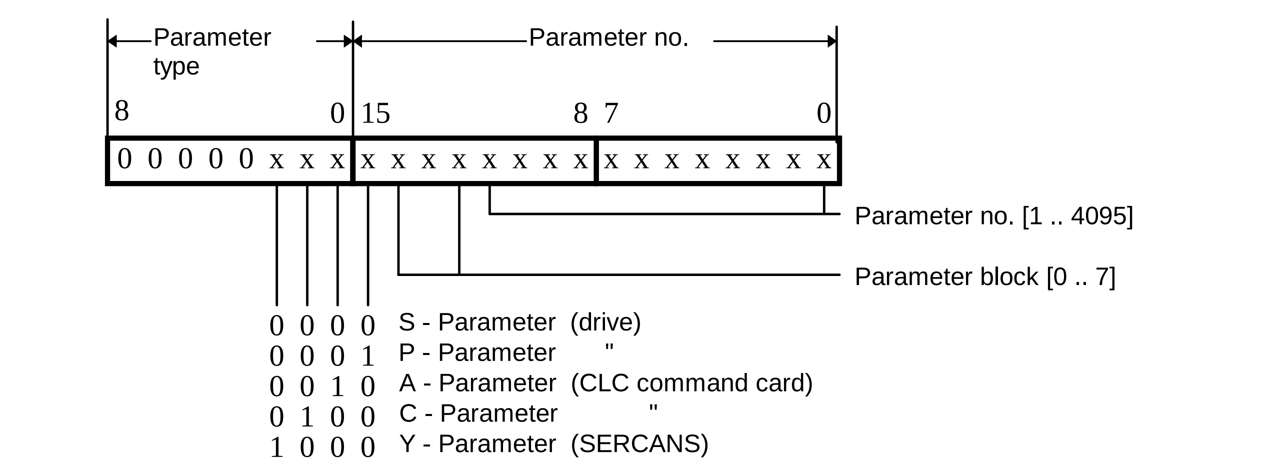

Fig. 1-10: Parameter number and type in user data head

Structure of the User Data Field

Values of any kind can be entered in the user data byte. These cans can be interpreted j as needed by a specific service. For example, binary symbols are entered into the user data during flash programming and the decimal value when writing a parameter. The length of the user data field is set with both the DatL and DatLW bytes in the telegram head.

1.5 Communications procedures

General Information on the Parameter Structure

All parameters of the drive controller are stored in a uniform parameter structure. Each parameter is made up of 7 elements. The table below describes the individual elements and access possibilities. The parameter structures illustrated here will be referenced in the following sections.

Element no.	Data block element	Access posibilities
1	ID number	read
2	name	read
3	attribute	read
4	unit	read
5	min. input value	read
6	max. input value	read
7	operating data	read / write

Fig. 1-11: Parameter structure

Note: Attached is a parameter description with detailed data of the features of all available parameters.

Communicating with an ASCII Protocol

Actuating a Specific Bus User

To communicate with a bus user then it must be directly addressed with a CHANGE DRIVE command, specifying the drive address. With each CD command, the drive specified by the address is addressed. All other ddrives are switched into passive mode. The addressed drive signals with a prompt. As of this point, all further communication takes place with this drive until another CHANGE DRIVE command switches to another drive.

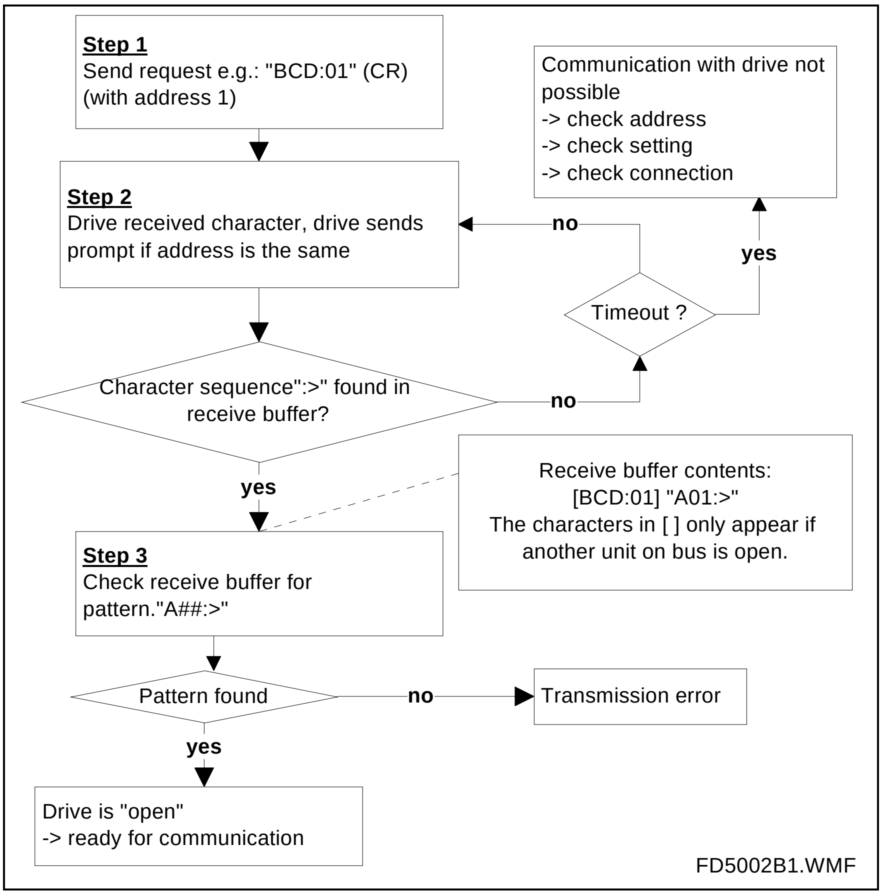

Fig. 1-12: Actuating a bus user

Write Accessing a Parameter

The write accessing of a parameter generally takes place as follows:

ID number of parameter, data block element number, with operating data (Carriage Return)

Once a write operation is completed, the drive signals with a prompt.

To access the parameter value of parameter P-0-4037, for example, the following must be input:

Note: All data entered must correspond to the data type set in the attribute (HEX, BIN, DEZ).

