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ASYCONT-600 System Controller

User Manual

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Abbreviations

FPGA	Field Programmable Gate Array
DO	Digital Output
NWA	Network Analyzer
PC	Personal Computer
TTL	Transistor Transistor Logic
USB	Universal Serial Bus

Document History		
Version	Date	Change Description
1.0 beta	Jul 25, 2019	Initial

1. Safety Instructions and Warnings

Without claiming completeness the following safety warnings and guidelines apply.

Warning

Unintentional movements of the motors may lead to danger of life, serious personal injury or property damage.

Follow the safety instructions of the test system.

Warning

Comply with safety rules and safety standards of the country in which this equipment will be used.

Warning

This device contains potentially dangerous voltages and currents.

2. About this Manual

This use manual describes options and the functional concepts of the ASYCONT-600 system controller as well as the remote control application and the remote control interface.

Chapters 1 to 12 describe the basic options and the functional concepts.

Chapter 13, ASYCONT 600 Remote Application contains the description of the controllers user interface which provides access to all controller functions. The application may run on the controller display (optional) or on client PC’s or tablets connected to the system network.

Remote operation and the remote interface is outlined in chapter 14, Remote Operation.

3. Overview

Asycont 600 is a system controller designed primary for antenna measurement and test systems. The main purpose is the control of time critical motion control tasks and the coordination with trigger/control of RF instrumentation and fast RF switches.

3.1 Front Panel Description

Fig 1: Controller Front Panel

Ethernet - RJ45

The front panel Ethernet connector is mainly intended for service and maintenance of the controller. Default IP address is 192.168.0.100.

USB – USB Type A

Allows firmware updates from USB memory device.

Power

Main power switch of the controller.

Emergency Stop

The emergency stop switch is connected to the integrated safety. If available, the switch is connected to the emergency switch loop of the measurement system.

Acknowledge

The acknowledge button for acknowledge of emergency stop and controller errors.

Maintenance/Operational

The maintenance/operational switch changes between the two operational states.

Operational LED

Controller operational status LED, see Operational Mode and Signaling for description.

Warning LED

Controller warning status LED, see Operational Mode and Signaling for description.

Error LED

Controller error status LED, see Operational Mode and Signaling for description.

3.2 Rear Panel Description

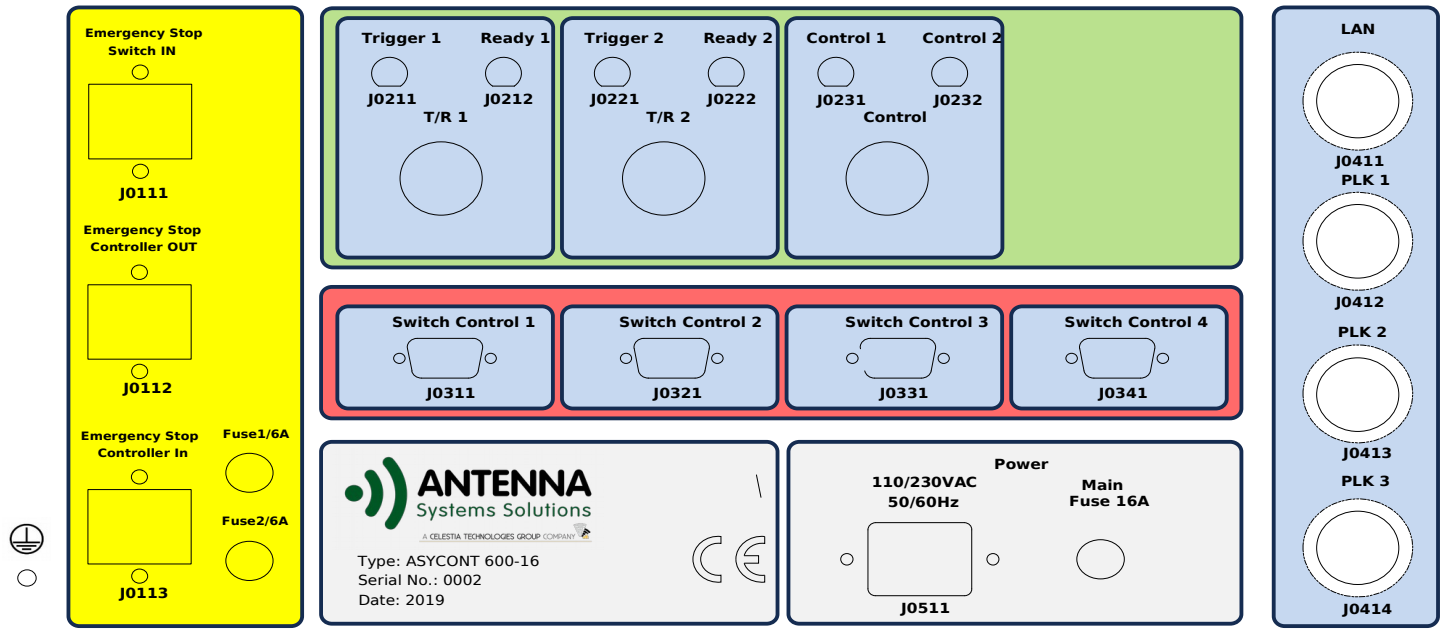

Fig 2: Controller Rear Panel

Emergency Stop

Connection to external emergency stop or safety logic.

J0111 - Emergency Stop Switch IN

Connects the controller to the external emergency switch loop. If no external emergency switches are used the connector needs to be terminated by a dummy plug to close the safety loop.

J0112 – Emergency Stop Controller OUT

Emergency stop output to an external controller. If no external controller is connected the connector needs to be terminated by a dummy plug to close the safety loop.

J0113 – Emergency Stop Controller IN

Emergency stop input from an external controller. If no external controller is connected the connector needs to be terminated by a dummy plug to close the safety loop.

Trigger/Control Group

Input and output connectors of this group provide access to the fast trigger/control signals.

J0211 - Trigger 1 (BNC)

Trigger output of TR resource #1

J0212 – Ready 1 (BNC)

Ready input of TR resource #1

J0221 - Trigger 2 (BNC)

Trigger output of TR resource #2

J0222 – Ready 2 (BNC)

Ready input of TR resource #2

J0231 – Control 1 (BNC)

Control/trigger output of TR resource 3

J0232 – Control 2 (BNC)

Control/trigger output of TR resource 4

Switch Control

The outputs of the internal control lines fro non real-time functions.

J0311 – Switch Control 1 (SUB-D, 9pol, female)

24V/0.5A control outputs of DO control, DO1...DO4

J0321 – Switch Control 2 (SUB-D, 9pol, female)

24V/0.5A control outputs of DO control, DO5...DO8

J0331 – Switch Control 3 (SUB-D, 9pol, female)

24V/0.5A control outputs of DO control, DO9...DO12

J0341 – Switch Control 4 (SUB-D, 9pol, female)

24V/0.5A control outputs of DO control, DO13...DO16

Power

J0511 – Mains Plug (C14)

110/230V AC, 50/60Hz

Main Fuse

Network

Network access for remote operation and maintenance as well as connection to the system by the real-time bus.

J0411 – LAN (RJ45)

100Mbit/s Fast Ethernet , default address 10.0.0.20

J0412 – PLK 1 (RJ45)

Powerlink real-time bus

J0413 – PLK 2 (RJ45)

Powerlink real-time bus

J0414 – PLK 3 (RJ45)

Powerlink real-time bus

4. Specifications and Options

4.1 Physical

Cabinet Dimensions and Physical Data	
Height	310.35 mm / 7U
Width	448.9 mm
Depth	495.5 mm
Weight	20 kg

Table 1: Cabinet Dimensions.

Environmental Specifications	
Temperature Operation Storage Transport	 0°C to 55°C -20°C to 60°C -20°C to 60°C
Humidity	Max 90%, non-condensing
Depth	495.5 mm
Weight	20 kg
Electrical Supply	110/230V, 50/60Hz, 6 A

Table 2: Environmental Specifications.

4.2 Motion Control

Max Nb. of Axes: unlimited[1]

Motion Modes: single axis motion, simultaneous motion of all axes
coordinated/synchronized motion of multiple axes
arbitrary trajectories

Position Correction: multi axis system position correction available for all axes, based on correction tables, up to 10 dimensions

1 Limited only by controller memory and resources; some special functions may be limited to a maximum number of axes

Position Capture:	real-time position capture of axis position unlimited capture period in parallel with other controller/motion functions time stamped

4.3 Real-Time Trigger and Control Signals[2]

The controller includes 4 fast digital outputs and 2 inputs. Outputs can be controlled as a function of axis motion, by remote interface commands or by external trigger inputs.

Additional external output modules can be connected to the system bus (optional) and are synchronized to controller internal signals.

The trigger and control signals can be synchronized to coordinate triggering and switching of RF instrumentation, fast RF switches or antenna systems.

Signal Level:	5V TTL, 50 mA
Time Resolution:	20 ns
Min Time between Pulses:	8, 16 or 24 µs??? TBD
Control Modes:	direct control by remote interface commands external trigger signal position based trigger/ready time measurement
Output Type:	non latching latching, 1 to 16 states
Application Examples:	on-point or on-sweep trigger of RF instrumentation fast control of pin-switches up to 4 nested loops of trigger/control signals timing measurements of RF instruments

4.4 Option 1, Integrated Display

A 10.4’’ panel PC with touch screen integrated in the controller provides full access to all controller functions. The PC runs the same ASYCONT 600 remote application used to control the controller from a tablet, labtop or desktop PC.

2 Specification applies to standard controller; optimizations and specializations available on request

4.5 Option 2, External Real-Time Trigger and Control Units

An external real-time trigger and control unit adds 4 fast digital outputs to the system. The unit can be connected at any location of the system bus. The outputs are synchronized to the internal controller outputs and follow the same specification.

Up to 2 external units can be connected to controller, cp chapter 5.1.2, Distributed Digital Output and Real-Time Control.

Time Jitter between Controller and ext. Control Modules: <1µs

4.6 Option 3, Digital Outputs[3]

Digital outputs are directly controlled by remote interface commands; application examples are control of electromechanical RF switches or amplifiers. Outputs may be located in the controller or externally, cp chapter 5.1.2, Distributed Digital Output and Real-Time Control.

Signal Level:	24V, 0.5A
Nb. of Outputs (controller):	16
Nb. of supported ext. Outputs:	32

4.7 Option 4, Integrated Safety

Safety logic integrated into the system bus for implementation of safety functions according to machine guideline 2006/42/EG. The safety logic disables all system drives in case of a safety issue in accordance with machine guideline 2006/42/EG. Safety functions include safe deceleration until stop followed by de-energizing of the drives.

Integration into the system bus allows distribution of safety functions through a fiber optical system bus.

Internal Emergency Stop:	1
Link to External Safety Logic:	1
External Emergency Stop Loop[4]:	1 (allows to connect multiple switches in a loop)

Additional emergency stop switches can be connected by external DI modules to the system bus at arbitrary locations in the system.

3 Additional outputs available on request
4 Additional safety functions on request

5. Distributed Control Concept

The ASYCONT-600 system controller is the core of a distributed control system. In a distributed control system the drives, digital output units and trigger/control units may be located at different places in the measurement system. The controller connects to each unit via a real-time bus that provides tight time synchronization of the remote units and the system controller.

The use of a single real-time bus system minimizes wiring efforts and the possibility to use fiber optical links provides an efficient way to penetrate the shielding of the measurement chamber.

5.1.1 Distributed Motion Control

Typically, each axis has its own drive system (power supply, servo amplifier, …) located closed to the motor.

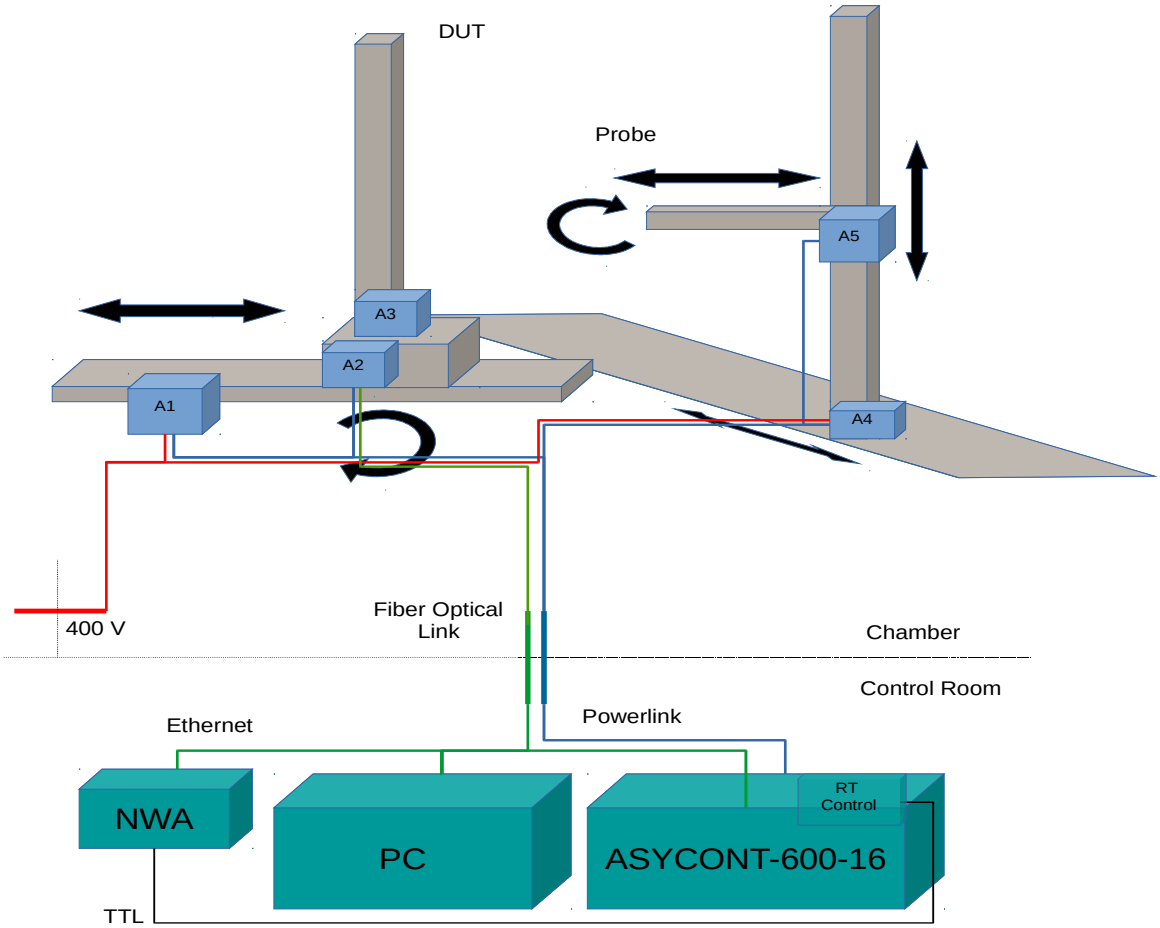

Fig 3: Distributed control example, NWA in control room.

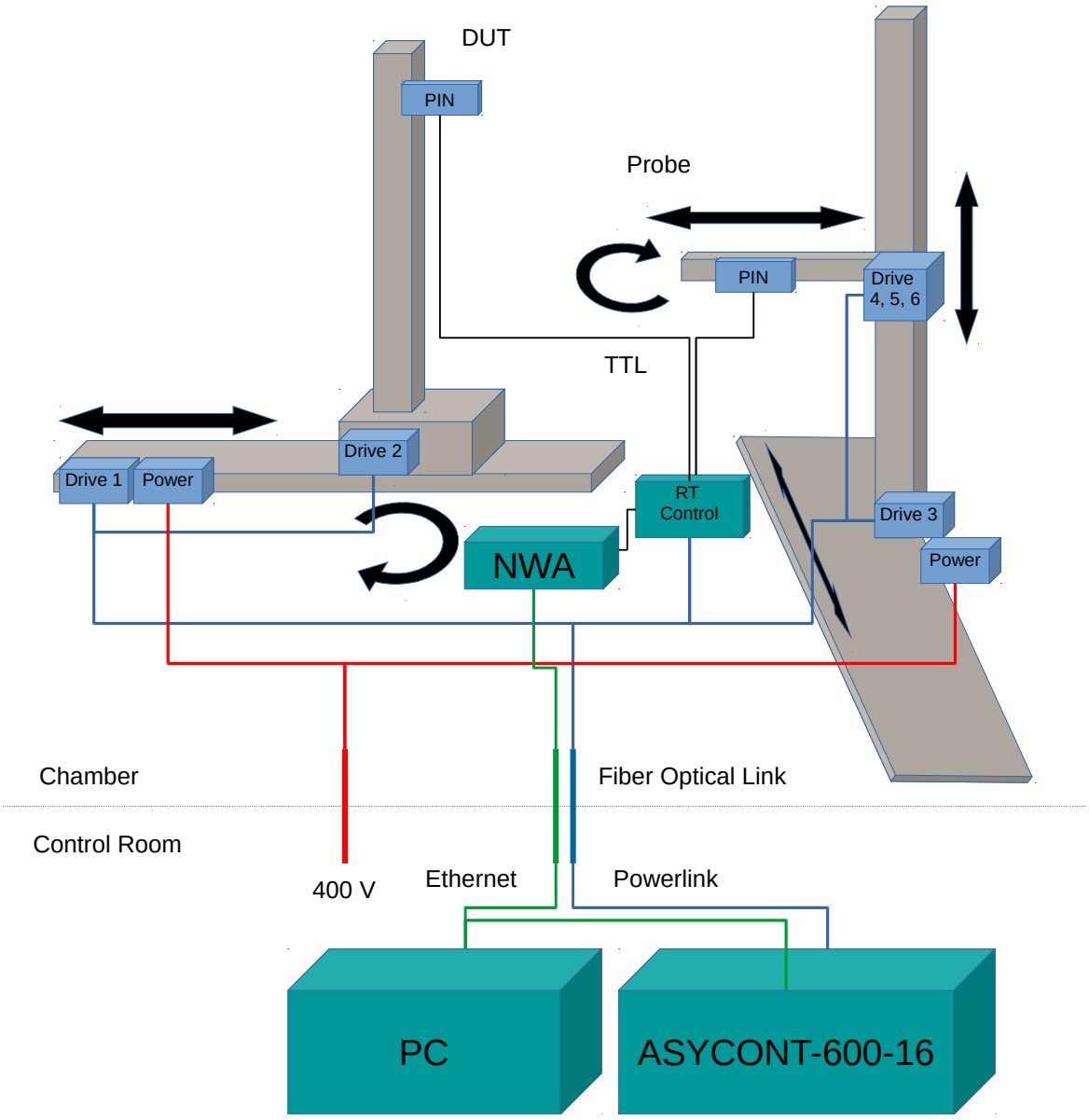

Fig 4: Distributed control example, NWA in chamber.

5.1.2 Distributed Digital Output and Real-Time Control

The controller contains an optional digital output unit and an FPGA based real-time trigger/control unit.

The DO unit is typically used for control of RF switches or amplifiers. The fast trigger/control unit allows fast and deterministic control and synchronization of the RF instruments and PIN switches. Fig 5 shows an example configuration.

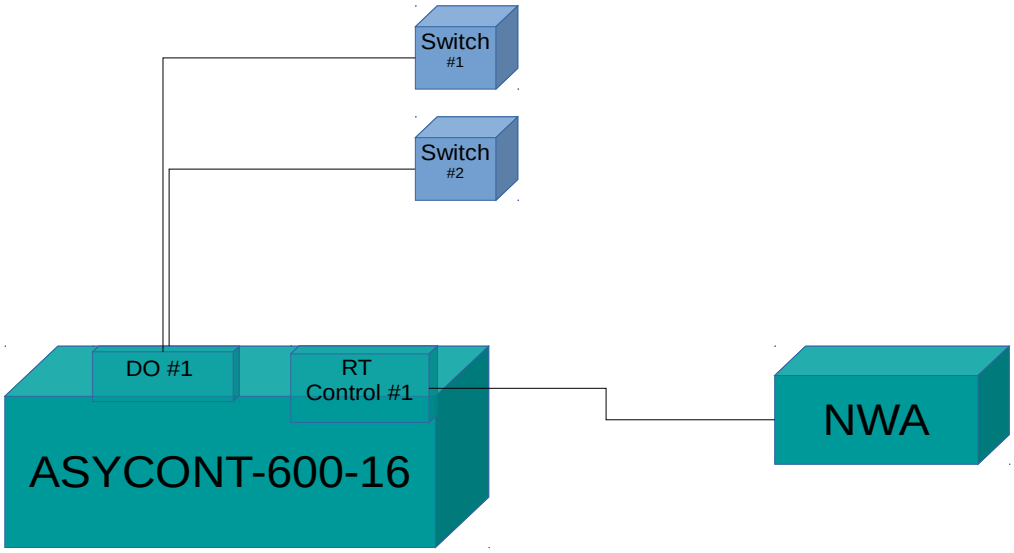

Fig 5: DO and Trigger/Control Connected to Standard Controller

Optionally, additional digital output units or real-time units may be connected to the bus and can be distributed over the measurement system. A typical configuration contains a real-time unit closed to the AUT and closed to the probe/feed antenna for pin-switch control and one or more digital output modules to control the RF path or for amplifier or measurement mode selection, see Fig 6.

See chapter 11, Trigger System and Fast Real-Time Control for a detailed description.

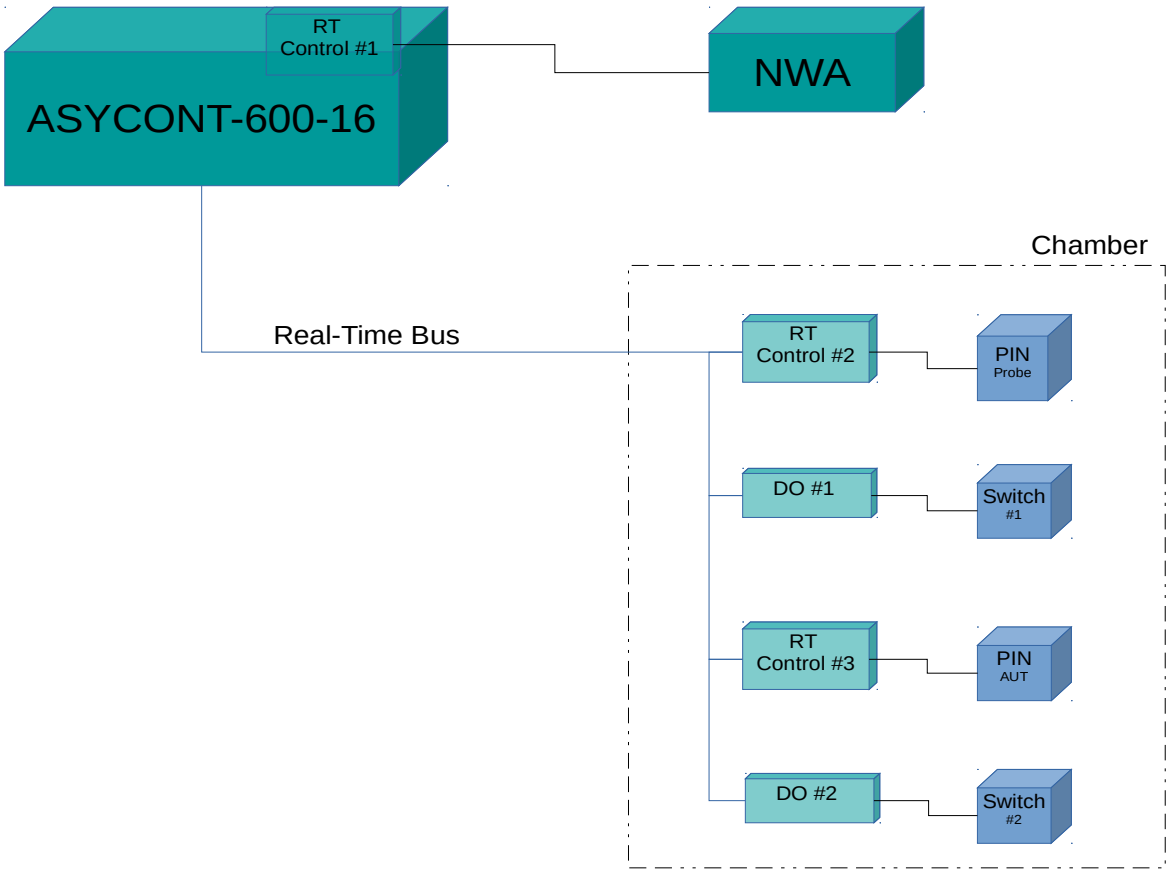

Fig 6: Distributed System Control with External Control Units

6. Integrated Safety

6.1 Configuration and Connectivity

The safety functions are integrated into the system bus and disable all system drives in case of an emergency stop event. The integration into the real-time bus allows to connect safety switches and the enable inputs of the drives by means of a single fiber optical link from the controller to the system so as to minimize wiring and shielding issues.

One emergency stop button is integrated directly into the front panel of the controller. A loop of external emergency stop buttons can be connected directly via the *EM-Stop Switch* connector on the rear panel. Note that the EM-Stop Switch connector needs to be bypassed by a special connector if no external switches are connected.

Additional EM-Stop buttons can be connected to the safety logic by means of the real-time bus and *Safe DI Units* that may be located at arbitrary positions of the measurement system.

A connection to an external safety logic can be established by the *EM-Stop Controller IN* and *EM-Stop Controller OUT* connectors. This can be used, for example, to integrate the safety logic of an external motion control system. The EM-Stop Controller OUT connector provides the state of the safety logic to the external logic. The EM-Stop Controller IN connector expects the state of the external logic. Note that both connectors need to be bypassed by special connectors if the external safety logic is not connected.

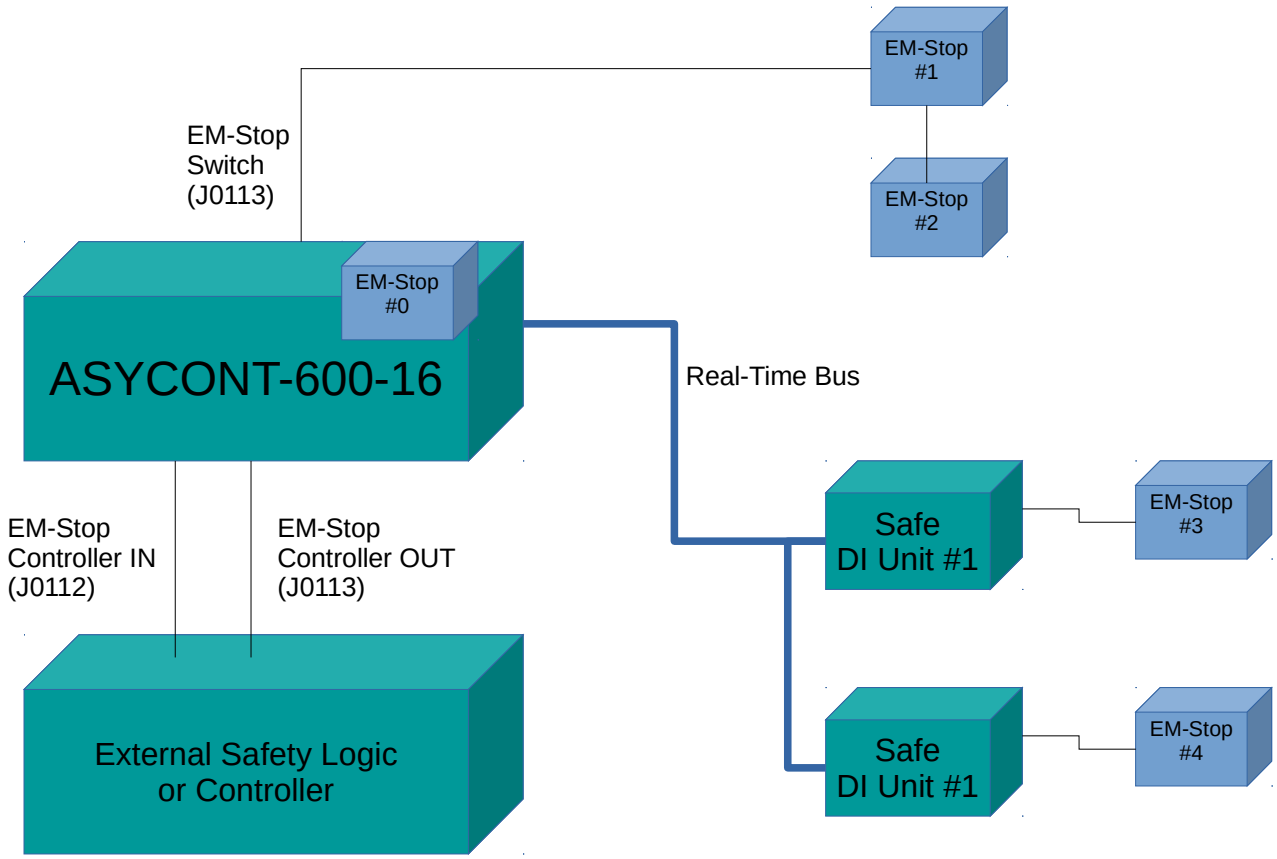

Fig 7: Integrated safety connectivity

6.2 Emergency Stop Operation

Triggering an EM-Stop

An emergency stop of the system can be triggered from any of the connected EM-Stop buttons or from a remote command, for instance from the remote application.

Warning

Triggering the emergency stop from the remote interface or from the remote application does not comply with applicable safety standards. This function is provided for convenience only.

On emergency stop all axes are decelerated with maximum deceleration to a stop. After a short delay to allow for deceleration the drives are disabled and de-energized. If applicable, the brakes are closes. The controller enters the *EM-Stop Active* state.

EM-Stop Active State

The EM-Stop Active state is indicated by the continuous red LED on the front panel of the controller.

All drivers remain disabled and the brakes remain closed.

The digital output logic and the fast real-time control functionality of the controller remain operational.

Acknowledge Emergency Stop

The emergency stop needs to be acknowledged to enter the normal operational state.

To acknowledge the emergency stop first remove the emergency stop condition and pull out the emergency stop buttons if necessary. The emergency stop can be acknowledged by the *Acknowledge* button on the controller front panel or by a remote command, for example from the remote application.

In case an external safety logic is connected, first acknowledge the emergency stop of the controller, then acknowledge the external emergency stop logic, if applicable, then acknowledge the emergency stop of the controller a second time. This procedure is required to avoid mutual locking of the emergency stop logic.

Programming Commands

```
<command name="EMStop" />
<command name="AckEMStop" />
```

7. Configuration

7.1 Base Configuration

The *base configuration* of the controller contains elementary system settings and absolute system limits that are mostly related to the connected hardware and that cannot be modified by the operator or at run-time.

For the attributes axis *Type, Forward* and *Reverse Limit* the base configuration contains absolute limits that can be further reduced by the user configuration.

The base configuration contains:

System	
Number of Axes	The number of configured mechanical axes
RT Prog 1	*TrgSeq3* | *TrgSeqS4* | *TrgTR3OL* | *Trg4OL* Trigger control FPGA program for RT location 1.
RT Address 1	Powerlink address of RT module at location 1.
RT Prog 2	*TrgSeq3* | *TrgSeqS4* | *TrgTR3OL* | *Trg4OL* Trigger control FPGA program for RT location 2.
RT Address 2	Powerlink address of RT module at location 2.
RT Prog 3	*TrgSeq3* | *TrgSeqS4* | *TrgTR3OL* | *Trg4OL* Trigger control FPGA program for RT location 3.
RT Address 3	Powerlink address of RT module at location 3.
Axis <n>, with n=[1...Number of Axes]	
Name	Unique axis name
Unit	Axis unit. Only SI base units m and deg are supported.
Type	*Limited* | *Periodic* Linear axes are always limited, rotary axes may be limited or

	periodic. A periodic axis can be changed to limited by the user configuration, but a limited axis remains limited.
Forward Limit	The absolute forward limit of the axis. The limit may be further reduced by the corresponding attribute of the user configuration, but the absolute forward limit cannot be exceeded.
Reverse Limit	The absolute reverse limit of the axis. The limit may be further reduced by the corresponding attribute of the user configuration, but the absolute reverse limit cannot be exceeded.
Resolution	The resolution of the underlying position feedback in axis unit. The value can be used to decide on truncation limits and to assign a number of digits for display purposes.

Table 3: Base Configuration parameters.

The base configuration is stored in the file *baseconfig.xml* located in the user memory area of the controller and is loaded only once at start-up.

7.1.1 Real Time Control Modules

Up to 3 real-time control modules may be connected at different locations of the real-time bus. Each module contains 4 fast outputs and 2 fast inputs. The outputs are configured and controlled by the TR resources of the trigger system.

The first module is usually located in the controller and is responsible for control of the rf instrumentation. In contrast to the other locations the configured control real time program is dynamically exchanged with a special timing measurement program when applicable.

Different real-time programs are available and can be configured at the different locations to handle different control requirements. The programs mainly differ in the mapping of the TR outputs to the 4 physical output lines and the latching/non latching nature of the outputs.

TrgSeq3

Trigger/control of the RF instrumentation, non-latching outputs, TR1 … TR4 are directly mapped to the physical outputs

TrgTR2OL

Control of PIN switch, latching outputs, up to 16 states are controlled by TR2, all 4 physical outputs are controlled

TrgTR3OL

Control of PIN switch, latching outputs, up to 16 states are controlled by TR3, all 4 physical outputs are controlled

The *RT Addresses* 1 to 3 are the addresses of the fast real-time modules on the real-time bus and are system dependent.

7.2 User Configuration

In addition to the *base configuration* the *user configuration* is initially loaded at start-up, but can be changed by the operator or by remote commands at run-time to a certain extend.

The user configuration can be read at any time, but for safety reasons configuration changes are only possible in maintenance mode. The *Operational/Maintenance* switch at the controller needs to be set physically to *maintenance*.

The following user configuration parameter are available for each axis and allow to further restrict the corresponding values of the base configuration.

The user configuration is found in the file *config.xml* in the user memory area of the controller.

Axis <n>, with n=[1...Number of Axes]	
Max Velocity	The maximum axis velocity of the base configuration can be reduced.
Max Acceleration	The maximum axis acceleration of the base configuration can be reduced.
Max Deceleration	The maximum axis deceleration of the base configuration can be reduced.
Forward Limit	The absolute forward position limit of the base configuration can be changed to a value between the forward and reverse limits of the base configuration.
Reverse Limit	The absolute reverse position limit of the base configuration can be changed to a value between the forward and reverse limits of the base configuration.
Type	*Limited* | *Periodic* Linear axes are always limited, rotary axes may be limited or periodic. If the base configuration is of type periodic the user configuration can change the type to limited and the forward and reverse position limits apply. A base configuration of type limited cannot be changed.

Table 4: User Configuration Parameters.

The following user configuration parameter are independent of the base configuration.

General

Axis <n>, with n=[1...Number of Axes]	
Power Mode	on | manual
Homing Mode	manual | auto Auto starts the homing automatically at start-up. In manual mode the operator needs to issue the homing command.

Table 5: User Configuration Parameters, General.

Position Correction Tables

Axis <n>, with n=[1...Number of Axes]	
Correction Table	The currently selected position correction table of the axis
Correction State	on | off Set position correction state on or off
Correction Tables	Contains a list of the currently available correction tables for this axis.

Table 6: User Configuration Parameters, Position Correction Tables.

Load Model

Axis <n>, with n=[1...Number of Axes]	
Load Model	linear | periodic Select between the linear or periodic load model.
Load Offset	Position offset of the load model in axis units
Load Max Torque	Maximum torque for the periodic model in Nm

Load Torque Offset	Constant offset for the linear model in Nm
Load Slope	Slope of the linear model in Nm/m
Load Min Step	The minimum torque step to update the calculated torque on the drive.

Table 7: User Configuration Parameters, Load Model.

Programming Commands

<command name="SendConfig" />
<command name="SendUserConfig" />

8. Operational Mode and Signaling

The LED's on the controller's front panel indicate the current operational status.

Operational LED - green

The boot sequence of the controller and the integrated safety has finished. The controller is in the operational or maintenance mode.

Warning LED - yellow

flashing: At least 1 axis is in error state.

Continuous: Controller is in Maintenance mode

Error LED - red

continuous: Emergency stop active or system error.

The operational/maintenance switch of the controller changes between the corresponding operational modes.

Preoperational State

Preoperational state is reach after the controller has been switched on. Firmware and safety logic are loading and initializing. All LED's are off.

The controller automatically changes to operational or maintenance, depending on the position of the Operational/Maintenance switch.

Operational Mode

In operational mode full functionality of the controller is available, but it is not possible to make changes in the system configuration.

Operational mode is indicated by the green LED continuously on and yellow LED off or flashing.

Maintenance Mode

In maintenance mode all drives are switched off and the motor brakes are engaged. Changes in the system configuration are possible.

Maintenance mode is indicated by the yellow LED continuously on.

9. Instrument States and Preset Condition

An instrument state contains the current settings of the controller including

- motion trajectory parameters
- user offsets
- digital output states
- trigger system
- enable state and selection of position correction data

Instrument states can be saved in the user memory area of the controller and they can be exchanged between the controller and another computer by means of the controller remote application or the programming interface.

9.1 Instrument State Files (*.ais)

Instrument state files (*.ais) are xml files. The content depends on the configuration of the controller and the system configuration.

Note

Changing the system configuration changes the content of the instrument state files. Instrument states saved in a previous configuration can still be used, but may contain additional data that will be ignored or attributes of the new configuration may be missing. If an instrument state does not contain an attribute of the current configuration the attribute will remain in the current state.

The same applies to instrument states saved by different controllers or measurement systems.

Instrument state saved on the controller and instrument states exchanged by the remote application share the same format.

9.2 Preset and Start-Up

The preset condition is saved in a dedicated instrument state file in the user memory of the controller. The file is usually assigned at system commissioning by ASYSOL and contains default system parameter for safe operation.

The *preset* condition is restored at start-up of the controller or by the preset command.

At start-up the controller always loads the *preset* instrument state that has been assigned at system commissioning. The current instrument state is not automatically saved at shut-down of the controller. In order to save critical test parameter, such as user offsets, the instrument state needs to be saved and recalled explicitly.

The preset file should only be modified by trained personal and with caution!

9.3 Save/Recall and Delete

The current instrument state can be saved in the user memory of the controller or can be uploaded to the remote application or via the remote interface. Loading an existing instrument state overwrites all currently selected instrument parameter with the new state.

Saving instrument states in the user memory of the controller makes them available to all clients.

Programming Commands

```
<command name="Preset" />
<command name="Recall" file=fname />
<command name="Save" file=fname />
<command name="Delete" file=fname />
<command name="SendParam" />
```

The commands expect the name of the instrument state without path and extention.

9.4 User Memory Area

The user memory area of the controller contains configuration files, the factory preset file, instrument states and position correction data.

The memory is accessible by ftp:

User: ASYSOL

Password: ****

The following files are found in the user memory area:

*.ais

Instrument state files

*.pcf

Position correction files

baseconfig.xml

The base configuration contains the fundamental system configuration that is mandatory for operation of the system and cannot be modified.

config.xml

User configuration settings that may be modified to a certain extend.

preset.xml

The preset state.

Warning

The user memory area contains files that are mandatory for the operation of the controller and the measurement system. These files should be modified by trained personal only. Do not modify those files unless you are absolutely sure what you are doing!

10. Motion Control

In principle the motion control consists of the trajectory generation and the closed loop position control.

For any of the basic motion commands the trajectory generator computes the desired motion profile and the closed loop position control attempts to follow the trajectory.

The remote interface allows to download and execute arbitrary trajectories. In this case the internal trajectory generator interpolates between the nodes and the position control follows the interpolated trajectory.

If position correction is enabled then the computed trajectory data is corrected by the correction algorithm before it is applied to an axis.

The motion control of the individual axes operate independent of each other and simultaneously. An exception is position correction, where the current set value for an axis may depend on the current position of the other axes.

10.1 Axis Reference

Referencing or homing of an axis is the procedure to establish an absolute position reference. Before any motion task can be performed the corresponding axis needs to be referenced. The current reference is lost on shutdown of the controller.

If the *Homing Mode* of an axis is configured as *auto* the referencing procedure is automatically performed on start-up of the controller.

Axes with *absolute position encoders* are usually homed automatically, because the homing does not require any axis movement and therefore does not represent a potential risk.

Axes with *incremental encoders* usually need to execute a homing sequence that requires to search for a reference or limit switch or for an encoder index position. In case this motion represents a potential risk the homing should not be configured to be executed automatically and needs to be started manually by the operator or remote application before the first motion task is executed.

For each axis a predefined homing method is configured that establishes the system position reference. The *Reference* command starts the predefined homing procedure and sets the position reference.

To change the system position reference the *Reference* command allows to set an offset to the system reference or to assign an arbitrary position to the current location of the axis. Assigning a position to the axis automatically calculates the corresponding offset value. In any case the system reference procedure needs to be performed once before an offset can be applied.

Warning
Depending on the axis type and configuration the reference procedure may start several axis movements.

The absolute system position limits of an axis are defined relative to the system reference. Applying an offset to an axis will update the actual position limits accordingly.

Programming Commands

```
<command name="Reference" axis=”Axis N” />
<command name="Reference" axis=”Axis N” Offset=”fval” />
<command name="Reference" axis=”Axis N” NewPosition=”fval” />
```

10.2 Basic Motion Commands

The basic motion commands execute motion profiles from the current axis status based on the command parameters. If the axis is currently moving the trajectory is update on-the-fly. Each command operates independent of the other axis.

For a description of the trajectory generation and the associated command parameter see chapter 10.5, Trajectory Generation, Basic Motion Profile.

ContF - <Axis>, <Acceleration>, <Velocity>

Start continuous motion in the forward direction. The motion continuous until it is overwritten by another motion command or until a position limit is reached.

ContR - <Axis>, <Acceleration>, <Velocity>

Start continuous motion in the reverse direction. The motion continuous until it is overwritten by another motion command or until a position limit is reached.

MoveAbs - <Axis>, <Acceleration>, <Deceleration>, <Velocity>, <Direction>, <Position>

Start move to an absolute target position. Motion direction and the interpretation of the target position depend on the type of the axis (Limited or Periodic) and the direction parameter.

