auma
Solutions for a world in motion

Actuator controls

ACV 01.2/ACVExC 01.2

Control
Parallel
Profibus DP
→ Modbus RTU
Modbus TCP/IP
Profinet
Foundation Fieldbus
HART

Read operation instructions first.

•   Observe safety instructions.

Purpose of the document:

This document contains information for the commissioning, operation and maintenance staff. It is intended to support local device operation and setting modifications.

Reference documents:

•   Operation instructions (Assembly, operation, commissioning) for actuator.

•   Manual (Device integration Fieldbus) actuator controls AC 01.2 Modbus

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 fieldbus 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.   Short description

Actuator controls

ACV 01.2/ACVExC 01.2 actuator controls are used to operate AUMA actuators and are supplied ready for use.

The functions of the actuator controls include standard valve control in OPEN-CLOSE duty, positioning, process control, logging of operating data, diagnostic functions right through control via various interfaces (e.g. Fieldbus, Ethernet and HART).

Local controls/ AUMA CDT

Operation, setting, and display can be performed directly at the actuator controls or alternatively from REMOTE via a fieldbus interface.

When set to local control, it is possible to

- operate the actuator via the local controls (push buttons and display) and perform settings (contents of these instructions).
- read in or out data or modify and save settings via AUMA CDT software (accessory), using a computer (laptop or PC). The connection between computer and actuator controls is wireless via Bluetooth interface (not included in these instructions).

Intrusive - Non-Intrusive

- Intrusive version (control unit: electromechanical):
  Limit and torque setting is performed via switches in the actuator.
- Non-Intrusive version (control unit: electronic):
  Limit and torque setting is performed via the controls, without removal of actuator or actuator controls covers. For this purpose, the actuator is equipped with an MWG (magnetic limit and torque transmitter), also capable to supply analogue torque feedback signals/torque indication and analogue position feedback signals/position indication at the actuator controls output.

3. Operation

3.1. Operating the actuator from local controls

Local actuator operation is performed using the local controls push buttons of actuator controls.

Figure 1: Local controls

[1]   Push button for operation command in direction OPEN
[2]   Push button STOP
[3]   Push button for operation command in direction CLOSE
[4]   Push button RESET
[5]   Selector switch

⚠ CAUTION

Hot surfaces, e.g. possibly caused by high ambient temperatures or strong direct sunlight!

Risk of burns

→ Verify surface temperature and wear protective gloves.

→ Set selector switch [5] to position **Local control** (LOCAL).
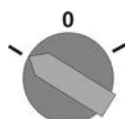
➥ The actuator can now be operated using the push buttons [1 – 3]:

- Run actuator in direction OPEN: Press push button [1] ☰.
- Stop actuator: Press push button STOP [2].
- Run actuator in direction CLOSE: Press push button [3] ⊥.

Information   The OPEN and CLOSE operation commands can be given either in push-to-run or in self-retaining operation mode. In self-retaining mode, the actuator runs to the defined end position after pressing the button, unless another command has been received beforehand. For further information, please refer to the Manual (Operation and setting).

Information   The OPEN and CLOSE operation commands can be given either in push-to-run or in self-retaining operation mode. For further information, please refer to <Push-to-run operation or self-retaining local> chapter.

3.2. Actuator operation from remote

⚠ **CAUTION**

Risk of immediate actuator operation when switching on!

Risk of personal injuries or damage to the valve

→ If the actuator starts unexpectedly: Immediately turn selector switch to **0** (OFF).

→ Check input signals and functions.

→ Set selector switch to position **Remote control** (REMOTE).
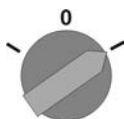
➠ Now, the actuator can be remote-controlled via fieldbus.

Information For actuators equipped with a positioner, it is possible to change over between **OPEN - CLOSE control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SETPOINT). For further information, refer to chapter <Change-over between OPEN - CLOSE control and setpoint control>.

Information For actuators equipped with a positioner, it is possible to change over between **OPEN - CLOSE control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SETPOINT). For further information, please refer to the Manual (Operation and setting).

3.3. Menu navigation via push buttons (for settings and indications)

Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

Set the selector switch [5] to position **0** (OFF) when navigating through the menu.
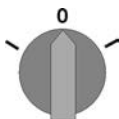
The bottom row of the display [6] serves as navigation support and explains which push buttons [1 – 4] are used for menu navigation.

Figure 2:
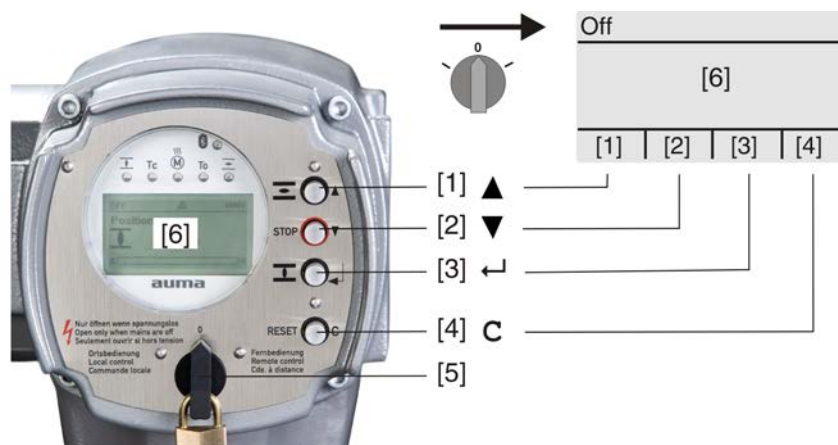
[1–4] Push buttons or navigation support
[5]   Selector switch
[6]   Display

Table 1: Important push button functions for menu navigation

Push buttons	Navigation support on display	Functions
[1] ▲	Up ▲	Change screen/selection
		Change values
		Enter figures from 0 to 9
[2] ▼	Down ▼	Change screen/selection
		Change values
		Enter figures from 0 to 9
[3] ↵	Ok	Confirm selection
	Save	Save
	Edit	Enter <Edit> menu
	Details	Display more details
[4] C	Setup	Enter Main menu
	Esc	Cancel process
		Return to previous display

Backlight
- The display is illuminated in white during normal operation. It is illuminated in red in case of a fault.
- The screen illumination is brighter when operating a push button. If no push button is operated for 60 seconds, the display will become dim again.

3.3.1. Menu layout and navigation

Groups The indications on the display are divided into 3 groups:

Figure 3: Groups

[1]   Start menu
[2]   Status menu
[3]   Main menu
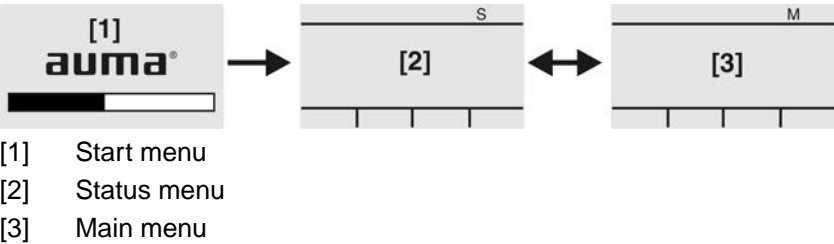
ID Status menu and main menu are marked with an ID.

Figure 4: Marking with ID

S   ID starts with S = status menu
M   ID starts with M = main menu
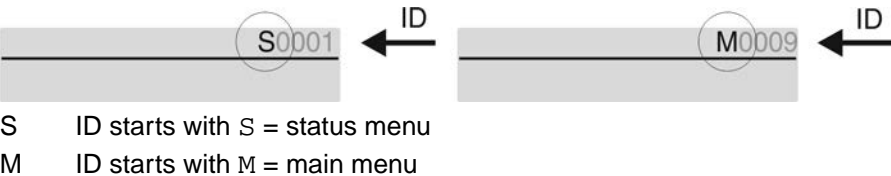
Group selection It is possible to select between status menu S and main menu M:

For this, set selector switch to **0** (OFF), hold down push button **C** for approx. 2 seconds until a screen containing the ID M... appears.

Figure 5: Select menu groups
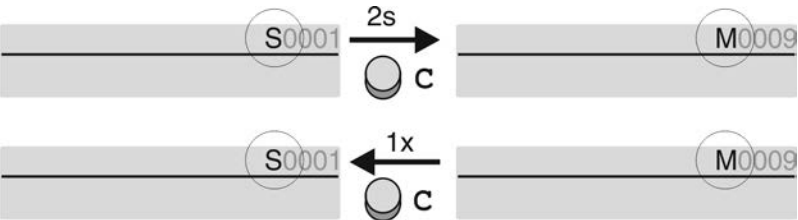
You return to the status menu if:

- the push buttons on the local controls have not been operated within 10 minutes
- or by briefly pressing **C**

Direct display via ID   When entering the ID within the main menu, screens can be displayed directly (without clicking through).

Figure 6: Direct display (example)
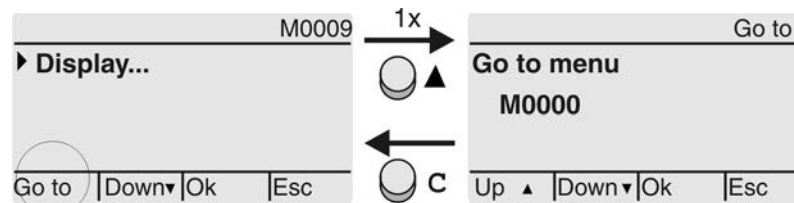
Display indicates in the bottom row: Go to

1. Press push button ▲ Go to.
   Display indicates: Go to menu M0000
2. Use push buttons ▲▼ Up ▲ Down ▼ to select figures 0 to 9.
3. Press push button ↵ Ok to confirm first digit.
4. Repeat steps 2 and 3 for all further digits.
5. To cancel the process: Press **C** Esc.

3.4. User level, password

User level   The user level defines which menu items or parameters can be displayed or modified by the active user.

There are 6 different user levels. The user level is indicated in the top row:

Figure 7: User level display (example)
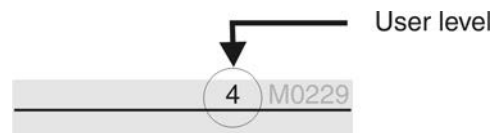
Password   A password must be entered to allow parameter modification. The display indicates: Password 0***

A specific password is assigned to each user level and permits different actions.

Table 2:

User levels and authorisations	
Designation (user level)	Authorisation/password
Observer (1)	Verify settings No password required
Operator (2)	Change settings Default factory password: 0000
Maintenance (3)	Reserved for future extensions
Specialist (4)	Change device configuration e.g. type of seating, assignment of output contacts Default factory password: 0000
Service (5)	Service staff Change configuration settings
AUMA (6)	AUMA administrator

➡ **Unauthorised access is made easier due to insecure password!**

→ We urgently recommend changing the password during initial commissioning.

3.4.1. Password entry

1. Select desired menu and hold down push button ↵ for approx. 3 seconds.
➥ Display indicates the set user level, e.g Observer (1)
2. Select higher user level via ▲ Up ▴ and confirm with ↵ Ok.
➥ Display indicates: Password 0***
3. Use push buttons ▲▼ Up ▴ Down ▾ to select figures 0 to 9.
4. Confirm first digit of password via push button ↵ Ok.
5. Repeat steps 1 and 2 for all further digits.
➥ Having confirmed the last digit with ↵ Ok, access to all parameters within one user level is possible if the password entry is correct.

3.4.2. Password change

Only the passwords of same or lower access level may be changed.

Example: If the user is signed in as Specialist (4), he/she can change passwords as for password levels (1) through (4).

M ▷   Device configuration   M0053
   Service functions   M0222
     Change passwords   M0229

Menu item Service functions M0222 is only visible, if user level Specialist (4) or higher is selected.

Select main menu
1. Set selector switch to position **0** (OFF).
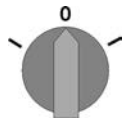
2. Press push button **C** Setup and hold it down for approx. 3 seconds.
➥ Display goes to main menu and indicates: ▸ Display

Change passwords
3. Select parameter Change passwords either:
  →   click via the menu M ▷ to parameter, or
  →   via direct display: press ▲ and enter ID M0229
- Display indicates: ▸ Change passwords
- The user level is indicated in the top row (1 – 6), e.g.:

                 (4) M0229

- For user level 1 (view only), passwords cannot be changed. To change passwords, you must change to a higher user level. For this, enter a password via a parameter.
4. For a user level between 2 and 6: Press push button ↵ Ok.
➥ The display indicates the highest user level, e.g.: For user 4
5. Select user level via push buttons ▲▼ Up ▴ Down ▾ and confirm with ↵ Ok.
➥ Display indicates: ▸ Change passwords Password 0***
6. Enter current password (→ enter password).
➥ Display indicates: ▸ Change passwords Password (new) 0***
7. Enter new password (→ enter password).
➥ Display indicates: ▸ Change passwords For user 4 (example)
8. Select next user level via push buttons ▲▼ Up ▴ Down ▾ or cancel the process via Esc.

3.4.3. Timeout for incorrect password entry

A timeout for incorrect password entry is provided with actuator controls. This prevents unauthorised access by systematic trials. The timeout is active for incorrect entries via the local controls as well as incorrect entries via our software tools (AUMA CDT, AUMA Assistant App). After five subsequent incorrect trials, further entry is inhibited for one minute. Each further incorrect entry doubles the timeout period. An active timeout is displayed on the screen. An individual timeout is available for each user level. This means that you may still log on with user level 3 if user level 4 is inhibited.

The incorrect entry counter can be reset in two ways:

1. Correct password entry with successful access authorisation.
2. 8 hours after the last incorrect entry.

3.5. Language in the display

The display language can be selected.

3.5.1. Language change

M ▷   Display   M0009
       Language   M0049

Select main menu 1. Set selector switch to position **0** (OFF).
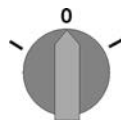
2. Press push button **C** Setup and hold it down for approx. 3 seconds.
➥ Display goes to main menu and indicates: ▸ Display

Change language 3. Press ↵ Ok.
➥ Display indicates: ▸ Language
4. Press ↵ Ok.
➥ Display indicates the selected language, e.g.: ▸ Deutsch
5. The bottom row of the display indicates:
    →   Save → continue with step 10
    →   Edit → continue with step 6
6. Press ↵ Edit.
➥ Display indicates: ▸ Observer (1)
7. Select user level via ▲ ▼ Up ▲ Down ▼ resulting in the following significations:
    →   black triangle: ▸ = current setting
    →   white triangle: ▷ = selection (not saved yet)
8. Press ↵ Ok.
➥ Display indicates: Password 0***
9. Enter password (→ enter password).
➥ Display indicates: ▸ Language and Save (bottom row)

Language selection 10. Select new language via ▲▼ Up ▲ Down ▼ resulting in the following significations:
    →   black triangle: ▸ = current setting
    →   white triangle: ▷ = selection (not saved yet)
11. Confirm selection via ↵ Save.
➥ The display changes to the new language. The new language selection is saved.

4. Indications

4.1. Indications during commissioning

LED test   When switching on the power supply, all LEDs on the local controls illuminate for approx. 1 second. This optical feedback indicates that the voltage supply is connected to the controls and all LEDs are operable.

Figure 8: LED test
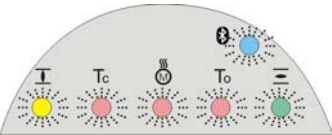
Language selection   During the self-test, the language selection can be activated so that the selected language is immediately indicated in the display. For this, set selector switch to position **0** (OFF).

Activate language selection:

1. Display indicates in the bottom line: Language selection menu? 'Reset'
2. Hold down push button **RESET** until display of the following text in the bottom line: Language menu loading, please wait.

Figure 9: Self-test
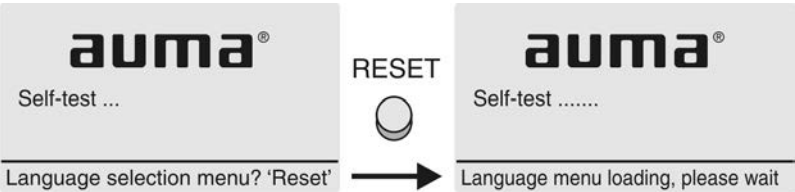
The language selection menu follows the startup menu.

Startup menu   The current firmware version is displayed during the startup procedure:

Figure 10: Startup menu with firmware version: 05.00.00–xxxx

If the language selection feature has been activated during the self-test, the menu for selecting the display language will now be indicated. For further information on language setting, please refer to chapter <Language in the display>.

Figure 11: Language selection
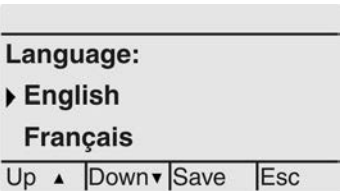
If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

4.2. Indications in the display

Menus and functions depend on the actuator controls firmware version!

→ Should menus or functions be unavailable, please contact the AUMA Service.

Status bar
The status bar (first row in the display) indicates the operation mode [1], the presence of an error [2] and the ID number [3] of the current display indication.

Figure 12: Information in the status bar (top)
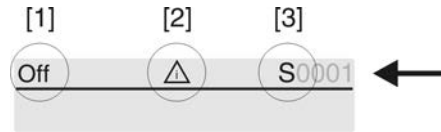
[1] Operation mode
[2] Error symbol (only for faults and warnings)
[3] ID number: S = Status page

Navigation support
If further details or information are available with reference to the display, the following indications Details or More appear in the navigation support (bottom display row). Then, further information can be displayed via the ↵ push button.

Figure 13: Navigation support (bottom)
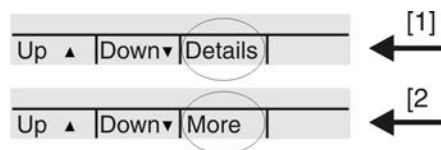
[1] shows list with detailed indications
[2] shows further available information

The navigation support (bottom row) is faded out after approx. 3 seconds. Press any push button (selector switch in position **0** (OFF)) to fade in the navigation support.

4.2.1. Feedback signals from actuator and valve

Display indications depend on the actuator version.

Valve position (S0001)

This indication is only available if a position transmitter (potentiometer, EWG, RWG or MWG) is installed in the actuator.

• S0001 on the display indicates the valve position in % of the travel.
• The bar graph display appears after approx. 3 seconds.
• When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 14: Valve position and direction of operation
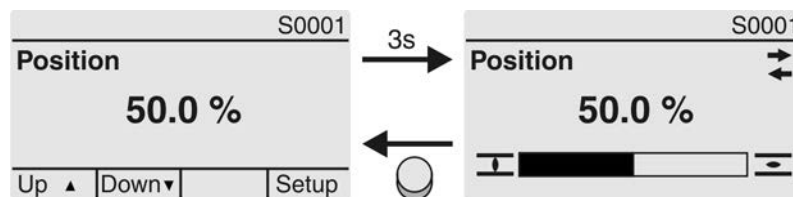
Reaching the preset end positions is additionally indicated via ⊥ (CLOSED) and ≍ (OPEN) symbols.

Figure 15: End position CLOSED/OPEN reached
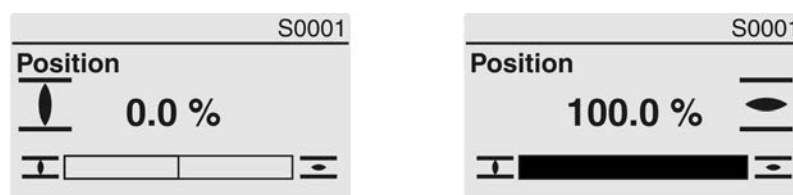
0% Actuator is in end position CLOSED
100% Actuator is in end position OPEN

Torque (S0002)

- S0002 on the display indicates the torque applied at the actuator output.
- The bar graph display appears after approx. 3 seconds.

Figure 16: Torque
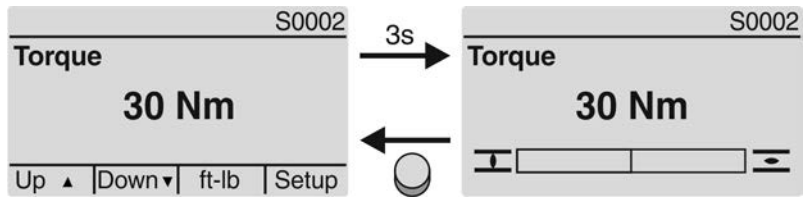
Select unit

The push button ↵ allows to select the unit displayed (percent %, Newton metre Nm or "foot-pound" ft-lb

Figure 17: Units of torque
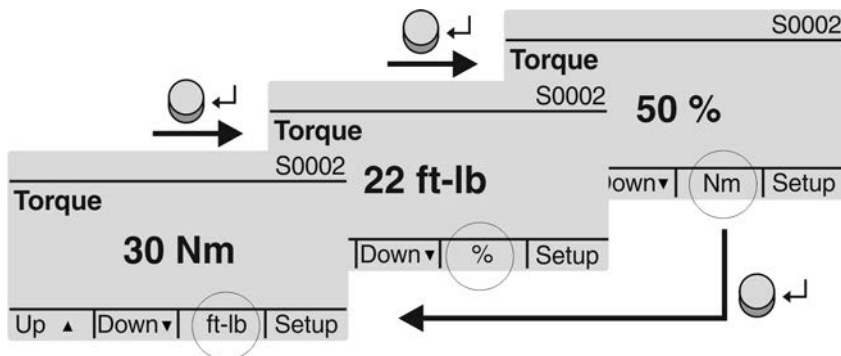
Display in percent

100 % indication equals the max. torque indicated on the name plate of the actuator.

Example: Torque range on name plate = 20 – 60 Nm.

- 100 % corresponds to 60 Nm of nominal torque.
- 50 % corresponds to 30 Nm of nominal torque.

Operation commands (S0003)

The display S0003 indicates:

- active operation commands, like e.g.: Operation in direction CLOSE or in direction OPEN
- the actual value E2 as bar graph indication and as value between 0 and 100 %.
- for setpoint control (positioner): setpoint E1
- for stepping mode or for intermediate positions with operation profile: pivot points and operation behaviour of pivot points

The navigation support (bottom row) is faded out after approx. 3 seconds and the axis/axes for pivot point display are shown.

OPEN - CLOSE control

Active operation commands (OPEN, CLOSE, ...) are shown above the bar graph display. The figure below shows the operation command in direction CLOSE.

Figure 18: Display for OPEN - CLOSE control
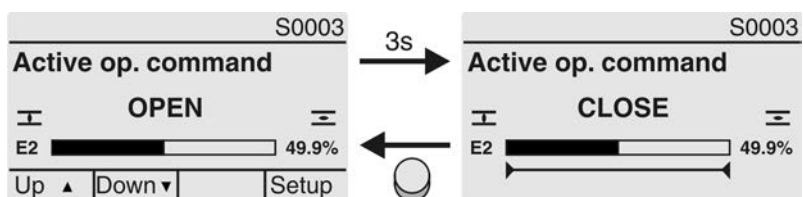
E2   Actual position value

Setpoint control

If the positioner is enabled and activated, the bar graph indication for E1 (position setpoint) is displayed.

The direction of the operation command is displayed by an arrow above the bar graph indication. The figure below shows the operation command in direction CLOSE.

Figure 19: Indication for setpoint control (positioner)

E1   Position setpoint
E2   Actual position value
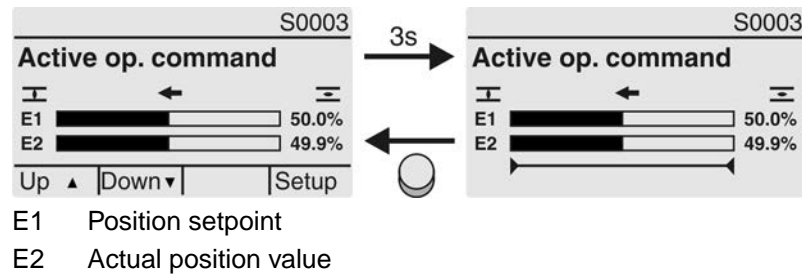
Pivot point axis   The pivot points and their operation behaviour (operation profile) are shown on the pivot point axis by means of symbols.

The symbols are only displayed if at least one of the following functions is activated:

Operation profile M0294

Timer CLOSE M0156

Timer OPEN M0206

Figure 20: Examples: on the left pivot points (intermediate positions); on the right stepping mode

Table 3: Symbols along the pivot point axis

Symbol	Pivot point (intermediate position) with operation profile	Stepping mode
|	Pivot point without reaction	End of stepping mode
◀	Stop during operation in direction CLOSE	Start of stepping mode in direction CLOSE
▶	Stop during operation in direction OPEN	Start of stepping mode in direction OPEN
◆	Stop during operation in directions OPEN and CLOSE	–
◁	Pause for operation in direction CLOSE	–
▷	Pause for operation in direction OPEN	–
◇	Pause for operation in directions OPEN and CLOSE	–

4.2.2.   Status indications according to AUMA classification

These indications are available if the parameter Diagnostic classific. M0539 is set to AUMA.

Warnings (S0005)

If a warning has occurred, the display shows S0005:

• the number of warnings occurred
• a blinking question mark after approx. 3 seconds

Figure 21: Warnings
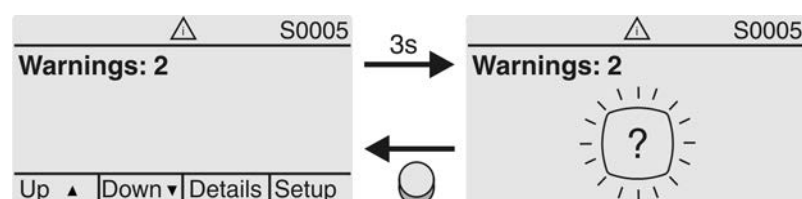
For further information, please also refer to <Corrective action>.

Not ready REMOTE (S0006)

The S0006 display shows indications of the Not ready REMOTE group.

If such an indication has occurred, the display shows S0006:

- the number of indications occurred
- a blinking crossbar after approx. 3 seconds

Figure 22: Not ready REMOTE indications
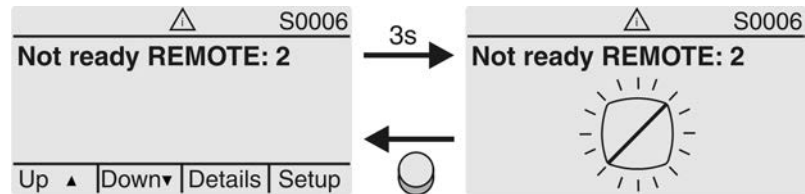
For further information, please also refer to <Corrective action>.

Fault (S0007)

If a fault has occurred, the display shows S0007:

- the number of faults occurred
- a blinking exclamation mark after approx. 3 seconds

Figure 23: Fault
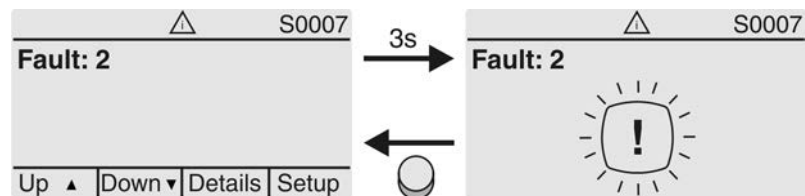
For further information, please also refer to <Corrective action>.

4.2.3. Status indications according to NAMUR recommendation

These indications are available, if the parameter Diagnostic classific. M0539 is set to NAMUR.

Out of Specification (S0008)

The S0008 indication shows out of specification indications according to NAMUR recommendation NE 107.

If such an indication has occurred, the display shows S0008:

- the number of indications occurred
- a blinking triangle with question mark after approx. 3 seconds

Figure 24: Out of specification
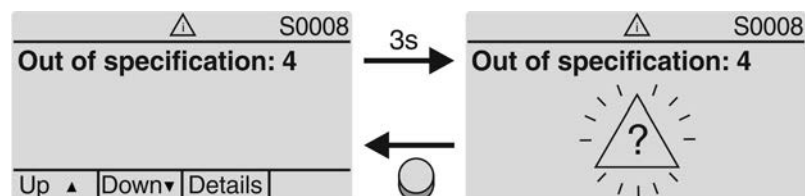
For further information, please also refer to <Corrective action>.

Function check (S0009)

The S0009 indication shows function check indications according to NAMUR recommendation NE 107.

If an indication has occurred via the function check, the display shows S0009:

- the number of indications occurred
- a blinking triangle with a spanner after approx. 3 seconds

Figure 25: Function check
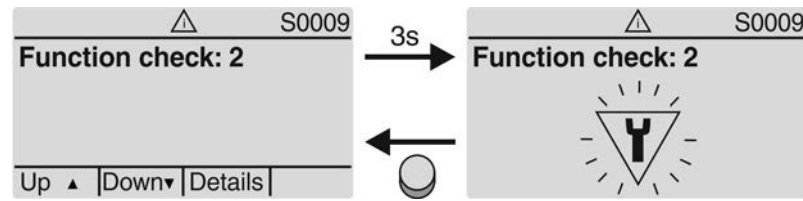
For further information, please also refer to <Corrective action>.

Maintenance required (S0010)

The S0010 indication shows maintenance indications according to NAMUR recommendation NE 107.

If such an indication has occurred, the display shows S0010:

- the number of indications occurred
- a blinking square with an oilcan after approx. 3 seconds

Figure 26: Maintenance required
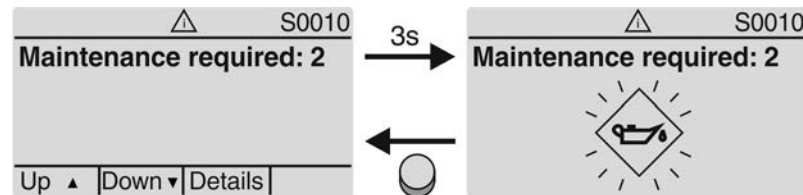
For further information, please also refer to <Corrective action>.

Failure (S0011)

The S0011 indication shows the causes of the failure indication according to NAMUR recommendation NE 107.

If such an indication has occurred, the display shows S0011:

- the number of indications occurred
- a blinking circle with a cross after approx. 3 seconds

Figure 27: Failure
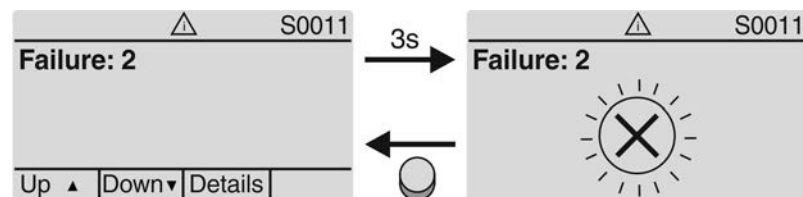
For further information, please also refer to <Corrective action>.

4.3. Indication lights of local controls

Figure 28: Arrangement and signification of indication lights

[1]   Marking with symbols (standard)

[2]   Marking with figures 1 – 6 (option)

1   End position CLOSED reached (blinking: operation in direction CLOSE)

2 Tc   Torque fault CLOSE

3   Motor protection tripped

4 To   Torque fault OPEN

5   End position OPEN reached (blinking: operation in direction OPEN)

6   Bluetooth connection active

Modify indication light assignment (indications)

Different indications can be assigned to LEDs 1 – 5.