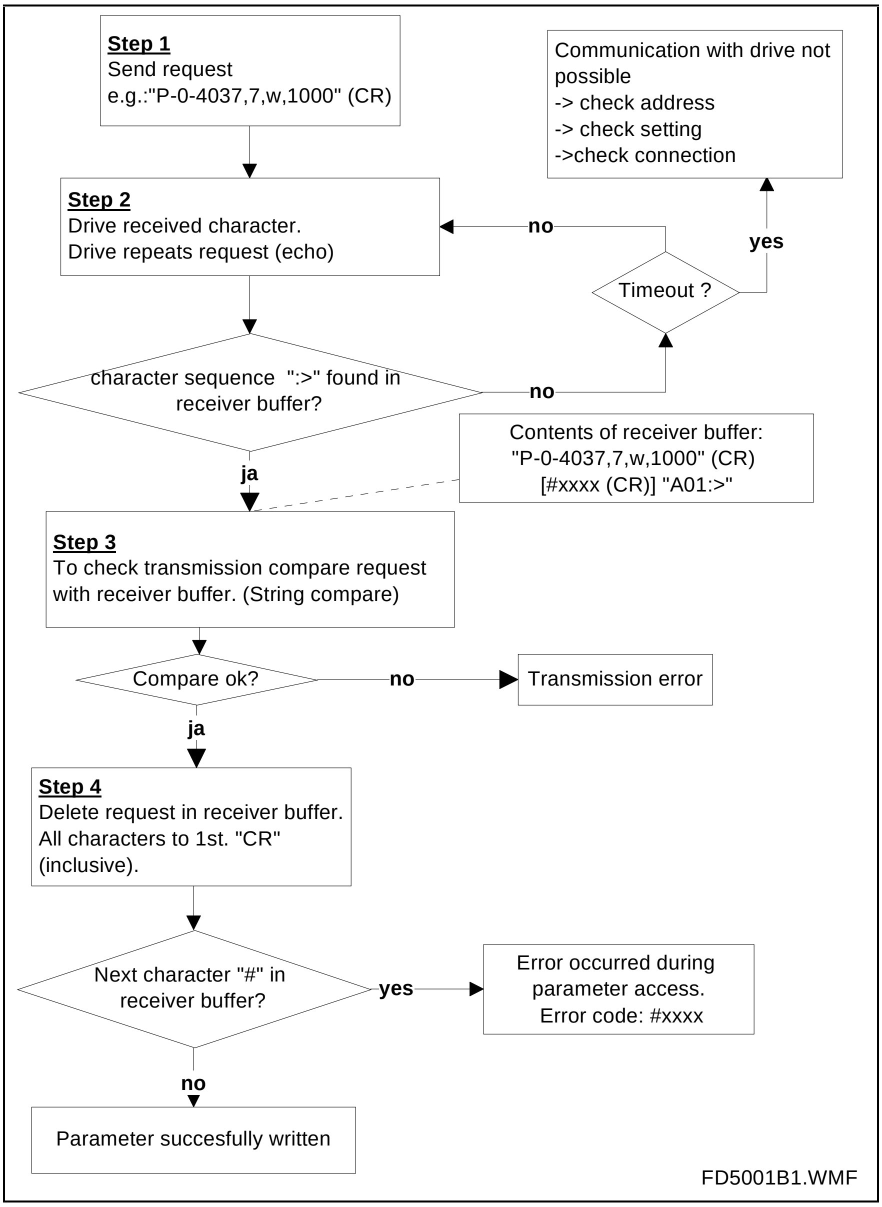

Fig. 1-13: Write accessing a parameter

Also see error messages.

Read Accessing a Parameter

Read accessing a parameter looks like this :

ID number of parameter, data block element number (Carriage Return)

The drive plays back the contents of the addressed data block element.

To access the operating data of parameter P-0-4040, for example, the following must be input:

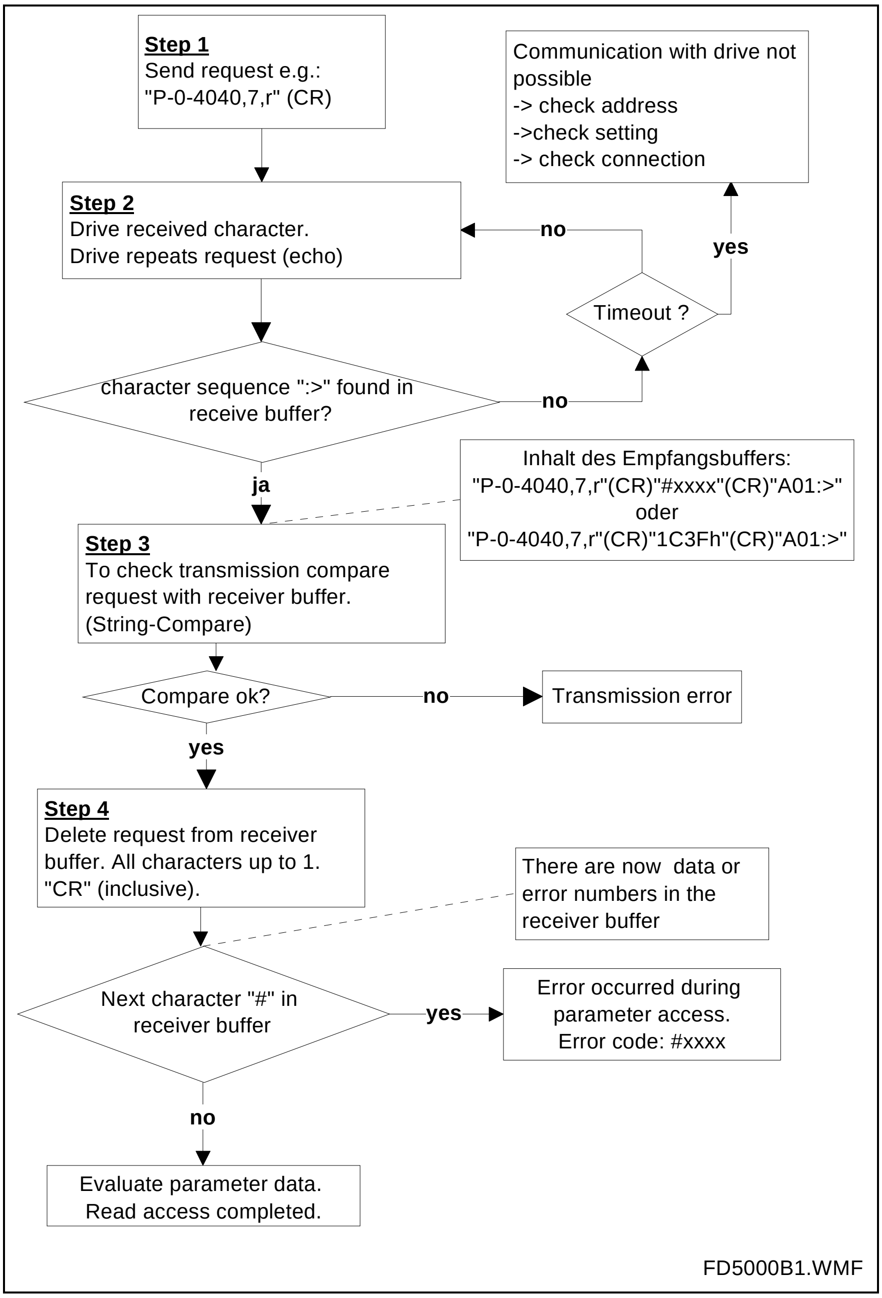

Fig. 1-14: Read accessing a parameter

Write Accessing List Parameters

There are a number of lists in the drive. These can be addressed when writing in a modified way.

