Actuator controls

AC(V) 01.2/AC(V)ExC 01.2

Modbus TCP/IP

Read operation instructions first.

•   Observe safety instructions.

Purpose of the document:

This document contains information for the commissioning staff of the distributed control system and DCS software
engineers. This document is intended to support actuator integration into the DCS via the communication interface.

Reference documents:

•   Operation instructions (Assembly and commissioning) for the actuator

Reference documents can be downloaded from the Internet (www.auma.com) or ordered directly from AUMA
(refer to <Addresses>).

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1. Safety instructions

1.1. Prerequisites for the safe handling of the product

Standards/directives

The end user or the contractor must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, electrical connection, commissioning and operation are met at the place of installation.

They include among others:

- Standards and directives such as IEC 60079 "Explosive atmospheres":
    - Part 14: Electrical installations design, selection and erection.
    - Part 17: Electrical installations inspection and maintenance.

- Applicable configuration guidelines for network applications.

Safety instructions/ warnings

All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.

Qualification of staff

Assembly, electrical connection, commissioning, operation, and maintenance must be carried out by suitably qualified personnel authorised by the end user or contractor of the plant only.

Prior to working on this product, the staff must have thoroughly read and understood these instructions and, furthermore, know and observe officially recognised rules regarding occupational health and safety.

Work performed in potentially explosive atmospheres is subject to special regulations which have to be observed. The end user or contractor of the plant is responsible for respect and control of these regulations, standards, and laws.

Electrostatic charging

Highly efficient charge generating processes (processes more efficient than manual friction) on the device surface must be excluded at any time, since they will lead to propagating brush discharges and therefore to ignition of a potentially explosive atmosphere.

This also applies to fireproof coatings or covers available as an option.

Ignition dangers

Gearboxes were subjected to an ignition hazard assessment in compliance with the currently applicable standard according to ISO 80079-36/ -37. Hot surfaces, mechanically generated sparks as well as static electricity and stray electric currents were identified and assessed as major potential ignition sources. Protective measures to prevent the likelihood that ignition sources arise were applied to the gearboxes. This includes in particular lubrication of the gearbox, the IP protection codes and the warnings and notes contained in these operation instructions.

Commissioning

Prior to commissioning, imperatively check that all settings meet the requirements of the application. Incorrect settings might present a danger to the application, e.g. cause damage to the valve or the installation. The manufacturer will not be held liable for any consequential damage. Such risk lies entirely with the user.

Operation

Prerequisites for safe and smooth operation:

- Correct transport, proper storage, mounting and installation, as well as careful commissioning.
- Only operate the device if it is in perfect condition while observing these instructions.
- Immediately report any faults and damage and allow for corrective measures.
- Observe recognised rules for occupational health and safety.
- Observe national regulations.
- During operation, the housing warms up and surface temperatures > 60 °C may occur. To prevent possible burns, we recommend checking the surface temperature prior to working on the device using an appropriate thermometer and wearing protective gloves.

Protective measures	The end user or the contractor are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.
Maintenance	To ensure safe device operation, the maintenance instructions included in this manual must be observed.
	Any device modification requires prior written consent of the manufacturer.

1.2.   Range of application

AUMA actuator controls are exclusively designed for the operation of AUMA actuators.

Other applications require explicit (written) confirmation by the manufacturer. The following applications are not permitted, e.g.:

- motor control
- pump control

No liability can be assumed for inappropriate or unintended use.

Observance of these operation instructions is considered as part of the device's designated use.

1.3.   Warnings and notes

The following warnings draw special attention to safety-relevant procedures in these operation instructions, each marked by the appropriate signal word (DANGER, WARNING, CAUTION, NOTICE).

⚠ DANGER	**Indicates an imminently hazardous situation with a high level of risk. Failure to observe this warning results in death or serious injury.**

⚠ WARNING	**Indicates a potentially hazardous situation with a medium level of risk. Failure to observe this warning could result in death or serious injury.**

⚠ CAUTION	**Indicates a potentially hazardous situation with a low level of risk. Failure to observe this warning could result in minor or moderate injury. May also be used with property damage.**

NOTICE	**Potentially hazardous situation. Failure to observe this warning could result in property damage. Is not used for personal injury.**

Safety alert symbol ⚠ warns of a potential personal injury hazard.

The signal word (here: DANGER) indicates the level of hazard.

1.4.   References and symbols

The following references and symbols are used in these instructions:

Information	The term **Information** preceding the text indicates important notes and information.
⊥	Symbol for CLOSED (valve closed)
≡	Symbol for OPEN (valve open)
M ▷	**Via the menu to parameter**
	Describes the menu path to the parameter. When using the push buttons of local controls, the required parameter can be quickly found on the display. Display texts are shaded in grey: Display.

➥ **Result of a process step**

Describes the result of a preceding process step.

Warning signs at the device

The following warning signs can be attached to the device.

General warning sign

General warning of a danger zone.

Hot surface

Warning of hot surfaces, e.g. possibly caused by high ambient temperatures or strong direct sunlight.

Electrical voltage

Hazardous voltage! Warning of electric shock. At some devices, the warning sign additionally includes a time interval, e.g. 30 s. Once power supply is switched off, you will have to wait for the indicated period. Only then may the device be opened.

2.   General information about Modbus

For exchange of information among automation systems and the connected decentralised field devices, the use of serial fieldbus systems for communication is state-of-the-art. Thousands of applications have proved impressively that, in comparison with conventional technology, cost savings of up to 40 % in wiring, commissioning, and maintenance are achieved by using fieldbus technology. While in the past the fieldbus systems used were often manufacturer specific and incompatible with other bus systems, those implemented today are almost exclusively open and standardized. This means that the user does not depend on individual suppliers and can choose within a large product range the most suitable product at the most competitive price.

Modbus is an open fieldbus system used successfully throughout the world. The first Modbus solution was initiated as early as 1979. Since then, Modbus has developed into a de-facto standard. Meanwhile, Modbus has been standardised by the IEC 61158 and IEC 61784 standards. This standardization ensures that the investments by manufacturers and users are protected to the best possible degree and the user no longer depends on one manufacturer. The application range includes automation in the areas of manufacturing, processing, and building.

2.1.   Basic characteristics

Modbus defines the technical and functional features of a serial fieldbus system used for interconnecting distributed digital automation devices. Modbus distinguishes between master and slave devices.

Master devices   Master devices control data traffic on the bus. A master is allowed to send messages without an external request. Masters are also called "active devices" in the Modbus protocol.

Slave device   Slave devices such as AUMA Modbus actuators are peripheral devices. Typical slave devices are input/output devices, valves, actuators, and measuring transducers. They do not have bus access rights, i.e. they may only acknowledge received messages or, at the request of a master, transmit messages to that master. Slaves are also called 'passive devices'.

2.2.   Modbus basic functions

Modbus uses a master-slave technique where only the master can initiate a transaction. The slaves respond by supplying the requested data in a response message or by executing the action requested in the query.

The Modbus telegram from the master contains the slave address, a function code defining the requested action, a data field, and a CRC field. The Modbus slaves' response message contains fields confirming the requested action and possibly the requested data as well as a CRC field.

If an error occurs during reception of the telegram or if the slave is unable to perform the requested action, the slave will generate an error telegram and send it as response to the master.

Modbus TCP/IP is based on the client-server model. The Modbus data telegram described above is completed with additional information (MBAP header) but without CRC field and embedded into an Ethernet frame.

2.3.   Transfer mode

- Ethernet IEC IEEE 802.3
- 10/100 Base-Tx

2.4.   Fieldbus access

- Client-server model

2.5.   Communication

- Client-server model with request-response cycle (polling)
- Modbus TCP/IP

2.6. Protective functions

- Request-response cycle monitoring with configurable timer interval at the master.

3.   Commissioning

3.1.   Introduction

To commission a Modbus slave, a special configuration of the master using a configuration file is usually not required.

Modbus TCP/IP data transmission is based on a simple protocol containing mainly the slave address, a function code with offset address, the process data, and a checksum.

An IP address is used for addressing the Modbus TCP/IP server. Addressing of the lower layer Modbus slave via the slave address.

3.1.1.   Modbus function overview

3.1.1.1.   Functions for data transmission

Function	Function code (decimal)	Description
Force Single Coil	05	Sets an individual bit in the slave to ON or OFF.
Force Multiple Coils	15	Sets several consecutive bits in the slave to ON or OFF.
Read Coil Status	01	Reads out the status of individual pieces of output bit information from the slave.
Read Input Status	02	Reads out the status of individual pieces of input bit information from the slave.
Preset Single Register	06	Writes data to individual Holding Registers (16 bit) of the slave.
Preset Multiple Register	16	Writes data into consecutive Holding Registers.
Read Input Register	04	Reads out the contents of the Input Data Registers (16 Bit) from the slave
Read Holding Register	03	Reads out the contents of the Holding Registers.

3.1.1.2.   Diagnostic functions

Function	Function code (decimal)	Description
Diagnostics	08	Reads diagnostic data. • 00 00 Loopback • 00 10 (0AHex) Clear Counters and Diagnostic Register • 00 11 (0BHex) Return Bus Message Count • 00 12 (0CHex) Return Bus Communication Error Count • 00 13 (0DHex) Return Bus Exception Error Count • 00 14 (0EHex) Return Slave Message Count • 00 15 (0FHex) Return Slave No Response Count • 00 16 (10Hex) Return Slave NAK Count • 00 17 (11Hex) Return Slave Busy Count • 00 18 (12Hex) Return Character Overrun Count
Report Slave ID	17	Reads the device-specific data from the slave. • Byte 1: Slave Address • Byte 2: 0x11 (Function Code) • Byte 3: Byte Count = 97 • Byte 4: 0x01 (Ident Code) • Byte 5: 0x00 = Not ready REMOTE, 0xFF = Ready REMOTE • from byte 6 (vendor, 18 bytes): AUMA Riester GmbH • from byte 24 (actuator controls order number, 18 bytes) • from byte 42 (firmware version, 13-byte ASCII string) • from byte 55 (device tag, 20-byte ASCII string) • from byte 75 (actuator controls serial number, 13-byte ASCII string) • from byte 88 (actuator controls serial number, 13-byte ASCII string)

3.1.2. Modbus function and pertaining offset addresses of actuator controls

Action	Permissible function/function code (decimal)	Permissible offset addresses (decimal)	Permissible offset addresses (hexadecimal)
Read or write process representation output data (master outputs)	Force Single Coil (05) Force Multiple Coils (15) Read Coil Status (01)	0 to 511	0x0000 to 0x01FF
	Preset Single Register (06) Preset Multiple Register (16) Read Holding Register (03)	1,000 to 1,031	0x03E8 to 0x0407
Read process representation input data (master inputs)	Read Input Status (02)	0 to 511	0x0000 to 0x01FF
	Read Input Register (04)	1,000 to 1,031	0x03E8 to 0x0407
	Read Holding Register (03)	1,032 to 1,063	0x0408 to 0x0427
Read or write parameters of actuator controls	Preset Multiple Register (16) Read Holding Register (03)	View Objects: 1,200 to 1,499 (refer to <Parameters>) Individual parameter requests from 2,000	0x04B0 to 0x05DB

3.1.3. Operation parameters of the actuator

Parameters and notes on the parametrisation of actuator controls via Modbus TCP/IP (Modbus function codes, offset addresses, parameter descriptions as well as the read/write access codes) are described in the appendix.

Functions to be used

Parameters of actuator controls can be written or read using the following functions:

- Preset Multiple Register (16)
- Read Holding Register (03)

4.   Description of the data interface

4.1.   Input data – signals

The master (actuator controls) can read the state of the slave (actuator) by means of the input data.

4.1.1.   Reading input data from the actuator using register functions

Function to be used: Read Input Register (04)

When using the Read Holding Register (03) function, an additional offset of 32 has to be addressed (1032 – 1063 or 0x0408 – 0x0472).

Grey bits are collective signals. They contain the results of a disjunction (OR operation) of other information.

Offset (hexadecimal)	Offset (decimal)	Register contents
0x03E8	1000	**Byte 1: Logical signals** — Bit 7: Fault, Bit 6: Warnings, Bit 5: Running CLOSE, Bit 4: Running OPEN, Bit 3: Not ready REMOTE, Bit 2: Setpoint reached, Bit 1: End p. CLOSED, Bit 0: End p. OPEN. **Byte 2: Actuator signals** — Bit 7: Torque sw. CLOSED, Bit 6: Torque sw. OPEN, Bit 5: Limit sw. CLOSED, Bit 4: Limit sw. OPEN, Bit 3: Selector sw. LOCAL, Bit 2: Sel. sw. REMOTE, Bit 1: Phase fault, Bit 0: Thermal fault
0x03E9	1001	Byte 3: Actual position high byte (position transmitter) Byte 4: Actual position low byte (position transmitter)
0x03EA	1002	**Byte 5: Device status** — Bit 7: Device ok, Bit 6: Failure, Bit 5: Function check, Bit 4: Out of specification, Bit 3: Maintenance required, Bit 2: Fault, Bit 1: Warnings, Bit 0: Not ready REMOTE. **Byte 6: Operation status** — Bit 7: Running LOCAL, Bit 6: Running REMOTE, Bit 5: Handwheel oper., Bit 4: Actuator running, Bit 3: MPV position reached, Bit 2: Start stepping mode, Bit 1: In intermed. position, Bit 0: Op. pause active
0x03EB	1003	**Byte 7: Intermediate positions** — Bit 7: Intermed. pos. 8, Bit 6: Intermed. pos. 7, Bit 5: Intermed. pos. 6, Bit 4: Intermed. pos. 5, Bit 3: Intermed. pos. 4, Bit 2: Intermed. pos. 3, Bit 1: Intermed. pos. 2, Bit 0: Intermed. pos. 1. **Byte 8: Discrete inputs** — Bit 7: Bluetooth connected, Bit 6: –, Bit 5: Input DIN 6, Bit 4: Input DIN 5, Bit 3: Input DIN 4, Bit 2: Input DIN 3, Bit 1: Input DIN 2, Bit 0: Input DIN 1
0x03EC	1004	Byte 9: Input AIN 1 (high byte) Byte 10: Input AIN 1 (low byte)
0x03ED	1005	Byte 11 Torque (high byte) Byte 12: Torque (low byte)

Offset (hexadecimal)	Offset (decimal)	Register contents
0x03EE	1006	*See Byte 13/14 below*
0x03EF	1007	*See Byte 15/16 below*
0x03F0	1008	*See Byte 17/18 below*
0x03F1	1009	*See Byte 19/20 below*
0x03F2	1010	Byte 21: Input AIN 2 (high byte) Byte 22: Input AIN 2 (low byte)
0x03F3	1011	*See Byte 23/24 below*

0x03EE / 1006

Byte 13: Not ready REMOTE 1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
I/O interface	FailState fieldbus	EMCY behav.act.	EMCY STOP act.	Local STOP	Interlock active	Sel. sw. not REMOTE	Incorrect op.cmd

Byte 14: Not ready REMOTE 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Handwheel active	Service active	PVST active	Interlock by-pass	Disabled	SIL function active	FQM Failsafe Active	FQM Failsafe Init

0x03EF / 1007

Byte 15: Fault 1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
No reaction	Internal error	Torque fault CLOSE	Torque fault OPEN	Phase failure	Thermal fault	Mains quality	Configuration error

Byte 16: Fault 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Incorrect phase seq	Config. error REMOTE	Incorrect dir. rotation	--	--	--	--	--

0x03F0 / 1008

Byte 17: Warnings 1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Wrn no reaction	SIL fault	Torque wrn OPEN	Torque wrn CLOSE	FQM fail safe fault	--	--	Maintenance required

Byte 18: Warnings 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Config. warning	RTC not set	RTC button cell	--	24 V DC external	--	--	Wrn controls temp.