M ▷   Device configuration   M0053
    Local controls   M0159
      Indication light 1 (left)   M0093
      Indication light 2   M0094
      Indication light 3   M0095
      Indication light 4   M0096
      Indicat. light 5 (right)   M0097
      Signal interm. pos.   M0167

Defaut values (Europe):
Indication light 1 (left)   =   End p. CLOSED, blink
Indication light 2   =   Torque fault CLOSE
Indication light 3   =   Thermal fault
Indication light 4   =   Torque fault OPEN
Indicat. light 5 (right)   =   End p. OPEN, blink
Signal interm. pos.   =   OPEN/CLOSED = Off

Further setting values:

Refer to <Appendix>/<Selection overview for output contacts and indication lights>

4.3.1. Indication lights: change colour

User level required to make changes: AUMA (6)

M ▷   Device configuration   M0053
    Local controls   M0159

Table 4:

Parameters	Menu	Default values for European variant	Setting values
Colour ind.light 1	M0838	Yellow	Yellow Green Yellow/green
Colour ind.light 2	M0839	Red	Red Blue Purple
Colour ind.light 3	M0840	Red	Red Yellow Orange
Colour ind.light 4	M0841	Red	Red Blue Purple
Colour ind.light 5	M0842	Green	Green Red Orange

Information   Default values can vary for other variants.

5. Signals (output signals)

5.1. Signals via fieldbus

The feedback signals via Modbus RTU can be read using the appropriate Modbus function codes.

For further information, please refer to the Manual (Device integration fieldbus) Modbus.

5.2. Status signals via output contacts (digital outputs)

Conditions Output contacts are only available if a parallel interface is provided in addition to the fieldbus interface.

Characteristics Output contacts are used to send status signals (e.g. reaching the end positions, selector switch position, faults...) as binary signals to the control room.

Status signals only have two states: active or inactive. Active means that the conditions for the signal are fulfilled.

5.2.1. Assignment of outputs

The output contacts (outputs DOUT 1 – 6) can be assigned to various signals.

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   I/O interface M0139
     Digital outputs M0110
       Signal DOUT 1 M0109

Default values:

Signal DOUT 1 = Fault
Signal DOUT 2 = End position CLOSED
Signal DOUT 3 = End position OPEN
Signal DOUT 4 = Selector sw. REMOTE
Signal DOUT 5 = Torque fault CLOSE
Signal DOUT 6 = Torque fault OPEN

Further setting values:

Refer to <Appendix>/<Selection overview for output contacts and indication lights>

5.2.2. Coding the outputs

The output signals Coding DOUT 1 – Coding DOUT 6 can be set either to high active or low active.

- High active = output contact closed = signal active
- Low active = output contact open = signal active

Signal active means that the conditions for the signal are fulfilled.

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   I/O interface M0139
     Digital outputs M0110
       Coding DOUT 1 M0102

Default values:

Coding DOUT 1 = Low active
Coding DOUT 2 – Coding DOUT 6 = High active

5.3. Configurable status signals

Requirements <Additional inputs> or additional <Parallel interface>.

The status signals described here are collective signals of various other signals. For configuration, the contained signals can be selected from a list and activated ( ) or deactivated ( ) individually.

The status signals can either be assigned to a digital output (output contact) or to an indication light (LED).

For detailed information on these signals, refer to page 146, Fault indications and warning indications chapter.

Configure status signals

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   Config. of signals M0860
      Failure (configurable) M0879
      Fault (Cfg) M0880
      Warnings (Cfg) M0881
      Not ready REMOTE (Cfg) M0882

A dot in the display indicated whether the signal is active or not.

Figure 29: Example
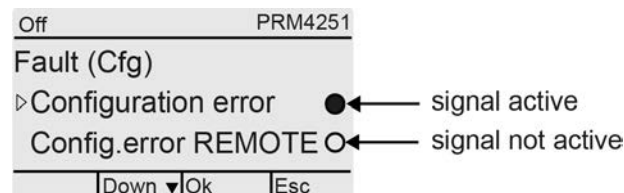
Black dot (●): Signal active

White dot (○): Signal not active

Activation/deactivation is switched on/off by push button Ok.

5.4. Analogue signals (analogue outputs)

Conditions   The actuator is equipped with a position transmitter.

Characteristics   Depending on the actuator equipment, different signals, such as travel, torque or output speed can be recorded and issued as continuous values, e.g. 4 to 20 mA. Actuator controls are equipped with up to two analogue outputs, AOUT1 and AOUT2.

5.4.1. Assignment of analogue output 1

Required user level: AUMA (6).

M ▷ Device configuration M0053
   I/O interface M0139
      Analogue outputs M0335
         Signal AOUT 1 M0131

Default value: Actual position

Information   The signal range of the output (e.g. 0/4 – 20 mA) is set via a separate parameter (Signal range AOUT1 M0129).

Setting values:

Not used   Analogue output 1 is not assigned.

Actual position   Position feedback of the valve position (actual position value E2)

Condition: Position transmitter installed in the actuator.

An adjustment to the end positions or the defined travel is not required. An automatic adjustment is done via the end positions (LSC (WSR) and LSO (WOEL)).

For torque seating, the end positions OPEN and CLOSED of the limit switching should be set as close as possible to the end positions of the valve to minimise the deviation of the feedback.

Torque | Torque feedback E6

Condition: MWG position transmitter in actuator.

The zero point is in the centre of the selected output range (10 mA or 12 mA). The torque in direction CLOSE is indicated with 0 – 10 mA or 4 – 12 mA, the torque in direction OPEN with 10 – 20 mA or 12 – 20 mA. For 127 % of the maximum nominal output torque, 0 or 4 mA are indicated in direction CLOSE, and 20 mA are indicated in direction OPEN.

Figure 30: Actual torque value
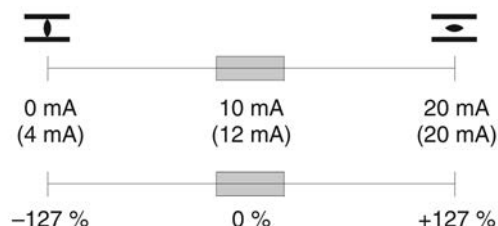
–127 %= maximum nominal torque in end position CLOSED reached

+127 %= maximum nominal torque in end position OPEN reached

Input AIN 1 | Analogue value transmitted via AIN1 (refer to wiring diagram) to the actuator.

Condition: An analogue signal (e.g. 0 – 20 mA) is connected to the analogue input AIN 1.

Input AIN 2 | Analogue value transmitted via AIN 2 (refer to wiring diagram) to the actuator.

Condition: An analogue signal (e.g. 0 – 20 mA) is connected to the analogue input AIN 2.

Fieldbus AOUT 1 | Analogue value transmitted from the fieldbus to the actuator.

The value is transmitted via fieldbus in per mil (value: 0 – 1000) and can be sent as continuous value. e.g 4 to 20 mA, via output Signal AOUT 1.

Fieldbus AOUT 2 | If another analogue value is transmitted via fieldbus to the actuator, it can be sent as continuous value. e.g 4 to 20 mA, via output Signal AOUT 2.

Temp. ctrls norm. ‰ | Actuator controls temperature (normalised) in per mil.

Condition: MWG position transmitter in actuator.

Temp. ctrl unit norm ‰ | Control unit temperature (normalised) in per mil.

Condition: MWG position transmitter in actuator.

5.4.2. Signal range of analogue output 1

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  I/O interface M0139
    Analogue outputs M0335
      Signal range AOUT1 M0129

Default value: 0 - 20 mA

Setting values:

0 - 20 mA | Analogue output 1 generates a 0 – 20 mA signal.

4 - 20 mA | Analogue output 1 generates a 4 – 20 mA signal.

20 - 0 mA | Analogue output 1 generates a 20 – 0 mA signal.

20 - 4 mA | Analogue output 1 generates a 20 – 4 mA signal.

X to Y mA | The signal range (X-Y) of the analogue output can be freely configured using two parameters.

5.4.3. Adjustment of analogue output 1

Initial values and end values of the signal range can be corrected by ± 10 % of the maximum value range (20 mA)

Example: Parameter Signal range AOUT1 = 4 - 20 mA

The initial value (4 mA) can be adapted within a range of 2 mA to 6 mA.

The end value (20 mA) can be adapted within a range of 18 mA to 22 mA.

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
　 I/O interface M0139
　　 Analogue outputs M0335
　　　 Adjustment AOUT 1 M0544
　　　　 0/4 mA (initial value) M0140
　　　　 20 mA (final value) M0210

Default value: 0

Setting ranges: –10.0 ... 10.0 % (in %)

5.4.4. Assignment of analogue output 2

Required user level: Specialist (4).

M ▷ Device configuration M0053
　 I/O interface M0139
　　 Analogue outputs M0335
　　　 Signal AOUT 2 M0132

Default value: Torque

Setting values:

Description see <Assignment of analogue output 1>.

5.4.5. Signal range of analogue output 2

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
　 I/O interface M0139
　　 Analogue outputs M0335
　　　 Signal range AOUT2 M0130

Default value: 0 - 20 mA

Setting values:

0 - 20 mA	Analogue output 2 generates a 0 – 20 mA signal.
4 - 20 mA	Analogue output 2 generates a 4 – 20 mA signal.
20 - 0 mA	Analogue output 2 generates a 20 – 0 mA signal.
20 - 4 mA	Analogue output 2 generates a 20 – 4 mA signal.
X to Y mA	The signal range (X-Y) of the analogue output can be freely configured using two parameters.

5.4.6. Adjustment of analogue output 2

Initial values and end values of the signal range can be corrected by ± 10 % of the maximum value range (20 mA)

Example: Parameter Signal range AOUT1 = 4 - 20 mA

The initial value (4 mA) can be adapted within a range of 2 mA to 6 mA.

The end value (20 mA) can be adapted within a range of 18 mA to 22 mA.

Required user level: Specialist (4) or higer.

M ▷ Device configuration M0053
      I/O interface M0139
        Analogue outputs M0335
          Adjustment AOUT 2 M0545
            0/4 mA (initial value) M0141
            20 mA (final value) M0211

Default values: 0

Setting ranges: –10.0 ... 10.0 % (in %)

6. Operation

Different operation modes (states) are available. The current operation mode is indicated in the first line of the display:

Figure 31: Example: Operation mode Off

This chapter describes the characteristics of the different operation modes; the respective functions are described in separate chapters.

6.1. Operation mode Off

The selector switch is in position **0** (OFF).
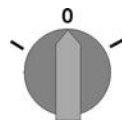
Characteristics
- The indication in the top row of the display shows: Off
- Electric operation is not possible (not even EMERGENCY operation).
- The controls remain fully operative as far as signalling is concerned (controls' power supply is maintained).
- Push buttons ▲▼↵C can be used for menu navigation via the display.

6.2. Operation mode Local

Selector switch is in position **Local control** (LOCAL).
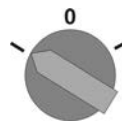
Properties
- The indication in the top row of the display shows: Local
- In motor operation, the actuator can be controlled locally via the push buttons ⊥ (OPEN), STOP, ⊇ (CLOSE).
- Faults and warnings without automatic reset can be confirmed with the push button RESET.

6.2.1. Push-to-run operation or self-retaining Local

Parameter Self-retaining Local M0076 determines the actuator operation behaviour to operation commands via push buttons on local controls.

M ▷ Customer settings M0041
   Local controls M0075
    Self-retaining Local M0075

Default value: OPEN and CLOSE

Setting values:

Off (push-to-run op.) Push-to-run operation activated, self-retaining off:

Actuator only runs in directions OPEN or CLOSE while an operation command is being received. The actuator stops if the operation command is cancelled.

OPEN In direction OPEN = self-retaining (in direction CLOSE push-to-run operation):

After an operation command in direction OPEN, the actuator continues to run, even if the operation command is cancelled (self-retaining). The actuator is either stopped by the STOP command or if end position OPEN or an intermediate position OPEN has been reached.

CLOSE In direction CLOSE = self-retaining (in direction OPEN push-to-run operation):

After an operation command in direction CLOSE, the actuator continues to run, even if the operation command is cancelled (self-retaining). The actuator is either stopped by the CLOSE command or if end position CLOSED or an intermediate position CLOSED has been reached.

OPEN and CLOSE   In directions OPEN and CLOSE = self-retaining:

After an operation command, the actuator continues to run in directions OPEN or CLOSE, even if the operation command is cancelled (self-retaining). The actuator is either stopped by the STOP command or if an end position or intermediate position has been reached.

Direct reversal of operation is not possible. Operation commands in directions OPEN or CLOSE must be stopped first by STOP command. Only then is an operation command into the opposite direction allowed.

OPEN & CL w/o STOP   In directions OPEN and CLOSE = self-retaining without stop:

Direct reversal of operation is also possible without the STOP command. However, operation can be stopped at any time by the STOP command.

6.3.   Operation mode remote

Selector switch is in position **Remote control** (REMOTE).
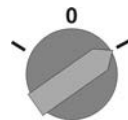
Properties   The indication in the top row of the display shows the set source of the operation commands:

- Remote (parallel interface)
- Remote II (parallel interface, service box)
- Fieldbus (channel 1 or channel 2)

Depending on the control, a distinction is made between:

- OPEN-CLOSE control (operation mode Remote OPEN-CLOSE):
  Control is made via binary operation commands OPEN, STOP, CLOSE.
- Setpoint control (operation mode Remote SETPOINT):
  Control via analogue operation commands, e.g. 4 – 20 mA.

Information   • Binary signals (e.g. +24 V DC) via digital inputs are only recognised as valid operation commands if the signal is present for at least 10 ms.

- If a positioner or process controller is available, change-over between OPEN-CLOSE control (operation mode Remote OPEN-CLOSE) and setpoint control (operation mode Remote SETPOINT) is possible. Refer to chapter <Change-over between OPEN-CLOSE control and setpoint control>.

6.3.1.   Push-to-run operation or self-retaining Remote

Parameters Self-retaining Remote M0100, Self-retaining M01193 and Self-retaining Remote II M0101 determine the operation behaviour of the actuator to binary operation commands (OPEN, STOP, CLOSE), controlling the actuator "from Remote" via the I/O interface.

"Self-retaining" parameters have no impact on operation commands transmitted via fieldbus. When equipped with fieldbus interface, setting of these parameters is only required if digital inputs (OPEN, STOP, CLOSE) are available in addition to the fieldbus interface.

M ▷   Customer settings M0041
   I/O interface M0015
      Self-retaining Remote M0100
      Self-retaining Remote II M0101

Default values:

Self-retaining = Off (push-to-run op.)

Self-retaining Remote II = OPEN and CLOSE

Setting values for parameters Self-retaining Remote M0100 **and** Self-retaining Remote II M0101**:**

Off (push-to-run op.) Push-to-run operation activated, self-retaining off:

Actuator only runs in directions OPEN or CLOSE while an operation command is being received. The actuator stops if the operation command is cancelled.

OPEN In direction OPEN = self-retaining (in direction CLOSE push-to-run operation):

After an operation command in direction OPEN, the actuator continues to run, even if the operation command is cancelled (self-retaining). The actuator is either stopped by the STOP command or if end position OPEN or an intermediate position OPEN has been reached.

CLOSE In direction CLOSE = self-retaining (in direction OPEN push-to-run operation):

After an operation command in direction CLOSE, the actuator continues to run, even if the operation command is cancelled (self-retaining). The actuator is either stopped by the CLOSE command or if end position CLOSED or an intermediate position CLOSED has been reached.

OPEN and CLOSE In directions OPEN and CLOSE = self-retaining:

After an operation command, the actuator continues to run in directions OPEN or CLOSE, even if the operation command is cancelled (self-retaining). The actuator is either stopped by the STOP command or if an end position or intermediate position has been reached.

Direct reversal of operation is not possible. Operation commands in directions OPEN or CLOSE must be stopped first by the STOP command. Only then is an operation command into the opposite direction allowed.

OPEN & CL w/o STOP In directions OPEN and CLOSE = self-retaining without stop:

Direct reversal of the operation direction without STOP command is possible.

Direct reversal of operation is also possible without the STOP command. However, operation can be stopped at any time by the STOP command.

6.4. Operation mode EMERGENCY

See also: Failure function <EMERGENCY behaviour>

Characteristics
- The indication in the top row of the display shows: EMERGENCY
- The operation mode EMERGENCY is initiated by the EMERGENCY signal.
- The actuator performs an EMERGENCY operation. For example, the actuator moves to a predefined EMERGENCY position (i.e. end position OPEN or end position CLOSED).
- As long as the EMERGENCY signal is present, the actuator does not respond to any other operation commands (EMERGENCY signal has top priority).

⚠ CAUTION **The actuator can start immediately when switching on!**

Risk of personal injuries or damage to the valve.

→ Ensure that the EMERGENCY signal is present when switching on.

→ Should the actuator start unexpectedly: Immediately set selector switch to position **0** (OFF).

6.5. Operation mode EMERGENCY stop

See also: Failure function <EMERGENCY stop function>

Condition An EMERGENCY stop button (latching) is either located on the electrical connection or outside.

Characteristics
- The indication in the top row of the display shows: EMCY stop

- In an emergency, the EMERGENCY stop button can be used to interrupt the power supply of the motor control (contactors or thyristors).
- Operation mode EMERGENCY stop supersedes all other operation modes.
- A new operation command can only be executed once the pressed EMERGENCY stop button is released and operation mode EMERGENCY Stop is cancelled using a Reset command.
- Once operation mode EMERGENCY Stop is cancelled (Reset command), incoming analogue operation commands (e.g. 0/4 – 20 mA) or incoming operation commands via fieldbus will immediately be executed again.

6.6. Operation mode Disabled

See also: Application function <Local controls:enable>

Characteristics
- The indication in the top row of the display shows: Disabled
- The operation via the push buttons on the local controls is disabled.
- Operation mode Disabled is possible in selector switch positions LOCAL and OFF.

Table 5: Functions depending on the selector switch position:

Selector switch is in position	Function during indication = Disabled
Local control (LOCAL)	Actuator cannot be operated locally
0 (OFF)	Local menu operation not possible

- For control via fieldbus interface, the fieldbus disables or enables the operation.

6.7. Operation mode Service

Conditions: Set selector switch = position **Local control** (LOCAL) or **Remote control** (REMOTE).

Display indicates in the first row: Service

Characteristics
- The indication in the top row of the display shows: Service
- For operation mode Service, a PC or laptop with AUMA CDT service software is required. AUMA service uses this software (e.g. during commissioning or maintenance) to perform settings at the actuator controls.

Information In selector position **Local control** (LOCAL), press any push button to exit the service operation mode and to activate operation mode Local.

7. Basic settings for commissioning

Definition Basic settings such as type of seating, torque and limit switching are required for safe commissioning of the actuator controls together with the actuator. Basic settings for display, such as date and time or display formats, can be changed, if required.

7.1. Type of seating for end positions

Function
- Selection of the type of seating (according to valve manufacturer's specifications)
  - Limit seating in end position
  - Torque seating in end position
- For end positions OPEN and CLOSED, the following can be set individually:

Limit seating

Actuator controls switch off the actuator in the end positions (OPEN/CLOSED) set via limit switching.

For end position seating via limit switching, you have to account for the overrun of the actuator. Overrun [1] is the travel from switching off until complete standstill. The overrun depends on the inertia of both the actuator and the valve and the delay time of the actuator controls.

Figure 32: Limit seating
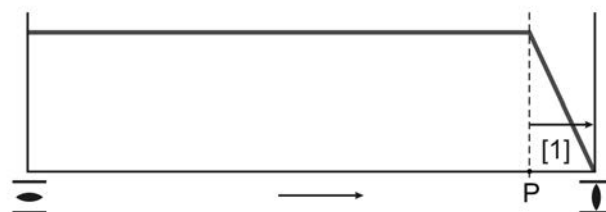
P   Tripping position
[1]   Overrun

Torque seating

Actuator controls switch off the actuator in the end positions via torque tripping.

For this, the torque switching has to be set to the tripping torque specified by the valve manufacturer. When reaching the end position, the torque increases within the valve seat. Actuator controls switch off the actuator once the set tripping torque has been reached.

With this setting, the limit switching is used for signalling and must be set to trip shortly **before** reaching the end position.

7.1.1. Type of seating: set

NOTICE

Valve damage due to incorrect setting!

→ The type of seating setting (limit or torque seating) must match the selection for the valve.

→ Only change the setting with prior consent of the valve manufacturer.
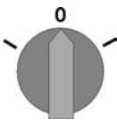
M ▷ Customer settings M0041
       Type of seating M0012
          End position CLOSED M0086
          End position OPEN M0087

Default value: Limit

Setting values:

Limit   Seating in end positions via limit switching.

Torque   Seating in end positions via torque switching.

Select main menu 1. Set selector switch to position **0** (OFF).

2. Press push button **C** Setup and hold it down for approx. 3 seconds.
➥ Display goes to main menu and indicates: ► Display

Select parameter 3. Select parameter either:
→ click via the menu M ▷ to parameter, or
→ via direct display: Press ▲ and enter ID M0086 or M0087
➥ Display indicates: End position CLOSED

CLOSE or OPEN 4. Use ▲▼ Up ▲ Down ▼ to select:
→ ► End position CLOSED
→ ► End position OPEN
➥ The black triangle ► indicates the current selection.
5. Press ↵ Ok.
➥ Display indicates the current setting: Limit or Torque
➥ The bottom row of the display indicates either:
- Edit → continue with step 6
- Save → continue with step 10
6. Press ↵ Edit.
➥ Display indicates: ► Specialist (4)

User login 7. Use ▲▼ Up ▲ Down ▼ to select user:
Information: Required user level: Specialist (4) or higher

➥ The symbols have the following meaning:
- black triangle: ► = current setting
- white triangle: ▷ = selection (not saved yet)
8. Press ↵ Ok.
➥ Display indicates: Password 0***
9. Enter password (→ enter password).
➥ The screen indicates the pre-set type of seating (►Limit or ►Torque) by means of a black triangle ►.

Change settings 10. Use ▲▼ Up ▲ Down ▼ to select new setting.
➥ The symbols have the following meaning:
- black triangle: ► = current setting
- white triangle: ▷ = selection (not saved yet)
11. Confirm selection via ↵ Save.
➥ The setting for the type of seating is complete.
12. Back to step 4 (CLOSED or OPEN): Press ↵ Esc.

7.2. Torque switching

Conditions MWG in actuator (non-intrusive version).

For torque switches within the actuator (intrusive version), the torque switching is set as described in the operation instructions pertaining to the actuator.

Function • Overload protection across full travel
• Tripping in end positions (for torque seating)
• Tripping in during manual operation also possible

- Indication or setting either in percent %, Newton metre Nm or in pounds per foot. ft-lb

Read more <Torque monitoring> chapter

7.2.1. Torque switching: set

Once the set torque is reached, the torque switches will be tripped (overload protection of the valve).

Information The torque switches may also trip during manual operation.

NOTICE	**Valve damage due to excessive tripping torque limit setting!**

→ The tripping torque must suit the valve.

→ Only change the setting with the consent of the valve manufacturer.

M ▷ Customer settings M0041
  Torque switching M0013
    Trip torque CLOSE M0088
    Trip torque OPEN M0089

Default value: According to order data

Setting range: Torque range according to actuator name plate

Select main menu 1. Set selector switch to position **0** (OFF).
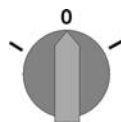
2. Press push button **C** Setup and hold it down for approx. 3 seconds.

➥ Display goes to main menu and indicates: ▸ Display

Select parameter 3. Select parameter either:

→ click via the menu **M ▷** to parameter, or

→ via direct display: press ▲ and enter ID M0088.

➥ Display indicates: Trip torque CLOSE

CLOSE or OPEN 4. Use ▲▼ Up ▲ Down ▼ to select:

→ ▸ Trip torque CLOSE

→ ▸ Trip torque OPEN

➥ The black triangle ▸ indicates the current selection.

5. ↵ Press Ok.

➥ Display shows the set value.

➥ The bottom row indicates: Edit Esc

6. ↵ Press Edit.

➥ Display indicates:

- Specialist (4) → continue with step 7

- in bottom row Up ▲ Down ▼ Esc → continue with step 11

User login 7. Use ▲▼ Up ▲ Down ▼ to select user:
Information: Required user level: Specialist (4) or higher.

➥ The symbols have the following meanings:

- black triangle: ▸ = current setting

- white triangle: ▷ = selection (not saved yet)

8. ↵ Press Ok.

➥ Display indicates: Password 0***

9.   Enter password (→ enter password).

➥   Display shows the set value.

➥   The bottom row indicates: Edit Esc

10.   ↵ Press Edit.

Change value   11.   Enter new value for tripping torque via ▲▼ Up ▲ Down ▼.
Information: The adjustable torque range is shown in round brackets.

12.   Save new value via ↵ Save.

➥   The tripping torque is set.

13.   Back to step 4 (CLOSED or OPEN): Press ↵ Esc.

Information   The following fault signals are issued if the torque setting performed has been reached **in mid-travel**:

- In the display of the local controls: Status indication S0007 Fault = Torque fault OPEN or Torque fault CLOSE

The fault has to be acknowledged before the operation can be resumed. The acknowledgement is made:

1.   either by an operation command in the opposite direction.
   -    For Torque fault OPEN: Operation command in direction CLOSE
   -    For Torque fault CLOSE: Operation command in direction OPEN

2.   or, in case the torque applied is lower than the preset tripping torque:
   -    in selector switch position **Local control** (LOCAL) via push button **RESET**.
   -    in selector switch position **Remote control** (REMOTE):
      -    via the fieldbus, command reset. (byte 1 bit 3 of output data), if the fieldbus is the active command source.
      -    via a digital input (I/O interface) with RESET command if a digital input is configured for signal RESET and the I/O interface is the active command source.

7.3.   Limit switching

Conditions   Electronic control unit with MWG in the actuator (non-intrusive version)

For an electro-mechanical control unit equipped with switches in the actuator (intrusive version), the limit switches are set as described in the operation instructions.

Functions   - Tripping in end positions (limit seating)
- Signalling the end positions (torque seating)

7.3.1.   Limit switching: set

→   **If the valve cannot be operated during commissioning, only one end position can be set. The other end position must then be set via the stroke.**

→   For this, refer to page 41, End position setting via stroke.

NOTICE   **Valve damage at valve/gearbox due to incorrect setting!**

→   When setting with motor operation: Stop actuator **prior** to reaching end of travel (press STOP push button).

→   For limit seating, provide for sufficient backlash between end position and mechanical end stop due to potential overrun.

M ▷   Customer settings M0041
   Limit switching M0010
    Set end pos.CLOSED? M0084
    Set end pos. OPEN? M0085

Select main menu   1.   Set selector switch to position **0** (OFF).

2.   Press push button **C** and hold it down for approx. 3 seconds.

➥   Display goes to main menu and indicates: ▸ Display

Select parameter   3.   Select parameter either:

→   click via the menu M ▷ to parameter, or

→   via direct display: press ▲ and enter ID M0084.

➥   Display indicates: Set end pos.CLOSED?

CLOSED or OPEN   4.   Select via ▲▼ Up ▲ Down ▼:

→   ▸ Set end pos.CLOSED? M0084

→   ▸ Set end pos. OPEN? M0085

➥   The black triangle ▸ indicates the current selection.

5.   Press ↵ Ok.

➥   The display indicates either:

-   Set end pos.CLOSED? CMD0009 → continue with step 9

-   Set end pos. OPEN? CMD0010 → continue with step 12

-   Specialist (4) → continue with step 6

User login   6.   Use ▲▼ Up ▲ Down ▼ to select user:
Information: Required user level: Specialist (4) or higher

➥   The symbols have the following meaning:

-   black triangle: ▸ = current setting

-   white triangle: ▷ = selection (not saved yet)

7.   Press Ok to confirm selected user.

➥   Display indicates: Password 0***

8.   Enter password (→ enter password).

➥   The display indicates either:

-   Set end pos.CLOSED? CMD0009 → continue with step 9

-   Set end pos. OPEN? CMD0010 → continue with step 12

Set end position   9.   Set end position CLOSED again :
CLOSED CMD0009

9.1   For large strokes: Set selector switch in position **Local control** (LOCAL)
and operate actuator in motor operation via push button ⊥̄ (CLOSE) in
direction of the end position.
Information: Stop actuator **before** reaching end of travel (press **STOP**
push button to avoid damage.

9.2   Engage manual operation.

9.3   Turn handwheel until valve is closed.

9.4   Turn handwheel by approximately half a turn (overrun) in the opposite
direction of end position.

9.5   Turn back the handwheel by an amount equal to the overrun.

9.6   Set selector switch to position **0** (OFF).

➥   Display indicates: Set end pos.CLOSED? Yes No

**Confirm new end posi-
tion**

10. Press ↵ Yes to confirm new end position.

➥ Display indicates: End pos. CLOSED set!

➥ The left LED is illuminated (standard version) and thus indicates that the end
position CLOSED setting is complete.
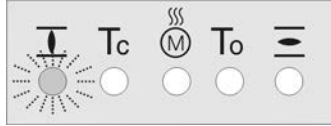
11. Make selection:

→ Edit → back to step 9: Set end position CLOSED "once again"

→ Esc → back to step 4; either set end position OPEN or exit the menu.

Set end position OPEN
CMD0010

12. Re-set end position OPEN:

12.1 For large strokes: Set selector switch in position **Local control** (LOCAL)
and operate actuator in motor operation via push button ▬ (OPEN) in
direction of the end position.
Information: Stop actuator **before** reaching end of travel (press **STOP**
push button to avoid damage.

12.2 Engage manual operation.

12.3 Turn handwheel until valve is open.

12.4 Turn handwheel by approximately half a turn (overrun) in the opposite
direction of end position.

12.5 Turn back the handwheel by an amount equal to the overrun.

12.6 Set selector switch to position **0** (OFF).

➥ Display indicates: Set end pos. OPEN? Yes No

**Confirm new end posi-
tion**

13. Press ↵ Yes to confirm new end position.

➥ Display indicates: End pos. OPEN set!

➥ The right LED is illuminated (standard version) and thus indicates that the end
position OPEN setting is complete.
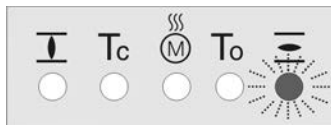
14. Make selection:

→ Edit → back to step 12: Set end position OPEN "once again"

→ Esc → back to step 4; either set end position CLOSED or exit the menu.

Information   If an end position cannot be set: Check the type of control unit in actuator.

7.3.2. End position setting via stroke

→ **For all applications not allowing to operate the valve during commissioning,
the second end position can be set via the stroke.**

→ The basics are the MWG incremental values shown in this chapter.

→ The first end position either OPEN or CLOSED, depending on the valve position
during commissioning, can be set as usual using the limit switching. For this,
refer to page 39, Limit switching: set.

NOTICE	**Valve damage at valve/gearbox due to incorrect setting!**

→ When setting with motor operation: Stop actuator **prior** to reaching end of travel (press STOP push button).

→ For limit seating, provide for sufficient backlash between end position and mechanical end stop due to potential overrun.

MWG incremental values depending on the actuator type

Depending on the generation, the MWG of actuator controls can represent the following revolutions:

Generation 1: 512 turns at a value of 16 bit

Generation 2: 544 turns at a value of 16 bit

Information

The type of generation integrated within the actuator can be identified by the item "Positioner" of the order-related data sheet. This data sheet can be downloaded from the website **www.auma.com** via "Service & Support".

Table 6: Determine the generation via the order-related data sheet

Value on the order-related data sheet	MWG generation
30.1	1
30.2, 30.4, 30.5	2

The table below lists the number of incremented values per revolution at the output drive of the respective actuator.

Table 7: Incremented values per revolution (multi-turn actuator)

Actuator	Incremented values per revolution Generation 1	Incremented values per revolution Generation 2
SA 07.2 / SA 07.6	125.490	118.108
SA 10.2	128	120.461
SA 14.2 / SA 14.6	127.543	120.041
SA 16.2	128	120.461

Table 8: Incremented values per revolution (part-turn actuator)

Actuator	Incremented values per 1/4 revolution Generation 1	Incremented values per 1/4 revolution Generation 2
SQ 05.2	665.546	626.397
SQ 07.2	665.546	626.397
SQ 10.2	851.899	801.788
SQ 12.2	1703.798	1603.575
SQ 14.2	3918.737	3688.222

Finally, the incremented values per revolution are to be multiplied by the stroke. Thereafter, the end position can be set via stroke.