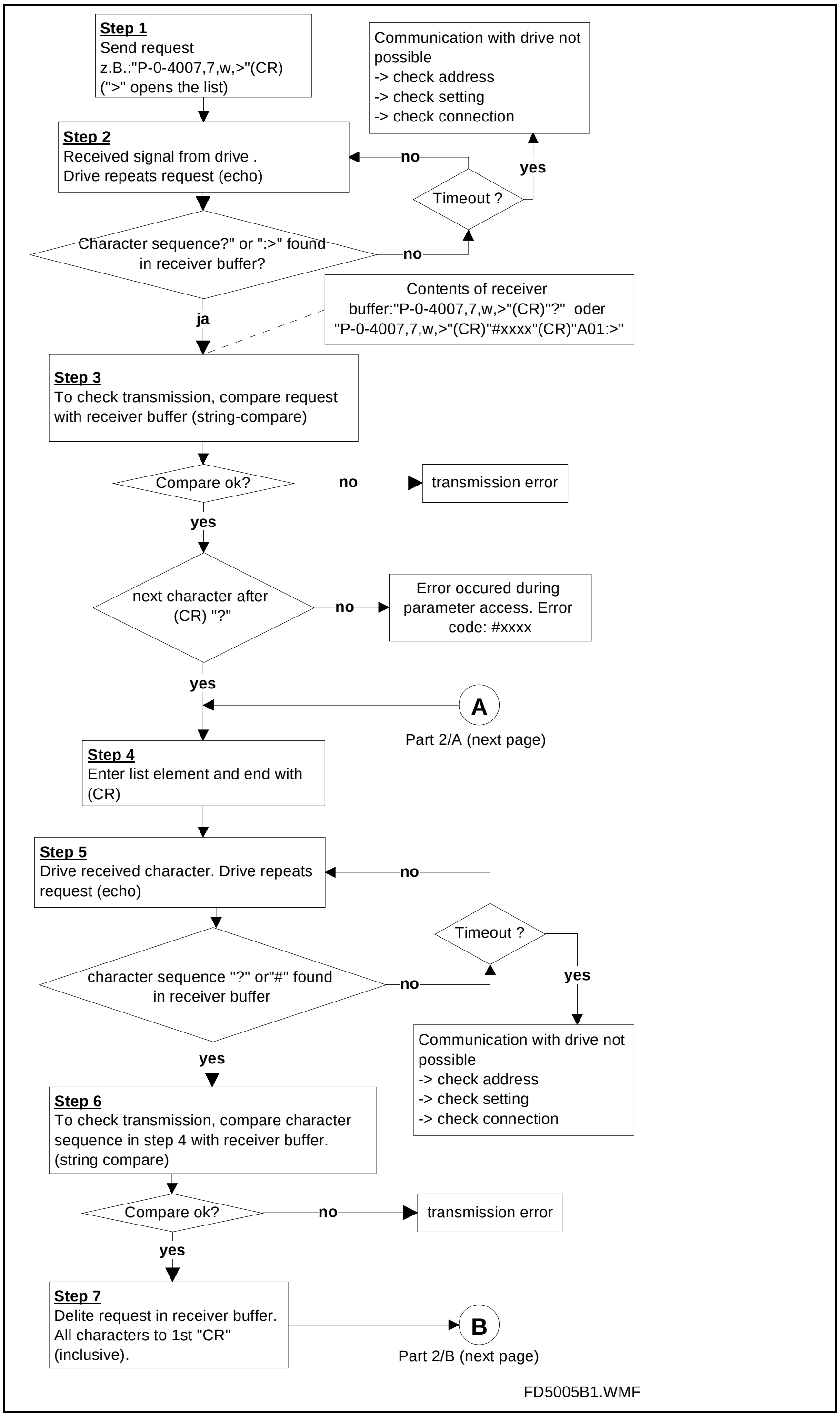

Fig. 1-15: Write accessing list parameters (part 1)

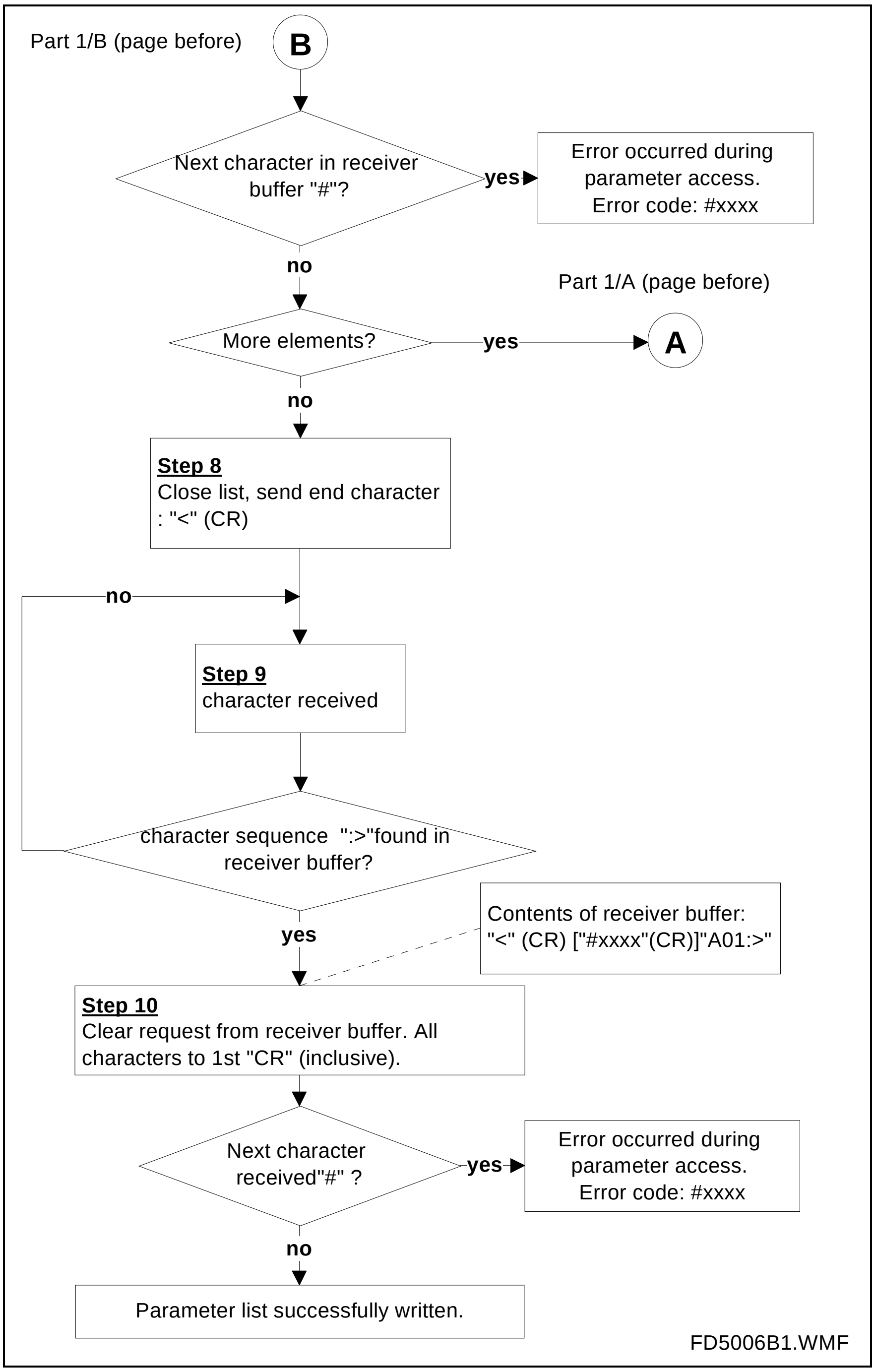

Fig. 1-16: Write accessing list parameters (part 2)

It is important to conclude the input with a "<" symbol as only then will be the data be assumed in the drive.

Reading Accessing List Parameters

List parameters are read accessed in the same way as normal parameters. The drive supplies a list element as response, however.