<Direction>

For a periodic axis this parameter defines the direction to the target position and the number of periods. For a limited axis the parameter is ignored. Possible values are

Auto

shortest path to the target position

For

forward direction;
move forward to the target position, the target position is confined in the interval [0°...360°[, target positions outside this interval are automatically adjusted to the corresponding position inside the interval

Rev

reverse direction;
move reverse to the target position, the target position is confined in the

interval [0°...360°[, target positions outside this interval are automatically adjusted to the corresponding position inside the interval

Ex

exceed period,
this mode allows to command to a target position outside the [0°...360°[interval, for example to command a move that exceeds one rotation,
Example:
if the current position is 110° a target position of
100° will move 10° backwards
120° will move 10° forward
360° will move forward to 0° (360°)
0° will move reverse to 0°
500° will move forward to 360°+140° → 140°

MoveRel - <Axis>, <Acceleration>, <Deceleration>, <Velocity>, <Direction>, <Position>

Start move to a target position relative to the current nominal position. Motion direction and the interpretation of the target position depend on the type of the axis (Limited or Periodic) and the direction parameter.

<Direction>

For a periodic axis this parameter defines the direction to the target position and the number of periods. For a limited axis the parameter is ignored. Possible values are

Auto

shortest path to the target position

For

forward direction;
move forward to the target position, the target position is confined in the interval [0°...360°[, target positions outside this interval are automatically adjusted to the corresponding position inside the interval

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reverse direction;
move reverse to the target position, the target position is confined in the

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0° will move reverse to 0°
500° will move forward to 360°+140° → 140°

Stop - <Axis>, <Deceleration>

Initiate a decelerated stop of the axis.

QuickStop - <Axis>

Initiate a stop with maximum deceleration.

EMStop

Trigger an emergency stop of the system. The effect is the same as pressing an emergency stop button.

Differences between Stop, Quickstop and EM-Stop

Stop and Quickstop will decelerate the axis until standstill, but the position control loop will remain active. Stop uses the current deceleration as maximum value for the trajectory. Quickstop uses the maximum deceleration of the axis.

In contrast, EM-Stop will decelerate the axis and trigger the emergency stop system. The emergency stop system will allow the axis to perform a controlled deceleration and will then disable the drive which will switch off the control loop and de-energize the drive.

Programming Commands

```
<command name="MoveAbs" axis="Axis 1" Acceleration=”10.0” Deceleration=”10.0”
Velocity="10.0" Direction=”Auto” Position="5.0"/>
<command name="MoveRel" axis="Axis 1" Acceleration=”10.0” Deceleration=”10.0”
Velocity="10.0" Direction=”Auto” Position="5.0"/>
<command name="ContF" axis="Axis 1" Acceleration=”10.0” Velocity="10.0" />
<command name="ContR" axis="Axis 1" Acceleration=”10.0” Velocity="10.0" />
<command name="Stop" axis="Axis 1" Deceleration=”10.0” />
<command name="QuickStop" axis="Axis 1" />
<command name="EMStop" />
```

10.3 Axis and Parameter Limits

Most of the motion parameters have associated limit values. The current limit value of a motion parameter is returned by a parameter query in addition to the current parameter value.

Executing a motion command with a parameter value out-of-limits will result in an axis error.

Position Limits

An axis configured as *Limited* has an absolute position limit that is defined relative to the system reference position. System reference position and the absolute limits are usually adjusted during system commissioning. They are part of the base configuration and cannot be modified by the operator.

In addition to the absolute software limit a limited axis usually has hardware limit switches. Under normal operating conditions the hardware limits should never be reached, because the software limits should always restrict the motion range accordingly.

The current position limit of an axis can change dynamically in the following situations:

If a *user offset* value is assigned to an axis the current limits are updated according to the offset so that the physical range of the axis remains unchanged.

The operator may further restrict the travel range of the axis by applying smaller limit values to the *user configuration*.

Collision avoidance procedures or switches may be configured that may change position limits based on the position of the other axes or other inputs.

In any of those cases the parameter query of the position will return the current position limit value.

Motion Parameter Limits

Most of the motion parameters of an axis have associated limit values. A status query of the parameter will return the min and max values in addition to the current parameter value.

Programming Commands

The current limit value of an axis is returned with the response of the status query of the respective parameter.

Query

```
<par>
  <section name="Axis 1">
    <query name="Position"/>
    <query name="Velocity"/>
    <query name="Acceleration"/>
  </section>
</par>
```

10.4 Error Handling

Each error is logged in the system error queue and is automatically shown on the controller remote application if applicable. The error is available for download by the remote interface. Reading an error removes the error message from the error queue,

The system distinguishes between *system errors* and *axis errors.*

10.4.1 System Errors

System errors are not related to a specific axis and may be issued by the remote interface command processor, the trigger system or the digital output system, for example.

10.4.2 Axis Errors

Axis errors may occur immediately when a motion command is issued or they may appear during execution.

For a complete list of possible errors see 15, Error Codes and Messages.

Examples for errors that are triggered immediately are *invalid command parameter*, *target position out of limits* or *axis not referenced.*

Execution of a motion profile may be interrupted by *lag error exceeded*, for example.

Axis errors are handled for each axis independently. In case an axis is in an error state the remaining axes can continue to operate, except if the axes are linked to each other

Each axis error needs to be acknowledged. This can be done by a remote command or by the acknowledge button on the controller.

10.4.3 Emergency Stop

If the emergency stop of the integrated safety is triggered any attempt to issue a motion command will provoke an EM-Stop error.

An emergency stop needs to be acknowledged by *Ack EM-Stop* after the emergency stop condition has been removed. This can be done by a remote command or by the acknowledge button on the controller.

Programming Commands

```
<state>
  <section name="System">
    <query name="Last Error" type="string" />
  </section>
```

```
</state>

<state>
  <section name="System">
    <query name=”Errors" type="string" />
  </section>
</state>
```

10.5 Trajectory Generation, Basic Motion Profile

For the basic motion commands *MoveAbs* and *MoveRel* the trajectory generator computes the motion profile bases on the trajectory parameters target position, maximum velocity, maximum acceleration, maximum deceleration and maximum jerk.

Motion commands *ContF* and *ContR* do not have a target position and only require maximum velocity, maximum acceleration, maximum deceleration and maximum jerk.

Target Position

The trajectory is calculated from the current position and velocity to the target position using the parameter for maximum velocity, maximum acceleration, maximum deceleration and jerk. Depending on the command the target position is interpreted as absolute or relative to the current position.

Maximum Velocity

The maximum velocity of the motion profile.

Maximum Acceleration, Maximum Deceleration

The maximum acceleration/deceleration of the motion profile.

Jerk and Jolt Time

Jerk is the maximum rate of change for acceleration/deceleration. The controller actually uses the *jolt time* parameter T_j which is calculated from jerk and the current maximum acceleration:

$$T_j = \frac{a}{j}$$

Jerk is used to limit the stimulation of oscillations. If jerk limitation is not used (jolt time is 0) the motion profile corresponds to a simple trapezoidal profile. The effect of the jerk is to round the edges of the velocity profile. The total time required for the profile is increased, but the total time for positioning may be reduces, because if oscillations can be avoided the settling time can usually be reduced.

Jolt Time is usually set to a fixed value based on the dynamic response of the underlying system and should not be changed during normal operation.

The trajectory generator computes the current set values of position, velocity and acceleration based on the maximum values. The relation between the current values is

$$j(t) = \dot{a}(t) = \ddot{v}(t) = \dddot{s}(t)$$

Example Motion Profile

The following example shows a velocity and position profile from standstill to a target position with jerk limitation.

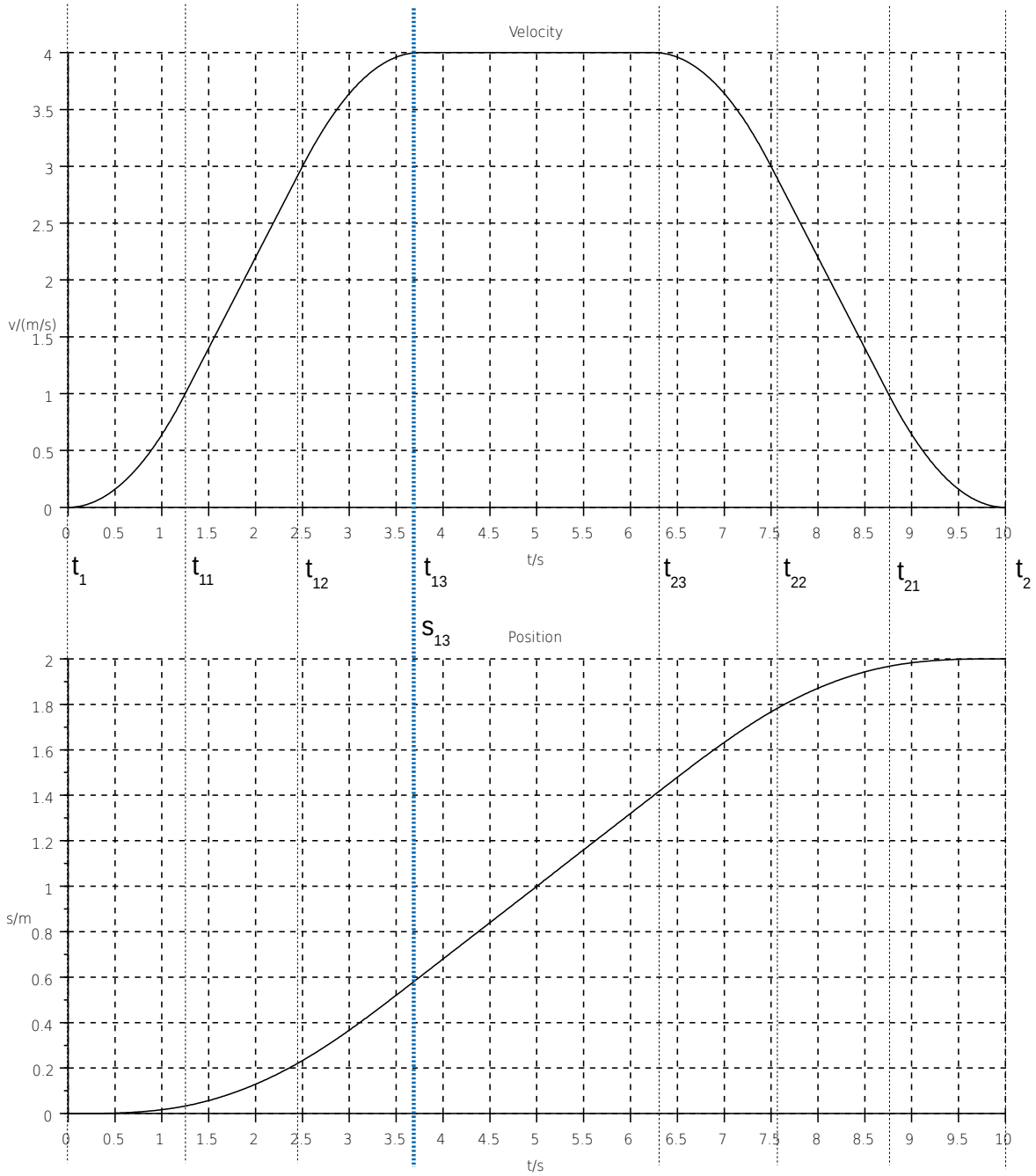


Fig 8: Standard motion profile with jerk limitation

The motion control system does not require the axis to standstill to start a new trajectory. If the axis is already moving the trajectory is updated on-the-fly.

A parameter that is often of interest is the time t_{13} and the distance s_{13} required to accelerate to a constant velocity:

$$t_{13} = \frac{a}{j} + \frac{v}{a} = T_j + \frac{v}{a}$$

$$v_{13} = v$$

$$s_{13} = \frac{av}{2j} + \frac{v^2}{2a} = \frac{vT_j}{2} + \frac{v^2}{2a}$$

The **total time** required for the profile is

$$T = \frac{(s_2 - 2\,s_{13})}{v} + 2\,t_{13}$$

10.6 Arbitrary Trajectories

In addition to the basic motion profiles arbitrary trajectories can be defined and executed.

The trajectories are defined as a list of

time	in s
position	in axis units

pairs, where the time values do not need to be equally spaced, but they are rounded to the nearest cycle time of the motion task.

If the time step is larger then the cycle time of the motion tasks the trajectories are interpolated using the same profile as for the basic motion profiles, using the trajectory parameters velocity, acceleration, deceleration and jerk. This allows to implement stepped motion profiles which stop at the next sampling point as well as continuous motion profiles with a high update rate.

The operator or programmer is responsible whether the axis can actually follow the trajectory and can reach the individual sampling points or whether the next point will overwrite the current target position before the last one could be reached.

10.7 Position Correction

The dynamic position correction function allows to correct for repeatable position or alignment errors of the measurement system.

If activated the position correction algorithm continuously computes the difference between the current *axis position* and the *system position*. The system position of an axis is the corrected position of the measurement system. The correction is a function of the current (raw) axis position and the current positions of all other axes that are included in the correction data. The target position for the trajectory generation is the system position.

The system position of an axis under position correction may depend on up to 10 independent axes.

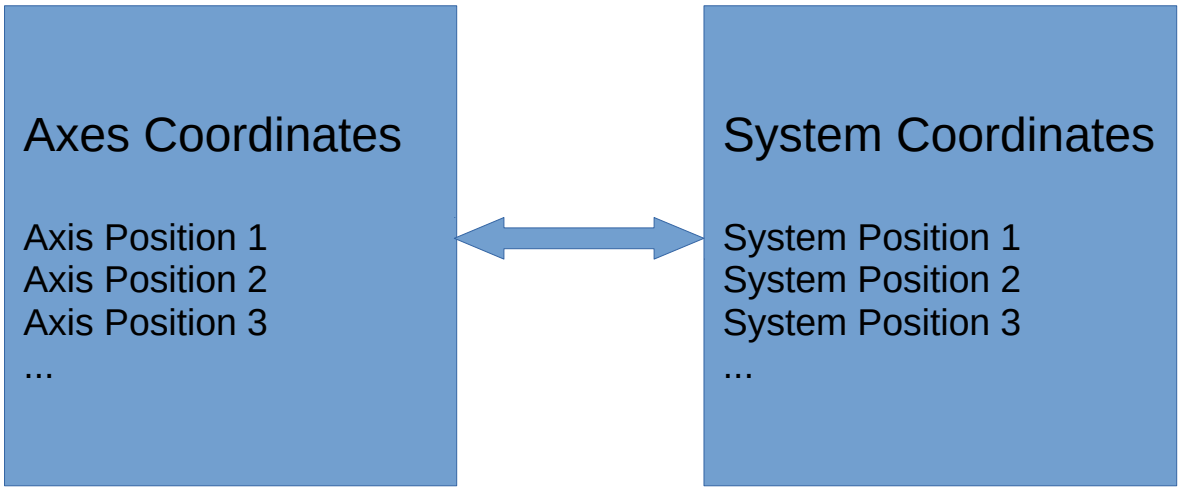


Fig 9: Axis Coordinates and System Coordinates

A position correction table can be assigned and enabled for each axes. The table defines a correction offset to the current axis position as a function of one or more other axis.

$$\widetilde{p_1} = p_1 + f(p_1, p_2, p_3, \ldots)$$

where $\widetilde{p_n}$ is the corrected position and p_n are the uncorrected axis positions. Intermediate correction offsets are obtained by linear interpolation.

The actual set position of a corrected axis is continuously updated based on the nominal command position and the current positions of the other axes in the correction table. As a consequence, the axis target position of a corrected axis may change if one of the axes in the correction table changes position. Or in other words, a corrected axis may move if one of the other axes moves.

The controller provides the current raw axis position, the corrected position and the nominal position of the axis:

Axis Position

This is the raw axis position without correction offset.

System Position

This is the corrected position, i.e. the position with correction offset. If position correction is disabled the system position equals the axis position.

Nominal Position

Current position of the set point generation.

Warning
A corrected axis may execute unexpected and potentially dangerous movements as a response to the movement of any other axis in the correction table.

10.7.1 Correction Tables

Correction tables are located in the user memory area of the controller. Multiple tables can be stored for a single axis, but only one table can be selected at a time. The tables contain the correction offsets as a function of the uncorrected axis positions in a binary file format. Each file contains the correction data for a single axis.

File Format

A position correction file contains a fixed header, the number of coordinate variables (rank), the definition of each coordinate variable and the actual data block.

The number of coordinate variables definitions must match the rank. Order and size of the data block matches the coordinate variables. The number of floating point values is

N = n1 * n2 * n3 * …

Entry	Data Type	Description
“Position Correction Data 1.0”	string	header
rank	unsigned int	number of coordinate variables
name1	string	name of coordinate variable #1
unit1	string	unit of coordinate variable #1
start1	double	start value of coordinate variable #1
stop1	double	stop value of coordinate variable #1
n1	unsigned int	number of values of coordinate variable #1
… repeats for <*rank*> number of coordinate variables		
data	float[]	data block

Table 8: Position Correction File Format.

Data Types

unsigned int: little-endian, 32 bit
float: little-endian, 32 bit
double: little-endian, 64 bit
string: C-style, null terminated string

The name of a coordinate variable must match the name of the corresponding axis of the controller.

10.8 Current Trajectory Status

The controller continuously provides the following parameter of the trajectory.

Nominal Position

This is the current position value of the trajectory as calculated by the trajectory generator. The set value for the position control loop.

Axis Position

The actual position of the axis which is usually provided by the on-axis position encoder.

System Position

The system position is the corrected position after position correction has been applied. If position correction is disabled the system position equals the axis position.

Nominal Velocity

This is the current velocity of the trajectory as calculated by the trajectory generator.

Axis Velocity

The actual velocity of the axis.

Position Error

The difference between the actual position and the nominal position of the axis.

State

Status flag that summarizes the status of system, drive and axis.

Programming Commands

```
<state>
  <section name="Axis N">
    <entry name="Position" type="float"/>
    <entry name="Axis Position" type="float" />
    <entry name="Axis Velocity" type="float"  />
    <entry name="Nominal Position" type="float" />
    <entry name="Nominal Velocity" type="float" />
    <entry name="System Position" type="float" />
    <entry name="Position Error" type="float" />
    <entry name="Error ID" type="int" />
    <entry name="Error Message" type="string" />
    <entry name="State" type="int" unit="" />
  </section>
  </state>
```

10.9 Position Control

10.9.1 Position and Velocity Control Loops

Position and velocity control loops are configured during commissioning of the measurement system and should not be modified by the operator.

10.9.2 Load Model

For axes with position dependent load the controller provides a load model that can be used to compensate the torque or force. The compensation can help to reduce the position error and to improve the dynamic response.

Application examples are vertical linear axes with a cable chain, where the weight of the chain changes with the height, or rotary axes with unbalanced load.

Two load models are available: A linear model for linear axes and a periodic model for rotary axes.

The *linear model* applies a torque to the axis according to the following equation.

$$F = (p - p_{offset})\, g + F_{offset}$$

with

F : torque
p : axis position in axis units
p_{offset} : position offset in axis units
g : torque factor

and for the *periodic model*

$$F = \sin(\phi - \phi_{offset})\, F_{max}$$

with

F : torque in Nm
ϕ : axis position in °
ϕ_{offset} : position offset in °
F_{max} : maximum torque in Nm

The torque models are defined in the user configuration of the controller, see chapter 7.2, User Configuration.

10.10 Collision Avoidance

The purpose of the collision avoidance is to prevent collisions of the axes of the measurement system with each other or collisions of the axes with other obstacles in the measurement chamber.

The collision avoidance algorithm is running independent of the motion control system in the background and dynamically adjust the axes position limits based on the current axis positions and additional safety inputs, if applicable.

11. Trigger System and Fast Real-Time Control

11.1 Trigger System

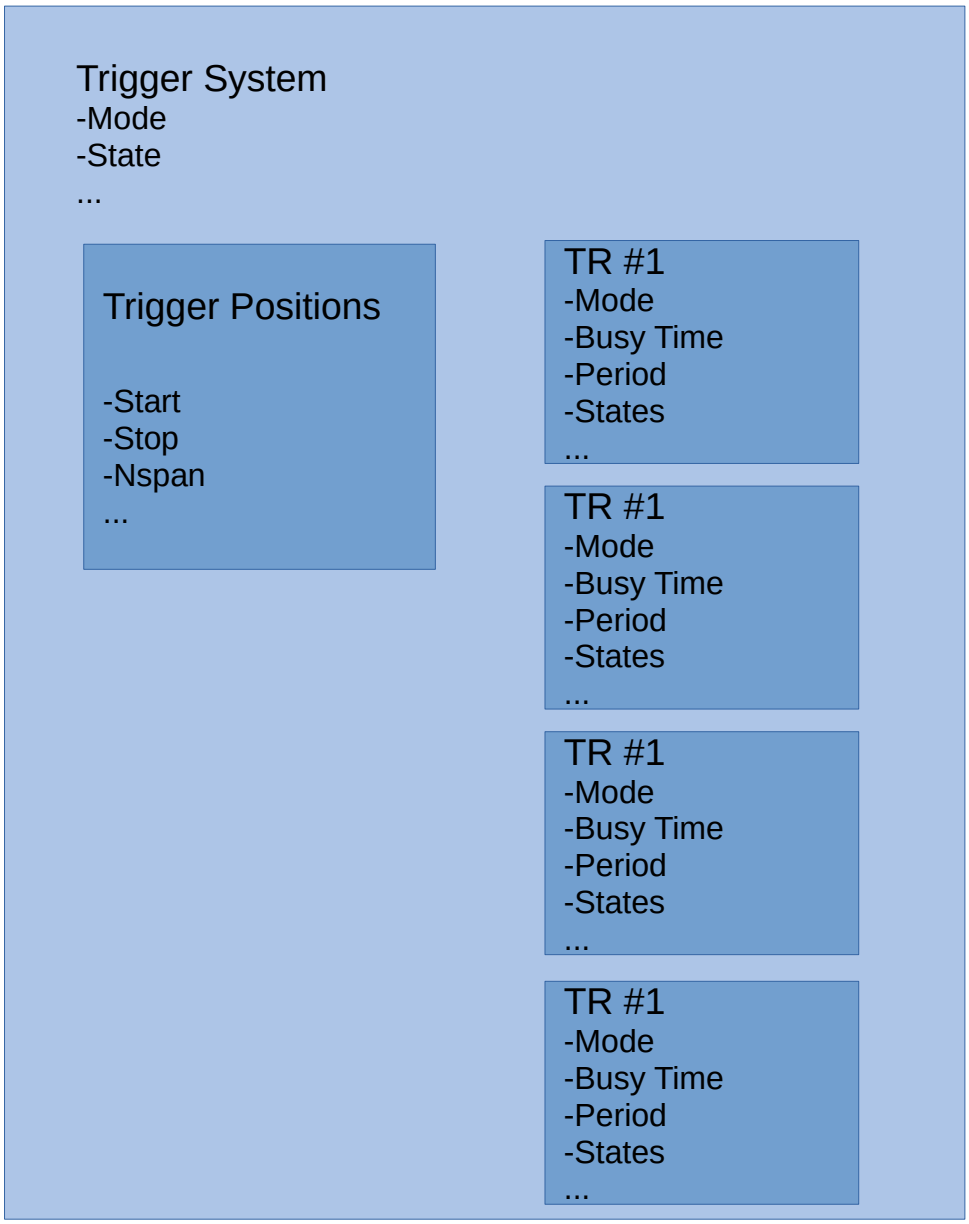


Fig 10: Overview of the Trigger System.

The trigger system generates real-time trigger and control signals and operates independently of the motion control system. A combination of a trigger and ready signal is usually used to synchronize the RF instrumentation with the measurement. Real-time control signals can be used to directly control and synchronize fast pin diode switches with the measurement.

The distributed control approach of the controller allows to connect the trigger, ready and control signals directly to the ASYCONT-600 controller or to connect remote real-time units that provide additional trigger, ready and control signals which are tight time synchronized to the main controller, cp. Fig 6, Distributed System Control with External Control Units.

The trigger system contains the subsystems *Trigger Positions* and *TR 1* to *TR 4*.

Trigger and control sequences may be initiated based on axis positions, but the motion control system operates independently of the trigger system and motion commands need to be executed separately. This allows to combine the trigger and control signal generation with arbitrary trajectories.

In addition to the controlling functions the trigger system provides a trigger/ready measurement function that allows to test the timing of the instrumentation based on a ready or busy signal that is usually provided by a network analyzer or signal generator.

The basic operational *mode*s of the trigger system are

direct

A software trigger command is used to initiate a sequence of fast real-time trigger/control signals or to trigger the RF instrumentation directly.

position

A span or list of position breakpoints is loaded to the controller. Each breakpoint initiates a sequence of fast real-time trigger/control signals or triggers the RF instrumentation directly.

external

Trigger sequences are generated based on an input trigger pulse at the external trigger input connector. This can be used for example to connect an external motion controller.

measure

This mode activates the timing measurement function of the trigger system

In addition to the basic operational modes the digital outputs of the real-time modules can be set directly by software commands.

Programming Commands

```
<par>
  <section name="Trigger System">
    <entry name="Mode" type="string" v1="sval"/>
    <entry name="State" type="string" v1="sval"/>
  </section>
<\par>

<command name="EnableTrg" />
<command name="DisableTrg" />

<state>
        <section name=”Trigger System>
                <query> name=”State”/>
        </section>
</state>
```

11.2 Position Trigger and Trigger/Control Sequence

A trigger/control sequence is a sequence of one or multiple trigger and control signals that is usually configured to measure a single sweep. Where a sweep may contain frequencies, receiver channels, switch states or antenna parameters. The trigger and control signals provide fast and accurate timing and control the connected instrumentation and hardware directly.

In the simplest case the trigger sequence is a single trigger pulse.

Based on the operational mode of the trigger system a single sequence can be started by a remote command, a position breakpoint or an external trigger input signal.

The position trigger subsystem starts a new trigger/control sequence for each position breakpoint.

11.3 Trigger Positions

The T*rigger Position* subsystem is enabled only in trigger system mode *position*. Depending on the trigger position type the position breakpoints are defined as a span of equally spaced values or as a free list of positions.

Type span

Start

First breakpoint position in axis units.

Stop

Last breakpoint position in axis units

NSpan

Number of breakpoint positions

Type list

List

Arbitrary list of breakpoint positions in axis units. The list must contain the positions in increasing or decreasing order, depending on the direction of motion. The maximum size is limited to 36000 positions.

Execution of the position trigger is further controlled by the indices

Next

This is the index of the currently armed breakpoint position. 0 points to the first item in the span or list.

Last

This is the index of the last breakpoint position. If Next equals Last the trigger system is automatically disabled after the current breakpoint has been issued.

Only one trigger position is enabled at a time. The *Next* parameter holds the currently activated position and needs to be initialized to the index of the first position. *Next* is incremented automatically after a position has been reached. The *Last* parameter holds the index of the last trigger position that stops the trigger generation after this last trigger has been issued. Trigger positions are enabled in sequential order.

The trigger index position counter *Next* operates in a cyclic mode, meaning when the last index is reached the system continues with the first index position until *Last* is reached. *Next* and *last* allow to start trigger generation of a periodic axis at an arbitrary index position. Setting *Last* to an out-of-range value will produce continuous trigger generation of a periodic axis.

The trigger system operates independent on the motion control system of an axis. A position trigger is issued when the current position passes over an activated breakpoint position. To avoid unintentional triggers, the trigger is only issued when the position is passed over in the programmed direction. The direction is automatically determined based on increasing or decreasing order of the position breakpoints.

For limited axes the position breakpoints are uniquely defined within the axis limits.

For periodic axes the axis period is taken into account. For example, for a rotary axis with a 360° period a trigger position of 10° equals a trigger position of 370°. Both breakpoint positions will issue a trigger at 10°.

Breakpoint positions may be defined outside the [0°...360°[interval and overlap is allowed. For example, to configure an equispaced trigger sequence from -90° to 810° in 1° steps choose Start=-90°, Stop=810° and NSpan=901. This will allow to trigger during 2.5 rotations of the axis.

To start a position based trigger the *Trigger System Mode* needs to be set to *position* and the T*rigger System State* must be *on*. The position trigger starts a trigger sequence which need to be configured accordingly to obtain output trigger signals.

Progamming Commands

```
<par>
 <section name="Trigger Positions">
  <entry name="Axis" type="string" v1="Phi"/>

  <entry name="Type" type="string" v1="span"/>
  <entry name="Start" type="float" v1="0-0"/>
  <entry name="Stop" type="float" v1="359.0"/>
  <entry name="NSpan" type="int" v1="360"/>
  <entry name="List" type="float" size="2" v1="1.2" v2="1.3"/>
  <entry name="Next" type="int" v1="0"/>
  <entry name="Last" type="int" v1="359"/>
 </section>
</par>

<par>
 <section name="Trigger System">
  <entry name="Mode" type="string" v1="position"/>
  <entry name="State" type="string" v1="on"/>
 </section>
<\par>
```

11.4 Direct Trigger

In trigger system mode *direct* a single trigger/control sequence is issued when the *TriggerTRSequence* command is received.

After setting trigger system mode to *direct* and trigger system state to *on* the direct mode is enabled when the trigger system is enabled by the *EnableTrg* command. *DisableTrg* disables the direct mode.

Programming Commands

```
<par>
  <section name="Trigger System">
    <entry name="Mode" type="string" v1="direct"/>
    <entry name="State" type="string" v1="on"/>
  </section>
<\par>

<command name="EnableTrg" />
<command name="DisableTrg" />
<command name="TriggerTRSequence" />
```

11.5 External Trigger

In trigger system mode *external* a single trigger/control sequence is issued on the rising edge of an external trigger signal at the trigger input of the controller.

After setting trigger system mode to *external* and trigger system state to *on* the external mode is enabled when the trigger system is enabled by the *EnableTrg* command. *DisableTrg* disables the external mode.

Programming Commands

```
<par>
  <section name="Trigger System">
    <entry name="Mode" type="string" v1="external"/>
    <entry name="State" type="string" v1="on"/>
  </section>
<\par>

<command name="EnableTrg" />
<command name="DisableTrg" />
```

11.6 Direct Control of the Output Lines

Direct control of the outputs of the real-time modules allows to set the states of connected PIN switches by remote commands. In this case the outputs are not part of the deterministic real-time trigger/control sequence.

To control the output states directly the trigger system state needs to be *on* and the corresponding TR resource mode must be set to *direct*. The trigger system needs o be enabled.

The state of the trigger outputs may be set directly by software commands.

Programming Commands

```
<par>
  <section name="Trigger System">
    <entry name="State" type="string" v1="on"/>
  </section>
<\par>

<par>
  </section>
  <section name="TRn">
    <entry name="Mode" type="string" v1="direct"/>
  </section>
</par>

<command name="StateTRn" State=”ival” />
```

11.7 Trigger/Control Sequence

A trigger/control sequence is a sequence of one or multiple trigger and control signals that is usually configured to measure a single sweep. Where a sweep may contain frequencies, receiver channels, switch states or antenna parameters. The trigger and control signals provide fast and accurate timing and control the connected instrumentation and hardware directly.

In the simplest case the trigger sequence is a single trigger pulse.

The fast real-time modules responsible for generation of the trigger/control signals are based on FPGAs and support a time resolution of 20 ns.

Based on the operational mode of the trigger system a single sequence can be started by a remote command, a position breakpoint or an external trigger input signal.

A sequence is defined by a combination of one or multiple trigger/ready resources (TR1...TR4). In the simplest case a sequence consists of only a single trigger pulse. A more complex sequence may synchronize the measurement trigger of a NWA, frequency trigger of an external synthesizer and fast pin diode switches to perform the measurement task.

The controller supports 4 TR resources. A TR resource is an internal timing function that is connected to the other TR resources to generate synchronized time signals. All real-time modules connected to the controller operate on the 4 TR resources.

A single real-time module supports 4 output lines and 2 input lines. All modules operate on the same TR resources and the same trigger system, but the mapping of the time signals to the outputs may be different. This mapping depends on the RT program that is assigned to the module.

TrgSeq3 – Control of RF Instruments

TrgSeq3 is loaded on the RT module that controls the network analyzer and the synthesized sources. This module is usually integrated in the controller. The output signals of TR 1 to TR 4 are directly connected to the trigger outputs 1 to 4 of the real-time module to provide the trigger signals.

TrgTR2OL – Switch Control, up to 16 States

This real-time program supports 16 output states and latches the output signal of TR 2 according to the state definition to the 4 output lines.

TrgTR3OL – Switch Control, up to 16 States

This real-time program supports 16 output states and latches the output signal of TR 3 according to the state definition to the 4 output lines.

11.7.1 TR1 ... TR4

Depending on the current operational mode a TR resource is either disabled, assigned to the timing measurement function, set to direct control by software commands or configured as part of a real-time timing/control sequence.

TR Modes

off

disabled

direct

The resource is set to direct control mode and the output state can be directly set by remote commands.

measure

The resource is assigned to the timing measurement function. When a timing measurement is started the default real-time program is replaced by the TrgRdy timing measurement program.

trgrdy

The resource is part of a real-time trigger/control sequence.

Each TR resource can be configured by the following parameter.

Parameter	Description
Mode	off | direct | measure | trgrdy TR mode
Busy Time	[0s...10s] The time the underlying measurement parameter requires for the switch-over to the next state (TR2...TR4) or the measurement time (TR1).
Period	[1...N] Number of measurement trigger of TR1 between a switch-over to the next state (TR2...TR4) or the total number of measurements (TR1)
States(1...16)	List of up to 16 output states for the output lines of a real-time module. Bits 1 to 4 represent the output state of the corresponding output line.

Table 9: Parameters of TR Resource.

11.7.2 Real-Time Trigger/Control Sequence

A real-time trigger/control sequence is defined by the combination of *busy times* and *periods* of the TR resources that are assigned to the sequence. To assign a resource to be part of the sequence set the mode to *trgrdy*. Unused resources must be set to o*ff* or *direct.*

Each TR resource represents the timing of a measurement parameter such as the frequency of the network analyzer, the state of a switch or the measurement trigger.

TR1 has a special meaning in the sense that it represents the measurement trigger connected to the measurement instrument.

For TR1 the *Busy Time* represents the measurement time required from receiving the measurement trigger until the measurement has finished. The *Period* is the total number of measurements of the sequence.

For TR2 to TR4 the *Busy Time* is the time the underlying measurement parameter requires for the switch-over to the next state. And the *Period* represents the number of measurement trigger after that the next switch-over is to take place.

For **example**, to configure a single measurement trigger pulse with a pulse width of 1 ms set

TR1

Mode:	trgrdy
Busy Time:	1E-3
Period:	1
States:	-

TR 1 … TR4

Mode:	Off

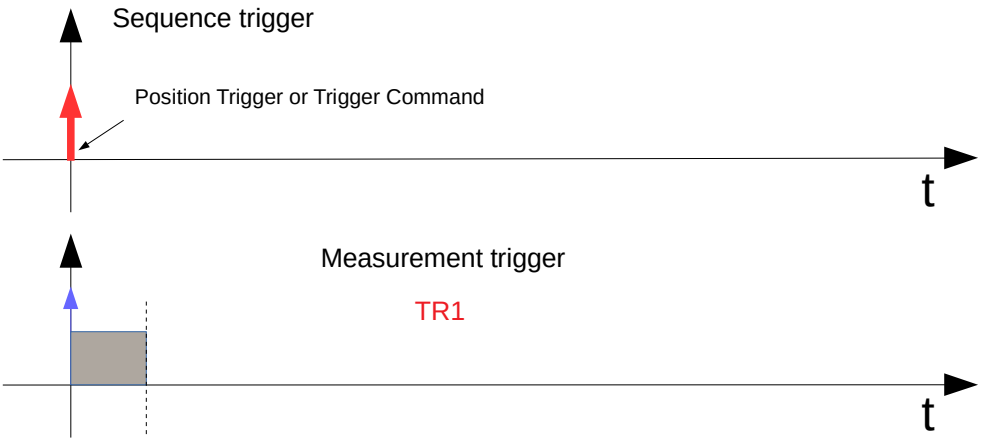


Fig 11: Trigger sequence, single trigger pulse

Now, depending on the system trigger mode each trigger position, trigger command or external trigger signal will issue a single pulse at trigger output Trg1.

The next **example** demonstrates a configuration for a single frequency measurement with a 2-port switch.

TR1

Mode:	trgrdy
Busy Time:	1E-3
Period:	2
States:	-

TR2

Mode:	trgrdy
Busy Time:	10E-6
Period:	1
States:	0, 1

TR 3 … TR4

Mode:	Off

This configuration will output the following signals at the connectors Trg1 and Trg2 of the controller. The duration of the measurement trigger pulse is 1 ms and represents the measurement time of the instrument. After the measurement has finished a switching time (busy time) of 10 µs is assumed for the switch-over of the pin switch to the next state. The output is latched, because the 2 states 0 and 1 are defined.

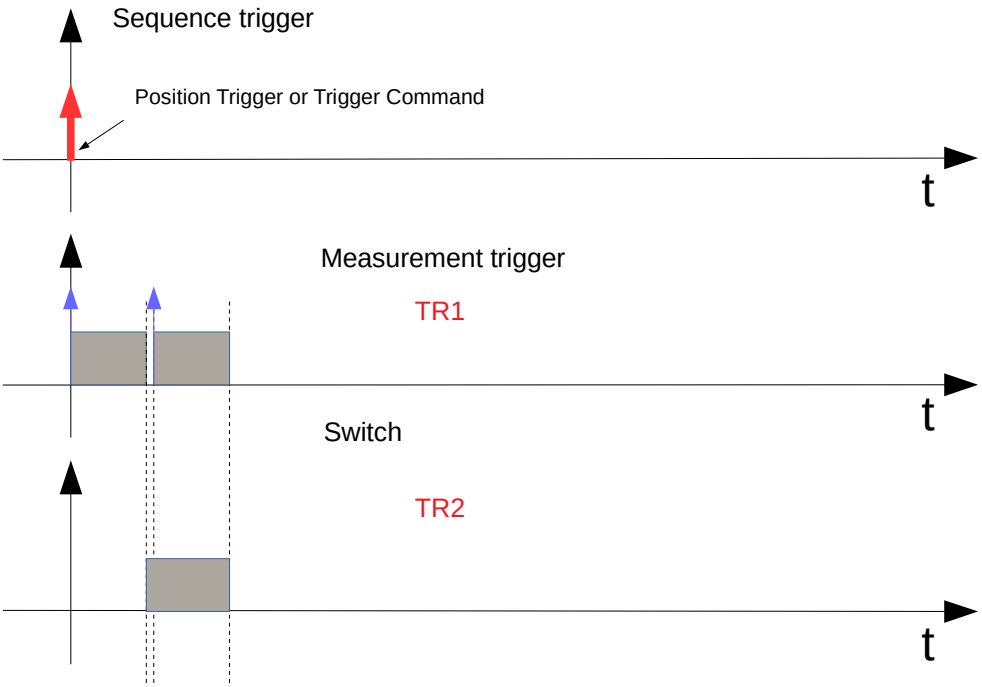


Fig 12: Trigger/control sequence, measurement trigger and switch control signal

Advanced Example

The following example represents a control sequence with 2 pin switches and an external frequency trigger. A 2-port switch and a BCD coded 16-port switch are connected to external real-time control units.

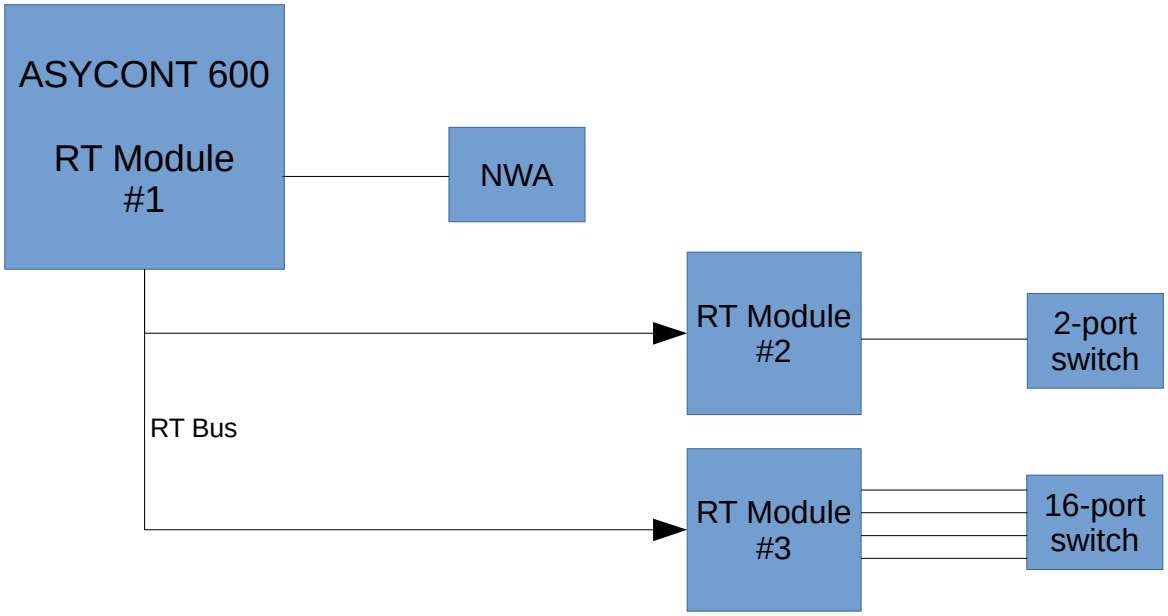


Fig 13: System configuration of the advanced example

In the first real-time unit TR1 is linked to the trigger output Trg1 and provides the measurement trigger to the network analyzer or receiver. The signal of TR4 is available at output Trg4 and could be used as frequency trigger.

Real-time unit 2 connects to a 2-port switch. One control line is required and is linked to TR2.

All 4 output lines of real-time unit 3 are required to control the 16-port pin switch. TR3 is linked to the output lines.