0x03F1 / 1009

Byte 19: Warnings 3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Op. time warning	WrnOnTiRunning	WrnOnTiStarts	Internal warning	Wrn input AIN 1	Wrn input AIN 2	Wrn FOC	Wrn FO cable budget

Byte 20: Warnings 4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
PVST fault	PVST abort	Failure behav. active	Wrn FOC connection	PVST required	WrnSetpointPos	--	--

0x03F3 / 1011

Byte 23: Failure

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault	--	--	--	--	--	--	--

Byte 24: Maintenance required

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
--	--	--	Maintenance interval	Maintenance contactors	Maintenance lubricant	Maintenance seals	Maintenance mechanics

Offset (hexadecimal)	Offset (decimal)	Register contents
0x03F4	1012	Byte 25: Out of specification 1 / Byte 26: Out of specification 2 (see below)
0x03F5	1013	Byte 27: Out of specification 3 / Byte 28: Out of specification 4 (see below)
0x03F6	1014	Byte 29: Function check 1 / Byte 30: Function check 2 (see below)
0x03F7	1015	Byte 31: Status fieldbus / Byte 32: SIL signals (see below)
0x03F8 – 0x03FB	1016 – 1019	Byte 33 to byte 40: Reserve

0x03F4 / 1012

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 25: Out of specification 1	Wrn no reaction	SIL fault	Torque wrn OPEN	Torque wrn CLOSE	FQM fail safe fault	-	-	-
Byte 26: Out of specification 2	Config. warning	RTC not set	RTC button cell	-	24 V DC external	-	-	Wrn controls temp.

0x03F5 / 1013

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 27: Out of specification 3	Op. time warning	WrnOnTiRunning	WrnOnTiStarts	Internal warning	Wrn input AIN 1	Wrn input AIN 2	Wrn FOC	Wrn FO cable budget
Byte 28: Out of specification 4	PVST fault	PVST abort	Failure behav. active	Wrn FOC connection	PVST required	WrnSetpointPos	-	-

0x03F6 / 1014

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 29: Function check 1	-	-	PVST active	EMCY stop active	Handwheel active	Service active	Sel. sw. not REMOTE	Local STOP
Byte 30: Function check 2	-	-	-	-	-	-	-	-

0x03F7 / 1015

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 31: Status fieldbus	Channel 2 activity	Channel 1 activity	Ch. 2 FailState Fieldb.	Ch. 1 FailState Fieldb.	Channel 2 DataEx	Channel 1 DataEx	Channel 2 active	Channel 1 active
Byte 32: SIL signals	-	FQM fail safe fault	FQM Failsafe Init	FQM Failsafe Active	SIL function active	SIL fault	Safe STOP	Safe ESD

4.1.2.   Description of the input data

Byte 1: Logical signals

Bits 3, 6, and 7 are collective signals.

Bits 5 and 4 of the logical signals (byte1) indicate a logical operation of the actuator, i.e. they are set when the actuator has received the command to perform an electrical operation (also active when e.g. the actuator is in a stepping pause during stepping mode or waiting for the end of the dead time).

Table 1: Byte 1: Logical signals

Bit	Designation (process representation)	Value	Description
0	End position OPEN	1	For limit seating: Limit switch operated in direction OPEN For torque seating: Torque switch and limit switch operated in direction OPEN
		0	No signal
1	End position CLOSED	1	For limit seating: Limit switch operated in direction CLOSE For torque seating: Torque switch and limit switch operated in direction CLOSE
		0	No signal
2	Setpoint pos.reached	1	The setpoint is within max. error variable (outer dead band). Is only signalled if Modbus master has set the Fieldbus SETPOINT bit (process representation output).
		0	No signal
3	Not ready REMOTE	1	Collective signal 04: Contains the result of a disjunction (OR-operation) of all bits comprised in bytes 13 and 14 (Not ready REMOTE 1 and Not ready REMOTE 2). The actuator cannot be operated from REMOTE. The actuator can only be operated via the local controls.
		0	In bytes 13 and 14, no signals are active (all bits are set to 0).
4	Running OPEN	1	An operation command via the local controls push buttons or via fieldbus in direction OPEN is performed: Fieldbus OPEN or Fieldbus SETPOINT (process representation output). This bit remains also set during operation pauses (e.g. due to the dead time or the reversing prevention time).
		0	Operation in direction OPEN via fieldbus is not executed.
5	Running CLOSE	1	An operation command via the local controls push buttons or via fieldbus in direction CLOSE is performed: Fieldbus CLOSE or Fieldbus SETPOINT (process representation output). This bit remains also set during operation pauses (e.g. due to the dead time or the reversing prevention time).
		0	Operation in direction CLOSE via fieldbus is not executed.
6	Warning	1	Collective signal 02: Contains the result of a disjunction (OR-operation) of all bits of bytes 17 to 20 (Warning 1 to Warning 4).
		0	In bytes 17 and 20, no warnings are active (all bits are set to 0).
7	Fault	1	Collective signal 03: Contains the result of a disjunction (OR-operation) of all bits of bytes 15 and 16 (Fault 1 and Fault 2). The actuator cannot be operated.
		0	In bytes 15 and 16, no faults are active (all bits are set to 0).

Byte 2: Actuator signals

Table 2: Byte 2: Actuator signals

Bit	Designation (process representation)	Value	Description
0	Thermal fault	1	Motor protection tripped
		0	No signal
1	Phase fault	1	• When connecting to a 3-ph AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. • When connecting to a 3-ph or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.
		0	All phases are available.
2	Selector sw. REMOTE	1	Selector switch is in position REMOTE.
		0	Selector switch is not in position REMOTE.
3	Selector sw. LOCAL	1	Selector switch is in position LOCAL.
		0	Selector switch is not in position LOCAL.
4	Limit switch OPEN	1	Limit switch operated in direction OPEN
		0	No signal
5	Limit switch CLOSED	1	Limit switch operated in direction CLOSE
		0	No signal

Bit	Designation (process representation)	Value	Description
6	Torque sw. OPEN	1	Torque switch operated in direction OPEN.
		0	No signal
7	Torque sw. CLOSED	1	Torque switch operated in direction CLOSE.
		0	No signal

Bytes 3 and 4: Actual position

Byte 3 = high byte, byte 4 = low byte.

If a position transmitter (potentiometer, RWG, EWG, or MWG) is installed in the actuator, bytes 3 and 4 are used to transmit the current actuator position. The value is transmitted in per mil (value: 0 – 1,000).

Byte 5: Device status

Table 3: Byte 5: Device status

Bit	Designation (process representation)	Value	Description
0	Not ready REMOTE	1	Collective signal 04: Contains the result of a disjunction (OR-operation) of all bits comprised in bytes 13 and 14 (Not ready REMOTE 1 and Not ready REMOTE 2). The actuator cannot be operated from REMOTE. The actuator can only be operated via the local controls.
		0	In bytes 13 and 14, no signals are active (all bits are set to 0).
1	Warning	1	Collective signal 02: Contains the result of a disjunction (OR-operation) of all bits of bytes 17 to 20 (Warning 1 to Warning 4).
		0	In bytes 17 and 20, no warnings are active (all bits are set to 0).
2	Fault	1	Collective signal 03: Contains the result of a disjunction (OR-operation) of all bits of bytes 15 and 16 (Fault 1 and Fault 2). The actuator cannot be operated.
		0	In bytes 15 and 16, no faults are active (all bits are set to 0).
3	NAMUR mainten. req.	1	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance. Contains the result of a disjunction (OR-operation) of all bits of byte 24 (Maintenance required).
		0	In all bits of byte 24, no signals are active (all bits are set to 0).
4	NAMUR out of spec.	1	Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal operation conditions. Contains the result of a disjunction (OR-operation) of all bits of bytes 25 to 28 (Out of specification 1 to 4).
		0	In bytes 25 and 28, no signals are active (all bits are set to 0).
5	NAMUR funct. check	1	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid. Contains the result of a disjunction (OR-operation) of all bits of bytes 29 and 30 (Function check 1 and 2).
		0	In bytes 29 and 30, no signals are active (all bits are set to 0).
6	NAMUR failure	1	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid. Contains the result of a disjunction (OR-operation) of all bits of byte 23 (Failure).
		0	In all bits of byte 23, no signals are active (all bits are set to 0).
7	Device ok	1	Collective signal 05: The device is ready for remote control. No AUMA warnings, AUMA faults or signals according to NAMUR are present. Bit 7 is set if bits 0 to 6 are deleted.
		0	Contains the result of a disjunction (OR-operation) of bits 0 to 6 (device status).

Byte 6: Operation status

This byte stores information about actuator movement.

Table 4: Byte 6: Operation status

Bit	Designation (process representation)	Value	Description
0	Operation pause active	1	The actuator is in off-time (e.g. reversing prevention time).
		0	No signal
1	In intermediate pos.	1	The actuator is in an intermediate position e.g. neither in end position OPEN nor in end position CLOSED.
		0	No signal
2	Start stepping mode	1	The actuator is within the set stepping range.
		0	The actuator is outside the set stepping range.
3	—		No signal (reserved)
4	Actuator running	1	Actuator is running (output drive is moving) Hard wired collective signal consisting of signals: • (26) Running LOCAL • (27) Running REMOTE • (28) Handwheel oper.
		0	No signal
5	Handwheel oper.	1	Output drive rotates without electric operation command.
		0	No signal
6	Running REMOTE	1	Output drive rotates due to operation command from REMOTE.
		0	No signal
7	Running LOCAL	1	Output drive rotates due to operation command from LOCAL.
		0	No signal

Byte 7: Intermediate positions

Table 5: Byte 7: Intermediate positions

Bit	Designation (process representation)	Value	Description
0	Intermediate pos. 1	1	Intermediate position 1 reached
		0	No signal
1	Intermediate pos. 2	1	Intermediate position 2 reached
		0	No signal
2	Intermediate pos. 3	1	Intermediate position 3 reached
		0	No signal
3	Intermediate pos. 4	1	Intermediate position 4 reached
		0	No signal
4	Intermediate pos. 5	1	Intermediate position 5 reached
		0	No signal
5	Intermediate pos. 6	1	Intermediate position 6 reached
		0	No signal
6	Intermediate pos. 7	1	Intermediate position 7 reached
		0	No signal
7	Intermediate pos. 8	1	Intermediate position 8 reached
		0	No signal

Byte 8: Discrete inputs

Table 6: Byte 8: Discrete inputs

Bit	Designation (process representation)	Value	Description
0	Input DIN 1	1	A high signal (+24 V DC) is present at digital input 1.
		0	No signal
1	Input DIN 2	1	A high signal (+24 V DC) is present at digital input 2.
		0	No signal
2	Input DIN 3	1	A high signal (+24 V DC) is present at digital input 3.
		0	No signal
3	Input DIN 4	1	A high signal (+24 V DC) is present at digital input 4.
		0	No signal
4	Input DIN 5	1	A high signal (+24 V DC) is present at digital input 5.
		0	No signal
5	Input DIN 6	1	A high signal (+24 V DC) is present at digital input 6.
		0	No signal
6	—		No signal (reserved)
7	Bluetooth connected	1	The Bluetooth interface is connected.
		0	No signal

Bytes 9 and 10: Input AIN 1

Byte 9 = high byte, byte 10 = low byte.

Byte 9 and byte 10 transmit the value of the first additional free analogue current input of the Modbus interface. The start and end values can be set at the AC via push buttons and display. (For operation, please refer to the respective operation instructions for the actuator.)

If the measuring values are 0.3 mA below the initial value, a signal loss is indicated.

The value is transmitted in per mil (value: 0 – 1,000).

Bytes 11 and 12: Torque

Byte 11 = high byte, byte 12 = low byte.

Bytes 11 and 12 transmit the current torque of the actuator (only if an MWG is installed in the actuator).

The value transmitted is the current torque in percent or per mil of the nominal actuator torque.

The value is transmitted in per mil (value: 0 – 1,000).

- The value 1,000 corresponds to 127,0 % torque in direction OPEN.
- The value 500 is the torque zero point.
- The value 0 corresponds to 127,0 % torque in direction CLOSE.

Byte 13: Not ready REMOTE 1

Table 7: Byte 13: Not ready REMOTE 1

Bit	Designation (process representation)	Value	Description
0	Wrong oper. cmd	1	Wrong operation command Indicates that several operation commands were received simultaneously via Modbus (e.g. Remote OPEN and Remote CLOSE simultaneously or Remote CLOSE/Remote OPEN and Remote SETPOINT simultaneously) or that the max. value for a setpoint position has been exceeded (setpoint position > 1,000).
		0	Operation commands are ok.
1	Sel. sw. not REMOTE	1	Selector switch is in position **Local control** (LOCAL) or **0** (OFF).
		0	Selector switch is in position **Remote control** (REMOTE).

Bit	Designation (process representation)	Value	Description
2	Interlock active	1	Actuator is interlocked.
		0	No signal
3	Local STOP	1	Push button STOP of local controls is operated.
		0	No signal
4	EMCY stop active	1	Operation mode EMERGENCY stop is active (EMERGENCY stop button has been pressed).
		0	EMERGENCY stop button not pressed (normal operation).
5	EMCY behav. active	1	Operation mode EMERGENCY behaviour is active (EMERGENCY signal was sent).
		0	No signal
6	FailState fieldbus	1	No valid communication via fieldbus (despite available connection)
		0	Communication via fieldbus is ok.
7	I/O interface	1	The actuator is controlled via the I/O interface (parallel).
		0	The actuator is controlled via fieldbus.

Byte 14: Not ready REMOTE 2

Table 8: Byte 14: Not ready REMOTE 2

Bit	Designation (process representation)	Value	Description
0	FQM fail safe ini.		No signal
1	FQM fail safe act.		No signal.
2	SIL function active[1]	1	The safety function of the SIL module is active.
		0	No signal.
3	Disabled	1	Actuator is in operation mode Disabled..
		0	No signal
4	Interlock by-pass	1	By-pass of Interlock function is active.
		0	No signal
5	PVST active	1	Partial Valve Stroke Test (PVST) is active.
		0	No signal
6	Service active	1	Operation mode Service is active.
		0	No signal
7	Handwheel active	1	Manual operation is active (handwheel is engaged); optional indication
		0	No signal

1) The safety function indications via fieldbus are for information only and must not be used as part of a safety function. The I/O signals of the SIL module must be used for this purpose.

Byte 15: Fault 1

The fault signals contain the causes why the actuator cannot be operated.

Table 9: Byte 15: Fault 1

Bit	Designation (process representation)	Value	Description
0	Configuration error	1	Incorrect configuration, i.e. the current setting of the actuator controls is invalid.
		0	Configuration is ok.
1	Mains quality	1	Due to insufficient mains quality, the controls cannot detect the phase sequence (sequence of phase conductors L1, L2 and L3) within the pre-set time frame provided for monitoring.
		0	No signal
2	Thermal fault	1	Motor protection tripped
		0	No signal

Bit	Designation (process representation)	Value	Description
3	Phase fault	1	• When connecting to a 3-ph AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. • When connecting to a 3-ph or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.
		0	No signal
4	Torque fault OPEN	1	Torque fault in direction OPEN
		0	No signal
5	Torque fault CLOSE	1	Torque fault in direction CLOSE
		0	No signal
6	Internal error	1	Collective signal 14: Internal fault
		0	No internal fault
7	Wrn no reaction	1	No actuator reaction to operation commands within the set reaction time.
		0	No signal

Byte 16: Fault 2

The fault signals contain the causes why the actuator cannot be operated.