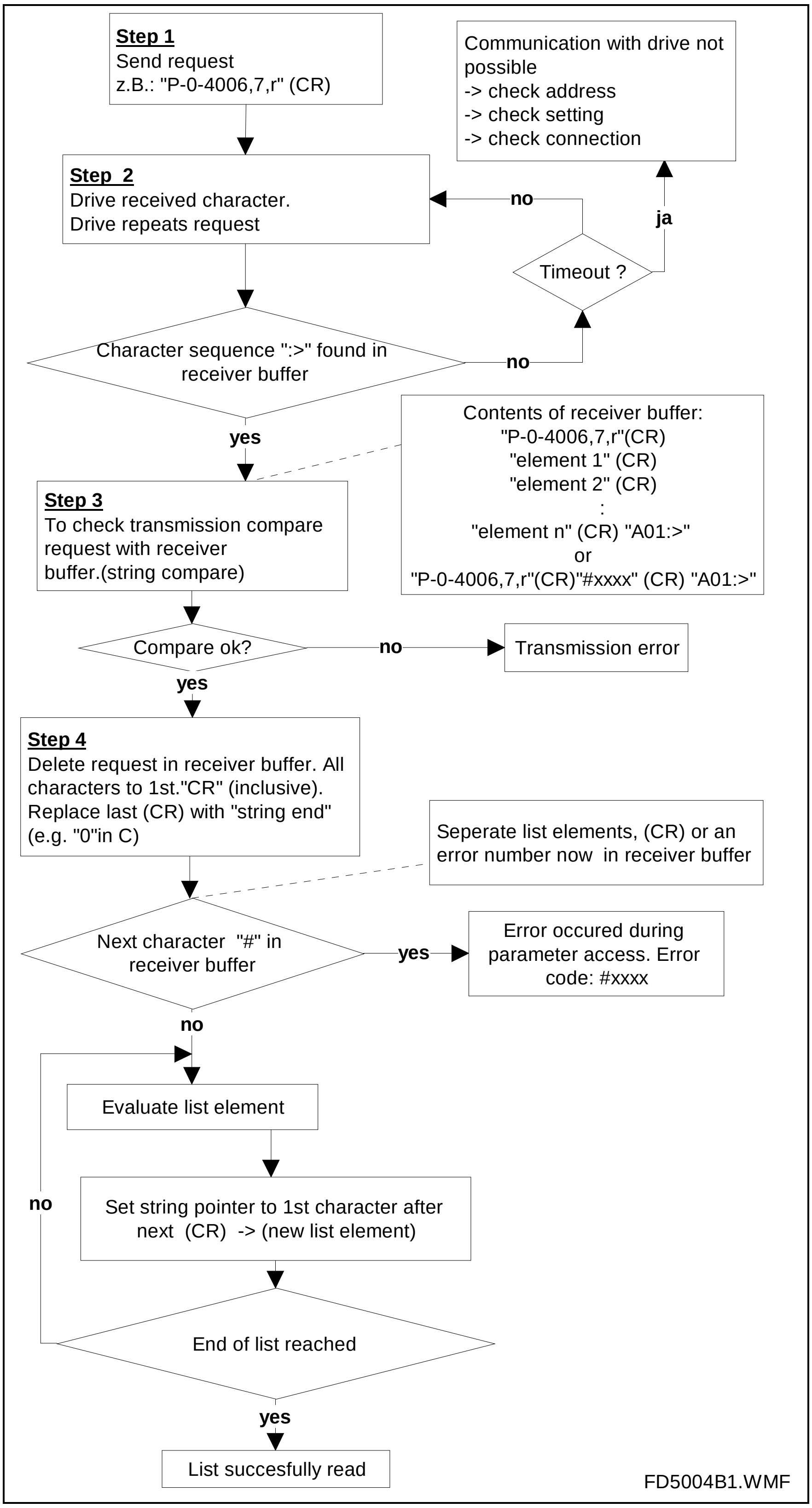

Fig. 1-17: Read accessing list parameters

Starting a Command

Numerous commands can be conducted in the drive controller . Command execution takes place automatically in the drive. There are commands for:

- **Switching between operating and parametrization modes: S-0-0127, C100 Communication phase 3 transition check S-0-0128, C200 Communication phase 4 transition check P-0-4023, C400 Communication phase 2 transition**
- **S-0-0262, C700 Command basic load**
- **S-0-0099, C500 Reset class 1 diagnostic**
- **S-0-0148, C600 Drive controlled homing procedure command**
- **P-0-0012, C300 Command 'Set absolute measurement**
- **P-0-4032, C3 Command set emulation absolute value**

A command can be started, terminated and completed via the serial interface. The status of command execution can also be read.

A command is triggered as follows:

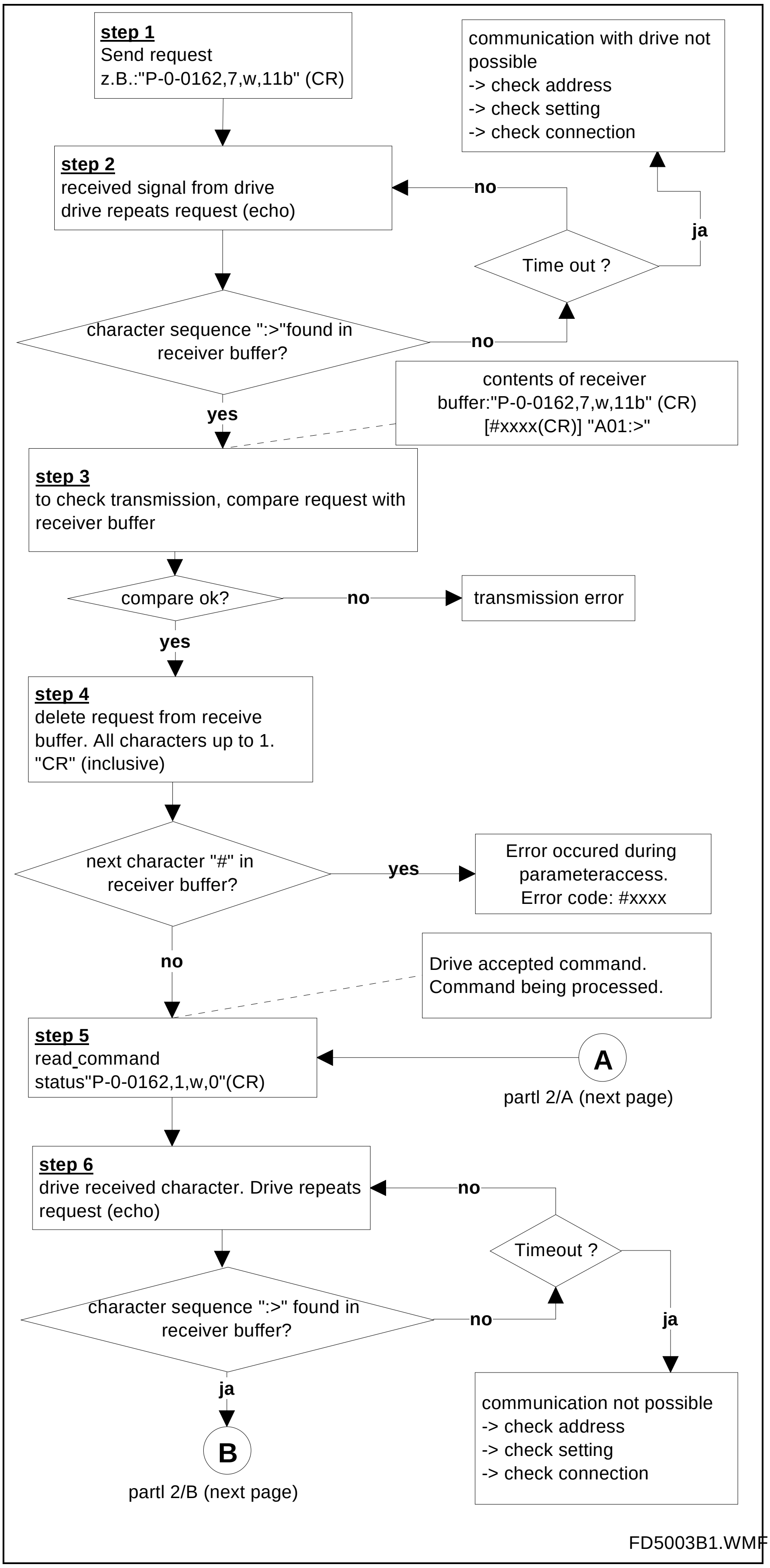

Fig. 1-18: Starting a command, part 1

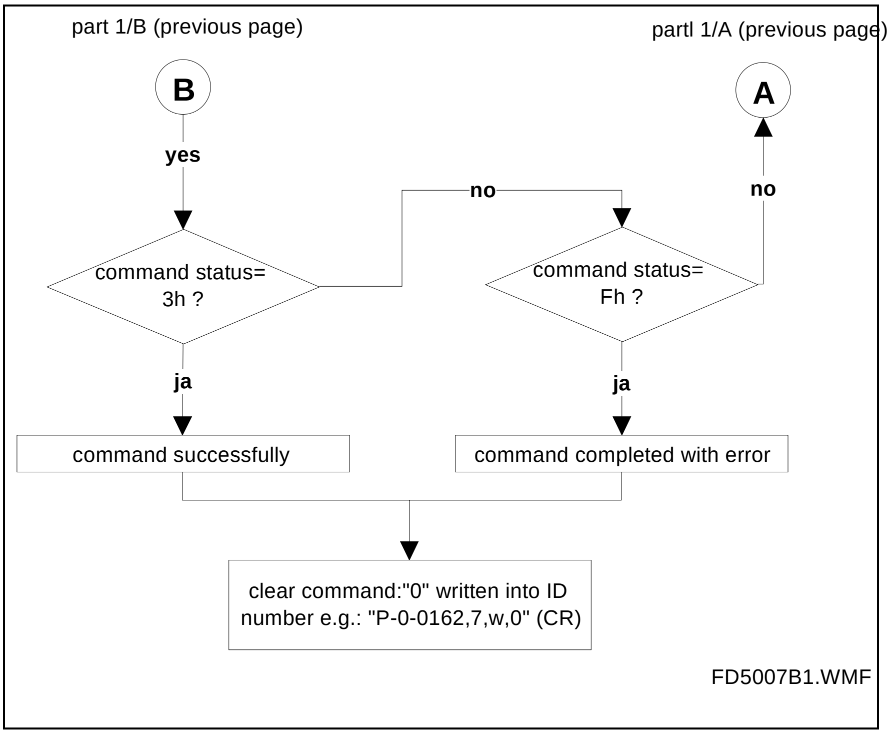

Fig. 1-19: Starting a command, part 2

Querying Command Status

The current status of a command can be queried. By doing so, it can be ascertained that the drive has concluded command execution before the control (or PC) has ended the command.

The command status is queried as follows:

ID number of command,1,w,0 (Carriage Return)

The drive signals the current command status after the ID number of the command parameter is written.

Possible status messages:

0 h	command not set in drive
1 h	command set in drive
3 h	command set, released and properly executed
5 h	command set in drive and enabled
7 h	command set and enabled, but not executed
F h	command set and enabled, but not executed, as error present

Fig. 1-20: Status messages

The command status is transmitted in bit list form. The definition of the individual bits is illustrated below.

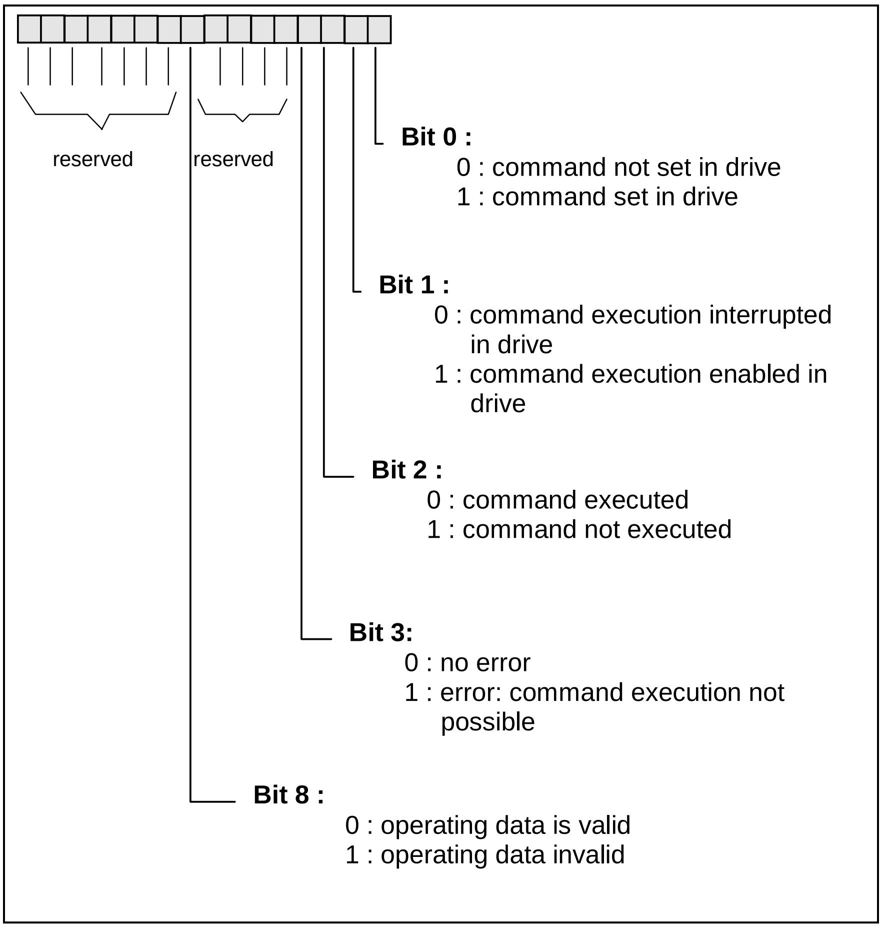

Fig. 1-21: Command acknowledgement (data status)

Ending a command

A command is ended as follows:

ID number of command,7,w,0 (Carriage Return)

Communicating with the SIS protocol

Actuating a Drive via an SIS protocol

When communicating with SISprotocols, a difference is made between **comand telegram** and **reaction telegramm** depending on transmission direction. A user can only be addressed if a specific telegram format (frame) is maintained at his address (see programming module).

Note: To be able to communicate with the drive via SIS telegrams, an initialization telegram must first be sent to the drive (e.g., service 0x00 identifying all users). Only after the drive has received at least a valid SIS telegram is the SIS channel free for further communications.

The individual **access modes** are described briefly below before the individual **services** are explained.

General information about read accessing

If a command telegram is used to start a read of a parameter, then the drive checks whether a **following telegram is needed.** In this case, the reaction telegram in the control byte is retained in

Bit 2 (running / final transmission) at "**0“** until the final reaction telegram is sent. Bit 2 is set to 1 herein.

The transmission of a following reaction telegram is triggered by the renewed transmission of an <u>unchanged</u> command telegram.

General information for following telegram accessing

If write or read of a parameter is started in the drive with a following telegram, then this must be concluded of terminated before a different service can be started. If a different service was started anyway, then error code **0x800C "unallowed access**“ is sent in the reaction telegram. The previously started service with following telegrams can then be processed as usual in the next command telegram, or terminated.

A difference is made between

- **general** and
- **special services**.

Service 0x00 Identifying all users

Command telegram

- Enter 0x00 in telegram heads.
- enter 0x80 of the drive in the group designation of the user data

Reaction telegram

- Enter the version number of the drive in the user data. It contains information about the drive single-axis and fieldbus software entered in the drive as well as the hardware used.

Service 0x01 Terminating a Data Transmission

Command telegram

- Enter 0x01 in the service of the telegram head.
- Enter the terminated service in the user head.

Reaction telegram

If there is **no error,** then the reaction telegram has the following structure:

Telegram head	Status byte

Fig. 1-22: Structure of the reaction telegram

If there is an **error,** then user data containing the error codes are sent. The user data head corresponds to the SIS specificaiton.

Telegram head	User data head	User data

Fig. 1-23: Structure of the reaction telegram

Note: If no following telegrams are processed but this service is sent anyway, then no error reaction telegram will be sent!

Service 0x0F Token Passing

Note: This service is not suppported in ECODRIVE!

Reaction telegram

Error code 0x0F "**Invalid service**“ is sent in the status byte of the des **user data**.

Telegram head	User data head

Fig. 1-24: Structure des Reaction telegrams

Service 0x80 read eines Parameters

Command telegram

- Enter **0x80** in the service of the telegram head.
- Enter the parameter to be read in bytes **Parameter type** and **Parameter no**. of the user data head.
- Do not enter **user data bytes**.

Reaction telegram

- Using bit 2 the running / final transmission is designated in the control byte of the reaction telegram.