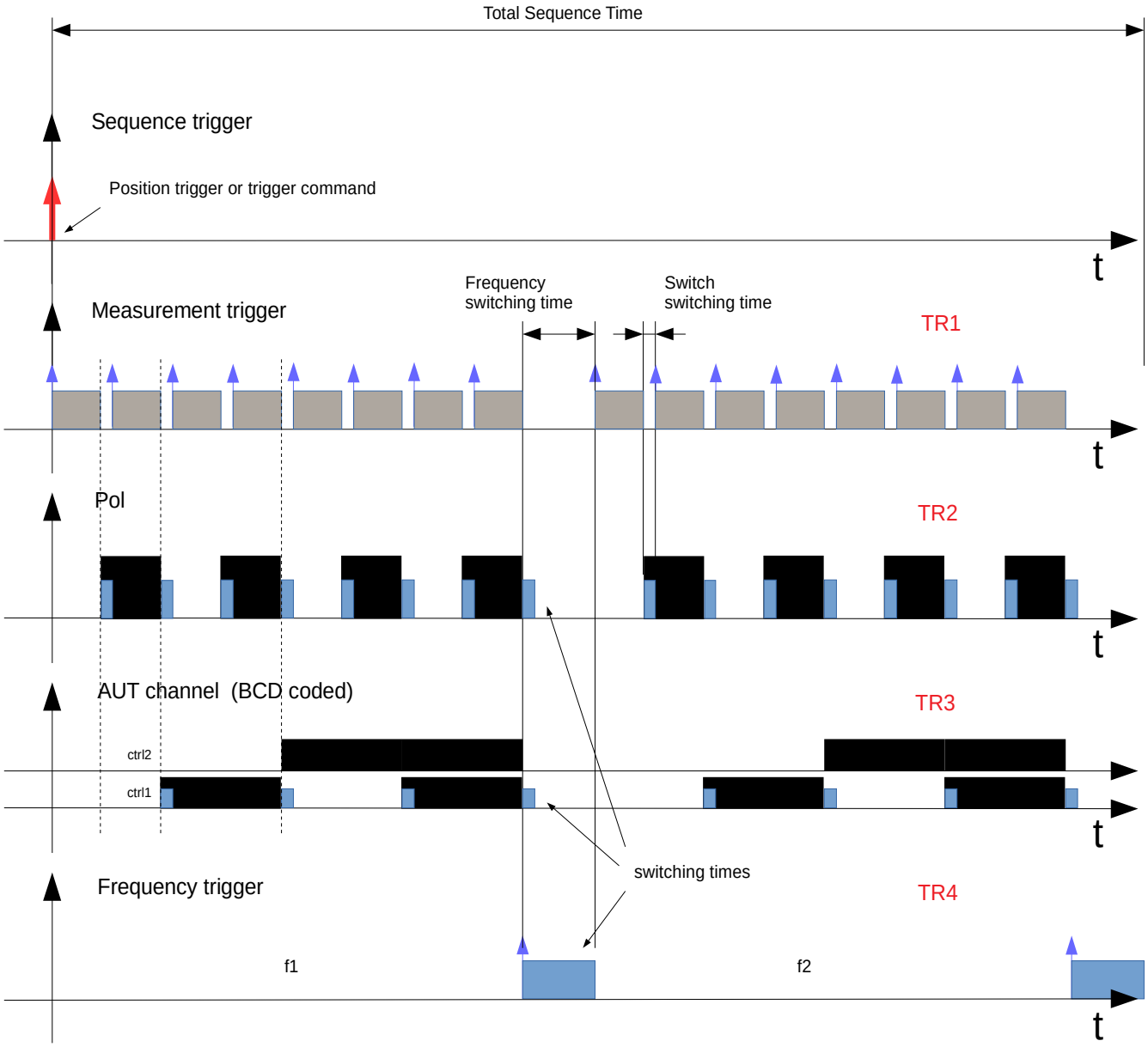


Fig 14: Advanced trigger/control sequence

For this example we want to measure 2 frequencies, 2 states of the 1st switch and 4 states of the 2nd switch in a single sweep. meaning we need 16 measurement trigger per position. Each measurement takes 1 ms. The time between the measurement triggers is the combination of the measurement time and the switching time of the following TR resources.

Then we want to measure 2 Polarisations (Pol switch, TR2), they are in the inner loop. Switching time is 10 µs. Period is 1, because the state of the Pol switch changes after each measurement trigger.

Then we have 4 AUT Channels (TR3) in the next outer loop. Switching time is 10 µs. Period is 2, because the state of the AUT Channel switch changes after 2 Pol measurements. We have 4 control lines for the switch and we need to define the 4 states we want to measure. The controller triggers the state from 1 to the last and then starts again with the first one.

Finally, we have the frequency trigger. In case we do not need the actual trigger signal, because we only use the NWA and do not need a TTL signal, for example to trigger the DUT or synthesizer, we still need to configure the TR4 to get the timing of the trigger system correct. Period is 8, because the next frequency is changed after 8 measurements. Frequency switching time of the example is 5 ms.

TR1

Mode:	trgrdy
Busy Time:	1E-3
Period:	16
States:	-

TR2

Mode:	trgrdy
Busy Time:	10E-6
Period:	1
States:	0, 1

TR3

Mode:	trgrdy
Busy Time:	10E-6
Period:	2
States:	0, 1, 2, 3

TR4

Mode:	trgrdy
Busy Time:	5E-3
Period:	8
States:	-

Programming Commands

```
<par>
  <section name="TR1">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="1E-3"/>
    <entry name="Period" type="int" v1="16"/>
  </section>
  <section name="TR2">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="1E-5"/>
    <entry name="Period" type="int" v1="2"/>
  </section>
  <section name="TR3">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="1E-5"/>
    <entry name="States" type="int" size=4 v1="0" v2="1" v3="2" v4="3"/>
    <entry name="Period" type="int" v1="4"/>
  </section>
  <section name="TR4">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="5E-3"/>
    <entry name="Period" type="int" v1="8"/>
  </section>
</par>
```

11.8 Timing Measurement Function

The operational mode *measure* of the trigger system provides the functionality to measure the response time of the instruments ready signal to a trigger signal.

A typical application is to measure the timing of a single sweep of a network analyzer. In this case the NWA sweep is initialized according to the actual measurement and the execution time of each measurement point is tested. The result can be used to set the timing of a TR sequence, to calculate the maximum velocity of the scan axis, to calculate the position offset of each individual measurements point or to reverse the measurements of the reverse motion direction properly.

The function issues the configured number of trigger signals and measures the time between the trigger signal and the response of the instruments ready signal. The next trigger is send following the ready response of the instrument until the configured number of tests has been executed. If the instrument does not respond within the timeout value the test is stopped and an error message is generated.

Note that the polarity of the busy/ready signal of the instrument is expected as busy equals high level.

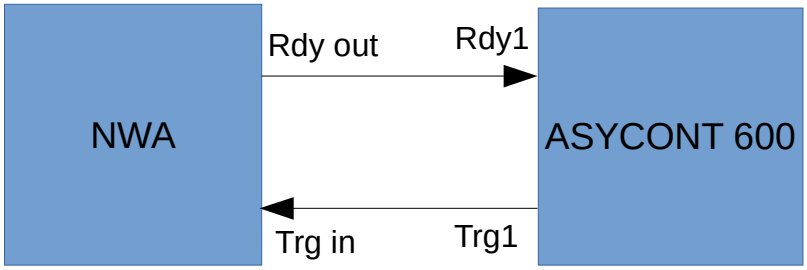


Fig 15: Timing measurement, NWA connection

To perform a TR measurement the trigger system mode must be set to *measure* and the state must be set to *on*. The TR1 must be set to *measure* and the number of measurements has to be set.

The *InitTRTest* command starts the actal test.

Parameter	Description
TR1/TR Test	
N	Number of measurements
Timeout	Timeout period to wait for the response of the instruments ready signal

Table 10: Parameter or TR Measurement.

Programming Commands

To configure the measurement:

```
<par>
  <section name="Trigger System">
    <entry name="Mode" type="string" v1="measure"/>
    <entry name="State" type="string" v1="on"/>
  </section>
  <section name="TR1">
    <entry name="Mode" type="string" v1="measure"/>
  </section>
  <section name="TR1/TR Test">
    <entry name="N" type="int" v1="201"/>
    <entry name="Timeout" type="float" v1="3.0"/>
  </section>
</par>
```

The actual measurement is started by the *InitTRTest* command.

```
<command name="InitTRTest" tr="1"/>
```

The test will run until the number of measurement has been performed or it will stop with an error if the instrument does not respond to a trigger within the timeout period.

The status of the test can be queried:

```
<state>
  <section name="Trigger System">
    <query name="TR Meas" type="string"/>
  </section>
</state>
```

The response of the query is one of the following:

off:	test not started or finished
busy:	test still running
timeout:	timeout waiting for ready signal
error:	an error occurred

After completion the measured response times can be read from the controller. The result contains the list of measured busy times.

Query

```
<par>
  <section name="TR1/TR Test">
    <query name="Result" type="float"/>
  </section>
</par>
```

Result

```
<par>
  <section name="TR1/TR Test">
    <query name="Result" type="float" size=”201” v1=”0.00316” v2=”0.00317” … />
  </section>
</par>
```

12. Digital Outputs

The controller supports internal and external digital outputs that are controlled by remote commands, see chapter 5.1.2, Distributed Digital Output and Real-Time Control. The outputs are independent of any motion function or of the fast real-time control units. Each output provides 24V/ 0.5A, positive logic.

The digital outputs are typically used to control the RF-path, the measurement mode or to select system amplifiers.

Outputs

DO1 to DO16 are integrated in the controller

DO17 to DO48 are located in external DO modules, if available

At start-up of the controller all digital outputs are set to the preset state.

The output state is part of the instrument state and is saved or recalled accordingly.

Programming Commands

```
<par>
<section name="DIO">
<entry name="DO1" type="bool" v1="true|false"/>
<entry name="DO2" type="bool" v1="true|false"/>
...
</section>
</par>
```

13. ASYCONT 600 Remote Application

The ASYCONT 600 remote application provides the user interface to the ASYCONT 600 controller.

If the controller includes the display option an instance of the application is running in the controller. Additional clients can be installed on remote PC's or tablets on the same network. Up to 5 simultaneous client connections are supported.

13.1 Connect to Controller

Click the *Connect* button on the main toolbar to establish a connection to the controller. If the connection could be established successfully, the connection status and the IP address of the connected controller are indicated in the status bar, cp. Fig 18

On connection the controller configuration and the current instrument state are automatically uploaded from the controller. System and axis status are continuously updated.

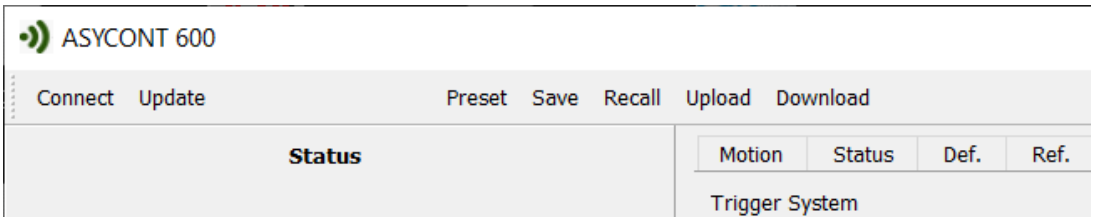


Fig 16: Connect

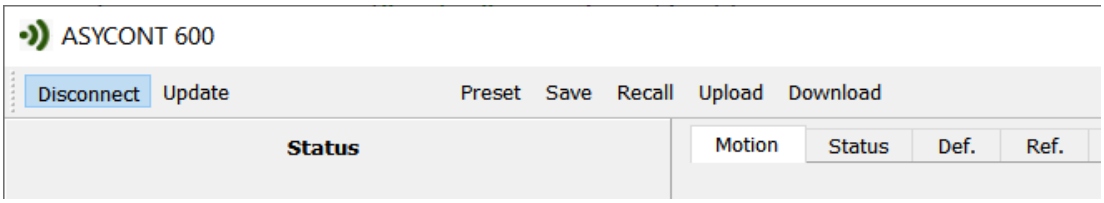


Fig 17: Disconnect

Click *Disconnect* to close the connection, cp. Fig 17

Fig 18: Connection status

13.2 Instrument State and Preset

Instrument states can be saved in the user memory area of the controller and they can be exchanged between the controller and another computer by means of the controller remote application.

At start-up the controller always loads the preset instrument state that has been assigned at system commissioning. The current instrument state is not automatically saved at shut-down of the controller.

13.2.1 Preset, Save and Recall Instrument state from Controller Memory

The current instrument state can be saved in the user memory of the controller where it is available to all clients. An existing instrument state can be recalled from any client. Recalling an instrument state will overwrite all controller parameter. The new state will subsequently uploaded to the remote application.

Preset loads the preset state.

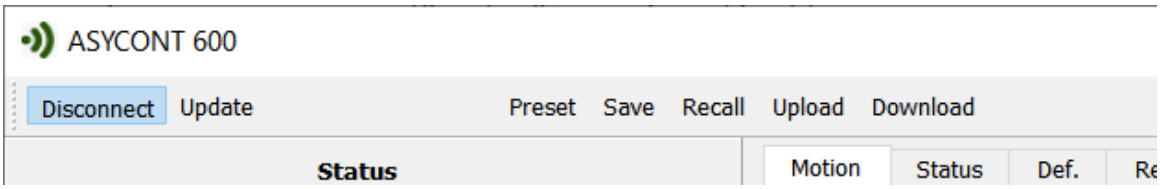


Fig 19: Instrument state functions

Preset

Restores the factory preset state.

Save

Saves the current instrument state to the user memory area of the controller.

Recall

Displays a list of instrument states that are currently saved on the controller and recalls the selected state.

13.2.2 Upload/Download Instrument State to Remote Application

The following commands transfer instrument states between the controller and the remote client application where they are saved in instrument state files.

Upload

Upload the current instrument state from the controller and save to a file on the client computer.

Download

Restores an instrument state from a file on the client computer.

13.2.3 Programming Commands

```
<command name="Preset" />
<command name="Recall" file=fname />
<command name="Save" file=fname />
<command name="SendParam" />
```

13.3 Axis Reference

Referencing or homing is the procedure to establish an absolute position reference for an axis. Depending on the underlying hardware and configuration the procedure may require a motion of the axis or the procedure may simply read the absolute position value from an encoder.

Axes can be configured to start the referencing procedure automatically at start-up or the procedure needs to be performed manually.

In any case an axis needs to be referenced before it can be moved. Once established, the reference remains valid until shut down of the controller.

The system referencing procedure establishes a fixed absolute position reference. However, the user can apply a *user offset* to the system reference.

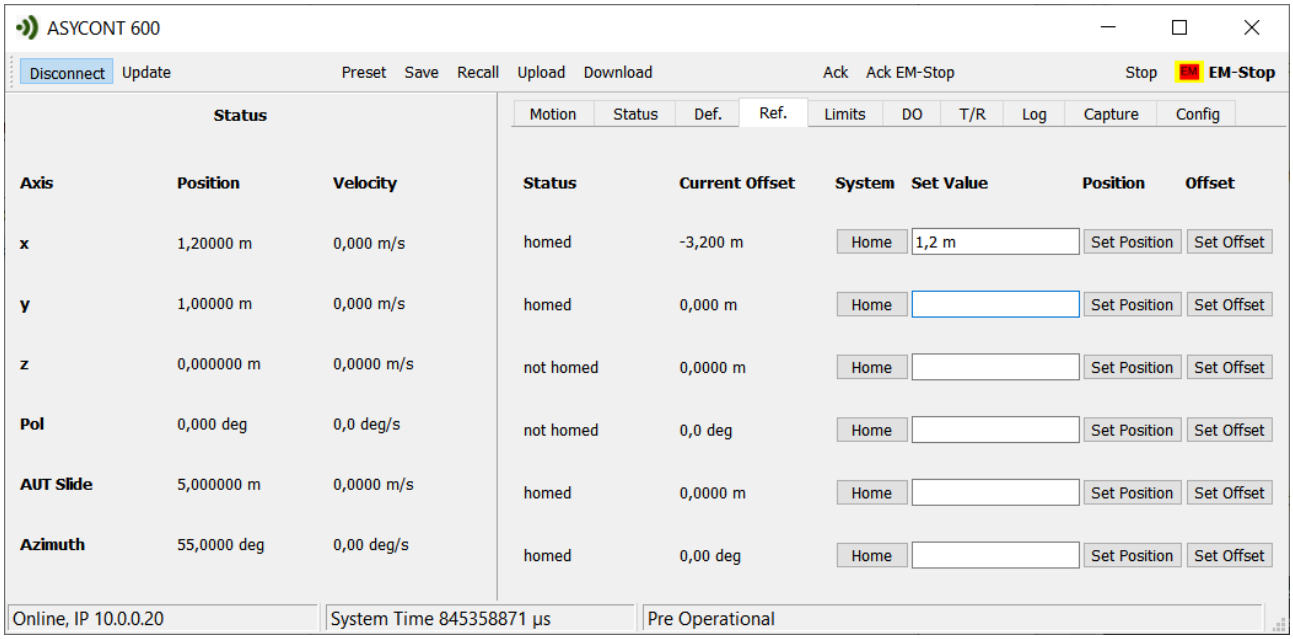


Fig 20: Axis reference page

The *Reference* page shows the current homing status for each axis and the current user offset.

Home

> The *Home* button starts the system reference procedure and sets the system reference position. User offset will be set to 0.

Set Position

Assigns the *Set Value* to the current axis position. The *user offset* is calculated and updated accordingly.

Set Offset

Sets the *user offset* directly to the Set Value.

Applying a user offset to an axis will change the axis position limits accordingly

Note!

Depending on the axis type and configuration the homing procedure may start several axis movements.

13.3.1 Programming Commands

```
<command name="Reference" axis=”Axis N” />
<command name="Reference" axis=”Axis N” Offset=”fval” />
<command name="Reference" axis=”Axis N” NewPosition=”fval” />
```

13.4 Axis Limits

The current *forward and reverse position limits* for each axis and the current limits for *acceleration* and *velocity* are shown on the *Limits page*.

Forward and *Reverse* position limits will change dynamically with the *user offset*.

In principle, depending on the underlying system and the axis configuration all axis limits can change dynamically during operation. Position limits will change with the user offset and may change as a response to external switches or if *keep-out-zones* are implemented to avoid collisions. The maximum limits for acceleration and velocity may depend on the load or other factors.

The *Limits page* always shows the actual limit value.

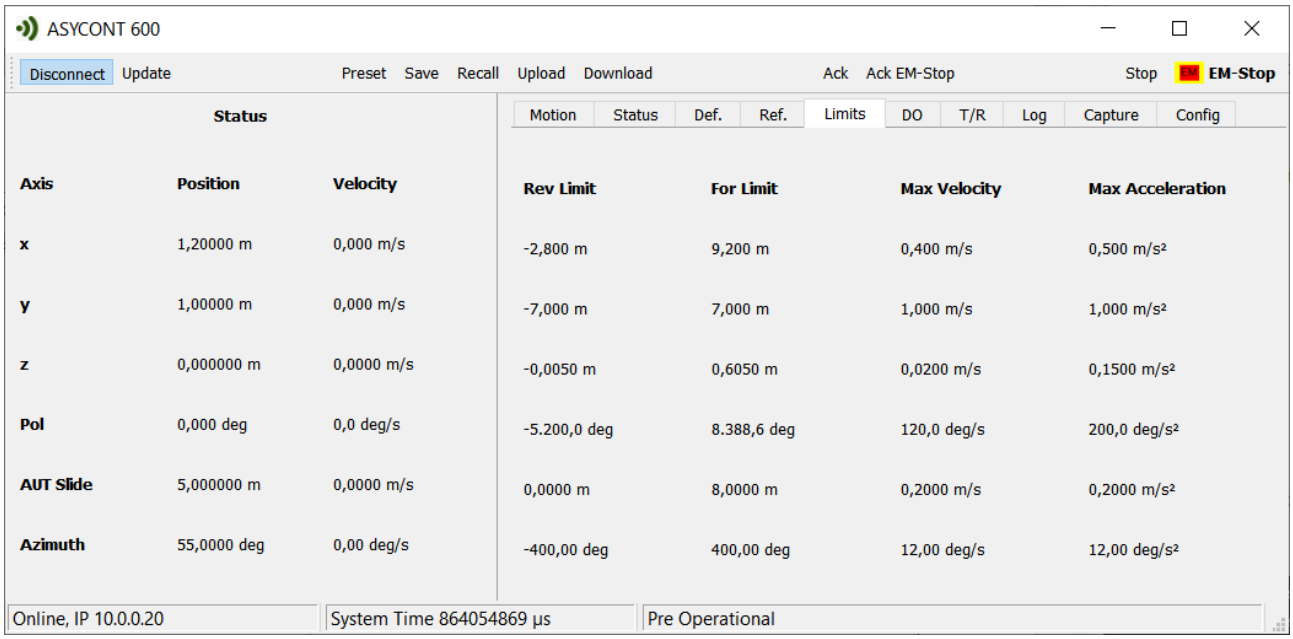


Fig 21: Axis Limits page

13.4.1.1 Programming Commands

The current limit value of an axis is provided with the response of the status query of the respective parameter.

Query

```
<par>
  <section name="Axis 1">
    <query name="Position"/>
    <query name="Velocity"/>
    <query name="Acceleration"/>
  </section>
</par>
```

Response

```
<state>
  <section name="Axis 1">
        <entry name="Position" type="float" unit="" min=”fval” max=”fval” size="1"
v1="fval" />
        <entry name="Velocity" type="float" unit="" min=”fval” max=”fval” size="1"
v1="fval" />
        <entry name="Acceleration" type="float" unit="" min=”fval” max=”fval” size="1"
v1="fval" />
  </section>
</state>
```

13.5 Motion

The *Motion page* provides access to the basic motion commands for the individual axes. The motion of each axis can be controlled independent of the other axes. Multiple axes can be controlled simultaneously.

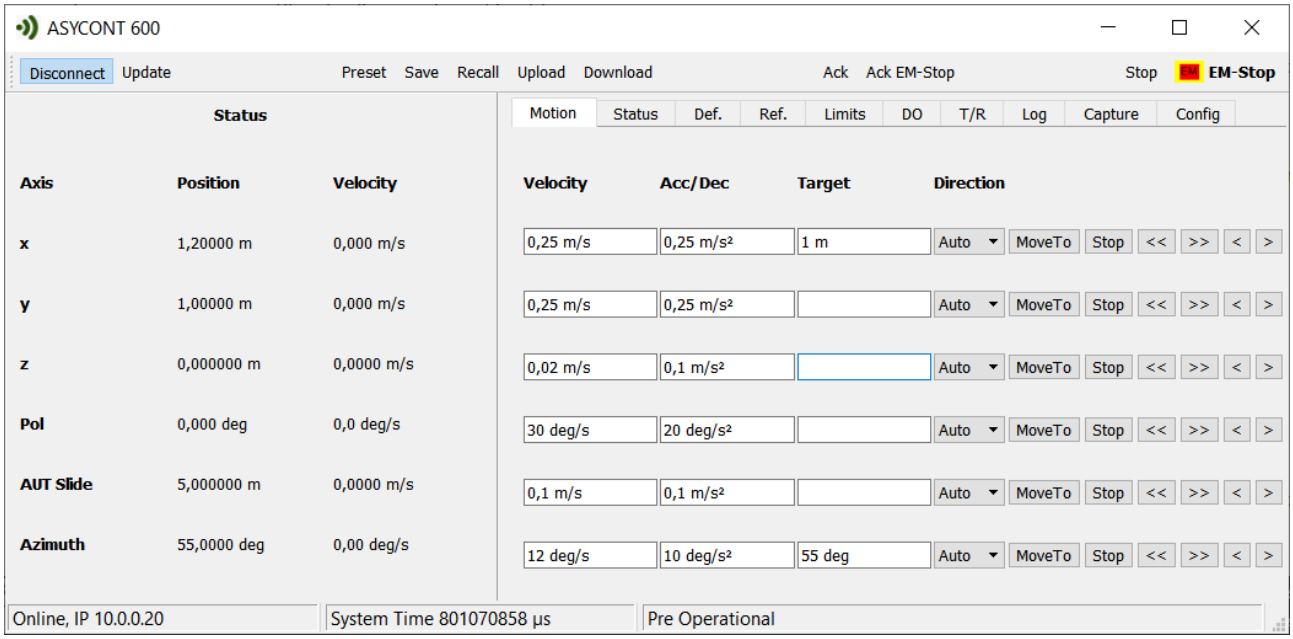


Fig 22: Motion page

The motion parameters *Velocity*, *Acc/Dec* and *Target* define the motion profile, cp Trajectory Generation, Basic Motion Profile. For a description of the *Direction* options *Forward*, *Reverse*, *Auto* and *Exceed Period* see Basic Motion Commands.

Motion commands are issued by the following controls:

MoveTo

Start a move to the absolute target position.

Stop

Decelerates the axis with the deceleration value *Acc/Dec* until the axis comes to a stop.

<< >>

Move forward or reverse, respectively, while the button is pressed. If released, decelerate and stop.

< >

These buttons latch and move the axis continuously forward or reverse. Click again to release the button and to stop the motion.

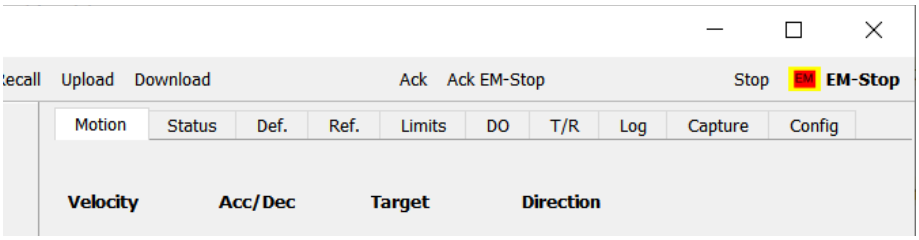


Fig 23: Main Toolbar, Stop and EM-Stop

In addition to the controls on the motion page the main toolbar provides the controls Stop and *EM-Stop*.

Stop will force a decelerated stop of all axes.

EM-Stop triggers the emergency stop system and has the same effect as pressing one of the emergency stop buttons on the system. An emergency stop needs to be acknowledged to enter the operational state.

Note!

Triggering the emergency stop from the remote application does not comply with applicable safety standards. This function is provided for convenience only.

13.5.1 Programming Commands

<command name="MoveAbs" axis="Axis 1" Acceleration=”10.0” Deceleration=”10.0” Velocity="10.0" Direction=”Auto” Position="5.0"/>
<command name="MoveRel" axis="Axis 1" Acceleration=”10.0” Deceleration=”10.0” Velocity="10.0" Direction=”Auto” Position="5.0"/>
<command name="ContF" axis="Axis 1" Acceleration=”10.0” Velocity="10.0" />
<command name="ContR" axis="Axis 1" Acceleration=”10.0” Velocity="10.0" />
<command name="Stop" axis="Axis 1" Deceleration=”10.0” />
<command name="QuickStop" axis="Axis 1" />
<command name="EMStop" />

13.6 Axis Status and Controller Status

The axis *Status page* provides additional axis status information and the control to enable or disable the drive.

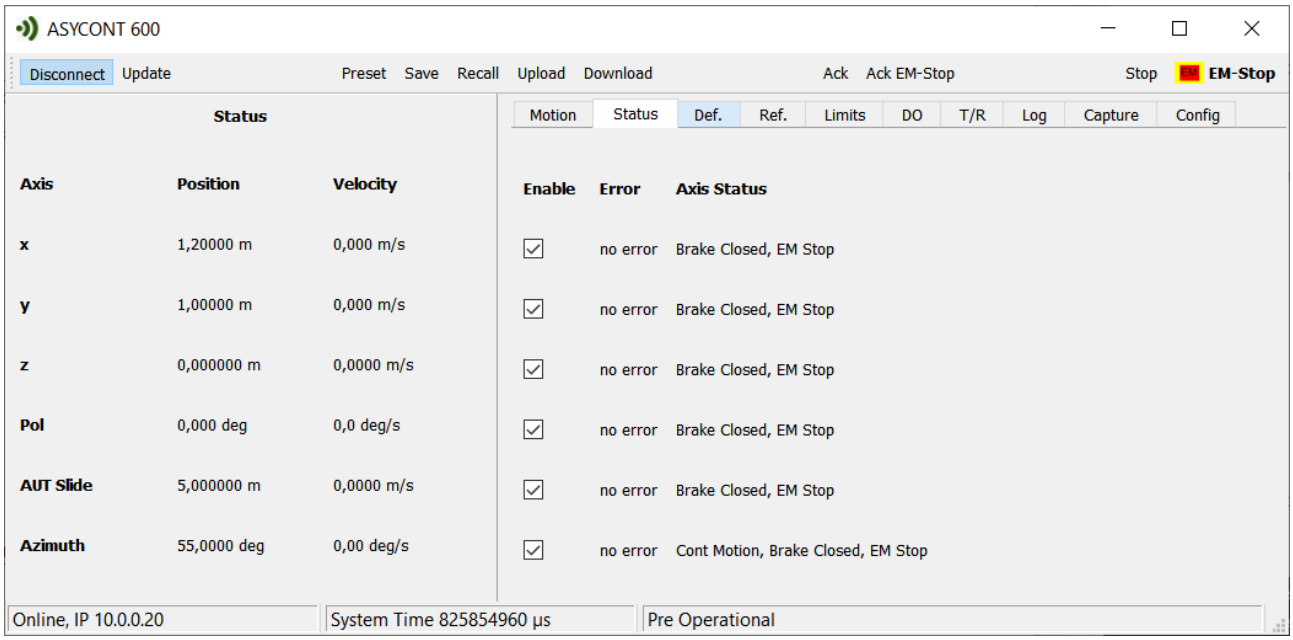


Fig 24: Axis Status page

Enable

Select or deselect the check box to *enable* or *disable* the drive. Disabling the drive will switch off the control loop and de-energize the drive.

Error

Pending axis errors are shown with number and description text. A pending error needs to be acknowledged by the *Ack* button on the main toolbar.

Axis Status

The axis status label summarizes the current status in a single string which is a combination of the following:

Drive On

The drive is enabled and energized.

Error Stop

The axis is stopped as a result of an axis error, the control loop is off and the drive is de-energized.

Discrete Motion

The drive is in the discrete motion state.

Cont Motion

The drive is in the continuous motion state.

Sync Motion

The drive is in the synchronized motion state.

Forward Limit

Forward hardware limit switch active.

Reverse Limit

Reverse hardware limit switch active.

Home Switch

Axis home switch is active.

Axis Error

Axis is in error state.

Lag Warning

The warning limit of the lag error is exceeded.

Brake Open|Brake Closed

The status of the motor holding brake or external brake is open or closed, respectively.

EM-Stop

An emergency stop is pending. An active emergency stop disables all axes.

The *operational status* of the controller is displayed in the main status bar. Possible conditions are:

Operational

This is the normal *Operational* status of the controller.

Pre-Operational

The *Operational* status is not yet reached or the emergency stop is active. *Pre-Operational* status is usually active during start-up of the controller until the emergency stop is acknowledged.

Maintenance

The operational/maintenance switch of the controller is set to maintenance. All drives are disabled.

13.6.1.1 Programming Commands

Query

```
<state>
  <section name="Axis 1">
    <query name="State"/>
  </section>
</state>
```

Response

```
<state>
        <section name="Axis 1">
                <entry name="State" type="int" unit="" size="1" v1="86" />
        </section>
</state>
```

13.7 Default Positions

The *Def.* Page displays pre-configured default positions of the controller.

Default positions are usually defined to simplify moving to special system positions, for example the center position or special mounting positions for DUT or the measurement probe.

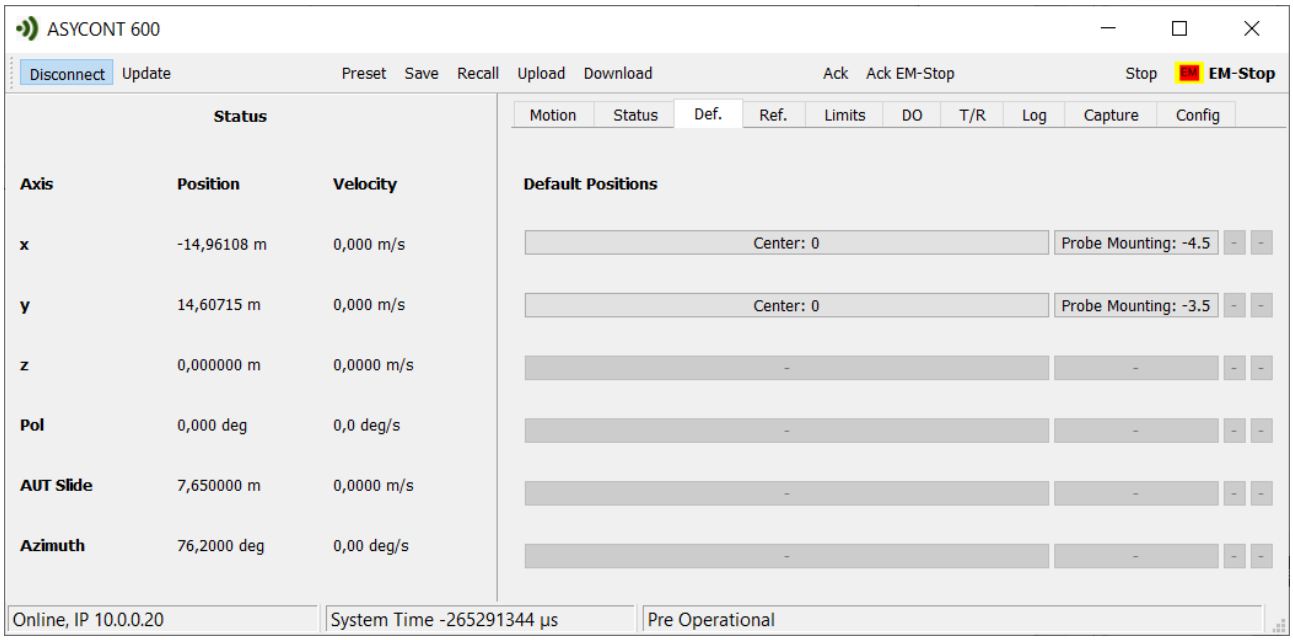


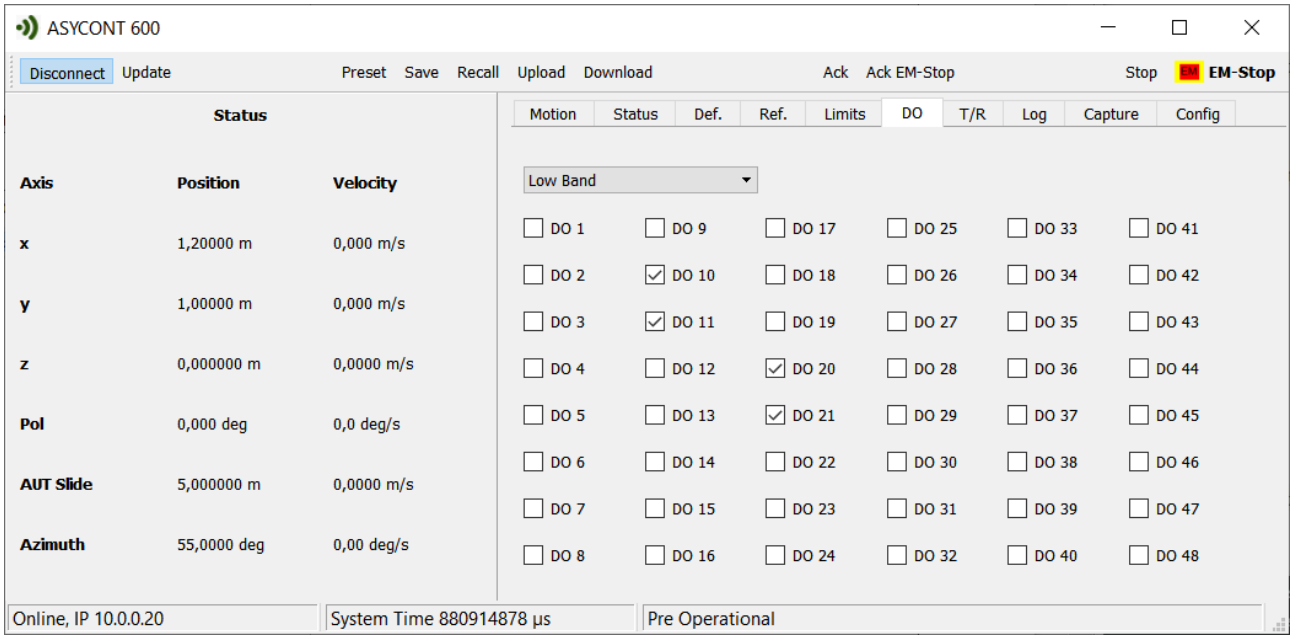
Fig 25: Default positions page

Clicking on one of the *default position buttons* starts a move to the corresponding absolute axis position.

13.8 Digital Outputs

The *DO page* provides access to the digital outputs of the system. The check boxes reflect the current output state and allow to change each individual state.

If configured, the *outputs state combo box* provides a means to set all outputs simultaneously to predefined states, so as to set a system state or operational mode.



Clicking the corresponding check box toggles the digital state of the corresponding output.

13.8.1.1 Programming Commands

```
<par>
<section name="DIO">
<entry name="DO1" type="bool" v1="true|false"/>
<entry name="DO2" type="bool" v1="true|false"/>
...
</section>
</par>
```

13.9 Trigger System

The *T/R page* provides access to the trigger system, trigger positions and the TR resources of the measurement system.

The trigger system generates real-time trigger and control signals and operates independently of the motion control system. A combination of a trigger and ready signal is usually used to synchronize the RF instrumentation with the measurement. Real-time control signals can be used to directly control and synchronize fast pin diode switches with the measurement.

For a detailed description of the trigger system and the functionality refer to Trigger System and Fast Real-Time Control.

13.9.1 Trigger System

The *trigger system* defines the main operational mode and contains the subsystems *trigger positions* and the resources *TR 1* to *TR 4*.

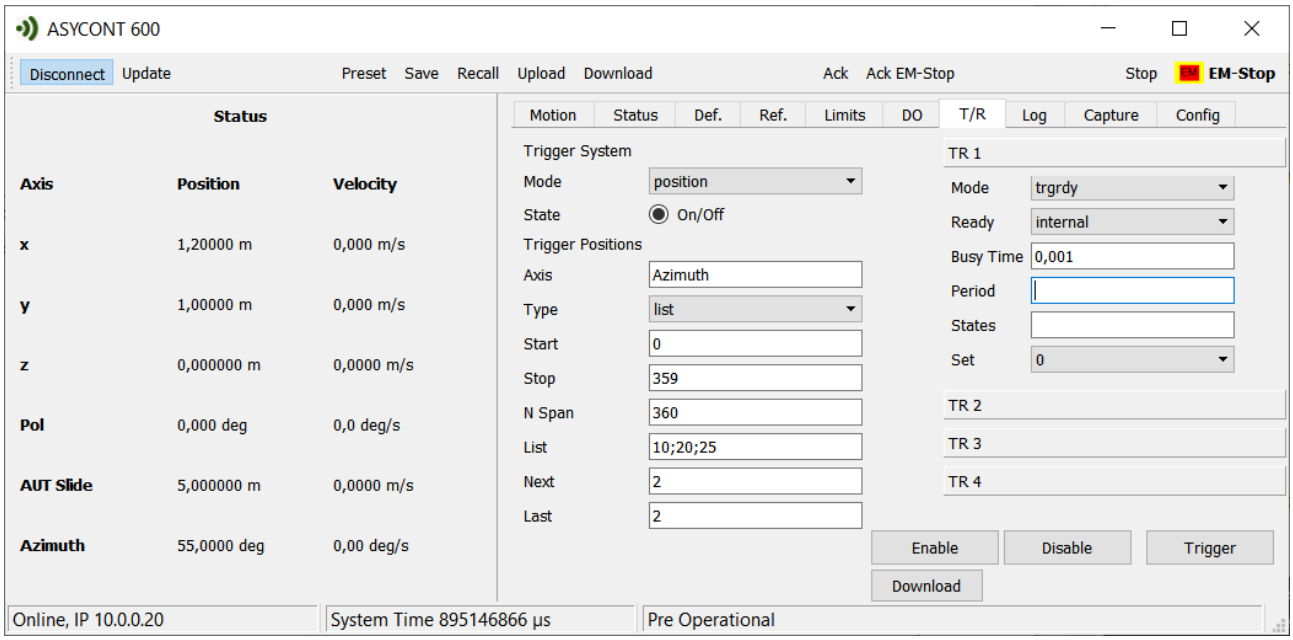


Fig 26: Trigger System page

The basic operational *mode*s of the trigger system are

direct

Trigger sequences are initiated directly by clicking the *Trigger* button.

position

Trigger sequences are initiated when the corresponding axes crosses over defined position breakpoints of the *trigger positions* subsystem.

external

A trigger sequences is initiated for each input trigger pulse at the external trigger input connector.

measure

This mode activates the timing measurement function of the trigger system.

The trigger system *state* can be

on

Trigger system and subsystems is active.

off

Trigger system and subsystems are disabled.

Once all settings of the trigger system and its subsystems are made the *Enable* button downloads the parameter and enables the trigger system. *Disable* disables the trigger system. The trigger system needs to be disabled before it can be properly enabled.

The trigger system is also disabled by the trigger positions subsystem once the defined number of trigger positions has been reached and all sequences have been issued.

13.9.2 Trigger Positions

The *trigger positions* subsystem is active when the trigger system mode is set to *position*. When active, trigger/control sequences are issued based on the system position of an axis. The *Type* parameter allows to define the positions either as a span of equispaced values or as a free list of arbitrary positions.

Axis

The axis that acts as a source for the position values.

Type

Position trigger type *span* or *list*.

For type *span* the position breakpoints are defined by the parameter *Start*, *Stop* and *N Span.*

Start

Position of first breakpoint.

Stop

Position of last breakpoint.

N Span

Total number of equally spaced breakpoints.

And for type *list*

List

List of arbitrary positions separated by colons.

Next

The index of the currently active position breakpoint. Set *Next* to the index of the first position of the span or list. While *Next* is automatically updated in the controller the *Next* parameter on the GUI is not.

Last

The index of the last position breakpoint. The trigger system is disabled when Next equals Last and after the last trigger sequence has been issued.