Table 10: Byte 16: Fault 2

Bit	Designation (process representation)	Value	Description
0	—		No signal (reserved)
1	—		No signal (reserved)
2	—		No signal (reserved)
3	—		No signal (reserved)
4	—		No signal (reserved)
5			No signal
6	Config. error REMOTE	1	Configuration error of REMOTE interface active.
		0	No signal.
7	Incorrect phase seq	1	The phase conductors L1, L2 and L3 are connected in the wrong sequence.
		0	Phase sequence is ok.

Byte 17: Warnings 1

The warning signals are for information only and do not interrupt or disable an operation (as opposed to faults).

Table 11: Byte 17: Warnings 1

Bit	Designation (process representation)	Value	Description
0	—		No signal (reserved)
1	—		No signal (reserved)
2	—		No signal (reserved)
3	FQM fail safe flt		No signal
4	Torque wrn CLOSE	1	Warning: Limit value for torque warning in direction CLOSE exceeded.
		0	No signal
5	Torque wrn OPEN	1	Warning: Limit value for torque warning in direction OPEN exceeded.
		0	No signal

Bit	Designation (process representation)	Value	Description
6	SIL fault[1]	1	Warning: A SIL fault of the SIL module has occurred.
		0	No signal
7	Wrn no reaction	1	Warning: No actuator reaction to operation commands within the set reaction time.
		0	No signal

1) The safety function indications via fieldbus are for information only and must not be used as part of a safety function. The I/O signals of the SIL module must be used for this purpose.

Byte 18: Warnings 2

Table 12: Byte 18: Warnings 2

Bit	Designation (process representation)	Value	Description
0	Wrn controls temp.	1	Warning: Temperature within controls housing too high
		0	No signal
1	—		No signal (reserved)
2	—		No signal (reserved)
3	24 V DC external	1	The external 24 V AC voltage supply of the controls has exceeded the power supply limits.
		0	No signal
4	—		No signal (reserved)
5	RTC voltage	1	Warning: The voltage of the RTC button cell is too low.
		0	No signal
6	Time not set	1	The real time clock has not yet been set on the basis of valid values.
		0	No signal
7	Config. warning	1	Warning: Configuration setting is incorrect. The device can still be operated with restrictions.
		0	No signal

Byte 19: Warnings 3

Table 13: Byte 19: Warnings 3

Bit	Designation (process representation)	Value	Description
0	Wrn FO cable budget	1	Warning: FO cable system reserve reached (critical or permissible Rx receive level)
		0	No signal
1	Wrn FOC	1	Warning: Optical receiving signal (channel 1) incorrect (no or insufficient Rx receive level) or RS-485 format error (incorrect bit(s))
		0	No signal
2	Wrn input AIN 2	1	Warning: Loss of signal analogue input 2
		0	No signal
3	Wrn input AIN 1	1	Warning: Loss of signal analogue input 1
		0	No signal
4	Internal warning	1	Collective signal 15: Internal warning
		0	No internal warning
5	Wrn op.mode starts	1	Warning: Max. number of motor starts (starts) exceeded
		0	No signal
6	Wrn op.mode run time	1	Warning: Max. running time/h exceeded
		0	No signal
7	Op. time warning	1	Warning: Max. permissible operating time for an operation (OPEN-CLOSE) exceeded
		0	No signal

Byte 20: Warnings 4

Table 14: Byte 20: Warnings 4

Bit	Designation (process representation)	Value	Description
0	—		No signal (reserved)
1	—		No signal (reserved)
2	Wrn setpoint position	1	Warning: Loss of signal of actuator setpoint position
		0	No signal
3	PVST required	1	Warning: A Partial Valve Stroke Test (PVST) should be performed.
		0	No signal
4	Wrn FOC connection	1	Warning: FO cable connection not available.
		0	No signal
5	Failure behav. active	1	The failure behaviour is active.
		0	No signal
6	PVST abort	1	Partial Valve Stroke Test (PVST) was aborted or could not be started. Remedy: Perform RESET or restart PVST.
		0	No signal
7	PVST fault	1	Partial Valve Stroke Test (PVST) could not be successfully completed.
		0	No signal

Bytes 21 and 22: Input AIN 2

Byte 21 = high byte, byte 22 = low byte.

Byte 9 and 10 transmit the value of the second additional free analogue current input of the Modbus interface. The start and end values can be set at the AC via push buttons and display. (For operation, please refer to the respective operation instructions for the actuator.)

If the measuring values are 0.3 mA below the initial value, a signal loss is indicated.

The value is transmitted in per mil (value: 0 – 1,000).

Byte 23: Failure

Causes of the Failure signal in accordance with NAMUR recommendation NE 107.

Table 15: Byte 23: Failure

Bit	Designation (process representation)	Value	Description
0	—		No signal (reserved)
1	—		No signal (reserved)
2	—		No signal (reserved)
3	—		No signal (reserved)
4	—		No signal (reserved)
5	—		No signal (reserved)
6	—		No signal (reserved)
7	Fault	1	Collective signal 03: Contains the result of a disjunction (OR-operation) of all bits of bytes 15 and 16 (Fault 1 and Fault 2). The actuator cannot be operated.
		0	In bytes 15 and 16, no faults are active (all bits are set to 0).

Byte 24: Maintenance required

Causes of the Maintenance required signal in accordance with NAMUR recommendation NE 107.

Table 16: Byte 24: Maintenance required

Bit	Designation (process representation)	Value	Description
0	Mainten. mechanics	1	Mechanic maintenance requirement
		0	No signal
1	Mainten. seals	1	Seal maintenance requirement
		0	No signal
2	Mainten. lubricant	1	Lubricant maintenance requirement
		0	No signal
3	Mainten. contactors	1	Contactor maintenance requirement
		0	No signal
4	Mainten. interval	1	The set maintenance interval has expired.
		0	No signal
5	—		No signal (reserved)
6	—		No signal (reserved)
7	—		No signal (reserved)

Byte 25: Out of specification 1

Causes of the Out of specification signal in accordance with NAMUR recommendation NE 107.

Table 17: Byte 25: Out of specification 1

Bit	Designation (process representation)	Value	Description
0	—		No signal (reserved)
1	—		No signal (reserved)
2	—		No signal (reserved)
3	FQM fail safe flt		No signal
4	Torque wrn CLOSE	1	Warning: Limit value for torque warning in direction CLOSE exceeded.
		0	No signal
5	Torque wrn OPEN	1	Warning: Limit value for torque warning in direction OPEN exceeded.
		0	No signal
6	SIL fault[1]	1	Warning: A SIL fault of the SIL module has occurred.
		0	No signal
7	Wrn no reaction	1	Warning: No actuator reaction to operation commands within the set reaction time.
		0	No signal

1) The safety function indications via fieldbus are for information only and must not be used as part of a safety function. The I/O signals of the SIL module must be used for this purpose.

Byte 26: Out of specification 2

Table 18: Byte 26: Out of specification 2

Bit	Designation (process representation)	Value	Description
0	Wrn controls temp.	1	Warning: Temperature within controls housing too high
		0	No signal
1	—		No signal (reserved)
2	—		No signal (reserved)
3	24 V DC external	1	The external 24 V AC voltage supply of the controls has exceeded the power supply limits.
		0	No signal
4	—		No signal (reserved)
5	RTC voltage	1	Warning: The voltage of the RTC button cell is too low.
		0	No signal

Bit	Designation (process representation)	Value	Description
6	Time not set	1	The real time clock has not yet been set on the basis of valid values.
		0	No signal
7	Config. warning	1	Warning: Configuration setting is incorrect. The device can still be operated with restrictions.
		0	No signal

Byte 27: Out of specification 3

Table 19: Byte 27: Out of specification 3

Bit	Designation (process representation)	Value	Description
0	Wrn FO cable budget	1	Warning: FO cable system reserve reached (critical or permissible Rx receive level)
		0	No signal
1	Wrn FOC	1	Warning: Optical receiving signal (channel 1) incorrect (no or insufficient Rx receive level) or RS-485 format error (incorrect bit(s))
		0	No signal
2	Wrn input AIN 2	1	Warning: Loss of signal analogue input 2
		0	No signal
3	Wrn input AIN 1	1	Warning: Loss of signal analogue input 1
		0	No signal
4	Internal warning	1	Collective signal 15: Internal warning
		0	No internal warning
5	Wrn op.mode starts	1	Warning: Max. number of motor starts (starts) exceeded
		0	No signal
6	Wrn op.mode run time	1	Warning: Max. running time/h exceeded
		0	No signal
7	Op. time warning	1	Warning: Max. permissible operating time for an operation (OPEN-CLOSE) exceeded
		0	No signal

Byte 28: Out of specification 4

Table 20: Byte 28: Out of specification 4

Bit	Designation (process representation)	Value	Description
0	—		No signal (reserved)
1	—		No signal (reserved)
2	Wrn setpoint position	1	Warning: Loss of signal of actuator setpoint position
		0	No signal
3	PVST required	1	Warning: A Partial Valve Stroke Test (PVST) should be performed.
		0	No signal
4	Wrn FOC connection	1	Warning: FO cable connection not available.
		0	No signal
5	Failure behav. active	1	The failure behaviour is active.
		0	No signal
6	PVST abort	1	Partial Valve Stroke Test (PVST) was aborted or could not be started. Remedy: Perform RESET or restart PVST.
		0	No signal
7	PVST fault	1	Partial Valve Stroke Test (PVST) could not be successfully completed.
		0	No signal

Byte 29: Function check 1

Causes of the Function check signal in accordance with NAMUR recommendation NE 107.

Table 21: Byte 29: Function check 1

Bit	Designation (process representation)	Value	Description
0	Local STOP	1	Push button STOP of the local controls is operated.
		0	No signal
1	Sel. sw. not REMOTE	1	Selector switch is in position Local control (LOCAL) or 0 (OFF).
		0	Selector switch is in position Remote control (REMOTE).
2	Service active	1	Operation mode Service is active.
		0	No signal
3	Handwheel active	1	Manual operation is active (handwheel is engaged); optional indication
		0	No signal
4	EMCY stop active	1	Operation mode EMERGENCY stop is active (EMERGENCY stop button has been pressed).
		0	EMERGENCY stop button not pressed (normal operation).
5	PVST active	1	Partial Valve Stroke Test function (PVST) is active.
		0	No signal
6	—		No signal (reserved)
7	—		No signal (reserved)

Byte 30: Function check 2

The contents are reserved for further Function check signals in accordance with NAMUR recommendation NE 107.

Byte 31: Fieldbus status

Information on the fieldbus status.

Table 22: Byte 31: Status Feldbus

Bit	Designation (process representation)	Value	Description
0	Channel 1 active	1	Channel 1 is the active operation command channel.
		0	No signal
1	Channel 2 active	1	Channel 2 is the active operation command channel.
		0	No signal
2	Channel 1 DataEx	1	Channel 1 is in the data exchange state.
		0	No signal
3	Channel 2 DataEx	1	Channel 2 is in the data exchange state.
		0	No signal
4	Ch.1 FailState Fieldb.	1	No valid fieldbus communication via channel 1 (application does not communicate with the DCS).
		0	No signal
5	Ch.2 FailState Fieldb.	1	No valid fieldbus communication via channel 2 (application does not communicate with the DCS).
		0	No signal
6	Channel 1 activity	1	Bus communication available on channel 1.
		0	No signal
7	Channel 2 activity	1	Bus communication available on channel 2.
		0	No signal

Byte 32: SIL indications

Detailed information of an optional SIL module.

Table 23: Byte 32: SIL indications

Bit	Designation (process representation)	Value	Description
0	Safe ESD[1]	1	Safe ESD (Emergency Shut Down) safety function of the SIL module is active.
		0	No signal
1	Safe Stop[1]	1	Safe STOP safety function of the SIL module is active.
		0	No signal
2	SIL fault[1]	1	Collective signal Warning: A SIL fault of the SIL module has occurred.
		0	No signal
3	SIL function active[1]	1	A safety function of the SIL module is active.
		0	No signal
4	—		No signal (reserved)
5	—		No signal (reserved)
6	—		No signal (reserved)
7	—		No signal (reserved)

[1] The safety function indications via fieldbus are for information only and must not be used as part of a safety function. The I/O signals of the SIL module must be used for this purpose.

Byte 33 to byte 40: Reserve

The contents are reserved for future extensions.

4.1.3. Reading the feedback signals from the actuator using status functions

Function to be used: Read Input Status (02)

Offset (hexadecimal)	Offset (decimal)	Contents (for details refer to <Description of the input data>)
0x0000	0	End position OPEN (byte 1)
0x0001	1	End position CLOSED (byte 1)
0x0002	2	Setpoint pos.reached (byte 1)
0x0003	3	Not ready REMOTE (byte 1, collective signal 04)
0x0004	4	Running OPEN (byte 1)
0x0005	5	Running CLOSE (byte 1)
0x0006	6	Warning (byte 1, collective signal 02)
0x0007	7	Fault (byte 1, collective signal 03)
0x0008	8	Thermal fault (byte 2)
0x0009	9	Phase fault (Byte 2)
0x000A	10	Selector sw. REMOTE (byte 2)
0x000B	11	Selector sw. LOCAL (byte 2)
0x000C	12	Limit switch OPEN (byte 2)
0x000D	13	Limit switch CLOSED (byte 2)
0x000E	14	Torque sw. OPEN (byte 2)
0x000F	15	Torque sw. CLOSED (byte 2)
0x0010 - 0x0017	16 to 23	Actual position high byte (position transmitter) – (byte 3)
0x0018 – 0x001F	24 to 31	Actual position low byte (position transmitter) – (byte 4)
0x0020	32	Not ready REMOTE (byte 5, collective signal 04)
0x0021	33	Warning (byte 5, collective signal 02)
0x0022	34	Fault (byte 5, collective signal 03)
0x0023	35	NAMUR mainten. req. (byte 5, collective signal 09)
0x0024	36	NAMUR out of spec. (byte 5, collective signal 07)
0x0025	37	NAMUR funct. check (byte 5, collective signal 08)
0x0026	38	NAMUR failure (byte 5, collective signal 10)
0x0027	39	Device ok (byte 5, collective signal 05)

Offset (hexa-decimal)	Offset (decimal)	Contents (for details refer to <Description of the input data>)
0x0028	40	Operation pause active (byte 6)
0x0029	41	In intermediate pos. (byte 6)
0x002A	42	Start stepping mode (byte 6)
0x002B	43	—
0x002C	44	Actuator running (byte 6)
0x002D	45	Handwheel oper. (byte 6)
0x002E	46	Running REMOTE (byte 6)
0x002F	47	Running LOCAL (byte 6)
0x0030	48	Intermediate pos. 1 (byte 7)
0x0031	49	Intermediate pos. 2 (byte 7)
0x0032	50	Intermediate pos. 3 (byte 7)
0x0033	51	Intermediate pos. 4 (byte 7)
0x0034	52	Intermediate pos. 5 (byte 7)
0x0035	53	Intermediate pos. 6 (byte 7)
0x0036	54	Intermediate pos. 7 (byte 7)
0x0037	55	Intermediate pos. 8 (byte 7)
0x0038	56	Input DIN 1 (byte 8)
0x0039	57	Input DIN 2 (byte 8)
0x003A	58	Input DIN 3 (byte 8)
0x003B	59	Input DIN 4 (byte 8)
0x003C	60	Input DIN 5 (byte 8)
0x003D	61	Input DIN 6 (byte 8)
0x003E	62	—
0x003F	63	—
0x0040 – 0x0047	64 – 71	Input AIN1 (high-byte) – (byte 9)
0x0048 – 0x004F	72 – 79	Input AIN1 (low-byte) – (byte 10)
0x0050 - 0x0057	80 – 87	Torque (high byte) – (byte 11)
0x0058 – 0x005F	88 – 95	Torque (low byte) – (byte 12)
0x0060	96	Wrong oper. cmd (byte 13)
0x0061	97	Sel. sw. not REMOTE (byte 13)
0x0062	98	Interlock active (byte 13)
0x0063	99	Local STOP (byte 13)
0x0064	100	EMCY stop active (byte 13)
0x0065	101	EMCY behav. active (byte 13)
0x0066	102	FailState fieldbus (byte 13)
0x0067	103	I/O interface (byte 13)
0x0068	104	—
0x0069	105	—
0x006A	106	SIL function active (byte 14)
0x006B	107	Disabled (byte 14)
0x006C	108	Interlock by-pass (byte 14)
0x006D	109	PVST active (byte 14)
0x006E	110	Service active (byte 14)
0x006F	111	Handwheel active (byte 14)
0x0070	112	Configuration error (byte 15)
0x0071	113	Mains quality (byte 15)
0x0072	114	Thermal fault (byte 15)
0x0073	115	Phase fault (byte 15)
0x0074	116	Torque fault OPEN (byte 15)
0x0075	117	Torque fault CLOSE (byte 15)
0x0076	118	Internal error (byte 15)