M ▷ Customer settings M0041
   Limit switching M0010
     Set end pos. CLOSED? M0084
     Set end pos. OPEN? M0085

Select main menu

1. Set selector switch to position **0** (OFF).

2. Press push button **C** and hold it down for approx. 3 seconds.

➥ Display goes to main menu and indicates: ▸ Display

Select parameter   3.   Select parameter either:

→   click via the menu M ▷ to parameter, or

→   via direct display: Press ▲ and enter ID M0084

➥   Display indicates: Set end pos.CLOSED?

OPEN or CLOSED   4.   Select via ▲▼ Up ▲ Down ▼:

→   ▸ Set end pos.CLOSED? M0084

→   ▸ Set end pos. OPEN? M0085

➥   The black triangle ▸ indicates the current selection.

5.   Press ↵ Ok.

Information   If the end position CLOSED (or end position OPEN) is to be set via stroke, the end position OPEN (or end position CLOSED) must be set first via limit switching. For this, refer to page 39, Limit switching: set.

➥   The display indicates either:

-    Set end pos.CLOSED? CMD0009 → continue with step 9

-    Set end pos. OPEN? CMD0010 → continue with step 12

-    Specialist (4) → continue with step 6

Log on user   6.   Use ▲▼ Up ▲ Down ▼ to select user:

Information: Required user level: Specialist (4) or higher

➥   The symbols have the following meaning:

-    black triangle: ▸ = current setting

-    white triangle: ▷ = selection (not saved yet)

7.   Press ↵ Ok to confirm selected user.

➥   Display indicates: Password 0***

8.   Enter password (→ enter password).

➥   The display indicates either:

-    Set end pos.CLOSED? CMD0009 → continue with step 9

-    Set end pos. OPEN? CMD0010 → continue with step 12

Set end position
CLOSED via stroke   **Information:** If the end position CLOSED is to be set via stroke, the end position
CMD0009   OPEN must be set first via limit switching. For this, refer to page 39, Limit switching: set.

9.   Display indicates: Set end pos.CLOSED? Stroke Yes No

10. Press ▼ Down ▼.

➥   Now, the incremented values for end position CLOSED can be set.

11. Use ▲▼ Up ▲ Down ▼ to adapt the incremented value in compliance with the table at the beginning of this chapter.

→   **Do not enter 0 as incremented value. Otherwise both set values are at the same valve position.**

Confirm incremented   12. Press ↵ Save to confirm new end position.
value
➥   Display indicates: End pos. CLOSED set!

➥   The left LED is illuminated (standard version) and thus indicates that the end position CLOSED setting is complete.

13. Select:

   →   Edit → back to step 9: Set end position CLOSED "once again"

   →   Esc → back to step 4; either set end position OPEN or exit the menu.
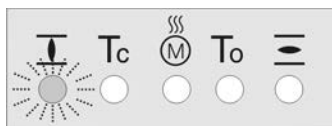
Set end position CLOSED via stroke
CMD0010

Information: If the end position OPEN is to be set via stroke, the end position CLOSED must be set first via limit switching. For this, refer to page 39, Limit switching: set.

14. Display indicates: Set end pos.CLOSED? Stroke Yes No

15. Press ▼ Down ▼.

➥ Now, the incremented values for end position OPEN can be set.

16. Use ▲ ▼ Up ▲ Down ▼ to adapt the incremented value in compliance with the table at the beginning of this chapter.

→ **Do not enter 0 as incremented value. Otherwise both set values are at the same valve position.**

Confirm incremented value

17. Press ↵ Save to confirm new end position.

➥ Display indicates: End pos. OPEN set!

➥ The right LED is illuminated (standard version) and thus indicates that the end position OPEN setting is complete.
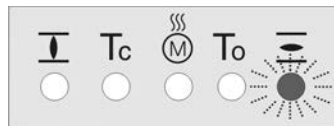
18. Select:

   →   Edit → back to step 12: Set end position OPEN "once again"

   →   Esc → back to step 4; either set end position CLOSE or exit the menu.

Information

If an end position cannot be set: Check the type of control unit in actuator.

7.4. Date and time

After commissioning, we recommend checking and setting date and time. Date and time are required for the event report function.

In case of a mains failure, date and time are stored. This data will only have to be checked after a longer downtime.

M ▷ Display M0009
   Date and time M0221

Information
- The date format, e.g. day/month/year, can be changed via the parameter Date format M0310.
- The time format, e.g. 12/24h can be changed via the parameter Time format M0050.

7.5. Display formats

The indications on the display can be represented in different formats: Country-specific spellings, for example, can be accounted for.

7.5.1. Date format

The data can be represented in day/month/year or in year/month/day.

M ▷ Display M0009
   Date format M0310

Default value: DD.MM.YYYY

Setting values:

MM/DD/YYYY   Indication in: Month/day/year, example: 01/21/2009

| DD.MM.YYYY | Indication in: Day/month/year, example: 21.01.2009 |
| YYYY-MM-DD | Indication in: Year/month/day, example: 2009–01–21 |

7.5.2. Time format

The time can be indicated in 12 or 24 hour format.

M ▷ Display M0009
       Time format M0050

Default value: 24h

Setting values:

| 12h | Indication of hour/minute/second in 12-hour format, example: 02:25:09 PM |
| 24h | Indication of hour/minute/second in 24-hour format, example: 14:25:09 |

7.5.3. Number format

The number format determines the sign for indicating the decimal places. Either a decimal point or a decimal comma can be used to separate integral numbers and decimal places.

M ▷ Display M0009
       Number format M0231

Default values:

- For English as display language = xx.x
- For all other display languages = xx,x

Setting values:

| xx.x | Indication of the decimal places using a decimal point, example: 20.0 mA |
| xx,x | Indication of the decimal places using a decimal comma, example: 20,0 mA |

7.5.4. Torque unit

The torque can be indicated in different units.

M ▷ Display M0009
       Torque unit M0051

Default value: Nm

Setting values:

Nm	Indication in Nm
ft-lb	Indication in foot-pound
%	Indication in percent

7.5.5. Temperature unit

The temperature unit can either be displayed in Celsius [°C] or Fahrenheit [°F].

M ▷ Display M0009
       Temperature unit M0052

Default value: °C

Setting range: °C or °F

7.5.6. Position units

The valve position (e.g. actual position, setpoint position) or other positions (e.g. pivot points) are indicated in percent of the travel on the actuator controls display (default setting).. By activating the parameter Position, you may select other physical units instead of percent to represent the positions. Furthermore, both scaling and maximum value may be adapted. The change-over affects all screens indicating a position. This includes status pages such as S0001 S0003, but also the representation of characteristics (e.g. position-time) as well as histograms.

Activate position unit

Required user level: Specialist (4) or higher.

M ▷ Display M0009
   Units M1205
Position M1206
Position activation M1207

Default value: Function not active

Setting values:

Function not active   <Units of position> function deactivated. Position indications in the display (e.g. the valve position S0001) are indicated in percent.

Function active   <Units of position> function activated. Position indications in the display are not shown in percent but in the unit set for the values in parameter group Position.

Set max. value, scaling and unit

Required user level: Specialist (4) or higher.

M ▷ Display M0009
   Units M1205
Position M1206
Max. value at 100.0 % M1208
Scaling M1209
Unit M1210

Default values:
Max. value at 100.0 % = 1000
Scaling = 1
Unit = mA

Setting ranges/values:
Max. value at 100.0 % = 1 – 1000
Scaling = 0.001 – 1000 (multiplier factor for unit)
Unit = mA; °C; bar; m³/h; m³/min; m; cm; mm; °

7.5.7. Process factor units

Process factors (e.g. process setpoint, actual process value...) are shown in percent of travel in the actuator controls display (default setting). By activating the parameter Process factor, you may select other physical units apart from percent. The change-over affects all screens indicating a process value.

Activate process factor units

Required user level: Specialist (4) or higher.

M ▷ Display M0009
   Units M1205
     Process factor M1211
      Proc. var. activation M1212

Default value: Function not active

Setting values:

Function not active   <Process factor units> deactivated. Position indications in the display are shown in percent.

Function active   <Process factor units> activated. Position indications in the display are not shown in percent but in the unit set for the values in parameter group Process factor.

Set max. value, scaling and unit

Required user level: Specialist (4) or higher.

M ▷   Display M0009
        Units M1205
           Process factor M1211
             Max. value at 100.0 % M1213
             Scaling M1214
             Unit M1215

Default values:
Max. value at 100.0 % = 1000
Scaling = 1
Unit = mA

Setting ranges/values:
Max. value at 100.0 % = 1 – 1000
Scaling = 0.001 – 1000 (multiplier factor for unit)
Unit = mA; °C; bar; m³/h; m³/min; m; cm; mm; °

7.5.8.   Analogue working value units (AIN)

Activate working value units (AIN)

Required user level: Specialist (4) or higher.

M ▷   Display M0009
        Units M1205
           Working values (AIN) M1216
             Work. val. activ. (AIN) M1217

Default value: Function not active

Setting values:

Function not active   <Working value units (AIN)> function deactivated.

Function active   <Working value units (AIN)> function activated.

Set max. value, scaling and unit

Required user level: Specialist (4) or higher.

M ▷   Display M0009
        Units M1205
           Working values (AIN) M1216
             Max. value at 100.0 % M1217
             Scaling M1218
             Unit M1219

Default values:
Max. value at 100.0 % = 1000
Scaling = 1
Unit = mA

Setting ranges/values:
Max. value at 100.0 % = 1 – 1000
Scaling = 0.001 – 1000 (multiplier factor for unit)
Unit = mA; °C; bar; m³/h; m³/min; m; cm; mm; °

7.5.9.   Analogue signal output units (AOUT)

Activate signal output units (AOUT)

Required user level: Specialist (4) or higher.

M ▷   Display M0009
        Units M1205
           Signal outputs (AOUT) M1221
             Sig. outp. activ. (AOUT) M1222

Default value: Function not active

Setting values:

Function not active   <Signal output units (AOUT)> function deactivated.

Function active   <Signal output units (AOUT)> function activated.

Set max. value, scaling and unit

Required user level: Specialist (4) or higher.

M ▷   Display M0009
　　　Units M1205
　　　　Signal outputs (AOUT) M1221
　　　　　Max. value at 100.0 % M1223
　　　　　Scaling M1224
　　　　　Unit M1225

Default values:
Max. value at 100.0 % = 1000
Scaling = 1
Unit = mA

Setting ranges/values:
Max. value at 100.0 % = 1 – 1000
Scaling = 0.001 – 1000 (multiplier factor for unit)
Unit = mA; °C; bar; m³/h; m³/min; m; cm; mm; °

7.6.   Contrast

The contrast can be used to adapt the display backlight (light or dark background).

M ▷   Display M0009
　　　Contrast M0230

8.   Application functions

Definition   Application functions are functions used to adapt the actuator controls to special applications. This includes device functions, communication functions and device information.

If they are enabled, these functions can be programmed by the user for his/her specific task using parameters.

8.1.   Speed functions

SAV/SARV actuators can be controlled via ACV actuator controls using individual speed setpoints for operations in direction OPEN or CLOSE. This chapter describes control in standard operation (operation modes Local and Remote). Settings and behaviour in e.g. emergencies (operation mode EMERGENCY) as well as failure behaviour (on loss of signal) are described together with the respective safety functions.

8.1.1.   Speed source for local operation and remote operation

The actuator speed for local operation (via local controls) and remote operation can be provided from different speed sources. The speed can be set individually for each operation direction (OPEN/CLOSE). The input signal of the respective speed source can either be programmed as consistent or variable speed value.

- •   as constant, internal value (programmable speed)
- •   as constant, external value (via fieldbus)
- •   as variable, external value (via analogue signal)

As a general rule, the speed source has already been set in the factory according to the indications on the order.

Required user level: Specialist (4)

M ▷   Customer settings M0041
  Speed functions M1699
    Sp. source LOC OP M1700
    Sp. source LOCAL CL M2039
    Sp. source REM OP M1701
    Sp. source REM CL M2040
[1)]

Default value: Fieldbus

Setting values:

Fieldbus   The actuator speed is specified externally, via fieldbus. For this, constant speed values which may be programmed via fieldbus are provided (0 – 100 % or 0 – 1,000 per mil). For parameter configuration via fieldbus interface refer to Manual (Device integration fieldbus).

Internal 1 – Internal 4   The actuator is controlled with a constant speed. For this, four programmable internal speed values are available. The four internal speed values are programmed via parameters Speed internal1 M1930 – Speed internal 4 M1933.

2 DigIn: "Internal (1-4)"   Speed selection via two external signals. For this setting, changing between the four internally programmed, constant speeds (Internal 1 – Internal 4) is possible.

Two digital inputs have to be configured as control signals for speed selection.

Analogue input   The actuator speed is specified/modified externally via an analogue value (e.g. 0 – 20 mA). An analogue input has to be defined as speed source.

Configuration of digital inputs for external speed selection

For setting of parameter Sp. source... = 2 DigIn: "Internal (1-4)" (external speed selection)

---

1)   For the Multiport Valve product variant, the speed specifications are only made via both parameters "Speed source LOCAL **CLOSED**" (M5039) and "Speed source REMOTE **CLOSED**" (M5040). They are valid for both directions of rotation (counterclockwise = CCW and clockwise = CW.

According to the present description, two digital inputs have to be configured as control signals to allow for external speed selection.

Required user level: Specialist (4)

M ▷   Device configuration M0053
    I/O interface M0139
      Digital inputs M0116

Example   Use inputs DIN 5 and DIN 6 as control signals for external speed selection:

Parameter: Signal DIN 5 M0122 = Speed int. sel. bit 0

Parameter: Signal DIN 6 M0123 = Speed int. sel. bit 1

Table 9:

Input signals (DIN) for external speed selection		Output speed[1]
Speed int. sel. bit 0	Speed int. sel. bit 1	
0	0	Speed internal1
0	1	Speed internal2
1	0	Speed internal3
1	1	Speed internal 4

0 = low level (0 V DC or input open)
1 = high level (standard: +24 V DC)

[1]   Speed value for coding both digital inputs with "high active"

Information   The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 6 M0128), the input is either High active or Low active. Default setting is High active.

Configuration of analogue input for speed

For setting of parameter Sp. source... = Analogue input.

An analogue input (AIN 1 or AIN 2) has to be configured as described to be able to use an external (analogue) speed setpoint.

Required user level: Specialist (4).

M ▷   Device configuration M0053
    I/O interface M0139
      Analogue inputs M0389
        Signal AIN 1 M0135
        Signal AIN 2 M0138

Example   Use analogue input AIN 1 for speed setpoint:

Parameter Signal AIN 1 M0135 = Interface speed

Information   The speed range for the analogue input is determined via parameters Speed rem. min. M1936 and Speed rem. max M1937.

8.1.2. Speed for constant (internal) speed setpoint: set

For setting of parameter Sp. source... (internal speed setpoint)

- Sp. source... = Internal 1/Internal 2/Internal 3/Internal 4
- Sp. source... = 2 DigIn: "Internal (1-4)"

If the actuator is controlled via an external speed source, the internal speed values described here will not have an impact on the operation behaviour.

M ▷   Customer settings M0041
    Speed functions M1699
      Speed internal1 M1930
      Speed internal2 M1931
      Speed internal3 M1932

Speed internal 4 M1933

Default values: 45 rpm

Setting range: The adjustable speed range is indicated on the actuator name plate.

8.1.3.   Speed range for analogue input: set

This setting is only effective if one of the speed sources is either set to Analogue input or Fieldbus.

M ▷   Customer settings M0041
        Speed functions M1699
          Speed rem. min. M1936
          Speed rem. max M1937

Default values:

Speed rem. min. = 6 rpm (≜ 0/4 mA)

Speed rem. max = 60 rpm (≜ 20 mA)

Setting values:

Speed rem. min. = 6 ... 240 rpm (revolutions/minute)

Speed rem. max = 6 ... 240 rpm (revolutions/minute)

The adjustable speed range is indicated on the actuator name plate.

8.1.4.   Time for speed increase and time for speed reduction at pivot points

The transition time from a low to a high speed can be set. This applies e.g. to speed transition within pivot point range. Refer to <Speed profile>.

Figure 33: Example of time for speed increase
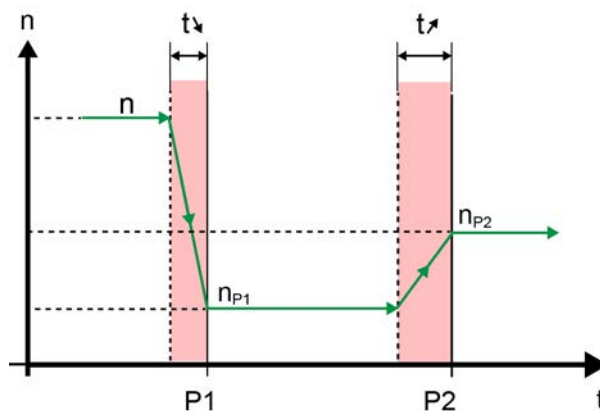
n   Output speed
P   Pivot point
t   Operating time (travel)
t↗   Time for speed increase

Set time for speed increase

M ▷   Customer settings M0041
        Speed functions M1699
          Time speed incr. M1769

Default values:

Time speed incr. = 0.2 s (seconds) from lower to higher speed

Setting ranges:

Time speed incr. = 0.1 – 10.0 (seconds)

8.1.5. Speed reduction before reaching end positions OPEN/CLOSED (soft stop in end positions)

Prior to reaching the end position, the speed can be linearly reduced within a programmable range.

Figure 34: Example of speed reduction in end positions
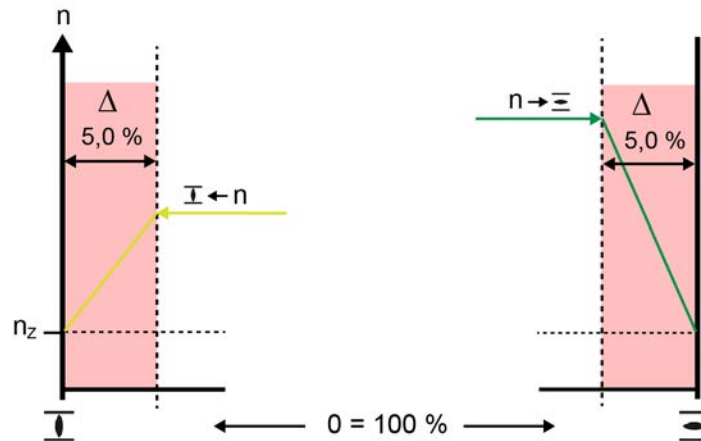
n   Current speed in direction OPEN/CLOSE

n_Z Target speed for end positions

Δ   Speed reduction range before end positions

Activate speed reduction before reaching end positions

Required user level: Specialist (4) or higher.

M ▷   Customer settings M0041
     Speed functions M1699
       Speed adapt.prior end M1906
         Speed red.pr.end pos. M1903

Default value: Function active

Setting values:

Function not active	<Speed reduction range> function deactivated.
Function active	<Speed reduction range> function activated.

Adjust speed reduction range before reaching end position

Within this range before the end position, the current speed will be linearly reduced to the target speed (Targ.speed end pos. M1905 parameter).

Information   If the current speed is lower than the target speed, the speed is increased to the target speed!

M ▷   Customer settings M0041
     Speed functions M1699
       Speed adapt.prior end M1906
         Speed red. range M1904

Default value: 5.0 %

Setting range: 0.0 ... 25.0 % (in % before reaching the end position, in relation to the full travel)

Set target speed before reaching end position

The actuator runs to the end position at the target speed set by means of this parameter.

M ▷   Customer settings M0041
     Speed functions M1699
       Speed adapt.prior end M1906

Targ.speed end pos. M1905

Default values: 8 (rpm)

Setting range: 6 ... 240 rpm (revolutions/minute)

The adjustable speed range is indicated on the actuator name plate.

8.2.	Speed profile

Properties
The <Speed profile> function is used to change the actuator speed to a new predefined value once the pivot point is reached. This way, different speed value settings of up to ten sections across the overall travel (separately for each direction of operation OPEN/CLOSE, if required) can be made. Thus, a valve specific speed profile can be defined across the travel.

The speed between two pivot points is linearly interpolated (straight line). The speed before to an end position (OPEN/CLOSED) to the first/last pivot point and vice versa is constant (linearly even) to the first/last pivot point speed. Speed reduction prior to end positions (parameter) is not active.

The speed profile for EMERGENCY operations can be deactivated as desired.

Application
This function is used for special applications to avoid pressure surges. Pressure surges might occur e.g. in case of a quick change of flow speed e.g. when quickly closing a gate valve.

Figure 35: Example of a speed profile

Drehzahl
[1/min]

⊥   P1   P2   P3   P4   P5   P6   P7   P8   P9   ⬥
0 %   Stellweg   100 %

[P]   Pivot points (P1 – P9)
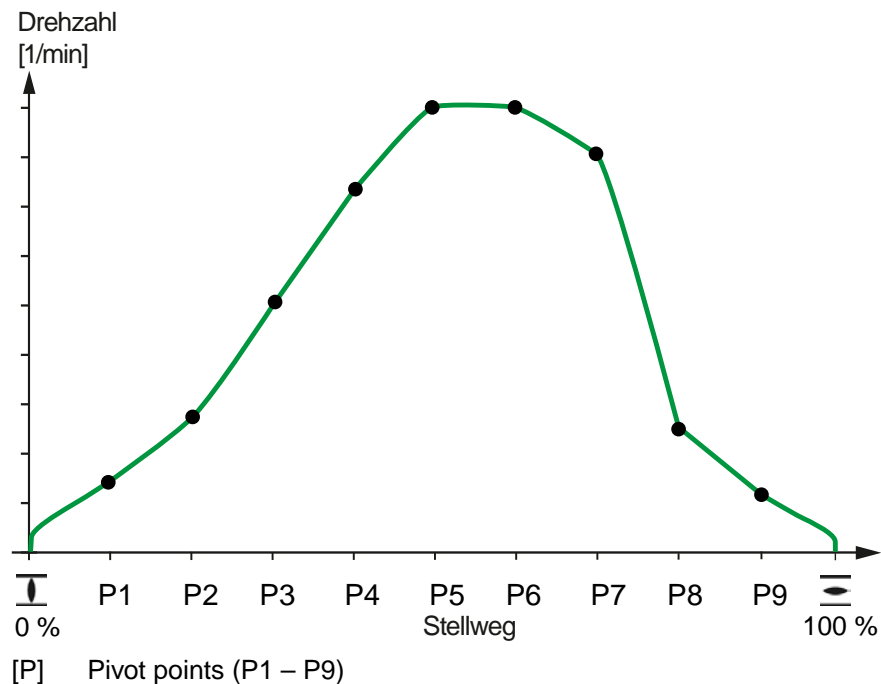
Information
The speed profile can also be used for modulating actuators with activated positioner. Refer to <Positioner> chapter.

8.2.1.	Speed profile: activate

Required user level: Specialist (4) or higher.

M ▷   Device configuration M0053
        Application functions M0178
          Activation M0212
            Speed profile M2122

Default value: Function not active

Setting values:

Function not active   <Speed profile> function deactivated.

Function active   <Speed profile> function activated.

8.2.2. Operation mode for speed profile: set

The speed values set at pivot points can be set identically or individually for both operation directions (OPEN/CLOSE).

M ▷   Customer settings M0041
   Speed profile M2065
    Speed profile mode M2116

Default value: Different profile

Setting values:

Different profile   Speed values at each pivot point can be set individually for each operation direction (OPEN/CLOSE).

Identical profile   Identical speed values for both operation directions. This setting copies the preset speed values in operation direction OPEN to the pivot points in operation direction OPEN.

Figure 36: Example: Different speed profile for operation direction OPEN/CLOSE

[P]   Pivot points (P1 – P9)
[●]   Speed values for operation direction OPEN
[○]   Speed values for operation direction CLOSE
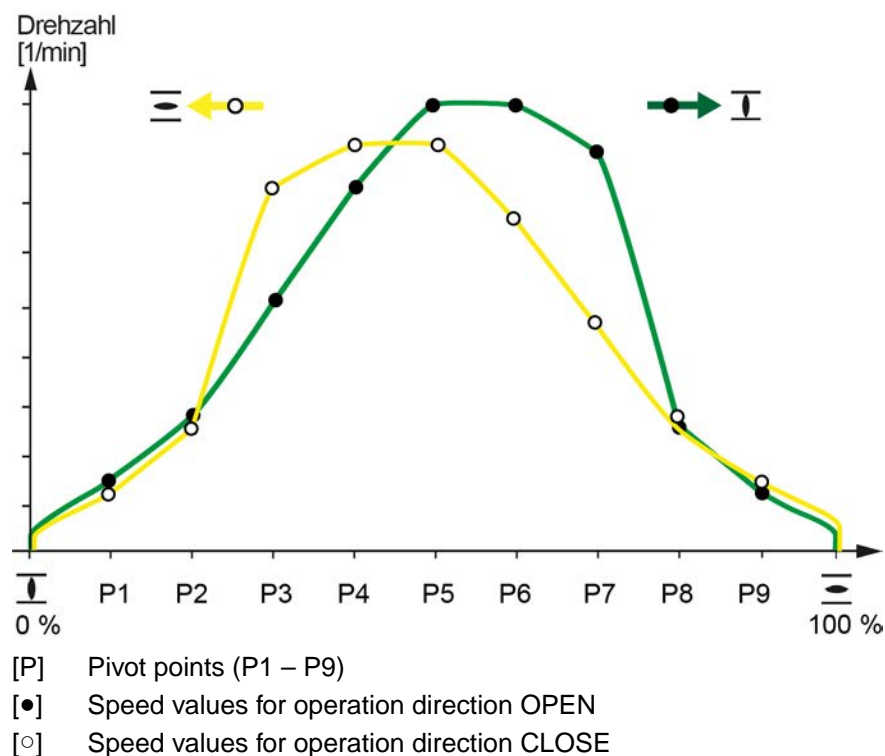
8.2.3. Pivot points for speed profile: define

Up to nine pivot points can be defined for each operation direction (OPEN/CLOSE)

M ▷   Customer settings M0041
   Speed profile M2065
    Pivot points OPEN M2067
    Pivot points CLOSE M2066

Information   Pivot points in operation direction CLOSE are only visible if the profile is different (parameter setting Speed profile mode = Different profile).

Activate pivot points

At least one pivot point must be activated to use the speed profile.

Example: Activate pivot point 1 in operation direction OPEN

M ▷ Customer settings M0041
  Speed profile M2065
   Pivot points OPEN M2067
    Pivot point 1 OPEN M2125
     Pivot point 1 OPEN M2076

Setting values:

Function active <Speed profile> function is activated for the pivot point. When reaching the pivot point, the actuator changes the speed to the value preset for this pivot point.

Function not active <Speed profile> function is deactivated for the pivot point. The actuators passes the pivot point without modifying the speed.

Define positions of pivot points

Each pivot point can be set to a value between 0 % and 100 % of the travel.

Information The position of pivot points must be in ascending order (e.g. position 1 before position 2). If this is not the case, the actuator cannot be operated and actuators controls generate a fault signal: Config.fault speed prof.

Define pivot points for operation direction OPEN:

M ▷ Customer settings M0041
  Speed profile M2065
   Pivot points OPEN M2067
    Pivot point 1 OPEN M2125
    ...
    Pivot point 9 OPEN M2133

Parameters for setting the positions (with default values):
      Pivot 1 position OPEN M2096 =10.0 %
      Pivot 2 position OPEN M2097 =20.0 %
      Pivot 3 position OPEN M2098 =30.0 %
      Pivot 4 position OPEN M2099 =40.0 %
      Pivot 5 position OPEN M2100 =50.0 %
      Pivot 6 position OPEN M2101 =60.0 %
      Pivot 7 position OPEN M2102 =70.0 %
      Pivot 8 position OPEN M2103 =80.0 %
      Pivot 9 position OPEN M2104 =90.0 %

Setting range: 0.0 ... 100.0 % (in % before the end position, in relation to the full travel)

Define pivot points for operation direction CLOSE:

M ▷ Customer settings M0041
  Speed profile M2065
   Pivot points CLOSE M2066
    Pivot point 1 CLOSE M2134
    ...
    Pivot point 9 CLOSE M2142

Parameters for setting the positions (with default values):
      Pivot 1 position CLOSE M2105 =10.0 %
      Pivot 2 position CLOSE M2106 =20.0 %
      Pivot 3 position CLOSE M2108 =30.0 %
      Pivot 4 position CLOSE M2109 =40.0 %
      Pivot 5 position CLOSE M2110 =50.0 %
      Pivot 6 position CLOSE M2111 =60.0 %
      Pivot 7 position CLOSE M2112 =70.0 %
      Pivot 8 position CLOSE M2113 =80.0 %

Pivot 9 pos. CLOSE M2114 =90.0 %

Setting range: 0.0 ... 100.0 % (in % before the end position, in relation to the full travel)

<table>
<tr><td>**Set speeds for pivot points**</td></tr>
</table>

Information For **multi-turn actuators**, parameters for setting the **speeds** are displayed (according to description in this section). For **part-turn actuators**, parameters for setting the **operating times** are displayed (refer to section <Operating times for pivot points: set>)

Set speeds for operation direction OPEN:

M ▷ Customer settings M0041
 Speed profile M2065
  Pivot points OPEN M2067
    Pivot point 1 OPEN M2125
    ...
    Pivot point 9 OPEN M2133

Parameters for setting speeds:
        Pivot 1 speed OPEN M1969
        Pivot 2 speed OPEN M1971
        Pivot 3 speed OPEN M1973
        Pivot 4 speed OPEN M1975
        Pivot 5 speed OPEN M1977
        Pivot 6 speed OPEN M1979
        Pivot 7 speed OPEN M1981
        Pivot 8 speed OPEN M1983
        Pivot 9 speed OPEN M2072

Default value: 45.0 rpm (for all pivot points)

Setting range: 6 ... 240 rpm (revolutions/minute). The adjustable speed range is indicated on the actuator name plate.

Set speeds for operation direction CLOSE:

M ▷ Customer settings M0041
 Speed profile M2065
  Pivot points CLOSE M2066
    Pivot point 1 CLOSE M2134
    ...
    Pivot point 9 CLOSE M2142

Parameters for setting speeds:
        Pivot 1 speed CLOSE M1970
        Pivot 2 speed CLOSE M1972
        Pivot 3 speed CLOSE M1974
        Pivot 4 speed CLOSE M1976
        Pivot 5 speed CLOSE M1978
        Pivot 6 speed CLOSE M1980
        Pivot 7 speed CLOSE M1982
        Pivot 8 speed CLOSE M1984
        Pivot 9 speed CLOSE M2073

Default value: 45.0 rpm (for all pivot points)

Setting range: 6 ... 240 rpm (revolutions/minute). The adjustable speed range is indicated on the actuator name plate.

8.3. Intermediate positions

Conditions The actuator is equipped with a position transmitter.

Characteristics
- With the actuator controls, up to 8 intermediate positions can be set to any value between 0 % and 100 % of the travel.
- Each intermediate position can be activated or deactivated individually.
- When reaching an intermediate position, a signal can be generated.
- A hysteresis can be defined for each pivot point.

8.3.1. Intermediate positions of pivot points: define

Each intermediate position can be set to a value between 0 and 100 % of the travel.