13.9.2.1 Programming Commands

Position trigger parameter:

```
<par>
  <section name="Trigger Positions">
    <entry name="Axis" type="string" v1="Phi"/>
    <entry name="Type" type="string" v1="span"/>
    <entry name="Start" type="float" v1="0-0"/>
    <entry name="Stop" type="float" v1="359.0"/>
    <entry name="NSpan" type="int" v1="360"/>
    <entry name="List" type="float" size="2" v1="1.2" v2="1.3"/>
    <entry name="Next" type="int" v1="0"/>
    <entry name="Last" type="int" v1="359"/>
  </section>
</par>
```

13.9.3 TR1 … TR4, Trigger/Control Sequence

A trigger/control sequence is defined by a combination of the settings of TR1 to TR4. In the simplest case the sequence is a single trigger pulse.

For a detailed description of how to configure a trigger/control sequence refer to Real-Time Trigger/ Control Sequence.

Depending on the current operational *Mode* a TR resource can be part of a trigger/control sequence, the associated output can be set directly or it can be used to perform a trigger/ready timing measurement.

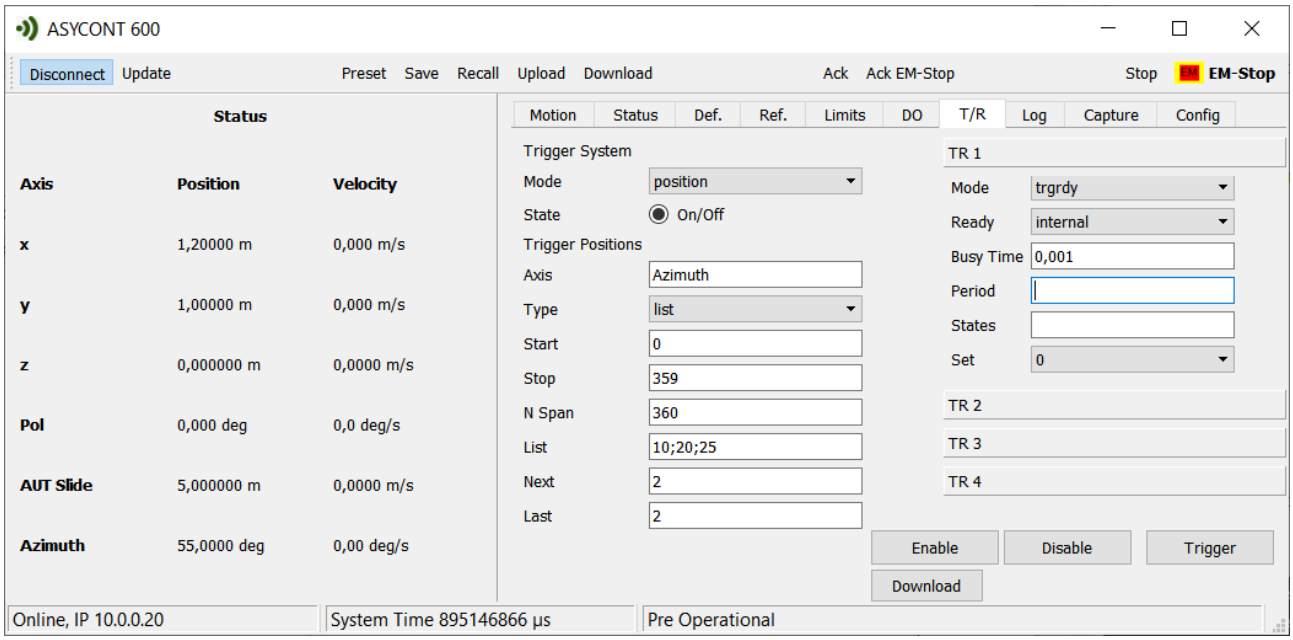


Fig 27: T/R page, TR1 ... TR4

Each TR resource can be set to one of the following *mode*s:

off

The resource is disabled

direct

The resource is set to direct control mode and the associated output state can be set directly.

measure

The resource is assigned to the timing measurement function.

trgrdy

The resource is part of a real-time trigger/control sequence.

When set to *direct* control the associated outputs can be set directly by the set control:

Set

Provides a list of 16 states. Each state represents a bitmap with 4 bits. Each bit represents an output. In case less then 4 outputs are associated to the resource the remaining bits are ignored.

When set to *trgrdy* the resource takes part in the fast, real-time trigger/control sequence.

Ready

internal | external
Currently only internal blank time generation is supported

Busy Time

The time the underlying measurement parameter requires for the switch-over to the next state (TR2...TR4) or the measurement time (TR1).

Period

Number of measurement trigger of TR1 between a switch-over to the next state (TR2...TR4) or the total number of measurements (TR1)

States

List of up to 16 output states for the output lines of a real-time module. Bits 1 to 4 represent the output state of the corresponding output line.

13.9.3.1 Programming Commands

```
<par>
  <section name="TR1">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="1E-3"/>
    <entry name="Period" type="int" v1="16"/>
  </section>
  <section name="TR2">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="1E-5"/>
    <entry name="Period" type="int" v1="2"/>
  </section>
  <section name="TR3">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="1E-5"/>
    <entry name="States" type="int" size=4 v1="0" v2="1" v3="2" v4="3"/>
    <entry name="Period" type="int" v1="4"/>
  </section>
  <section name="TR4">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="5E-3"/>
    <entry name="Period" type="int" v1="8"/>
  </section>
</par>
```

13.10Controller Log

Error messages, warnings and messages from the controller are automatically output to the log window.

For a list of error messages refer to Error Codes and Messages.

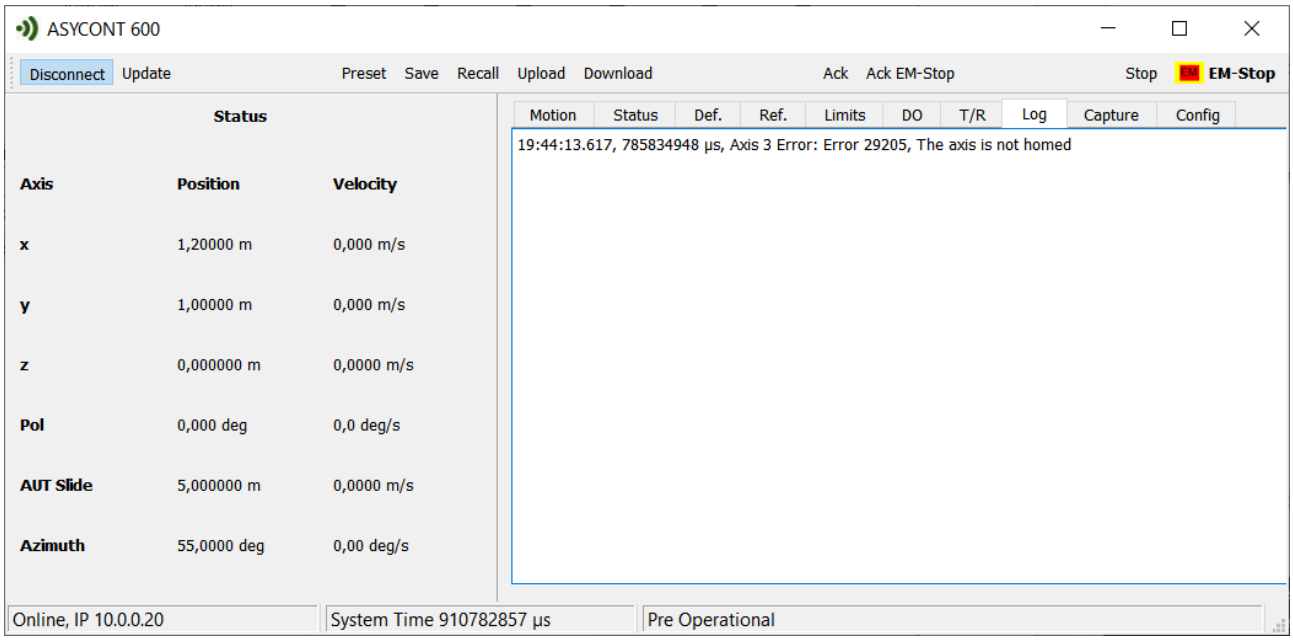


Fig 28: Log page

13.10.1.1 Programming Commands

```
<state>
        <section name="System">
                <query name="Last Error" />
        </section>
</state>

<state>
        <section name="System">
                <query name="Errors" />
        </section>
</state>
```

13.11 Position Capture

The *Capture page* provides access to the position capture function of the controller. The position capture function allows to capture the position of one or multiple axes in real-time. The controller collects the positions of the axes to be captured in equally spaced intervals and sends the data in blocks to the remote application. The data of the selected axes are saved in a single file. The capture interval corresponds to the cycle time of the real-time bus.

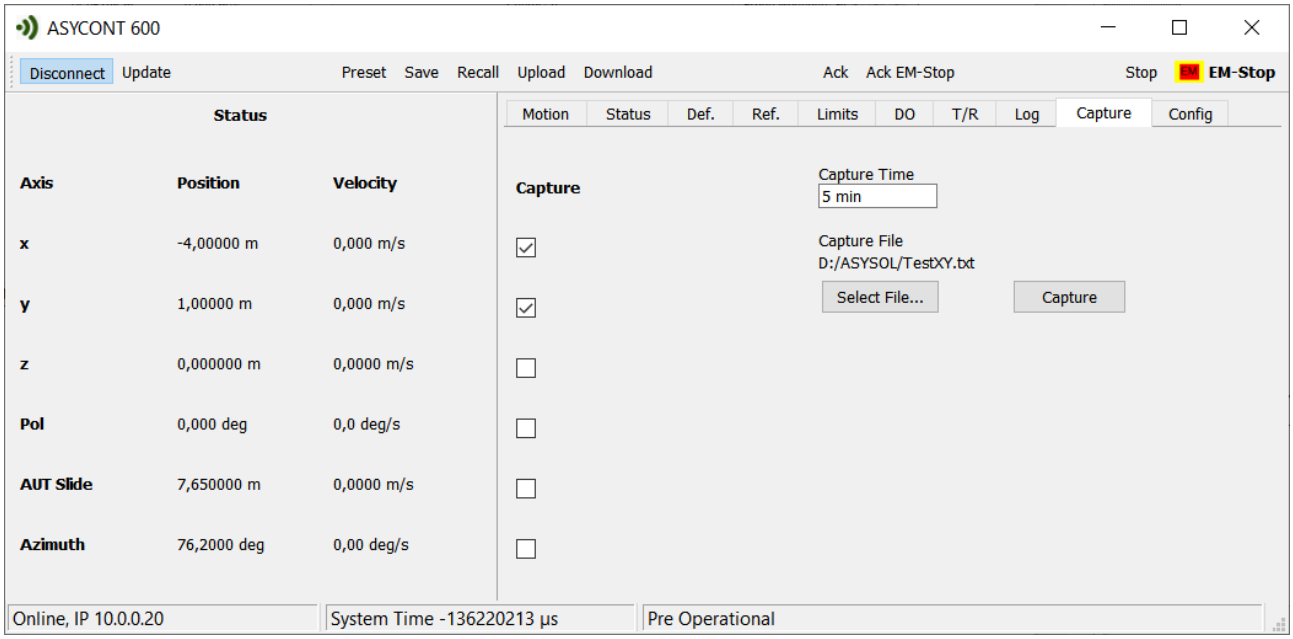


Fig 29: Position Capture page

Capture Check Boxes

Capture positions of the checked axes.

Capture Time

Data is captured for this period.

Capture File

The file for the captured data.

Capture

Start position capture.

13.12Configuration

The *Config page* provides access to the changeable part of the user configuration. In operational mode of the controller the configuration is read-only. Changes are only possible in maintenance mode.

14. Remote Operation

14.1 Remote Interface

The controller provides an Ethernet interface and allows remote operation by TCP/IP on port 4000. The default IP address is 10.0.0.20. A fixed IP address is required. The communication protocol is based on XML.

The controller allows connection of up to 5 clients at a time. If more then a single client is connected the clients are responsible for command synchronization.

The ASYCONT 600 remote application connects to the controller by the remote interface.

14.1.1 Conventions in this Manual

Variable names are indicated in blue.

In this document the XML header is omitted for convenience.

14.1.2 Axis Identification

Axes are identified by a unique axis name or by the axis index.

Example

<section name="Axis n"> or <section name="Name">

14.1.3 Axis Units

All communication to and from the controller uses standard SI units without prefix. For rotary axes positions are interpreted and returned in degrees. For linear axes in meters. Time is in seconds. Derived units are defined accordingly.

14.1.4 Interpretation of Current Position for Periodic Axes

For a periodic axis the current *Axis Position*, *System Position* or *Nominal Position* returned by the controller is always confined in the [0°...360°[range.

14.1.5 Interpretation of Command Position for Periodic Axes

For a periodic axis the position is confined in the interval [0°...360°[, but command positions outside this interval are allowed for convenience or to provide a means to command moves that exceed the 360° range, for example to command multiple rotations.

The following applies to the motion commands *MoveAbs* and *MoveRel*.

In the direction modes *Auto*, *Forward* and *Reverse* a command position outside this range is automatically mapped into the [0°...360°[range. In other words -10°, 350° and 710° all define the same target position.

The direction mode *Exceed Period* provides a means to command an axis outside the [0°...360°[range and to allow movement distances of more then 360°. The range of a motion depends on the current axis position and the target position.

If, for example, the current position is 350° then a command position of

360° will move the axis 10° forward,

370° will move 20° forward and

360°+350°=710° will start a full rotation back to the same position

Moves in the negative direction are defined accordingly.

14.2 XML Command Interface

Commands and queries are exchanged by an XML based communication protocol. The protocol allows to exchange single commands and parameter or complete XML documents in a single step. The complete controller configuration or the complete parameter state can be queried in a single step.

For messages send to the controller the XML header may be omitted. For commands a shortened version without a root element is allowed.

Messages send from the controller always include the XML header.

In this document the XML header is omitted for convenience.

14.2.1 Configuration

A config message is defined by the root element <config>. The configuration is grouped into sections to distinguish between different axes or subsystems. The remote interface allows to exchange an arbitrary number of parameters in a single XML message.

Data types bool, string, int, float and complex are supported. A parameter may contain a single value or a list of values. The response to a query returns the current value and the parameter limits if available.

The configuration is further subdivided into the *base configuration* and the user *configuration*. The base configuration is read-only and cannot be modified by the remote interface. The user

configuration has read access in all operational modes. For safety reasons write access is provided in *Maintenance* mode only. Configuration parameter send in operational mode are ignored.

In order to change user configuration settings the *Operational/Maintenance switch* on the controller needs to be set to *Maintenance*.

The user configuration overwrites the corresponding setting of the base configuration within applicable restrictions, see chapter xxx. A configuration parameter query returns the corresponding value of the user configuration if available, else the value of the base configuration.

To set a config parameter:

```
<config>
  <section name="Sec1">
        <entry name="Par1" type="Typ1" size=”1” v1="Val1"/>
        <entry name="Par2" type="Typ2" size=”1” v1="Val2"/>
        ...
  </section>
</config>
```

A config parameter query is formed by the node name *query*:

```
<config>
  <section name="Sec1">
        <query name="Par1"/>
        <query name="Par2"/>
        ...
  </section>
</config>
```

The response to the query is a single XML message with the requested config parameters. The timestamp contains the system time where the parameters were captured in µs.

```
<config timestamp=”ts”>
  <section name="Sec1">
    <entry name="Par1" type=”Typ1” size=”1” unit=”” v1=”Val1”/>
    <entry name="Par2" type=”Typ2” size=”1” unit=”” v1=”Val1”/>
    ...
  </section>
</config>
```

14.2.2 Configuration Tree

Base Configuration Parameter

```
<config>
  <section name="System">
    <entry name="Number of Axes" type="int" v1="N"/>
    <entry name="RT Prog 1" type="string" v1="TrgSeq3 | TrgTR3OL | TrgTR4OL"/>
    <entry name="RT Address 1" type="string" v1="Address1"/>
    <entry name="RT Prog 2" type="string" v1="TrgSeq3 | TrgTR3OL | TrgTR4OL"/>
    <entry name="RT Address 2" type="string" v1="Address2"/>
    <entry name="RT Prog 3" type="string" v1="TrgSeq3 | TrgTR3OL | TrgTR4OL"/>
    <entry name="RT Address 3" type="string" v1="Address3"/>
  </section>
  <section name="Axis <n>">
    <entry name="Name" type="string" v1="Name"/>
    <entry name="Unit" type="string" v1="Unit"/>
    <entry name="Resolution" type="float" v1="F"/>
    <entry name="Forward Limit" type="float" v1="Fwd"/>
    <entry name="Reverse Limit" type="float" v1="Rev"/>
    <entry name="Type" type="string" v1="Limited | Periodic"/>
  </section>
...
</config>
```

The range for the axis index n is [1...N].

User Configuration Parameter

```
<config>
  <section name="Axis <n>">
    <entry name="Forward Limit" type="float" v1="Fwd"/>
    <entry name="Reverse Limit" type="float" v1="Rev"/>
    <entry name="Type" type="string" v1="Limited | Periodic"/>
    <entry name="Power Mode" type="string" v1="on | manual"/>
    <entry name="Homing Mode" type="string" v1="auto | manual"/>
    <entry name="Load Model" type="string" v1="linear | periodic"/>
    <entry name="Load Offset" type="float" v1="F1"/>
    <entry name="Load Torque Offset" type="float" v1="F2"/>
    <entry name="Load Slope" type="float" v1="F3"/>
    <entry name="Load Min Step" type="float" v1="F4"/>
    <entry name="Correction Table" type="string" v1="Label1"/>
    <entry name="Correction State" type="string" v1="on | off"/>
</section>
...
</config>
```

14.2.3 Configuration Reference, Base Configuration

Refer to chapter xxx, Configuration, for a description of the system configuration.

System

The system subsystem contains system wide configuration settings.

Number of Axes

The total number of configured axes

type int

size 1

range [1…N]

RT Prog 1

Trigger/control program for RT module #1

type string

size 1

range TrgSeq3 | TrgSeq3OL | TrgSeq4OL

RT Address 1

System address of real-time module #1

type string

size 1

range -

RT Prog 2

Trigger/control program for RT module #2

type string

size 1

range TrgSeq3 | TrgSeq3OL | TrgSeq4OL

RT Address 2

System address of real-time module #2

type string

size 1

range -

RT Prog 3

Trigger/control program for RT module #3

type string

size 1

range TrgSeq3 | TrgSeq3OL | TrgSeq4OL

RT Address 3

System address of real-time module #3

type string

size 1

range -

Axis <int>

The parameter of the config system are organized in sections per axis. The section name is the keyword Axis followed by a blank and the index number of the axis. The range for the axis index is

[1...N], where N is the total number of configured axes.

Name

A unique name for the axis

type string

size 1

range Max 80 characters

Unit

The SI unit of the axis position value. Units of axis parameters are derived from this unit.

type string

size 1

range deg | m

Resolution

The resolution is the smallest step of the axis position. The actual resolution may be higher, but should not be assumed higher then this value for display or accuracy considerations.

type float

size 1

unit deg | m

Type

Limited or unlimited (periodic) axis

type string

size 1

range limited | periodic

Forward Limit

Absolute forward position limit relative to the system reference position

type float

size 1

unit deg | m

Reverse Limit

Absolute reverse position limit relative to the system reference position

type float

size 1

unit deg | m

14.2.4 Configuration Reference, User Configuration

Refer to chapter xxx, Configuration, for a description of the system configuration.

Axis <int>

The parameter of the config system are organized in sections per axis. The section name is the keyword Axis followed by a blank and the index number of the axis.

Type

Limited or unlimited (periodic) axis

type string

size 1

range limited | periodic

Forward Limit

Absolute forward position limit relative to the system reference position

type float

size 1

unit deg | m

Reverse Limit

Absolute reverse position limit relative to the system reference position

type float

size 1

unit deg | m

Power Mode

Drive power switched on automatically at start-up or manually

type string

size 1

range manual | on

Homing Mode

Homing procedure automatically started at start-up or manually by the reference command

type string

size 1

range auto | manual

Correction Table

Position correction file

type string

size 1

range <filename>.pcf

Correction State

Position correction enabled or disabled

type string

size 1

range on | off

Load Model

-

type string

size 1

range linear | periodic

Load Torque Offset

-

type float

size 1

unit Nm

Load Offset

-

type float

size 1

unit Nm

Load Slope

-

type float

size 1

unit Nm/m

Load Min Step

Minimum step of actuator value to initiate value update

type float

size 1

unit Nm

14.2.5 Parameter

A parameter message is defined by the root element <par>. Parameters are grouped into sections to distinguish between different axes or subsystems. The remote interface allows to exchange an arbitrary number of parameters in a single XML message.

Parameter data types bool, string, int, float and complex are supported. A parameter may contain a single value or a list of values. The response to a parameter query returns the current value and the parameter limits if available.

Set parameters:

```
<par>
  <section name="Sec1">
        <entry name="Par1" type="Typ1" size=”1” v1="Val1"/>
        <entry name="Par2" type="Typ2" size=”1” v1="Val2"/>
        ...
  </section>
</par>
```

A parameter query is formed by the node name *query*:

```
<par>
  <section name="Sec1">
        <query name="Par1"/>
        <query name="Par2"/>
        ...
  </section>
</par>
```

The response to the query is a single XML message with the requested parameters and the parameter limits, if applicable. The timestamp contains the system time where the parameters were captured in µs.

```
<par timestamp=”ts”>
  <section name="Sec1">
    <entry name="Par1" type=”Typ1” size=”1” min=”l1” max=”l2” unit=”” v1=”Val1”/>
    <entry name="Par2" type=”Typ2” size=”1”  min=”l1” max=”l2”unit=”” v1=”Val1”/>
    ...
  </section>
</par>
```

14.2.6 Parameter Tree

The following XML document lists the available parameters. Axes are grouped into sections per axis and per subsystem. The number of available sections depends on the number of configured axes.

```
<par>
 <section name="Axis n">
  <entry name="Velocity" type="float" size=”1” v1="fval"/>
  <entry name="Acceleration" type="float" size=”1” v1="fval"/>
  <entry name="Deceleration" type="float" size=”1” v1="fval"/>
  <entry name="Jerk" type="float" size=”1” v1="fval"/>
  <entry name="Direction" type="string" size=”1” v1="Forward|Reverse|Auto|Exceed
  Period"/>
  <entry name="Position" type="float" size=”1” v1="fval"/>
  <entry name="Offset" type="float" size=”1” v1="fval"/>
  <entry name="Enabled" type="string" size=”1” v1="on|off"/>
 </section>
 … repeats for axis index 1 to number of configured axes
  <section name="DIO">
     <entry name="DOn" type="bool" v1="true|false"/>
     … repeats for n=1...64
  </section>
  <section name="Trigger System">
     <entry name="Mode" type="string" v1="direct|position|external|measure"/>
     <entry name="State" type="string" v1="on|off"/>
  </section>
  <section name="Trigger Positions">
     <entry name="Axis" type="string" v1="sval"/>
     <entry name="Type" type="string" v1="span|list"/>
     <entry name="Start" type="float" v1="fval"/>
     <entry name="Stop" type="float" v1="fval"/>
     <entry name="NSpan" type="int" v1="ival"/>
     <entry name="List" type="float" size="ival" v1="fval1" v2="fval2" … />
     <entry name="Next" type="int" v1="ival"/>
     <entry name="Last" type="int" v1="ival"/>
  </section>
  <section name="TR1">
     <entry name="Mode" type="string" v1="off|direct|trgrdy|measure"/>
     <entry name="Trigger" type="string" v1="OnSweep|OnPoint"/>
     <entry name="Ready" type="string" v1="internal|external"/>
     <entry name="Busy Time" type="float" v1="fval"/>
     <entry name="Period" type="int" v1="ival"/>
```

```
    <entry name="States" type="int" size=”n” v1="ival" v2="ival" … />
  </section>
 … repeats for TR1 … TR4
  <section name="TR1/TR Test">
    <entry name="N" type="int" v1="ival"/>
    <entry name="Timeout" type="float" v1="fval"/>
    <entry name="Result" type="float" size=”n” v1="fval1" v2="fval2 ..."/>
  </section>
 … repeats for TR1 … TR4
</par>
```

14.2.7 Parameter Reference

14.2.7.1 Motion System

Axis <int>

The parameter of the motion control system are organized in sections per axis. The section name is the keyword Axis followed by a blank and the index number of the axis. The index runs from 1 to the total number of configured axes.

Velocity

Defines the maximum velocity for simple motion profile generation.

type float

size 1

unit m/s or °/s

Acceleration

Defines the maximum acceleration for simple motion profile generation.

type float

size 1

unit m/s² or °/s²

Deceleration

Defines the maximum deceleration for simple motion profile generation.

type float

size 1

unit m/s² or °/s²

Jerk

Query only

Defines the maximum jerk.

type float

size 1

unit m/s³ or °/s³

Direction

For a periodic axis this parameter defines the direction to the target position. For a limited axis the setting is ignored.

Affects motion commands MoveAbs and MoveRel.

Possible values are

Auto

shortest path to the target position

Forward

move forward to the target position, target position is confined in the interval [0°...360°], target position outside this interval is automatically adjusted to the corresponding position inside the interval

Reverse

reverse direction;
move reverse to the target position, target position is confined in the interval [0°...360°], target position outside this interval is automatically adjusted to the corresponding position inside the interval

Exceed Period

this mode allows to command to a target position outside the [0°...360°] interval, for example to command a move that exceeds one rotation,
Example:
if the current position is 110° a target position of
100° will move 10° back
120° will move 20° forward

360° will move forward to 0° (360°)
0° will move reverse to 0°
500° will move forward to 360°+140° → 140°

type string

size 1

unit -

Offset

Query only

User defined position offset relative to the systems absolute position reference.

After the reference procedure has been executed the offset is always set to 0. The offset can only be changed by the *Reference* command.

type float

size 1

unit m or °

Position

Defines the absolute or relative traget position for simple motion profile generation.

type float

size 1

unit M or °

Enabled

Enable the drive and release the break.

type float

size 1

range on | off

Refer to chapter xxx for a description of the digital outputs.

DIO

The digital outputs are found in the section DIO.

DOn, n=[1...64]

The current state of a single digital output.

The outputs are numbered from 1 to 64.

Changing the logical state of a parameter immediately changes the signal state of the corresponding digital output. A parameter query reflects the current output state.

type int

size 1

unit -

14.2.7.2 Trigger System

Refer to chapter xxx for a description of the trigger system.

Trigger System

Mode

The operational mode of the trigger system defines how trigger sequences are initiated or if the system is used to measure instrument measurement times.

type string

size 1

unit -

range **direct|position|external|measure**

In **direct** mode the sequence is initiated by the remote command *TriggerTRSequence*.

In ***position*** mode the sequence is triggered position based and according to the *Trigger Positions* subsystem.

In **external** mode the sequence is triggered by an external trigger signal applied to the trigger input.

In **measure** mode the system performs trigger/ready measurements

State

Enables or disables the trigger system.

type string

size 1

unit -

range on|off

Trigger Positions

Axis

Axis used as the source of the position

type String

size 1

unit -

range Name of a configured axis

Type

Select position trigger mode

span

position breakpoints are equally spaced, the span is defined by Start, Stop and NSpan

list

use the List parameter as source for the position breakpoints

type string

size 1

unit -

range span|list

Start

Start position for trigger type Span

type float

size 1

unit m or °

range axis limits

Stop

Stop position for trigger type Span

type float

size 1

unit m or °

range axis limits

NSpan

Number of trigger position for trigger type Span

type int

size 1

unit -

range [1...]

List

List of trigger breakpoint positions for trigger type List

type float

size 1…?

unit m or °

range axis limits

Next

Index of the currently active trigger position within the span or list of position breakpoints. This is the next position that issues a trigger. After a trigger has been issued the value is incremented.

The trigger system is disabled when Next equals Last and the last position breakpoint has been issued.

At the beginning of a trigger sequence set this parameter to the first position that should issue a trigger. During the measurement *Next* can be used to monitor the current status.

type int

size 1

unit -

range [0...number of breakpoints-1]

Last

Index of the last trigger position within the span or list of positions.

The trigger system is disabled after *Next* equals *Last* and the last breakpoint has been issued.

type int

size 1

unit -

range [0...number of breakpoints-1]

TR1 … TR4 (Trigger/Ready Resource 1 to 4)

Mode

off

the resource is disabled

direct

direct control of the output state by the remote commands StateTR1 … StateTR4

trgrdy

the resource is part of a real-time trigger sequence where the timing is a combined of all resources

measure

the resource is used for trigger/ready measurements

type string

size 1

unit -

range off | direct | trgrdy | measure

~~Ready <external|internal>~~

~~If set to External the ready signal is generated externally and applied to the configured ready input. If Internal the signal is internally created by means of the fixed busy time.~~

Busy Time

The time required to change from one state to the next.

type float

size 1

unit s

range 0…?

Period

For the measurement trigger resource TR1 this is the total number of triggers for one

complete sequence.

For TR2...TR4 the value represents the repeat period, i.e. the number of measurement trigger between changes to the next state.

type int

size 1

unit s

range 1…?

TR1/TR Test … TR4/TR Test

Timeout

Timeout value for a single Trigger/Ready measurement.

type float

size 1

unit s

range 0…?

N

Number of Trigger/Ready measurements to perform

type int

size 1

unit -

range 1…?

Result

Query only

Measured trigger/ready times.

type float

size 1…?

unit s

range 0…?

14.2.8 Status Queries

Status queries are defined by the root element <state>. Queries are grouped into sections. The remote interface allows to query an arbitrary number of items in a single step.

A status query is formed by the node name *query*:

```
<state>
  <section name="Sec1">
        <query name="Par1"/>
        <query name="Par2"/>
        ...
  </section>
</state>
```

The response to the query is a single XML message with the requested items:

```
<state>
  <section name="Sec1" timestamp=”ts”>
        <entry name="Par1" type=”Typ1” size=”1” unit=”” v1=”Val1”/>
        <entry name="Par2" type=”Typ1” size=”1” unit=”” v1=”Val1”/>
        ...
  </section>
</state>
```

The response message includes a timestamp. The timestamp contains the start time of the cycle in which the status was updated and the message was send in µs.

Status Tree

```
<state>
  <section name="System">
    <entry name="Last Error" type="string" />
    <entry name=”Errors" type="string" />
  </section>
  <section name="Axis n">
    <entry name="Position" type="float"/>
    <entry name="Axis Position" type="float" />
    <entry name="Axis Velocity" type="float"  />
    <entry name="Nominal Position" type="float" />
    <entry name="Nominal Velocity" type="float" />
    <entry name="System Position" type="float" />
    <entry name="Position Error" type="float" />
    <entry name="Error ID" type="int" />
```

```
    <entry name="Error Message" type="string" />
    <entry name="State" type="int" unit="" />
    … repeats for n=1...number of configured axes
  </section>
  <section name="Trigger System" >
    <entry name="State" type="string"  />
    <entry name="TR Meas" type="string"  />
  </section>
</state>
```

14.2.9 Status Reference

System

The section system contains system level status information, for example errors and log messages.

Last Error

Returns the last error from the system error queue.

The error is removed from the queue.

type string

size 1

Errors

Returns all errors in the error queue.

The error are removed from the queue.

type string

size 1...20

Axis <int>

The status of the different axes are organized in individual sections. The section name is the keyword Axis followed by a blank and the index number of the axis.

Position | Axis Position

Returns the raw axis position without correction.

type float

size 1

unit m or °

Axis Velocity

Returns the current axis velocity.

type float

size 1

unit m/s or °/s

Nominal Position

Returns the current nominal position (set position).

The current nominal position is the calculated position from the trajectory generator.

type float

size 1

unit m or °

Nominal Velocity

Currently the axis velocity is returned.

type float

size 1

unit m/s or °/s

System Position

Returns the current axis position after position correction has been applied.

If position correction is disabled the system position equaly the axis position.

type float

size 1

unit m or °

Position Error

Returns the difference between Axis Position and Nominal Position.

type float

size 1

unit m or °

Error ID

Returns the last axis error ID.

The error is not automatically removed from the axis error queue. To remove the error the

error needs to be acknowledged by the *Ack* command.

type int

size 1

Error Message

Returns the last axis error message.

The error is not automatically removed from the axis error queue. To remove the error the error needs to be acknowledged by the *Ack* command.

type string

size 1

State

Returns the status word of the axis. The status word summarizes axis and drive status.

bit 0: drive power on

bit 1: homing in progress

bit 2: axis in error stop

bit 3: stopping

bit 4: standstill

bit 5: discrete motion

bit 6: continuous motion

bit 7: synchronized motion

bit 8: forward software limit active

bit 9: reverse software limit active

bit 10: forward hardware limit active

bit 11: reverse hardware limit active

bit 16: home switch active

bit 17: homing done and ok

bit 18: axis error

bit 19: lag error warning

bit 20: brake open

bit 21: EM stop active

bit 22: reset done

bit 23: trigger 1

bit 24: trigger 2

bit 25: error message available

type int

size 1

Trigger System

The status of the trigger system is found in the section Trigger System.

State

Returns the state of the trigger system:

idle

in the idle state the trigger system is disabled, a previously running trigger sequence has finished successfully

prepare

trigger system is initializing and not yet ready

ready

trigger system initialized and running

busy

trigger system in error state, either initialization did not succeed or error during execution

type string

size 1

range idle | prepare | ready | busy

TR Meas

Returns the state of the trigger/ready measurement function

off

the measurement function is off; the trigger system is off or configured for trigger/control functions

error

internal error

timeout

the instrument did not response to a trigger within the timeout period

ready

trigger system initialized and running

busy

busy preparing

type string

size 1

range off | error | timeout | ready | busy

Commands

Commands can be send to the controller in a shortened XML structure without root element and header.

```
<command name="Com1" par1="parv1" par2="parv2" … />
```

Each command has a unique command name and optional command parameter.

Multiple commands can be send in a single message.

```
<command name="Com1" par11="parv11" par12="parv12" … />
<command name="Com2" par21="parv21" par22="parv22" … />
```

Sending multiple commands in a single message ensures simultaneous execution.

14.2.10 Command Reference

14.2.10.1 Instrument State and Configuration

The following commands can be used to handle the instrument state of the controller.

<command name="Preset" />

Restore the factory preset instrument state.

<command name="Load" file=”spar” />

Load an instrument state from the user memory area of the controller. The parameter must contain the name of a valid instrument state file (*.ais).

spar	Name of the instrument state file to load

<command name="Save" file=”spar” />

Save the current instrument state to file.

If the file already exists it will be overwritten.

spar	File name of the new instrument state

<command name="SendConfig" />

Send the complete controller configuration to the client

<command name="SendUserConfig" />

Send the user configuration to the client.

<command name="SendParam" />

Send the complete instrument state to the client.

14.2.10.2 Trigger System

The following commands control the trigger system and the fast real-time digital outputs of the controller and of the remote units.

<command name="EnableTrg" />

Initialize and enable the trigger system.

This command loads and initializes the FPGA modules for the fast real-time control and initializes the trigger system in the current configuration. Depending on the complexity of the measurement system, the new trigger configuration and the current system state this operation may last from a few milliseconds to several seconds.

The trigger system must be disabled before it can be enabled in a new configuration.

<command name="DisableTrg" />

Disable the trigger system..

<command name="TriggerTRSequence" />

Start a single trigger sequence immediately.

The trigger system needs to be in state *on* and in *direct* mode. The sequence needs to be properly configured and enabled.

<command name="StateTR1" State="ipar" />

Set the state of TR1 directly.

TR1 has to be in direct mode and the trigger system needs to be enabled.

For a standard controller TR1 to TR4 are usually configured as single output line. In this case the possible states are 0 and 1. If remote control units are connected to the controller several lines may be assigned to a single TR resource. In this case the number of possible states depends on the number of output lines.

ipar	The new state of TR1 in integer representation

<command name="StateTR2" State="ipar" />

Set the state of TR2 directly.

TR2 has to be in direct mode and the trigger system needs to be enabled.

For a standard controller TR1 to TR4 are usually configured as single output line. In this case the possible states are 0 and 1. If remote control units are connected to the controller several lines may be assigned to a single TR resource. In this case the number of possible states depends on the number of output lines.

ipar The new state of TR2 in integer representation

<command name="StateTR3" State="ipar" />

Set the state of TR3 directly.

TR3 has to be in direct mode and the trigger system needs to be enabled.

For a standard controller TR1 to TR4 are usually configured as single output line. In this case the possible states are 0 and 1. If remote control units are connected to the controller several lines may be assigned to a single TR resource. In this case the number of possible states depends on the number of output lines.

ipar The new state of TR3 in integer representation

<command name="StateTR4" State="ipar" />

Set the state of TR4 directly.

TR4 has to be in direct mode and the trigger system needs to be enabled.

For a standard controller TR1 to TR4 are usually configured as single output line. In this case the possible states are 0 and 1. If remote control units are connected to the controller several lines may be assigned to a single TR resource. In this case the number of possible states depends on the number of output lines.

ipar The new state of TR4 in integer representation

<command name="InitTRTest" />

Start the TR measurement.

The trigger system needs to be in *measure* mode and the measurement needs to be configured. Execution time depends on the configured measurement and the instrument.

14.2.10.3 Motion System

<command name="Ack" />

Acknowledge a pending axis error.

This command acknowledges the last axis error of all axes. If one or more axes have more then 1 pending axis error the command needs to be executed several times.

<command name="AckEMStop" />

Acknowledge an emergency stop.

This command acknowledges an emergency stop if the emergency stop condition has been removed.

<command name="MoveAbs" axis="Axis N" Acceleration="fpar1" Deceleration="fpar2" Velocity="fpar3" Direction="spar1" Position="fpar4"/>

Start a movement to an absolute target position.

If the optional trajectory parameters are present the corresponding parameter values are updated and a motion profile to the absolute target position is executed. Parameters that are not present remain at their current values.

axis — Axis name or index position.

Direction — For a periodic axis this parameter defines the direction to the target position. For a limited axis the setting is ignored. Possible values are

Auto

shortest path to the target position

Forward

move forward to the target position, target position is confined in the interval [0°...360°], target position outside this interval is automatically adjusted to the corresponding position inside the interval

Reverse

reverse direction;
move reverse to the target position, target position is confined in the interval [0°...360°], target position outside this interval is automatically adjusted to the corresponding position inside the interval

Exceed Period

this mode allows to command to a target position outside the [0°...360°] interval, for example to command a move that exceeds one rotation,
Example:
if the current position is 110° a target position of
100° will move 10° back
120° will move 20° forward
360° will move forward to 0° (360°)
0° will move reverse to 0°
500° will move forward to 360°+140° → 140°

Acceleration	Optional acceleration parameter
Deceleration	Optional deceleration parameter
Velocity	Optional velocity parameter
Position	Target position

<command name="MoveRel" axis="Axis N" Acceleration="fpar1" Deceleration="fpar2" Velocity="fpar3" Position="fpar4"/>

Start a movement to a target position relative to the current position.

If the optional trajectory parameters are present the corresponding parameter values are updated and a motion profile to the relative target position is executed. Parameters that are not present remain at their current values.

The target position is interpreted relative to the current nominal axis position.

axis	Axis name or index position.
Acceleration	Optional acceleration parameter
Deceleration	Optional deceleration parameter
Velocity	Optional velocity parameter
Position	Relative target position

<command name="ContF" axis="Axis N" Acceleration=”fpar1” Velocity="fpar2" />

Start continuous motion forward.

The axis is accelerated until the velocity is reached. In case acceleration and/or Velocity are missing the current values are used.

The command can be interrupted by another motion command. If not interrupted the motion continues until a limit is reached. In case of a software limit the axis will decelerate with the current deceleration value and stop at the limit position. In case of a hardware limit switch the axis will decelerate with the maximum deceleration value.

axis	Axis name or index position.
Acceleration	Optional acceleration parameter
Velocity	Optional velocity parameter

<command name="ContR" axis="Axis N" Acceleration=”fpar1” Velocity="fpar2" />

Start continuous motion reverse.

The axis is accelerated until the velocity is reached. In case acceleration and/or Velocity are missing the current values are used.

The command can be interrupted by another motion command. If not interrupted the motion continues until a limit is reached. In case of a software limit the axis will decelerate with the current deceleration value and stop at the limit position. In case of a hardware limit switch the axis will decelerate with the maximum deceleration value.

axis	Axis name or index position.
Acceleration	Optional acceleration parameter
Velocity	Optional velocity parameter

<command name="Stop" axis=”Axis N” Deceleration=”fpar” />

Stop current motion until standstill.

The axis is stopped with the passed deceleration value or with the currently set deceleration if the parameter is omitted.

The Stop command can be canceled by another motion command.

axis	Axis name or index position
Deceleration	Optional deceleration value

<command name="QuickStop" axis=”Axis N” />

Stop current motion with maximum deceleration value.

The QuickStop command is always executed until the axis is stopped and cannot be canceled by another motion command.

axis	Axis name or index position

<command name="EMStop" />

Trigger an emergency stop.

This command is only available for systems with an emergency stop system.

<command name="Reference" axis=”Axis N” />

<command name="Reference" axis=”Axis N” Offset=”fval” />

<command name="Reference" axis=”Axis N” NewPosition=”fval” />

Reference the axis.

If this command is executed without Offset and NewPosition parameter the system reference procedure is started and any user offset value will be reset to 0.

If executed with the Offset parameter the offset value is added to the systems absolute axis position.

If executed with NewPosition parameter the current axis position is set to the NewPosition value and the user offset is calculated accordingly.

Any motion task requires that the axis has been referenced by the systems reference procedure. Assigning user offsets by *Offset* or *NewPosition* requires that the systems reference procedure has previously been executed.

axis	Axis name or index position.
Offset	Offset value that is added to the factory defined position reference
NewPosition	New position that is assigned to the current position

14.3 Programming and Application Examples

The following python examples demonstrate remote operation of the controller.

For simplification and clarity any error handling has been omitted and most configuration parameter are loaded from parameter files rather than changing single parameter values programmatically. The class Asycont600 is used to wrap the low level communication to the controller.