Offset (hexa-decimal)	Offset (decimal)	Contents (for details refer to <Description of the input data>)
0x0077	119	Wrn no reaction (byte 15)
0x0078	120	— (reserved for further fault signals)
0x0079	121	— (reserved for further fault signals)
0x007A	122	— (reserved for further fault signals)
0x007B	123	— (reserved for further fault signals)
0x007C	124	— (reserved for further fault signals)
0x007D	125	— (reserved for further fault signals)
0x007E	126	Config. error REMOTE (byte 16)
0x007F	127	Incorrect phase seq (byte 16)
0x0080 – 0x0083	128 – 131	— (reserved for further warnings)
0x0084	132	Torque wrn CLOSE (byte 17)
0x0085	133	Torque wrn OPEN (byte 17)
0x0086	134	SIL fault (byte 17)
0x0087	135	Wrn no reaction (Byte 17)
0x0088	136	Wrn controls temp. (byte 18)
0x0089	137	— (reserved for further warnings)
0x008A	138	— (reserved for further warnings)
0x008B	139	24 V DC external (byte 18)
0x008C	140	— (reserved for further warnings)
0x008D	141	RTC voltage (byte 18)
0x008E	142	Time not set (byte 18)
0x008F	143	Config. warning (byte 18)
0x0090	144	Wrn FO cable budget (byte 19)
0x0091	145	Wrn FOC (byte 19)
0x0092	146	Wrn input AIN 2 (byte 19)
0x0093	147	Wrn input AIN 1 (byte 19)
0x0094	148	Internal warning (Byte 19)
0x0095	149	Wrn op.mode starts (Byte 19)
0x0096	150	Wrn op.mode run time (Byte 19)
0x0097	151	Op. time warning (Byte 19)
0x0098	152	—
0x0099	153	—
0x009A	154	Wrn setpoint position (byte 20)
0x009B	155	PVST required (byte 20)
0x009C	156	Wrn FOC connection (byte 20)
0x009D	157	Failure behav. active (byte 20)
0x009E	158	PVST abort (byte 20)
0x009F	159	PVST fault (byte 20)
0x00A0 - 0x00A7	160 – 167	Input AIN2 (high-byte) – (byte 21)
0x00A8 – 0x00AF	168 – 175	Input AIN2 (low-byte) – (byte 22)
0x00B0 – 0x00B6	176 – 182	— (reserved for further Failure signals in accordance with NAMUR recommendation NE 107)
0x00B7	183	Fault (byte 23)
0x00B8	184	Mainten. mechanics
0x00B9	185	Mainten. seals
0x00BA	186	Mainten. lubricant
0x00BB	187	Mainten. contactors
0x00BC	188	Mainten. interval
0x00BD	189	— (reserved for further Maintenance required signals in accordance with NAMUR recommendation NE 107)
0x00BE	190	— (reserved for further Maintenance required signals in accordance with NAMUR recommendation NE 107)

Offset (hexa-decimal)	Offset (decimal)	Contents (for details refer to <Description of the input data>)
0x00BF	191	— (reserved for further Maintenance required signals in accordance with NAMUR recommendation NE 107)
0x00C0 – 0x00C3	192 – 195	— (reserved for further warnings)
0x00C4	196	Torque wrn CLOSE (byte 25)
0x00C5	197	Torque wrn OPEN (byte 25)
0x00C6	198	SIL fault (byte 25)[1]
0x00C7	199	Wrn no reaction (byte 25)
0x00C8	200	Wrn controls temp. (byte 26)
0x00C9	201	— (reserved for further Out of specification signals in accordance with NAMUR recommendation NE 107)
0x00CA	202	— (reserved for further Out of specification signals in accordance with NAMUR recommendation NE 107)
0x00CB	203	24 V DC external (byte 26)
0x00CC	204	— (reserved for further Out of specification signals in accordance with NAMUR recommendation NE 107)
0x00CD	205	RTC voltage (byte 26)
0x00CE	206	Time not set (Byte 26)
0x00CF	207	Config. warning (Byte 26)
0x00D0	208	Wrn FO cable budget (byte 27)
0x00D1	209	Wrn FOC (byte 27)
0x00D2	210	Wrn input AIN 2 (byte 27)
0x00D3	211	Wrn input AIN 1 (byte 27)
0x00D4	212	Internal warning (byte 27)
0x00D5	213	Wrn op.mode starts (byte 27)
0x00D6	214	Wrn op.mode run time (byte 27)
0x00D7	215	Op. time warning (byte 27)
0x00D8	216	— (reserved for further Function check signals in accordance with NAMUR recommendation NE 107)
0x00D9	217	— (reserved for further Function check signals in accordance with NAMUR recommendation NE 107)
0x00DA	218	Wrn setpoint position (byte 28)
0x00DB	219	PVST required (byte 28)
0x00DC	220	Wrn FOC connection (byte 28)
0x00DD	221	Failure behav. active (byte 28)
0x00DE	222	PVST abort (byte 28)
0x00DF	223	PVST fault (byte 28)
0x00E0	224	Local STOP (Byte 29)
0x00E1	225	Sel. sw. not REMOTE (byte 29)
0x00E2	226	Service active (byte 29)
0x00E3	227	Handwheel active (byte 29)
0x00E4	228	EMCY stop active (byte 29)
0x00E5	229	PVST active (byte 29)
0x00E6	230	— (reserved for further Function check signals in accordance with NAMUR recommendation NE 107)
0x00E7	231	— (reserved for further Function check signals in accordance with NAMUR recommendation NE 107)
0x00E8 – 0x00EF	232 – 239	— (reserved for further Function check signals in accordance with NAMUR recommendation NE 107)
0x00F0	240	Channel 1 active (byte 31)
0x00F1	241	Channel 2 active (byte 31)
0x00F2	242	Channel 1 DataEx (byte 31)
0x00F3	243	Channel 2 DataEx (byte 31)
0x00F4	244	Ch.1 FailState Fieldb. (byte 31)

Offset (hexa-decimal)	Offset (decimal)	Contents (for details refer to <Description of the input data>)
0x00F5	245	Ch.2 FailState Fieldb. (byte 31)
0x00F6	246	Channel 1 activity (byte 31)
0x00F7	247	Channel 2 activity (byte 31)
0x00F8	248	Safe ESD (byte 32)[1]
0x00F9	249	Safe Stop (byte 32)[1]
0x00FA	250	SIL fault (byte 32)[1]
0x00FB	251	SIL function active (byte 32)[1]
0x00FC – 0x0147	252 – 327	Reserve

[1]   The safety function indications via fieldbus are for information only and must not be used as part of
       a safety function. The I/O signals of the SIL module must be used for this purpose.

4.2.   Output data – operation commands

The master (actuator controls) can control the slave (actuator) via the process
representation output.

4.2.1.   Transmitting or reading out operation commands from the actuator using register functions

Information   To perform remote operations, the selector switch must be in position **Remote
control** (REMOTE).

Functions to be used:

- Preset Single Register (06)
- Preset Multiple Register (16)
- Read Holding Register (03)

Offset (hexadecimal)	Offset (decimal)	Register contents
0x03E8	1000	Byte 1: Commands — Bit 7, Bit 6, Bit 5, Bit 4: Fieldbus STOP, Bit 3: Fieldbus RESET, Bit 2: Fieldbus SETPOINT, Bit 1: Fieldbus CLOSE, Bit 0: Fieldbus OPEN. Byte 2: Speed - Setpoint — Fieldbus Speed - Setpoint
0x03E9	1001	Byte 3: setpoint position /(process setpoint, option) High byte Byte 4: setpoint position /(process setpoint), option Low byte
0x03EA	1002	Byte 5: Additional commands — Bit 7: PVST, Bit 6: Fieldbus EMCY, Bit 5: Fieldbus channel 2, Bit 4: Fieldbus channel 1, Bit 3: Bluetooth activation, Bit 2: Fieldb. enable CLOSE, Bit 1: Fieldb. enable OPEN, Bit 0: Fieldb. enable LOCAL. Byte 6: Intermediate positions — Bit 7: Fieldb. interm.pos 8, Bit 6: Fieldb. interm.pos 7, Bit 5: Fieldb. interm.pos 6, Bit 4: Fieldb. interm.pos 5, Bit 3: Fieldb. interm.pos 4, Bit 2: Fieldb. interm.pos 3, Bit 1: Fieldb. interm.pos 2, Bit 0: Fieldb. interm.pos 1
0x03EB	1003	Byte 7: Digital outputs 1 — Bit 7, Bit 6, Bit 5, Bit 4, Bit 3: reserved, Bit 2: reserved, Bit 1: reserved, Bit 0: reserved. Byte 8: Digital outputs 2 — Bit 7: reserved, Bit 6: reserved, Bit 5: Fieldbus DOUT 6, Bit 4: Fieldbus DOUT 5, Bit 3: Fieldbus DOUT 4, Bit 2: Fieldbus DOUT 3, Bit 1: Fieldbus DOUT 2, Bit 0: Fieldbus DOUT 1
0x03EC	1004	Byte 9: Actual process value (high byte) – option Byte 10: Actual process value (low byte) – option
0x03ED	1005	Byte 11 Output AOUT 1 (high byte) Byte 12: Output AOUT 1 (Low-Byte)
0x03EE	1006	Byte 13 Output AOUT 2 (high byte) Byte 14: Output AOUT 2 (low byte)
0x03EF – 0x03F4	1007 – 1012	Byte 15 to byte 26: Reserve

4.2.2. Description of the output data

Byte 1: Commands

Table 24: Byte 1: Commands

Bit	Designation (process representation)	Value	Description
0	Fieldbus OPEN	1	Operation command in direction OPEN
		0	No command
1	Fieldbus CLOSE	1	Operation command in direction CLOSE
		0	No command

Bit	Designation (process representation)	Value	Description
2	Fieldbus SETPOINT	1	Run to setpoint Setpoint is provided via bytes 3 and 4. In combination with a proces controller, this bit is used to change-over between process controller mode and OPEN-CLOSE control.
		0	No command
3	Fieldbus RESET	1	Certain indications of the actuator controls can be reset using this command in selector switch position **Remote control** (REMOTE) via fieldbus (e.g. PTC tripping device and torque fault). The function of this bit corresponds to the push button **RESET** at the local controls.
		0	No command
4	Not used		Fieldbus STOP.
5	—		No command (reserved)
6	—		No command (reserved)
7	—		No command (reserved)

Bits 0, 1, 2 = operation commands

Bits 0 – 2 are used to transmit operation commands to the actuator. Only one of these bits may be set to 1 at any given time. If several bits are set, no operation is performed and the following signal is given: Wrong oper. cmd

For operation commands via bit 2 (Fieldbus SETPOINT):

- Condition: Position transmitter (potentiometer, RWG, EWG or MWG) installed in the actuator
- If the setpoint is 0 per mil, the actuators runs to the end position CLOSED; it runs to the end position OPEN for 1000 per mil.
- If the limit of 1,000 is exceeded, the actuator completely runs to end position OPEN.
- To avoid placing too much strain on the mechanics, the reversing of direction is delayed. The default setting in the factory for the reversing prevention time is 300 ms.

Bits 4, 5, 6 , 7

Bits 4 through 7 are not used and must be set to 0.

Byte 2: Fieldbus speed setpoint

Byte 2 - Fieldbus speed setpoint in % (value range 0 – 100)

Bytes 3 and 4: setpoint position /(process setpoint, option)

Byte 3 = high byte, byte 4 = low byte.

The setpoint position is transmitted via bytes 3 and 4 (value: 0 – 1,000), using the position controller.

- The value 1,000 corresponds to the maximum setpoint, e.g. end position OPEN.
- The value 0 corresponds to the minimum setpoint, e.g. end position CLOSED.

As an alternative, the process setpoint can be transmitted via bytes 3 and 4 (value 0... 1,000), using a process controller (option). Value 1,000 corresponds to the maximum process setpoint, value 0 to the minimum process setpoint.

Byte 5: Additional commands

Table 25: Byte 5: Additional commands

Bit	Designation (process representation)	Value	Description
0	Fieldb. enable LOCAL	1	Actuator operation via local controls enabled
		0	Actuator operation via local controls disabled
1	Fieldb. enable OPEN	1	Enabling operation command in direction OPEN
		0	Operation command in direction OPEN disabled.
2	Fieldb. enable CLOSE	1	Enabling operation command in direction CLOSE
		0	Operation command in direction CLOSE disabled.
3	BluetoothActivDigIn	1	Activation of Bluetooth interface.
		0	Activation of Bluetooth interface disabled.
4	Fieldbus channel 1	1	Initiate change-over to channel 1
		0	No operation command
5	Fieldbus channel 2	1	Initiate change-over to channel 2
		0	No operation command
6	Fieldbus EMCY	1	EMERGENCY signal, triggers EMERGENCY behaviour.
		0	No command
7	PVST	1	Start Partial Valve Stroke Test (functional test)
		0	No operation command

Byte 6: Intermediate positions

Byte 6 is used for coding operation commands. Thus, 8 intermediate positions can be directly selected via fieldbus commands. Hereby, the selected intermediate position is approached directly, without stopping in another intermediate position.

In this case, the actuator continues running until the selected intermediate position has been reached. Example: Operation from position 5 to 7 without stopping at position 6.

Table 26: Byte 6: Operation commands for intermediate positions

Value	Behaviour
0x01	Position 1 is approached selecting the shortest path
0x02	Position 2 is approached selecting the shortest path
0x04	Position 3 is approached selecting the shortest path
0x08	Position 4 is approached selecting the shortest path
0x10	Position 5 is approached selecting the shortest path
0x20	Position 6 is approached selecting the shortest path
0x40	Position 7 is approached selecting the shortest path
0x80	Position 8 is approached selecting the shortest path

For further information, please refer to the Manual (Operation and setting) of AC 01.2 actuator controls Modbus.

If the multiport valve function is active (option), the entire byte 6 is used for coding of multiport valve operation commands. Up to 12 positions can either be approached selecting the shortest path, in clockwise direction (CW), or in counterclockwise direction (CCW). Furthermore, the actuator can also be operated without any position indications (CW or CCW).