M ▷ Customer settings M0041
   Intermediate positions M0143
    Pivot points M0160
     Pivot point 1 M0249

Default values: 0.0 % for all 8 intermediate positions

Setting range: 0.0 % (CLOSED) to 100.0 % (OPEN) of the travel

Information   The pivot points also apply to the <Operation profile> function.

8.3.2. Signal behaviour of intermediate positions: set

Reaching a pivot point (intermediate position) can be signalled:
- via fieldbus (refer to separate operation instructions)
- via indication lights (LEDs) of the local controls or
- via output contacts

Each pivot point (intermediate position) can be assigned a specific signal behaviour.

M ▷ Customer settings M0041
   Intermediate positions M0143
    Signal behaviour M0266
     Signal behaviour 1 M0269

Default value: No signal

Setting values:

No signal   Behaviour **A:** "Off", intermediate position is not signalled.

C_____|_____O   Behaviour **B:** Signal is active from reaching the pivot point (P) up to end position OPEN (100 %)

C_____|_____O   Behaviour **C:** Signal is active from end position CLOSED (0 %) until reaching the pivot point (P).

C_____⎴|_____O   Behaviour **D:** When passing the pivot point (P), a pulse signal is issued.

Figure 37: Signal behaviour (A to D) of the intermediate positions
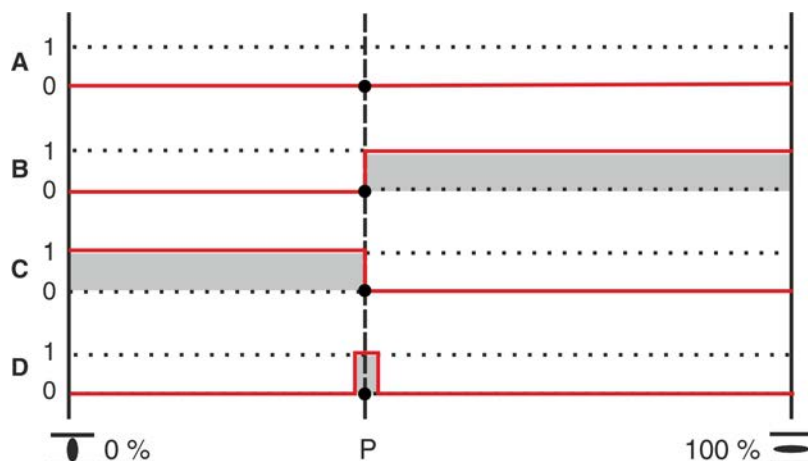
Special characteristics of B, C and D

Behaviour of **B** and **C**: The signal is directly activated when reaching the set pivot point (P).

Behaviour **D**: The signal is activated shortly before reaching the set pivot point (P). The switch-on point is determined by pulse duration (+/– range around the pivot point). Pulse duration depends on parameter Outer dead band M0148 and amounts to 1.0 % of the travel for default setting.

Information   For behaviours B and C, the signal might be omitted if, e.g when using a positioner, pivot point (P) is not fully reached due to the dead band. In this case, behaviour D can be selected as the dead band is considered.

8.3.3.   Hysteresis for intermediate positions: set

The hysteresis determines the **tripping point** of the signal.

Example   Parameter Pivot point 6 M0253 is set to 50.0 % of the travel.

Parameter Hysteresis 6 M0282 is set to 1.0 %.

Figure 38: Signal behaviour B, C, D for hysteresis = 1 %
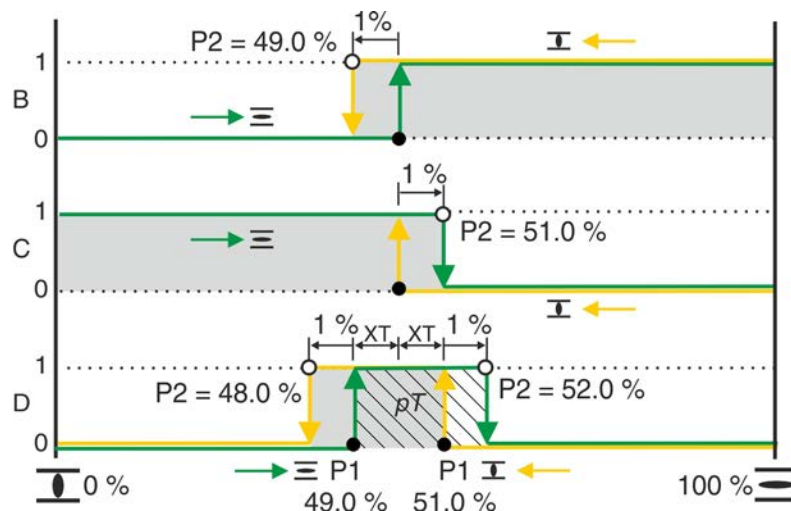
P1   Switching on point (●)
P2   Switch-off point (○)
pT   Pulse duration = 2 times XT + hysteresis

Required user level: AUMA (6).

M ▷   Customer settings M0041
         Intermediate positions M0143
            Hysteresis M0267
               Hysteresis 1 M0277

Default values: 0.5 % for all 8 positions

Setting range: 0.0 % to 5.0 % of the travel (from OPEN to CLOSED)

Information   For signal behaviour D, the value XT (parameter Outer dead band M0148) determines pulse duration pT and influences **switch-on point** P1.

8.4.   Operation profile (operation behaviour) for intermediate positions

Conditions   Function <Positioner>, parameter Positioner M0158 = Function active (Required user level: Specialist (4) or higher)

Characteristics   The function <Operation profile> can be used to define the operation behaviour of the actuator when reaching an end position. Example: The actuator stops and only continues its operation after another operation command.

This function is required in special applications to avoid water hammer, possibly also in combination with the timer.

8.4.1. Operation profile: activate

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   Application functions M0178
      Activation M0212
         Operation profile M0294

Default value: Function not active

Setting values:

Function not active	Function <Operation profile> deactivated.
Function active	Function <Operation profile> activated.

8.4.2. Operation profile for intermediate positions (pivot points): set

When reaching an intermediate position, the operation behaviour of the actuator may be set.

M ▷ Customer settings M0041
   Intermediate positions M0143
      Operation behaviour M0257
         Operation behaviour 1 M0258

Default value: Off

Setting values:

Off	No intermediate stop, actuator continues the operation.
Stop in OPEN	• Actuator stops at pivot point during operation in direction OPEN.
	• The operation command has to be cleared by means of the STOP command and a new operation command has to be sent to resume operation.
	• This function is not active in operation mode Remote SETPOINT.
Stop in CLOSED	• Actuator stops at pivot point during operation in direction CLOSE.
	• The operation command has to be cleared by means of the STOP command and a new operation command has to be sent to resume operation.
	• This function is not active in operation mode Remote SETPOINT.
Stop in OPEN & CL.	• Actuator stops automatically upon reaching the pivot point.
	• The operation command has to be cleared by means of the STOP command and a new operation command has to be sent to resume operation.
	• This function is not active in operation mode Remote SETPOINT.
Off time in OPEN	Actuator stops at pivot point during operation in direction OPEN. If an operation command in direction OPEN is present at the end of the pause time, the actuator resumes operation into direction OPEN. If an operation command in direction CLOSE is present during the pause time, the pause is aborted and operation into direction CLOSE resumed.
Off time in CLOSED	When reaching the pivot point, the actuator stops during operation in direction CLOSE. If an operation command in direction CLOSE is present at the end of the pause time, the actuator resumes operation into direction CLOSE. If an operation command in direction OPEN is present during the pause time, the pause is interrupted and operation into direction OPEN resumed.
Off time in OPEN & CL.	Actuator stops automatically upon reaching the pivot point. If an operation command in direction OPEN or CLOSE is present at the end of the pause time, the actuator resumes operation depending on the operation command.
Information	The actuator stops for each activated intermediate position for which operation behaviour Stop in OPEN, Stop in CLOSED or Stop in OPEN & CL. is assigned.

8.4.3. Off times for intermediate positions (pivot points): set

An off time can be defined for each pivot point.

If a pivot point is reached with the operation behaviour Off time in OPEN, Off time in CLOSED or Off time in OPEN & CL., the actuator controls generate a signal during off time:Operation pause active

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   Intermediate positions M0143
     Off times M0268
       Off time 1 M0285

Default values: 00:01.0 min:s (1 second)

Setting ranges: 00:00.2 ... 30:00.0 min : s (0.2 seconds – 30 minutes)

8.5. Two-wire control

Conditions
-    \<Additional inputs\> or additional \<parallel interface\>
-    Operation mode Remote (Selector switch = position **Remote control**).

Characteristics With the \<Two-wire control\> function, the actuator can be operated to end position OPEN or CLOSED via **one** digital input.

Information In this function, the actuator only reacts to commands via the input OPEN / CLOSE. Other inputs to which the operation commands OPEN, STOP, CLOSE were assigned, do not have any function.

Execute operation commands via digital input:

Designation of digital input OPEN / CLOSE

(Wiring diagram designation: `OPEN/CLOSE`

Default setting
-    Input OPEN / CLOSE = **low level** (0 V DC or input open):
  Actuator runs in direction CLOSE.
-    Input OPEN / CLOSE = **high level** (standard: +24 V DC):
  Actuator runs in direction OPEN.

Configuration of digital input

For the two-wire control, a digital input for the OPEN / CLOSE signal has to be configured.

Required user level: Specialist (4)

M ▷ Device configuration M0053
   I/O interface M0139
     Digital inputs M0116

Example Use input DIN 5 for signal OPEN / CLOSE:

Parameter: Signal DIN 5 M0122 = OPEN/CLOSE

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 6 M0128), the input is either High active or Low active. Default setting is High active.

8.6. Positioner (operation mode Remote SETPOINT)

Conditions This function requires one of the following equipments within the actuator:

-    Electronic control unit (non-intrusive version)
-    Potentiometer
-    Electronic position transmitter EWG/RWG

Further conditions for the positioner operation mode:

-    Positioner enabled and activated.

- Operation mode Remote (selector switch = position **Remote control**).

Characteristics   The positioner records setpoint position E1 and actual position value E2 for comparison. Depending on the detected deviation, the actuator motor then runs in direction OPEN or CLOSE.

Information
- If the actuator is controlled via a setpoint (e.g. 0 – 20 mA), the status indication S0003 on the display shows both setpoint position E1 and actual position value E2.
- If the status indication S0003 only shows the actual position value E2, OPEN-CLOSE control is active and there is no setpoint control via the positioner. In this case, you have to change-over to setpoint control first, refer to <Change-over between OPEN-CLOSE control and setpoint control> chapter.

8.6.1.   Positioner: activate

Required user level: Specialist (4) or higher.

M ▷   Device configuration M0053
   Application functions M0178
    Activation M0212
     Positioner M0158

Default value: Function not active

Setting values:

Function not active	Function <Positioner> deactivated.
Function active	Function <Positioner> activated.

8.6.2.   Adaptive behaviour: activate deactivate

Adaptive positioning may reduce the number of starts and compensate for the overrun of the actuator.

M ▷   Customer settings M0041
   Positioner M0145
    Adaptive behaviour M0147

Default value: Adaptive I

Setting values:

Off   Adaptive behaviour switched off.

Adaptive I   Adaptive behaviour for precise positioning (high positioning accuracy).

Due to the inertia of both actuator and valve, the valve position changes only slightly after switching off the actuator (overrun). The positioner determines the resulting error between setpoint and actual value for both directions and automatically adapts the inner dead bands Xi and therefore switching point P2.

On the basis of the determined inner dead bands Xi and the set hysteresis (parameters Posit. hyst. OPEN M0598 or Posit. hyst. CLOSE M0599), the outer dead bands X_T are automatically determined.

This reduces the error caused by the overrun after only a few operations and a high positioning accuracy is achieved.

Figure 39: Positioner positioning behaviour
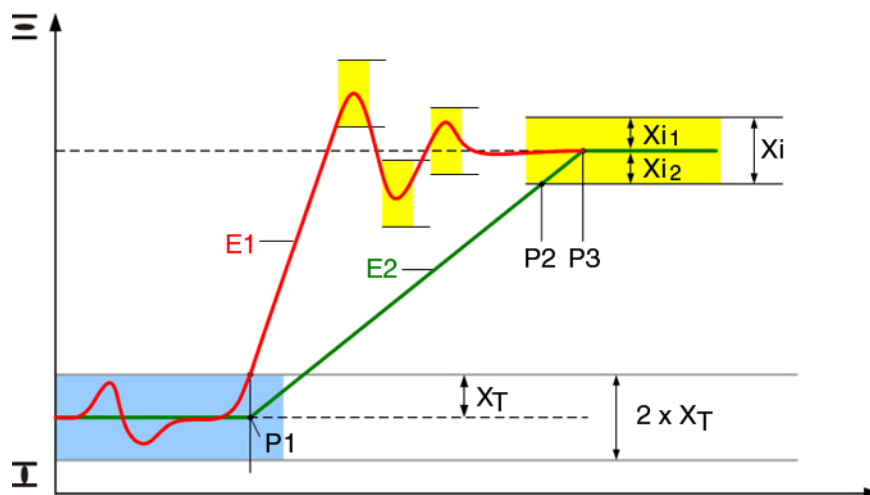
E1	Setpoint
E2	Actual value
P1	Switch-on point
P2	Switch-off point in direction OPEN
P3	Setpoint reached
X_T	Max. error (outer dead band)
Xi_1	Overrun in direction OPEN (inner dead band OPEN)
Xi_2	Overrun in direction CLOSE (inner dead band CLOSE)

Adaptive II   Contrary to adaptive positioner 1, adaptive positioner 2 will not be subject to oscillation. The positioner detects overshooting and enlarges the inner dead band in steps of 0.1 % until the overshooting is cancelled. After entering the idle state, the inner dead band will be gradually reduced after a certain time (10.6 s).

8.6.3. Overrun (inner dead band): set manually

The inner dead band determines the switch-off point of the actuator and, therefore, influences the overrun.

The inner dead band may be set individually for the directions OPEN and CLOSE.

Manual setting is only possible if the adaptive behaviour, parameter Adaptive behaviour M0147, is switched off.

M ▷   Customer settings M0041
  Positioner M0145
    Dead band OPEN M0234
    Dead band CLOSE M0235

Default values: 0.5 % (for dead band OPEN and CLOSE)

Setting ranges: 0.0 % to 10.0 % (for dead band OPEN and CLOSE)

Information   •   Inner dead bands may not be set wider than outer dead bands.
•   Inner dead bands may not be set too narrow as this may cause unnecessary switching procedures (premature wear) or oscillation of the actuator.
.

8.6.4. Max. error variable (outer dead band): set manually

The outer dead band determines the switching-on point of the actuator.

The motor starts if the actual value (input signal E2) or a change in setpoint is higher than the maximum error variable determined by the outer dead band.

Manual setting is only possible if the adaptive behaviour, parameter Adaptive behaviour M0147, is switched off.

M ▷ Customer settings M0041
  Positioner M0145
    Outer dead band M0148

Default value: 1.0 %

Setting range: 0.1 – 10.0 %

8.6.5. Dead time: set

The dead time prevents the operation to a new setpoint position within a pre-determined time.

M ▷ Customer settings M0041
  Positioner M0145
    Dead time M0149

Default value: 3.0 s

Setting range: = 0.2 – 60.0 (seconds)

Information   Actuator controls ensure that the max. permissible number of starts of the actuator is not exceeded. This can be achieved by setting the dead time to a sufficiently high value.

8.6.6. Hysteresis for positioner: set

The hysteresis determines the switching accuracy. It can be used to reduce the number of starts for example.

This setting can only be made if the adaptive behaviour, parameter Adaptive behaviour M0147, is set to Adaptive I.

M ▷ Customer settings M0041
  Positioner M0145
    Posit. hyst. OPEN M0598
    Posit. hyst. CLOSE M0599

Default values: 0.5 % for OPEN and CLOSE

Setting range: 0.2 % to 5.0 % of travel (from OPEN to CLOSED)

8.6.7. Closing fully/opening fully (end position tolerance for setpoint)

If the end positions cannot be reached due to inaccurate analogue setpoint signals (0/4 mA or 20 mA), a tolerance for the setpoint within the end position range can be set. If the tolerance is exceeded or not reached, the actuator continues the operation until the full end position has been reached. This ensures that the actuator opens and closes fully.

M ▷ Customer settings M0041
  Positioner M0145
    Tolerance CLOSE M0150
    Tolerance OPEN M0151

Default values:
Tolerance CLOSE = 0.0 %
Tolerance OPEN = 100.0 %

Setting ranges: (in percent of the travel)
Tolerance CLOSE = 0.0 – 5.0 %
Tolerance OPEN = 95 – 100.0 %

8.6.8. Setting range: limit

Setting range can be limited in directions OPEN and/or CLOSE.

This prevents end position(s) OPEN and/or CLOSED from being approached in modulating duty. The actuator stops when reaching the set limit value.

For OPEN-CLOSE control (LOCAL or REMOTE OPEN-CLOSE operation mode), this limitation is not active. The valve can then be run into the end positions either via the local controls or from remote.

Figure 40: Limitation of setting range
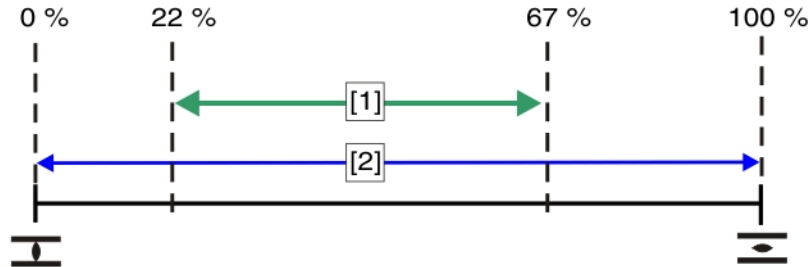
[1]   Permissible actuator travel for setpoint control
[2]   Permissible actuator travel for OPEN-CLOSE control

Activate limitation

M ▷   Customer settings M0041
  Positioner M0145
    Limit setting range M0845

Default value: Function not active

Setting values:

Function not active   Limitation deactivated.

Function active   Limitation activated.

Adjust setting limits

M ▷Parameters   Customer settings M0041
  Positioner M0145
    Limit OPEN M0162
    Limit CLOSE M0161

Default values:
Limit OPEN = 100.0 %
Limit CLOSE = 0.0 %

Setting ranges: 0.0 ... 100.0 % of setting range

8.6.9.   Speed reduction before reaching setpoint position

Characteristics   The function adapts the setpoint depending on the error variable compared to the setpoint. In case of a low error variable compared to the setpoint, the actuator runs at low speed. For a high error variable, the actuator runs at maximum speed. The maximum speed is then equal to the current speed.

Application   For modulating duty with high positioning accuracy.

Activate speed reduction before reaching setpoint position

Required user level: Specialist (4) or higher.

M ▷   Customer settings M0041
  Speed functions M1699
    Speed functions M2148
      Speed red.prior setp. M0835

Default value: Function active

Setting values:

Function not active   <Speed reduction> function deactivated.

Function active   <Speed reduction> function activated.

Set speed reduction range

Range in relation to the setpoint, where the speed – depending on the deviation from the setpoint – is either reduced or increased from the current speed to the "target speed" (parameter Target speed at setp.M1939).

M ▷   Customer settings M0041
   Speed functions M1699
    Speed functions M2148
     Speed red. range M0836

Default value: 10.0 %

Setting range: 2.0 – 20.0 (deviation from the setpoint in %)

Set target speed before reaching setpoint position

Minimum speed for modulating duty.

M ▷   Customer settings M0041
   Speed functions M1699
    Speed functions M2148
     Target speed at setp. M1939

Default values: 10 rpm

Setting range: 6 ... 240 rpm

The adjustable speed range is indicated on the actuator name plate.

8.6.10. Change-over between OPEN - CLOSE control and setpoint control

For actuators equipped with a positioner, it is possible to change over between **OPEN - CLOSE control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SETPOINT).

Change-over via fieldbus command:

For control via fieldbus interface, the change-over is done via fieldbus command Fieldbus SETPOINT.

Switching behaviour:

- Fieldbus SETPOINT = 0 = Remote OPEN-CLOSE:
  The actuator reacts to operation commands OPEN, STOP, CLOSE
- Fieldbus SETPOINT = 1 = Remote SETPOINT:
  The actuator reacts to a setpoint signal (e.g. 0,0 ... 100,0 %)

If the operation commands are not transmitted via fieldbus commands, but via <Additional inputs> or additional <Parallel interface>, a digital input for the MODE signal has to be available and configured for change-over.

Configuration of digital input

Required user level: Specialist (4).

M ▷   Device configuration M0053
   I/O interface M0139
    Digital inputs M0116

Example   Use input DIN 1 for change-over:

Parameter: Signal DIN 1 M0118

Setting value: MODE (wiring diagram designation: MODE)

Information   The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 4 M0126), the input is either High active or Low active. Default setting of MODE input is Low active.

Change-over via digital input MODE

Switching behaviour for coding Low active**:**

(Default factory setting)

- Input MODE = **low level** (0 V DC or input open) = Remote SETPOINT
  The actuator reacts to a setpoint signal (e.g. 0/4 – 20 mA)
- Input MODE = **high level** (standard: +24 V DC) = Remote OPEN-CLOSE:
  The actuator reacts to operation commands OPEN, STOP, CLOSE.

8.6.11. Input of setpoint position

In Modbus RTU version, the setpoint position is transmitted via the fieldbus interface, channel 1 or channel 2.

Actuator controls with two additional analogue inputs

The setpoint position can also be fed via an analogue input. In this case, one of the inputs AIN 1 or AIN 2 has to be configured as setpoint position.

Required user level: AUMA (6).

M ▷ Device configuration M0053
   I/O interface M0139
    Analogue inputs M0389
    Signal AIN 1 M0135
    Signal AIN 2 M0138

Setting value: Setpoint position

Information The AC will only react to the additional analogue input if high level (standard: +24 V DC) is present at the I/O INTERFACE input (refer to wiring diagram).

8.6.12. Input range of setpoint position

The input range defines the signal range, i.e the initial and the end value of the setpoint signal. For example: 0 – 20 mA, 4 – 20 mA or another value.

In Modbus RTU version, the input range for setpoint position is set to 0.0 % ... 100.0 %.

Actuator controls with two additional analogue inputs

If the setpoint position is fed via an analogue input, the signal range of the respective input (AIN1 or AIN2) has to be correctly set. The configuration is then made via parameters.

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   I/O interface M0139
    Analogue inputs M0389
    Low limit AIN 1 M0133
    High limit AIN 1 M0134

Default values:

Low limit AIN 1 = 0 mA

High limit AIN 1 = 20 mA

Setting values: 0 ... 20 mA

Information If set accordingly, the lower limit Low limit AIN 1 can be used for monitoring the setpoint signal. Refer to <Failure behaviour on loss of signal>.

8.6.13. Split Range operation

Requirements • <Additional inputs> or additional <Parallel interface>.
    • <Positioner> function must be enabled and activated:

Function In Split Range operation, a setpoint position E1 can be shared by up to three positioners. A typical application example is a pipeline with a by-pass. The actuator mounted on the by-pass reacts in the lower limit (e.g. 0 – 10 mA), the actuator on the main valve in the upper limit (e.g. 10 – 20 mA). If the setpoint position is within the setpoint range defined for the individual actuator, the actuator behaviour will be identical to standard positioner operation. If the setpoint position is higher or lower than the upper or the lower limit of the setpoint range of the respective actuator, the actuator will run to positions OPEN or CLOSED.

The upper and lower limit of the respective actuator is defined via the analogue input. (<Input range of setpoint position>)

In addition, the upper and lower limit of the total target value (valid for all actuators grouped in a split range operation).

Activate split range operation

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
    Application functions M0178
      Activation M0212
        Split range operation M01650

Default value: Function not active

Setting values:

Function not active <Split range operation> function deactivated.

Function active <Split range operation> function activated.

Set total target value range

The set lower limit of total target value is used as failure source for failure behaviour during split range operation: <Failure behaviour on loss of signal>

M ▷ Customer settings M0041
    Positioner M0145
      Low limit target value M01651
      High limit target value M01652

Default values:
Low limit target value = 0.0 mA
High limit target value = 20.0 mA

Setting ranges: 0.0 ... 20.0 mA

8.7. Process controller

Requirements This function requires one of the following equipments within the actuator:

- Electronic control unit with MWG (non-intrusive version)
- Potentiometer
- Electronic position transmitter EWG/RWG

Further conditions for the process controller operation mode:

- Process controller enabled and activated.
- Operation mode Remote (Selector switch = position **Remote control**).

Characteristics The following figure illustrates the function of the process controller:

The process controller [2] receives the process setpoint E7 and the actual process value E4 (e.g. from a sensor). On the basis of both values, the process controller calculates the position setpoint E1 for positioner [3]. In turn, the positioner [3] compares this target setpoint with the actual position value E2 of the valve and issues the operation commands (OPEN - CLOSE) for the actuator.

Figure 41: Process controller function
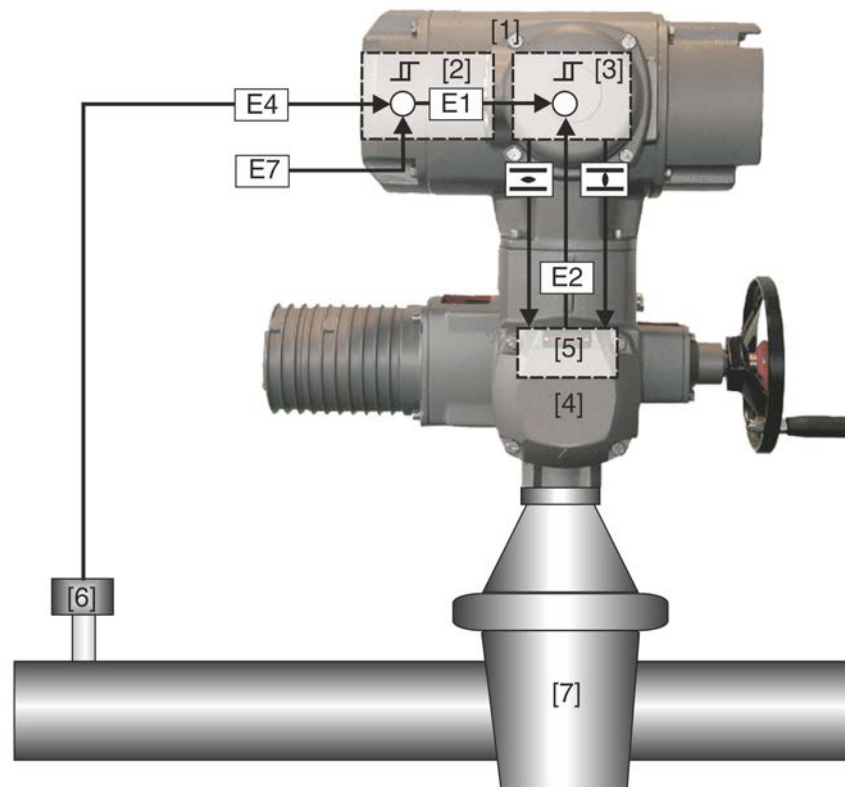
[1]	Actuator controls
[2]	Process controller
[3]	Positioner
[4]	Actuator
[5]	Position transmitter e.g. EWG/RWG/MWG
[6]	Sensor
[7]	Valve
E1	Position setpoint (internal)
E2	Actual position value
E4	Actual process value
E7	Process setpoint

Application The process controller can be used to control pressure, flow or flow rates, flow levels and temperature.

8.7.1. Process controller activation

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Application functions M0178
    Activation M0212
      Process controller M0741

Default value: Function not active

Setting values:

Function not active <Process controller> function deactivated.

Function active <Process controller> function activated.

8.7.2. Process controller: set modulating behaviour

Three controller types are available to ideally adapt the modulating behaviour of the process controller to the respective application.

M ▷ Customer settings M0041
  Process controller M0742
   Modulating behaviour M0887

Default value: PI controller

Setting values:

P controller
P controllers immediately react to an error variable (i.e. actively) and amplify the input signal (error variable) proportionally to the set amplification. Setting parameter: Proport. gain Kp M0744

Figure 42: Step response of P controller
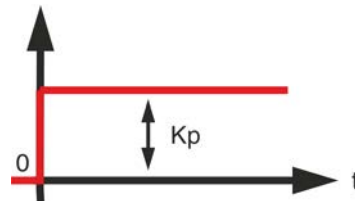
P controller application
For uncritical closed-loop applications allowing to accept continuous error variables in the event of failures, e.g. pressure, flow, filling level and temperature control.

PI controller
PI controllers consist of a P fraction immediately (actively) reacting to an error variable and an I fraction for chronological integration of the input signal (error variable). Due to the additional time constant of the I fraction, the output value takes more time to reach the target status (i.e. inertia of control loop response) whereas positioning accuracy increases at the same time (lower control deviation). Parameters for setting the time constant: Reset time Ti M0745

Figure 43: Step response of PI controller
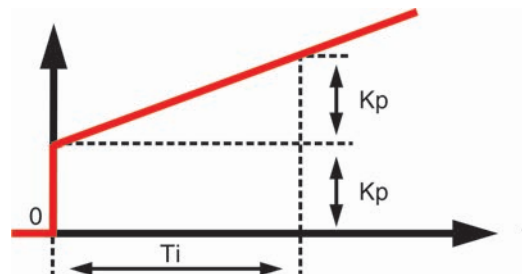
PI controller application
Quick control circuits not allowing continuous error variables, e.g. pressure, temperature and ratio control.

PID controller
Compared to the PI controller, the PID controller has an additional D fraction accounting for changes in the error variable (change rate). The D fraction quickly reacts to changes, even to minor error variables with large output values. Parameter for setting the D fraction: Rate time Td M0746

Figure 44: Step response of PID controller
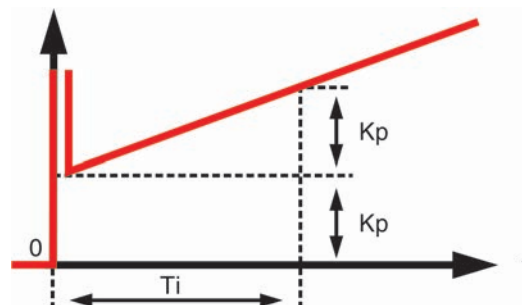
PID controller use
For precise and highly dynamic control not allowing a continuous error variable.

8.7.3. Setpoint source (input for process setpoint)

M ▷ Customer settings M0041
  Process controller M0742

Setpoint source   M0743

Default value: I/O interface

Setting values:

I/O interface   The process setpoint is defined via an analogue input (AIN 1 or AIN 2) of the I/O interface.

Fieldbus interface

The process setpoint is defined via fieldbus.

Internal setpoint   The process setpoint is generated internally via actuator controls. Parameters Internal setpoint 1 M0749 / Internal setpoint 2 M0750

Information   To use internal setpoint 2, a digital input must be configured accordingly.

8.7.4.   Behaviour on loss of process setpoint

M ▷   Customer settings   M0041
  Process controller   M0742
    Beh. setpoint failure   M0747

Default value: Internal setpoint 1

Setting values:

Internal setpoint 1   In case of process setpoint signal loss, actuator controls switch to the internal setpoint 1. Parameter Internal setpoint 1 M0749

Internal setpoint 2   In case of process setpoint signal loss, actuator controls switch to the internal setpoint 2. Parameter Internal setpoint 2 M0750

Failure behaviour   In case of process setpoint signal loss, failure behaviour procedure is activated. Parameter Failure behaviour M0378

Last setpoint   In case of process setpoint signal loss, the last available process setpoint will still be used as setpoint.