14.3.1 Asycont600 Class

Asycont600 is a class that wraps the communication to the controller into a convenient interface. All examples provided in this chapter use this class.

class Asycont600:

```
def __init__(self,TCP_IP):
self.TCP_IP=TCP_IP
self.TCP_PORT=4000
self.s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
def Connect(self):
self.s.connect((self.TCP_IP,self.TCP_PORT))
def Disconnect(self):
self.s.close()
def Send(self,msg):
emsg=bytes(msg,"UTF-8")
self.s.send(emsg)
def Read(self):
res=""
res=self.s.recv(4*1024)
return res


def ReadXML(self):
res=""
res=self.s.recv(4*1024).decode()
tag=GetXMLStartTag(res)
while CheckXMLStopTag(res,tag) == False:
res=res+self.s.recv(4*1024).decode()
return res
```

```
def SendFile(self,fn):
f=open(fn,"r")
msg=f.read()
self.Send(msg)
f.close()
def ReceiveFile(self,fn):
f=open(fn,"w")
msg=self.Read()
f.write(msg.decode("utf-8"))
f.close()
def sf(self,fn):
self.Connect()
self.SendFile(fn)
self.Disconnect()

def gf(self,fn):
self.Connect()
self.SendFile(fn)
time.sleep(0.2)
self.ReceiveFile("rec.xml")
self.Disconnect()
def ActPosition(self,axis):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "Axis " + str(axis))
q1=ET.SubElement(section,"query")
q1.set("name", "System Position")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
try:
r=self.Read()
except:
print("read error")
raise
try:
tree2=ET.fromstring(r.decode())
```

```
except:
print("parse error")
print(r)
try:
p=tree2.find("section")
q=p.find("entry")
fp=float(q.get("v1"))
except:
print("float")
return 1E9
return fp
def ActVelocity(self,axis):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "Axis " + str(axis))
q1=ET.SubElement(section,"query")
q1.set("name", "Velocity")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
q=p.find("entry")
fp=float(q.get("v1"))
return fp
def ActStatus(self,axis):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "Axis " + str(axis))
# query position
q1=ET.SubElement(section,"query")
q1.set("name", "System Position")
# query velocity
q2=ET.SubElement(section,"query")
q2.set("name", "Velocity")
tree=ET.ElementTree(root)
```

```
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
qlist=p.findall("entry")
fp=[0,0,0]
fp[0]=float(qlist[0].get("v1"))
fp[1]=float(qlist[1].get("v1"))
#fp[2]=int(root.get("timestamp"))
return fp
def MoveAbs(self,axis,acc,dec,vel,di,pos):
root=ET.Element("command")
root.set("name","MoveAbs")
root.set("axis",str(axis))
root.set("Acceleration",str(acc))
root.set("Deceleration",str(dec))
root.set("Velocity",str(vel))
root.set("Direction",di)
root.set("Position",str(pos))
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
def Wait(self,axis,pos,window,delay,tmo):
tstart=time.time()
pact=self.ActPosition(axis)
while abs(pos-pact) > window:
time.sleep(0.0)
if (time.time()-tstart) > tmo:
return False
try:
pact=self.ActPosition(axis)
except:
pact=1E9
time.sleep(delay)
return True
def EnableTrg(self):
```

```
root=ET.Element("command")
root.set("name","EnableTrg")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
def DisableTrg(self):
root=ET.Element("command")
root.set("name","DisableTrg")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
def SetStartTrg(self,si):
root=ET.Element("par")
section=ET.SubElement(root,"section")
section.set("name", "Trigger Positions")
q1=ET.SubElement(section,"entry")
q1.set("name", "Next")
q1.set("type", "int")
q1.set("v1", str(si))
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
def StatusTrg(self):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "Trigger System")
q1=ET.SubElement(section,"query")
q1.set("name", "State")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
q=p.find("entry")
res=q.get("v1")
return res
```

```
def CountTrg(self):
root=ET.Element("par")
section=ET.SubElement(root,"section")
section.set("name", "Trigger Positions")
q1=ET.SubElement(section,"query")
q1.set("name", "Next")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
q=p.find("entry")
res=q.get("v1")
return res


def GetErrors(self):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "System")
q1=ET.SubElement(section,"query")
q1.set("name", "Errors")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
Q=p.find("entry")
size=int(Q.get("size"))
res=[]
for i in range(size):
vs="v"+str(i+1)
res.append(Q.get(vs))
return res
```

```
def LastError(self):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "System")
q1=ET.SubElement(section,"query")
q1.set("name", "Last Error")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
q=p.find("entry")
res=q.get("v1")
return res


def GetRecLog(self):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "System")
q1=ET.SubElement(section,"query")
q1.set("name", "Receive Log")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
Q=p.find("entry")
size=int(Q.get("size"))
res=[]
for i in range(size):
vs="v"+str(i+1)
res.append(Q.get(vs))
return res
```

```
def GetRecLogRaw(self):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "System")
q1=ET.SubElement(section,"query")
q1.set("name", "Receive Log")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
return r

def GetSendLog(self):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "System")
q1=ET.SubElement(section,"query")
q1.set("name", "Send Log")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
Q=p.find("entry")
size=int(Q.get("size"))
res=[]
for i in range(size):
vs="v"+str(i+1)
res.append(Q.get(vs))
return res

def Trg(self):
root=ET.Element("command")
root.set("name","TriggerTRSequence")
```

```
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)


def DefTRTest(self,res,N,tmo):
root=ET.Element("par")
section=ET.SubElement(root,"section")
section.set("name", "Trigger System")
q1=ET.SubElement(section,"entry")
q1.set("name", "Mode")
q1.set("type", "string")
q1.set("v1", "measure")
q2=ET.SubElement(section,"entry")
q2.set("name", "State")
q2.set("type", "string")
q2.set("v1", "on")
section=ET.SubElement(root,"section")
section.set("name", "TR1")
q1=ET.SubElement(section,"entry")
q1.set("name", "Mode")
q1.set("type", "string")
q1.set("v1", "measure")
section=ET.SubElement(root,"section")
section.set("name", "TR1/TR Test")
q1=ET.SubElement(section,"entry")
q1.set("name", "N")
q1.set("type", "int")
q1.set("v1", str(N))
q1=ET.SubElement(section,"entry")
q1.set("name", "Timeout")
q1.set("type", "float")
q1.set("v1", str(tmo))
xmls=ET.tostring(root).decode()
self.Send(xmls)
def InitTRTest(self):
root=ET.Element("command")
root.set("name","InitTRTest")
```

```
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)


def StatusTRMeas(self):
root=ET.Element("state")
section=ET.SubElement(root,"section")
section.set("name", "Trigger System")
q1=ET.SubElement(section,"query")
q1.set("name", "TR Meas")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.Read()
tree2=ET.fromstring(r.decode())
p=tree2.find("section")
q=p.find("entry")
res=q.get("v1")
return res
def ResultTRMeas(self):
root=ET.Element("par")
section=ET.SubElement(root,"section")
section.set("name", "TR1/TR Test")
q1=ET.SubElement(section,"query")
q1.set("name", "Result")
tree=ET.ElementTree(root)
xmls=ET.tostring(root).decode()
self.Send(xmls)
r=self.ReadXML()
tree2=ET.fromstring(r)
p=tree2.find("section")
Q=p.find("entry")
size=int(Q.get("size"))
res=[]
for i in range(size):
vs="v"+str(i+1)
res.append(float(Q.get(vs)))
```

```
return res
def test(self):
X=np.linspace(1,100,100)
for x in X:
t=time.time();
p=self.ActPosition(2)
delta=time.time()-t
print(t,"; ",p)
#time.sleep(0.1)
print("done")
```

14.3.2 Trigger Configuration – Single Pulse, Direct Trigger

The program TrgSingleDir.py configures the trigger system to output a single trigger pulse per trigger command. Trigger system parameters are loaded from file.

Program TrgSingleDir.py

```
import time

runfile("asycont.py")

# connect to controller
c=Asycont600("10.0.0.20")
c.Connect()

# load trigger configuration from file,
# enable the trigger system and wait until ready
c.SendFile("TrgSingleDir.xml")
c.EnableTrg()
while c.StatusTrg()!="ready":
   time.sleep(0.1)

# output trigger pulse each 500 ms
for i in range(100):
   time.sleep(0.5)
   c.Trg()

# disable and disconnect
c.DisableTrg()
c.Disconnect()
```

File TrgSingleDir.xml

```
<par>
  <section name="Trigger System">
    <entry name="Mode" type="string" v1="direct"/>
    <entry name="State" type="string" v1="on"/>
  </section>
  <section name="TR1">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Busy Time" type="float" v1="1E-3"/>
    <entry name="Period" type="int" v1="1"/>
  </section>
  <section name="TR2">
```

```
    <entry name="Mode" type="string" v1="off"/>
   </section>
   <section name="TR3">
    <entry name="Mode" type="string" v1="off"/>
   </section>
   <section name="TR4">
    <entry name="Mode" type="string" v1="off"/>
   </section>
  </par>
```

14.3.3 Trigger Configuration – Complex Trigger Sequence

The program TrgSeqDir.py configures the trigger system to output a sequence with a measurement trigger, a frequency trigger and two control signals for 2-port switches, see Fig 30. Trigger system parameters are loaded from file.

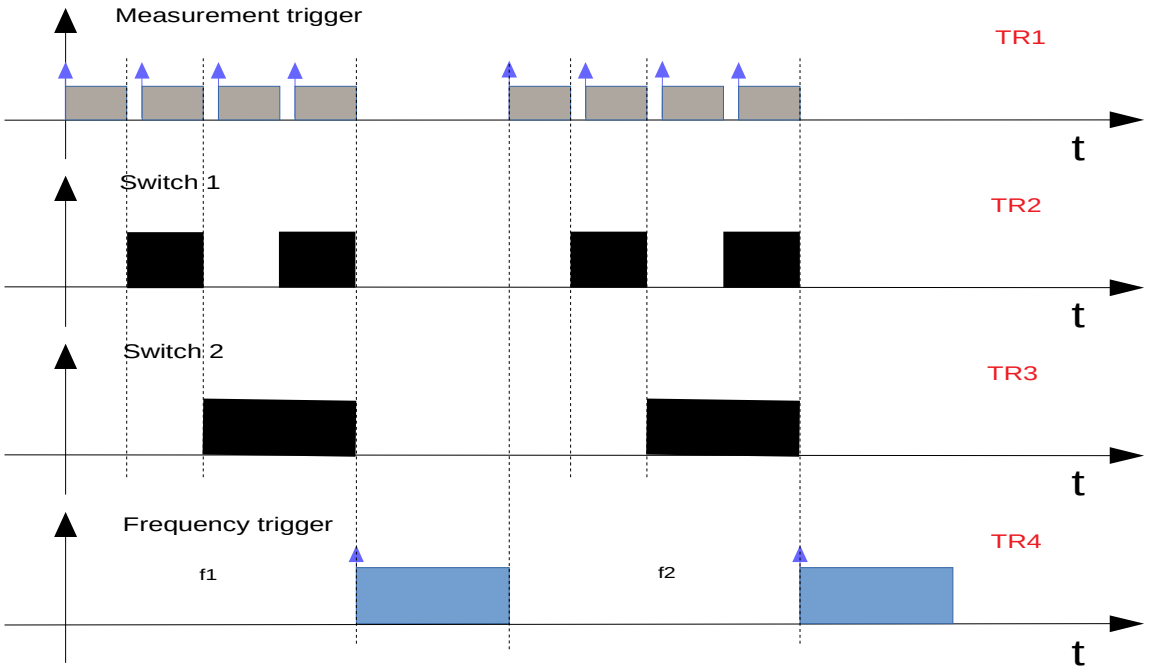


Fig 30: Trigger sequence of example TrgSeqDir

Program TrgSeqDir.py

```
import time

runfile("asycont.py")

# connect to controller
c=Asycont600("10.0.0.20")
c.Connect()

# load trigger configuration from file,
# enable the trigger system and wait until ready
c.SendFile("TrgSeqDir.xml")
c.EnableTrg()
while c.StatusTrg()!="ready":
   time.sleep(0.1)
```

```
# output trigger pulse each 500 ms
for i in range(100):
   time.sleep(0.5)
   c.Trg()

# disable and disconnect
c.DisableTrg()
c.Disconnect()
```

File TrgSeqDir.xml

```
<par>
<section name="Trigger System">
<entry name="Mode" type="string" v1="direct"/>
<entry name="State" type="string" v1="on"/>
</section>
<section name="TR1">
<entry name="Mode" type="string" v1="trgrdy"/>
<entry name="Busy Time" type="float" v1="1E-3"/>
<entry name="Period" type="int" v1="8"/>
</section>
<section name="TR2">
<entry name="Mode" type="string" v1="trgrdy"/>
<entry name="Busy Time" type="float" v1="100E-6"/>
<entry name="Period" type="int" v1="1"/>
<entry name="States" type="int" size="2" v1="1" v2="2" />
</section>
<section name="TR3">
<entry name="Mode" type="string" v1="trgrdy"/>
<entry name="Busy Time" type="float" v1="100E-6"/>
<entry name="Period" type="int" v1="2"/>
<entry name="States" type="int" size="2" v1="1" v2="2" />
</section>
<section name="TR4">
<entry name="Mode" type="string" v1="trgrdy"/>
<entry name="Busy Time" type="float" v1="2E-3"/>
<entry name="Period" type="int" v1="4"/>
</section>
</par>
```

14.3.4 Trigger Configuration – Position Trigger

The following example demonstrates how to configure the trigger system to output single trigger pulses in 1° steps from 0° to 360°. After configuration, the axis is moved to the start position of -10° followed by a full rotation and stopping at the stop position of +10° (730°). The trigger pulses are output accordingly.

Program TrgPos.py

```
import time

runfile("asycont.py")

# motion parameter axis, velocity and acceleration
axis=1
vel=5.0
acc=2.0

# connect to controller
c=Asycont600("10.0.0.20")
c.Connect()

# load trigger configuration from file,
# enable the trigger system and wait until ready
c.SendFile("TrgPos1.xml")
c.EnableTrg()
while c.StatusTrg()!="ready":
   time.sleep(0.1)

# move axis 1 to start position (-10deg)
c.MoveAbs(axis,acc,acc,vel,”Auto”,-10.0)
c.Wait(axis,-10.0,WMODE.Prec,0.01,0.1,120.0)
# move axis 1 to stop position, 1 rotation, stop at +10deg (730deg)
c.MoveAbs(axis,acc,acc,vel,”Exceed Period”,730.0)
c.Wait(axis,730.0, WMODE.Prec,0.01,0.1,120.0)

# disable and disconnect
c.DisableTrg()
c.Disconnect()
```

File TrgPos1.xml

```
<par>
  <section name="Trigger System">
    <entry name="Mode" type="string" v1="position"/>
    <entry name="State" type="string" v1="on"/>
  </section>
  <section name="Trigger Positions">
    <entry name="Axis" type="string" v1="Axis 1"/>
    <entry name="Type" type="string" v1="span"/>
    <entry name="Start" type="float" v1="0.0"/>
    <entry name="Stop" type="float" v1="359.0"/>
    <entry name="NSpan" type="int" v1="360"/>
    <entry name="Next" type="int" v1="0"/>
    <entry name="Last" type="int" v1="359"/>
  </section>
  <section name="TR1">
    <entry name="Mode" type="string" v1="trgrdy"/>
    <entry name="Trigger" type="string" v1="OnPoint"/>
    <entry name="Ready" type="string" v1="internal"/>
    <entry name="Busy Time" type="float" v1="1E-3"/>
    <entry name="Period" type="int" v1="1"/>
  </section>
  <section name="TR2">
    <entry name="Mode" type="string" v1="off"/>
  </section>
  <section name="TR3">
    <entry name="Mode" type="string" v1="off"/>
  </section>
  <section name="TR4">
    <entry name="Mode" type="string" v1="off"/>
  </section>
</par>
```

14.3.5 2 Axes Antenna Measurement, Step Motion Mode

The example program *StepMode.py* demonstrates how to perform a step mode measurement with an external trigger pulse to the NWA issued by the controller. Axes 1 and 2 are assumed to be the measurement axes. The trigger system is configured as in example 14.3.2Trigger Configuration – Single Pulse, Direct Trigger to output a single pulse.

Commands to control the NWA are indicated, but not provided with the example code.

Program StepMode.py

```
import time
import numpy as np

runfile("asycont.py")
runfile("NWA.py")

# motion parameter axis, velocity and acceleration
axis1=1
axis2=2
vel=5.0
acc=2.0
POS1={-90,-45,0-45,90}
POS2=np.linspace(0,350.0,36)

# connect to controller and NWA
c=Asycont600("10.0.0.20")
c.Connect()
n=NWA()
n.Connect()

# load trigger configuration from file,
# enable the trigger system and wait until ready
c.SendFile("TrgSingleDir.xml")
c.EnableTrg()
while c.StatusTrg()!="ready":
   time.sleep(0.1)

for pos1 in POS1:
        c.MoveAbs(axis1,acc,acc,vel,"Auto",pos1)
        for pos2 in POS2:
                c.MoveAbs(axis2,acc,acc,vel,"Auto",pos2)
                c.Wait(axis1,pos11,WMODE.Prec,0.01,0.1,60)
                c.Wait(axis2,pos11,WMODE.Prec,0.01,0.1,60)
```

```
c.Trg()
n.Measure()

# disable and disconnect
c.DisableTrg()
c.Disconnect()
n.Disconnect()
```

14.3.6 2 Axes Antenna Measurement, Continuous Motion Mode

The example program ScanMode.py demonstrates how to perform a continuous mode measurement with 1 stepped axis and 1 continuous axis. The trigger system is configured as in example Trigger Configuration – Position Trigger to output a single trigger pulse at each position breakpoint.

Commands to control the NWA are indicated, but not provided with the example code.

Program ScanMode.py

```
import time
import numpy as np

runfile("asycont.py")
runfile("NWA.py")

# motion parameter axis, velocity and acceleration
axis1=1
axis2=2
vel=5.0
acc=2.0
STEP={-90,-45,0-45,90}
scanStart=-10.0
scanStop=730.0

# connect to controller and NWA
c=Asycont600("10.0.0.20")
c.Connect()
n=NWA()
n.Connect()

for step in STEP:
    # move  axes to position
    c.MoveAbs(axis1,acc,acc,vel,"Auto",step)
    c.MoveAbs(axis2,acc,acc,vel,"Auto",scanStart)
    c.Wait(axis1,step,WMODE.Prec,0.01,0.1,120.0)
    c.Wait(axis2,scanStart,WMODE.Prec,0.01,0.1,60)
    # load trigger configuration from file,
    # enable the trigger system and wait until ready
    c.SendFile("TrgPos1.xml")
    c.EnableTrg()
    while c.StatusTrg()!="ready":
       time.sleep(0.1)
    n.EnableMeasurement()
```

```
    # move continuous axis to stop position, 1 rotation, stop at +10deg (730deg)
    c.MoveAbs(axis2,acc,acc,vel,”Exceed Period”,730.0)
    c.Wait(axis2,730.0,WMODE.Prec,0.01,0.1,120.0)

# disable and disconnect
c.DisableTrg()
c.Disconnect()
n.Disconnect()
```

15. Error Codes and Messages

ErrNr: 1 - Invalid parameter ID
ErrNr: 2 - Data block for upload is not available
ErrNr: 3 - Write access for a read-only parameter
ErrNr: 4 - Read access for a write-only parameter
ErrNr: 8 - Data block read access already initialized
ErrNr: 9 - Data block write access already initialized
ErrNr: 10 - Data block read access not initialized
ErrNr: 11 - Data block write access not initialized
ErrNr: 16 - The data segment is already the last when reading the data block
ErrNr: 17 - The data segment is already the last when writing the data block
ErrNr: 18 - The data segment is not yet the last when reading the data block
ErrNr: 19 - The data segment is not yet the last when writing the data block
ErrNr: 21 - Checksum after data block write is invalid
ErrNr: 23 - Parameter ID in data block is invalid (data block write)
ErrNr: 25 - Burn system module only allowed immediately after download
ErrNr: 27 - Operating system not able to be started (operating system is not on the FPROM)

ErrNr: 40 - Value of parameter higher than maximum value
ErrNr: 41 - Value of parameter higher than maximum value
ErrNr: 42 - Value of parameter higher than maximum value
ErrNr: 52 - Value of parameter lower than minimum value
ErrNr: 53 - Value of parameter lower than minimum value
ErrNr: 54 - Value of parameter lower than minimum value
ErrNr: 64 - Hardware ID in BR module is invalid (data block write)
ErrNr: 65 - Hardware version in BR module is invalid (data block write)
ErrNr: 66 - The operating system on the drive is incompatible to the existing network
ErrNr: 67 - Necessary parameter is missing or is invalid
ErrNr: 68 - Data block length invalid
ErrNr: 69 - Command interface is occupied
ErrNr: 70 - Value of a necessary parameter too high
ErrNr: 71 - Value of a necessary parameter too low
ErrNr: 72 - firmware version less than minimal necessary firmware version
ErrNr: 73 - Invalid R4 floating point format
ErrNr: 74 - Parameter can only be written via channel 1 (Axis 1)
ErrNr: 75 - Parameter is not allowed for selected motor type
ErrNr: 1001 - Error-FIFO overflow
ErrNr: 1002 - Parameter outside the valid range
ErrNr: 1003 - Parameter cannot be written while loop control is active
ErrNr: 1004 - Timeout in network life sign monitor
ErrNr: 1005 - Parameter cannot be written while a movement is active

ErrNr: 1006 - Invalid parameter for trigger event (digital input + edge)
ErrNr: 1008 - Master for network coupling deactivated - Encoder error
ErrNr: 1009 - Error during memory allocation
ErrNr: 1011 - Quickstop input active
ErrNr: 1012 - Breakdown of cyclic network communication
ErrNr: 1013 - Station is not available for network communication
ErrNr: 1014 - Network command interface is occupied
ErrNr: 1016 - Maximum cycle time exceeded - CPU load too high
ErrNr: 1017 - Invalid parameter ID for cyclic read access
ErrNr: 1018 - Invalid parameter ID for cyclic write access
ErrNr: 1021 - Parameter cannot be written: Function block active
ErrNr: 1022 - Timeout in life sign monitoring of cyclic data to drive
ErrNr: 1023 - Network coupling with the cyclic communication mode not allowed
ErrNr: 1024 - Cyclic communication mode with current network configuration not possible

ErrNr: 1025 - Value of parameter in connection with holding brake not allowed
ErrNr: 1026 - Value of parameter in connection with SAFETY modules not allowed
ErrNr: 1027 - Function is not available for this hardware
ErrNr: 1028 - Maximum number of network couplings exceeded
ErrNr: 1029 - Parameter cannot be written: Stop ramp active
ErrNr: 1030 - Function is available with ACOPOS simulation only in mode 'Complete'
ErrNr: 1031 - Position controller cycle time exceeded - CPU load too high
ErrNr: 1032 - Internal bus error
ErrNr: 1034 - Value of parameter in connection with motor encoder gear not allowed
ErrNr: 2001 - Upload of trace data not allowed: Recording active
ErrNr: 2003 - Trace start not allowed: Recording active
ErrNr: 2006 - Initialization of trace parameters not allowed: Recording active
ErrNr: 4005 - Controller cannot be switched on: Drive in error state
ErrNr: 4007 - Lag error stop limit exceeded
ErrNr: 4008 - Positive limit switch reached
ErrNr: 4009 - Negative limit switch reached
ErrNr: 4010 - Controller cannot be switched on: Both limit switches are closed
ErrNr: 4011 - Controller cannot be switched off: Movement active
ErrNr: 4012 - Controller cannot be switched on: Init parameters missing or not valid
ErrNr: 4014 - Two encoder control: Stop limit of positions difference exceeded
ErrNr: 4015 - Error triggered by command
ErrNr: 4016 - Taskclass cycle time invalid
ErrNr: 5001 - Target position exceeds positive SW limit
ErrNr: 5002 - Target position exceeds negative SW limit
ErrNr: 5003 - Positive SW limit reached
ErrNr: 5004 - Negative SW limit reached
ErrNr: 5005 - Start of movement not possible: Position controller inactive
ErrNr: 5006 - Start of movement not possible: Axis not referenced

ErrNr: 5010 - Move in pos. direction not possible: Pos. limit switch is closed
ErrNr: 5011 - Move in neg. direction not possible: Neg. limit switch is closed
ErrNr: 5012 - Start of movement not possible: Stop ramp active
ErrNr: 5015 - Start of movement not possible: Homing procedure active
ErrNr: 5016 - Parameter cannot be written: Homing procedure active
ErrNr: 5017 - Homing procedure mode not possible: Position controller inactive
ErrNr: 5018 - Homing procedure not possible: Movement active
ErrNr: 5019 - Homing parameter outside the valid range
ErrNr: 5020 - Homing procedure not possible: Both limit switches are closed
ErrNr: 5021 - Limit switch closed: No direction change for this homing mode
ErrNr: 5022 - Second limit switch signal received: Reference switch not found
ErrNr: 5023 - Incorrect limit switch signal received for current movement direction
ErrNr: 5025 - Homing offset with counting range correction cannot be set
ErrNr: 5026 - Basis movement parameters (with override) exceed speed limit value
ErrNr: 5027 - Basis movement parameters (with override) exceed acceleration limit value

ErrNr: 5028 - Current movement is not a basis movement
ErrNr: 5029 - Trigger ignored - remaining distance exceeds SW limit
ErrNr: 5032 - Acceleration too low - braking distance exceeds positive SW limit
ErrNr: 5033 - Acceleration too low - braking distance exceeds negative SW limit
ErrNr: 5034 - Homing procedure not possible: Encoder error
ErrNr: 5035 - Reference marks not detected
ErrNr: 5036 - Acceleration stop limit exceeded
ErrNr: 5037 - Homing procedure mode not possible: Wrong encoder type
ErrNr: 5038 - Homing procedure mode not possible: Restore data invalid
ErrNr: 5039 - Function not possible: Encoder error
ErrNr: 5043 - Homing procedure mode not possible: Compensation active
ErrNr: 5044 - Homing procedure mode not possible: Change of direction required
ErrNr: 5101 - Compensation gear: Limit values exceeded
ErrNr: 5102 - Too many changes of cam per cycle (master period too short)
ErrNr: 5107 - Cam coupling cannot be started: Parameter outside the valid range
ErrNr: 5110 - Cam coupling aborted: Cyclic set positions missing
ErrNr: 5111 - Cam coupling aborted: Encoder error
ErrNr: 5115 - Restart command not possible: The cam automat is not active
ErrNr: 5202 - Cam Control: Switch positions not in ascending order
ErrNr: 5300 - Data block for upload is not available
ErrNr: 5301 - Start cam automat linkage not possible: Parameter outside the valid range

ErrNr: 5302 - Parameter cannot be written: Cam automat active
ErrNr: 5303 - Cam data not available at index
ErrNr: 5304 - Format error in cam data
ErrNr: 5311 - Cam automat: Event leads to non initialized state
ErrNr: 5315 - Download error: Cam data in use by cam automat or function block

ErrNr: 5316 - Event type is not possible for entry in compensation gears
ErrNr: 5319 - Cam data not allowed for state 0
ErrNr: 5329 - No valid cam data
ErrNr: 6000 - Master sampling time is not a multiple of position controller sampling time

ErrNr: 6002 - Sync controller: Error tolerance of system time difference exceeded
ErrNr: 6008 - Controller is already active
ErrNr: 6014 - Drive initialization active
ErrNr: 6017 - Software: Watchdog active
ErrNr: 6018 - Hardware: Internal power supply failure
ErrNr: 6019 - ACOPOS: Overcurrent
ErrNr: 6020 - 24 VDC supply: Undervoltage
ErrNr: 6021 - Low level at controller enable input
ErrNr: 6023 - Voltage sag at controller enable input
ErrNr: 6026 - Holding brake: Stator current limit exceeded during release
ErrNr: 6027 - Holding brake: Manual operation not permitted
ErrNr: 6029 - Holding brake: Control signal on and output status off
ErrNr: 6030 - Holding brake: Brake output is active, but no brake entered in motor data

ErrNr: 6031 - System module already deleted
ErrNr: 6032 - Interface: FPGA configuration error
ErrNr: 6033 - Type of servo amplifier is not supported by ACOPOS-firmware
ErrNr: 6034 - Cyclic set value mode aborted: Set speeds missing
ErrNr: 6036 - Motor parameters missing or invalid
ErrNr: 6038 - Torque limit higher than peak motor torque
ErrNr: 6043 - PHASING_MODE is not valid
ErrNr: 6044 - Phasing: Rotational direction or position not valid
ErrNr: 6045 - Inverter: Output: No current flow
ErrNr: 6046 - Phasing: No rotor movement
ErrNr: 6047 - Holding brake: Control signal off and output status on
ErrNr: 6048 - Motor holding brake movement monitor: Position error too large
ErrNr: 6049 - Inverter: Output: Current measurement faulty
ErrNr: 6050 - Write parameter not allowed: Set current filter or notch filter active
ErrNr: 6051 - Phasing: Speed to high
ErrNr: 6052 - Power stage: High-side: Overcurrent
ErrNr: 6053 - Power stage: Low-side: Overcurrent
ErrNr: 6054 - Power stage: Overcurrent
ErrNr: 6055 - Holding brake: Low voltage
ErrNr: 6056 - Holding brake: Low current
ErrNr: 6057 - Position loop controller: Load encoder error
ErrNr: 6058 - Enable1: Voltage sag
ErrNr: 6059 - Enable2: Voltage sag
ErrNr: 6060 - Power stage: Limit speed exceeded

ErrNr: 6061 - CTRL Speed controller: Limit speed exceeded
ErrNr: 6062 - CTRL Speed controller: Speed error stop limit exceeded
ErrNr: 6063 - Holding brake: External voltage on output over 24V
ErrNr: 6064 - Parameter cannot be written: Repetitive Control active
ErrNr: 6065 - Initialization active
ErrNr: 6066 - Index overflow while initilization of matrices
ErrNr: 6067 - Error during initialization of the dynamical system
ErrNr: 6068 - Parameter cannot be written while a brake test is active
ErrNr: 6069 - Holding brake: Overcurrent
ErrNr: 6070 - Parameter cannot be written: Phasing procedure active
ErrNr: 6071 - Phasing: Number of polepairs MOTOR_POLEPAIRS not valid
ErrNr: 6072 - Holding brake: High voltage
ErrNr: 6073 - Additional control function in error state
ErrNr: 6074 - 24 VDC supply: Overvoltage
ErrNr: 6075 - Initialization of load simulation failed
ErrNr: 6076 - Inverter: Wiring: Phase sequence not correct
ErrNr: 7012 - Encoder: Hiperface error bit
ErrNr: 7013 - Encoder: Status message
ErrNr: 7014 - Encoder: CRC error during parameter transfer
ErrNr: 7015 - Encoder: Timeout error during parameter transfer
ErrNr: 7017 - Encoder: Error while reading encoder parameter
ErrNr: 7022 - Encoder: Initialization is active
ErrNr: 7023 - Encoder: Parameter transfer is active
ErrNr: 7029 - Encoder: Incremental signal amplitude too small
ErrNr: 7030 - Encoder: Incremental signal amplitude too large
ErrNr: 7031 - Encoder: Incremental signal amplitude too large (Disturbance)
ErrNr: 7032 - Encoder: Incremental signal amplitude too small (Disturbance, no connection)

ErrNr: 7033 - Encoder: Incremental position step too large
ErrNr: 7036 - Encoder: Interface ID invalid (Check slot and Interface EEPROM data)
ErrNr: 7038 - Encoder: Position value not synchronous with absolute value
ErrNr: 7039 - Incremental encoder: Cable disturbance track A
ErrNr: 7040 - Incremental encoder: Cable disturbance track B
ErrNr: 7041 - Incremental encoder: Cable disturbance track R
ErrNr: 7042 - Incremental encoder: Edge distance of quadrature signal too small
ErrNr: 7043 - Encoder: Cable disturbance track D
ErrNr: 7044 - Encoder: Parity
ErrNr: 7045 - Resolver: Signal disturbance (plausibility check)
ErrNr: 7046 - Resolver: Cable disturbance
ErrNr: 7047 - Invalid distance of reference marks
ErrNr: 7048 - Error during the reading of encoder memory
ErrNr: 7049 - Abnormal encoder current consumption
ErrNr: 7050 - Incremental encoder: Illegal AB signal change

ErrNr: 7051 - Encoder: Acceleration too large (Disturbance)
ErrNr: 7052 - Encoder: Encoder is not Supported
ErrNr: 7053 - Encoder: Power failure
ErrNr: 7054 - Encoder: Position in channel already defined
ErrNr: 7055 - Encoder: Invalid content type 'frame end'
ErrNr: 7057 - Encoder: Register read/write forbidden or not implemented
ErrNr: 7058 - Encoder: Alarm bit is set
ErrNr: 7059 - Virtual Encoder: Error state
ErrNr: 7060 - Virtual Encoder: Transition error
ErrNr: 7061 - Virtual Encoder: stall detection
ErrNr: 7062 - Encoder: SMC module not ready
ErrNr: 7063 - Encoder: Error in the UART communication
ErrNr: 7064 - Encoder: Error in the SMC communication
ErrNr: 7065 - Encoder: Encod type invalid
ErrNr: 7066 - Encoder: Encoder not ready
ErrNr: 7067 - EnDat encoder: SMC modul not in operational state
ErrNr: 7068 - Encoder: Maximum cycle time exceeded
ErrNr: 7069 - Encoder: encoder error filter activ
ErrNr: 7070 - Encoder: Lag error stop limit exceeded
ErrNr: 7071 - Encoder: Limit speed error exceeded
ErrNr: 7072 - Encoder: Transfer time position exceeded
ErrNr: 7073 - Encoder: Multiturn failure
ErrNr: 7074 - Encoder: SafeMOTION error
ErrNr: 7075 - Encoder: Incorrect configuration encoder type
ErrNr: 7076 - Encoder: Data transfer active
ErrNr: 7077 - Encoder: Encoder evaluation blocked by the SafeMOTION configuration

ErrNr: 7078 - Encoder: Intersegment communication failure
ErrNr: 7079 - Encoder: Internal Error
ErrNr: 7080 - Encoder: Error in the encoder communication
ErrNr: 7081 - Encoder: Timeout during initialization
ErrNr: 7082 - Encoder: Link to encoder disturbed
ErrNr: 7083 - Reference pulse monitoring: Faulty position, resolution, or reference pulse

ErrNr: 7084 - Encoder: Error in the position evaluation
ErrNr: 7085 - Encoder: SafeMOTION not initialized
ErrNr: 7100 - Parameter function not supported. (Module ?)
ErrNr: 7103 - Incompatible interface
ErrNr: 7104 - Initialization aborted
ErrNr: 7200 - DC bus: Overvoltage
ErrNr: 7210 - DC bus: Pre-charging: Voltage unstable
ErrNr: 7211 - DC bus: Voltage dip
ErrNr: 7212 - DC bus: Large voltage dip

ErrNr: 7214 - DC bus: Pre-charging resistor hot (too many power line fails)
ErrNr: 7215 - Power mains: At least one phase of the power line failed
ErrNr: 7217 - DC bus: Nominal voltage detection: Voltage too high
ErrNr: 7218 - DC bus: Nominal voltage detection: Voltage too low
ErrNr: 7219 - DC bus: Pre-charging: Voltage too low
ErrNr: 7220 - DC bus: Nominal voltage detection: Voltage not allowed
ErrNr: 7221 - Mains: Failure
ErrNr: 7222 - Inverter: Output: Summation current: Overcurrent (Ground fault)
ErrNr: 7223 - DC bus: Overvoltage DC-GND
ErrNr: 7224 - Connector to back plane: 24V-GND contact monitoring: Voltage too low
ErrNr: 7225 - DC bus: Overvoltage
ErrNr: 7226 - DC bus: Overcurrent
ErrNr: 7227 - Bleeder: Overcurrent
ErrNr: 7228 - DC bus: Nominal voltage detection: High inrush current
ErrNr: 7229 - Chopper: Overcurrent
ErrNr: 7230 - DC bus: measurement site 2 out of bounds
ErrNr: 7231 - Motor: Overvoltage
ErrNr: 7232 - Mains: Detected frequency outside the range [20,200]
ErrNr: 7300 - Analog/Digital IO: IO Configuration invalid
ErrNr: 7303 - Analog/Digital IO: 24V power supply fail
ErrNr: 7401 - Parameter position exceeds maximum data length
ErrNr: 7402 - Processing of parameter sequence aborted: Write error
ErrNr: 7403 - Processing of parameter sequence is still active
ErrNr: 7404 - Parameter sequence not available at index
ErrNr: 8001 - EEPROM select not valid
ErrNr: 8003 - Table index not valid
ErrNr: 8004 - EEPROM variable type not valid
ErrNr: 8005 - EEPROM type not valid
ErrNr: 8006 - Value of EEPROM parameter is zero
ErrNr: 8007 - Value of EEPROM parameter is not valid
ErrNr: 8011 - EPROM: Data not valid
ErrNr: 8012 - EPROM: Controller-ID not valid
ErrNr: 8013 - EPROM: CRC error
ErrNr: 8020 - Invalid switch frequency
ErrNr: 9000 - Heatsink temperature sensor: Stop limit exceeded
ErrNr: 9001 - Heatsink temperature sensor: Switch off limit exceeded
ErrNr: 9003 - Heatsink temperature sensor: Not connected or destroyed
ErrNr: 9010 - Temperature sensor (Motor|Choke|External): Stop limit exceeded
ErrNr: 9011 - Temperature sensor (Motor|Choke|External): Switch off limit exceeded
ErrNr: 9012 - Temperature sensor (Motor|Choke|External): Not connected or destroyed
ErrNr: 9013 - Temperature sensor (Motor|Choke|External): Short circuit
ErrNr: 9030 - Junction temperature model: Stop limit exceeded
ErrNr: 9031 - Junction temperature model: Switch off limit exceeded

ErrNr: 9040 - Bleeder temperature model: Stop limit exceeded
ErrNr: 9041 - Bleeder temperature model: Switch off limit exceeded
ErrNr: 9050 - ACOPOS peak current: Stop limit exceeded
ErrNr: 9051 - ACOPOS peak current: Switch off limit exceeded
ErrNr: 9060 - ACOPOS continuous current: Stop limit exceeded
ErrNr: 9061 - ACOPOS continuous current: Switch off limit exceeded
ErrNr: 9070 - Motor temperature model: Stop limit exceeded
ErrNr: 9071 - Motor temperature model: Switch off limit exceeded
ErrNr: 9075 - ACOPOS continuous power: Stop limit exceeded
ErrNr: 9076 - ACOPOS continuous power: Switch off limit exceeded
ErrNr: 9078 - Power stage: Temperature sensor 1: Stop limit exceeded
ErrNr: 9079 - Power stage: Temperature sensor 1: Switch off limit exceeded
ErrNr: 9080 - Pre-charging resistor temperature model: Stop limit exceeded
ErrNr: 9081 - Power stage temperature model: Stop limit exceeded
ErrNr: 9082 - Power stage temperature model: Switch off limit exceeded
ErrNr: 9083 - Power stage: Temperature sensor 2: Stop limit exceeded
ErrNr: 9084 - Power stage: Temperature sensor 2: Switch off limit exceeded
ErrNr: 9085 - Power stage: Temperature sensor 3: Stop limit exceeded
ErrNr: 9086 - Power stage: Temperature sensor 3: Switch off limit exceeded
ErrNr: 9087 - Power stage: Temperature sensor 4: Stop limit exceeded
ErrNr: 9088 - Power stage: Temperature sensor 4: Switch off limit exceeded
ErrNr: 9089 - Encoder temperature sensor: Stop limit exceeded
ErrNr: 9090 - Encoder temperature sensor: Temperature value not valid
ErrNr: 9091 - 24V Supply/Main relay temperature sensor: Stop limit exceeded
ErrNr: 9092 - Power stage: Temperature sensor 5: Stop limit exceeded
ErrNr: 9093 - Power stage: Temperature sensor 5: Switch off limit exceeded
ErrNr: 9094 - Rectifier temperature model: Stop limit exceeded
ErrNr: 9095 - Rectifier temperature model: Switch off limit exceeded
ErrNr: 9096 - DC bus relay temperature model: Stop limit exceeded
ErrNr: 9097 - DC bus relay temperature model: Switch off limit exceeded
ErrNr: 9098 - DC bus capacitor temperature model: Stop limit exceeded
ErrNr: 9099 - DC bus capacitor temperature model: Switch off limit exceeded
ErrNr: 9100 - DC bus: Continuous total power: Stop limit exceeded
ErrNr: 9101 - DC bus: Continuous total power: Switch off limit exceeded
ErrNr: 9102 - DC bus: Peak total power: Stop limit exceeded
ErrNr: 9103 - DC bus: Peak total power: Switch off limit exceeded
ErrNr: 9104 - DC connector temperature model: Stop limit exceeded
ErrNr: 9105 - DC connector temperature model: Switch off limit exceeded
ErrNr: 9106 - Power stage: Temperature sensor: Stop limit exceeded
ErrNr: 9107 - Power stage: Temperature sensor: Stop limit exceeded
ErrNr: 9300 - Current controller: Overcurrent
ErrNr: 9302 - Current controller: Cycle time invalid
ErrNr: 9303 - Infeed: Summation current: Overcurrent

ErrNr: 10000 - Identification parameter(s) missing
ErrNr: 10001 - Parameter identification: Invalid sub-mode
ErrNr: 10100 - Parameter identification: Quality factor not fulfilled
ErrNr: 10101 - No ISQ-filter free
ErrNr: 10102 - No resonance-frequency for ISQ-filter (band-stop) found
ErrNr: 10103 - Autotuning: Maximum lag error exceeded
ErrNr: 10500 - Induction stop was terminated
ErrNr: 29200 - The axis object is invalid
ErrNr: 29203 - Drive is not ready
ErrNr: 29204 - Invalid parameter number
ErrNr: 29205 - The axis is not homed
ErrNr: 29206 - The controller is off
ErrNr: 29207 - This movement type is currently not allowed
ErrNr: 29208 - The axis object was changed since last function block call
ErrNr: 29209 - The drive is in error state
ErrNr: 29210 - Parameter initialization (Global-init) failed
ErrNr: 29211 - Holding brake cannot be switched. The controller is on
ErrNr: 29214 - Homing procedure not possible
ErrNr: 29215 - Discrete movement not possible
ErrNr: 29216 - Continuous movement not possible
ErrNr: 29217 - Invalid input parameter
ErrNr: 29218 - Unknown PLCopen axis state
ErrNr: 29219 - Invalid value for PLCopen parameter
ErrNr: 29221 - No cam name
ErrNr: 29222 - Error at cam download
ErrNr: 29225 - The target position is outside the axis period
ErrNr: 29226 - Drive error. Call MC_(BR_)ReadAxisError for details
ErrNr: 29227 - Drive unable to transmit additional master positions on network
ErrNr: 29228 - This drive cannot read any more master positions from the network
ErrNr: 29229 - Synchronized movement not possible
ErrNr: 29230 - Internal error: Error transferring the parameter list
ErrNr: 29231 - The master velocity is invalid, 0 or negative
ErrNr: 29232 - Internal error: Invalid SPT resource type
ErrNr: 29233 - SPT resources of required type not available
ErrNr: 29234 - Internal error: Number of requested SPT resources is not available
ErrNr: 29235 - Functionality not available for the current axis type
ErrNr: 29237 - Error in TriggerInput parameters
ErrNr: 29238 - The function block cannot be used in the current PLCopen axis state
ErrNr: 29239 - This functionality is not available on CAN-Bus
ErrNr: 29240 - The specified ParID cannot be used due to the data type size
ErrNr: 29241 - Wrong data type for specified ParID
ErrNr: 29242 - Cyclic read data full
ErrNr: 29244 - Internal error while configuring cyclic data