Table 27: Operation commands via byte 6 for activated multiport valve function

Value	≙ Operation direction/position	Behaviour
0x01	Position 1	Position 1 is approached selecting the shortest path
0x02	Position 2	Position 2 is approached selecting the shortest path
0x04	Position 3	Position 3 is approached selecting the shortest path
0x08	Position 4	Position 4 is approached selecting the shortest path
0x10	Position 5	Position 5 is approached selecting the shortest path
0x20	Position 6	Position 6 is approached selecting the shortest path
0x40	Position 7	Position 7 is approached selecting the shortest path
0x80	Position 8	Position 8 is approached selecting the shortest path
0x81	Position 9	Position 9 is approached selecting the shortest path
0x82	Position 10	Position 10 is approached selecting the shortest path
0x83	Position 11	Position 11 is approached selecting the shortest path
0x84	Position 12	Position 12 is approached selecting the shortest path
0x90	CW	Actuator operates in clockwise direction (without stop at any position)
0x91	CW Position 1	Position 1 is approached in clockwise direction (CW).
0x92	CW Position 2	Position 2 is approached in clockwise direction (CW).
0x93	CW Position 3	Position 3 is approached in clockwise direction (CW).
0x94	CW Position 4	Position 4 is approached in clockwise direction (CW).
0x95	CW Position 5	Position 5 is approached in clockwise direction (CW).
0x96	CW Position 6	Position 6 is approached in clockwise direction (CW).
0x97	CW Position 7	Position 7 is approached in clockwise direction (CW).
0x98	CW Position 8	Position 8 is approached in clockwise direction (CW).
0x99	CW Position 9	Position 9 is approached in clockwise direction (CW).
0x9A	CW Position 10	Position 10 is approached in clockwise direction (CW).
0x9B	CW Position 11	Position 11 is approached in clockwise direction (CW).
0x9C	CW Position 12	Position 12 is approached in clockwise direction (CW).
0xA0	CCW	Actuator operation in counterclockwise direction (without stop at any position)
0xA1	CCW Position 1	Position 1 is approached in counterclockwise direction (CCW).
0xA2	CCW Position 2	Position 2 is approached in counterclockwise direction (CCW).
0xA3	CCW Position 3	Position 3 is approached in counterclockwise direction (CCW).
0xA4	CCW Position 4	Position 4 is approached in counterclockwise direction (CCW).
0xA5	CCW Position 5	Position 5 is approached in counterclockwise direction (CCW).
0xA6	CCW Position 6	Position 6 is approached in counterclockwise direction (CCW).

Value	≙ Operation direction/position	Behaviour
0xA7	CCW Position 7	Position 7 is approached in counterclockwise direction (CCW).
0xA8	CCW Position 8	Position 8 is approached in counterclockwise direction (CCW).
0xA9	CCW Position 9	Position 9 is approached in counterclockwise direction (CCW).
0xAA	CCW Position 10	Position 10 is approached in counterclockwise direction (CCW).
0xAB	CCW Position 11	Position 11 is approached in counterclockwise direction (CCW).
0xAC	CCW Position 12	Position 12 is approached in counterclockwise direction (CCW).

Byte 7: Digital outputs 1

The digital outputs Fieldbus DOUT 1 – DOUT 6 of the fieldbus interface can be used as commands for the output contact. For this, the outputs of the output contacts have to be assigned with the signals Fieldbus DOUT 1 – Fieldbus DOUT 6.

Table 28: Byte 7: Digital outputs 1

Bit	Designation (process representation)	Value	Description
0	—		No command (reserved)
1	—		No command (reserved)
2	—		No command (reserved)
3	—		No command (reserved)
4	—		No command (reserved)
5	—		No command (reserved)
6	—		No command (reserved)
7	—		No command (reserved)

Byte 8: Digital outputs 2

Table 29: Byte 8: Digital outputs 2

Bit	Designation (process representation)	Value	Description
0	Fieldbus DOUT 1	1	Digital output 1 is activated.
		0	Output is deactivated.
1	Fieldbus DOUT 2	1	Digital output 2 is activated.
		0	Output is deactivated.
2	Fieldbus DOUT 3	1	Digital output 3 is activated.
		0	Output is deactivated.
3	Fieldbus DOUT 4	1	Digital output 4 is activated.
		0	Output is deactivated.
4	Fieldbus DOUT 5	1	Digital output 5 is activated.
		0	Output is deactivated.
5	Fieldbus DOUT 6	1	Digital output 6 is activated.
		0	Output is deactivated.
6	—		No command (reserved)
7	—		No command (reserved)

Bytes 9 and 10: Actual process value

Byte 9 = high byte, byte 10 = low byte.

Byte 9 and byte 10 in combination with a process controller (option) can be used to transmit the actual process value.

Byte 11 and byte 12: Fieldbus output AOUT 1

Byte 11 = high byte, byte 12 = low byte.

Bytes 11 and 12 can be used to send an analogue value to the actuator.

The value is transmitted in per mil (value: 0 – 1,000).

The outputs "Fieldbus output AOUT 1" and "Fieldbus output AOUT 2) can be used as output values via the analogue outputs. For this, the outputs of the analogue outputs have to be assigned with the signals Fieldbus AOUT 1 or Fieldbus AOUT 2.

Bytes 13 and 14: Fieldbus output AOUT 2

Byte 13 = high byte, byte 14 = low byte.

A second analogue value can be sent to the actuator using bytes 13 and 14.

The value is transmitted in per mil (value: 0 – 1,000).

Byte 15 to byte 26: Reserve

The contents are reserved for future extensions.

4.2.3. Transmitting operation commands from the actuator using Coil functions

Functions to be used:

- Force Single Coil (05)
- Force Multiple Coils (15)
- Read Coil Status (01)

Offset (hexa-decimal)	Offset (decimal)	Contents (for details refer to <Description of the output data>)
0x0000	0	Fieldbus OPEN (byte 1)
0x0001	1	Fieldbus CLOSE (byte 1)
0x0002	2	Fieldbus SETPOINT (byte 1
0x0003	3	Fieldbus RESET (byte 1)
0x0004 – 0x000F	4 – 15	—
0x0010 - 0x0017	16 to 23	Setpoint position high byte (position transmitter) – (byte 3)
0x0018 – 0x001F	24 to 31	Setpoint position low byte (position transmitter) – (byte 4)
0x0020	32	Fieldb. enable LOCAL (byte 5)
0x0021	33	Fieldb. enable OPEN (byte 5)
0x0022	34	Fieldb. enable CLOSE (byte 5)
0x0023	35	—
0x0024	36	Fieldbus channel 1 (byte 5)
0x0025	37	Fieldbus channel 2 (byte 5)
0x0026	38	Fieldbus EMCY (byte 5)
0x0027	39	PVST (byte 5)
0x0028	40	Fieldb. interm. pos. 1 (byte 6)
0x0029	41	Reset self-retaining (byte 6)
0x002A	42	Doub. Cmd CW MPV (byte 6)
0x002B	43	Doub. Cmd CCW MPV (byte 6)
0x002C	44	Fieldb. interm. pos. 5 (byte 6)
0x002D	45	MWG hall sensor3 fail (byte 6)
0x002E	46	IE MWG hall sensor (byte 6)
0x002F	47	Fieldb. interm. pos. 8 (byte 6)
0x0030	48	—
0x0031	49	—
0x0032	50	—
0x0033	51	—

Offset (hexa-decimal)	Offset (decimal)	Contents (for details refer to <Description of the output data>)
0x0034	52	—
0x0035	53	—
0x0036	54	—
0x0037	55	—
0x0038	56	—
0x0039	57	—
0x003A	58	Fieldbus DOUT 6 (byte 8)
0x003B	59	Fieldbus DOUT 5 (byte 8)
0x003C	60	Fieldbus DOUT 4 (byte 8)
0x003D	61	Fieldbus DOUT 3 (byte 8)
0x003E	62	Fieldbus DOUT 2 (byte 8)
0x003F	63	Fieldbus DOUT 1 (byte 8)
0x0040 - 0x0047	64 – 71	Actual process value (high byte) – (byte 9)
0x0048 – 0x004F	72 – 79	Actual process value (low byte) – (byte 10)
0x0050 - 0x0057	80 – 87	Fieldbus output AOUT 1 (high byte) – (byte 11)
0x0058 – 0x005F	88 – 95	Fieldbus output AOUT 1 (low byte) – (byte 12)
0x0060 – 0x0067	96 – 103	Fieldbus output AOUT 2 (high byte) – (byte 13)
0x0068 – 0x006F	104 – 111	Fieldbus output AOUT 2 (low byte) – (byte 14)
0x0070 – 0x00C7	112 – 199	—

5.   Description of Modbus board

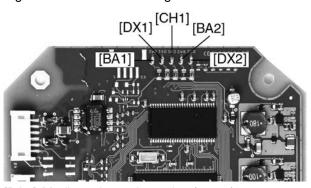The Modbus board is directly located below the local controls.

Figure 1: Modbus board

⚠ DANGER	**Hazardous voltage!**

Risk of electric shock.

→   When connected to the mains, the local controls may only be removed by suitably qualified personnel (electricians).

5.1.   Indications (indication and diagnostic LEDs)

Figure 2: Indication and diagnostic LEDs

[BA2] Modbus channel 2 active (green)
[DX1] Data Exchange channel 1 (yellow)
[BA1] Modbus channel 1 active (green)
[CH1] Communication via channels 1/2 (yellow)
[DX2] Data Exchange channel 2 (yellow)

[BA2]   Option for redundancy

Illuminated in green if Modbus channel 2 is active.

[DX1]   If the LED is illuminated in yellow, the Modbus interface has entered the 'Data Exchange' state on channel 1. Only in this state can the actuator be controlled by the Modbus master and the status of the actuator can be read.

[BA1]   Illuminated in green if Modbus channel 1 is active.
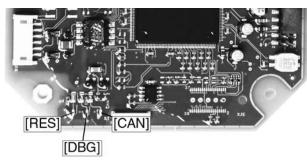
[CH1]   Option for redundancy

ON (illuminated in yellow): Communication via channel 1

OFF: Communication via channel 2

[DX2] Option for redundancy

If the LED is illuminated in yellow, the Modbus interface has entered the 'Data Exchange' state on channel 2. Only in this state can the actuator be controlled by the Modbus master and the status of the actuator can be read.

Figure 3: Status LEDs

[RES] RESET (green)
[DBG] DEBUG (green)
[CAN] CAN (red)

[RES] Illuminated in green after Reset phase: 3.3 V voltage supply is ok.

[DBG] Blinking in green after reset phase: 5 V power supply is ok.

Blinking at 1 Hz: PCB test

Blinking at 2 Hz: Application is ok.

[CAN] Illuminated in red: Communication to logic is faulty.

Not illuminated: Communication with logic is ok.

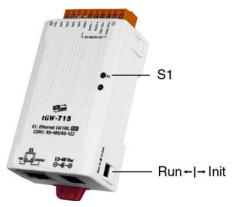## 5.2.   Modbus gateway TCP – RTU

Figure 4: Modbus gateway

Table 30: Functions of system LED S1

Behaviour of LED S1	Function
Continuous illumination	Firmware update active
Slow flahsing (every 3 seconds)	Network ready
Fast flashing (every 0.2 seconds)	Data transmission active

Table 31: Switch functions Run/Init mode

Switch position	Function
Run (default setting)	**Run mode:** Operation mode
Init	**Init mode:** Update configuration mode for firmware

6. Corrective action

6.1. Troubleshooting

In case of problems with Modbus communication, the actuator controls provide important information on troubleshooting via the display (menu DiagnosticsM0022).

The indication and diagnostic LEDs on the Modbus board can also be used as support.

Table 32: Troubleshooting table

			Causes and remedies
1.	Can the actuator be controlled via Modbus?	Yes	No fault
		No	→ Continue with 2
2.	Select menu: Diagnostics M0022		→ Continue with 3
3.	Select menu: for channel 1: Modbus MD1 M0241		→ Continue with 4
4.	Select menu: for channel 1: Modbus MD1 M0241	Channel 1 DataEx or LED on Modbus board [DX1] is illuminated.	Valid telegrams to the own address Modbus communication via channel 1 is ok. → Continue with 4

		Channel 1 activity	Bus communication available on channel 1
			Valid telegrams, however not sent to the own address
			Possible causes and remedies:
			• Incorrect slave address → Check slave address (MD1 slave address parameter)
			• Check LED S1 of gateway: If the LED is neither illuminated nor blinking, the power supply of the gateway has failed.
			• Configuration of gateway faulty → Start gateway web server (Default settings of Ethernet interface: Check Static IP, IP Address = 192.168.255.1, Subnet Mask = 255.255.0.0) and the gateway settings (default password = "admin")
			  - Check network interface settings (network setting) and adapt if required.
			  - RS-485 interface settings (port 1) must agree with the settings of the AUMATIC Modbus interface. In particular relating to settings for baud rate, data size, parity and stop bits.
			  - Check further settings and adapt if required:
			    - Flow Control = None
			    - Local TCP Port = 502
			    - Modbus protocol = Modbus RTU
			• Faulty configuration of Modbus TCP/IP client.
			• Physical interruption of connection to Modbus TCP/IP client.

5.	Operation via push button of local controls possible?	Yes	Possible causes and remedies: • Master does not send an operation command. • Master sends wrong operation command. → Check program of the DCS.
		No	Possible causes and remedies: Faults such as torque, thermal or internal fault → Check logic board, motor control and motor. → Continue with 6
6.	LED [RES] on Modbus board is illuminated in green.	Yes	3.3 V power supply is ok.
		No	3.3 V power supply not available
7.	LED [DBG] on Modbus board	is blinking in green.	5 V power supply is ok.
		is not illuminated	5 V power supply not available Possible causes and remedies: → Check power supply of the AUMATIC (check fuses). → Check Modbus board

6.2. Diagnostics

Menu Diagnostics M0022 and the AUMA CDT software can be used to check the different states of the Modbus interface.

The <Information on Modbus 1> table shows the menus for the first Modbus interface.

Table 33: Information on Modbus 1

Indication on display	Value and description
MD1 slave address M0412	Bus address (slave address)
Baud rate M0766	Baud rate
Channel 1 DataEx M0784	Channel 1 is in the data exchange state (DataEx).
Channel 1 activity M0767	Bus communication available on channel 1
Bus Message Count M0918	Number of valid messages received (including all addresses). Number of messages that the remote device has detected on the communications system since its last restart, clear counters operation, or power-up. Messages with bad CRC are not taken into account.
Bus Com Err Count M0919	Number of messages with CRC or parity/block check/data loss error. Number of CRC errors recorded by the remote device since its last restart, clear counters operation, or power-up. In case of an error detected on the character level, (overrun, parity error), or in case of a message length < 3 bytes, the recipient is not able to perform the CRC test. In such cases, this counter is also incremented.
Slave Except Err Count M0920	Number of sent exceptions. Number of Modbus exceptions detected by the remote device since its last restart, clear counters operation, or power–up. It comprises also the error detected in broadcast messages even if an exception message is not returned in this case. Exception responses are described and listed in "MODBUS Application Protocol Specification" document.
Slave Message Count M0921	Number of messages received (including slave addresses). Number of messages addressed to the remote device, including broadcast messages, that the remote device has processed since its last restart, clearing of the diagnostic counters, or power-up.
Slave No Resp. Count M0922	Number of messages without response. Number of messages received by the remote device for which it returned no response (neither a normal response nor an exception response), since its last restart, clear counters operation, or power-up (number of broadcast messages received).
Slave NAK Count M0923	Number of messages answered with NAK. Number of messages addressed to the remote device for which it returned a Negative Acknowledge (NAK) exception response, since its last restart, clearing of the diagnostic counters, or power-up. Exception responses are described and listed in "MODBUS Application Protocol Specification" document.
Slave Busy Count M0924	Quantity of messages addressed to the remote device for which it returned a Slave Device Busy exception response, since its last restart, clear counters operation, or power-up. Exception responses are described and listed in "MODBUS Application Protocol Specification" document.
Bus Char Overr Count M0925	Number of messages with data loss error. Quantity of messages addressed to the remote device that it could not handle due to a character overrun condition, since its last restart, clearing of the diagnostic counters, or power-up. A character overrun is caused by data characters arriving at the port faster than they can be stored, or by the loss of a character due to a hardware fault.
Parity Error Count M0926	Number of parity errors

Table 34: Modbus details

Indication on display	Value and description
Channel 1 active	Modbus interface of channel 1 is used.