8.7.5.   Inverse operation

As standard, the valve is opened by the modulating actuator as soon as the actual process value falls below the process setpoint. Depending on the process, it may, however, be necessary that the valve closes as soon as the actual process value falls below the process setpoint. In this case, the respective parameters are used to set the process controller to inverse operation.

M ▷   Customer settings   M0041
  Process controller   M0742
    Inverse operation   M0748

Default value: Function not active

Setting values:

Function not active   Inverse operation is deactivated.

Function active   Inverse operation is activated.

8.7.6.   Internal process setpoint

An internal process setpoint may be set with this parameter. The internal process setpoint is used if:

- Parameter Setpoint source M0743 is set to Internal setpoint or
- Parameter Beh. setpoint failure M0747 is set to Internal setpoint 1 or Internal setpoint 2.

M ▷   Customer settings   M0041
  Process controller   M0742
    Internal setpoint 1   M0749
    Internal setpoint 2   M0750

Default value: 50.0 %

Setting range: 0.0 ... 100.0 %

8.7.7. Setting procedure

The setting of the process controller largely depends on the area of controller application. A PI controller suffices for most applications.

Procedure
1. Operate the controller as PI controller, i.e. set the parameters as follows:
   - Proportional gain Kp = 1
   - Reset time Ti = 1,000 s
   - Rate time Td = 0

2. Double proportional gain Kp until the control loop starts to oscillate.
3. Reduce proportional gain Kp to 60 % of the set value.
4. Decrease reset time Ti until the error variable equals zero.

8.7.8. Proportional gain Kp: set

In the event of an error variable, the P portion immediately (i.e. actively) changes the position value proportionally to the error variable.

If a small error variable already requires a major valve position adjustment, the proportional gain Kp must be increased.

Information If the reaction is too extreme (overshoot), the value must be reduced. If the reaction is too weak, the value must be increased.

M ▷ Customer settings M0041
  Process controller M0742
    Proport. gain Kp M0744

Default value: 1.0

Setting range: 0.1 ... 10.0

8.7.9. Reset time Ti: set

The reset time determines the I portion of the controller. The more inert a system, the higher this value should be set.

Information
- Increase Ti in case of propensity for oscillation.
- Decrease Ti if the reactions are excessively delayed.
- Starting value for fast processes (e.g. pressure): 10 s
- Starting value for slow processes (e.g. temperature): 1000 s

M ▷ Customer settings M0041
  Process controller M0742
    Reset time Ti M0745

Default value: 1,000 s (seconds)

Setting range: 1 ... 1000 s

8.7.10. Rate time Td: set

The rate time determines the D portion of the controller. Typically, no setting is required here (= 0), since actuator and valve – due to the operating time – cannot react abruptly to a sudden occurrence of an error variable.

Information
- Increase Td in case of propensity for oscillation.
- Initial value for actuators: 0 s

M ▷ Customer settings M0041
  Process controller M0742
    Rate time Td M0746

Default value: 0 s (seconds)

Setting range: 1 ... 100 s

8.7.11. Actual value source (input for actual process value)

M ▷ Customer settings M0041
   Process controller M0742
      Actual value source M0756

Default value: I/O interface

Setting values:

I/O interface   The actual process value is defined via an analogue input (AIN 1 or AIN 2) of the I/O interface.

Fieldbus interface   The actual process value is defined via the fieldbus.

8.7.12. Speed source for actual process value

The actuator speed for control via the actual process value can be specified by different sources.

M ▷ Customer settings M0041
   Process controller M0742
      Speed source PID M1968

Default value: Fieldbus

Setting values:

Fieldbus   The actuator speed is specified externally, via fieldbus. For this, four constant speed values which may be programmed via fieldbus are available.

Internal 1 – Internal 4   The actuator is controlled with a constant speed. For this, four programmable internal speed values are available. The four internal speed values are programmed via parameters Speed internal1 M1930 – Speed internal 4 M1933.

2 DigIn: "Internal (1-4)"   External speed selection. For this setting, two external signals may be used to change between the four internally programmed, constant speeds (Internal 1 – Internal 4).

Two digital inputs have to be configured as control signals for speed selection.

Analogue input   The actuator speed is specified/modified externally via an analogue value (e.g. 0 – 20 mA). An analogue input has to be defined as speed source.

The speed range for the analogue input is determined via parameters Speed rem. min. M1936 and Speed rem. max M1937.

8.8. Stepping mode

Conditions   This function requires one of the following equipments within the actuator:

- Electronic control unit (non-intrusive version)
- Potentiometer
- Electronic position transmitter EWG/RWG

Characteristics
- With stepping mode, the operating time can be increased for the entire or any portion of the valve travel.
- Stepping mode can be individually activated for the directions OPEN and CLOSE.

Figure 45: Stepping mode
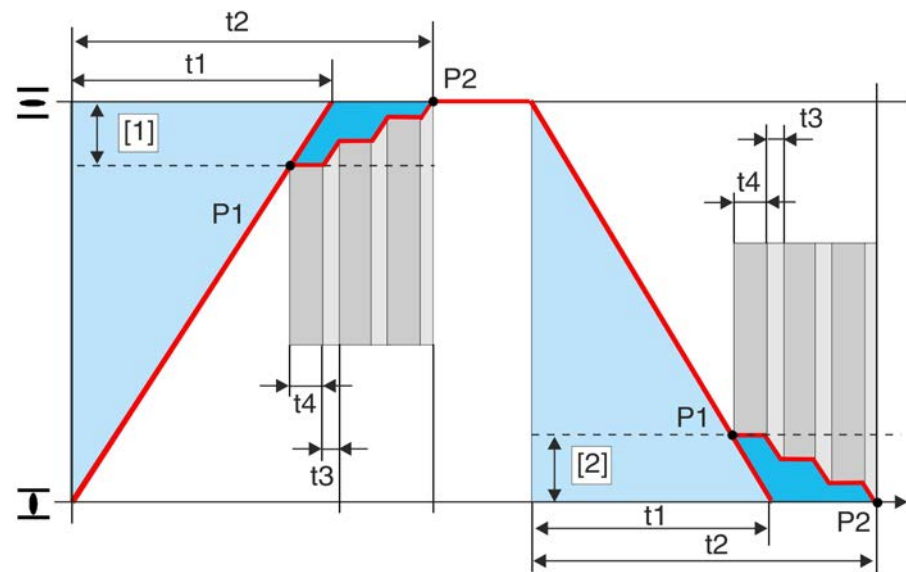
[1]   Stepping range OPEN
[2]   Stepping range CLOSE
P1   Start of stepping mode
P2   End of stepping mode
t1   Operating time for normal operation
t2   Operating time for stepping mode
t3   Running time
t4   Off time

8.8.1.   Stepping mode: activate

Stepping mode can be individually activated for the directions OPEN and CLOSE.

Required user level: Specialist (4) or higher.

M ▷   Device configuration   M0053
          Application functions   M0178
            Activation   M0212
              Timer CLOSE   M0156
              Timer OPEN   M0206

Default value: Function not active

Setting values:

Function not active   Function <Stepping mode> deactivated.

Function active   Function <Stepping mode> activated.

8.8.2.   Operation mode for stepping mode

Stepping mode can be activated via operation modes Local and/or Remote.

M ▷   Customer settings   M0041
          Timer   M0142
            Step mode CLOSE   M0157
            Step mode OPEN   M0207

Default value: Off both directions

Setting values:

Off   Stepping mode is switched off.

Remote	Stepping mode is active in the operation modes: Remote, Remote II, Fieldbus
Local	Stepping mode is active in the operation modes: Local, Service
Remote and local	Stepping mode is active in the operation modes: Remote, Remote II, Fieldbus, Local, Service
Information	The timer cannot be by-passed in <Operation mode EMERGENCY>.

8.8.3. Start and end of stepping mode

Start and end of stepping mode can be individually set for both directions.

M ▷   Customer settings M0041
      Timer M0142
        End stepping CLOSE M0152
        Start stepping CLOSE M0153
        Start stepping OPEN M0154
        End stepping OPEN M0155

Default values:
End stepping CLOSE = 0.0 %
Start stepping CLOSE = 100.0 %
Start stepping OPEN = 0.0 %
End stepping OPEN = 100.0 %

Setting ranges:
End stepping CLOSE = 0.0 – 99.9 %
Start stepping CLOSE = 0.1 – 100.0 %
Start stepping OPEN = 0.0 – 99.9 %
End stepping OPEN = 0.1 – 100.0 %

8.8.4. On times and off times

On or off times can be set individually for directions OPEN and CLOSE.

M ▷   Customer settings M0041
      Timer M0142
        On time CLOSE M0163
        Off time CLOSE M0164
        On time OPEN M0165
        Off time OPEN M0166

Default values: 00:05.0 min : s (= 5 seconds; for all on and off times)

Setting ranges: 00:01.0 ... 00:05.00.0 min : s (= 1 second up to 30 minutes; for all on and off times)

8.9. Modbus interface

8.9.1. Bus address (slave address)

The bus address can be entered manually via the push buttons at local controls according to the description below.

M ▷

Customer settings M0041
  Modbus M0341
    MD1 slave address M0342
    MD2 slave address M0409

Default value: 247

Setting range: 1 ... 247

Information	Parameter MD2 slave address is only available if parameter Redundancy M0800 is set to AUMA redundancy I. For settings AUMA redundancy II and Loop redundancy, the address of the second channel is automatically assigned automatically: MD1 slave address = MD2 slave address

8.9.2. Baud rate

M ▷

Customer settings M0041
  Modbus M0341
    Baud rate M0343

Default value: Auto

Setting range: 9.6 ... 115.2 kbit/s

Information	The baud rate setting must correspond to the setting at the master.

8.9.3. Parity/stop bit

M ▷

Customer settings M0041
  Modbus M0341
    Parity/stop bit M0782

Default value: Even, 1 stop bit

Setting ranges:
Even, 1 stop bit
Odd, 1 stop bit
None, 2 stop bits
None, 1 stop bit

Information	The parity setting must correspond to the setting at the master.

8.9.4. Monitoring time

Monitoring time of Modbus connection

This time should exceed the cycle time of the Modbus data transmission to all connected devices. If no valid Modbus telegram was received within this time, the "DATA EX" status is left and failure behaviour or change-over of the communication channel is initiated, if applicable.

M ▷ Customer settings M0041
  Modbus M0341
    Monitoring time M0781

Default value: 15 s (seconds)

Setting range: 0 ... 60 s

8.9.5. Response timeout

Unless the AUMATIC application provides an answer to a Modbus request within the time set here, the Modbus interface answers this request with Exception Code 6 (Busy Acknowledge).

M ▷ Customer settings M0041
  Modbus M0341
    Response Timeout M0916

Default value: 2.5 s (seconds)

Setting range: 0.1 ... 5.0 s

8.9.6. Redundancy

Redundancy can be entered manually via the push buttons the local controls according to the description below.

M ▷

Device configuration M0054
  Modbus M0799
    Redundancy M0800

Default value: None

Setting values:

None	No redundancy
AUMA redundancy I	Redundant line topology with universal redundancy behaviour according to AUMA redundancy type I.
AUMA redundancy II	Redundant line topology with universal redundancy behaviour according to AUMA redundancy type II.
Loop redundancy	Redundant loop topology in combination with the SIMA Master Station
Information	For detailed information on redundancy types, refer to Manual Device integration Modbus.

8.9.7. Response telegrams for AUMA redundancy II

When using AUMA redundancy II, response telegrams can be sent on both channels.

M ▷

Device configuration M0053
  Modbus M0799
    Behaviour TxM0801

Default value: Tx active channel

Setting values:

Tx active channel	Response telegrams are only sent via the active channel.
Tx both channels	Response telegrams are sent via both channels, the active and the passive channel.

8.10. Additional inputs for fieldbus

Actuator controls with fieldbus interface can be equipped with additional digital and analogue inputs. Depending on the version, up to 6 digital inputs (default: 24 V DC) and two analogue 0/4 –20 mA inputs are available.

If additional inputs are available, operation commands can be sent both via fieldbus and the additional inputs.

For manual change-over between fieldbus interface and the additional inputs, a digital input has to be available and configured.

For automatic change-over (in the event of fieldbus failure), the <Auto change-over I/O (fieldbus failure> function is required.

Configuration of additional inputs

Required user level: Specialist (4).

M ▷ Device configuration M0053
  I/O interface M0139
    Digital inputs M0116
    Analogue inputs M0389

Example • Use digital inputs DIN 2 to 4 for operation commands:
Signal DIN 2 M0120 = CLOSE
Signal DIN 3 M0119 = OPEN
Signal DIN 4 M0118 = STOP

- Use digital input DIN 6 for manual change-over:
  Signal DIN 6 M0121 = I/O interface (wiring diagram designation: `I/O inter-face`)

Information   The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 6 M0128), the input is either High active or Low active. Default setting is High active.

Manual change-over via I/O interface input

Switching behaviour for coding High active

(Default factory setting)

- Input I/O interface = **low level** (0 V DC or input open):
  Actuator controls react to operation commands via fieldbus only.
- Input I/O interface = **high level** (standard: +24 V DC):
  Actuator controls react to additional input signals only.
  Irrespective of the signal assignment of the additional inputs, the fieldbus communication with the DCS will remain intact.

8.11. Combination of fieldbus-parallel interface

Actuator controls with fieldbus interface may be additionally equipped with a parallel interface. Depending on the version, up to 6 digital inputs (default: 24 V DC) and up to two analogue 0/4 –20 mA inputs are available via parallel interface.

For this combined version, operation commands can be executed both via fieldbus and the inputs of the parallel interface (I/O interface).

For manual change-over between fieldbus interface and parallel interface, a digital input has to be available and configured.

The <Auto change-over I/O (during bus failure)> function is required for automatic change-over (bus failure).

Configuration of I/O interface inputs

Required user level: Specialist (4)

M ▷   Device configuration   M0053
          I/O interface   M0139
        Digital inputs   M0116
        Analogue inputs   M0389

Example   • Use digital inputs DIN 2 to 4 for operation commands:
  Signal DIN 2 M0120 = CLOSE
  Signal DIN 3 M0119 = OPEN
  Signal DIN 4 M0118 = STOP

- Use digital input DIN 6 for manual change-over:
  Signal DIN 6 M0121 = I/O interface (wiring diagram designation: `I/O inter-face`)

Information   The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 6 M0128), the input is either High active or Low active. Default setting is High active.

Manual change-over via I/O interface input

Switching behaviour for coding High active

(Default factory setting)

- Input I/O interface = **low level** (0 V DC or input open):
  Actuator controls react to operation commands via fieldbus only.
- Input I/O interface = **high level** (standard: +24 V DC):
  Actuator controls react to parallel interface signals only.
  Irrespective of the signal assignment of the inputs of the parallel interface, the fieldbus communication with the DCS will remain intact.

Change-over to passive channel

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Application functions M0178
Activation M0212
Fieldbus operation M1236

Default value: Commands&feedback

Setting values:

Commands&feedback	Operation commands can be executed both via fieldbus and the inputs of the parallel interface (I/O interface).
Feedback only	Operation commands are exclusively permitted via parallel interface (I/O) interface. Fieldbus is only used for feedback signals.

8.12. Auto change-over I/O (during fieldbus failure)

Requirements The function is only available for a combination of additional bus inputs or parallel interface (I/O) and a fieldbus interface.

Properties If this function is activated, automatic change-over to the parallel interface (I/O) will be performed on loss of fieldbus communication.

Change-over is performed before activation of <Failure behaviour> or <EMERGENCY behaviour>.

Activate auto change-over I/O

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Application functions M0178
   Activation M0212
    Auto change-over I/O M0790

Default value: Function not active

Setting values:

Function not active	<Auto change-over I/O (fieldbus failure> function deactivated.
Function active	<Auto change-over I/O (fieldbus failure> function activated.

8.13. Functions for FO cable connection

Requirements FO cable module or FO coupler (for explosion-proof actuators) within actuator controls.

8.13.1. FO cable monitoring: activate/deactivate

Actuator controls monitor the FO cable signal for communication, connection and signal strength.

M ▷

Device configuration M0053
  FOC connection M0600
   FO cable monitoring M0709

Default value: On (not final device)

Setting values:

On (not final device)	Monitoring is activated.
	On loss of FOC connection, the following is signalled: Wrn FOC
Off (final device)	Monitoring is deactivated.
	This setting is used if the actuator is the last participant within line topology, or for all actuators within star topology.

8.13.2. FO cable topology: check setting

Required user level: .

M ▷

Device configuration M0053
　FOC connection M0600
　　FO cable topology M0637

Default value: Star/line

Setting values:

Star/line	Star, line topology
Ring	Ring topology

8.13.3. FO cable baud rate, check setting

Required user level: .

M ▷

Device configuration M0053
　FOC connection M0600
　　FO cable baud rate M0642

Default value: Auto

Setting values:

Auto	Automatic baud rate selection
9.6 kbit/s – 12000 kbit/s	Setting depending on fieldbus systems and FO cable module or FO coupler.

8.14. By-pass function

Application The by-pass function is used, e.g. for district heating pipelines. Under high pipeline pressure, the gate valve of the main valve cannot be used, pressure compensation via by-pass valve is therefore required.

Requirements •　<Additional inputs> or additional <Parallel interface>.

Function Two MOVs – one main valve and one by-pass valve – are linked via enable signals Bypass Sync In and By-pass Sync Out. Operation commands can only be executed if one of the two actuators sends the enable signal to the other device. Enable depends on the end position. This ensures that only the following operation commands may be executed:

•　The main valve can only be operated in directions OPEN or CLOSE if the by-pass valve is in end position OPEN.

Figure 46: Function
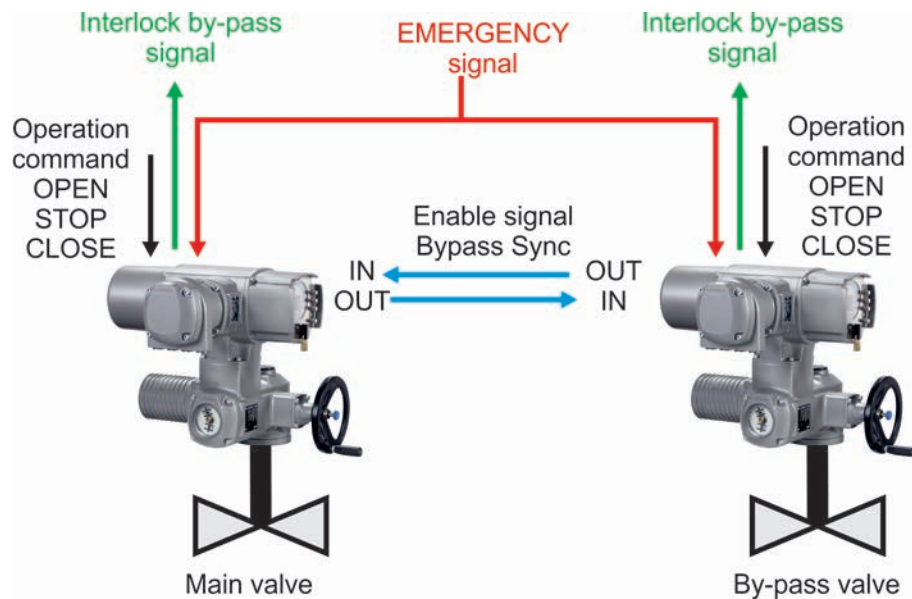
Table 10: Main valve reaction to by-pass valve position

By-pass valve		Main valve
Position	**Enable signal Bypass Sync OUT**	**Release (available operation commands)**
End position OPEN	High level (release) (Default: +24 V DC	in directions OPEN and CLOSE
Other position	Low level (interlock) (0 V DC or input open-circuit):	No operation possible[1]

1)   In case of an operation command, the "Interlock by-pass" signal is sent (no release).

Table 11: By-pass valve reactions to main valve position

Main valve		By-pass valve
Position	**Enable signal Bypass Sync OUT**	**Release (available operation commands)**
End position CLOSED	High level (release) (Standard: +24 V DC)	in directions OPEN or CLOSE
Other position	Low level (interlock) (0 V DC or input open-circuit):	In direction OPEN or CLOSE[1]

1)   In case of an operation command in direction CLOSE, the "Interlock by-pass" signal is sent (no release).

EMERGENCY behaviour   The EMERGENCY behaviour of the by-pass function has the same properties as the <EMERGENCY behaviour> function with the following differences:

In an EMERGENCY situation, both actuator controls receive the EMERGENCY signal at the same time. This signal starts the EMERGENCY operation specially defined for the by-pass function. (Parameter EMCY operation M0204 is therefore not available in the <EMERGENCY behaviour> function).

EMERGENCY operation procedure

1.   By-pass valve is opened first.
2.   Once the by-pass valve is fully opened, the main valve is closed.
3.   Once the main valve is fully closed, the by-pass valve is fully opened.

Configuration of digital inputs

Required user level: Specialist (4) or higher.

M ▷   Device configuration M0053
        I/O interface M0139

Digital inputs M0116

Example   Use input DIN4 for signal Bypass Sync In:

Use input DIN6 for signal EMERGENCY:

Setting values:

- Signal DIN 5 M0122 = By-pass Sync In
  (wiring diagram designation: BYPASS SYNC IN)
- Signal DIN 6 M0121 = EMERGENCY
  (wiring diagram designation: NOT/EMERGENCY)

Information   The logic for the digital inputs may be inverted. Depending on the parameter setting
(e.g. Coding DIN 6 M0128), the input is either High active or Low active. Default
setting is High active.

Configuration of digital output

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
     I/O interface M0139
        Digital outputs M0110

Example   Use output DOUT6 for signal Bypass Sync Out:

Parameters: Signal DOUT 6 M0111

Setting value: Bypass Sync Out (wiring diagram designation: BYPASS SYNC
OUT)

8.14.1. By-pass function: activate

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
     Application functions M0178
        Activation M0212
           By-pass function M0941

Default value: Function not active

Setting values:

Function not active   Bypass function deactivated.

Function active   Bypass function activated.

8.14.2. By-pass application: configure

The actuators for the two MOVs (valves) have to be configured according to their
application (main or by-pass valve).

M ▷ Customer settings M0041
     By-pass function M0942
        By-pass application M0943

Default value: Main valve

Setting values:

Main valve   Actuator for main valve.

By-pass valve   Actuator for by-pass valve.

8.15. Automatic deblocking

Requirements This function requires one of the following equipments within the actuator:

- Electronic control unit
- Electronic position transmitter EWG/RWG

This function CANNOT be combined with the functions listed below:

- By-pass function
- Operation profile
- If the setting range was limited for the positioner (parameter Limit setting range M0845 = Function active)

For actuator controls in SIL version, we DISADVISE using the automatic deblocking function.

NOTICE	**Unexpected starting of actuator!**

When using automatic deblocking with level-controlled operation command evaluation, unexpected starting of actuator into the wrong direction might occur when trying to eliminate a double-sided torque fault (torque faults in directions OPEN and CLOSE are present at the same time).

→ Use automatic deblocking only in combination with edge controlled operation command evaluation (parameter Com. eval. REMOTE M1709).

Properties In case of torque switch tripping in intermediate position (i.e. prior to reaching the end position), the actuator automatically attempts to reach the end position by operation into the opposite direction and executing the actual operation command once again.

The torque fault signal is suppressed during automatic deblocking. Should torque switching trip again once automatic deblocking is complete, the actuator is switched off and actuator controls signal a torque fault.

8.15.1. Automatic deblocking function: activate

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
　Application functions M0178
　　Activation M0212
　　　Automatic deblocking M1678

Default value: Function not active

Setting values:

Function not active	Function deactivated.
Function active	Function activated.

8.15.2. Operation time for operation in opposite direction: set

The actuator controls remember the first seating position and operate the actuator for the set operation time into opposite direction.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
　Automatic deblocking M1680
　　Oper. time opposite M1681

Default value: 3 s

Setting ranges: 1 ... 60 s (seconds)

8.15.3. Number of deblocking attempts: set

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
　Automatic deblocking M1680
　　Deblocking attempts M1682

Default value: 3

Setting ranges: 1 ... 5

8.15.4. Tolerance range: set

Tolerance range (+/-) for initial torque seating position, within which a torque fault will be signalled after unsuccessful automatic deblocking.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
    Automatic deblocking M1680
        Tolerance range M1683

Default value: 10 %

Setting ranges: 5 ... 30 % (percentage of operating time into opposite direction)

8.16. Heater system and heaters

Possible components:

- Heater system within the actuator controls
- Heaters within the actuator:
    - Control unit heater in switch compartment
    - Motor heater (within motor housing)

8.16.1. Heater system within the actuator controls

The heater system is generally used for low temperature (in low temperature version up to –60 °C). For an installed heater system, the other heaters (control unit, motor heater) will also be connected to the heater system.

Wiring diagram designation: R5 H

Marking of variants within the wiring diagram code (position 11)

- **B** = 115 V AC or 230 V AC externally supplied
- **C, E, H** = internally supplied via actuator controls

The heater system is temperature-controlled. The heater system will automatically be activated for a temperature range between –5 °C and –10 °C and ensures that the temperature within the controls housing does not fall below –20 °C.

8.16.2. Heater on control unit (actuator)

Properties For AUMA actuators with AC actuator controls, a resistance type heater is installed on the control unit (within actuator switch compartment).

The heater minimises condensation within the actuator switch compartment.

Wiring diagram designation: R1 H

Marking within the wiring diagram code: position 11 = A – H

Information The proper function of the heater can be monitored. For further information, refer to <Heater system/heater monitoring>.

Activate/deactivate heater on control unit

The heater on the control unit of the actuator can be activated/deactivated. Activation/deactivation can either be permanent or automatically when exceeding/falling short of defined temperature values. An electronic control unit (MWG) is required for automatic setting.

Information If the heater is deactivated, heater monitoring is also deactivated (parameter Heater monitor)!

Required user level: Specialist (4).

M ▷ Device configuration M0053
    Actuator M0168
        Heater control unit M1338

Default value: Auto

Setting values:

Off   Heater is deactivated.

On   Heater is activated.

Auto   Heater is automatically activated/deactivated by the actuator controls:

- For temperatures exceeding +40 °C within the switch compartment = deactivated
- For temperatures of less than +35 °C within the switch compartment = activated

8.16.3.   Motor heater

The motor heater minimises condensation within the motor and improves the start-up behaviour for extremely low temperatures.

Wiring diagram designation: R4 H

Marking within the wiring diagram code: position 11 = D (motor heater externally supplied), G (motor heater internally supplied)

9. Failure functions

Definition   Failure functions are started by certain events and lead to a defined action of the controls or the actuator. A failure operation can be started by a manual action (e.g. pressing an EMERGENCY stop button). In general, a failure operation is automatically started by a fault signal from a monitoring function (e.g. loss of signal).

9.1. Reversing prevention time

Application   Prevention of impermissible operation states such as: Operation command in direction OPEN, actuator still runs in direction CLOSE due to the delay time.

Properties   The reversing prevention time (off-time between two operation commands in opposite direction) prevents a restart for a defined interval once the motor has switched off.

Parameters and instructions for setting

Required user level: AUMA (6).

M ▷   Device configuration M0053
   Switchgear M0173
     Revers. prevent. time M0174

Default values: For 3-phase AC motors = 1.0 s seconds

For 1-phase AC motors = 2.5 s seconds

Setting range: 0.3 ... 30.0 s seconds

9.2. Failure behaviour on loss of signal

Characteristics   The failure behaviour can be used to define AC reaction to loss of signal or a defective signal.

Only in operation mode Remote will the failure behaviour react to a signal loss. In operation modes Local or Off, there will be no reaction.

As soon as the cause for initiating the failure function is eliminated (connection restored), the operation commands from the master can be executed again at once.

The last received operation command is deleted once the connection is aborted. To ensure a defined behaviour, a valid operation command must be transmitted to the actuator upon resuming communication.

9.2.1. Failure reaction on loss of signal

Required user level: Specialist (4) or higher.

M ▷   Customer settings M0041
   Failure behaviour M0378
     Signal loss beh. M0379

Default value: Good signal first

Setting values:

Good signal first   The <Failure behaviour> is only initiated if the monitored signal fails (falling edge).

This setting ensures that if the signal is missing, the actuator will not start when switching on (Good signal first).

Immediately active   The <Failure behaviour> is immediately initiated if the monitored signal is missing (is not present).

For the setting Immediately active**:**

⚠ CAUTION	**Risk of immediate actuator operation when switching on!**

Risk of personal injuries or damage to the valve.

→ Ensure that the signal set under parameter Source M0385 is present when switching on.

→ If the actuator starts unexpectedly: Immediately turn selector switch to position **Local operation** (LOCAL) or **0** (OFF).

9.2.2. Failure source (failure reason) for a failure operation: set

M ▷ Customer settings M0041
   Failure behaviour M0378
     Source M0385

Default value: Active interface

Setting values:

Fieldbus interface   Failure behaviour is initiated in case of fieldbus communication loss.

I/O interface   The failure behaviour is initiated in case of setpoint loss (setpoint position, process setpoint, actual process value).

The monitoring depends on the preset setpoint range, e.g.:

- Setpoint = 4 – 20 mA, E1 lower than 3.7 mA = loss of signal
- Setpoint = 10 – 20 mA, E1 lower than 9.7 mA = loss of signal

Information
- For a setpoint range of 0 – 20 mA , monitoring is not possible.
- Actuator controls will only respond to a setpoint signal loss, if a signal is present at the MODE input, i.e. actuator controls are in operation mode Remote SETPOINT (setpoint control).

Active interface   In case of fieldbus communication loss (if the fieldbus interface is active) or loss of setpoints (if the I/O interface is active), the failure behaviour is initiated.

Possible failure reasons in case of fieldbus communication loss:

- The connection to the master is interrupted.
- The master does not send telegrams to the actuator controls.
- The pre-set connection monitoring time is less than the cycle time of the Modbus communication.

9.2.3. Failure operation (reaction of the actuator) on loss of signal

The failure operation defines which action is executed by the actuator once the failure behaviour is initiated.

M ▷ Customer settings M0041
   Failure behaviour M0378
     Failure operation M0384

Default value: STOP

Setting values:

STOP   The actuator stops in the current position.

CLOSE   The actuator runs to end position CLOSED.

OPEN   The actuator runs to end position OPEN.

Approach position   The actuator runs to the specified position. Conditions:

- The function <Positioner> is activated.
- Parameter Source M0385 is set to I/O interface
  (for fieldbus control: Active interface)

Execute last CMD   The actuator executes the last operation command before it is stopped.

If the last operation command was a setpoint definition via analogue input (AIN 1/AIN 2), the lower limit of the setpoint position is used (parameter Low limit AIN 1/Low limit AIN 2). The actuator is operated to the defined end position, usually end position CLOSED.

Behaviour depending on the selector switch position

Once the failure operation is triggered, the defined position is approached. If the actuator is then moved to another position (e.g. by manual operation), it will try to perform the set failure operation while the selector switch is in position **Remote control** (REMOTE).

Information   To prevent a new approach to the failure position during manual operation, the selector switch must be set to position **Local control** (LOCAL) or **0** (OFF) **prior** to operating the handwheel.

9.2.4. Preset position: define

If the Approach position failure operation is set, the actuator runs to the preset failure position indicated here.

Required access level: Specialist (4) or higher.

M ▷   Customer settings   M0041
     Failure behaviour   M0378
       Fail.pos.OPEN CLOSE   M0387

Default value: 50.0 %

Setting range: 0.0 ... 100.0 % (from end position OPEN to CLOSED)

9.2.5. Failure position MPV: define

This parameter is only available in multiport valve version.

If the Approach position failure operation is set, the actuator runs to the preset failure position indicated here.

Required user level: Specialist (4) or higher.