Service 0x81 Read a List Segment

Command telegram

- Enter **0x81** in the service of the telegram head.
- Parameter type and parameter no. of the parameter to be read must be entered in the user data head.
- in the user data bytes 0 and 1 of the **offset** within the list as word =16 Bit
- in user data bytes 2 and 3 the **number** of the **words** to be read

Reaction telegram

- Bit 2 identifies the running / final transmission in tge control byte of the reaction telegram.

Note: The output of a following telegram is started by a renewed tarnsmission of the unchanged command telegram.

Service 0x8E write a list segment

Command telegram

- Enter **0x8E** in the service of the telegram head.
- Enter parameter type and number of the parameter to be read in the user data head.
- in user data bytes 0 and 1 of the **offset** within the list as word =16 Bit
- in user data bytes 2 and 3 the **number** of the **words** to be written

Reaction telegram

- Any occurring errors are entered in the user data of the reaction telegram.

Note: Only list segments can be processed with this service that are contained in the present list. If the actual list length is to be changed, then this change must be specified. It is not possible to operate in following telegram mode.

Service 0x8F write a parameter

Command telegram

- Enter 0x8F in the service of the telegram head.
- Enter the parameter to be written into into in parameter type and number bytes of the user data head.
- Enter the value to be written into the user data head.

Reaction telegram

Note: This service can be used to start all commands in the drive.

Starting a command

Via the SIS interface all commands in the drive can be started with Service **0x8F "write a parameter“**.

Telegram head	User data head	1 byte user data

Fig. 1-25: Structure of the command telegram

- Enter 0x8F in the service of the telegram head.
- Enter the actuating command in parameter type and number bytes of the user data head.
- Enter the default of the command in the user data head.

Possible commands in the drive

Command	Drive parameter	Parameter no. in telegram
Drive-guided referencing	S-0-0148	0x0094
Reset C1D	S-0-0099	0x0063
Communications phase 3 transition check	S-0-0127	0x007F
Communications phase 4 transition check	S-0-0128	0x0080
Base load	S-0-0262	0x0106
Set absolute measurement	P-0-0012	0x800C
Load base parameters	P-0-4094	0x8FFE
Communications phase 2 transition check	P-0-4023	0x8FB7
Set absolute dimension emulator	P-0-4032	0x8FC0
Automatic control loop settings	P-0-0162	0x80A2

Fig. 1-26: Commands in drive

Always set parameter type to 0x00. Thus only S and P parameters sare possible.

Default in user data byte	Effects
0	clears command
3	starts command

Fig. 1-27: Command default

Note: Command status can be read by writing "0" into the first element of the command parameter to be read.

1.6 Error Messages

The error codes defined in the SERCOS interface specification are used. (See **SERCOS Interface specification, sec. 4.3.2.3 "Error messages in service channel**"). These codes are also used with faulty accessing of control and systems parameters.

Error code	Explanation
0x1001	IDN not available
0x1009	element 1 incorrectly accessed
0x2001	name not available
0x2002	name transmission too short
0x2003	name transmission too long
0x2004	name cannot be changed
0x2005	name presently write protected
0x3002	attribute transmission too short
0x3003	attribute transmission too long
0x3004	attribute cannot be changed
0x3005	attribute presently write protected
0x4001	unit not available
0x4002	unit transmission too short
0x4003	unit transmission too long
0x4004	unit cannot be changed
0x4005	unit presently write protected
0x5001	minimum input value not available
0x5002	minimum input value transmission too short
0x5003	minimum input value transmission too long
0x5004	minimum input value cannot be changed
0x5005	minimum input value presently write protected
0x6001	maximum input value not available
0x6002	maximum input value transmission too short
0x6003	maximum input value transmission too long
0x6004	maximum input value cannot be changed
0x6005	maximum input value presently write protected
0x7002	data transmission too short
0x7003	data transmission too long
0x7004	data cannot be changed
0x7005	data presently write protected
0x7006	data semaller than minimum input value
0x7007	data greater than maximum input value
0x7008	data not correct
0x7009	data password protected

Fig. 1-28: Error specification per SERCOS

Error with ASCII Communication

The following error messages specifically occur when communicqating with an ASCII protocol!

Error code	Explanation
0x9001	fatal error (symbol cannot be identified)
0x9002	parameter type error
0x9003	invalid data block number
0x9004	"Input cannot be identified"
0x9005	data element number not defined
0x9006	error in write/read (r/w)
0x9007	nonsense symbol in data

Fig. 1-29: Error messages during ASCII communications

Error with SIS Communication

Error during Parameter Transmission

status byte

If an error occurs during parameter transmission, then "error during parmeter transmission" is signalled in the **status byte**.

Error code

An **error code** is transmitted in the first two bytes of the **user data**. It describes the type of error.

The following errors can occur during parameter transmission:

Error code	Explanation
0x0000	no error
0x0001	service channel not open
0x0009	element 0 incorrectly accessed
0x8001	"Service channel presently occupied (BUSY)" The desired acces presently not possible as service channel is busy.
0x8002	"problem in service channel" The requested drive cannot presently be accessed.
0x800B	"Transmission terminated (higher priority)"
0x800C	"Unallowed access (service channel not active)" A new request is started before the last one is completed.

Fig. 1-30: Error messages in serial protocol

Execution and Protocol Acknowledgement

One **status byte** is transmitted with each reaction telegram. The status byte supplies the results of a transmission in the form of a code number.

It generally applies:

Status byte results	Code number
transmission no error	0x00
protocol error	0xF0 ... 0xFF
execution error	0x01 ... 0xEF

Fig. 1-31: Definition of status bytes

Protocol error	Code Number	Error description
"Invalid service“	0xF0	The requested service is not specified or is not supported by the addressed user.
"General protocol violation“	0xF1	The command telegram cannot be evaluated. (**Example**: wrong telegram length)

Fig. 1-32: Definition of protocol error

Execution error	Code Number	Error description
"Error during parameter transmission“	0x01	An error occurred during read/write of a parmeter
"Error during phase transition“	0x02	The specified target phase was not reached

Fig. 1-33: Definition of execution errors

Example:

Write accessing a write-protected parameter **S-0-0106, Current loop proportional gain 1**:

The master is trying to write 0 to the parameter. The drive acknowledges with error message 0x7004 ("data cannot be changed").

Command telegram:

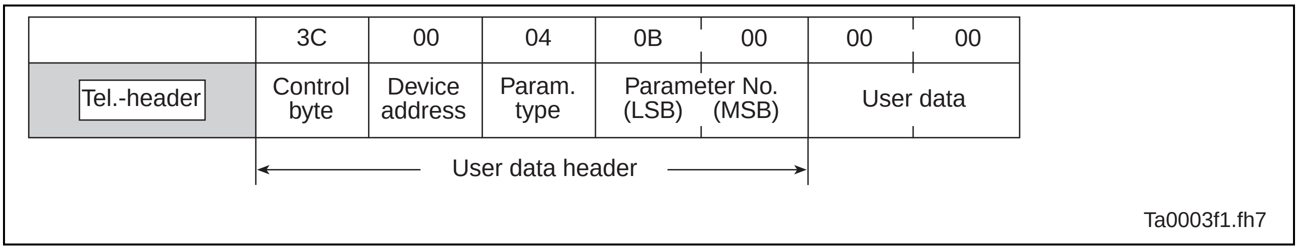

Fig. 1-34: Write S-0-0106 (Command telegram)

Reaction telegram:

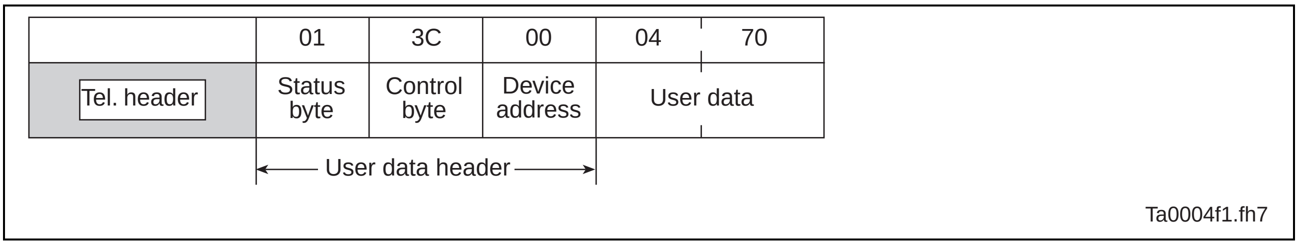

Fig. 1-35: Read S-0-0106 (Reaction telegram)

1.7 Application Examples (Changing Position Block Data)

ASCII Protocol

Suppositions:

- Several drives are connected with a PLC via an RS485 interface. The drive's address is 1.
- Drive working in positioning mode. Four positioning blocks are used.
- The target positions of the positioning blocks are to be changed via RS485 interface.