ErrNr: 29246 - Invalid TouchProbe window
ErrNr: 29247 - Master synchronous position cannot be reached
ErrNr: 29250 - Invalid CamTableID
ErrNr: 29251 - Error downloading the ACOPOS parameter table
ErrNr: 29252 - Error initializing the parameter list
ErrNr: 29253 - Error downloading the parameter sequence
ErrNr: 29254 - Error initializing the parameter sequence
ErrNr: 29255 - Initialization not possible, axis coupling is active
ErrNr: 29256 - Multiple simultaneous commands not possible
ErrNr: 29257 - The specified data address is invalid
ErrNr: 29260 - No data object name specified
ErrNr: 29261 - Invalid data object index
ErrNr: 29262 - Master channel already in use
ErrNr: 29263 - Slave channel already in use
ErrNr: 29264 - Cyclic write data full
ErrNr: 29265 - Loss of communication with the drive
ErrNr: 29266 - The MasterParID has changed since last function block call
ErrNr: 29267 - Invalid number of cam profile polynomials
ErrNr: 29268 - Function block aborted by another function block
ErrNr: 29269 - Error saving NC-INIT parameter module
ErrNr: 29270 - Error loading NC-INIT parameter module
ErrNr: 29271 - The selected function block with the type MC_TouchProbe is not enabled

ErrNr: 29272 - Cam Profile Automat data not initialized
ErrNr: 29273 - The specified 'Subject' is invalid
ErrNr: 29274 - An error has occurred while initializing the data
ErrNr: 29275 - At least one input value was changed while 'Enable = TRUE'
ErrNr: 29276 - A phase shift is already in progress
ErrNr: 29277 - A offset shift is already in progress
ErrNr: 29278 - No period for Axis, Master, Slave or function block input defined
ErrNr: 29279 - Output value cannot be calculated
ErrNr: 29280 - No valid master axis defined
ErrNr: 29281 - This functionality is not available for ACOPOSmulti
ErrNr: 29282 - Command can't currently be executed
ErrNr: 29283 - Master or slave position of the first cam profile point not equal to 0
ErrNr: 29284 - Too few curve points
ErrNr: 29285 - Invalid type for cam profile section
ErrNr: 29286 - Invalid mode for the last cam profile point
ErrNr: 29287 - Invalid master or slave position for last cam profile point
ErrNr: 29288 - Master positions are not strictly monotonic increasing
ErrNr: 29289 - Invalid boundary parameters
ErrNr: 29290 - Too many cam profile polynomials
ErrNr: 29291 - Turning point outside of cam profile section

ErrNr: 29292 - Identical slave boundary positions not permitted
ErrNr: 29293 - Specified data length is 0 or too low
ErrNr: 29294 - Not able to determine error text. For details, see error text string
ErrNr: 29295 - An error has occurred. For details, see 'ErrorRecord' output
ErrNr: 29297 - Problem with variable in permanent memory
ErrNr: 29299 - Error occurred during the setup operation
ErrNr: 29300 - Invalid number of polynomials in cam profile
ErrNr: 29301 - Unable to calculate cam profile value
ErrNr: 29302 - Instance of function block already active on this axis
ErrNr: 29303 - The specified IntervalTime is too small
ErrNr: 29305 - ParID cannot be read with the specified mode
ErrNr: 29306 - Invalid interpolation mode
ErrNr: 29307 - Master period is zero
ErrNr: 29308 - Internal calculation error
ErrNr: 29309 - General internal error
ErrNr: 29310 - Calculated compensation exceeds limit values
ErrNr: 29311 - The maximum time was exceeded
ErrNr: 29312 - Error occurred during the holding brake test
ErrNr: 29313 - FIFO - Maximum amount of available elements exceeded
ErrNr: 29314 - The function block is called in a wrong task class
ErrNr: 29315 - Abortion of cyclic position transfer due to axis error
ErrNr: 29316 - Two encoder control is not activated
ErrNr: 29488 - Permanent variable for endless position was overwritten
ErrNr: 29489 - Internal values in the axis structure are invalid
ErrNr: 29490 - Internal initialization error (global init)
ErrNr: 29491 - Internal initialization error (SW limits)
ErrNr: 29492 - Internal initialization error (homing of virtual axis)
ErrNr: 29498 - ACP10_MC library: Initialization aborted
ErrNr: 29499 - ACP10_MC library: Error with details in 'ASCII Data'
ErrNr: 31201 - Di/Do Interface: Drive not ready
ErrNr: 31220 - Encoder error: Encoder not configured
ErrNr: 31221 - Encoder error: Cable disturbance or signal disturbance
ErrNr: 31224 - Encoder Interface: HW Module not OK
ErrNr: 31240 - Homing procedure mode not allowed with current HW Type
ErrNr: 31247 - Drive Interface: DrvOK not set from HW Module
ErrNr: 31248 - Trigger Interface: HW Module not OK
ErrNr: 31249 - Drive Interface: HW Module not OK
ErrNr: 31250 - Di/Do Interface: HW Module not OK
ErrNr: 31260 - Current axis configuration only possible in simulation mode
ErrNr: 31261 - Change mode for servo drive adjustment not allowed
ErrNr: 32001 - Error calling CAN_xopen()
ErrNr: 32002 - Error defining Write COB for Broadcast Command
ErrNr: 32003 - Error defining Write COB for Parameter Read Request

ErrNr: 32004 - Error defining Write COB for Parameter Write Request
ErrNr: 32005 - Error defining Read COB for Parameter Read Response
ErrNr: 32006 - Error defining Read COB for Parameter Write Response
ErrNr: 32007 - Error defining Read COB for Monitor Data from the drive
ErrNr: 32008 - Error sending Read Request (network error ?)
ErrNr: 32009 - Error sending Write Request (network error ?)
ErrNr: 32010 - Drive not responding to Read Request (is the drive in the network ?)
ErrNr: 32011 - Drive not responding to Write Request (is the drive in the network ?)
ErrNr: 32012 - Error reading module description of system module
ErrNr: 32013 - No operating system present on the drive
ErrNr: 32014 - NCSYS version on the drive not compatible with NC software version
ErrNr: 32015 - Error creating message queue
ErrNr: 32016 - Error sending an idle time command to the NC Manager Task
ErrNr: 32017 - Wrong boot state after start of operating system
ErrNr: 32018 - Invalid Parameter ID in system module
ErrNr: 32019 - Download of NC system module not allowed (the module is on the PLC)

ErrNr: 32020 - System module data could not be read from the drive for initialization
ErrNr: 32021 - System module data could not be read from the drive after download
ErrNr: 32022 - Error aborting data block access before download
ErrNr: 32023 - Error reading boot state before download
ErrNr: 32025 - Wrong boot state after SW Reset before download
ErrNr: 32026 - Error during INIT of data block write access for download
ErrNr: 32027 - Error sending data segment for download
ErrNr: 32029 - Response error after sending data segment for download
ErrNr: 32030 - Error at command for system module burn after download
ErrNr: 32031 - Error reading status for system module burn after download
ErrNr: 32032 - Error while burning system module after download
ErrNr: 32033 - Timeout while burning system module after download
ErrNr: 32034 - Error at SW Reset before download
ErrNr: 32035 - Error at SW Reset after download
ErrNr: 32036 - Different system module data after download
ErrNr: 32037 - Error message(s) lost because of FIFO overflow (acknowledge errors)
ErrNr: 32040 - Version of INIT parameter module is not compatible to NC manager
ErrNr: 32041 - The module acp10cfg does not exist
ErrNr: 32042 - The module acp10cfg is not an NC data module
ErrNr: 32043 - The NC module type of the module acp10cfg is invalid
ErrNr: 32044 - The NC module type of the module acp10cfg cannot be read
ErrNr: 32045 - The data address in module acp10cfg cannot be read
ErrNr: 32046 - The data section of module acp10cfg is empty
ErrNr: 32047 - A CAN node number in module acp10cfg is invalid
ErrNr: 32048 - A CAN node number in module acp10cfg is used repeatedly
ErrNr: 32049 - This NC action is not allowed during Trace is active

ErrNr: 32050 - A Trace Data Upload is already active
ErrNr: 32053 - Error defining Write COB for Parameter Read Request 2
ErrNr: 32054 - Error defining Write COB for Parameter Write Request 2
ErrNr: 32055 - Error defining Read COB for Parameter Read Response 2
ErrNr: 32056 - Error defining Read COB for Parameter Write Response 2
ErrNr: 32057 - Error accessing HS task class table
ErrNr: 32058 - Error accessing task class table
ErrNr: 32059 - Parameter tk_no invalid for access to task class table
ErrNr: 32060 - Timeout for cyclic data from drive - Indications invalid (network error ?)

ErrNr: 32061 - Timeout sending a Read Request telegram (network error ?)
ErrNr: 32062 - Timeout sending a Write Request telegram (network error ?)
ErrNr: 32063 - Data address zero (set/read parameter via service interface)
ErrNr: 32064 - Convert text into binary data is not possible for this parameter data type
ErrNr: 32065 - Convert binary data into text is not possible for this parameter data type
ErrNr: 32066 - Parameter ID zero (set/read parameter via service interface)
ErrNr: 32067 - Parameter ID invalid (set/read parameter with option ncDATA_TEXT)
ErrNr: 32069 - The data address of the ACOPOS parameters in module acp10cfg cannot be read

ErrNr: 32070 - Drive for ACOPOS parameters in module acp10cfg not found
ErrNr: 32071 - The ACOPOS parameters are invalid (an update of AutomationStudio is necessary)

ErrNr: 32072 - Wrong boot state after SW Reset
ErrNr: 32073 - Download of NC system module: Error reading NC hardware version of BsLoader

ErrNr: 32074 - Incompatible NC hardware version: Download of BsLoader not possible

ErrNr: 32075 - Incompatible NC hardware version: Download of operating system not possible

ErrNr: 32076 - The FIFO for messages with high priority to NC Idle Task is full
ErrNr: 32077 - A POWERLINK node number in module acp10cfg is invalid
ErrNr: 32078 - A POWERLINK node number in module acp10cfg is used repeatedly
ErrNr: 32079 - With this variant one CAN interface must be in module acp10cfg
ErrNr: 32080 - With this variant one POWERLINK interface must be in module acp10cfg

ErrNr: 32084 - The NC configuration does not contain any ACOPOS module
ErrNr: 32085 - Module acp10cfg invalid (AutomationStudio V2.2 or higher necessary)
ErrNr: 32086 - With this variant no CAN interface is allowed in module acp10cfg
ErrNr: 32087 - With this variant no POWERLINK interface is allowed in module acp10cfg

ErrNr: 32088 - The INIT parameter module specified in the NC Mapping Table does not exist

ErrNr: 32089 - NC-HW-ID of INIT parameter module is not compatible to NC manager

ErrNr: 32090 - NC object type of INIT parameter module is not equal to NC object
ErrNr: 32091 - Invalid block data in INIT parameter module (data range exceeded)
ErrNr: 32092 - Error sending a command to the NC Idle Task
ErrNr: 32093 - NcManCtrl is defined repeatedly with different values
ErrNr: 32094 - NetworkInit is defined repeatedly for ncMANAGER with different values

ErrNr: 32095 - Value of drive group in CAN-CFG-Module higher than maximum value

ErrNr: 32098 - Version of the module acp10cfg is not compatible with NC manager
ErrNr: 32099 - Length of data section of module acp10cfg is too small
ErrNr: 32100 - Memory for NC error text management cannot be allocated
ErrNr: 32102 - Version ID of error text module not equal to that of NC manager
ErrNr: 32103 - Data section of error text module cannot be read
ErrNr: 32104 - Data section of error text module is empty
ErrNr: 32105 - Length of data section of error text module is too small
ErrNr: 32106 - Error list of error text module not equal with that of NC manager
ErrNr: 32107 - Parameter list of error text module not equal with that of NC manager
ErrNr: 32108 - The last error number of error text module is not equal to 65535
ErrNr: 32109 - The last parameter ID of error text module is not equal to 65535
ErrNr: 32110 - Length of data section of CAN-CFG-Module cannot be read
ErrNr: 32111 - Length of data section of CAN-CFG-Module is too small
ErrNr: 32112 - The data address in the CAN-CFG-Module cannot be read
ErrNr: 32113 - The enable code in the CAN-CFG-Module is invalid
ErrNr: 32114 - Values not equal to zero in reserved area of CAN-CFG-Module
ErrNr: 32115 - The basis CAN ID for WR/RD channel1 in the CAN-CFG-Module is invalid

ErrNr: 32116 - The basis CAN ID for WR/RD channel2 in the CAN-CFG-Module is invalid

ErrNr: 32117 - The basis CAN ID for WR/RD channel3 in the CAN-CFG-Module is invalid

ErrNr: 32118 - The basis CAN ID for monitor data in the CAN-CFG-Module is invalid
ErrNr: 32119 - Invalid basis CAN ID for cyclic data to the drive in CAN-CFG-Module
ErrNr: 32120 - Invalid basis CAN ID for cyclic data from the drive in CAN-CFG-Module

ErrNr: 32121 - The CAN ID for the SYNC telegram in the CAN-CFG-Module is invalid

ErrNr: 32122 - The CAN ID for the broadcast command in the CAN-CFG-Module is invalid

ErrNr: 32123 - Error defining Read COB for WR2 Request (external set position mode)

ErrNr: 32124 - Error defining Read COB for WR2 Response (external set position mode)

ErrNr: 32125 - Error defining Read COB for RD2 Request (external set position mode)

ErrNr: 32126 - Error defining Read COB for RD2 Response (external set position mode)

ErrNr: 32127 - Error deleting Write COB for Broadcast Command (external set position mode)

ErrNr: 32128 - Error defining Read COB for Broadcast Command (external set position mode)

ErrNr: 32129 - Error defining Read COB for cyclic user data from drive (ext. set pos. mode)

ErrNr: 32130 - This external set position mode is only allowed with one CAN interface
ErrNr: 32131 - The specified NC data module does not exist
ErrNr: 32132 - The specified module is not an NC data module
ErrNr: 32133 - The NC module type of the specified NC data module is invalid
ErrNr: 32134 - The NC module type of the specified NC data module cannot be read
ErrNr: 32135 - The data address of the specified NC data module cannot be read
ErrNr: 32136 - The data section of the specified NC data module is empty
ErrNr: 32137 - Data address of structure for a data block operation is zero
ErrNr: 32138 - Data address zero (data structure for data block operation)
ErrNr: 32139 - Data length zero (data structure for data block operation)
ErrNr: 32140 - Data block operation: Data module name or data address must be zero
ErrNr: 32141 - Invalid data format in a parameter sequence
ErrNr: 32142 - ID or type of a parameter invalid in parameter sequence with text format

ErrNr: 32143 - Data of a parameter in a parameter sequence longer than 6 bytes
ErrNr: 32144 - Error for an ACOPOS parameter table specified in the NC Mapping Table

ErrNr: 32145 - The ACOPOS parameter table does not exist
ErrNr: 32146 - The ACOPOS parameter table is not an NC data module
ErrNr: 32147 - The NC module type of the ACOPOS parameter table is invalid
ErrNr: 32148 - The NC module type of the ACOPOS parameter table cannot be read
ErrNr: 32149 - The data address in the ACOPOS parameter table cannot be read
ErrNr: 32150 - The data section of the ACOPOS parameter table is empty
ErrNr: 32151 - Error initializing memory buffer for XML parser
ErrNr: 32152 - No XML elements present in an ACOPOS parameter table
ErrNr: 32153 - The first XML element is invalid in the ACOPOS parameter table
ErrNr: 32154 - The ACOPOS parameter table does not contain any ACOPOS parameters

ErrNr: 32155 - Nesting depth for ACOPOS parameter groups exceeded
ErrNr: 32156 - ID or type of an ACOPOS parameter invalid for text conversion

ErrNr: 32157 - Length of parameter data too large for ACOPOS parameter in XML data

ErrNr: 32158 - ACOPOS parameter: An attribute is not defined (ID)
ErrNr: 32159 - ACOPOS parameter: An attribute is not defined (Value)
ErrNr: 32161 - ncNC_SYS_RESTART,ncACKNOWLEDGE is not allowed (network.init=ncFALSE)
ErrNr: 32163 - A system module download to all drives is not possible with SwNodeSelect

ErrNr: 32164 - The text defined with NetworkInit (global) is invalid
ErrNr: 32165 - A CAN node number is equal to NodeNr_SwNodeSelect
ErrNr: 32166 - Network initialization not allowed during active network initialization
ErrNr: 32167 - The text defined with NetworkInit is invalid
ErrNr: 32168 - NodeNr_SwNodeSelect is defined repeatedly with different values
ErrNr: 32169 - The node number defined with NodeNr_SwNodeSelect is invalid
ErrNr: 32170 - A data module name has to be entered for this data block operation
ErrNr: 32171 - Index zero is not allowed (data structure for data block operation)
ErrNr: 32172 - The specified data module name is not valid for a BR module
ErrNr: 32173 - Memory for data module creation cannot be allocated
ErrNr: 32174 - Error with installation of data module into BR module table
ErrNr: 32175 - Error with installation of data module into BR module table
ErrNr: 32176 - Text for parameter data too large for parameter sequence with text format

ErrNr: 32177 - Text for parameter data too large for parameter list with text format
ErrNr: 32178 - This axis is not enabled for this ACOPOS (channel number too high)
ErrNr: 32179 - ID or type of a parameter invalid in parameter list with text format
ErrNr: 32180 - Data address of structure for a parameter list operation is zero
ErrNr: 32181 - Data address zero (data structure for parameter list operation)
ErrNr: 32182 - Data length zero (data structure for parameter list operation)
ErrNr: 32183 - Data length invalid (data structure for parameter list operation)
ErrNr: 32184 - Invalid data format in a parameter list
ErrNr: 32185 - Data of a parameter in a parameter list longer than 6 bytes
ErrNr: 32186 - NetBasisInitNr is defined repeatedly for ncMANAGER with different values

ErrNr: 32187 - Error for synchronization of network initialization (details in Logger)
ErrNr: 32188 - This NC object is defined in hardware configuration and NC Mapping Table

ErrNr: 32189 - Timeout for cyclic data from drive - Indications invalid (network error ?)

ErrNr: 32190 - Error defining Write COB for selection of node number via software
ErrNr: 32191 - This parameter ID is reserved for the PLCopen MC library
ErrNr: 32192 - The specified data module is not an INIT Parameter module
ErrNr: 32193 - For this NC object type no INIT parameter module is present
ErrNr: 32194 - This function is not implemented for this NC object type

ErrNr: 32195 - Error downloading BsLoader to ACOPOS
ErrNr: 32196 - Error downloading operating system to ACOPOS
ErrNr: 32197 - Error downloading BsLoader to ACOPOS (additional info in Logger)
ErrNr: 32198 - Error downloading operating system to ACOPOS (additional info in Logger)

ErrNr: 32200 - Error calling plAcycWrite() (read parameter)
ErrNr: 32201 - Error calling plAcycWrite() (write parameter)
ErrNr: 32202 - Error calling plAcycRead() (read parameter)
ErrNr: 32203 - Error calling plAcycRead() (write parameter)
ErrNr: 32204 - Timeout while reading par. via acyclic channel (is the drive in the network ?)

ErrNr: 32205 - Timeout while writing par. via acyclic channel (is the drive in the network ?)

ErrNr: 32206 - Cyclic channel: Read Request in spite of Wait for Response
ErrNr: 32207 - Cyclic channel: Write Request in spite of Wait for Response
ErrNr: 32208 - Error using plAction(DEVICE_TO_BUS_NR) (additional info in Logger)

ErrNr: 32209 - Error using plAction(GET_IDENT) (additional info in Logger)
ErrNr: 32210 - Wrong interface ident when calling plState() (additional info in Logger)
ErrNr: 32211 - Interface not available when calling plState() (additional info in Logger)

ErrNr: 32212 - Fatal interface error when calling plState() (additional info in Logger)
ErrNr: 32213 - Timeout for POWERLINK interface (additional info in Logger)
ErrNr: 32214 - Error calling plAcycOpen() (additional info in Logger)
ErrNr: 32215 - Error calling plCECreate() (additional info in Logger)
ErrNr: 32216 - Error using plAction(GET_IF_PAR) (additional info in Logger)
ErrNr: 32217 - Broadcast channel: Error calling plAcycWrite() (read parameter)
ErrNr: 32218 - Broadcast channel: Error calling plAcycWrite() (write parameter)
ErrNr: 32219 - Error using plAction(GET_IF_MUXPRESCALE) (additional info in Logger)

ErrNr: 32220 - Error using plAction(GET_IF_CYCLE_TIME) (additional info in Logger)

ErrNr: 32221 - Error using plAction(GET_IF_PRESCALE) (additional info in Logger)
ErrNr: 32222 - Error using plAction(GET_STATIONFLAG) (additional info in Logger)

ErrNr: 32223 - Error calling plGetNodeInfo() (additional info in Logger)
ErrNr: 32224 - Error calling plAction(GET_PROTOCOL_VERSION) (additional info in Logger)

ErrNr: 32225 - This ACOPOS POWERLINK node does not exist in the AR Configuration

ErrNr: 32226 - A SDC node number in module acp10cfg is invalid
ErrNr: 32227 - A SDC node number in module acp10cfg is used repeatedly

ErrNr: 32228 - There is no network interface (POWERLINK or SDC) contained in acp10cfg

ErrNr: 32229 - The SDC object needed for operation of SDC axes does not exist
ErrNr: 32230 - Error at initialization of SDC oder SIM object (see Logger)
ErrNr: 32231 - Error at SDC configuration (see Logger)
ErrNr: 32232 - The SIM object needed for ACOPOS Simulation does not exist
ErrNr: 32233 - NCBSL (name see logger) contains no NC system module with module type 0x4F

ErrNr: 32234 - NCSYS (name see logger) contains no NC system module with module type 0x4F

ErrNr: 32235 - Data address zero for parameter in parameter sequence
ErrNr: 32236 - Data address zero for parameter in parameter list
ErrNr: 32237 - Channel index for ACOPOS parameters in module acp10cfg is invalid
ErrNr: 32238 - This function is not implemented at this time
ErrNr: 32239 - Basic memory for INIT parameter modules could not be allocated
ErrNr: 32240 - NC object data invalid (PV with INIT value in variable declaration ?)
ErrNr: 32241 - Data block operation: Data module name must be zero
ErrNr: 32243 - Error using plAction(GET_PDO_INFO) (additional info in Logger)
ErrNr: 32244 - No PDO defined in the cyclic frame for this channel: The channel is disabled

ErrNr: 32245 - The Memory for operating the broadcast channel cannot be allocated
ErrNr: 32246 - 'Direction' of the POWERLINK broadcast channel is not 'Output'
ErrNr: 32247 - Error using plAction(GET_TC_INFO) (additional info in Logger)
ErrNr: 32248 - Invalid ACOPOS parameter header in module acp10cfg (section exceeded)

ErrNr: 32249 - Invalid ACOPOS parameter descriptor in module acp10cfg (section exceeded)

ErrNr: 32250 - ACOPOS parameter in module acp10cfg: Length of parameter data too large

ErrNr: 32251 - NcNetCyc: Response timeout
ErrNr: 32252 - NcNetCyc: Unexpected Response (invalid counter value)
ErrNr: 32253 - The task class for POWERLINK output cycle trigger is invalid
ErrNr: 32254 - No PDO mapping defined (PDO mapping is required for this ACOPOS ID)

ErrNr: 32255 - Trace start is not allowed while trace is active
ErrNr: 32256 - Trace trigger: Invalid Data
ErrNr: 32257 - Trace trigger: This channel is not enabled for this ACOPOS
ErrNr: 32258 - More than one trace trigger defined for a channel
ErrNr: 32259 - There are currently no trace data to be saved
ErrNr: 32260 - Trace: No valid test data point is defined
ErrNr: 32261 - Trace trigger: Invalid data
ErrNr: 32262 - Trace test data point: Invalid data
ErrNr: 32263 - Trace trigger: This channel is not enabled for this ACOPOS

ErrNr: 32264 - Trace test data point: This channel is not enabled for this ACOPOS
ErrNr: 32265 - Trace trigger: Trace for this NC object already active at trace start
ErrNr: 32266 - Trace test data point: Trace for this NC object already active at trace start

ErrNr: 32267 - Trace trigger: The NC object is not enabled for trace commands
ErrNr: 32268 - Trace test data point: The NC object is not enabled for trace commands
ErrNr: 32269 - Trace: Too many test data points defined for one trace channel
ErrNr: 32270 - ACOPOS coupling: The channel number of the send data is invalid
ErrNr: 32271 - ACOPOS coupling: The channel number of the receive data is invalid
ErrNr: 32272 - ACOPOS coupling: Send data with this channel number are not configured

ErrNr: 32273 - ACOPOS coupling: The NC object of the send data is invalid
ErrNr: 32274 - Network coupling: The broadcast channel was not configured
ErrNr: 32275 - Network coupling: The broadcast channel was not successfully initialized

ErrNr: 32276 - Network coupling: Cycle times not equal (network interfaces, NC task class)

ErrNr: 32277 - Network coupling: In the broadcast channel no more data record has place

ErrNr: 32278 - ACOPOS coupling: Zero as Parameter ID of the send data is not allowed

ErrNr: 32279 - Service interface: Data address zero
ErrNr: 32280 - Timeout for enable of acyclic network communication
ErrNr: 32281 - Version of SafeMC lower than minimum version (see Logger)
ErrNr: 32282 - Network coupling: Incompatible cycle times (network interfaces, NC task class)

ErrNr: 32283 - INIT broadcast data point: Call of action only allowed with NC task class

ErrNr: 32284 - Ext. coupling data: With this AR/NC version only for TC1 with synchr. output

ErrNr: 32285 - INIT broadcast data point: Incompatible cycle times (POWERLINK, NC task class)
ErrNr: 32286 - Network coupling: Incompatible cycle times (network interfaces, NC task class)

ErrNr: 32287 - Extended coupling data not possible (OutTime difference too large)
ErrNr: 32288 - Extended coupling data not possible (task class tolerance is not zero)
ErrNr: 32289 - Network coupling: SDC/SIM master and slave in different task classes
ErrNr: 32290 - INIT broadcast data point: Call of NC action only allowed in SDC task class

ErrNr: 32291 - INIT broadcast data point: "dp_data_bits" or "dp_task_class" is zero
ErrNr: 32302 - Start setup not possible: A setup operation is already active
ErrNr: 32322 - Data block upload/download: The data object name is zero
ErrNr: 32323 - Data block upload/download: The data block parameter ID is invalid

ErrNr: 32324 - Data block upload/download: The parameter ID of data block index 1 is invalid

ErrNr: 32325 - Data block upload/download: The parameter ID of data block index 2 is invalid

ErrNr: 32326 - Data block upload/download: Address of data buffer is zero
ErrNr: 32327 - Data block upload/download: Length of data buffer is zero
ErrNr: 32328 - Data block upload: Length of data buffer lower than length of data block

ErrNr: 32329 - Setup: Maximum number of initial ACOPOS parameters exceeded
ErrNr: 32330 - Setup: Data of an ACOPOS parameter longer than 6 bytes
ErrNr: 32331 - Start setup not possible: The mode parameter is zero
ErrNr: 32396 - Changing the cycle time is not allowed for this ACOPOS hardware type

ErrNr: 32397 - NCSYS version on the target system is not compatible with NC software version

ErrNr: 32398 - NCSYS does not contain an operating system for this ACOPOS hardware type

ErrNr: 32399 - Manual ACOPOS restart (POWER-OFF/-ON) after NCSYS download necessary

ErrNr: 32400 - Memory cannot be allocated
ErrNr: 32401 - No data object name specified
ErrNr: 32402 - The specified file cannot be opened
ErrNr: 32403 - The specified file cannot be created
ErrNr: 32404 - Error at writing into a file
ErrNr: 32405 - Error at reading from a file
ErrNr: 32406 - The specified file cannot be created
ErrNr: 32407 - Error at writing into a file
ErrNr: 32408 - Error at closing a file
ErrNr: 32409 - The specified file cannot be deleted
ErrNr: 32410 - The data object type is invalid
ErrNr: 32411 - The address of the data object structure is zero
ErrNr: 32412 - The name in the data object structure is zero
ErrNr: 32413 - The data address in the data object structure is zero
ErrNr: 32414 - The data length in the data object structure is zero
ErrNr: 32415 - No File Device specified
ErrNr: 32416 - The FileIO functions do not exist (is library FileIO existing ?)
ErrNr: 32417 - Error at writing into an NC data module
ErrNr: 32418 - No XML elements present in MTC data
ErrNr: 32419 - MTC data: XML elements invalid or in wrong order
ErrNr: 32420 - The MTC data contain an invalid configuration
ErrNr: 32421 - The MTC data contain no configuration for Multi Axes Trace
ErrNr: 32422 - The MTC data contain more than one configuration for Multi Axes Trace

ErrNr: 32423 - MTC data: Trigger.NcObject is invalid
ErrNr: 32424 - MTC data: Trigger.Condition is invalid
ErrNr: 32425 - MTC data: Channel.NcObject is invalid
ErrNr: 32426 - Trace trigger: The event is invalid
ErrNr: 32427 - Trace trigger: Parameter ID zero not allowed if event unequal to OFF
ErrNr: 32428 - The data object format is invalid
ErrNr: 32429 - MTC data: Maximum number of test data points exceeded
ErrNr: 32492 - ACOPOS Simulation: TC for cyclic PLCopen data not equal to NC Manager TC

ErrNr: 32494 - AcoposSimulation=Off for one channel although activated for the other channel

ErrNr: 32495 - AcoposSimulation: Different values defined for real and virtual axis
ErrNr: 32496 - Error creating cyclic task for PLCopen MC (details in Logger)
ErrNr: 32497 - Task class for handling of cyclic data with PLCopen in acp10cfg is invalid

ErrNr: 32498 - PLCopen_CyclicData_TaskClass is lower than zero or higher than maximum value

ErrNr: 32499 - PLCopen_CyclicData_TaskClass: Values for real and virtual axis are not equal

ErrNr: 32500 - The Message FIFO already exists
ErrNr: 32501 - Error creating Message FIFO
ErrNr: 32502 - The Critical Section for Command Semaphore already exists
ErrNr: 32503 - Error creating Critical Section for Command Semaphore
ErrNr: 32504 - The NC Idle Task already exists
ErrNr: 32505 - Error creating NC Idle Task
ErrNr: 32506 - Error reading Taskclass Cycle Time
ErrNr: 32507 - Error reading Taskclass Tolerance
ErrNr: 32508 - Error sending an idle time command to the NC Idle Task
ErrNr: 32509 - The Critical Section for Network Command Trace already exists
ErrNr: 32510 - Error creating Critical Section for Network Command Trace
ErrNr: 32511 - The Critical Section for messages with high priority already exists
ErrNr: 32512 - Error creating Critical Section for messages with high priority
ErrNr: 32513 - The Critical Section for global variables already exists
ErrNr: 32514 - Error creating Critical Section for global variables
ErrNr: 32515 - The Critical Section for network coupling already exists
ErrNr: 32516 - Error creating Critical Section for network coupling
ErrNr: 32738 - Error writing into SDM Motion FIFO
ErrNr: 32739 - Error creating SDM Motion FIFO (see Logger)
ErrNr: 32740 - Error deleting SDM Motion FIFO (see Logger)
ErrNr: 32741 - Error creating SDM Motion task (see Logger)
ErrNr: 32742 - Error deleting SDM Motion task (see Logger)
ErrNr: 32743 - SDM_Motion_Action: ncaction() did not return with ncOK
ErrNr: 32744 - SDM_Motion_Action not allowed (still no Trace configuration loaded)

ErrNr: 32745 - SDM_Motion_Action not allowed (Motion Trace already started by application)

ErrNr: 32746 - SDM_Motion_Action not allowed (Motion Trace already started by SDM)

ErrNr: 32747 - SDM_Motion_Action: DataAddress is zero or defined
ErrNr: 32748 - SDM_Motion_Action: DataLen is zero or defined
ErrNr: 32749 - SDM_Motion_Action: BrModName is too long
ErrNr: 32750 - SDM_Motion_Action: BrModName is not defined
ErrNr: 32751 - SDM_Motion_Action: FileName is not defined
ErrNr: 32752 - SDM_Motion Action not possible: AR function does not exist (see Logger)

ErrNr: 32753 - SDM_Motion_Action: CREATE_NCOBJ_LIST must be called before this action

ErrNr: 32754 - SDM_Motion_Action: The NC object type is invalid for this action
ErrNr: 32755 - SDM_Motion_Action: Memory free error
ErrNr: 32756 - SDM_Motion_Action: Memory alloc error
ErrNr: 32757 - SDM_Motion_Action: This action is not yet implemented
ErrNr: 32758 - SDM_Motion_Action: The NC object ident is invalid for this action
ErrNr: 32759 - SDM_Motion_Action: The NC object ident must be zero for this action
ErrNr: 32760 - SDM_Motion_Action: Pointer of exit function arguments is zero or not defined

ErrNr: 32761 - SDM_Motion_Action: Pointer of exit function is zero or not defined
ErrNr: 32762 - SDM_Motion_Action: The first XML element in input data is invalid
ErrNr: 32763 - SDM_Motion_Action: No XML element in input data
ErrNr: 32764 - SDM_Motion_Action: Error initializing memory buffer for XML parser

ErrNr: 32765 - SDM_Motion_Action: Length of XML input data is zero
ErrNr: 32766 - SDM_Motion_Action: Pointer of XML input data is zero
ErrNr: 32767 - SDM_Motion_Action: Invalid actionID
ErrNr: 33002 - Floating-Point exception
ErrNr: 33003 - Address error exception
ErrNr: 33004 - Bus error exception
ErrNr: 33005 - Exception
ErrNr: 33006 - Access violation Exception
ErrNr: 33007 - Violation address
ErrNr: 35000 - SMC FS: Internal error, Program flow
ErrNr: 35001 - SMC FS: Internal error, NULL pointer access
ErrNr: 35002 - SMC FS: Internal error, SPI transfer
ErrNr: 35003 - SMC FS: Internal error, MFW NVM data memory
ErrNr: 35004 - SMC FS: Internal error, Communication EnDat Master
ErrNr: 35005 - SMC FS: Internal error, Communication ACOPOS
ErrNr: 35006 - SMC FS: Internal error, Communication Encoder
ErrNr: 35007 - SMC FS: Module/compensation data is incompatible!

ErrNr: 35008 - SMC FS: CRC of the module/compensation data is not correct!
ErrNr: 35009 - SMC FS: SOS and STO not connected but needed for RSP
ErrNr: 35010 - SMC FS: Internal error, Axis index out of range
ErrNr: 35011 - SMC FS: Internal error, Function parameter out of range
ErrNr: 35012 - SMC FS: Unsafe encoder connected
ErrNr: 35013 - SMC FS: ACP10 version does not support the enabled safety function
ErrNr: 35014 - SMC FS: Function is not supported by hardware.
ErrNr: 35016 - SMC FS: Internal error, Cross communication of checkpoints
ErrNr: 35017 - SMC FS: Internal error, Cross communication of status word
ErrNr: 35018 - SMC FS: Internal error, Cross communication of output state
ErrNr: 35019 - SMC FS: Internal error, Cross communication of EnDat position
ErrNr: 35020 - SMC FS: Internal error, Cross communication of EnDat error register
ErrNr: 35021 - SMC FS: Internal error, Cross communication of Encoder state machine

ErrNr: 35022 - SMC FS: Internal error, Cross communication of EnDat state machine
ErrNr: 35023 - SMC FS: Internal error, Cross communication of EnDat state machine
ErrNr: 35024 - SMC FS: "EUS - Units per count of physical reference system" invalid
ErrNr: 35025 - SMC FS: "EUS - Maximum speed to normalize speed range" invalid
ErrNr: 35026 - SMC FS: EUS - Encoder resolution too low
ErrNr: 35027 - SMC FS: EUS - Encoder resolution too high
ErrNr: 35028 - SMC FS: EUS - Units resolution too high
ErrNr: 35029 - SMC FS: EUS - One unit is shorter than one nm
ErrNr: 35030 - SMC FS: Encoder mismatch - Configuration data changed several times

ErrNr: 35031 - SMC FS: Encoder mismatch - Configuration data changed
ErrNr: 35032 - SMC FS: Wrong parameterization
ErrNr: 35033 - SMC FS: Module cycle time is not valid
ErrNr: 35034 - SMC FS: Parameterization - Deceleration ramp is too steep
ErrNr: 35035 - SMC FS: Internal state machine is in Fail Safe State
ErrNr: 35036 - SMC FS: Deactivated safety function was requested
ErrNr: 35037 - SMC FS: SMS - Speed limit is out of range
ErrNr: 35038 - SMC FS: SLS1 - Speed limit is out of range
ErrNr: 35039 - SMC FS: SLS2 - Speed limit is out of range
ErrNr: 35040 - SMC FS: SLS3 - Speed limit is out of range
ErrNr: 35041 - SMC FS: SLS4 - Speed limit is out of range
ErrNr: 35042 - SMC FS: Standstill speed limit is out of range
ErrNr: 35043 - SMC FS: SLS1 - Speed limit violates the configuration instruction
ErrNr: 35044 - SMC FS: SLS2 - Speed limit violates the configuration instruction
ErrNr: 35045 - SMC FS: SLS3 - Speed limit violates the configuration instruction
ErrNr: 35046 - SMC FS: SLS4 - Speed limit violates the configuration instruction
ErrNr: 35047 - SMC FS: Standstill Speed limit violates the configuration instruction
ErrNr: 35048 - SMC FS: Violation of parameter limits
ErrNr: 35049 - SMC FS: SMP is used but Homing was not configured

ErrNr: 35050 - SMC FS: SMP - Lower position limit is greater or equal than upper limit

ErrNr: 35051 - SMC FS: SLP is used but Homing was not configured
ErrNr: 35052 - SMC FS: SLP - Lower position limit is greater or equal than upper limit

ErrNr: 35053 - SMC FS: SLP - Position window outside SMP position window
ErrNr: 35054 - SMC FS: SMP - Tolerance is greater than SMP position window
ErrNr: 35055 - SMC FS: SLP - Tolerance is greater than SLP position window
ErrNr: 35056 - SMC FS: Value of Deceleration ramp is out of range
ErrNr: 35057 - SMC FS: SLT Parameterization - Torque limit too high
ErrNr: 35058 - SMC FS: Motor Parameterization - Torque characteristic invalid
ErrNr: 35059 - SMC FS: Blackout Mode Parameterization - Configured SF invalid
ErrNr: 35060 - SMC FS: SSO tolerance violates the configuration instruction
ErrNr: 35061 - SMC FS: SMS - Speed limit violates the configuration instruction
ErrNr: 35062 - SMC FS: SMS - Speed lag error monitoring not activated
ErrNr: 35063 - SMC FS: SMS - Position lag error monitoring activated
ErrNr: 35064 - SMC FS: SMS - Homing activated
ErrNr: 35065 - SMC FS: SMS - A not allowed safety function is activated
ErrNr: 35066 - SMC FS: SMS - Encode mode invalid
ErrNr: 35068 - SMC FS: "Homing - Maximum trigger speed" is out of range
ErrNr: 35069 - SMC FS: Homing - Ref Switch: No reference switch connected
ErrNr: 35070 - SMC FS: Homing - Home Offset: No absolute encoder connected
ErrNr: 35071 - SMC FS: Homing - Home Offset with Correction: SMP not configured
ErrNr: 35072 - SMC FS: Homing - SMP window is greater than safe absolute encoder range

ErrNr: 35073 - SMC FS: Homing - SLP window is greater than safe absolute encoder range

ErrNr: 35074 - SMC FS: Homing - Encoder doesn't support a safe reference pulse
ErrNr: 35075 - SMC FS: Homing - Speed tolerance is out of range
ErrNr: 35076 - SMC FS: Homing - reference pulse : Max. trigger speed is too big
ErrNr: 35077 - SMC FS: Homing - Function is requested but not configured
ErrNr: 35078 - SMC FS: Homing - RefSwitch bit is set but not configured
ErrNr: 35079 - SMC FS: Homing - Position is out of SMP window
ErrNr: 35080 - SMC FS: Homing - Direct with reference pulse: Not supported
ErrNr: 35081 - SMC FS: Internal error, Cross communication of output signals
ErrNr: 35082 - SMC FS: Internal error, Cross communication of output state machine
ErrNr: 35084 - SMC FS: Program error in PreOperational state
ErrNr: 35085 - SMC FS: Safe output - Stuck at high detected
ErrNr: 35086 - SMC FS: Safe output - Test state has changed
ErrNr: 35087 - SMC FS: Encoder - Speed limit exceeded
ErrNr: 35088 - SMC FS: Encoder - Acceleration limit exceeded
ErrNr: 35091 - SMC FS: Encoder mismatch detected
ErrNr: 35092 - SMC FS: Internal error, Lockbit set

ErrNr: 35093 - SMC FS: Velocity error tolerance too large
ErrNr: 35094 - SMC FS: Lag error tolerance too large
ErrNr: 35095 - SMC FS: Encoder - Configuration error
ErrNr: 35096 - SMC FS: Homing - Configuration error
ErrNr: 35097 - SMC FS: Internal error, Invalid current sensor resolution
ErrNr: 35098 - SMC FS: Internal error, Invalid current sensor measurement range
ErrNr: 35099 - SMC FS: Internal error, Current values sum not plausible
ErrNr: 35100 - SMC FS: Internal error, Cross communication of stator current vector
ErrNr: 35101 - SMC FS: Internal error, Cross communication of current vector angle
ErrNr: 35102 - SMC FS: Internal error, Cross communication of the status register IPWM