M ▷   Customer settings   M0041
     Failure behaviour   M0378
       Failure position MPV   M1172

Default value: 0.0 °

Setting range: 0.0 ... 360 °

9.2.6. Speed for safety operation: set

The speed during safety operation may be set individually for both direction (OPEN/CLOSE).

Required user level: Specialist (4) or higher.

M ▷   Customer settings   M0041
     Failure behaviour   M0378
       Failure speed OPEN   M1935
       Failure speed CLOSE   M2042

Default value: 45 rpm

Setting ranges: 6 ... 240 rpm

The adjustable speed range is indicated on the actuator name plate.

9.2.7. Delay time: set

A failure operation is only performed once the delay time has expired. This prevents a short-term loss of signal, which does not have an effect on the process, from directly starting a failure operation

Required user level: Specialist (4) or higher.

M ▷ Customer settings   M0041
   Failure behaviour   M0378
      Delay time   M0386

Default value: 00:03.0 min:s (3 seconds)

Setting range: 0.0 ... 30:00.00.0 min:s (30 minutes)

Time behaviour in case of bus communication loss

The connection monitoring time (parameter Monitoring time M0781) is started with the last Modbus query-response cycle prior to communication failure. If no valid Modbus telegram was received within this connection monitoring time, this is considered as loss of bus communication and the delay time is started. At the end of the delay time, the failure operation will be executed.

Figure 47: Time behaviour
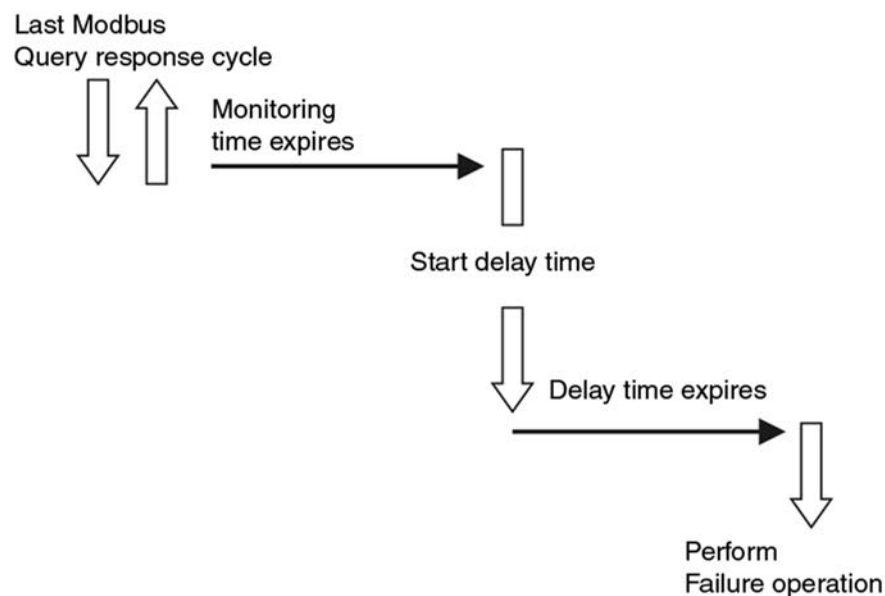
9.3. EMERGENCY behaviour

Application   The EMERGENCY behaviour can be used to determine the actuator behaviour in an emergency.

Characteristics
- The function <EMERGENCY behaviour> is initiated by the EMERGENCY signal.
- The actuator performs a defined EMERGENCY operation. For example, the actuator moves to a predefined EMERGENCY position (i.e. end position OPEN or end position CLOSED).
- As long as the EMERGENCY signal is present, the actuator does not respond to any other operation commands (EMERGENCY signal has top priority).
- After initiating the EMERGENCY behaviour, binary operation commands (via digital inputs) may have to be sent again.
- Analogue operation commands (e.g. 0/4 – 20 mA) or operation commands via fieldbus are immediately executed again.

Perform EMERGENCY operation via fieldbus command

For control via fieldbus interface, the EMERGENCY command is done via fieldbus command Fieldbus EMCY.

Switching behaviour:

- Fieldbus EMCY = 1 = EMERGENCY behaviour is initiated.
- Fieldbus EMCY = 0 = No EMERGENCY operation

If the EMERGENCY command is not to be transmitted via a fieldbus command but using a binary signal, (e.g. + 24 V DC) via <Additional inputs> or via an additional <Parallel interface>, a digital input has to be available and configured.

Configuration of digital input

Required access level: Specialist (4).

M ▷ Device configuration M0053
    I/O interface M0139
      Digital inputs M0116

Example Use input DIN 4 for signal EMERGENCY:

Parameter: Signal DIN 4 M0118

Setting value: EMERGENCY (wiring diagram designation: EMERGENCY)

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 4 M0126), the input is either High active or Low active. For safety reasons, the EMERGENCY signal input is generally set to Low active.

Perform EMERGENCY operation via digital input

Switching behaviour for coding Low active:

- Input EMERGENCY = **low level** (0 V DC or input open-circuit)
  EMERGENCY operation is initiated.
- Input EMERGENCY = **high level** (standard: +24 V DC)
  No EMERGENCY operation

9.3.1. EMERGENCY behaviour: activate

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
    Application functions M0178
      Activation M0212
        EMCY behaviour M0589

Default value: Function not active

Setting values:

Function not active Function <EMERGENCY behaviour> deactivated.

Function active Function <EMERGENCY behaviour> activated.

For activated EMERGENCY behaviour:

⚠ CAUTION | **Risk of actuator operation due to an EMERGENCY signal!**

Risk of personal injuries or damage to the valve.

→ For commissioning and maintenance work: Set selector switch to position **0** (OFF). Motor operation can only be interrupted in this selector switch position.

→ If the actuator starts unexpectedly: Immediately turn selector switch to position **0** (OFF).

Information EMERGENCY behaviour must be completely configured during first activation. This means the setting of the following parameters must be adapted to the required actuator behaviour in particular: EMCY fail.reac. EMCY source EMCY operation mode EMCY operation EMCY position

9.3.2. EMERGENCY failure reaction

Required user level: Specialist (4) or higher.

M ▷ Customer settings   M0041
   EMCY behaviour   M0198
      EMCY fail.reac.   M0203

Default value: Good signal first

Setting values:

Good signal first
The <EMERGENCY behaviour> is initiated as soon as the EMERGENCY signal changes from high to low. Example: for binary EMERGENCY input of +24 V DC to 0 V. This prevents the <EMERGENCY behaviour> from being initiated immediately once the actuator controls are switched on and no EMERGENCY signal is present.

Immediately active
The <EMERGENCY behaviour> is initiated by a low level at the EMERGENCY signal. For this setting, the EMERGENCY signal has to have a high level before switching on the actuator controls; otherwise <EMERGENCY behaviour> is initiated immediately after switching on.

For the setting Immediately active**:**

⚠ CAUTION

The actuator can start immediately when switching on!

Risk of personal injuries or damage to the valve.

→ Ensure that the EMERGENCY signal is present when switching on.

→ Should the actuator start unexpectedly: Immediately set selector switch to position **0** (OFF).

9.3.3. Failure source (failure reason) for an EMERGENCY operation: set

M ▷ Customer settings   M0041
   EMCY behaviour   M0198
      EMCY source   M0591

Default value: I/O interface

Setting values:

I/O interface
The EMERGENCY signal is present as binary signal (standard: +24 V DC) at a digital input. If this voltage (i. e. the signal) is no longer present, the EMERGENCY behaviour is initiated.

Fieldbus interface
The EMERGENCY signal is sent as fieldbus command. If the command is no longer present, the EMERGENCY behaviour is initiated.

I/O or fieldbus
If the fieldbus command or the binary signal is no longer present, the EMERGENCY behaviour is initiated.

Active interface
If active interface fails, the EMERGENCY behaviour is initiated; e.g. when changing the command source the failure source for the EMERGENCY signal also fails.

9.3.4. Operation mode for EMERGENCY behaviour

The EMERGENCY behaviour can be activated for the operation modes Remote and/or Local

M ▷ Customer settings   M0041
   EMCY behaviour   M0198
      EMCY operation mode   M0202

Default value: Remote only

Setting values:

Remote only
EMERGENCY behaviour is active in the operation modes: Remote, Remote II, Fieldbus

	Remote and local	EMERGENCY behaviour is active in the operation modes: Remote, Remote II, Fieldbus, Local, Service
	Information	In the operation mode Off (selector switch position 0), no emergency operation is executed.

9.3.5. EMERGENCY operation

The EMERGENCY operation determines which action is executed by the actuator once the EMERGENCY behaviour is initiated.

M ▷ Customer settings M0041
   EMCY behaviour M0198
    EMCY operation M0204

Default value: STOP

Setting values:

STOP	The actuator stops in the current position.
CLOSE	The actuator runs to end position CLOSED.
OPEN	The actuator runs to end position OPEN.
Approach EMCY pos.	The actuator runs to the specified position.

9.3.6. EMERGENCY position

If the Approach EMCY pos. EMERGENCY operation is set, the actuator runs to the indicated EMERGENCY position.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   EMCY behaviour M0198
    EMCY position M0232

Default value: 0.0 %

Setting range: 0.0 … 100.0 % (from end position OPEN to CLOSED)

9.3.7. EMERGENCY position MPV

This parameter is only visible for Multiport valve product variant and replaces the EMERGENCY position parameter.

If the Approach EMCY pos. EMERGENCY operation is selected, the actuator runs to the currently specified EMERGENCY position of the Multiport valve.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   EMCY behaviour M0198
    EMCY position MPV M1171

Default value: 0.0 °

Setting range: 0.0° ... 360.0° (degree)

9.3.8. EMERGENCY speed

Speed for an EMERGENCY operation.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   EMCY behaviour M0198
    Speed EMCY OPEN M1934
    Speed EMCY CLOSE M2041

Default value: 6 (rpm)

Setting range: 6 ... 240 (rpm)

The adjustable speed range is indicated on the actuator name plate.

9.3.9. Torque switching: by-pass

If an EMERGENCY operation is initiated, the torque switches can be by-passed during this operation.

Required access level: Specialist (4) or higher.

M ▷ Customer settings M0041
   EMCY behaviour M0198
     By-pass torque M0199

Default value: Off

Setting values:

Off   No by-pass of the torque switching.

On   The signals of the torque switching in the actuator are by-passed.

9.3.10. Motor protection: by-pass

If an EMERGENCY operation is initiated, the motor protection can be by-passed during this operation.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   EMCY behaviour M0198
     Thermal by-pass M0200

Default value: Off

Setting values:

Off   No by-pass of motor protection.

On   The signals of the thermoswitches or the PTC thermistors of the motor winding are by-passed.

Information   It is not possible to by-pass the motor protection for actuators with explosion protection.

9.3.11. Stepping mode: by-pass

If an EMERGENCY operation is initiated, stepping mode can be by-passed during this operation.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   EMCY behaviour M0198
     By-pass timer M0201

Default value: Off

Setting values:

Off   No by-pass of stepping mode.

On   Stepping mode is by-passed.

9.3.12. Operation profile: by-pass

If an EMERGENCY operation is initiated, the pre-set operation profile (operation behaviour) can be by-passed.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   EMCY behaviour M0198
     By-pass operat.profile M0596

Default value: Off

Setting values:

Off   No by-pass of operation profile.

On   The operation profile is by-passed.

9.3.13.   Interlock: by-pass

If the Interlock function is activated, you may by-pass this function during
EMERGENCY operation to prevent that an enable command must be issued to
perform EMERGENCY operation.

Required user level: Specialist (4) or higher.

M ▷   Customer settings M0041
    EMCY behaviour M0198
        By-pass Interlock   M0668

Default value: Off

Setting values:

Off   By-pass mode is deactivated. Interlock function is even active during EMERGENCY
operation.

On   By-pass mode is activated. Interlock function is deactivated during EMERGENCY
operation.

9.3.14.   Local stop: by-pass

If activated, you may by-pass Local Stop function during an EMERGENCY operation
to prevent interruption of EMERGENCY operation by pressing the push button STOP.

Required user level: Specialist (4) or higher.

M ▷   Customer settings   M0041
    EMCY behaviour M0198
        By-pass Local STOP   M0682

Default value: Off

Setting values:

Off   By-pass mode is deactivated. Local Stop function is even active during EMERGENCY
operation.

On   By-pass mode is activated. Local Stop function is deactivated during EMERGENCY
operation.

9.3.15.   Speed profile: by-pass

If an EMERGENCY operation is initiated, the pre-set speed profile can be by-passed
during this operation.

Required user level: Specialist (4) or higher.

M ▷   Customer settings M0041
    EMCY behaviour M0198
        Bypass speed profile M0596

Default value: Off

Setting values:

Off   No by-pass of torque profile. In EMERGENCY operation, the actuator operates into
the EMERGENCY position following the pre-set speed profile.

On   The speed profile is by-passed. In EMERGENCY operation, the actuator operates
into the EMERGENCY position at EMERGENCY speed (Speed EMCY OPEN
parameters M1934 or Speed EMCY CLOSE M2041). Refer to <EMERGENCY
speed> chapter.

9.3.16.   Delay time for EMERGENCY operation

An EMERGENCY operation is only performed once the delay time has expired. Consequently, a short-term signal failure will not have an impact on the process and will not immediately initiate an EMERGENCY operation.

Required user level: AUMA (6) or higher.

M ▷   Customer settings   M0041
        EMCY behaviour   M0198
            Delay time   M0804

Default value: 00:01.00 min : s

Setting range: 00:00.0 ... 30:00.0 min : s

9.4.   Enable local controls

Application • Protection against unauthorised operation via local controls
              • Protection against unauthorised parameter setting via local controls

Properties The selector switch functions LOCAL and/or OFF may be enabled or disabled.

Enable/disable local controls via fieldbus commands

For control via fieldbus interface, the command for enabling the local controls is done via fieldbus command Fieldb. enable LOCAL.

Switching behaviour:

• Fieldb. enable LOCAL = 1 = enable:
  Operation via local controls enabled

• Fieldb. enable LOCAL = 0 = disabled:
  Operation via local controls disabled

Information In the event of loss of fieldbus communication, the local controls will be disabled since no enable signal is present.

If operation commands are not transmitted via fieldbus commands, but via <Additional inputs> or an additional <Parallel interface>, a digital input has to be available and configured to enable/disable the local controls.

Configuration of digital input

Required user level: Specialist (4).

M ▷   Device configuration   M0053
        I/O interface   M0139
            Digital inputs   M0116

Example Use input DIN 5 for signal Enable Local:

Parameters: Signal DIN 5 M0122

Setting value: Enable Local (wiring diagram designation: `Enable LOCAL`)

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 5 M0127), the input is either High active or Low active. Default setting is High active.

Enable/disable local controls via digital input

Switching behaviour for coding High active:

• Input Enable Local = **high level** (standard: +24 V DC):
  Operation via local controls enabled

• Input Enable Local = **low level** (0 V DC or input open):
  Operation via local controls disabled

9.4.1. Enabling function: activate

Required user level: Specialist (4) or higher.

M ▷ Device configuration   M0053
    Application functions   M0178
      Activation   M0212
      Enable LOCAL   M0631

Default value: Function not active

Setting values:

Function not active	Function <Local controls: enable from REMOTE> deactivated.
Function active	Function <Local controls: enable from REMOTE> activated.

9.4.2. Enabling function behaviour

The enable behaviour determines which selector switch functions (LOCAL, OFF) require an additional enable signal.

Required user level: Specialist (4) or higher.

M ▷ Customer settings   M0041
    Local controls   M0075
      Enable LOCAL   M0628

Default value: Sel. sw. Local

Setting values:

Sel. sw. Local	Disabling or enabling is only effective in operation mode LOCAL (selector switch is in position **Local control**). If no enable signal is present, operation via push buttons on the local controls is disabled and the display shows the following signal: Disabled.
Sel. sw. Local + Off	Disabling or enabling is effective in operation modes LOCAL and OFF (selector switch positions **Local control** and **0**). If no enable signal is present, operation via push buttons on the local controls is disabled and the display shows the following signal: Disabled.
Information	If the <Priority REMOTE> function is also activated, the two functions should have different setting values. In case of identical setting values, e.g. Sel. sw. Local + Off, the <Enable local controls> function will have no function, since the actuator controls will be exclusively in operation mode REMOTE if the enable signal is missing.

9.5. Priority REMOTE

Properties	A control signal can provide REMOTE control with priority over actuator operation via local controls (irrespective of the selector switch position)
	This function uses the same input signal as the <Enabling local controls> function.
Application	No changing possibility via selector switch from LOCAL

Priority REMOTE over fieldbus command

For control via fieldbus interface, the Priority REMOTE command is done via fieldbus command Fieldb. enable LOCAL.

Switching behaviour:

- Fieldb. enable LOCAL = 1 = enable:
  Operation via local controls enabled

- Fieldb. enable LOCAL = 0 = Priority REMOTE:
  Operation via local controls disabled

If the operation commands are not transmitted via fieldbus commands, but via <Additional inputs> or additional <Parallel interface>, a digital input has to be available and configured for the <Priority REMOTE> function.

Configuration of digital input

Required user level: Specialist (4).

M ▷ Device configuration M0053
 I/O interface M0139
  Digital inputs M0116

Example Use input DIN 5 for signal Enable Local:

Parameters: Signal DIN 5 M0122

Setting value: Enable Local (wiring diagram designation: `Enable LOCAL`)

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 5 M0127), the input is either High active or Low active. Default setting is High active.

Priority REMOTE via digital input

Switching behaviour for coding High active:

- Input Enable Local = **high level** (standard: +24 V DC):
  Operation via local controls enabled
- Input Enable Local = **low level** (0 V DC or input open):
  Priority REMOTE: Operation via local controls disabled

9.5.1. Priority REMOTE: activate

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
 Application functions M0178
 Activation M0212
  Priority REMOTE M0770

Default value: Function not active

Setting values:

Function not active <Priority REMOTE> function is deactivated.

Function active <Priority REMOTE> function is activated.

9.5.2. Priority REMOTE behaviour

This function determines which selector switch function (LOCAL, OFF) requires an additional enable signal.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
 Local controls M0075
  Priority REMOTE M0773

Default value: Sel. sw. Local

Setting values:

Sel. sw. Local Priority of control from REMOTE is only effective in operation mode LOCAL (selector switch is in position **Local control**). If no enable signal is present, operation via push buttons on the local controls is disabled and the actuator can be controlled from REMOTE. The actuator controls indicates the symbol $\varnothing$ in the status line of the display (menu S0001).

Sel. sw. Local + Off Priority of control from REMOTE is effective in operation modes LOCAL and OFF (selector switch positions **Local control** and **0**). If no enable signal is present, operation via push buttons on the local controls is disabled and the actuator can be controlled from REMOTE. The actuator controls indicates the symbol $\varnothing$ in the status line of the display (menu S0001).

9.5.3. Fieldbus auto enable

Properties Generating an enable signal for the <Priority REMOTE> function in case of fieldbus communication failure

Condition <Priority REMOTE> function.

M ▷ Customer settings M0041
   Local controls M0075
     Fieldbus auto enable M0774

Default value: On

Setting values:

Off   <Fieldbus auto enable> function is deactivated. In case of bus failure, NO enable signal is generated via fieldbus (command Fieldb. enable LOCAL = 0). <Priority REMOTE> function is active and operation vial local controls disabled.

On   In case of bus failure, the actuator controls generate the enable signal themselves to be able to operate the actuator locally.

9.6. Interlock (enabling operation commands)

Characteristics
- An operation command will only be executed if an additional enable signal for the operation command is present.
- Enabling may be activated or deactivated individually for operation commands OPEN and CLOSE.
- Enabling can be set for the different operation modes.

Enable/disable operation commands via fieldbus commands

For control via fieldbus interface, the commands for enabling the operation commands is done via commands Fieldb. enable OPEN or Fieldb. enable CLOSE.

Switching behaviour:

- Fieldb. enable OPEN or Fieldb. enable CLOSE = 1 = enabled:
Operation command enabled.
- Fieldb. enable OPEN or Fieldb. enable CLOSE = 0 = disabled:
Operation command disabled.

If operation commands are not transmitted via fieldbus commands, but via <Additional inputs> or an additional <Parallel interface>, a digital input has to be available and configured to enable/disable the local controls.

Configuration of digital input

Required user level: Specialist (4).

M ▷ Device configuration M0053
   I/O interface M0139
     Digital inputs M0116

Example Use input DIN 5 to enable operation commands in direction CLOSE:

Parameter: Signal DIN 5 M0122

Setting value: Enable CLOSE (wiring diagram designation: `Interlock CLOSE`)

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 5 M0127), the input is either High active or Low active. Default setting is High active.

Enable/disable commands via digital input

Switching- behaviour for coding High active:

- Input Enable OPEN = **low level** (0 V DC or input open):
Operation command enabled.
- Input or Enable OPEN = **high level** (default: +24 V DC):
Operation command disabled,

9.6.1. Interlock: activate

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   Application functions M0178
    Activation M0212
     Interlock M0663

Default value: Function not active

Setting values:

Function not active	Function <Interlock (enable operation commands)> deactivated.
Function active	Function <Interlock (enable operation commands)> activated.

9.6.2. Source of Interlock enable signal: set

M ▷ Customer settings M0041
   Interlock M0664
    Interlock source M1013

Default value: Active comm. source

Setting values:

Active comm. source	Signals for enabling operation commands are sent via the active interface. I.e. changing the command source also changes the failure source of the enable signal.
Interface	The enable signal for the operation commands must be configured as binary signal (default: +24 V DC) at a digital input (parameter: Enable OPEN/Enable CLOSE).
Fieldbus	The enable signal for the operation commands must be triggered by the fieldbus commands Interlock OPEN or Interlock CLOSE.

9.6.3. Operation mode for interlock

The additional enable signal can be activated for different operation modes.

M ▷ Customer settings M0041
   Interlock M0664
    Oper. mode Interlock M0665

Default value: Off both directions

Setting values:

Off	Interlock is off.
Remote	Interlock is active in operation modes: RemoteRemote II Fieldbus
Local	Interlock is active in operation modes: Local, Service
Remote and local	Interlock is active in operation modes: Remote, Remote II, Fieldbus, Local, Service

9.6.4. Interlock behaviour (running direction)

The Interlock behaviour determines which selector switch functions (LOCAL, OFF) require an additional enable signal.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   Interlock M0664
    Running dir. Interlock M0666

Default value: OPEN and CLOSE

Setting values:

OPEN	The enable signal is only required for operation commands in direction OPEN.
CLOSE	The enable signal is only required for operation commands in direction CLOSE.

| OPEN and CLOSE | The enable signal is required for operation commands in directions OPEN and CLOSE. |

9.7. Local Stop

| Properties | • The function Local Stop can be used to stop an operation from Remote locally with the push button STOP.
• All operation commands are interrupted. |
| Information | After releasing push button STOP, an operation command which might still be present will become active immediately. |

9.7.1. Behaviour

Required user level: Specialist (4) or higher.

M ▷

Customer settings M0041
  Local controls M0075
Local STOP M0627

Default value: Off

Setting values:

Off	Push button STOP can only interrupt an operation in operation mode Local (selector switch = position **Local control**).
Sel.sw.Local + Remote	In the operation modes Local, Remote, Remote II, EMERGENCY and Service, push button STOP interrupts an operation.
Information	In operation mode Disabled, an interruption is NOT possible.

9.8. EMERGENCY stop function

| Conditions | An EMERGENCY stop button (latching) is either located on the electrical connection or outside. |
| Characteristics | • In an emergency, the EMERGENCY stop button can be used to interrupt the power supply. Possibly available operation commands will be reset via self-re-taining.
• The indication in the top row of the display shows: EMCY stop |

Figure 48: EMERGENCY stop button on the electrical connection

| Information | The EMERGENCY stop button is reserved for operation in the event of an emergency. For maintenance work, the mains supply of the actuator controls has to be switched off and protected against accidental switching on. |
| Information | The EMERGENCY stop push button is not available for explosion-proof versions, but only for weatherproof versions of the actuator controls. |

Operation commands

After having unlocked the EMERGENCY stop button, a possibly active operation command will **NOT** immediately be re-activated, but only respective acknowledgement by the operator. This resets the EMERGENCY stop status.

The acknowledgement is made:

- via the **RESET** push button in selector switch position **Local control** (LOCAL).
- or via fieldbus reset byte 1 bit 3 of output data (for this, the selector switch must be set to **Remote control**).
- via a digital input from Remote. Assignment: RESET

9.9. Partial Valve Stroke Test (PVST)

Properties The Partial Valve Stroke Test (PVST) is used to check the function of both actuator and actuator controls. During this test, the function of the valve is tested by means of partial opening or closing within a defined period of time without interrupting the process. After successful testing, actuator controls operate the actuator to its initial position.

If the test was not successful, actuator controls will generate the following signals: PVST fault PVST abort. For monitoring the PVST, these signals must be evaluated by a PLC.

Requirements
- Position transmitter in the actuator
- If the actuator is in safe state (caused by the failure behaviour), the test will not be performed.
- The test can only be performed during OPEN - CLOSE control. For setpoint control (modulating duty), a test cannot be performed.

Execute PVST via fieldbus command

For control via fieldbus interface, the tests are initiated via the PVST command.

Switching behaviour:

- PVST = 0 (low active) = no test
- PVST = 1 = test is initiated

If the test is not to be transmitted via a fieldbus command but using a binary signal, (e.g. +24 V DC) via <Additional inputs> or via an additional <Parallel interface>, a digital input has to be available and configured.

Configuration of digital input

Required user level: Specialist (4).

M ▷ Device configuration M0053
  I/O interface M0139
    Digital inputs M0116

Example Use input DIN 5 for Execute PVST signal:

Parameters: Signal DIN 4 M0118

Setting value: Execute PVST (wiring diagram designation: ESD)

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 4 M0126), the input is either High active or Low active. For safety reasons, the Execute PVST signal input is generally set to Low active.

Execute PVST via digital input

Switching behaviour for coding Low active**:**

- Input Execute PVST = **low level** (0 V DC or input open):
  No test

- Input Execute PVST = **high level** (standard: +24 V DC):
  Test is initiated

Execute PVST manually via push buttons of the local controls

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
    Service functions M0222
       Execute PVST M0850

The actuator must be in the initial position. The initial position depends on the following parameter settings: PVST behaviour M0853, PVST stroke M0854

Information Der PVST kann durch Senden eines Reset-Befehls abgebrochen werden:
- local (manual), in selector switch position **local operation**, via push button **Reset**.
- From Remote, in selector switch position **Remote control** via a digital input. Assignment: RESET
- or via fieldbus reset byte 1 bit 3 of output data (for this, the selector switch must be set to **Remote control**).

9.9.1. PVST activation

Required user level: Specialist (4) or higher.

M ▷ Device configuration   M0053
    Application functions   M0178
       Activation   M0212
          PVST   M0851

Default value: Function not active

Setting values:

Function not active <PVST> function deactivated.

Function active <PVST> function activated.

9.9.2. PVST source: set

M ▷ Customer settings M0041
    PVST   M0852
       PVST source M1339

Default value: Active interface

Setting values:

Active interface Signals for triggering a PVST are sent via the active interface, i.e. changing the command source also changes the failure source of the PVST.

I/O interface Signals for triggering a PVST must be configured as binary signals (default: +24 V DC) at a digital input.

Fieldbus interface Signals for triggering a PVST must be enabled via PVST fieldbus command.

9.9.3. Operation mode for PVST

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
    PVST M0852
       PVST operation mode M0889

Default value: Stroke

Setting values:

Stroke Stroke controlled PVST; operation across defined stroke (parameter PVST stroke) within a defined time (parameter PVST monitoring). In this operation mode, the PVST can be started in any valve position (even outside the end position).

End position test   Operating time controlled PVST; operation within a defined time (parameter PVST operating time) after leaving an end position. In this operation mode, PVST can only be started from one of the end positions.

9.9.4. Behaviour for PVST: define

The test can be performed in direction OPEN or direction CLOSE.

M ▷   Customer settings   M0041
     PVST   M0852
       PVST behaviour   M0853

Default value: OPEN

Setting values:

OPEN   Testing by operation in direction OPEN.

CLOSE   Testing by operation in direction CLOSE.

9.9.5. Partial stroke for PVST: set

During stroke controlled PVST execution (parameter PVST operation mode M0889 = Stroke), this parameter determines the partial stroke for a PVST.

Usually, the valve stroke amounts to 10 to 15 %. The amount of the partial stroke depends on process requirements and the required diagnostic coverage rate.

M ▷   Customer settings   M0041
     PVST   M0852
       PVST stroke   M0854

Default value: 10.0 %

Setting range: 0.0 ... 100.0 %

9.9.6. PVST monitoring time: set

The actuator remains in the current position if the test could not be completed within the pre-set time.

M ▷   Customer settings   M0041
     PVST   M0852
       PVST monitoring   M0855

Default value: 01:00.0 min:s (1 minute)

Setting range: 00:01.0 ... 50:00.0 min:s (minutes:seconds)

9.9.7. PVST operating time: set

During operating time controlled PVST execution (parameter PVST operation mode M0889 = End position test), this parameter determines the permissible PVST operating time.

M ▷   Customer settings   M0041
     PVST   M0852
       PVST operating time   M0890

Default value: 00:02.0 min:s (2 seconds)

Setting range: 00:00.1 ... 15:00.0 min:s (minutes:seconds)

9.9.8. PVST reversing time: set

Waiting time during PVST prior to returning to initial position.

M ▷   Customer settings   M0041
     PVST   M0852
       PVST reversing time   M0891

Default value: 00:02.0 min:s (2 seconds)

Setting range: 00:00.1 ... 15:00.0 min:s (minutes:seconds)

9.9.9. PVST reminder

If this function is active, a signal is generated if no PVST was executed during the reminder period.

Activate reminder

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  PVST M0852
    PVST reminder M0892

Default value: Function not active

Setting values:

Function not active Reminder not activated.

Function active Reminder activated.

Set reminder period

M ▷ Customer settings M0041
  PVST M0852
    PVST reminder period M0893

Default value: 0 d

Setting range: 0 ... 65535 d (days)

9.9.10. Speed for PVST: set

The speed during PVST may be set individually for both directions (OPEN/CLOSE).

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  PVST M0852
    Speed PVST Open M2056
    Speed PVST Close M2057

Default value: 45 rpm

Setting ranges: 6 ... 240 rpm

The adjustable speed range is indicated on the actuator name plate.

9.10. Bluetooth interface can be activated and deactivated

Behaviour of the Bluetooth interface of the actuator controls can be set.

M ▷ Device configuration M0053
  Application functions M0178
    Activation M0212
      | M0573

Information The last menu | only exists for configuration via local controls. For AUMA CDT and AUMA Assistant App, the parameter is already available for configuration in the Activation menu.

The parameter | may have the following values:

0 Switched off (CDT & App)

  Off (local controls)

1 Switched on (CDT & App)

  On (local controls)

2	I/O or fieldbus
3	Selector switch position OFF (CDT & App)

Selector switch OFF (local controls)

The Bluetooth interface is permanently switched off for parameter value "0". To establish a connection is not possible.

The Bluetooth interface is permanently switched on and ready for reception for parameter value "1". A connection can be established at any time.

The parameter values "2" and "3" will be explained hereafter.

Activation/deactivation via I/O, fieldbus or selector switch position OFF

The Bluetooth interface can have three different states:

BT_OFF The Bluetooth interface is deactivated. To establish a connection via a master is not possible. The Bluetooth LED (blue) of the local controls is switched off.

BT_READY The Bluetooth interface is activated and waits for connection by a master. The Bluetooth LED (blue) of the local controls is blinking.