Taking up communications with the relevant drive

BCD:01 (CR)	Command to switch to drive **A01:>** Echo of connected drives. All other drives remain passive.

Note: There is no echo by symbol. Not until after the receipt of the CR does the drive send the entire input sequence back.

Activate non-resident storage

Generally, the parameters are stored in the EEPROM when writing so that even if the power voltage is switched off the data is retained.

If frequent parameter changes are desired during operation, for example a change of the target position of the positioning blocks, then there exists the danger that the maximum allowable number of write cycles of the EEPROM can be exceeded. To avoid this, the resident memory must be switched off.

It is necessary to switch off the resident memory off each time the power supply to the control is switched on. This applies until the next time the power voltage is switched off again.

Switching resident memory off: S-0-0269,7,w,1 (CR)

Write list of target positions into drive

The target positions of all axes are stored in the form of a list in parameter **P-0-4006, Process block target position**. To change one or more values in this list, it is necessary to write all relevant values of this list. If, therefore, four target positions are used, then all four positions must be written even if only one position is changed.

Drive reaction: **Input:**

P-0-4006,7,w,> (CR)
? *100.0 (CR)* target position block0
? *200.0 (CR)* target position block1
etc.
? *<(CR)*
A01:>

SIS Protocol

One-time read access (Service 0x00)

A single read acces is concluded with 1 transmission step. The master enters the following information into the command telegram:

- The desired element is selected in the **control byte** in bits 3-5 "Element". Bit 2 is set to ’1’ (last transmission).
- The unit **address** is entered.
- **Parameter type and number** are entered.
- No user data are transmitted.

The answer to a read access is put together as follows:

- The acknowledgement to a request is written in to the **status byte**.
- The **control byte** is read out of the command telegram and copied into the reaction telegram.
- The unit **address** is read out of the command telegram and copied into the reaction telegram.
- The requested data is written into the **user data**.

Example:

Read parameter S-0-0044 (Velocity data scaling type) out of drive with address ‘3’. The value of the parameter is 0x0042.

Command telegram:

	3C	03	00	2C	00
Tel. header	Control byte	Device address	Param. type	Parameter No. (LSB)	(MSB)
	User data header				

Ta0005f1.fh7

Fig. 1-36: Read S-0-0044 (Command telegram)

Reaction telegram:

	00	3C	03	42	00
Tel. header	Status byte	Control byte	Device address	User data (LSB)	(MSB)
	User data header				

Ta0006f1.fh7

Fig. 1-37: Read S-0-0044 (Reaction telegram)

Read acces with following telegrams (Service 0x01)

Parameters or elements with a length exceeding maximum data field length of 245 bytes are read in several steps. Bit 2 in the control byte designates the current transmission step as either **running** or **last** transmission.

The following is the control word for a transmission in several steps.

1st step:

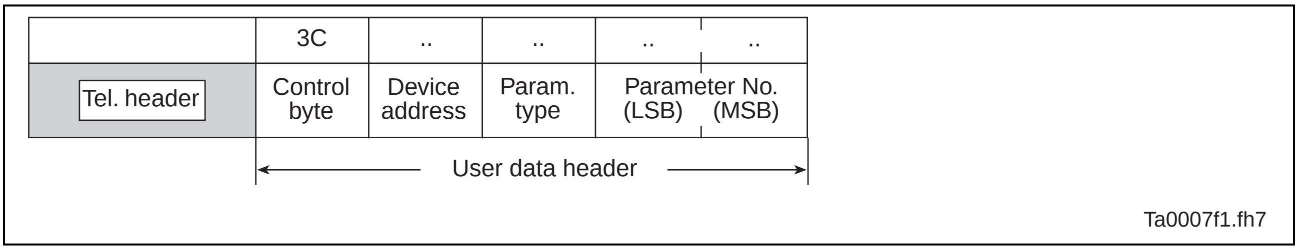

Fig. 1-38: Following command telegram 1

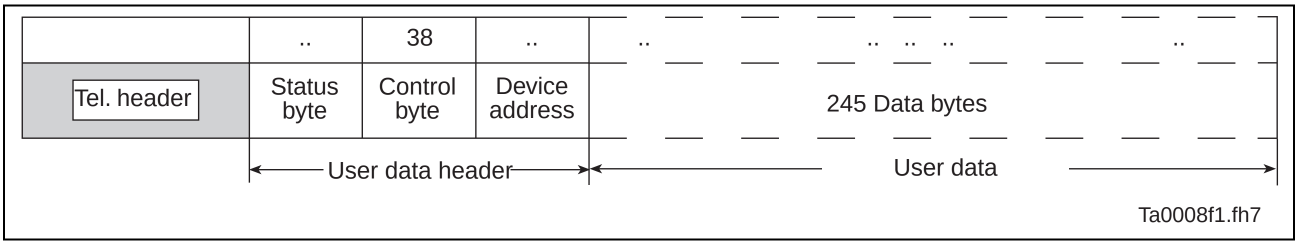

Fig. 1-39: Following command telegram 1

2nd step:

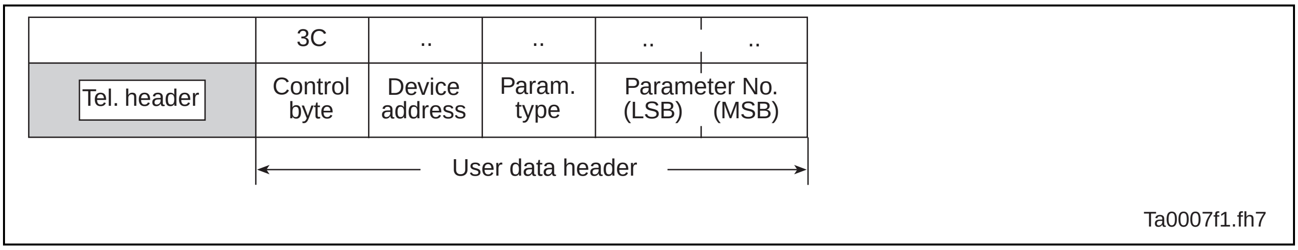

Fig. 1-40: Following command telegram 2

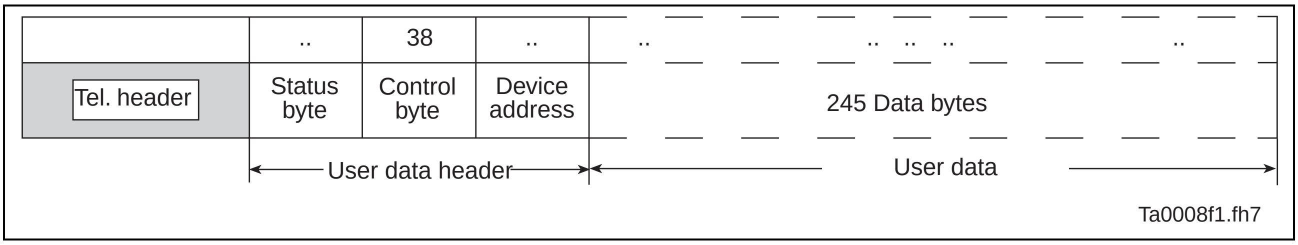

Fig. 1-41: Following command telegram 2

Last step

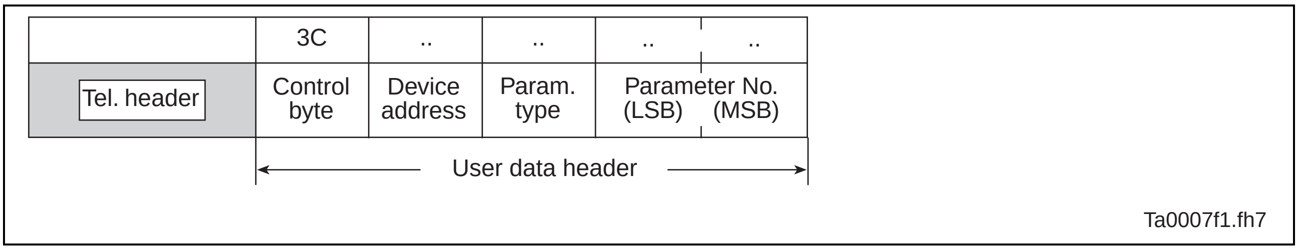

Fig. 1-42: Following command telegram 3

	..	3C	..	.. ..
Tel. header	Status byte	Control byte	Device address	1...245 Data bytes
	User data header			User header

Ta0015f1.fh7

Fig. 1-43: Following command telegram 3

Single write-accessing with execution acknowledgement (Services 0xFD and 0xFF)

A single write-access is concluded with one transmission step.

The master enters the following information into the command telegram:

- The unit address is entered.
- In the **control byte** in bits 3-5 "Element" the operating data is selected. Bit 2 is set to ’1’ (last transmission).
- The ID number of the parameter to be written into the **parameter number.**
- The value of the operating data is entered in the **user data**.

The response to a write accessing is put together as follows:

- The acknowledgement of a request is written into the **status byte**.
- The **control byte** is read out of the command telegram and copied into the reaction telegram.
- The unit address is rad out of the command telegram and copied into the reaction telegram.
- No **user data** are transmitted.

Example:

Transmit parameter S-0-0044 (Velocity data scaling type) to drive with address ‘3’. The value 0x0042 is written into the parameter.

Command telegram:

	3C	03	00	2C	00	42	00
Tel. header	Control byte	Device address	Param. type	Parameter No. (LSB)	(MSB)	User data	
	User data header						

Ta0009f1.fh7

Fig. 1-44: Write parameter S-0-0044 (Command telegram)

Reaction telegram:

	00	3C	03
Tel. header	Status byte	Control byte	Device address
	User data header		

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Fig. 1-45: Write parameter S-0-0044 (Reaction telegram)

The difference between a write access with protocol acknowledgement (Service 0xFF) and write access with execution acknowledgement (Service 0xFD) lies in the chronological sequence of the telegram.

Accessing with protocol acknowledgement

An access with *Protocol acknowledgment* is answered immediately after receipt of command telegram. The reaction telegram acknowledges receipt of the request.

Accessing with accessing acknowledgement

An access with *access acknowledgement* is acknowledged after the request is processed.

Write accessing with following telegrams (Service 0xFE)

Parameters or elements with a length exceeding **243 bytes**are read in **several steps**. A transmission of lists of this kind are performed in several steps. Bit 2 in the control byte identifies the current transmission steps as either **running of final** transmission.

The **control word for a transmission in several steps** is described below.

1st step:

	38	..	..	.. ..	.. ..
Tel. header	Control byte	Device address	Param. type	Parameter No. (LSB) (MSB)	243 Data bytes
	User data header				User data

Ta0011 f1.fh7

Fig. 1-46: Write following command telegram (step 1)

	..	38	..
Tel. header	Status byte	Control byte	Device address
	User data header		

Ta0012f1.fh7

Fig. 1-47: Write following reaction telegram (step 1)

2nd step:

	38	..	..	.. ..	.. ..
Tel. header	Control byte	Device address	Param. type	Parameter No. (LSB) (MSB)	243 Data bytes
	User data header				User data

Ta0011 f1.fh7

Fig. 1-48: Write following command telegram (step 2)

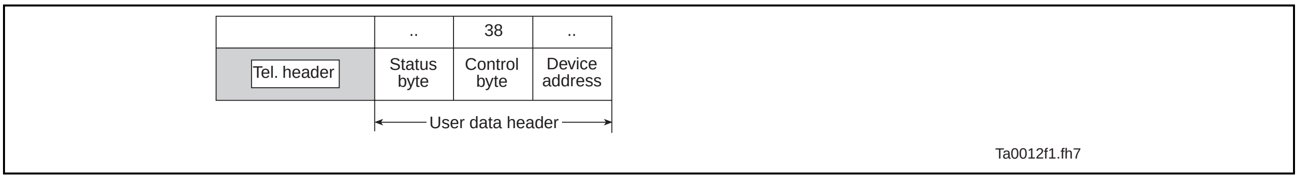

Fig. 1-49: Write following reaction telegram (step 2)

Final step:

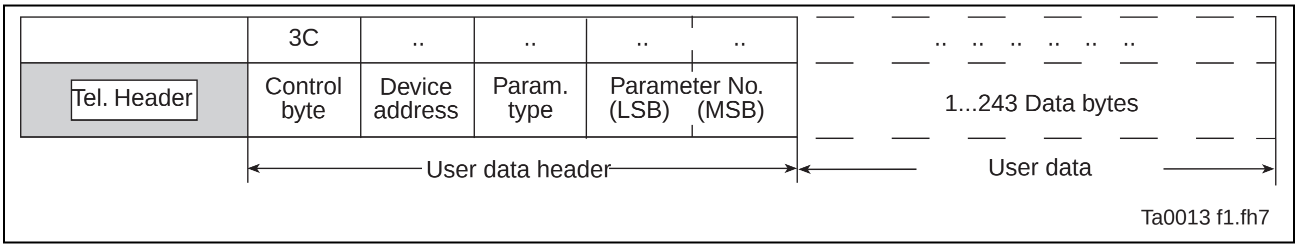

Fig. 1-50: Write with following reaction telegram (step 3)

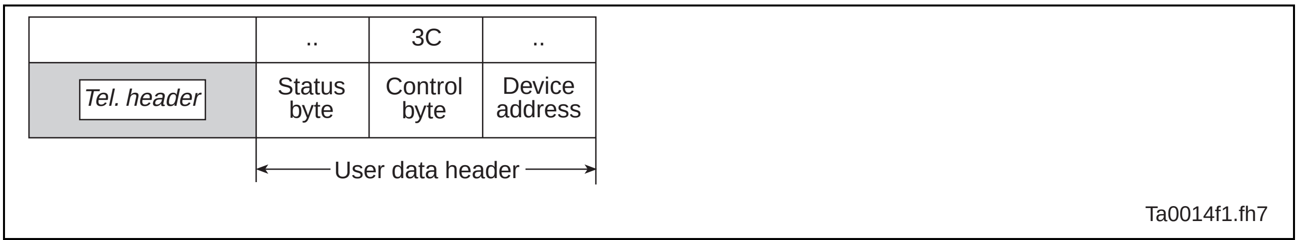

Fig. 1-51: Write with following reaction telegram (step 3)

1.8 Connection Techniques

See Project Planning Manual.

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Kundenbetreuungsstellen außerhalb Europa / USA
- Service agencies outside Europe / USA

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