7. Technical data

Information The following tables include standard and optional features. For detailed information on the customer-specific version, refer to the order-related data sheet. The technical data sheet can be downloaded from the Internet in both German and English at **http://www.auma.com** (please state the order number).

7.1. Modbus interface

Settings/programming the Modbus TCP/IP interface	
Setting the fieldbus address	Baud rate, parity and Modbus address are set via the display of actuator controls
Setting the Modbus gateway	Settings are made via web server Default settings of the IP interface:

IP Address Selection	
Address Type	Static IP
Static IP Address	192.168.255.1
Subnet Mask	255.255.0.0
Default Gateway	192.168.0.1

General Modbus TCP/IP data	
Communication protocol	Modbus TCP/IP according to IEC 61158 and IEC 61784
Network topology	Star topology/ point-to-point topology
Transmission medium	IEC IEEE 802.3, cable recommendation: Cat. 6_A
Transmission rate/cable length	• Baud rate of 10/100 Mbits/s • Maximum cable length: 100 m
Supported Modbus functions (services)	01 Read Coil Status 02 Read Input Status 03 Read Holding Registers 04 Read Input Registers 05 Force Single Coil 15 (0FHex) Force Multiple Coils 06 Preset Single Register 16 (10Hex) Preset Multiple Registers 17 (11Hex) Report Slave ID 08 Diagnostics: • 00 00 Loopback • 00 10 (0AHex) Clear Counters and Diagnostic Register • 00 11 (0BHex) Return Bus Message Count • 00 12 (0CHex) Return Bus Communication Error Count • 00 13 (0DHex) Return Bus Exception Error Count • 00 14 (0EHex) Return Slave Message Count • 00 15 (0FHex) Return Slave No Response Count • 00 16 (10Hex) Return Slave NAK Count • 00 17 (11Hex) Return Slave Busy Count • 00 18 (12Hex) Return Character Overrun Count

Commands and signals of the Modbus TCP/IP interface	
Process representation output (command signals)	OPEN, STOP, CLOSE, position setpoint, RESET, EMERGENCY operation command, enable LOCAL, Interlock OPEN/CLOSE
Process representation input (feedback signals)	• End positions OPEN, CLOSED • Actual position value • Actual torque value, requires magnetic limit and torque transmitter (MWG) in actuator • Selector switch in position LOCAL/REMOTE • Running indication (directional) • Torque switches OPEN, CLOSED • Limit switches OPEN, CLOSED • Manual operation by handwheel or via local controls • Analogue (2) and digital (4) customer inputs
Process representation input (fault signals)	• Motor protection tripped • Torque switch tripped in mid-travel • One phase missing • Failure of analogue customer inputs
Behaviour on loss of communication	The behaviour of the actuator is programmable: • Stop in current position • Travel to end position OPEN or CLOSED • Travel to any intermediate position • Execute last received operation command

8. Appendix

8.1. Parameters

This appendix structured as table contains references for configuration of actuator controls via Modbus TCP/IP (Modbus function codes, offset addresses, parameter descriptions as well as the read/write access codes).

The parameters listed in the tables below can be read or written using the following Modbus functions.

- Preset Multiple Register (16)
- Read Holding Register (03)

Several parameters (view objects) are read or written for each Modbus request. The data lengths indicated in the tables have to be considered accordingly.

View Objects

View Objects group several parameters enabling easy write access to the grouped parameters. The bus load is reduced as the parameters do no longer have to be read out individually.

Explanations to the table:

No.   View Object no.

Type

Data type	Description	Data length
BOOL	Logical value	4 bytes
BS8/16/32/64	Bit string	2/4/6/8 bytes
DRVCMD4	Process data	4 bytes
enum	Value from the value list	2 bytes
I8/16/32	Integer values	1/2/4 bytes
MMSS01	Time information	2 bytes
OS4/8/16/32/48/64	Octet string	4/8/16/32/48/64 bytes
S10/20/30/40	Character string	10/20/30/40 bytes
U8/16/32	Unsigned value	1/2/4/ bytes (8/16/32 bits)

Parameter   Parameter name. Indicated on the display of actuator controls.

Access   Read and write access

R = Read

W = Write

Default   Default value

Setting value   Permissible, settable value or setting range. Depending on the data type, scale factor and unit are also indicated in square brackets. Example:

Min = 0 [0.1 s]

Max = 50 [0.1 s]

Corresponds to a setting range between 0.1 and 5.0 seconds

Table 35: Display...

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04B1 Offset (decimal) = 1201 Data length = 14 bytes					
1-1	enum	Language	R/W	1	1: Deutsch
					2: English
					3: Français
					4: Español
					5: Italiano
					6: Русский
					7: Polski
					8: Português
					9: Türkçe
					10: Magyar
					11: 中国
					12: Nederlands
					13: Čeština
					14: Română
					15: 日本語
					16: Български
					17: Dansk
					18: Ελληνικά
					19: Suomi
					20: 한국어
					21: Svenska
					22: Tiếng Việt
					23: عربي
					24: Eesti keel
					25: Hrvatski
					26: Lietuvių
					27: Latviešu
					28: Norsk
					29: Slovenčina
					30: Slovenščina
					31: Srpski
					32: ไทย
					33: Bahasa Indonesia
					34: Bahasa Indonesia
					35: فارسی □
1-2	enum	Date format	R/W	1	0: MM/DD/YYYY
					1: DD.MM.YYYY
					2: YYYY-MM-DD
1-3	enum	Time format	R/W	1	0: 12h
					1: 24h
1-4	enum	Number format	R/W	0	0: xx.x
					1: xx,x
1-5	enum	Torque unit	R/W	0	0: Nm
					1: ft-lb
					2: %

No.	Type	Parameters	Access	Default	Setting value
1-6	enum	Temperature unit	R/W	0	0: °C
					1: °F
1-7	enum	Diagnostic classific.	R/W	0	0: AUMA
					1: NAMUR

Table 36: Identifications

No.	Type	Parameters	Access	Default
Offset (hexadecimal) = 0x04B2 Offset (decimal) = 1202 Data length = 60 bytes				
2-1	S20	Device designation	R	AC 01.2
2-2	S20	Device tag	R/W	_GERAETE-TAG_
2-3	S20	Project name	R/W	_PROJEKT_

Table 37: Controls

No.	Type	Parameters	Access	Default
Offset (hexadecimal) = 0x04B3 Offset (decimal) = 1203 Data length = 80 bytes				
3-1	S20	Order no. controls	R	_ KOMMNR STEUERUNG _
3-2	S20	Serial no. controls	R	_ WERKNR STEUERUNG _
3-3	S20	Wiring diagram	R	TPC
3-4	S20	Date of manufacture	R	_DATE_PRODUCTION_

Table 38: Actuator

No.	Type	Parameters	Access	Default
Offset (hexadecimal) = 0x04B4 Offset (decimal) = 1204 Data length = 60 bytes				
4-1	S20	Order no. actuator	R	_ KOMMNR ANTRIEB _
4-2	S20	Serial no. actuator	R	_ WERKNR ANTRIEB _
4-3	S20	Wiring diag. actuator	R	TPA

Table 39: Version

No.	Type	Parameters	Access	Default
Offset (hexadecimal) = 0x04B5 Offset (decimal) = 1205 Data length = 40 bytes				
5-1	S20	Firmware	R	Vxx.xx.xx
5-2	S20	Language	R	Vxxx

Table 40: Firmware details

No.	Type	Parameters	Access	Default
Offset (hexadecimal) = 0x04B6 Offset (decimal) = 1206 Data length = 160 bytes				
6-1	S20	LC	R	0
6-2	S20	LC (Bootloader)	R	0
6-3	S20	Logic	R	0
6-4	S20	Logic (Bootloader)	R	0
6-5	S20	Fieldbus	R	0
6-6	S20	Fieldbus (Bootloader)	R	0
6-7	S20	MWG	R	0

No.	Type	Parameters	Access	Default
6-8	S20	MWG (Bootloader)	R	0
PRM_4959	S20	FW version MWG	R	0
PRM_5076	S20	Version FQM	R	0
PRM_5077	S20	Version FQM-Btl	R	0
PRM_5100	S20	Version Motor Crtl	R	0
PRM_5101	S20	Version Motor Crtl Btl	R	0

Table 41: Hardware article no.

No.	Type	Parameters	Access	Default
Offset (hexadecimal) = 0x04B7 Offset (decimal) = 1207 Data length = 140 bytes				
7-1	S20	ArtNo LC	R	_ ARTNR OSS _
7-2	S20	ArtNo logic	R	_ ARTNR LOGIK _
7-3	S20	ArtNo MCM	R	_ ARTNR RELAIS _
7-4	S20	ArtNo PSO	R	_ ARTNR_OPT _
7-5	S20	ArtNo I/O interface	R	_ ARTNR INTF _
7-6	S20	ArtNo fieldbus	R	_ ARTNR PBD _
7-7	S20	ArtNo MWG	R	_ ARTNR MWG _
PRM_5083	S20	Art. no. FQM Ctrl	R	_ ARTNR FQM _
PRM_5094	S20	ArtNo motor ctrl	R	_ ARTNR MCTRL_

Table 42: Type of seating

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04B9 Offset (decimal) = 1209 Data length = 4 bytes					
9-1	enum	End position CLOSED	R/W	0	0: Limit 1: Torque
9-2	enum	End position OPEN	R/W	0	0: Limit 1: Torque

Table 43: Torque switching

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04BA Offset (decimal) = 1210 Data length = 12 bytes					
10-1	enum	Torque by-pass	R/W	1	0: Function not active 1: Function active
10-2	U16	Torque by-pass [s]	R/W	0	Min = 0 [0.1 s] Max = 50 [0.1 s]
PRM_5161	enum	Torque limitation	R/W	1	0: Function not active 1: Function active
PRM_5162	I16	Torque peak [%]	R/W	0	Min = 100 [%] Max = 150 [%]
10-3	U16	Trip torque CLO [Nm]	R/W	20	Min = 0 [Nm] Max = 65535 [Nm]
10-4	U16	Trip torque OPEN [Nm]	R/W	20	Min = 0 [Nm] Max = 65535 [Nm]

No.	Type	Parameters	Access	Default	Setting value
10-5	I16	Wrn torque CLOSE	R/W	80	Min = 20 [%]
					Max = 100 [%]
10-6	I16	Wrn torque OPEN	R/W	80	Min = 20 [%]
					Max = 100 [%]

Table 44: Local controls

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04BB Offset (decimal) = 1211 Data length = 10 bytes					
11-1	enum	Self-retaining Local	R/W	3	0: Off (push-to-run op.)
					1: OPEN
					2: CLOSE
					3: OPEN and CLOSE
					4: OPEN & CL w/o STOP
11-2	enum	Local STOP	R/W	0	0: Off
					1: Sel.sw.Local + Remote
11-3	enum	Enable LOCAL	R/W	0	0: Sel. sw. Local
					1: Sel. sw. Local + Off
11-4	enum	Priority REMOTE	R/W	0	0: Selector switch Local
					1: Sel. sw. Local + Off
11-5	enum	Fieldbus auto enable	R/W	1	0: Off
					1: On

Table 45: I/O interface

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04BC Offset (decimal) = 1212 Data length = 4 bytes					
12-1	enum	Self-retaining Remote	R/W	3	0: Off (push-to-run op.)
					1: OPEN
					2: CLOSE
					3: OPEN and CLOSE
					4: OPEN & CL w/o STOP
12-2	enum	Self-retaining Remote II	R/W	0	0: Off (push-to-run op.)
					1: OPEN
					2: CLOSE
					3: OPEN and CLOSE
					4: OPEN & CL w/o STOP

Table 46: Positioner

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04BE Offset (decimal) = 1214 Data length = 30 bytes					
14-1	enum	Adaptive behaviour	R/W	0	0: Off
					1: Adaptive I
14-2	U16	Dead time	R/W	5	Min = 2 [0.1 s]
					Max = 600 [0.1 s]
14-3	U16	Dead band OPEN	R/W	5	Min = 0 [0.1 %]
					Max = 100 [0.1 %]

No.	Type	Parameters	Access	Default	Setting value
14-4	U16	Dead band CLOSE	R/W	5	Min = 0 [0.1 %]
					Max = 100 [0.1 %]
14-5	U16	Posit. hyst. OPEN	R/W	5	Min = 0 [0.1 %]
					Max = 50 [0.1 %]
14-6	U16	Posit. hyst. CLOSE	R/W	5	Min = 0 [0.1 %]
					Max = 50 [0.1 %]
PRM_5316	U16	Dead band min. (ad.2)	R/W	2	Min = 2 [0.1 %]
					Max = 50 [0.1 %]
PRM_5317	U16	Dead band max. (ad.2)	R/W	25	Min = 2 [0.1 %]
					Max = 50 [0.1 %]
14-7	I32	Tolerance CLOSE	R/W	0	Min = 0 [0.1 %]
					Max = 50 [0.1 %]
14-8	I32	Tolerance OPEN	R/W	1000	Min = 950 [0.1 %]
					Max = 1000 [0.1 %]
14-10	U16	Outer dead band	R/W	10	Min = 1 [0.1 %]
					Max = 100 [0.1 %]
14-11	enum	Limit setting range	R/W	0	0: Function not active
					1: Function active
14-12	U16	Limit OPEN	R/W	1000	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
14-13	U16	Limit CLOSE	R/W	0	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
PRM_4076	enum	Speed red.prior setp.	R/W	1	0: Function not active
					1: Function active
PRM_4070	U16	Speed red. range	R/W	0	Min = 2.0 [%]
					Max = 20.0 [%]
PRM_5116	U16	Target speed at setp.	R/W	10	Min = 6 [rpm]
					Max = 240 [rpm]
PRM_5139	U16	Target op. time at setp.	R/W	5.6	Min = 4.0 [s]
					Max = 268.0 [s]
PRM_4957	U16	Low limit target value	R/W	0.0	Min = 0.0 [mA]
					Max = 20.0 [mA]
PRM_4958	U16	High limit target value	R/W	20.0	Min = 0.0 [mA]
					Max = 20.0 [mA]

Table 47: Process controller

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04F3 Offset (decimal) = 1267 Data length = 26 bytes					
67-1	enum	Setpoint source	R/W	0	0: I/O interface
					1: Fieldbus interface
					2: Internal setpoint
67-2	enum	Beh. setpoint failure	R/W	0	0: Internal setpoint 1
					1: Internal setpoint 2
					2: Failure behaviour
67-3	enum	Inverse operation	R/W	0	0: Function not active
					1: Function active

No.	Type	Parameters	Access	Default	Setting value
67-4	U16	Internal setpoint 1	R/W	500	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
67-5	U16	Internal setpoint 2	R/W	500	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
67-6	U16	Proport. gain Kp	R/W	10	Min = 1 [0.1]
					Max = 100 [0.1]
67-7	U16	Reset time Ti	R/W	1000	Min = 1 [s]
					Max = 1000 [s]
67-8	U16	Rate time Td	R/W	0	Min = 0 [s]
					Max = 100 [s]
67-12	enum	Actual value source	R/W	0	0: I/O interface
					1: Fieldbus interface
67-13	enum	Modulating behaviour	R/W	0	0: P controller
					1: PI controller
					2: PID controller
PRM_5278	enum	Speed source PID	R/W	1	Internal 1
					Internal 2
					Internal 3
					Internal 4
					2 DigIn: "Internal (1-4)"
					Analogue input
					Fieldbus

Table 48: Failure behaviour

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04BF Offset (decimal) = 1215 Data length = 12 bytes					
15-1	enum	Signal loss beh.	R/W	1	0: Good signal first
					1: Immediately active
15-2	enum	Failure operation	R/W	0	0: STOP
					1: CLOSE
					2: OPEN
					3: Approach position
					4: Execute last CMD
15-3	enum	Source	R/W	4	1: Fieldbus interface
					2: I/O interface
					4: Active interface
15-4	Mmss01	Delay time	R/W	30	Min = 0 [0.1 s]
					Max = 1800 [0.1 s]
15-5	U16	Fail.pos.OPEN CLOSE	R/W	500	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
15-6	U16	Failure position MPV	R/W	500	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
PRM_5126	U16	Failure speed OPEN	R/W	45	Min = 6 [rpm]
					Max = 240 [rpm.]