ErrNr: 35103 - SMC FS: Internal error, Cross communication FPGACom state machine

ErrNr: 35104 - SMC FS: Internal error, FPGA communication
ErrNr: 35105 - SMC FS: Internal error, FPGA SinCos - Reference voltage Channel A
ErrNr: 35106 - SMC FS: Internal error, FPGA SinCos - Reference voltage Channel B
ErrNr: 35107 - SMC FS: Internal error, FPGA SinCos - Configuration
ErrNr: 35108 - SMC FS: Internal error, Hardware tests - Voltage monitoring
ErrNr: 35109 - SMC FS: Internal error, ADC compensation data - Flash validation
ErrNr: 35110 - SMC FS: Internal error, FPGA current measurement - ADC processing
ErrNr: 35111 - SMC FS: Internal error, FPGA current measurement - Reference monitoring

ErrNr: 35112 - SMC FS: Internal error, FPGA current measurement - Efficiency test
ErrNr: 35113 - SMC FS: Internal error, FPGA current measurement - Configuration
ErrNr: 35114 - SMC FS: Internal error, FPGA SinCos - Efficiency test
ErrNr: 35115 - SMC FS: SBT Parameterization - Current threshold too high
ErrNr: 35116 - SMC FS: SBT Parameterization - External load greater than threshold
ErrNr: 35117 - SMC FS: SBT Parameterization - External load too small
ErrNr: 35118 - SMC FS: Internal error, extended flashdata is wrong
ErrNr: 35119 - SMC FS: SBT Parameterization - External load too high
ErrNr: 35120 - SMC FS: Homing - S_SwitchHomingMode is set but not connected
ErrNr: 35121 - SMC FS: Homing - S_SwitchHomingMode is connected but ReqHoming not

ErrNr: 35122 - SMC FS: Homing - S_SwitchHomingMode connection and configuration not conform
ErrNr: 35123 - SMC FS: Internal error, Cross communication of RSP receive data frame

ErrNr: 35124 - SMC FS: Internal error, Cross communication of RSP send data frame
ErrNr: 35125 - SMC FS: RSP - Save operation failed
ErrNr: 35126 - SMC FS: RSP - Homing, SOS position tolerance too big
ErrNr: 35127 - SMC FS: Internal error, Invalid current sensor measurement offset
ErrNr: 35128 - SMC FS: Internal error, Sigma delta conversion is not plausible
ErrNr: 35129 - SMC FS: Internal error, gain and offset corrected current out of range

ErrNr: 35130 - SMC FS: Internal error, testcase
ErrNr: 35131 - SMC FS: Internal error
ErrNr: 35132 - SMC FS: Internal error
ErrNr: 35150 - SMC FS: Additional safety parameters: Disbld. function enable bit is set

ErrNr: 35151 - SMC FS: Additional safety parameters: Placeholder enable bit is set
ErrNr: 35152 - SMC FS: Additional safety parameters: Invalid payload size
ErrNr: 35153 - SMC: Interner error, CUnit test
ErrNr: 35154 - SMC FS: Additional safety parameters: Invalid structure size
ErrNr: 35155 - SMC FS: Received data for additional safety parameters too big
ErrNr: 35156 - SMC FS: CRC chekc of the additional safety parameters failed
ErrNr: 35161 - SMC FS: Incompatible parameter structure
ErrNr: 35162 - SMC FS: Incompatible axis type
ErrNr: 35163 - SMC FS: Error in PreOperational function
ErrNr: 35164 - SMC FS: Cross communication SinCos status during FPGA boot phase
ErrNr: 35165 - SMC FS: Encoder not configured but needed for safety functions
ErrNr: 35166 - SMC FS: Squared vector length too large
ErrNr: 35167 - SMC FS: Cross communication vector control trigger counter
ErrNr: 35170 - SMC FS: SBT Current threshold too small
ErrNr: 35171 - SMC FS: Internal error while processing the additional paramters
ErrNr: 35172 - SMC FS: Homing - RefSwitch is connected but ReqHoming not
ErrNr: 35173 - SMC FS: Additional safety parameters: Invalid axis type ID
ErrNr: 35174 - SMC FS: Additional safety parameters: Invalid structure version
ErrNr: 35175 - SMC: Safely Limited Acceleration - Violation of the acceleration monitoring

ErrNr: 35176 - SMC: Safe Brake Test - SBT: Timeout
ErrNr: 35177 - SMC: Safe Brake Test - SBT: SBC is active
ErrNr: 35178 - SMC: Safe Brake Test - Illegal sector change
ErrNr: 35179 - SMC: additional parameters - Error during download
ErrNr: 35180 - SMC FFS: RSP - Homing, stored position invalid
ErrNr: 35181 - SMC: Safe Brake Test - Rho has left the actual sector too early
ErrNr: 35182 - SMC: Safe Brake Test - Measured and parametrized external load differ

ErrNr: 35183 - SMC: Safe Brake Test - Current fell below parametrized test current threshold

ErrNr: 35184 - SMC FFS: Drift of raw positions between uP1 and uP2 to big
ErrNr: 35185 - SMC FFS: internal error
ErrNr: 35186 - SMC FFS: Encoder not ready
ErrNr: 35189 - SMC: Safe Brake Test - Violation of the position tolerance
ErrNr: 35190 - SMC FFS: Encoder error SinCos processing
ErrNr: 35191 - SMC: Safe Brake Test - Test interval elapsed, test required
ErrNr: 35192 - SMC: Current sum exeeded tolerance range
ErrNr: 35193 - SMC: Current sensor range exceeded phase U

ErrNr: 35194 - SMC: Current sensor range exceeded phase V
ErrNr: 35195 - SMC: Current sensor range exceeded phase W
ErrNr: 35196 - SMC: Compensation data incomplete
ErrNr: 35197 - SMC FFS: SS2, SOS Violation of standstill position tolerance
ErrNr: 35198 - SMC FFS: Encoder error was detected
ErrNr: 35199 - SMC FFS: SDI - Violations of the safe direction
ErrNr: 35200 - SMC FFS: SDI - Violation of the positive direction
ErrNr: 35201 - SMC FFS: SDI - Violation of the negative direction
ErrNr: 35202 - SMC FFS: SLI - Violation of standstill speed limit
ErrNr: 35203 - SMC FFS: SLI - Violation of position window (increments)
ErrNr: 35204 - SMC FFS: Violation of the actual speed limit
ErrNr: 35205 - SMC FFS: Violation of the deceleration ramp
ErrNr: 35206 - SMC FFS: SMS - Violation of the speed limit
ErrNr: 35207 - SMC FFS: SOS - Violation of the speed limit
ErrNr: 35208 - SMC FFS: SS2 - Violation of the speed limit
ErrNr: 35209 - SMC FFS: SLS1 - Violation of the speed limit
ErrNr: 35210 - SMC FFS: SLS2 - Violation of the speed limit
ErrNr: 35211 - SMC FFS: SLS3 - Violation of the speed limit
ErrNr: 35212 - SMC FFS: SLS4 - Violation of the speed limit
ErrNr: 35213 - SMC FFS: Alive test of set position was not executed
ErrNr: 35214 - SMC FFS: Warning on output was not acknowledged
ErrNr: 35215 - SMC FFS: Alive test - Monitoring timeout
ErrNr: 35216 - SMC FFS: SMP - Homing timeout exceeded
ErrNr: 35217 - SMC FFS: SMP - Violation of the deceleration ramp
ErrNr: 35218 - SMC FFS: SLP - Violation of the deceleration ramp
ErrNr: 35219 - SMC FFS: SMP - Violation of lower SMP limit
ErrNr: 35220 - SMC FFS: SMP - Violation of upper SMP limit
ErrNr: 35221 - SMC FFS: SLP - Violation of lower SLP limit
ErrNr: 35222 - SMC FFS: SLP - Violation of upper SLP limit
ErrNr: 35223 - SMC FFS: SMP - Movement in neg. direction outside SMP limit
ErrNr: 35224 - SMC FFS: SMP - Movement in pos. direction outside SMP limit
ErrNr: 35225 - SMC FFS: SLP requested, axis is not homed yet
ErrNr: 35226 - SMC FFS: SMP, SLP - Internal error
ErrNr: 35227 - SMC FFS: SMP, SLP - INT32 overflow of S_SafePosition
ErrNr: 35228 - SMC FFS: Homing - Timeout elapsed
ErrNr: 35229 - SMC FFS: Homing - Standstill Speed tolerance violated
ErrNr: 35230 - SMC FFS: Homing reference pulse - Max. trigger speed exceeded
ErrNr: 35231 - SMC FFS: Homing - Movement invalid
ErrNr: 35232 - SMC FFS: Homing offset - Position outside INT32 range
ErrNr: 35233 - SMC FFS: Homing offset - Violation of safe encoder range
ErrNr: 35234 - SMC: Encoder mismatch - Length of encoder configuration data changed

ErrNr: 35235 - SMC: Encoder mismatch - Serial number of encoder changed

ErrNr: 35236 - SMC: Encoder mismatch - Version changed or no encoder data stored
ErrNr: 35237 - SMC: Encoder mismatch - EnDat master data or encoder data changed
ErrNr: 35238 - SMC: Encoder - EnDat Master state error register is set
ErrNr: 35239 - SMC FFS: Homing failed
ErrNr: 35240 - SMC FFS: Violation of safety function
ErrNr: 35241 - SMC FFS: Function block switched back into IDLE state
ErrNr: 35243 - SMC FFS: Safe output - Teststate has changed
ErrNr: 35244 - SMC: Encoder - Received position not valid
ErrNr: 35245 - SMC: Encoder mismatch detected
ErrNr: 35246 - SMC: Encoder - Initialization error
ErrNr: 35247 - SMC: Debug information
ErrNr: 35248 - SMC: Internal warning, Lockbit set
ErrNr: 35249 - SMC: Encoder - SafeSpeed exceeded INT16 range
ErrNr: 35250 - SMC: Encoder - EnDat Master encoder error register is set
ErrNr: 35251 - SMC: Velocity error limit exceeded
ErrNr: 35252 - SMC: Position lag error limit exceeded
ErrNr: 35253 - SMC: Encoder - Rounding error due to parametrization
ErrNr: 35254 - SMC: Encoder - Length of physical reference system too large
ErrNr: 35255 - SMC FS: Encoder - Acceleration limit exceeded
ErrNr: 35497 - SMC: Blackout Mode - Delay time expired
ErrNr: 35498 - SMC: SSO - A limitation of the observed acceleration is not possible
ErrNr: 35499 - SMC FFS: Current measurement error was detected
ErrNr: 35500 - SMC: SSO - Safe speed observer speed error
ErrNr: 35501 - SMC: SSO - Safe speed observer speed error
ErrNr: 35502 - SMC: UTILS - Testinterface, dummy logbook entry
ErrNr: 35503 - SMC FFS: Internal error in ADC conversion
ErrNr: 35504 - SMC FFS: RSP - Homing, INT32 overflow of S_SafePosition
ErrNr: 35505 - SMC FFS: SLT - Violation of torque limit
ErrNr: 35506 - SMC FFS: RSP - Homing, Positional change during power off too big
ErrNr: 35507 - SMC FFS: RSP - Homing, Config changed
ErrNr: 35508 - SMC FFS: Internal error, FPGA communication
ErrNr: 35509 - SMC FFS: RSP - Homing, CRC error while receiving the remanent safe position

ErrNr: 35510 - SMC FFS: RSP - Homing, Homing already done without RSP
ErrNr: 35511 - SMC: RSP - State RSP Valid changed during safe operation
ErrNr: 36001 - Parameter limited to valid range
ErrNr: 36002 - Total time for the position loop controller limited to prediction time
ErrNr: 36003 - Braking distance exceeds positive SW limit - Deceleration parameter increased

ErrNr: 36004 - Braking distance exceeds negative SW limit - Deceleration parameter increased

ErrNr: 36005 - Warning triggered by command
ErrNr: 37101 - Calculated compensation distance on slave axis limited to maximum

ErrNr: 37102 - Calculated compensation distance on slave axis limited to minimum
ErrNr: 37108 - Calculated compensation distance of master axis limited to minimum
ErrNr: 37111 - Cam data: Difference between polynomial value y(xn) and slave period
ErrNr: 37112 - Polynomial within cam data exceeds limit value
ErrNr: 37113 - Compensation gear: Limit values exceeded
ErrNr: 38001 - Torque limiter: Limit value higher than maximum value
ErrNr: 38003 - Motor holding brake: Test torque was limited
ErrNr: 38004 - Motor holding brake: Test torque less than load torque
ErrNr: 38006 - Current controller: Permissible current offset values exceeded
ErrNr: 38008 - Bleeder: No current flow
ErrNr: 39001 - Encoder: Position correction active
ErrNr: 39002 - Resolver: Speed limit for 14 bit resolution exceeded
ErrNr: 39003 - EnDat encoder: Alarm bit is set
ErrNr: 39004 - EnDat encoder: Alarm bit - Lighting failure
ErrNr: 39005 - EnDat encoder: Alarm bit - Signal amplitude too small
ErrNr: 39006 - EnDat encoder: Alarm bit - Position value contains an error
ErrNr: 39007 - EnDat encoder: Alarm bit - Overvoltage
ErrNr: 39008 - EnDat encoder: Alarm bit - Undervoltage
ErrNr: 39009 - EnDat encoder: Alarm bit - Overcurrent
ErrNr: 39010 - EnDat encoder: Alarm bit - Battery change required
ErrNr: 39011 - EnDat encoder: Warning bit - Frequency too high
ErrNr: 39012 - EnDat encoder: Warning bit - Temperature too high
ErrNr: 39013 - EnDat encoder: Warning bit - Lighting reserve reached
ErrNr: 39014 - EnDat encoder: Warning bit - Battery charge too low
ErrNr: 39015 - EnDat encoder: Warning bit - Reference point not reached
ErrNr: 39016 - Incremental encoder emulation: Frequency too high
ErrNr: 39017 - Encoder: CRC error while reading position
ErrNr: 39018 - Reference pulse monitoring: Faulty position, resolution, or reference pulse

ErrNr: 39019 - Serial encoder interface: Stop bit error
ErrNr: 39020 - Serial encoder interface: Receive data overrun
ErrNr: 39021 - Serial encoder interface: Send data error
ErrNr: 39022 - EnDat encoder: Warning bit is set
ErrNr: 39023 - EnDat encoder: CRC error while reading EnDat2.2 additional information

ErrNr: 39024 - EnDat encoder: Operating status error sources: M ALL Power down
ErrNr: 39025 - EnDat encoder: Operating status error sources: M Overflow / Underflow

ErrNr: 39026 - EnDat encoder: Type 3 error while reading EnDat2.2 additional information

ErrNr: 39027 - Encoder Emulation: 5V power supply fail
ErrNr: 39028 - Encoder: Multiturn failure
ErrNr: 39029 - Encoder: Battery charge too low

ErrNr: 39030 - Encoder: Warning bit is set
ErrNr: 39032 - EnDat encoder: Operating status error sources: Lighting
ErrNr: 39033 - EnDat encoder: Operating status error sources: Signal amplitude
ErrNr: 39034 - EnDat encoder: Operating status error sources: S Pos 1
ErrNr: 39035 - EnDat encoder: Operating status error sources: Overvoltage
ErrNr: 39036 - EnDat encoder: Operating status error sources: Undervoltage
ErrNr: 39037 - EnDat encoder: Operating status error sources: over current
ErrNr: 39038 - EnDat encoder: Operating status error sources: Temperature exceeded
ErrNr: 39039 - EnDat encoder: Operating status error sources: S Pos
ErrNr: 39040 - EnDat encoder: Operating status error sources: S sytem
ErrNr: 39041 - EnDat encoder: Operating status error sources: S ALL power down
ErrNr: 39042 - EnDat encoder: Operating status error sources: M Pos 1
ErrNr: 39043 - EnDat encoder: Operating status error sources: M Pos 2
ErrNr: 39044 - EnDat encoder: Operating status error sources: M System
ErrNr: 39045 - EnDat encoder: Operating status error sources: M battery
ErrNr: 39046 - Encoder: Incorrect encoder address acknowledgment
ErrNr: 39047 - Encoder: Position value not synchronous with absolute value
ErrNr: 39048 - Encoder: Incorrect command code acknowledgment
ErrNr: 39049 - Encoder: Timeout during parameter transfer
ErrNr: 39050 - Encoder: Parity
ErrNr: 39051 - Encoder: Hiperface error bit
ErrNr: 39052 - Encoder: Measurement range exceeded
ErrNr: 39053 - Encoder: Internal check of the encoder interface failed
ErrNr: 39054 - Encoder: Invalid supply voltage
ErrNr: 39055 - Encoder: Incremental signal amplitude too small
ErrNr: 39056 - Encoder: Incremental signal amplitude too large
ErrNr: 39059 - Encoder: Status message
ErrNr: 39060 - Encoder: Sync bit error
ErrNr: 39061 - Encoder: UART Transmission error
ErrNr: 39301 - Analog/Digital IO: 24V power supply fail
ErrNr: 39302 - Digital IO 1-4: Diagnose bit active (current, 24V supply)
ErrNr: 39303 - Digital IO 5-8: Diagnose bit active (current, 24V supply)
ErrNr: 39305 - Digital IO 10: Diagnose bit active (current, temperature)
ErrNr: 39306 - Digital IO 9: Diagnose bit active (current, temperature)
ErrNr: 39307 - Digital IO: Outputs deactivated by output mask after network error
ErrNr: 39308 - Analog/Digital IO: Diagnose bit active
ErrNr: 39309 - Digital IO: Diagnose bit active
ErrNr: 39310 - Analog IO: Diagnose bit active
ErrNr: 39311 - Analog IO: Analog input disturbed
ErrNr: 39312 - Analog IO: Analog value too small
ErrNr: 39313 - Analog IO: Analog value too large
ErrNr: 39314 - Analog IO: Wire break or analog value below the measuring range
ErrNr: 39315 - Analog IO: Wire break or analog value above the measuring range

ErrNr: 39500 - Encoder: HIPERFACE: Status: Incorrect alignment data (01h)
ErrNr: 39501 - Encoder: HIPERFACE: Status: Sensor not adjusted or in adjustment mode (20h)

ErrNr: 39502 - Encoder: HIPERFACE: Status: Distance measure/sensor too high (21h)
ErrNr: 39504 - Encoder: HIPERFACE: Status: Linear position fault (23h)
ErrNr: 39510 - Encoder: HIPERFACE: Status: The encoder has not detected any faults (00h)

ErrNr: 39511 - Encoder: HIPERFACE: Status: Analog signals outside specification (01h)

ErrNr: 39512 - Encoder: HIPERFACE: Status: Incorrect internal angular offset (02h)
ErrNr: 39513 - Encoder: HIPERFACE: Status: Data field partitioning table destroyed (03h)

ErrNr: 39514 - Encoder: HIPERFACE: Status: Analog limit values not available (04h)
ErrNr: 39515 - Encoder: HIPERFACE: Status: Internal I\B2C bus not operational (05h)

ErrNr: 39516 - Encoder: HIPERFACE: Status: Internal checksum error (06h)
ErrNr: 39517 - Encoder: HIPERFACE: Status: Program watchdog fault (07h)
ErrNr: 39518 - Encoder: HIPERFACE: Status: Counter overflow (08h)
ErrNr: 39519 - Encoder: HIPERFACE: Status: Parity error (09h)
ErrNr: 39520 - Encoder: HIPERFACE: Status: Checksum error (0Ah)
ErrNr: 39521 - Encoder: HIPERFACE: Status: Unknown command (0Bh)
ErrNr: 39522 - Encoder: HIPERFACE: Status: Wrong command length (0Ch)
ErrNr: 39523 - Encoder: HIPERFACE: Status: Wrong command argument (0Dh)
ErrNr: 39524 - Encoder: HIPERFACE: Status: Read-only data field (0Eh)
ErrNr: 39525 - Encoder: HIPERFACE: Status: Incorrect access code (0Fh)
ErrNr: 39526 - Encoder: HIPERFACE: Status: Out of memory fault (10h)
ErrNr: 39527 - Encoder: HIPERFACE: Status: Wrong data field offset (11h)
ErrNr: 39528 - Encoder: HIPERFACE: Status: Wrong data field number (12h)
ErrNr: 39538 - Encoder: HIPERFACE: Status: Value monitoring analog signals (1Ch)
ErrNr: 39539 - Encoder: HIPERFACE: Status: Transmitter current critical (1Dh)
ErrNr: 39540 - Encoder: HIPERFACE: Status: Encoder temperature critical (1Eh)
ErrNr: 39541 - Encoder: HIPERFACE: Status: Speed too high (1Fh)
ErrNr: 39542 - Encoder: HIPERFACE: Status: Singleturn position unreliable (20h)
ErrNr: 39543 - Encoder: HIPERFACE: Status: Multiturn amplitude fault (21h)
ErrNr: 39544 - Encoder: HIPERFACE: Status: Multiturn sync fault (22h)
ErrNr: 39545 - Encoder: HIPERFACE: Status: Multiturn vectorlength fault (23h)
ErrNr: 39546 - Encoder: HIPERFACE: Status: Multiturn counter fault (24h)
ErrNr: 41001 - Heatsink temperature sensor: Warning limit exceeded
ErrNr: 41002 - Heatsink temperature sensor: Not connected or damaged
ErrNr: 41011 - Temperature sensor (Motor|Choke|External): Warning limit exceeded
ErrNr: 41031 - Junction temperature model: Warning limit exceeded
ErrNr: 41041 - Bleeder temperature model: Warning limit exceeded
ErrNr: 41051 - ACOPOS peak current: Warning limit exceeded

ErrNr: 41061 - ACOPOS continuous current: Warning limit exceeded
ErrNr: 41070 - Motor temperature model: Warning limit exceeded
ErrNr: 41075 - ACOPOS continuous power: Warning limit exceeded
ErrNr: 41078 - Power stage: Temperature sensor 1: Warning limit exceeded
ErrNr: 41080 - Pre-charging resistor temperature model: Warning limit exceeded
ErrNr: 41081 - Power stage temperature model: Warning limit exceeded
ErrNr: 41083 - Power stage: Temperature sensor 2: Warning limit exceeded
ErrNr: 41085 - Power stage: Temperature sensor 3: Warning limit exceeded
ErrNr: 41087 - Power stage: Temperature sensor 4: Warning limit exceeded
ErrNr: 41089 - Encoder temperature sensor: Warning limit exceeded
ErrNr: 41090 - 24V Supply/Main relay temperature sensor: Warning limit exceeded
ErrNr: 41091 - Power stage: Temperature sensor 5: Warning limit exceeded
ErrNr: 41092 - Rectifier temperature model: Warning limit exceeded
ErrNr: 41093 - DC bus relay temperature model: Warning limit exceeded
ErrNr: 41094 - DC bus capacitor temperature model: Warning limit exceeded
ErrNr: 41095 - DC bus: Continuous total power: Warning limit exceeded
ErrNr: 41096 - DC bus: Peak total power: Warning limit exceeded
ErrNr: 41097 - DC connector temperature model: Warning limit exceeded
ErrNr: 41098 - Power stage: Temperature sensor: Warning limit exceeded
ErrNr: 64002 - Delay before SW Reset (network with ascending node numbers ?)
ErrNr: 64003 - Delay before NC System Start (network with ascending node numbers ?)

ErrNr: 64004 - The following boot error could be entered here with a delay
ErrNr: 64005 - Timeout for parameter enable after start of operating system
ErrNr: 64006 - Drive did not become synchronous with network master
ErrNr: 64007 - Timeout for enable of acyclic network communication
ErrNr: 64008 - Timeout for enable of cyclic network communication
ErrNr: 64009 - Acp10cfg contains a POWERLINK interface, for which no axis is defined

ErrNr: 64010 - NC software test version (validity period in Logger)
ErrNr: 64011 - Timeout for completion of encoder initialization
ErrNr: 64012 - NCSYS does not contain an operating system for this ACOPOS hardware type

ErrNr: 64013 - The basis initialization was aborted due to an error
ErrNr: 64014 - No integral cycle time ratio between NetCyc and POWERLINK
ErrNr: 64015 - No integral cycle time ratio between NetCyc and POWERLINK "multiplexed"

ErrNr: 64016 - Name of SDC axis configuration PV is too long (PV is not used)
ErrNr: 65535 - Response error
ParameterText
ParID: 1 - INTERNAL1
ParID: 2 - INTERNAL2
ParID: 3 - INTERNAL3

ParID: 4 - SafeMC: Status
ParID: 5 - SafeMC: Control
ParID: 6 - SafeMC: Actual speed
ParID: 7 - SafeMC: Speed limit
ParID: 8 - Motor holding brake: Status
ParID: 9 - INTERNAL9
ParID: 10 - Bleeder: External: Resistance
ParID: 11 - Bleeder: External: Limit temperature
ParID: 12 - Bleeder: External: Thermal resistance
ParID: 13 - Bleeder: External: Thermal capacity
ParID: 14 - Motor holding brake: Test torque
ParID: 15 - Motor holding brake: Position error limit
ParID: 16 - Inverter: Rated power
ParID: 17 - Inverter: Rated current
ParID: 18 - Inverter: Peak current
ParID: 19 - Power mains: Parameter ID of the phase failure signal
ParID: 20 - Power mains: Status phase failure
ParID: 21 - Encoder1: DCM Distance difference
ParID: 22 - Encoder2: DCM Distance difference
ParID: 23 - Encoder3: DCM Distance difference
ParID: 24 - CTRL Feed forward: Speed torque factor
ParID: 25 - Power limiter: Mode
ParID: 30 - Motor: Type
ParID: 31 - Motor: Software compatibility
ParID: 32 - Motor: Test date
ParID: 33 - Encoder1: Serial data block
ParID: 34 - Encoder1: Serial status
ParID: 35 - Encoder2: Serial data block
ParID: 36 - Encoder2: Serial status
ParID: 37 - Encoder3: Serial data block
ParID: 38 - Encoder3: Serial status
ParID: 39 - INTERNAL39
ParID: 40 - Motor: Order text
ParID: 41 - Motor: Serial number
ParID: 42 - Motor holding brake: Rated current
ParID: 43 - Motor holding brake: Rated torque
ParID: 44 - Motor holding brake: Engaging delay
ParID: 45 - Motor holding brake: Release delay
ParID: 46 - Motor: Winding connection
ParID: 47 - Motor: Number of pole-pairs
ParID: 48 - Motor: Rated voltage
ParID: 49 - Motor: Voltage constant
ParID: 50 - Motor: Rated speed

ParID: 51 - Motor: Maximum speed
ParID: 52 - Motor: Stall torque
ParID: 53 - Motor: Rated torque
ParID: 54 - Motor: Peak torque
ParID: 55 - Motor: Torque constant
ParID: 56 - Motor: Stall current
ParID: 57 - Motor: Rated current
ParID: 58 - Motor: Peak current
ParID: 59 - Motor: Phase cross section
ParID: 60 - Motor: Stator resistance
ParID: 61 - Motor: Stator inductance
ParID: 62 - Motor: Moment of inertia
ParID: 63 - Motor: Commutation offset
ParID: 64 - Temperature sensor: Parameter 1
ParID: 65 - Temperature sensor: Parameter 2
ParID: 66 - Temperature sensor: Parameter 3
ParID: 67 - Temperature sensor: Parameter 4
ParID: 68 - Temperature sensor: Parameter 5
ParID: 69 - Temperature sensor: Parameter 6
ParID: 70 - Temperature sensor: Parameter 7
ParID: 71 - Temperature sensor: Parameter 8
ParID: 72 - Temperature sensor: Parameter 9
ParID: 73 - Temperature sensor: Parameter 10
ParID: 74 - Motor: Limit temperature
ParID: 75 - Motor: Thermal time constant (for MOTOR_COMPATIBILITY 0x0202)
ParID: 76 - Motor: Rotor resistance
ParID: 77 - Motor: Rotor inductance
ParID: 78 - Motor: Mutual inductance
ParID: 79 - Motor: Magnetizing current
ParID: 80 - Power mains: Ignore phase failure
ParID: 81 - Motor: Command
ParID: 82 - Encoder1: Status
ParID: 83 - INTERNAL83
ParID: 84 - Motor: Encoder data transfer: Status
ParID: 85 - Encoder2: Type
ParID: 86 - Motor holding brake: Command
ParID: 87 - CTRL Feed forward: Torque in positive direction
ParID: 88 - Encoder2: Status
ParID: 89 - CTRL Feed forward: Torque in negative direction
ParID: 90 - Motor holding brake: Mode
ParID: 91 - Encoder1: Actual position
ParID: 92 - CTRL Position controller: Actual speed
ParID: 93 - CTRL Controller: Command

ParID: 96 - Encoder1: Load scaling: Count direction
ParID: 97 - Encoder1: Type
ParID: 98 - Limit values: Lag error for stop of a movement
ParID: 99 - Limit values: Lag error for display of a warning
ParID: 100 - CTRL Position controller: Proportional amplification
ParID: 101 - CTRL Position controller: Integral action time
ParID: 102 - CTRL Position controller: Prediction time
ParID: 103 - CTRL Position controller: Total delay time
ParID: 104 - CTRL Position controller: Maximum proportional action
ParID: 105 - CTRL Position controller: Maximum integral action
ParID: 106 - Encoder1: Load scaling: Units per load revolution
ParID: 107 - Encoder1: Load scaling: Encoder revolutions per load revolution
ParID: 108 - Encoder1: Encoder scaling: motor revolutions
ParID: 109 - Encoder1: Encoder scaling: increments per encoder revolution
ParID: 110 - Simulation mode: Command
ParID: 111 - CTRL Position controller: Actual position
ParID: 112 - CTRL Position controller: Lag error
ParID: 113 - CTRL Position controller: Set position
ParID: 114 - CTRL Position controller: Set speed
ParID: 115 - Basis movements: Start movement with absolute target position
ParID: 116 - Basis movements: Override
ParID: 117 - Basis movements: Speed override
ParID: 118 - Basis movements: Acceleration override
ParID: 119 - Limit values: Maximum speed in positive direction
ParID: 120 - Limit values: Maximum speed in negative direction
ParID: 121 - Limit values: Maximum acceleration in positive direction
ParID: 122 - Limit values: Maximum deceleration in positive direction
ParID: 123 - Limit values: Maximum acceleration in negative direction
ParID: 124 - Limit values: Maximum deceleration in negative direction
ParID: 125 - Limit values: Jolt time
ParID: 126 - Limit values: Positive SW end position
ParID: 127 - Limit values: Negative SW end position
ParID: 128 - Limit values: Ignore SW end positions
ParID: 129 - Trace: Status
ParID: 130 - CTRL Position controller: Actual position fractional part
ParID: 131 - Trace: Parameter ID for trigger event
ParID: 132 - Trace: Trigger event
ParID: 133 - Trace: Trigger threshold
ParID: 134 - Trace: Trigger window
ParID: 135 - Trace: Parameter ID for test date
ParID: 136 - Trace: Data type for test date
ParID: 137 - Trace: Command
ParID: 138 - INTERNAL138

ParID: 139 - Diagnosis: Peak value CPU computing time per cycle
ParID: 140 - Trace: Index for test date
ParID: 141 - Trace: Recording time
ParID: 142 - Trace: Sampling time
ParID: 143 - Trace: Delay time relative to trigger event
ParID: 144 - Trace: Maximum length of data
ParID: 145 - CTRL Controller: Mode of controller cascade cycle times
ParID: 146 - CTRL Position controller: Parameter ID for cyclic set position
ParID: 147 - CTRL Position controller: Start movement with cyclic position set values
ParID: 148 - INTERNAL148
ParID: 149 - INTERNAL149
ParID: 150 - Limit values: Waiting time before message 'target position reached'
ParID: 151 - Homing: Reference pulse distance
ParID: 152 - Homing: Reference position
ParID: 153 - Homing: Speed for searching the reference switch
ParID: 154 - Homing: Trigger speed
ParID: 155 - Homing: Acceleration for homing procedure
ParID: 156 - Homing: Mode
ParID: 157 - Homing: Mode control bits
ParID: 158 - Homing: Distance for blocking the reference pulse
ParID: 159 - Basis movements: Target position
ParID: 160 - Basis movements: Relative move distance
ParID: 161 - Basis movements: Speed in positive direction
ParID: 162 - Basis movements: Speed in negative direction
ParID: 163 - Basis movements: Acceleration in positive direction
ParID: 164 - Basis movements: Deceleration in positive direction
ParID: 165 - Basis movements: Acceleration in negative direction
ParID: 166 - Basis movements: Deceleration in negative direction
ParID: 167 - Homing: Command start homing procedure
ParID: 168 - Basis movements: Start movement with relative move distance
ParID: 169 - Basis movements: Start movement in positive direction
ParID: 170 - Basis movements: Start movement in negative direction
ParID: 171 - Movement stop: Index of parameter record for the stop command
ParID: 172 - Homing: Offset
ParID: 173 - Movement stop: Index of parameter record for stop configuration
ParID: 174 - Movement stop: Deceleration ramp
ParID: 175 - Movement stop: Controller state after movement stop
ParID: 176 - Movement stop: Command stop movement
ParID: 177 - INTERNAL177
ParID: 178 - Status: General bits
ParID: 179 - Status: Cyclic bits
ParID: 180 - Messages: Error number
ParID: 181 - Messages: Additional error info

ParID: 183 - Messages: Error record from drive
ParID: 184 - Digital inputs: Force enable bits
ParID: 185 - Digital inputs: Force function
ParID: 186 - Digital inputs: Active level bits
ParID: 187 - INTERNAL187
ParID: 188 - INTERNAL188
ParID: 189 - Time for network live sign control
ParID: 191 - Basis movements: Halt
ParID: 194 - Cam automat: Reset parameter
ParID: 195 - VAX Cam automat: Reset parameter
ParID: 197 - Movement stop: Deceleration ramp after drive error
ParID: 198 - Cyclic communication: Time for life sign monitoring of data to drive
ParID: 200 - INTERNAL200
ParID: 201 - INTERNAL201
ParID: 202 - INTERNAL202
ParID: 203 - Encoder1: Resolver polepairs per encoder revolution
ParID: 204 - Encoder2: Resolver polepairs per encoder revolution
ParID: 205 - INTERNAL205
ParID: 206 - INTERNAL206
ParID: 207 - Cyclic communication: Parameter ID of data to drive
ParID: 209 - Inverter: Phase 1: Current
ParID: 210 - Inverter: Phase 2: Current
ParID: 211 - Motor holding brake: Control monitoring filter time
ParID: 212 - Encoder1: Diagnosis 1
ParID: 213 - CTRL Current controller: Set stator current quadrature component
ParID: 214 - CTRL Current controller: Actual stator current quadrature component
ParID: 215 - INTERNAL215
ParID: 216 - CTRL Current controller: Stator voltage quadrature component
ParID: 217 - INTERNAL217
ParID: 218 - CTRL Current controller: Set stator current direct component
ParID: 219 - CTRL Current controller: Actual stator current direct component
ParID: 220 - INTERNAL220
ParID: 221 - CTRL Current controller: Stator voltage direct component
ParID: 222 - Flux controller: Manipulated variable
ParID: 223 - CTRL Current controller: Proportional amplification factor
ParID: 225 - CTRL Current controller: Integral action time
ParID: 226 - CTRL Speed controller: Notchfilter frequence
ParID: 227 - CTRL Speed controller: Notchfilter bandwidth
ParID: 228 - CTRL Two encoder control: Position difference
ParID: 229 - CTRL Two encoder control: Position difference limit for stop of a movement

ParID: 230 - CTRL Position controller: Actual encoder position parameter ID
ParID: 231 - CTRL Position controller: Parameter ID enable input

ParID: 232 - Cyclic communication: Parameter index of data to drive
ParID: 234 - Cyclic communication: Index of parameter record for data from drive
ParID: 235 - Cyclic communication: Parameter index of data from drive
ParID: 236 - Cyclic communication: Parameter ID of data from drive
ParID: 237 - Encoder1: SSI Number of leading zeros
ParID: 238 - Encoder1: SSI Number of data bits
ParID: 239 - Encoder1: SSI, Data code
ParID: 240 - Encoder1: SSI Parity check
ParID: 241 - Encoder2: SSI Number of leading zeros
ParID: 242 - Encoder2: SSI Number of data bits
ParID: 243 - Encoder2: SSI Data code
ParID: 244 - Encoder2: SSI Parity check
ParID: 245 - Encoder1: Actual position per revolution
ParID: 246 - Encoder2: Actual position per revolution
ParID: 247 - CTRL Current controller: Additive torque
ParID: 248 - CTRL Torque limiter: Maximum acceleration torque in positive direction
ParID: 249 - CTRL Torque limiter: Maximum acceleration torque in negative direction
ParID: 250 - CTRL Speed controller: Set speed
ParID: 251 - CTRL Speed controller: Actual speed
ParID: 252 - INTERNAL252
ParID: 253 - CTRL Speed controller: Proportional amplification
ParID: 254 - INTERNAL254
ParID: 255 - CTRL Speed controller: Integral action time
ParID: 256 - CTRL Speed controller: Manipulated variable
ParID: 257 - CTRL Flux: Set magnetizing current
ParID: 258 - CTRL Flux: Actual magnetizing current
ParID: 259 - CTRL Flux: Proportional amplification factor
ParID: 260 - CTRL Flux: Integral action time
ParID: 261 - CTRL DC bus: Parameter ID additive active current
ParID: 262 - Power mains: Mode
ParID: 263 - INTERNAL263
ParID: 264 - INTERNAL264
ParID: 265 - INTERNAL265
ParID: 266 - INTERNAL266
ParID: 267 - INTERNAL267
ParID: 268 - INTERNAL268
ParID: 269 - INTERNAL269
ParID: 270 - INTERNAL270
ParID: 271 - INTERNAL271
ParID: 272 - INTERNAL272
ParID: 273 - INTERNAL273
ParID: 274 - INTERNAL274
ParID: 275 - Motor: Phasing: Current

ParID: 276 - Motor: Phasing: Mode
ParID: 277 - Motor: Torque
ParID: 278 - Motor: Power
ParID: 279 - INTERNAL279
ParID: 280 - Encoder1: Gear ratio motor revolutions
ParID: 281 - CTRL Feed forward: Set stator current
ParID: 282 - CTRL Feed forward: Parameter ID load torque
ParID: 283 - CTRL Speed controller: Filter time constant
ParID: 284 - Encoder3: Resolver polepairs per encoder revolution
ParID: 285 - CTRL Feed forward: Parameter ID mass moment of inertia
ParID: 286 - Encoder1: Emulation: Output parameter ID
ParID: 287 - Motor holding brake: Electrical state
ParID: 288 - CTRL Speed controller: Parameter ID additive set value
ParID: 289 - Encoder2: Encoder scaling: Increments per encoder revolution
ParID: 292 - Function block: Constant zero
ParID: 298 - CTRL DC bus: Voltage
ParID: 299 - CTRL DC bus: Filter time constant
ParID: 300 - CTRL DC bus: Voltage detection: Lower limit
ParID: 301 - CTRL Feed forward: Mass moment of inertia
ParID: 302 - CTRL DC bus: Filtered voltage
ParID: 303 - Encoder1: ADC1 value
ParID: 304 - INTERNAL304
ParID: 305 - INTERNAL305
ParID: 306 - Function block: Constant minimum value 2byte signed
ParID: 307 - INTERNAL307
ParID: 308 - INTERNAL308
ParID: 309 - SafeMC: Actual position
ParID: 310 - Function block: Constant one
ParID: 311 - ENABLE: Configuration
ParID: 312 - CTRL Flux: Magnetizing current limiter: Upper limit
ParID: 313 - CTRL Speed controller: Monitoring: Speed limit
ParID: 314 - CTRL Chopper: Minimum pwm duty cycle
ParID: 315 - Inverter: Junction temperature model: Power loss
ParID: 317 - INTERNAL317
ParID: 318 - INTERNAL318
ParID: 319 - INTERNAL319
ParID: 320 - INTERNAL320
ParID: 321 - INTERNAL321
ParID: 322 - INTERNAL322
ParID: 323 - Motor holding brake: Maximal position error
ParID: 324 - INTERNAL324
ParID: 325 - CTRL Current controller: Additive set value parameter ID
ParID: 326 - INTERNAL326

ParID: 327 - INTERNAL327
ParID: 328 - CTRL Controller: Mode
ParID: 330 - INTERNAL330
ParID: 331 - INTERNAL331
ParID: 332 - INTERNAL332
ParID: 333 - INTERNAL333
ParID: 334 - Motor: Phasing: Command
ParID: 335 - INTERNAL335
ParID: 336 - Encoder1: Error state
ParID: 337 - Encoder2: Error state
ParID: 338 - Encoder3: Error state
ParID: 340 - Messages: Command write error state into error FIFO
ParID: 342 - Motor: Temperature model: Load
ParID: 343 - CTRL Torque limiter: Override
ParID: 344 - CTRL Torque limiter: LIM_T1_POS override
ParID: 345 - CTRL DC bus: Limiter: Switch on threshold
ParID: 346 - CTRL Torque limiter: LIM_T1_NEG override
ParID: 347 - Inverter: Switch frequency
ParID: 348 - CTRL Torque limiter: Maximum deceleration torque in positive direction
ParID: 349 - CTRL Torque limiter: Maximum deceleration torque in negative direction
ParID: 350 - Rotor flux angle
ParID: 351 - Power mains: Error response
ParID: 352 - Motor: Temperature model: Maximum load
ParID: 353 - INTERNAL353
ParID: 354 - INTERNAL354
ParID: 355 - Drive synchronisation: Total time
ParID: 359 - Drive synchronisation: Deviation from master time
ParID: 364 - INTERNAL364
ParID: 365 - INTERNAL365
ParID: 366 - INTERNAL366
ParID: 367 - Power mains: Status
ParID: 368 - CTRL DC bus: Limiter: Mode
ParID: 369 - Encoder1: INC Reference pulse state
ParID: 370 - Encoder2: INC Reference pulse state
ParID: 371 - Encoder3: INC Reference pulse state
ParID: 372 - Encoder1: Gear ratio encoder revolutions
ParID: 373 - Motor: Temperature model: Mode
ParID: 374 - CTRL Torque limiter: LIM_T2_POS override
ParID: 375 - CTRL Torque limiter: LIM_T2_NEG override
ParID: 376 - INTERNAL376
ParID: 377 - Inverter: Continuous current: Load
ParID: 378 - Inverter: Continuous current: Maximum load
ParID: 379 - Inverter: Peak current: Load