BT_CONNECTED The Bluetooth interface is connected to a master. The Bluetooth LED is permanently illuminated.

Properties of the input signals:

- The inputs are edge triggered.
- The Bluetooth interface is activated by rising edge.
- The Bluetooth interface is deactivated by falling edge.

Information For details on the process representation, please refer to <Manual (Device integration Fieldbus) AC .2/ACV .2 actuator controls>.

If the parameter corresponds to the value "2" or "3", the Bluetooth interface is in status "BT_OFF" when switching on the actuator controls.

By activating the Bluetooth interface, the status will change from "BT_OFF" to "BT_READY". The duration for the interface to remain in status "BT_READY" depends on the selected parameter value.

Parameter value 2 – fieldbus or I/O

The Bluetooth interface remains in the "BT_READY" status until a connection is established. Exception: In case a master was already connected, the status will change to "BT_OFF" once the set time is exceeded.

Parameter value 3 – selector switch position OFF

The Bluetooth interface remains in the "BT_READY" status until the set time is exceeded. Once the set time is exceeded, the status will change to "BT_OFF".

If a Bluetooth master tries to connect within the set time, the connection will be established. The interface will then change to status "BT_CONNECTED".

- Generally, the status is always signalled either via fieldbus or via I/O interface.
- The Bluetooth interface may at any time be interrupted via the fieldbus or the I/O interface. The status will then directly change to "BT_OFF".
- Deactivation via the selector switch is not possible.

The following graphic chart describes the overall behaviour of the Bluetooth interface:

Figure 49: Behaviour of the Bluetooth interface
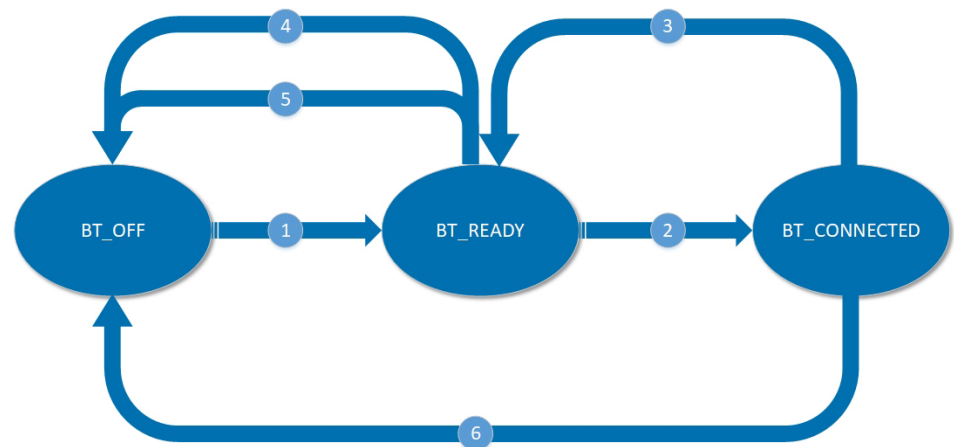
[1]   Activation of the Bluetooth interface via I/O or fieldbus (value 2) or via the se-
        lector switch position OFF (value 3)
[2]   Establishment of connection by Bluetooth master
[3]   Separation of the connection by the master
[4]   Abort by the DCS
[5]   Timeout
[6]   Abort by the DCS

When changing the parameter value, the Bluetooth interface behaviour pattern in
states "BT_READY" and "BT_OFF" is as follows:

Table 12: Change of parameter value

Current parameter value	Current status	New parameter value	New status
0 (switched off)	BT_OFF	1 (switched on)	BT_READY
0 (switched off)	BT_OFF	2 (fieldbus or I/O)	BT_OFF
0 (switched off)	BT_OFF	3 (selector switch position OFF)	BT_OFF
1 (switched on)	BT_READY	0 (switched off)	BT_OFF
1 (switched on)	BT_READY	2 (fieldbus or I/O)	BT_OFF
1 (switched on)	BT_READY	3 (selector switch position OFF)	BT_OFF
2 (fieldbus or I/O)	BT_READY or BT_OFF	0 (switched off)	BT_OFF
2 (fieldbus or I/O)	BT_READY or BT_OFF	1 (switched on)	BT_READY
2 (fieldbus or I/O)	BT_READY or BT_OFF	3 (selector switch position OFF)	BT_OFF
3 (selector switch position OFF)	BT_READY or BT_OFF	0 (switched off)	BT_OFF
3 (selector switch position OFF)	BT_READY or BT_OFF	1 (switched on)	BT_READY
3 (selector switch position OFF)	BT_READY or BT_OFF	2 (fieldbus or I/O)	BT_OFF

If the Bluetooth interface is in the status "BT_CONNECTED", a change of parameter
value does not cause a status change. In order to change the status, the master
must interrupt the connection or the connection must be interrupted otherwise:

Table 13: Status change for disconnect or abort

Current parameter value	Current status	Cause	New status
0 (switched off)	BT_CONNECTED	Disconnect by master	BT_OFF
0 (switched off)	BT_CONNECTED	Abort by DCS	BT_OFF
1 (switched on)	BT_CONNECTED	Disconnect by master	BT_READY
1 (switched on)	BT_CONNECTED	Abort by DCS	BT_CONNECTED
2 (fieldbus or I/O)	BT_CONNECTED	Disconnect by master	BT_READY (until timeout)
2 (fieldbus or I/O)	BT_CONNECTED	Abort by DCS	BT_OFF
3 (selector switch position OFF)	BT_CONNECTED	Disconnect by master	BT_READY (until timeout)
3 (selector switch position OFF)	BT_CONNECTED	Abort by DCS	BT_OFF

Timeout for Bluetooth activation

The time during during which the Bluetooth interface remains in status "BT_READY" after activating via "selector switch position OFF" or after the connection abort by the Bluetooth master, can be set via a parameter .

M ▷ Device configuration M0053
   Bluetooth interface M2235
    | M2234

Information The last menu | only exists for configuration via local controls. For AUMA CDT and AUMA Assistant App, the parameter is already available for configuration in the Bluetooth interface menu.

Default value: 180 [s]

Setting range: [60 ... 300] [s]

10.   Monitoring functions

Definition   The monitoring functions signal a warning or a fault as soon as a certain value is outside the permissible range. Faults generally cause an actuator shutdown.

10.1.   Torque monitoring

Torque monitoring has the following functions:

- Valve overload protection against excessive torques (leads to switching off)
- Torque warning before overload protection tripping (only in combination with electronic control unit in the actuator)

Overload protection

Once the overload protection trips (torque exceeds set tripping torque), the actuator is stopped.

Actuator controls generate a fault indication if:

- Excessive torque occurs **between** end positions
- Excessive torque occurs **in** the end positions **and** limit seating is set.

The fault indication is shown in the display

- Status indication: S0007 Fault or S0011 Failure
    - Details: Torque fault CLOSE or Torque fault OPEN

The fault has to be acknowledged before the operation can be resumed:

1.   Either by an operation command in the opposite direction.
    - For Torque fault CLOSE: Operation command in direction OPEN
    - For Torque fault OPEN: Operation command in direction CLOSE

2.   Or, in case the torque applied is lower than the preset tripping torque after tripping:
    - via the **RESET** push button in selector switch position **Local control** (LOCAL).
    - or via Modbus, command reset (output data: byte 1, bit 3).

Depending on the version, tripping torques for overload protection are either set via switches in the actuator or via software parameters in the controls. For the settings, refer to <Torque switching> chapter.

Torque warning

Requirements   Actuator with electronic control unit (MWG) .

The torque warning can be used e.g. for self-monitoring or for anticipating maintenance requirements.

M ▷   Customer settings   M0041
   Torque switching   M0013
      Wrn torque CLOSE   M0769
      Wrn torque OPEN   M0768

Default value: 80 %

Setting range: 20 ... 100 % of the set nominal torque

When exceeding the set limit values, the actuator is not stopped, however, the controls generate a warning signal:

- Status indications: S0005 Warnings or S0008 Out of specification
    - Details: Torque wrn CLOSE or Torque wrn OPEN

10.1.1.   Torque by-pass

By means of the torque by-pass, the torque monitoring is deactivated for a defined (short) time. During this interval, the full actuator torque may be used, for example, to release the actuator from a blocked end position or any other jammed position.

NOTICE	**Valve damage due to excessive torque!**
	→ Only apply torque by-pass with the consent of the valve manufacturer.

Torque by-pass: activate

M ▷ Customer settings M0041
   Torque switching M0013
     Torque by-pass M0092

Default value: Function not active

Setting values:

Function active | The torque by-pass is activated.

Function not active | The torque by-pass is deactivated.

Time interval for torque by-pass

During the time interval set here, the torque monitoring is deactivated.

M ▷ Customer settings M0041
   Torque switching M0013
     Torque by-pass [s] M0205

Default value: 0.0 s

Setting range: 0.0 ... 10.0 s seconds

Information | If torque by-pass is activated, the interval should be longer than the set time period for reversing prevention time to ensure torque by-pass will also be effective in the event of reversal of operation.

10.1.2. Torque limitation of torque by-pass

For activated torque by-pass, the torque monitoring (parameter Torque by-pass M0092) is deactivated for a defined (short) time. By activating the torque limitation, torque monitoring will be activated again, but not in relation to the set tripping torque but in relation to a torque peak which can be set separately via this function.

Condition | Electronic control unit with MWG in the actuator (non-intrusive version).

Activate torque limitation

M ▷ Customer settings M0041
   Torque switching M0013
     Torque limitation M1805

Default value: Function not active

Setting values:

Function active | The torque limitation of the torque by-pass is activated.

| The actuator will be stopped during the by-pass interval and a torque fault will be generated once the permitted torque peak has been exceeded.

Function not active | The torque limitation of the torque by-pass is deactivated.

| There is no torque monitoring. During the by-pass interval, no torque fault will be generated.

Set torque peak

M ▷ Customer settings M0041
   Torque switching M0013
     Torque peak [%] M1806

Default value: 120 %

Setting range: 100 ... 150 % (in relation to the set tripping torque)

10.2. Motor protection monitoring (thermal monitoring)

In order to protect against overheating and impermissibly high surface temperatures at the actuator, PTC thermistors or thermoswitches are embedded in the motor winding. Motor protection trips as soon as the max. permissible winding temperature has been reached.

The actuator is switched off and the following fault signals are issued:

- LED 3 (factory setting: motor protection tripped) on the local controls is illuminated.
- Status indications S0007 Fault or S0011 Failure display a fault.
  The fault Details is displayed when selecting Thermal fault.

The motor has to cool down before the operation can be resumed.

Depending on the parameter setting (motor protection behaviour), the fault signal is either automatically reset or the fault signal has to be acknowledged manually.

Manual acknowledgement can be made:

- In selector switch position **Local control** (LOCAL) via push button **RESET**.
- In selector switch position **Remote control** (REMOTE):
  - Via fieldbus, Reset command, byte 1 bit 3 of output data if fieldbus is the active command source.
  - Or via a digital input (I/O interface) with RESET command if a digital input is configured for RESET signal and the I/O interface is the active command source.

In addition, the actuator controls cyclically (once per month) check the motor protection monitoring for its proper function. If this check fails, the actuator controls generate the fault indication: IE mot. prot. monitor

Motor protection behaviour

Required user level: AUMA (6).

M ▷ Device configuration M0053
  Actuator M0168
    Motor prot. mode M0169

Default values:

Non-explosion-proof actuators = Auto

Explosion-proof actuators = Reset

Setting values:

Auto   Automatic reset after the motor has cooled down.

Not possible for explosion-proof version.

Reset   Manual reset.

Once the motor has cooled down, the fault has to be acknowledged (reset) manually as described above.

If required the thermal overload relay has to be reset manually. To this end, remove the cover on the back of actuator controls and operate the reset button on the thermal overload relay.

10.3. Type of duty monitoring (motor starts and running time)

This function monitors the permissible type of duty (e.g. S2 - 15 min) of the actuator.

For this, actuator controls monitor possible excess of

- Permissible motor starts (cycles) per hour
- Permissible running time (on-time) per hour

If any of these values has been exceeded, the actuator will however not be stopped, but the following warning signals are issued.

- Status indications: S0005 or S0008
  - Details: Wrn op.mode starts
- Status indications: S0005 or S0008
  - Details: Wrn op.mode run time

The warning signals will automatically be cleared if the permissible motor starts per second or the permissible running time per hour are no longer reached.

The operational info logger records the number of excesses (warnings) as well as the number of motor starts and motor running times.

M ▷ Asset Management M01231
   Operational info M0177
     Operational info M0188

On time warning 1 M0325 contains total number of all on time warnings.

On time warning 2 M0326 contains maximum duration of on time warning

Example: Due to excess of defined starts/h or defined running time/h, AC issue in total 4 on time warnings: two for 5 min, once for 10 min, once for 17 min. Afterwards the operating data counters contain the following values:

On time warning 1 M0325 = 37 min = total of all periods (5+5+10+17 min)

On time warning 2 M0326 = 17 min = longest period

Figure 50: Example
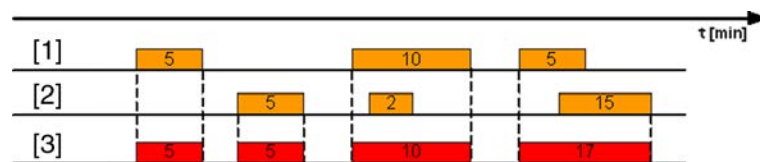
[1]   Running time/h
[2]   Starts/h
[3]   On time warning

Activate on time monitoring

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   Duty type monitoring M0355
     Duty type monitoring M0358

Default value: Function not active

Setting values:

Function not active   Function <On-time monitoring> deactivated.

Function active   Function <On-time monitoring> activated.

Set permissible starts/h

M ▷ Customer settings M0041
   Duty type monitoring M0355
     Permissible starts M0357

Default value: 1,200 starts/h

Setting range: 1 ... 1,800 starts/h

Set permissible running time/h

M ▷ Customer settings M0041
   Duty type monitoring M0355
     Perm. run time M0356

Default value: 15 min (minutes)

Setting range: 10 ... 60 min (minutes)

10.4.   Operating time monitoring

This function allows the monitoring of the operating time of the actuator. If the actuator needs longer than the set time to move from end position OPEN to end position CLOSED, a warning is issued (the actuator is not stopped):

- Status indication S0005 Warnings
    - Details: Op. time warning

- Via fieldbus: Op. time warning

The warning indication is automatically cleared once a new operation command is executed.

When the actuator moves from an intermediate position to an end position, the set monitoring time for the whole stroke is assigned in relation to the remaining stroke/travel.

Activate operation mode

Required access level: Specialist (4) or higher.

M ▷   Customer settings   M0041
         Oper. time monitoring   M0568
            Operation mode   M0569

Default value: Off

Setting values:

Off   The operating time monitoring is switched off

Manual   The operating time monitoring is activated. The permissible operation time is set via parameter Perm.op. time, manual M0570.

Set permissible operating time manually

Required user level: Specialist (4) or higher.

M ▷   Customer settings   M0041
         Oper. time monitoring   M0568
            Perm.op. time, manual   M0570

Default value: 15:00.0 min:s (15 minutes)

Setting range: 00:00.0 ... 59:59.9 min:s (minutes:seconds)

Display operating times

Operating times can be displayed via Asset Management. Refer to <Display operating times>

10.5.   Reaction monitoring

The actuator controls monitor whether the actuator moves after receiving an operation command.

If no reaction is recorded at the output drive of the actuator within a set time, either a warning or a fault signal is generated depending on the setting:

- Status indication: S0005 Warnings or S0008 Out of specification
    - Details: Wrn no reaction

- Status indication: S0007 Fault or S0011 Failure
    - Details: Fault no reaction

In the event of a fault signal, the fault has to be acknowledged to be able to resume the operation. The acknowledgement is made:

- In selector switch position **Local control** (LOCAL) via push button **RESET**.

- in selector switch position **Remote control** (REMOTE):
  - Via fieldbus, Reset command, byte 1 bit 3 of output data if fieldbus is the active command source.
  - Or via a digital input (I/O interface) with RESET command if a digital input is configured for RESET signal and the I/O interface is the active command source.

In case of operation from an intermediate position, reaction monitoring will only be performed if the actuator is equipped with position feedback function.

Activate switching off for reaction time error

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Reaction monitoring M0632
    Actuator behaviour M0633

Default value: No cut-off

Setting values:

No cut-off	The reaction monitoring only issues a warning.
Cut-off	The reaction monitoring issues a fault signal, the actuator is stopped.

Set reaction time

M ▷ Customer settings M0041
  Reaction monitoring M0632
    Reaction time M0634

Default value: 15.0 s

Setting range: 15.0 ... 300.0 seconds (0 seconds up to 5 minutes)

10.6. Motion detector

Requirements	Position transmitter in the actuator.
Characteristics	The motion detector checks whether the actuator moves even without operation command (e.g. in manual operation or if there is no self-retaining).
	Controls identify motion if the actuator moves more than the pre-set travel difference within the predefined recording time. Controls signal: Output drive rotates
Information	Parameters for motion detection have a direct impact on reaction monitoring.

10.6.1. Activate motion detector

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Motion detector M0676
    Motion detector M0675

Default value: Function active

Setting values:

Function not active	Monitoring is deactivated.
Function active	Monitoring is activated.

10.6.2. Detection time dt

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Motion detector M0676
    Detect. time dt M0677
    Detect. time dt (MWG) M0681

Default values:

Detect. time dt (for potentiometer/EWG/RWG within actuator) = 00:05.0 min:s (5 seconds)

Detect. time dt (MWG) (for MWG within actuator) = 00:00.5 min:s (0.5 seconds)

Setting ranges:

Detect. time dt = 00:01.0 ... 30:00.0 min:s (minutes:seconds)

Detect. time dt (MWG) = 00:00.1 ... 00:02.0 min:s (minutes:seconds)

10.6.3. Travel difference dx

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Motion detector M0676
    Travel diff. dx M0678
    Travel diff. dx (MWG) M0679

Default values:

Travel diff. dx (for potentiometer/EWG/RWG within actuator) = 1.0 %

Travel diff. dx (MWG) (for MWG within actuator) = 3 (increments)

Setting ranges:

Travel diff. dx = 1.0 ... 10.0 %

Travel diff. dx (MWG) = 2 ... 20 (increments)

10.6.4. Delay time

Delay time of the signal: Handwheel oper.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Motion detector M0676
    Delay time M0764

Default value: 6.000 s (seconds)

Setting range: 0.001 ... 65.535 s

10.7. Monitoring of electronics power supply

Actuator controls monitor the following voltages and signal a warning (refer to <Fault signals and warnings> chapter):

- Auxiliary voltage 24 V DC, e.g for supplying the control inputs
- Voltage 24 V AC for controlling the reversing contactors, for thermoswitches and heater within the actuator and for generating the 115 V AC auxiliary voltage for the customer (option)
- Internal 24 V DC power supply of the electronics components (within the actuator controls and in the actuator)
- External 24 V DC supply of the electronics (option)

Activate monitoring of auxiliary voltage 24 V DC

Required user level: Specialist (4).

M ▷ Device configuration M0053
  Monitoring function M0645
    Monitor 24 V DC cust. M0650

Default value: Function not active

Setting values:

Function not active   Monitoring is deactivated.

On   Monitoring is activated. Should the auxiliary voltage 24 V DC for supplying the control inputs fail, a warning will be issued.

Activate monitoring of external supply 24 V DC

Required user level: Specialist (4).

M ▷ Device configuration M0053
   Monitoring function M0645
     Monitor 24 V DC ext. M0649

Default value: Function not active

Setting values:

Function not active   Monitoring is deactivated.

On   Monitoring is activated. Should the external supply 24 V DC fail, a warning will be issued.

10.8.   Temperature monitoring

Characteristics   If the respective sensors are installed in the devices, the actuator controls monitor different temperatures.

If certain temperature limits are exceeded or fallen short of, the controls either send a warning or a fault signal.

Conditions:
- For temperature within the control unit of the actuator: MWG (magnetic limit and torque transmitter)
- For motor temperature: additionally temperature sensor (PT 100) in the motor
- For gear housing temperature: additionally temperature sensor (PT 100) in the gearing

Information   Current device temperatures can also be displayed. Refer to <Display device temperatures>.

10.9.   Heater system/heater monitoring

The heater system within the actuator controls housing and the heater on the control unit (within the switch compartment of the actuator) can be monitored. If the monitoring is activated the following warning will be generated if the heater system or the heater (circuit = interrupted) fails:

- In the display of the local controls, status indication S0005 Warnings
  - Details: Internal warning Wrn heater

- Via fieldbus: Wrn heater

For further information on the heater system and the heater refer to separate <Heater system and heater> chapter.

Activate heater system monitoring

Heater system monitoring monitors all connected heaters for failure.

Required user level: Specialist (4).

M ▷ Device configuration M0053
   Monitoring function M00645
     Monitor heat. system M0647

Default value: Function not active

Setting values:

Function not active   Heater monitoring is deactivated.

Function active   Heater monitoring is activated.

Activate heater control unit monitoring

Information   If a heater system is installed within the actuator controls, heater monitoring is not activated/deactivated via this parameter, but via parameter Monitor heat. system M0647 of the heater system.

Required user level: Specialist (4).

M ▷   Device configuration   M0053
   Actuator   M0168
     Heater monitor   M0646

Default value: Function not active

Setting values:

Function not active   Heater monitoring is deactivated.

Function active   Heater monitoring is activated. If the heater fails, a warning will be issued.

Information   Monitoring can only be made once the heater is activated (parameter Heater control unit).

Set reaction time for heater monitoring

Heater monitoring will only respond once a fault persists longer than the set monitoring time. Short-time faults occurring for less than the set monitoring time are not signalled as warning.

Required user level: AUMA (6).

M ▷   Device configuration   M0053
   Actuator   M0168
     Heating sys. mon. time   M0859

Default value: 300.0 seconds

Setting range: 60 ... 3600 seconds (1 minute to 1 hour)

10.10.   Verification of sub-assemblies

Conditions   • Actuators with electronic control unit

Characteristics   The controls verify whether sub-assemblies mounted in actuators and controls correspond to the desired version.

In case incorrect sub-assemblies are mounted or if sub-assemblies are missing the controls either send a warning or a fault signal.

For detailed information on this indication refer to <Fault signals and warnings> chapter.

10.11.   Phase failure monitoring

Conditions: Phase failure monitoring is only valid for connections to 3-phase AC power supplies. For versions with 1-phase AC or DC, phase failure monitoring is not possible.

Properties   The actuator controls monitor phase L2. If phase L2 is missing for a certain time interval, the actuator controls can still send and receive signals and generate a fault indication. Since the actuator controls are supplied via phases L1 and L3, the two phases cannot be monitored. In case L1 or L3 fails, the actuator controls are inoperable and the actuator stops.

Information   In case of L2 phase loss during motor operation, this does not necessarily lead to an immediate standstill of the actuator. The reason is that the rotating motor generates the missing phase itself. This leads, however, to a reduction of the motor output torque. If the applied torque is sufficient for valve operation, the missing phase L2 is only detected when switching off (e.g. in an end position) and the Phase fault fault signal is generated as a consequence.

Configuration of tripping time

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
    Phase monitoring M0170
      Tripping time M0172

Default value: 10.0 s

Setting range: 1.0 – 300.0 s

Information   Faults in supply voltage (e.g. voltage drops) do not generate a fault signal during the adjustable tripping time.

11. Functions: activate and enable

11.1. Functions: activate

Via Activation menu M0212, functions can be switched on (activated) or off (deactivated).

Required user level for enabling/disabling: Specialist (4) or higher.

M ▷ Device configuration M0053
    Application functions M0178
      Activation M0212

Information Some functions require enabling. Only enabled functions are visible and can be activated or deactivated.

Table 14:

Function	Menu	Enabling required
EMCY behaviour	M0589	No
Timer CLOSE	M0156	No
Timer OPEN	M0206	No
Positioner	M0158	Yes
Operation profile	M0294	No
Process controller	M0741	Yes
Bluetooth	M0573	No
Enable LOCAL	M0631	Yes
Priority REMOTE	M0770	Yes
Auto change-over I/O	M0790	Yes
Interlock	M0663	Yes
Torque wrn	M0796	No
PVST	M0851	Yes
By-pass function	M0941	Yes
Maintenance signals	M1136	No
Maintenance interval	M1137	No
Maintenance reminder	M1884	No
Limit sw. via CDT/App	M1197	Yes
Fieldbus operation	M1236	No
Split range operation	M1650	No
Automatic deblocking	M1679	Yes
DMF evaluation	M1842	No
Mean value curves	M1890	No
Com. eval. REMOTE	M1709	No
Speed profile	M2122	Yes

11.2. Functions: enable

Via Enabling menu M0179, optional functions can be enabled or disabled.

This menu is visible in the display from user level Specialist (4).

M ▷ Device configuration M0053
    Application functions M0178
      Enabling M0179

Table 15:

Function	Menu and user level
Positioner	M0209 AUMA (6)
Process controller	M0338 AUMA (6)
Enable LOCAL	M0630 AUMA (6)
Priority REMOTE	M0771 AUMA (6)
Auto change-over I/O	M0789 AUMA (6)
Interlock	M0661 AUMA (6)
PVST	M0856 AUMA (6)
By-pass function	M0940 AUMA (6)
Actuator config.	M1138 AUMA (6)
Limit sw. via CDT/App	M1198 AUMA (6)
Automatic deblocking	M1678 AUMA (6)
Speed profile	M2121 AUMA (6)

Information   In user level Specialist (4), an additional activation password (depending on the serial number) is required for enabling the function. The activation password can only be assigned and generated by the AUMA service.

12. Product variants

12.1. Multiport valve

The multiport valve function is considered as **product variant** and must be activated in the factory. Only for an activated multiport valve function will the respective parameters be available for setting in the actuator controls menu.

Properties The multiport valve function allows to directly access a valve port of a valve equipped with several ports without stopping at any other port. Example: Operation from position 2 to 4 without stopping at position 3.

In operation modes Local and Fieldbus, up to 16 positions can be approached. Operation mode Remote allows the function "next position" also up to 16 positions.

Depending on the setting, the actuator will either operate the valve at a defined direction of rotation (counterclockwise or clockwise) or as quickly as possible (irrespective of the actuator position) to the specified valve port.

Procedure for commissioning a multiport valve

1. Set/check multiport valve parameters:
   (generally, they are set in the factory prior to delivery)
   - Actuator type
   - Gear reduction ratio
   - Number of ports (positions)
   - Configuration of digital inputs

2. Define/check positions (of valve ports).
3. Set/check signal behaviour of positions.
4. Set home port (zero position).
5. Approach positions.
6. If required, perform/correct multiport valve parameter settings like inertia, dead band, backlash compensation and hysteresis.
7. If further multiport valve parameters were set: Reset the homeport and re-set parameters as required.

12.1.1. Actuator type: set/check

The actuator type is set in the factory but can be modified at a later date.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
    Multiport valve M1140
      Actuator type M1142

Default value: Actuator type set in the factory

Setting ranges: Selection list of all AUMA actuators

12.1.2. Gear reduction ratio: set/check

The reduction ratio of the gear stage of the actuator mounted to the valve gearbox must be set here. To facilitate adjustment, a selection table of supported gearboxes is available.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
    Multiport valve M1140
      Reduction ratio M1143

Default values: GS50.3

Setting values:

Table 16: Selection of gearboxes supported by AUMA

Sizes GS 50.3 – GS 125.3	Sizes GS160.3 – GS 250.3
GS50.3	GS160.3
GS63.3	GS160.3/GZ160.3(4:1)
GS80.3	GS160.3/GZ160.3(8:1)
GS100.3	GS200.3
GS100.3/VZ2.3	GS200.3/GZ200.3(4:1)
GS100.3/VZ3.3	GS200.3/GZ200.3(8:1)
GS100.3/VZ4.3	GS250.3
GS125.3	GS250.3/GZ250.3(4:1)
GS125.3/VZ2.3	GS250.3/GZ250.3(8:1)
GS125.3/VZ3.3	
GS125.3/VZ4.3	

12.1.3. Number of ports (positions)

Number of valve ports (positions)

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Multiport valve M1140
    Number of ports M1141

Default value: 8

Setting ranges:

In operation mode Remote 2 to 10

In operation mode Local or Fieldbus 2 to 16

12.1.4. Home port (zero position): set

The home port is the zero position (0° or 360° of one turn) and is consequently the starting point for all other intermediate positions.

Information Set the gear reduction ratio (parameter Reduction ratio M1143) and the actuator type (parameter Actuator type M1142) prior to setting the home port.

Set home port 1. Position multiport valve to zero position either via manual operation (handweel) or via motor operation (via push buttons of local controls)
2. In a next step, confirm this position (with Yes) as homeport via parameter MPV home port M1162.
As an alternative, the home port position can also be confirmed via a signal at a digital input. To this end, a digital input has to be available and configured.

Set home port (zero position) via parameter

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Multiport valve M1140
    MPV home port M1162
      Set?

Successful homeport setting is visualised by a black circle on the actuator controls display: ●.

Reset homeport (zero point)

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Multiport valve M1140

Reset MPV homeport M2863
  Reset?

Successful resetting of the homeport is shown by a white circle with a black line on the actuator controls display: C.

Configuration of digital input

Required user level: Specialist (4).

M ▷ Device configuration M0053
  I/O interface M0139
    Digital inputs M0116

Example Use input DIN 5 for "Set home port" signal:

Parameters: Signal DIN 5 M0122

Setting value: MPV set home pos. (wiring diagram designation: `Home port`)

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 5 M0127), the input is either High active or Low active. Default setting is High active.

12.1.5. Positions (of valve ports): define/check

Each position can be set to any value between 0° and 360° (one full turn of the valve).

Information Prior to setting the positions, the home port must be defined (parameter MPV home port).

This corresponds to the zero position of the valve (0° or 360° of one full valve turn as well as 0 % or 100 % of position feedback).

The positions of the valve ports have to be set afterwards.

M ▷ Customer settings M0041
  Multiport valve M1140
    MPV positions M1149

Setting ranges: 0.0 to 359.9°

Default values: 0.0° (for all positions)

If desired, positions can be preset in the factory.

Example configuration for a multiport valve comprising 8 ports: All 8 positions are evenly spread across 360°.

Position 1 = 0.0 `(bzw. 359,9°)`
Position 2 = 45.0
Position 3 = 90.0
Position 4 = 135.0
Position 5 = 180.0
Position 6 = 225.0
Position 7 = 270.0
Position 8 = 315.0

12.1.6. Operate to position via push buttons of the local controls

To operate to a position via push buttons of the local controls, status indication S0017 must be shown (refer to <Indications in the display>).

Figure 51: Status indication of multiport valve (selector switch in position OFF)
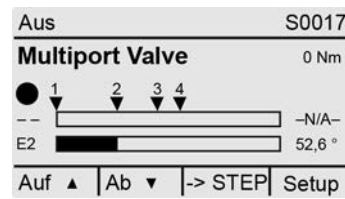
Operation in clockwise or counterclockwise direction:

When changing the selector switch to position **Local control** (LOCAL), the display changes:

Figure 52: Status indication of multiport valve (selector switch in position LOCAL)
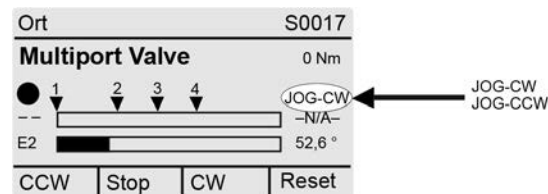
As a consequence, the valve can be operated into clockwise or counterclockwise direction (display shows CW or CCW)

Direct operation to a position:

When selector switch is in position **0** (OFF), the function "Direct operation to a position via push buttons" is activated via ->STEP (push button ↵) (display shows ->JOG).