No.	Type	Parameters	Access	Default	Setting value
PRM_5122	U16	Time speed red.	R/W	45	Min = 6 [rpm]
					Max = 240 [rpm.]
PRM_5132	U16	Op. time failure OPEN	R/W	11.0	Min = 4.0 [s]
					Max = 268.0 [s]
PRM_5134	U16	Oper. time rem. max.	R/W	11.0	Min = 4.0 [s]
					Max = 268.0 [s]

Table 49: EMERGENCY behaviour

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04C0 Offset (decimal) = 1216 Data length = 26 bytes					
16-1	enum	EMCY fail.reac.	R/W	1	1: Good signal first
					2: Immediately active
16-2	enum	EMCY operation mode	R/W	0	0: Remote only
					1: Remote and local
16-3	enum	EMCY source	R/W	3	1: I/O interface
					2: Fieldbus interface
					3: I/O or fieldbus
					4: Active interface
16-4	enum	EMCY operation	R/W	0	0: STOP
					1: CLOSE
					2: OPEN
					3: Approach EMCY pos.
16-5	U16	EMCY position	R/W	0	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
16-6	enum	By-pass torque	R/W	0	0: Off
					1: On
16-7	enum	Thermal by-pass	R/W	0	0: Off
					1: On
16-8	enum	By-pass timer	R/W	0	0: Off
					1: On
16-9	enum	By-pass operat.profile	R/W	0	0: Off
					1: On
16-10	enum	By-pass Interlock	R/W	0	0: Off
					1: On
16-11	enum	By-pass Local STOP	R/W	0	0: Off
					1: On
16-12	Mmss01	Delay time	R	10	Min = 0 [0.1 s]
					Max = 1800 [0.1 s]
16-13	U16	EMCY position MPV	R/W	10	Min = 0 [0.1 s]
					Max = 1800 [0.1 s]
PRM_5125	U16	Speed EMCY OPEN	R/W	45	Min = 6 [rpm]
					Max = 240 [rpm.]
PRM_5321	U16	Speed EMCY CLOSE	R/W	11	Min = 4.0 [s]
					Max = 268.0 [s]
PRM_5323	U16	Op. time EMCY CLOSE	R/W	11	Min = 4.0 [s]
					Max = 268.0 [s]

Table 50: Timer function

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04C1 Offset (decimal) = 1217 Data length = 20 bytes					
17-1	enum	Step mode CLOSE	R/W	0	0: Off 1: Remote 2: Local 3: Remote and local
17-2	Mmss01	On time CLOSE	R/W	50	Min = 10 [0.1 s] Max = 1800 [0.1 s]
17-3	Mmss01	Off time CLOSE	R/W	50	Min = 10 [0.1 s] Max = 1800 [0.1 s]
17-4	U16	Start stepping CLOSE	R/W	1000	Min = 1 [0.1 %] Max = 1000 [0.1 %]
17-5	U16	End stepping CLOSE	R/W	0	Min = 0 [0.1 %] Max = 999 [0.1 %]
17-6	enum	Step mode OPEN	R/W	0	0: Off 1: Remote 2: Local 3: Remote and local
17-7	Mmss01	On time OPEN	R/W	50	Min = 10 [0.1 s] Max = 1000 [0.1 s]
17-8	Mmss01	Off time OPEN	R/W	50	Min = 10 [0.1 s] Max = 1000 [0.1 s]
17-9	U16	Start stepping OPEN	R/W	0	Min = 0 [0.1 %] Max = 999 [0.1 %]
17-10	U16	End stepping OPEN	R/W	1000	Min = 1 [0.1 %] Max = 1000 [0.1 %]

Table 51: Monitoring operation mode

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04C7 Offset (decimal) = 1223 Data length = 6 bytes					
23-1	enum	Duty type monitoring	R/W	0	0: Function not active 1: Function active
23-2	U16	Perm. run time	R/W	15	Min = 10 [min] Max = 60 [min]
23-3	U16	Permissible starts	R/W	1200	Min = 1 Max = 1800

Table 52: Motion detector

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04C8 Offset (decimal) = 1224 Data length = 12 bytes					
24-1	enum	Motion detector	R/W	1	0: Function not active 1: Function active
24-2	Mmss01	Detect. time dt	R/W	50	Min = 10 [0.1 s] Max = 1800 [0.1 s]

No.	Type	Parameters	Access	Default	Setting value
24-3	U16	Travel diff. dx	R/W	10	Min = 10 [0.1 %]
					Max = 100 [0.1 %]
24-6	U16	Delay time	R/W	6000	Min = 1 [0.001 s]
					Max = 65535 [0.001 s]

Table 53: Operating time monitoring

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04C9 Offset (decimal) = 1225 Data length = 4 bytes					
25-1	enum	Operation mode	R/W	0	0: Off
					1: Manual
25-2	Mmss01	Perm.op. time, manual	R/W	9000	Min = 0 [0.1 s]
					Max = 36000 [0.1 s]

Table 54: Reaction monitoring

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04CA Offset (decimal) = 1226 Data length = 4 bytes					
26-1	enum	Actuator behaviour	R/W	0	0: No cut-off
					1: Cut-off
26-2	U16	Reaction time	R/W	150	Min = 50 [0.1 s]
					Max = 3000 [0.1 s]

Table 55: Interlock

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04CB Offset (decimal) = 1227 Data length = 8 bytes					
27-1	enum	Oper. mode Interlock	R/W	3	1: Remote
					2: Local
					3: Remote and Local
27-2	enum	Running dir. Interlock	R/W	3	1: OPEN
					2: CLOSE
					3: OPEN and CLOSE
27-4	enum	Interlock source	R/W	3	1 : Interface
					2 : Fieldbus
					3 : Active comm. source

Table 56: PVST

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04F2 Offset (decimal) = 1266 Data length = 18 bytes					
66-1	enum	PVST operation mode	R/W	0	0: Stroke
					1: End position test
66-2	enum	PVST behaviour	R/W	1	0: OPEN
					1: CLOSE
66-3	U16	PVST stroke	R/W	100	Min = 0 [0.1 %]
					Max = 1000 [0.1 %]

No.	Type	Parameters	Access	Default	Setting value
66-4	Mmss01	PVST monitoring	R/W	600	Min = 10 [0.1 s]
					Max = 3000 [0.1 s]
66-5	Mmss01	PVST operating time	R/W	20	Min = 1 [0.1 s]
					Max = 600 [0.1 s]
66-6	Mmss01	PVST reversing time	R/W	20	Min = 1 [0.1 s]
					Max = 600 [0.1 s]
66-7	enum	PVST reminder	R/W	0	0: Function not active
					1: Function active
66-8	U16	PVST reminder period	R/W	0	Min = 0
					Max = 65535
66-9	enum	PVST source	R/W	0	0: Active interface
					1: I/O interface
					2: Fieldbus interface

Table 57: Local controls

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04CC Offset (decimal) = 1228 Data length = 22 bytes					
28-1	enum	Indication light 1 (left)	R/W	370	
28-2	enum	Indication light 2	R/W	269	
28-3	enum	Indication light 3	R/W	270	
28-4	enum	Indication light 4	R/W	268	
28-5	enum	Indicat. light 5 (right)	R/W	369	
Setting values for parameter no.: 28-1/-2/-3/-4/-5					
					372: Not used
					259: End position CLOSED
					258: End position OPEN
					370: End p. CLOSED, blink
					369: End p. OPEN, blink
					401: Setpoint pos.reached
					265: Running CLOSE
					264: Running OPEN
					113: Selector sw. LOCAL
					115: Selector sw. REMOTE
					116: Selector sw. OFF
					376: Limit switch CLOSED
					375: Limit switch OPEN
					460: Torque sw. CLOSED
					459: Torque sw. OPEN
					86: NAMUR failure
					84: NAMUR funct. check
					83: NAMUR out of spec.
					85: NAMUR mainten. req.
					79: Fault
					78: Warning
					80: Not ready REMOTE
					554: Operation pause active
					560: Start stepping mode

No.	Type	Parameters	Access	Default	Setting value
					603: Actuator running
					539: Running LOCAL
					540: Running REMOTE
					541: Handwheel oper.
					549: In intermediate pos.
					392: Intermediate pos. 1
					399: Intermediate pos. 2
					398: Intermediate pos. 3
					397: Intermediate pos. 4
					396: Intermediate pos. 5
					395: Intermediate pos. 6
					394: Intermediate pos. 7
					393: Intermediate pos. 8
					500: Input DIN 1
					501: Input DIN 2
					505: Input DIN 3
					504: Input DIN 4
					503: Input DIN 5
					502: Input DIN 6
					285: EMCY stop active
					269: Torque fault CLOSE
					Torque fault OPEN
					Torque fault
					Thermal fault
					Phase fault
					Fieldbus DOUT 1
					Fieldbus DOUT 2
					Fieldbus DOUT 3
					Fieldbus DOUT 4
					Fieldbus DOUT 5
					Fieldbus DOUT 6
					Fieldbus DOUT 7
					Fieldbus DOUT 8
					Fieldbus DOUT 9
					Fieldbus DOUT 10
					Fieldbus DOUT 11
					Fieldbus DOUT 12
					FailState fieldbus
					Handwheel active
					PVST active
					PVST fault
					PVST abort

Table 58: FO cable connection

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04F4 Offset (decimal) = 1268 Data length = 6 bytes					
68-1	enum	FO cable monitoring	R/W	0	0: On (not final device)
					1: Off (final device)
68-2	enum	FO cable topology	R	1	0: Ring
					1: Star/line
68-3	enum	FO cable baud rate	R	0	0: Auto
					1: 9.6 kbit/s
					2: 19.2 kbit/s
					3: 38.4 kbit/s
					4: 45.45 kbit/s
					5: 57.6 kbit/s
					6: 93.75 kbit/s
					7: 115.2 kbit/s
					8: 187.5 kbit/s
					9: 500 kbit/s
					10: 1500 kbit/s
					11: 3000 kbit/s
					12: 6000 kbit/s
					13: 12000 kbit/s

Table 59: Actuator

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04D4 Offset (decimal) = 1236 Data length = 12 bytes					
36-1	enum	Motor prot. mode	R/W	0	0: Auto
					1: Reset
36-2	enum	Closing rotation	R	0	0: Clockwise rotation
					1: Counterclockwise rot.
36-3	enum	Handwheel switch	R	0	0: Without
					1: NC
					2: NO
36-4	enum	Heater monitor	R	0	0: Function not active
					1: Function active
36-5	U32	Heating sys. mon. time	R	3000	Min = 600 [0.1 s]
					Max = 36000 [0.1 s]

Table 60: MWG

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04D5 Offset (decimal) = 1237 Data length = 44 bytes					
37-1	U16	Nom. torque CLOSE	R	100	Min = 0 [Nm]
					Max = 65535 [Nm]
37-2	U16	FREI_FB_AnaIn1	R	100	Min = 0 [Nm]
					Max = 65535 [Nm]
37-3	U16	CLOSE min. angle	R	120	Min = 65
					Max = 125

No.	Type	Parameters	Access	Default	Setting value
37-4	U16	CLOSE min. torque	R	50	Min = 20 [%]
					Max = 80 [%]
37-5	U16	CLOSE max. angle	R	105	Min = 8
					Max = 122
37-6	U16	CLOSE max. torque	R	100	Min = 80 [%]
					Max = 125 [%]
37-7	U16	OPEN min. angle	R	134	Min = 129
					Max = 189
37-8	U16	OPEN min. torque	R	50	Min = 20 [%]
					Max = 80 [%]
37-9	U16	OPEN max. angle	R	149	Min = 132
					Max = 247
37-10	U16	OPEN max. torque	R	100	Min = 80 [%]
					Max = 125 [%]
37-11	U16	Correction CLOSE	R	100	Min = 80
					Max = 120
37-12	U16	Correction OPEN	R	100	Min = 80
					Max = 120
37-13	U16	Hysteresis torque	R	5	Min = 0
					Max = 20
37-14	U16	Dead band torque	R	2	Min = 2
					Max = 20
37-15	I32	Hysteresis limit	R	3	Min = 0
					Max = 100
37-16	I32	Torque adjust 0 point	R	0	Min = 20
					Max = 20
37-17	U16	Low limit T CLOSE	R	20	Min = 0 [Nm]
					Max = 65535 [Nm]
37-18	U16	High limit T CLOSE	R	100	Min = 0 [Nm]
					Max = 65535 [Nm]
37-19	U16	Low limit T OPEN	R	20	Min = 0 [Nm]
					Max = 65535 [Nm]
37-20	U16	High limit T OPEN	R	100	Min = 0 [Nm]
					Max = 65535 [Nm]
PRM_5057	U16	Speed EMCY OPEN	R/W	150	Min = 100 [%]
					Max = 200 [%]

Table 61: Potentiometer

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04D6					
Offset (decimal) = 1238					
Data length = 8 bytes					
38-1	U16	Low limit Uref	R	450	Min = 0
					Max = 1023
38-2	U16	Low limit Upoti	R	77	Min = 0
					Max = 1023

No.	Type	Parameters	Access	Default	Setting value
38-3	U16	Low limit Uspan	R/W	610	Min = 0
					Max = 1023
38-4	U16	Hysteresis	R	2	Min = 0
					Max = 10

Table 62: Phase failure monitoring

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04D7 Offset (decimal) = 1239 Data length = 4 bytes					
39-1	enum	Adapt rotary dir.	R	1	0: Function not active
					1: Function active
39-2	U16	Tripping time	R/W	100	Min = 20 [0.1 s]
					Max = 3000 [0.1 s]

Table 63: Switchgear

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04D8 Offset (decimal) = 1240 Data length = 2 bytes					
40-1	U16	Revers. prevent. time	R	3	Min = 1 [0.1 s]
					Max = 300 [0.1 s]
PRM_1329	U16	Frequency limit	R	50	Min = 31 [Hz]
					Max = 70 [Hz]
PRM_1343	U16	Frequency limit	R	20	Min = 5 [Hz]
					Max = 30 [Hz]

Table 64: Monitoring functions

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04D9 Offset (decimal) = 1241 Data length = 18 bytes					
41-1	enum	Monitor heat. system	R	0	0: Function not active
					1: Function active
PRM_3172	U16	Heater monitor	R	0	0: Function not active
					1: Function active
41-2	enum	Monitor 24 V DC ext.	R	0	0: Function not active
					1: Function active
41-3	enum	Monitor 24 V DC cust.	R/W	1	0: Function not active
					1: Function active
PRM_209	U16	Tripping time	R	100	Min = 20 [0.1 s]
					Max = 3000 [0.1 s]
41-4	enum	Monitor 24 V AC	R	1	0: Function not active
					1: Function active
41-5	enum	Monitor 24 V DC intern	R	1	0: Function not active
					1: Function active
41-6	enum	PTC trip. monit.	R	0	0: Function not active
					1: Function active
41-7	enum	RTC battery test	R	1	0: Function not active
					1: Function active