ParID: 380 - Power stage: Heatsink temperature sensor: Temperature
ParID: 381 - Temperature sensor: Temperature
ParID: 382 - Inverter: Junction temperature model: Temperature
ParID: 383 - Bleeder: Temperature model: Temperature
ParID: 384 - Power stage: Heatsink temperature sensor: Maximum temperature
ParID: 385 - Temperature sensor: Maximum temperature
ParID: 386 - Inverter: Junction temperature model: Maximum temperature
ParID: 387 - Bleeder: Temperature model: Maximum temperature
ParID: 388 - Inverter: Peak current: Maximum load
ParID: 389 - FB EPROM: Serial-ID
ParID: 390 - CTRL DC bus: Nominal voltage
ParID: 391 - Temperature prediction: Mode
ParID: 392 - Temperature prediction: Trigger Parameter-ID
ParID: 393 - Motor: Temperature model: Temperature
ParID: 394 - Motor: Temperature model: Maximum temperature
ParID: 395 - Power mains: Status main relay
ParID: 396 - INTERNAL396
ParID: 397 - INTERNAL397
ParID: 398 - Bleeder: Selector
ParID: 399 - INTERNAL399
ParID: 400 - VAX Basis movements: Start movement with absolute target position
ParID: 401 - VAX Basis movements: Start movement with relative move distance
ParID: 402 - VAX Basis movements: Start movement in positive direction
ParID: 403 - VAX Basis movements: Start movement in negative direction
ParID: 404 - VAX Basis movements: Speed in positive direction
ParID: 405 - VAX Basis movements: Speed in negative direction
ParID: 406 - VAX Basis movements: Acceleration in positive direction
ParID: 407 - VAX Basis movements: Deceleration in positive direction
ParID: 408 - VAX Basis movements: Acceleration in negative direction
ParID: 409 - VAX Basis movements: Deceleration in negative direction
ParID: 410 - VAX Basis movements: Target position
ParID: 411 - VAX Basis movements: Relative move distance
ParID: 412 - VAX: Position
ParID: 413 - VAX: Speed
ParID: 414 - INTERNAL414
ParID: 415 - VAX Limit values: Jolt time
ParID: 416 - Basis movements: Mode 'stop after trigger'
ParID: 417 - Basis movements: Remaining distance for mode 'stop after trigger'
ParID: 418 - Basis movements: Trigger event for mode 'stop after trigger'
ParID: 419 - Basis movements: Mode
ParID: 420 - Encoder2: Load scaling: Units per load revolution
ParID: 421 - Encoder2: Load scaling: Encoder revolutions
ParID: 422 - Encoder2: Load scaling: Count direction

ParID: 423 - Encoder2: Actual position
ParID: 427 - Encoder2: Status home position valid
ParID: 428 - CTRL Position controller: Input set position
ParID: 429 - Encoder2: Time constant for actual position filter
ParID: 432 - Cam automat: Index and data of polynomial cam
ParID: 451 - Trace: Address for test date
ParID: 457 - Cyclic communication: Mode
ParID: 458 - Trace: Address for trigger event
ParID: 459 - Digital inputs: Ignore limit switch
ParID: 460 - Digital inputs: Status reference switch
ParID: 461 - Digital inputs: Status positive end switch
ParID: 462 - Digital inputs: Status negative end switch
ParID: 463 - Digital inputs: Status trigger1
ParID: 464 - Digital inputs: Status trigger2
ParID: 465 - Status: Controller
ParID: 466 - Homing: Status home position valid
ParID: 467 - Basis movements: Status 'target position reached'
ParID: 468 - Status: Movement active
ParID: 469 - Messages: Status error record available
ParID: 470 - Messages: Status warning record available
ParID: 471 - Status: Drive ready
ParID: 484 - Network coupling: Parameter ID of send data master1
ParID: 485 - Network coupling: Parameter ID of send data master2
ParID: 494 - Network coupling: Parameter ID of send data master3
ParID: 495 - Cam automat: Index for start state
ParID: 496 - VAX Cam automat: Index for start state
ParID: 499 - INTERNAL499
ParID: 500 - Cam automat: Cam polynomial data
ParID: 501 - Cam automat: Index of cam data for Upload/Download
ParID: 502 - Cam automat: Command
ParID: 503 - Cam automat: Master axis
ParID: 504 - Cam automat: Start position of the master axis
ParID: 505 - Cam automat: Start interval of the master axis
ParID: 506 - Cam automat: Maximum speed of master axis
ParID: 507 - Cam automat: Index of parameter record for one state
ParID: 508 - Cam automat: Index of parameter record for one event
ParID: 509 - Cam automat: Index of cam data for one state
ParID: 510 - Cam automat: Compensation gears mode
ParID: 511 - Cam automat: Compensation distance of master axis
ParID: 512 - Cam automat: Compensation distance of slave axis
ParID: 513 - Cam automat: Event type
ParID: 514 - Cam automat: Event attribute
ParID: 515 - Cam automat: Index next state

ParID: 516 - Cam automat: Set signal
ParID: 517 - Cam automat: Index of the actual state
ParID: 518 - Cam automat: Reset signal
ParID: 519 - Cam automat: Multiplication factor of master axis
ParID: 520 - Cam automat: Multiplication factor of slave axis
ParID: 521 - Cam automat: Initial count of state repetitions for event ncCOUNT
ParID: 522 - Cam automat: Count of state repetitions for event ncCOUNT
ParID: 523 - Cam automat: Minimum compensation distance of master axis
ParID: 524 - Movement stop: Command quickstop
ParID: 527 - Cam automat: Lock for consistent online parameter change
ParID: 528 - Cam automat: Action at state transition
ParID: 529 - Cam automat: Cam type of the actual state
ParID: 542 - Network coupling: Cyclic position master1
ParID: 543 - Network coupling: Cyclic position master2
ParID: 544 - Parameter sequence: Index and data
ParID: 548 - Network coupling: Cyclic position master3
ParID: 549 - Cam automat: Relative start distance of master axis within cam
ParID: 550 - VAX Cam automat: Relative start distance of master axis within cam
ParID: 551 - VAX Cam automat: Command
ParID: 552 - VAX Cam automat: Master axis
ParID: 553 - VAX Cam automat: Start position of the master axis
ParID: 554 - VAX Cam automat: Start interval of the master axis
ParID: 555 - VAX Cam automat: Maximum speed of master axis
ParID: 556 - VAX Cam automat: Index of parameter record for one state
ParID: 557 - VAX Cam automat: Index of parameter record for one event
ParID: 558 - VAX Cam automat: Index of cam data for one state
ParID: 559 - VAX Cam automat: Compensation gears mode
ParID: 560 - VAX Cam automat: Compensation distance of master axis
ParID: 561 - VAX Cam automat: Compensation distance of slave axis
ParID: 562 - VAX Cam automat: Event type
ParID: 563 - VAX Cam automat: Event attribute
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ParID: 571 - VAX Cam automat: Count of state repetitions for event ncCOUNT
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ParID: 573 - VAX Cam automat: Lock for consistent online parameter change
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ParID: 611 - Cam automat: Parameter ID for event
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ParID: 619 - Cam automat: Cam offset of master axis
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ParID: 766 - Cam automat: Maximum acceleration of slave axis within compensation phase1

ParID: 767 - VAX Cam automat: Maximum acceleration of slave axis within compensation phase1

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ParID: 814 - INTERNAL814
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ParID: 827 - CTRL Speed controller: Set current filter1 parameter ID for coefficient C1

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ParID: 833 - Power stage: Heatsink temperature sensor: Predicted temperature
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ParID: 836 - Motor: Temperature model: Predicted load
ParID: 837 - Motor: Temperature model: Predicted temperature
ParID: 838 - Inverter: Continuous current: Predicted load
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ParID: 844 - Inverter: Output: Power
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ParID: 846 - CTRL Voltage controller: Parameter ID of set value stator voltage quadrature component
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ParID: 848 - CTRL Flux weakening: Integral action time
ParID: 849 - Motor: Thermal time constant
ParID: 850 - CTRL DC bus: Proportional amplification factor
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ParID: 855 - INTERNAL855
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ParID: 861 - Power stage: Temperature sensor 1: Temperature
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ParID: 866 - Motor: Test mode
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ParID: 870 - CTRL Flux: Mode
ParID: 871 - CTRL Flux: Magnetizing current limiter: Lower limit
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ParID: 878 - Parameter identification: Speed
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ParID: 880 - CTRL vector: Current feed forward time
ParID: 881 - ISQ-Ripple compensation: Current
ParID: 882 - ISQ-Ripple compensation: Data: Index
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ParID: 896 - Encoder1: CRC Polynomial
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ParID: 901 - VAX Cam automat: Status
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ParID: 904 - Network coupling: Configure station to receive on MA4_CYCLIC_POS
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ParID: 906 - Network coupling: Interpolation mode for cyclic position master4
ParID: 907 - Network coupling: Interpolation mode for cyclic position master5
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ParID: 909 - Cyclic communication: Count of data to drive
ParID: 910 - Move configuration: Index of parameter record
ParID: 911 - Move configuration: Maximum speed in positive direction
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ParID: 917 - Cam automat: Index of parameter record of move configuration
ParID: 918 - VAX Cam automat: Trigger1 delay time
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ParID: 921 - VAX Cam automat: Control bits for function mode
ParID: 922 - Network coupling: Receive data point: Bit offset within the data field of the frame

ParID: 923 - Network coupling: Receive data point: Data type
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ParID: 926 - Cam automat: Mode for event type ncS_START
ParID: 927 - VAX Cam automat: Mode for event type ncS_START
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ParID: 930 - Basis movements: Movement direction in relation to the position period

ParID: 931 - Basis movements: Start movement with target position of a period
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ParID: 934 - VAX Basis movements: Movement direction in relation to the position period

ParID: 935 - VAX Basis movements: Start movement with target position of a period
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ParID: 940 - VAX Cam automat: Parameter ID1 for event
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ParID: 948 - Network coupling: Error status for cyclic position master4
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ParID: 950 - Induction stop: Short circuit current (synchronous motor)
ParID: 951 - Encoder2: Resolver transmission ratio
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ParID: 953 - Encoder3: Diagnosis 1
ParID: 954 - CTRL Flux weakening: Demagnetizing current
ParID: 955 - INTERNAL955
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ParID: 958 - INTERNAL958
ParID: 959 - CTRL Flux weakening: Start speed flux weakening
ParID: 960 - INTERNAL960
ParID: 961 - INTERNAL961
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ParID: 964 - INTERNAL964
ParID: 965 - INTERNAL965
ParID: 966 - INTERNAL966
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ParID: 971 - INTERNAL971
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ParID: 973 - INTERNAL973
ParID: 974 - Parameter identification: Motor: Line cross section
ParID: 975 - Parameter identification: Motor: Type
ParID: 976 - Parameter identification: Motor: Number of polepairs
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ParID: 978 - Parameter identification: Motor: Voltage constant
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ParID: 980 - Parameter identification: Motor: Maximum speed
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ParID: 999 - Encoder: Position data block
ParID: 1000 - INTERNAL1000
ParID: 1001 - System administration: Module: BsLoader
ParID: 1002 - System administration: Module: NC operating System
ParID: 1003 - INTERNAL1003
ParID: 1004 - System administration: Parameter Request: Bit offset within the data field of the frame
ParID: 1005 - System administration: Parameter Response: Bit offset within the data field of the frame
ParID: 1006 - Cyclic communication: Data to drive: Bit offset within the data field of the frame

ParID: 1007 - Cyclic communication: Data from drive: Bit offset within the data field of the frame

ParID: 1008 - Cyclic communication: Monitor data from drive: Bit offset within the data field of the frame

ParID: 1009 - Basis movements: Halt
ParID: 1010 - System administration: Module: Version
ParID: 1011 - System administration: Module: Date and time
ParID: 1013 - System administration: Module: Section for read access
ParID: 1015 - Basis movements: Event start: Mode
ParID: 1016 - Basis movements: Event start: Parameter ID for event
ParID: 1017 - Basis movements: event start: Parameter ID for target position
ParID: 1018 - Basis movements: event start: Parameter ID for target speed
ParID: 1019 - Basis movements: Event start: Command parameter ID
ParID: 1020 - Basis movements: Event start: Status
ParID: 1021 - VAX Basis movements: Event start: Mode
ParID: 1022 - VAX Basis movements: Event start: Parameter ID for event
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ParID: 1024 - VAX Basis movements: Event start: Parameter ID for target speed
ParID: 1025 - VAX Basis movements: Event start: Command parameter ID
ParID: 1026 - VAX Basis movements: Event start: Status
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ParID: 1028 - Basis movements: Start movement with current speed
ParID: 1029 - VAX Basis movements: Start movement with current speed
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ParID: 1031 - CTRL Speed controller: Set current filter2 type
ParID: 1032 - CTRL Speed controller: Set current filter3 type
ParID: 1033 - CTRL Speed controller: Set current filter1 coefficient A0
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ParID: 1042 - CTRL Speed controller: Set current filter1 coefficient B1
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ParID: 1046 - CTRL Speed controller: Set current filter2 coefficient B2
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ParID: 1049 - CTRL Position controller: Input set position fractional part
ParID: 1050 - System administration: SW Reset
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ParID: 1054 - System administration: Module: Burn status
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ParID: 1058 - Encoder2: Homing offset
ParID: 1059 - Encoder3: Homing offset
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ParID: 1061 - Data block transfer: Read last data block segment
ParID: 1062 - Data block transfer: Abort data block read access
ParID: 1063 - Data block transfer: Offset for data block read access
ParID: 1064 - Data block transfer: Remaining bytes for data block read access
ParID: 1065 - Movement stop: Command stop movement
ParID: 1066 - VAX Movement stop: Command stop movement
ParID: 1067 - Cam automat: Position of slave axis
ParID: 1068 - VAX Cam automat: Position of slave axis
ParID: 1069 - INTERNAL1069
ParID: 1070 - Data block transfer: Write data block segment
ParID: 1071 - Data block transfer: Write last data block segment
ParID: 1072 - Data block transfer: Abort data block write access
ParID: 1073 - Encoder2: Command start homing procedure
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ParID: 1075 - Cam automat: Relative distance of master axis within cam
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ParID: 1078 - VAX Cam automat: Relative entry distance of master axis within cam
ParID: 1079 - VAX Cam automat: Control bits for message mode
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ParID: 1086 - INTERNAL1086
ParID: 1087 - INTERNAL1087
ParID: 1088 - INTERNAL1088
ParID: 1089 - INTERNAL1089
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ParID: 1091 - INTERNAL1091
ParID: 1092 - INTERNAL1092
ParID: 1093 - INTERNAL1093
ParID: 1094 - INTERNAL1094
ParID: 1095 - INTERNAL1095
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ParID: 1097 - INTERNAL1097
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ParID: 1099 - INTERNAL1099
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ParID: 1102 - Autotuning: Maximum percentage for speed limit value
ParID: 1103 - Autotuning: Maximum movement distance
ParID: 1104 - Autotuning: Maximum lag error
ParID: 1105 - INTERNAL1105
ParID: 1106 - Autotuning: Number of excitation periods
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ParID: 1123 - Parameter identification: Duration of the excitation signal
ParID: 1124 - Parameter identification: Type of the excitation signal
ParID: 1125 - Parameter identification: Sub-mode
ParID: 1126 - Parameter identification: State bits
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ParID: 1128 - ISQ-Ripple compensation: Data: Angle for quadrant I
ParID: 1129 - ISQ-Ripple compensation: Data: Amplitude for quadrant III
ParID: 1130 - ISQ-Ripple compensation: Data: Angle for quadrant III
ParID: 1131 - ISQ-Ripple compensation: Reference system
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ParID: 1138 - Parameter identification: Iteration counter
ParID: 1139 - PowerMeter: Mode

ParID: 1140 - PowerMeter: Observation period
ParID: 1141 - PowerMeter: Trigger parameter-ID
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ParID: 1144 - PowerMeter: Mean active power
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ParID: 1147 - PowerMeter: Mean reactive power
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ParID: 1172 - Motor: Temperature model: Limit temperature
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ParID: 1174 - Encoder1: Data: Index
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ParID: 1181 - CTRL Position controller: Deceleration in negative direction at activating the enable input
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ParID: 1194 - Drive synchronisation: Total time within the network cycle
ParID: 1196 - CTRL Position controller: Mode bits
ParID: 1197 - Axis crosslink: Axis number
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ParID: 1204 - Cam automat: Index for relative start position of the master axis within interval

ParID: 1205 - Cam automat: Relative start position of the master axis within interval
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ParID: 1209 - Motor: Encoder: Limit temperature
ParID: 1210 - Motor: Temperature model: Reference sensor: Parameter ID
ParID: 1211 - Motor: Temperature model: Thermal resistance 1
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ParID: 1215 - Temperature sensor: Type
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ParID: 1219 - Encoder: Index of position data block
ParID: 1220 - CTRL DC bus: Overvoltage monitoring: Threshold for torque off
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ParID: 1222 - Inverter: Temperature model: Temperature
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ParID: 1242 - CTRL Speed controller: Repetitive Control: State
ParID: 1243 - CTRL Speed controller: Repetitive Control: Type of filter
ParID: 1244 - CTRL Speed controller: Repetitive Control: Resolution
ParID: 1245 - CTRL Speed controller: Repetitive Control: Output value
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ParID: 1248 - CTRL Speed: Repetitive Control: Mode
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ParID: 1253 - INTERNAL1253
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ParID: 1255 - INTERNAL1255
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ParID: 1269 - Motor holding brake test: Torque slew rate
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ParID: 1294 - CTRL Vector controller: Additive commutation angle
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ParID: 1296 - Voltage observer: Phase voltage V
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ParID: 1298 - Voltage observer: Inverter adjustment amplification factor
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ParID: 1301 - Encoder2: Emulation: Offset
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ParID: 1307 - INTERNAL1307
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ParID: 1312 - Virtual Encoder: Parameter ID of input value position 1
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ParID: 1320 - Virtual Encoder: Mode
ParID: 1321 - Virtual Encoder: Actual position per revolution
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ParID: 1364 - Encoder2: Encoder command
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ParID: 1640 - INTERNAL1640
ParID: 1641 - Motor: Maximum permissible DC bus voltage
ParID: 1642 - INTERNAL1642
ParID: 1645 - Encoder2: Compensation: Mode
ParID: 1646 - Encoder2: Data: Index
ParID: 1647 - Encoder2: Data: Parameter A0
ParID: 1648 - Encoder2: Data: Parameter A1
ParID: 1649 - Encoder2: Data: Parameter A2
ParID: 3072 - FB LOGIC: Mode
ParID: 3080 - FB LOGIC: Parameter ID of input1
ParID: 3088 - FB LOGIC: Parameter ID of input2
ParID: 3096 - FB LOGIC: Result value
ParID: 3104 - FB LOGIC: Parameter ID of input3
ParID: 3112 - FB LOGIC: Parameter ID of input4
ParID: 3584 - FB ARITH: Mode
ParID: 3592 - FB ARITH: Parameter ID of input1
ParID: 3600 - FB ARITH: Parameter ID of input2
ParID: 3608 - FB ARITH: Result value I4
ParID: 3616 - FB ARITH: Result value I4 fractional part
ParID: 3624 - FB ARITH: Result value R4
ParID: 3632 - FB ARITH: Multiplication factor1
ParID: 3640 - FB ARITH: Multiplication factor2
ParID: 4096 - FB VAR: Variable0 I4
ParID: 4104 - FB VAR: Variable1 I4
ParID: 4112 - FB VAR: Variable2 I4
ParID: 4120 - FB VAR: Variable3 I4
ParID: 4128 - FB VAR: Variable0 R4
ParID: 4136 - FB VAR: Variable1 R4

ParID: 4144 - FB VAR: Variable2 R4
ParID: 4152 - FB VAR: Variable3 R4
ParID: 4160 - FB VAR: Variable0 I2
ParID: 4168 - FB VAR: Variable1 I2
ParID: 4176 - FB VAR: Variable2 I2
ParID: 4184 - FB VAR: Variable3 I2
ParID: 4192 - FB VAR: Variable0 UI1
ParID: 4200 - FB VAR: Variable1 UI1
ParID: 4208 - FB VAR: Variable2 UI1
ParID: 4216 - FB VAR: Variable3 UI1
ParID: 4608 - FB EVWR: Parameter ID of event input
ParID: 4616 - FB EVWR: Parameter ID of input
ParID: 4624 - FB EVWR: Event level
ParID: 4632 - FB EVWR: Parameter ID of output value
ParID: 4640 - FB EVWR: Mode
ParID: 5120 - FB MPGEN: Mode
ParID: 5128 - FB MPGEN: Target position
ParID: 5136 - FB MPGEN: Output value I4
ParID: 5144 - FB MPGEN: Output value I4 fractional part
ParID: 5152 - FB MPGEN: Output value R4
ParID: 5160 - FB MPGEN: Status
ParID: 5168 - FB MPGEN: Parameter ID of master position
ParID: 5176 - FB MPGEN: Maximum master speed
ParID: 5184 - FB MPGEN: Maximum speed
ParID: 5192 - FB MPGEN: Maximum acceleration
ParID: 5200 - FB MPGEN: Master compensation distance
ParID: 5208 - FB MPGEN: Parameter ID of target position
ParID: 5216 - FB MPGEN: Target speed
ParID: 5224 - FB MPGEN: Parameter ID of target speed
ParID: 5232 - FB MPGEN: Error counter
ParID: 5240 - FB MPGEN: Master start position
ParID: 5248 - FB MPGEN: Master interval
ParID: 5256 - FB MPGEN: Master start position within interval
ParID: 5264 - FB MPGEN: Master end position within interval
ParID: 5632 - FB DIO: input values
ParID: 5640 - FB DIO: output values
ParID: 5648 - FB DIO: input value 1
ParID: 5656 - FB DIO: input value 2
ParID: 5664 - FB DIO: input value 3
ParID: 5672 - FB DIO: input value 4
ParID: 5680 - FB DIO: input value 5
ParID: 5688 - FB DIO: input value 6
ParID: 5696 - FB DIO: input value 7

ParID: 5704 - FB DIO: input value 8
ParID: 5712 - FB DIO: input value 9
ParID: 5720 - FB DIO: input value 10
ParID: 5728 - FB DIO: input value 11
ParID: 5736 - FB DIO: input value 12
ParID: 5744 - FB DIO: input value 13
ParID: 5752 - FB DIO: input value 14
ParID: 5760 - FB DIO: input value 15
ParID: 5768 - FB DIO: input value 16
ParID: 5776 - FB DIO: parameter ID of output 1
ParID: 5784 - FB DIO: parameter ID of output 2
ParID: 5792 - FB DIO: parameter ID of output 3
ParID: 5800 - FB DIO: parameter ID of output 4
ParID: 5808 - FB DIO: parameter ID of output 5
ParID: 5816 - FB DIO: parameter ID of output 6
ParID: 5824 - FB DIO: parameter ID of output 7
ParID: 5832 - FB DIO: parameter ID of output 8
ParID: 5840 - FB DIO: parameter ID of output 9
ParID: 5848 - FB DIO: parameter ID of output 10
ParID: 5856 - FB DIO: parameter ID of output 11
ParID: 5864 - FB DIO: parameter ID of output 12
ParID: 5872 - FB DIO: Parameter ID of output 13
ParID: 5880 - FB DIO: parameter ID of output 14
ParID: 5888 - FB DIO: parameter ID of output 15
ParID: 5896 - FB DIO: parameter ID of output 16
ParID: 5904 - FB DIO: Command set outputs
ParID: 5912 - FB DIO: Command clear outputs
ParID: 5920 - FB DIO: IO configuration
ParID: 5928 - FB DIO: Counter input 1
ParID: 5936 - FB DIO: Counter input 2
ParID: 5944 - FB DIO: Checks
ParID: 5952 - FB DIO: output mask
ParID: 5960 - FB DIO: input filter: filter time
ParID: 5968 - FB DIO: input 7: Time of the rising edge
ParID: 5976 - FB DIO: input 7: Time of the falling edge
ParID: 5984 - FB DIO: input 8: Time of the rising edge
ParID: 5992 - FB DIO: input 8: Time of the falling edge
ParID: 6000 - FB DIO: Read output configuration
ParID: 6008 - FB DIO: Command set output configuration
ParID: 6016 - FB DIO: Command clear output configuration
ParID: 6024 - FB DIO: Read input configuration
ParID: 6032 - FB DIO: Command set input configuration
ParID: 6040 - FB DIO: Command clear input configuration

ParID: 6048 - FB DIO: output feedback
ParID: 6144 - FB AIO: channel 1: Analog value
ParID: 6152 - FB AIO: channel 2: Analog value
ParID: 6160 - FB AIO: channel 1: Comparator threshold pointer parameter
ParID: 6168 - FB AIO: channel 2: Comparator threshold pointer parameter
ParID: 6176 - FB AIO: channel 1: Comparator filter time
ParID: 6184 - FB AIO: channel 2: Comparator filter time
ParID: 6192 - FB AIO: channel 1: Time of the rising edge of the comparator output
ParID: 6200 - FB AIO: channel 2: Time of the rising edge of the comparator output
ParID: 6208 - FB AIO: channel 1: Time of the falling edge of the comparator output
ParID: 6216 - FB AIO: channel 2: Time of the falling edge of the comparator output
ParID: 6224 - FB AIO: channel 1: Comparator mode
ParID: 6232 - FB AIO: channel 2: Comparator mode
ParID: 6240 - FB AIO: channel 1: Comparator extremum (minimum, maximum)
ParID: 6248 - FB AIO: channel 2: Comparator extremum (minimum, maximum)
ParID: 6256 - FB AIO: channel 1: Comparator output
ParID: 6264 - FB AIO: channel 2: Comparator output
ParID: 6272 - FB AIO: state
ParID: 6280 - FB AIO: channel 1: Filter
ParID: 6288 - FB AIO: channel 2: Filter
ParID: 6296 - FB AIO: channel 3: Analog value
ParID: 6304 - FB AIO: channel 4: Analog value
ParID: 6312 - FB AIO: Read output configuration
ParID: 6320 - FB AIO: Command set output configuration
ParID: 6328 - FB AIO: Command clear output configuration
ParID: 6336 - FB AIO: Read input configuration
ParID: 6344 - FB AIO: Command set input configuration
ParID: 6352 - FB AIO: Command clear input configuration
ParID: 6360 - FB AIO: Index of the current analog IO
ParID: 6368 - FB AIO: parameter ID of output (Index)
ParID: 6376 - FB AIO: output mode
ParID: 6384 - FB AIO: IO-Kommando
ParID: 6392 - FB AIO: Checks
ParID: 6656 - FB CMP: parameter ID of input
ParID: 6664 - FB CMP: threshold
ParID: 6672 - FB CMP: window
ParID: 6680 - FB CMP: hysteresis window
ParID: 6688 - FB CMP: mode
ParID: 6696 - FB CMP: result value
ParID: 7168 - FB DELAY: parameter ID of input
ParID: 7176 - FB DELAY: time
ParID: 7184 - FB DELAY: I4 result value
ParID: 7192 - FB DELAY: I4 result value fractional part

ParID: 7200 - FB DELAY: R4 result value
ParID: 7680 - FB PID: parameter ID of input
ParID: 7688 - FB PID: proportional amplification factor
ParID: 7696 - FB PID: integral action time
ParID: 7704 - FB PID: maximum integral action
ParID: 7712 - FB PID: derivative action time
ParID: 7720 - FB PID: time delay constant
ParID: 7728 - FB PID: result value
ParID: 7736 - FB PID: parameter ID of enable input
ParID: 7744 - FB PID: result of P part
ParID: 7752 - FB PID: result of I part
ParID: 7760 - FB PID: result of DT1 part
ParID: 8192 - FB CURVE: Mode
ParID: 8200 - FB CURVE: Parameter ID of input
ParID: 8208 - FB CURVE: Index of cam data
ParID: 8216 - FB CURVE: Result value I4
ParID: 8224 - FB CURVE: Result value I4 fractional part
ParID: 8232 - FB CURVE: Result value R4
ParID: 8240 - FB CURVE: Result value I4 relative within interval
ParID: 8248 - FB CURVE: Result value I4 relative fractional part
ParID: 8256 - FB CURVE: Result value R4 relative within interval
ParID: 8264 - FB CURVE: Result value interval offset
ParID: 8272 - FB CURVE: Multiplication factor for input interval
ParID: 8280 - FB CURVE: Multiplication factor for output interval
ParID: 8288 - FB CURVE: Compensation gears command
ParID: 8296 - FB CURVE: Compensation distance of master axis, input interval
ParID: 8304 - FB CURVE: Compensation distance of slave axis, output interval
ParID: 8312 - FB CURVE: Entrance gradient in the compensation gears
ParID: 8320 - FB CURVE: Exit gradient from the compensation gears
ParID: 8328 - FB CURVE: Maximum speed of master axis
ParID: 8336 - FB CURVE: Maximum speed of slave axis within compensation gears
ParID: 8344 - FB CURVE: Minimum speed of slave axis within compensation gears
ParID: 8352 - FB CURVE: Maximum acceleration of slave axis within compensation phase1

ParID: 8360 - FB CURVE: Maximum acceleration of slave axis within compensation phase2

ParID: 8368 - FB CURVE: Compensation gears command status
ParID: 8376 - FB CURVE: Compensation gears command result
ParID: 8384 - FB CURVE: Additive input value
ParID: 8392 - FB CURVE: Additive output value
ParID: 8704 - FB IPL: Mode
ParID: 8712 - FB IPL: Parameter ID of input
ParID: 8720 - FB IPL: Cycle time

ParID: 8728 - FB IPL: Extrapolation time
ParID: 8736 - FB IPL: Result value I4
ParID: 8744 - FB IPL: Result value I4 fractional part
ParID: 8752 - FB IPL: Result value R4
ParID: 8760 - FB IPL: Parameter ID of event input
ParID: 9216 - FB VARITH: Mode
ParID: 9224 - FB VARITH: Dimension
ParID: 9232 - FB VARITH: Parameter ID of input, element a1
ParID: 9240 - FB VARITH: Parameter ID of input, element a2
ParID: 9248 - FB VARITH: Parameter ID of input, element a3
ParID: 9256 - FB VARITH: Parameter ID of input, element a4
ParID: 9264 - FB VARITH: Parameter ID of input, element a5
ParID: 9272 - FB VARITH: Parameter ID of input, element b1
ParID: 9280 - FB VARITH: Parameter ID of input, element b2
ParID: 9288 - FB VARITH: Parameter ID of input, element b3
ParID: 9296 - FB VARITH: Parameter ID of input, element b4
ParID: 9304 - FB VARITH: Parameter ID of input, element b5
ParID: 9312 - FB VARITH: Result value1
ParID: 9320 - FB VARITH: Result value2
ParID: 9328 - FB VARITH: Result value3
ParID: 9336 - FB VARITH: Result value4
ParID: 9344 - FB VARITH: Result value5
ParID: 9728 - FB LATCH: Mode
ParID: 9736 - FB LATCH: Parameter ID of input
ParID: 9744 - FB LATCH: Parameter ID of trigger event input
ParID: 9752 - FB LATCH: Trigger event type
ParID: 9760 - FB LATCH: Minimal signal width of trigger event
ParID: 9768 - FB LATCH: Maximum signal width of trigger event
ParID: 9776 - FB LATCH: Window
ParID: 9784 - FB LATCH: Window position
ParID: 9792 - FB LATCH: Interval of window position
ParID: 9800 - FB LATCH: Interval elongation of window position
ParID: 9808 - FB LATCH: Delay time
ParID: 9816 - FB LATCH: Signal width of trigger event
ParID: 9824 - FB LATCH: Result value
ParID: 9832 - FB LATCH: Difference: Window position minus result value
ParID: 9840 - FB LATCH: Status
ParID: 9848 - FB LATCH: Error counter
ParID: 9856 - FB LATCH: Window1
ParID: 9864 - FB LATCH: Window2
ParID: 9872 - FB LATCH: Status counter
ParID: 10240 - FB EPROM: ID
ParID: 10248 - FB EPROM: Data block index

ParID: 10256 - FB EPROM: Data block
ParID: 10264 - FB EPROM: Product code
ParID: 10272 - FB EPROM: Serial number
ParID: 10280 - FB EPROM: Product type
ParID: 10288 - FB EPROM: Hardware revision
ParID: 10296 - FB EPROM: Hardware variant
ParID: 10304 - FB EPROM: Status
ParID: 10312 - FB EPROM: End date of mission time
ParID: 10752 - FB CAMCON: Mode
ParID: 10760 - FB CAMCON: Parameter ID of input
ParID: 10768 - FB CAMCON: Start position
ParID: 10776 - FB CAMCON: Interval
ParID: 10784 - FB CAMCON: Delay time to switch output ON
ParID: 10792 - FB CAMCON: Delay time to switch output OFF
ParID: 10800 - FB CAMCON: Switch delay: Filter time constant
ParID: 10808 - FB CAMCON: Hysteresis window
ParID: 10816 - FB CAMCON: Maximum number of cams
ParID: 10824 - FB CAMCON: Index of parameter record for one cam
ParID: 10832 - FB CAMCON: Start position of cam within interval
ParID: 10840 - FB CAMCON: End position of cam within interval
ParID: 10848 - FB CAMCON: Output value
ParID: 10856 - FB CAMCON: Input speed
ParID: 10864 - FB CAMCON: Parameter ID start event
ParID: 10872 - FB CAMCON: Parameter record for one track
ParID: 10880 - FB CAMCON: Select parameter record for one track
ParID: 10888 - FB CAMCON: Mode to select a parameter record for one track
ParID: 10896 - FB CAMCON: Active parameter record for one track
ParID: 11264 - FB MUX: Mode
ParID: 11272 - FB MUX: Parameter ID of selector input
ParID: 11280 - FB MUX: Maximum selector value
ParID: 11288 - FB MUX: Output value I4
ParID: 11296 - FB MUX: Output value R4
ParID: 11304 - FB MUX: Output value offset I4
ParID: 11312 - FB MUX: Output value offset R4
ParID: 11320 - FB MUX: Parameter ID of input0
ParID: 11328 - FB MUX: Parameter ID of input1
ParID: 11336 - FB MUX: Parameter ID of input2
ParID: 11344 - FB MUX: Parameter ID of input3
ParID: 11352 - FB MUX: Parameter ID of input4
ParID: 11360 - FB MUX: Parameter ID of input5
ParID: 11368 - FB MUX: Parameter ID of input6
ParID: 11376 - FB MUX: Parameter ID of input7
ParID: 11384 - FB MUX: Parameter ID of input8

ParID: 11392 - FB MUX: Parameter ID of input9
ParID: 11400 - FB MUX: Parameter ID of input10
ParID: 11408 - FB MUX: Parameter ID of input11
ParID: 11416 - FB MUX: Parameter ID of input12
ParID: 11424 - FB MUX: Parameter ID of input13
ParID: 11432 - FB MUX: Parameter ID of input14
ParID: 11440 - FB MUX: Parameter ID of input15
ParID: 11448 - FB MUX: Gradient of offset ramp
ParID: 11456 - FB MUX: Time of offset ramp
ParID: 11776 - FB FIFO: Mode
ParID: 11784 - FB FIFO: Maximum length
ParID: 11792 - FB FIFO: Distance for output value2
ParID: 11800 - FB FIFO: Parameter ID input
ParID: 11808 - FB FIFO: Parameter ID input event
ParID: 11816 - FB FIFO: Parameter ID output event
ParID: 11824 - FB FIFO: Actual length
ParID: 11832 - FB FIFO: Output value I4
ParID: 11840 - FB FIFO: Output value R4
ParID: 11848 - FB FIFO: Output value2 I4
ParID: 11856 - FB FIFO: Output value2 R4
ParID: 12288 - FB MINMAX: Mode
ParID: 12296 - FB MINMAX: Output value I4
ParID: 12304 - FB MINMAX: Output value R4
ParID: 12312 - FB MINMAX: Parameter ID of input1
ParID: 12320 - FB MINMAX: Parameter ID of input2
ParID: 12328 - FB MINMAX: Parameter ID of input3
ParID: 12336 - FB MINMAX: Parameter ID of input4
ParID: 12800 - FB BIT: Mode
ParID: 12808 - FB BIT: Operand a1
ParID: 12816 - FB BIT: Operand a2
ParID: 12824 - FB BIT: Operand a3
ParID: 12832 - FB BIT: Operand a4
ParID: 12840 - FB BIT: Operand a5
ParID: 12848 - FB BIT: Operand a6
ParID: 12856 - FB BIT: Operand a7
ParID: 12864 - FB BIT: Operand a8
ParID: 12872 - FB BIT: Operand b1
ParID: 12880 - FB BIT: Operand b2
ParID: 12888 - FB BIT: Operand b3
ParID: 12896 - FB BIT: Operand b4
ParID: 12904 - FB BIT: Operand b5
ParID: 12912 - FB BIT: Operand b6
ParID: 12920 - FB BIT: Operand b7

ParID: 12928 - FB BIT: Operand b8
ParID: 12936 - FB BIT: Parameter ID of input1
ParID: 12944 - FB BIT: Parameter ID of input2
ParID: 12952 - FB BIT: Parameter ID of input3
ParID: 12960 - FB BIT: Parameter ID of input4
ParID: 12968 - FB BIT: Parameter ID of input5
ParID: 12976 - FB BIT: Parameter ID of input6
ParID: 12984 - FB BIT: Parameter ID of input7
ParID: 12992 - FB BIT: Parameter ID of input8
ParID: 13000 - FB BIT: Result value1 UI1
ParID: 13008 - FB BIT: Result value1 UI2
ParID: 13016 - FB BIT: Result value1
ParID: 13024 - FB BIT: Result value2
ParID: 13032 - FB BIT: Result value3
ParID: 13040 - FB BIT: Result value4
ParID: 13048 - FB BIT: Result value5
ParID: 13056 - FB BIT: Result value6
ParID: 13064 - FB BIT: Result value7
ParID: 13072 - FB BIT: Result value8
ParID: 13312 - INTERNAL13312
ParID: 13320 - INTERNAL13320
ParID: 13328 - INTERNAL13328
ParID: 13336 - INTERNAL13336
ParID: 13344 - INTERNAL13344
ParID: 13352 - INTERNAL13352
ParID: 13360 - INTERNAL13360
ParID: 13368 - INTERNAL13368
ParID: 13376 - INTERNAL13376
ParID: 13384 - INTERNAL13384
ParID: 13392 - INTERNAL13392
ParID: 13400 - INTERNAL13400
ParID: 13408 - INTERNAL13408
ParID: 13416 - INTERNAL13416
ParID: 13424 - INTERNAL13424
ParID: 13432 - INTERNAL13432
ParID: 13440 - INTERNAL13440
ParID: 13448 - INTERNAL13448
ParID: 13456 - INTERNAL13456
ParID: 13464 - INTERNAL13464
ParID: 13472 - INTERNAL13472
ParID: 13480 - INTERNAL13480
ParID: 13488 - INTERNAL13488
ParID: 13496 - INTERNAL13496

ParID: 13504 - INTERNAL13504
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ParID: 13544 - INTERNAL13544
ParID: 13552 - INTERNAL13552
ParID: 13560 - INTERNAL13560
ParID: 13568 - INTERNAL13568
ParID: 13576 - INTERNAL13576
ParID: 13584 - INTERNAL13584
ParID: 13592 - INTERNAL13592
ParID: 13600 - INTERNAL13600
ParID: 13608 - INTERNAL13608
ParID: 13616 - INTERNAL13616
ParID: 13824 - FB COUNT: Mode
ParID: 13832 - FB COUNT: Parameter ID of event input1
ParID: 13840 - FB COUNT: Parameter ID of event input2
ParID: 13848 - FB COUNT: Parameter ID trigger input to set counter value
ParID: 13856 - FB COUNT: Value to set counter
ParID: 13864 - FB COUNT: Maximum counter value
ParID: 13872 - FB COUNT: Comparator compare value
ParID: 13880 - FB COUNT: Result value
ParID: 13888 - FB COUNT: Comparator status
ParID: 13896 - FB COUNT: Event status
ParID: 13904 - FB COUNT: Parameter ID of enable input
ParID: 14336 - FB DYNSYS: Mode
ParID: 14344 - FB DYNSYS: System parameter A
ParID: 14352 - FB DYNSYS: System parameter B
ParID: 14360 - FB DYNSYS: System parameter C
ParID: 14368 - FB DYNSYS: System parameter D
ParID: 14376 - FB DYNSYS: Tuning parameter 1 for observer design
ParID: 14384 - FB DYNSYS: Tuning parameter 2 for observer design
ParID: 14392 - FB DYNSYS: Tuning parameter 1 for output design
ParID: 14400 - FB DYNSYS: Tuning parameter 2 for output design
ParID: 14408 - FB DYNSYS: Parameter ID for input 1
ParID: 14416 - FB DYNSYS: Parameter ID for input 2
ParID: 14424 - FB DYNSYS: Output 1
ParID: 14432 - FB DYNSYS: Output 2
ParID: 14440 - FB DYNSYS: Multiplier for output 1
ParID: 14448 - FB DYNSYS: Multiplier for output 2
ParID: 14456 - FB DYNSYS: System state 1
ParID: 14464 - FB DYNSYS: System state 2

ParID: 14472 - FB DYNSYS: System state 3
ParID: 14480 - FB DYNSYS: System state 4
ParID: 14488 - FB DYNSYS: System state 5
ParID: 14496 - FB DYNSYS: Status
ParID: 63488 - INTERNAL63488
ParID: 63489 - INTERNAL63489
ParID: 63490 - INTERNAL63490
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ParID: 64201 - Servo drive adjustment: Velocity at maximum output value
ParID: 64225 - Encoder1: Range of encoder position
ParID: 64232 - Stepper motor: Step scaling: Steps per motor revolution
ParID: 64233 - Stepper motor: Load scaling: Units per SM_SCALE_LOAD_MOTREV motor revolutions
ParID: 64234 - Stepper motor: Load scaling: Motor revolutions
ParID: 64237 - Encoder2: Range of encoder position
ParID: 64238 - INTERNAL64238
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ParID: 65535 - Messages: Error response