No.	Type	Parameters	Access	Default	Setting value
PRM_3517	U16	Vibration alarm level	R	1000	Min = 500 [0.001 g]
					Max = 4000 [0.001 g]
41-8	U32	Heating sys. mon. time	R	3000	Min = 600 [0.1 s]
					Max = 36000 [0.1 s]

Table 65: Service interface

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04DA Offset (decimal) = 1242 Data length = 22 bytes					
42-1	S20	Device tag	R/W	_GERAETE-TAG_	
42-2	enum	Service op. mode	R/W	0	0: Control: LOCAL
					1: Control: LOC+REM

Table 66: Service functions

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04DD Offset (decimal) = 1245 Data length = 4 bytes					
45-1	I16	Create factory settings	R	-1	Min = 32768
					Max = 32767
45-2	I16	Reset factory settings	R/W	-1	Min = 32768
					Max = 32767

Table 67: General

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04DC Offset (decimal) = 1244 Data length = 48 bytes					
44-1	BOOL	Torque fault OPEN	R		Min = 0
					Max = 1
44-2	BOOL	Torque fault CLOSE	R		Min = 0
					Max = 1
44-3	enum	Selector switch	R		1: Local
					2: Off
					3: Remote
44-4	U16	Actual position	R		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
44-5	U16	Torque	R/W		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]

No.	Type	Parameters	Access	Default	Setting value
44-6	enum	Operation mode	R		0: Power Off
					1: EMCY stop
					2: Off
					3: Service
					4: Local
					5: Interlock
					6: EMERGENCY
					7: Remote
					8: Remote II
					9: Fieldbus
					10: Disabled
44-7	DrvCmd4	Operation command	R		Min = 0
					Max = 0xFFFFFFFF
44-8	BOOL	Running OPEN	R		Min = 0
					Max = 1
44-9	BOOL	Running CLOSE	R		Min = 0
					Max = 1
44-10	BOOL	Setpoint pos.reached	R		Min = 0
					Max = 1
44-11	BOOL	Limit switch OPEN	R		Min = 0
					Max = 1
44-12	BOOL	Limit switch CLOSED	R		Min = 0
					Max = 1
44-13	BOOL	Torque sw. OPEN	R		Min = 0
					Max = 1
44-14	BOOL	Torque sw. CLOSED	R		Min = 0
					Max = 1

Table 68: Positioner

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04E4 Offset (decimal) = 1252 Data length = 26 bytes					
52-1	enum	Adaptive behaviour	R/W	0	0: Off
					1: Adaptive I
52-2	U16	Setpoint	R		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
52-3	U16	Actual position	R/W		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
52-4	U32	Outer dead band	R		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
52-5	U32	Outer dead b. OPEN	R		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
52-6	U32	Outer dead b. CLOSE	R		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
52-7	U32	Inner dead b. OPEN	R		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]
52-8	U32	Inner dead b. CLOSE	R		Min = 0 [0.1 %]
					Max = 1000 [0.1 %]

Table 69: Operation mode

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04E5 Offset (decimal) = 1253 Data length = 8 bytes					
53-1	U32	On time	R		Min = 0 Max = 3600
53-2	U32	No. mot. starts/h	R		Min = 0 Max = 3600
PRM_5241	BOOL	Incorrect dir. rotation	R		Min = 0 Max = 1

Table 70: Process controller

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04F9 Offset (decimal) = 1273 Data length = 8 bytes					
73-1	U16	Process setpoint	R		0 [0.0 %] 1000 [0.0 %]
73-2	U16	Actual process value	R		0 [0.0 %] 1000 [0.0 %]
73-3	U32	Op. com. PID contr.	R		0 0

Table 71: Bluetooth

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04E6 Offset (decimal) = 1254 Data length = 62 bytes					
54-1	S20	Device tag	R/W	_GERAETE-TAG_	
54-3	S20	Bluetooth add.partner	R	XXXXXXXXXXX	
54-4	enum	Bluetooth	R/W	1	0: Function not active 1: Function active

Table 72: Position transmitter potentiometer

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04F5 Offset (decimal) = 1269 Data length = 10 bytes					
69-1	U16	Low limit Uspan	R/W	610	Min = 0 Max = 1023
69-2	U16	Volt.level diff. potent.	R		Min = 0 Max = 1023
69-3	U16	Raw val. pos. OPEN	R		0 65535
69-4	U16	Raw val. pos. CLOSED	R		0 65535
69-5	U16	Potent. raw value /mV	R		0 5000 [mV]

Table 73: FO

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04EA Offset (decimal) = 1258 Data length = 28 bytes					
58-1	enum	FOC level channel 1	R		0: Chanel deactivated
					1: Level bad!
					2: Level critical, no Rx
					3: Level critical, Rx
					4: Level good, no Rx
					5: Level good, Rx
58-2	enum	FOC level channel 2	R		0: Chanel deactivated
					1: Level bad!
					2: Level critical, no Rx
					3: Level critical, Rx
					4: Level good, no Rx
					5: Level good, Rx
58-3	U16	FOC RS-485 error	R/W		Min = 0
					Max = 1
58-4	enum	FO cable baud rate	R		0: LnkNr_ReversAufAktiv
					1: LnkNr_ReversZuAktiv
					2: Speed LOCAL
					3: Charge time int.circuit
					4: Charge time Bootstrap
					5: Hold time Break
					6: Revers. prevent. time
					7: Hold time Restart
					8: Hold time fault elimin.
					9: Sampling intervall
					10: Ramp increment On
					11: Ramp imcrement Off
					12: FREI_FB_P70LedCtrl
					13: LnkNr_BetriebsmLokal
58-5	S20	FOC FPGA version	R	0	

Table 74: Operational info total

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04EB Offset (decimal) = 1259 Data length = 80 bytes					
59-1	MMSS01	Motor running time	R		Min = 0 [s]
					Max = 4294967295 [s]
PRM_5227	MMSS01	Max. running time /h	R		Min = 0 [s]
					Max = 4294967295 [s]
PRM_5068	MMSS01	Operating hours	R		Min = 0 [s]
					Max = 4294967295 [s]
59-2	U32	Motor starts	R		Min = 0 [s]
					Max = 4294967295 [s]
PRM_5226	U32	Max. starts/h	R		Min = 0
					Max = 4294967295

No.	Type	Parameters	Access	Default	Setting value
PRM_5213	U32	Mean torque value	R		Min = 0 [%] Max = 4294967295 [%]
59-3	U32	No. thermal faults	R		Min = 0 Max = 4294967295
59-4	U32	Torque fault CLOSE	R		Min = 0 Max = 4294967295
59-5	U32	Torque fault OPEN	R		Min = 0 [s] Max = 4294967295 [s]
59-6	U32	Limit trip CLOSE	R		Min = 0 Max = 4294967295
59-7	U32	Limit trip OPEN	R		Min = 0 Max = 4294967295
59-8	U32	Torque trip CLOSE	R		Min = 0 Max = 4294967295
59-9	U32	Torque trip OPEN	R		Min = 0 Max = 4294967295
59-10	U32	On time warning 1	R		Min = 0 [s] Max = 4294967295 [s]
59-11	U32	On time warning 2	R		Min = 0 [s] Max = 4294967295 [s]
59-12	U32	No. system starts	R		Min = 0 Max = 4294967295
59-13	I32	Max. temp. controls	R		Min = −100 [°C] Max = +150 [°C]
59-14	I32	Min. temp. controls	R		Min = −100 [°C] Max = +150 [°C]
59-19	I32	Max. temp. MWG	R		Min = −100 [°C] Max = +150 [°C]
59-20	I32	Min. temp. MWG	R		Min = −100 [°C] Max = +150 [°C]
PRM_5062	U32	Max. vibration	R		Min = 0 [g] Max = 4294967295 [g]

Table 75: Operational info

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04EC Offset (decimal) = 1260 Data length = 82 bytes					
60-1	U32	Motor running time	R		Min = 0 [s] Max = 4294967295 [s]
PRM_5225	U32	Max. running time /h	R		Min = 0 [s] Max = 4294967295 [s]
PRM_5067	U32	Operating hours	R		Min = 0 [s] Max = 4294967295 [s]
60-2	U32	Motor starts	R		Min = 0 [s] Max = 4294967295 [s]
PRM_5224	U32	Max. starts/h	R		Min = 0 Max = 4294967295

No.	Type	Parameters	Access	Default	Setting value
PRM_5212	U32	Mean torque value	R		Min = 0 [%]
					Max = 4294967295 [%]
60-3	U32	No. thermal faults	R		Min = 0 [s]
					Max = 4294967295 [s]
60-4	U32	Torque fault CLOSE	R		Min = 0 [s]
					Max = 4294967295 [s]
60-5	U32	Torque fault OPEN	R		Min = 0 [s]
					Max = 4294967295 [s]
60-6	U32	Limit trip CLOSED	R		Min = 0 [s]
					Max = 4294967295 [s]
60-7	U32	Limit trip OPEN	R		Min = 0 [s]
					Max = 4294967295 [s]
60-8	U32	Torque trip CLOSE	R		Min = 0 [s]
					Max = 4294967295 [s]
60-9	U32	Torque trip OPEN	R		Min = 0 [s]
					Max = 4294967295 [s]
60-10	U32	On time warning 1	R		Min = 0 [s]
					Max = 4294967295 [s]
60-11	U32	On time warning 2	R		Min = 0 [s]
					Max = 4294967295 [s]
60-12	U32	No. system starts	R		Min = 0 [s]
					Max = 4294967295 [s]
60-13	I32	Max. temp. controls	R		Min = −100 [°C]
					Max = +150 [°C]
60-14	I32	Min. temp. controls	R		Min = −100 [°C]
					Max = +150 [°C]
60-19	I32	Max. temp. MWG	R		Min = −100 [°C]
					Max = +150 [°C]
60-20	I32	Min. temp. MWG	R		Min = −100 [°C]
					Max = +150 [°C]
PRM_5061	I32	Max. vibration	R		Min = −100 [°C]
					Max = +150 [°C]
60-21	I16	Reset operating data	R/W		

Table 76: Event report

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04ED Offset (decimal) = 1261 Data length = 10 bytes					
61-1	U16	File size event. rep.	R	548	Min = 0
					Max = 1024
61-2	U16	Save interval	R	50000	Min = 1000
					Max = 65535
61-3	U16	Buffer size	R	50	Min = 10
					Max = 100

No.	Type	Parameters	Access	Default	Setting value
61-4	enum	System event filter	R	31	0: Commands
					1: Parameterization
					2: Enable processes
					3: System events
					4: Simulation
61-5	enum	Event filter for Events	R	93223	0: ER signals
					1: Warnings
					2: Fault
					3: Not ready REMOTE
					4: ER device status
					5: Configuration warning
					6: Out of specification
					7: Function check
					8: Maintenance required
					9: Failure
					10: Configuration error
					11: Hydraulics error
					12: Wrong oper. command
					13: Internal error
					14: Internal warning
					15: Fieldbus status
					16: Hydraulics warning
					17: Failure (Cfg)
					18: Fault (Cfg)
					19: Warnings (Cfg)
					20: Not ready REMOTE (Cfg)
					21: Config. error REMOTE
					22: Collective signal 23
					23: SIL status
					24: Collective signal 25
					25: Collective signal 26
					26: Collective signal 27
					27: Collective signal 28
					28: FOC status
					29: ER service 1
					30: ER service 2
					31: ER service 3
PRM_4846	BOOL	Long-term recording	R	0	0: Function not active
					1 Function active

Table 77: Characteristics

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04F1 Offset (decimal) = 1265 Data length = 62 bytes					
65-1	S20	Tag torque-position 1	R/W	_ REF 1 _	
65-2	S20	Tag torque-position 2	R/W	_ REF 2 _	
65-3	S20	Tag torque-position 3	R/W	_ REF 3 _	

No.	Type	Parameters	Access	Default	Setting value
PRM_5232	S20	No.TorqueCurvesOpen	R/W	0	Min = 0
					Max = 65535
PRM_5238	S20	No.TorqueCurvesClose	R/W	0	Min = 0
					Max = 65535
65-4	U16	Interval position-time	R/W	10	Min = 1 [s]
					Max = 3600 [s]

Table 78: Device temperatures

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04EE Offset (decimal) = 1262 Data length = 8 bytes					
62-1	I16	Temp. controls	R		Min = -60 [C°]
					Max = 150 [C°]
PRM_5171	I16	Temp mean value logic	R		Min = -100 C°]
					Max = 150 [C°]
62-2	I16	Temp. control unit	R		Min = -60 [C°]
					Max = 150 [C°]
PRM_5174	I16	Temp mean value MWG	R		Min = -100 [C°]
					Max = 150 [C°]

Table 79: Controls version

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04EF Offset (decimal) = 1263 Data length = 6 bytes					
63-1	enum	Ex version	R	0	0: Off
					1: On
63-2	enum	Hydraulic version	R	0	0: Schuck
					1: Ledeen
63-3	enum	SIL version	R	0	0: Off
					1: On

Table 80: Hardware equipment

No.	Type	Parameters	Access	Default	Setting value
Offset (hexadecimal) = 0x04F0 Offset (decimal) = 1264 Data length = 46 bytes					
64-1	enum	LC (target)	R	1	0: Not available
					1: Available
64-2	enum	LC	R	0	0: Not available
					1: Available
64-3	enum	Logic (target)	R	1	0: Not available
					1: Available
64-4	enum	Logic	R	0	0: Not available
					1: Available
64-5	enum	Pos. transm. (target)	R	1	0: None
					1: Potentiometer
					2: RWG
					4: MWG

No.	Type	Parameters	Access	Default	Setting value
64-6	enum	Position transmitter	R	0	0: None
					1: Potentiometer
					2: RWG
					4: MWG
64-7	enum	MCM (target)	R	1	0: Not available
					1: Available
64-8	enum	MCM	R	0	0: Not available
					1: Available
64-9	enum	PSO (target)	R	0	0: Not available
					1: Available
64-10	enum	PSO	R	0	0: Not available
					1: Available
64-11	enum	I/O interface (target)	R	1	0: Not available
					1: Available
64-12	enum	I/O interface	R	0	0: Not available
					1: Available
64-13	enum	I/O interface 2 (target)	R	0	0: Not available
					1: Available
64-14	enum	I/O interface 2	R	0	0: Not available
					1: Available
64-15	enum	Fieldbus (target)	R	0	0: No fieldbus
					1: Profibus
					2: Modbus
					3: Foundation Fieldbus
					4: HART
					5: Profinet
PRM_600	enum	Fieldbus	R	0	0: No fieldbus
					1: Profibus
					2: Modbus
					3: Foundation Fieldbus
					4: HART
					5: Profinet
64-20	enum	Redundancy (target)	R	0	0: Not available
					1: Red. for line and loop
					2: Red. for line and loop
64-21	enum	Redundancy	R	0	0: Not available
					1: Red. for line and loop
					2: Red. for line and loop
64-17	enum	MWG (target)	R	0	0: Not available
					1: Available
64-18	enum	MWG	R	0	0: Not available
					1: Available
64-19	enum	FO cables (target)	R	0	0: Not available
					1: Available
64-22	enum	FO cables	R	0	0: Not available
					1: Available

No.	Type	Parameters	Access	Default	Setting value
64-23	enum	FOC Ex (target)	R	0	0 : Without FOC Ex
					1 : FOC Ex for line/star
					2 : FOC Ex for ring
PRM_5080	enum	Target_FQM_available	R	0	0 : Not available
					1 : Available
PRM_5081	enum	Target_FQM_available	R	0	0 : Not available
					1 : Available
PRM_5091	enum	Target_MotorCtrl_avail.	R	0	0 : Not available
					1 : Available
PRM_5092	enum	Actual_MotorCtrl_avail.	R	0	0 : Not available
					1 : Available

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