Figure 53: Status indication of multiport valve (selector switch in position OFF)
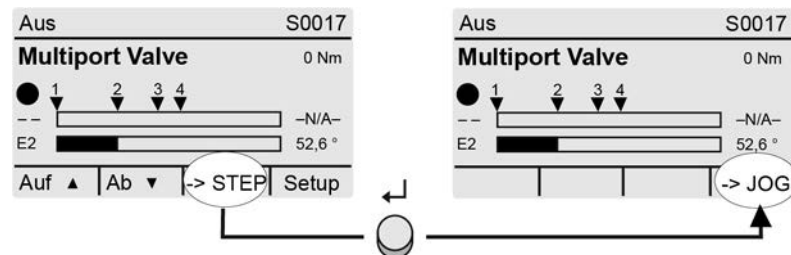
When changing the selector switch to position **Local control** (LOCAL), the display changes for selection of the desired position:

Figure 54: Status indication of multiport valve (selector switch in position LOCAL)
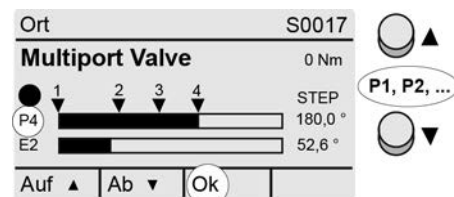
Select the desired position (P1, P2, ...) via push buttons ▲▼ and confirm selection via Ok (push button ↵).

→ The operation is issued as soon as push button Ok is pressed.

Symbol	
▼	Set positions (of valve ports)
P	(P1, P2, ...) selected position (1, 2, ...)
– – / –N/A–	No position has been selected.
E2	Actual position value
●	Homeport (zero point) set
○	No homeport (zero point) has been set

To interrupt an operation (triggered operation command):

→ Select "– – / –N/A–" during operation and confirm via Ok (push button ↵). The actuator stops in its current position.

12.1.7. Operate to position from Remote

For direct operation to position from remote, make sure that selector switch position **Remote control** (REMOTE) is selected.

Approach position via fieldbus command

If fieldbus interface control has been selected, the operation command for direct position approach is performed via a fieldbus command.

Example: Fieldbus command Fieldb. interm. pos. 1:

- Fieldb. interm. pos. 1 = 0 (low active) = no operation command
- Fieldb. interm. pos. 1 = 1 = intermediate position 1 is approached selecting the shortest path

The commands are described in the Manual (Device integration fieldbus).

If the operation commands for direct position approach are not issued via fieldbus command but are to be transmitted using a binary signal, (e.g. + 24 V DC) via <Additional inputs> or via an additional <Parallel interface>, digital inputs must be provided and configured accordingly.

Operation to position via digital inputs

An input (DIN) must be configured for each position (valve port).

Configuration of digital inputs

Required user level: Specialist (4) or higher.

M ▷   Device configuration M0053
  I/O interface M0139
    Digital inputs M0116

Example   DIN4 input to operate to position 1 selecting the shortest path:

Parameters: Signal DIN 4 M0118 = Intermediate pos. 1

Setting values for digital inputs (DIN)	Operation behaviour for input control
Intermediate pos. 1 to Intermediate pos. 16	Operation to defined position while selecting the shortest path
MPV: CW Position 1 to MPV: CW Position 10	Operation to defined position in clockwise direction
MPV: CCW Position 1 to MPV: CCW Position 10	Operation to defined position in counterclockwise direction
MPV DriveCW	Actuator operates in clockwise direction (without stop at any position).
MPV DriveCCW	Actuator operation in counterclockwise direction (without stop at any position).

Command "Next position"

Required user level: Specialist (4) or higher.

A digital input is used to select the desired operation to the next port including the direction of operation. Thus, up to 16 ports can be approached in both directions, even without fieldbus connection with only 2 inputs.

Device configuration M0053
  I/O interface M0139
    Digital inputs M0116

Example   Parameter Signal DIN 1 M0117:

- Next position CW = clockwise
- Next position CCW = counterclockwise

Self-retaining when leaving the factory in both direction (cw and ccw).

12.1.8. Dead band

The dead band prevents operation to a new setpoint position within a specified band.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   Multiport valve M1140
    Dead band M1145

Default value: 0.00°

Setting range: 0.00 – 36.0° (degrees)

12.1.9. Correction of inertia

Due to reaction times and inertia, each Multiport valve has a specific inertia. This can be compensated by inertia correction.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   Multiport valve M1140
Overrun M1656

Default value: 0.00°

Setting range: 0.00° – 10.0° (degrees)

12.1.10. Backlash compensation

Adjustable backlash compensation of the overall system including valve coupling.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
   Multiport valve M1140
    Backlash comp. M1146

Default value: 0.00°

Setting range: 0.00 – 36.0° (degrees)

12.1.11. Signalling behaviour of positions: set/check

Reaching of a point (valve port) can be signalled:

- via bus (see separate instructions)
- via indication lights (LEDs) of the local controls or
  (refer to chapters <Indications> <Indication lights>)
- via output contacts
  (refer to chapters <Indications> <Assignment of outputs>)

Signal behaviour, this means the signal behaviour upon reaching a position, is set via parameter MPV sign. beh. 1.

M ▷ Customer settings M0041
   Multiport valve M1140
    MPV sign. beh. 1 M1147

Default value: No signal

Setting values:

No signal	A: Signal behaviour Off. Position is not signalled.
C_____|_____O	B: Signal is active from reaching the position up to 360°.
C_____|_____O	C: Signal is active from 0° until the position is reached.
C_____|‾|_____O	D: When passing the position, a pulse signal is issued. The pulse range (range +/– around the pivot point) depends on the set hysteresis.

Figure 55: Signal behaviour of positions
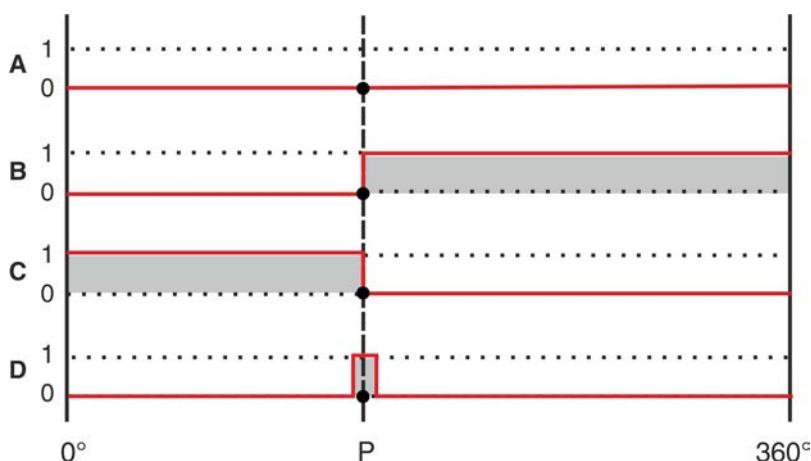
Information The set signal behaviour is valid for all positions.

12.1.12. Hysteresis for signalling intermediate positions: set

The hysteresis determines the tripping point.

Example Parameter Position 4 M1153 is set to 180° (50 % of the travel).

Parameter Hysteresis M1148 is set to 3.0°.

Figure 56: Switching behaviour for signalling behaviours B, C, D and hysteresis 3.0°.
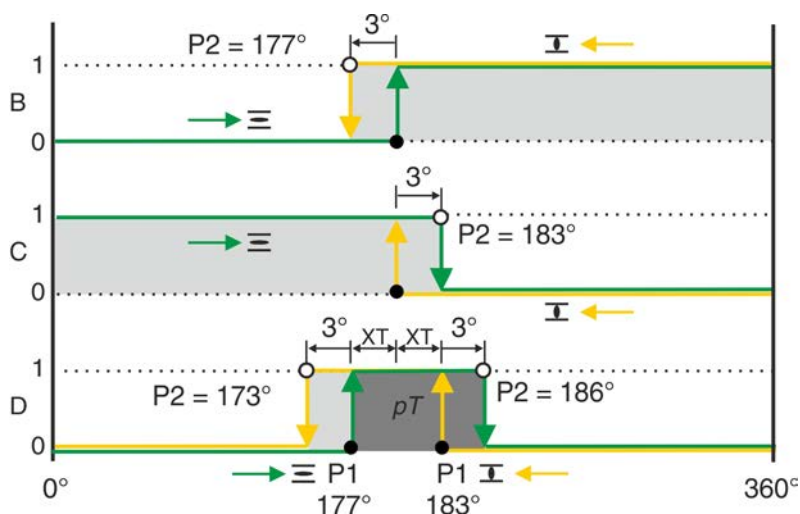
P1   Switch-on point (●)
P2   Switch-off point (○)
pT   Pulse duration = 2 times XT + hysteresis

Required user level: AUMA (6).

M ▷   Customer settings   M0041
         Multiport valve   M1140
            Hysteresis   M1148

Default values: 0.5° for all 16 intermediate positions

Setting range: 0.0° to 5.0° (degree)

13. Service functions

The functions described here may only be changed by the AUMA service or by authorised and trained personnel.

Menu item Service functions is only visible, if user level Specialist (4) or higher is selected.

13.1. Direction of rotation

Properties

This function allows changing the direction of rotation for actuator with 3-phase AC motors.

The direction of rotation indicates the direction into which the drive shaft rotates around its own axis. The view is on the top of the actuator. Distinction is made between clockwise and counterclockwise rotation.

Information

- When changing from clockwise closing to counterclockwise closing or vice versa, only the direction of rotation of the motor is changed. The change-over requires further action:
  - The wiring diagram designation is marked on the actuator controls name plate. In case of a change, a new name plate with the new wiring diagram number has to be requested from AUMA.
  - The wiring diagram number of the actuator is stored in the electronic device ID (parameter Wiring diag. actuator M0060). The ID has to be adapted to the new designation once conversion is complete.
  - The actuator mounted to the actuator controls must be configured for the set direction of rotation. Subsequent conversion from clockwise closing to counterclockwise closing is possible using an AUMA conversion kit.

Parameters and instructions for setting

Setting the direction of rotation using parameters is only possible for actuators with electronic control unit/MWG (Non-intrusive version).

NOTICE	**Valve damage due to incorrect direction of rotation!**
	→ For 3-phase AC motors, the rotation direction of the actuator must match the rotation direction of the valve.

Required user level: AUMA (6).

M ▷ Device configuration M0053
   Actuator M0168
     Closing rotation M0176

Default value: Clockwise rotation

Setting values:

Clockwise rotation
The motor is controlled with a clockwise rotating field with the following sequence: L1-U1, L2-U2, L3-U3 (clockwise closing).

Counterclockwise rot.
The motor is controlled with a counterclockwise rotating field with the following sequence: L1-U3, L2-U2, L3-U1 (counterclockwise closing).

13.2. Factory setting

The factory setting corresponds to the delivery state of the actuator controls.

When converting the controls e.g. by the AUMA service, a new factory setting can be generated to adapt the modified configuration.

Former factory settings can be restored.

Generate new factory setting

Required user level: Service (5) or higher.

M ▷ Device configuration M0053
  Service functions M0222
    Create factory settings M0225

Generates new factory settings by accepting the current settings.

Restore factory setting

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Service functions M0222
    Reset factory settings M0226

Resets the current settings to factory settings.

13.3. Languages: reload

If texts are changed or if a new display language is available, the language file can be updated from the external data carrier (SD card).

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Service functions M0222
    Reload languages M0227

13.4. Data export

During data export the data is saved from the device to an external data carrier (SD card).

Export data

Comprehensive export of all data (parameters, operation data and event protocol).

Operation data is device-specific data.

Required user level: Service (5) or higher.

M ▷ Device configuration M0053
  Service functions M0222
    Export all data M0223

Export parameters

Export of all parameters. No operation data is transmitted.

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Service functions M0222
    Export all parameters M0297

Export event report

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Service functions M0222
    Export event report M0298

13.5. Data import

During data import, the data is transmitted to the controls from an external data carrier (SD card).

Import parameters

Import of all parameters. Operating data is not overwritten.

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   Service functions M0222
     Import all parameters M0311

13.6. Actual configuration: accept

When retrofitting controls, sub-assemblies are replaced by new sub-assemblies with different functions.

Example: Replacing the PSU (different voltage).

If the controls detect a modified sub-assembly during start up, the following fault signal is generated: Configuration error

Accept current actual configuration

Accept new actual configuration as target configuration.

Required user level: AUMA (6).

M ▷ Device configuration M0053
   Service functions M0222
     Accept actual config. M0590

13.7. Firmware update

A firmware update is required in the following cases:

- Upgrade with new functions
- Corrective actions

A firmware update can be performed in the following ways:

1. via Bluetooth connection with AUMA CDT software
2. via an SD card (card slot in local controls)

Firmware version

The firmware version can be displayed via the following menu:

M ▷ Device ID M0021
   Version M0062
     Firmware M0077

Firmware update via SD card

The menu Update firmware is only displayed if an SD card has engaged in the card slot of the local controls.

Required access level: Service (5) or higher.

M ▷ Device configuration M0053
   Service functions M0222
     Update firmware M0564

13.8. Service software

Using the **AUMA CDT** software for Windows-based computers (notebooks or tablets) and the **AUMA Assistant App** for Android-based devices, actuator data can be uploaded and read, settings can be modified and stored. The connection between computer and AUMA actuator is established wireless via Bluetooth interface. With the **AUMA Cloud**, we provide an interactive platform to collect and assess e.g. detailed device data of all actuators within a plant.

AUMA CDT

AUMA CDT is a user-friendly setting and operation program for AUMA actuators controls.

Connection between computer (notebook, tablet) and actuator controls is wireless via Bluetooth interface.

AUMA CDT software can be downloaded free of charge from our website www.auma.com.

AUMA Cloud

The AUMA Cloud is the driving element of the digital AUMA world, acting as interactive platform for efficient maintenance of AUMA actuators at moderate cost. The AUMA Cloud collects all device data of all actuators within one site and provides a clear overview at a glance. Detailed analysis provides valuable information on potential maintenance requirements. Additional functions foster smooth asset management.

AUMA Assistant App

The AUMA Assistant App enables remote setting and remote diagnostics of AUMA actuators via Bluetooth using an Android smartphone or Android tablet.

The AUMA Assistant App is available on Google Play Store for free download.

Figure 57: Link to Google Play Store

Activate/deactivate Bluetooth

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
   Application functions M0178
    Activation M0212
     Bluetooth M0573

Default value: Function active

Setting values:

Function not active   Function deactivated.

Function active   Function activated. If the connection is active, the blue LED on the local controls is illuminated.

Addresses and device tag

Required user level: Specialist (4) or higher.

M ▷ Diagnostics M0022
  Bluetooth M0244
   Device tag M0423
   Bluetooth address M0422
   Bluetooth add.partner M0576

14. Diagnostics

Diagnostics comprise information on the device and on device sub-assemblies for support during commissioning, maintenance or corrective action.

14.1. Electronic device ID

The electronic device ID provides information about the order data (important for enquiries with the factory).

M ▷ Device ID M0021
    Identification M0026
    Version M0062

Information on device identifications can be modified with the appropriate rights (user level).

Table 17: Information on device identifications

Identification M0026		
Indication on display	**Description**	**User level required for modification**
Device designation M0072	Device designation of the actuator controls	Service (5)
Device tag M0072	Device ID for identification within the plant marking (e.g. KKS (Power Plant Classification System)	Specialist (4)
Project name M0068	Project name of the plant	Specialist (4)
Actuator controls M0028	Menu with information regarding identification of the actuator controls	
Order no. controls M0055	Order number of the actuator controls	Service (5)
Serial no. controls M0056	Serial number of the actuator controls	Service (5)
Wiring diagram M0059	Wiring diagram number of the actuator controls	Service (5)
Date of manufacture M0063	Date of manufacture of controls	Service (5)
Actuator M0029	Menu with information regarding identification of the actuator	
Order no. actuator M0057	Order number of the actuator	Service (5)
Serial no. actuator M0220	Serial number of the actuator	Service (5)
Wiring diag. actuator M0060	Wiring diagram number of the actuator	Service (5)

Table 18: Information on device version

Version M0062	
Indication on display	**Description**
Firmware M0077	Firmware version
Language M0565	Language version
Details Firmware M0515	Menu with further items for requesting the current image file versions of current sub-assemblies (only visible for user level AUMA (6))
Hardware art. no. M0684	Menu with further items for requesting the hardware article number of the actual sub-assemblies (only visible for user level AUMA (6))

14.2. Bluetooth connection diagnostic

Menu is only visible if function Bluetooth M0573 is activated.

Required user level: Specialist (4) or higher.

M ▷   Diagnostics M0022
      Bluetooth M0244

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Device tag	M0223	Device tag (Can be changed for user level Specialist (4) and higher)
Bluetooth address	M0222	Bluetooth address
Bluetooth add.partner	M0576	Bluetooth add.partner

14.3.   Diagnostic Interface

Required user level: Specialist (4) or higher.

M ▷   Diagnostics M0022
      Interface M0239

The following states can be checked via the menu:

Parameters	Menu ID	Signification
States DIN	M0245	Shows configuration, coding and state of the input signals.
States AIN 1	M0246	Shows configuration and current value at analogue input 1.
States AIN 2	M0583	Shows configuration and current value at analogue input 2.
States DOUT	M0247	Shows configuration, coding and state of the output signals.
States AOUT 1	M0248	Shows configuration and current value at analogue output 1.
States AOUT 2	M0584	Shows configuration and current value at analogue output 2.
Interface status	M0730	Status of the interface

Diagnostics of digital inputs

For the digital inputs (DIN), both coding and signal states are indicated at the input by means of symbols.

Table 19: Symbol explanation

Symbol	Code	Signal (command)	Input state
△	High active	Not active	Low level = 0 V or input open
▲	High active	Active	High level = Default: +24 V DC
▽	Low active	Not active	High level = Default: +24 V DC
▼	Low active	Active	Low level = 0 V or input open

Figure 58: Example of DIN 4 and DIN 5
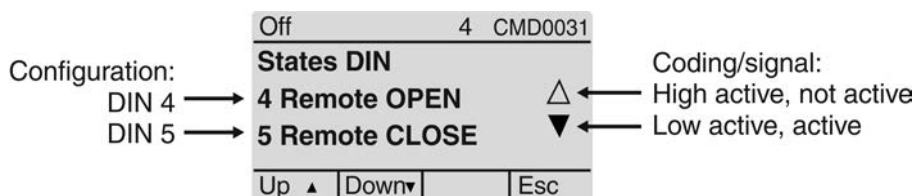
- Configuration:
  - DIN 4: Operation command OPEN
  - DIN 5: Operation command for EMERGENCY behaviour
- Coding:
  - DIN 4: High active (Triangle pointing in upward direction)
  - DIN 5: Low active (Triangle pointing in downward direction)

- Signal state at input:
  - DIN 4: Not active (triangle not filled in)
    Low level = 0 V = No operation command in direction OPEN
  - DIN 5: Active (triangle is black)
    Low level = 0 V = EMERGENCY operation command is available

Diagnostic of digital outputs

For the digital outputs (DOUT), both coding and signal states are indicated at the output by means of symbols.

Table 20: Symbol explanation

Symbol	Code	Signal (indication)	State output (output contact)
△	High active	Not active	Low = 0 (output contact not operated)
▲	High active	Active	High = 1 (output contact operated)
▽	Low active	Not active	High = 1 (output contact operated)
▼	Low active	Active	Low = 0 (output contact not operated)

Figure 59: Example of DOUT 1 and DOUT 2
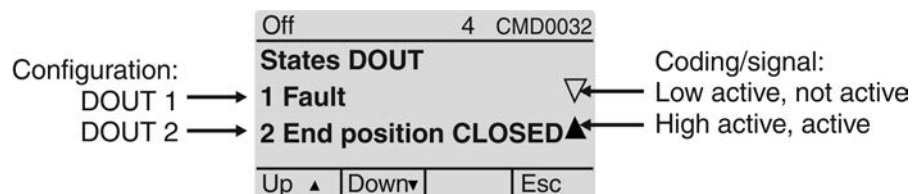
- Configuration:
  - DOUT 1: Indication: Fault has occurred.
  - DOUT 2: Indication: End position CLOSED reached

- Coding:
  - DOUT 1: Low active (Triangle pointing in downward direction)
  - DOUT 2: High active (Triangle pointing in upward direction)

- Signal state at output:
  - DOUT 1: Not active (triangle not filled in)
    High level = +24 V DC = no indication (no fault available)
  - DOUT 2: Active (triangle is black)
    High level = +24 V DC= indication (end position CLOSED reached)

14.4. Position transmitter and potentiometer diagnostic

Menu is only visible if the actuator is equipped with a potentiometer.

Required user level: Observer (1) or higher.

M ▷ Diagnostics M0022
  Position transm. potent. M0831

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Low limit Uspan	M0832	Low limit Uspan
Volt.level diff. potent.	M0833	Volt.level diff. potent.
Raw val. pos. OPEN	M0999	Raw val. pos. OPEN
Raw val. pos. CLOSED	M1001	Raw val. pos. CLOSED
Potent. raw value /mV	M1005	Potent. raw value /mV

14.5. Diagnostic Position transmitter RWG

Menu is only visible if the actuator is equipped with electronic position transmitter (RWG).

Required user level: Observer (1) or higher.

M ▷   Diagnostics   M0022
     Position transm. RWG   M0996

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Low limit RWG	M1010	
Raw val. pos. OPEN	M0997	
Raw val. pos. CLOSED	M0998	
RWG raw value /mA	M1000	

14.6.   Diagnostic Position transmitter MWG

Menu is only visible if the actuator is equipped with magnetic limit and torque transmitter (MWG).

Required user level: Observer (1) or higher.

M ▷   Diagnostics   M0022
     Position transm. MWG   M1006

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Minimum stroke	M1007	
Maximum stroke	M1012	
Abs. end pos. OPEN	M1011	
Abs. end pos. CLOSED	M1008	
Absolute value	M1009	

14.7.   Diagnostic Positioner

Required user level: Specialist (4) or higher.

M ▷   Diagnostics   M0022
     Positioner   M0613

Menu M0613 is only visible if function Positioner M0158 is activated.

The following states can be checked via diagnostic:

Parameters	Menu ID	Bedeutung
Adaptive behaviour	M0626	
Setpoint position	M0622	
Actual position	M0623	
Outer dead b. OPEN	M0625	
Outer dead b. CLOSE	M1002	
Inner dead b. OPEN	M1003	
Inner dead b. CLOSE	M1004	

14.8.   Diagnostic On time monitoring

Menu is only visible if on time monitoring (parameter Duty type monitoring M0573) is activated.

Required user level: Observer (1) or higher.

M ▷   Diagnostics   M0022
     Operation mode   M0593

The following states can be checked via diagnostics:

Parameters	Menu ID	Signification
On time	M0594	
No. mot. starts/h	M0595	

14.9. Diagnostic Process controller

Required user level: Specialist (4) or higher.

M ▷   Diagnostics M0022
    Process controller M0883

Menu M0883 is only visible if function Process controller M0741 is activated.

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Process setpoint	M0884	
Actual process value	M0885	
Op. com. PID contr.	M0886	

14.10. Modbus interface: diagnostic

This diagnostic provide information on the current status of the Modbus sub-assemblies.

Required user level: Specialist (4) or higher.

M ▷   Diagnostics M0022
    Modbus MD1 M0241
    Modbus MD2 M0775
    Details Modbus M0777

For a detailed description of the indications included in these menus refer to Manual (Device integration fieldbus) Modbus.

14.11. Diagnostic FO cable

Required user level: Observer (1) or higher.

M ▷   Diagnostics M0022
    FO cables M0638

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
FOC level channel 1	M0639	
DIN 4 configuration	M0640	
FOC RS-485 error	M0762	
FO cable baud rate	M0641	
FOC FPGA version	M0711	

14.12. Simulation (inspection and test function)

The service personnel or the commissioning engineer can use this simulation function to simulate the operation and failure behaviour of the actuator or the actuator controls to check the interface to the DCS and the correct behaviour of the DCS.

14.12.1. Actuator signals

By simulating the actuator signals, the signal behaviour of the actuator controls to the DCS can be tested, for example, without having to connect the actuator.

Required user level: Specialist (4) or higher.

M ▷   Diagnostics M0022
  Simulation M0023
  Actuator signals M0024

Simulation values:

End position OPEN   End position OPEN reached.

End position CLOSED   End position CLOSED reached.

Torque fault OPEN	Torque in direction OPEN reached.
Torque fault CLOSE	Torque in direction CLOSE reached.
Thermal fault	Motor protection tripped (thermal fault)

The simulation is activated and deactivated by push button Ok.

A loop on the display indicates that the simulation is active.

14.12.2. Interface signals

By simulating the interface signals, the signal behaviour of the AUMATIC to the DCS can be tested, for example, without having to connect the actuator.

Required access level: Specialist (4) or higher.

M ▷   Diagnostics M0022
         Simulation M0023
             Signals DOUT M0025
             Signals AOUT 1 M0413
             Signals AOUT 2 M0585

Signals for simulating digital outputs:

Only the assigned outputs are displayed.

Numbers 1, 2, 3, ... indicate the digital output.

Example: 1Fault

Indication Fault is assigned to digital output 1 (parameter Signal DOUT 1 M0109).

Simulation is activated and deactivated by push button Ok.

Triangles indicate the activation:

Triangle pointing in upward direction: Output is coded high active.	
▲	High active (voltage is present, e.g. + 24 V DC)
△	High active (voltage is not present)
Triangle pointing in downward direction: Output is coded low active.	
▼	Low active (voltage is not present)
▽	Low active (voltage is present, e.g. + 24 V DC)

Signals for simulating analogue outputs:

Signals AOUT 1	Simulation of output signal Actual position, setting range: 0 ... 20 mA
Signals AOUT 2	Simulation of output signal Torque, setting range: 0 ... 20 mA

15. Asset Management

The Asset Management function provides information (operational data, signals, reports and characteristics), which can be used within an asset management system but also generally for support during commissioning, maintenance or corrective action.

15.1. Operating data

Operating data provides details e.g. about the running time, the number of starts, number of torque faults etc.

The analysis of this data provides valuable information regarding the optimization of both actuator and valve. When using this information purposefully, actuator and valve will be carefully operated, e.g. through appropriate parameter setting. In case of faults, the logging of operating data allows for quick fault diagnostic.

View the operating data

Two counters are available, a lifetime counter and a resettable counter.

M ▷ Asset Management M1231
   Operational info M0177
     Operational info total M0183
     Operational info M0188

Description of the indications:

Operational info total = Lifetime counter

Operational info = Counter can be reset to 0

Table 21: Operating data

Indication on display	Description
Motor running time	Motor running time
Motor starts	Number of motor starts (starts)
No. thermal faults	Number of thermal faults (motor protection)
Torque fault CLOSE	Number of torque faults in direction CLOSE
Torque fault OPEN	Number of torque faults in direction OPEN
Limit trip CLOSED	Number of limit switch trippings in direction CLOSE
Limit trip OPEN	Number of limit switch trippings in direction OPEN
Torque trip CLOSE	Number of torque switch trippings in direction CLOSE
Torque trip OPEN	Number of torque switch trippings in direction OPEN
On time warning 1	Total of all time intervals during which a start/run warning was signalled.
On time warning 2	Max. time interval during which a start/run warning was signalled.
No. system starts	Total of AUMATIC system starts
Max. temp. controls	Maximum temperature of the controls
Min. temp. controls	Minimum temperature of the controls
Max. temp. MWG	Maximum temperature of the MWG
Min. temp. MWG	Minimum temperature of the MWG
Operating hours	Operating hours counter: Number of hours during which controls are supplied with power

Reset operating data

Required user level: Specialist (4) or higher.

M ▷ Asset Management M1231
   Operational info M0177
Reset operation. info M0197

The entries in the operating data logging can be reset (deleted) via this menu.

15.2.	Event report

The event report records system events and status signals. The event report can be exported to the external SD card or read via AUMA CDT software or the AUMA Assistant App. This allows e.g. comparisons of previous operations of actuator and valve.

Information Since the events are recorded with a time-stamp, date and time (parameter Date and time M0221) should be properly set.

Event filter for system events

The actuator controls record system events such as operation commands or modifications of the parameter settings. A filter is used to define the system events to be recorded in the event report.

Required user level: AUMA (6).

M ▷ Asset Management M1231
  Event report M0195
    System event filter M0334

An event is recorded (i.e. filter is active) if a black dot is placed behind the value displayed.

Events which can be recorded:

Commands All operation commands recognised as valid and executed are recorded. The command source of the operation command is also recorded.

Parameterization All modifications of parameter settings are also recorded. Both former and new value are recorded.

Enable processes The enabling of a function is recorded.

System events All important system events are recorded. These include: System start, change of date, downloads, modifications of the event filter, resetting of operating data and switching on the mains voltage.

Event filter for status indications

The actuator controls record status indications such as faults, errors, warnings or Actuator is in end position CLOSED/OPEN. A filter is used to define the status indications to be recorded in the event report.

Required user level: AUMA (6).

M ▷ Asset Management M1231
  Event report M0195
    Event filter for Events M0333

An event is recorded (i.e. filter is active) if a black dot is placed behind the value displayed.

Events which can be recorded:

The events which can be selected here are described in the <Faults and warnings> chapter.

File size of event report

The file size of the event report can be modified to record more or less events as desired. If the file is full, the oldest events will be overwritten so that the latest and current events are recorded.

Required user level: AUMA (6).

M ▷ Asset Management M1231
  Event report M0195
    File size event. rep. M0330

Default value: 548 [kByte]

Setting range: 1 ... 1,024 [kByte]

With the maximum setting range of 1,024 kbyte, at least 20,000 events can be stored.

Information   Some events are stored in a sector which cannot be overwritten. This includes, for example, modifications of the parameter setting, enabling of functions and certain special functions.

Number of events in the buffer

The events are first stored into an internal RAM. From this buffer, they are written to the event report after the set report cycle. The number of events in the buffer can be set here.

Information   In case of power failure, the events in the buffer will be lost.

Required user level: AUMA (6).

M ▷ Asset Management   M1231
       Event report   M0195
          Buffer size   M0332

Default value: 50 [events]

Setting range: 10 ... 100 [events]

Save interval

The event report is updated and saved at a defined cycle. This cycle (save interval) can be reduced or extended

Required user level: AUMA (6).

M ▷ Asset Management   M1231
       Event report   M0195
          Save interval   M0331

Default value: 50,000

Setting range: 1,000 ... 65,535 [ms]

15.3.   Characteristics

15.3.1.   Torque-travel characteristic

Conditions   • Electric actuators with electronic control unit
               • Actuator controls (non-intrusive version) from firmware version 02.03.01

Properties   Representation of torque requirement across complete travel (resolution of 0.1 %) During each travel, actuator controls continuously record the torques applied.

Application   When comparing two characteristics (current characteristic with archived characteristic), the wear within the valve or the actuator can be assessed.

Display torque-travel characteristics

M ▷ Asset Management   M1231
       Characteristics   M0313
          Torque-travel   M1229
             Characteristics   M0546

3 characteristics with two diagrams each (direction OPEN and direction CLOSE) are displayed while the arrow indicates the operation direction diagram.

Each characteristic has a designation (e.g. _REF 1_), which can be changed.

Use push buttons ▲▼ Up ▲Down ▼ to change between characteristics.

Figure 60: Example of torque-time characteristic

– – –   Set tripping torque

- - - -   Min. adjustable tripping torque

⊐⊏←   Diagram for direction CLOSE

⊐⊏→   Diagram for direction OPEN
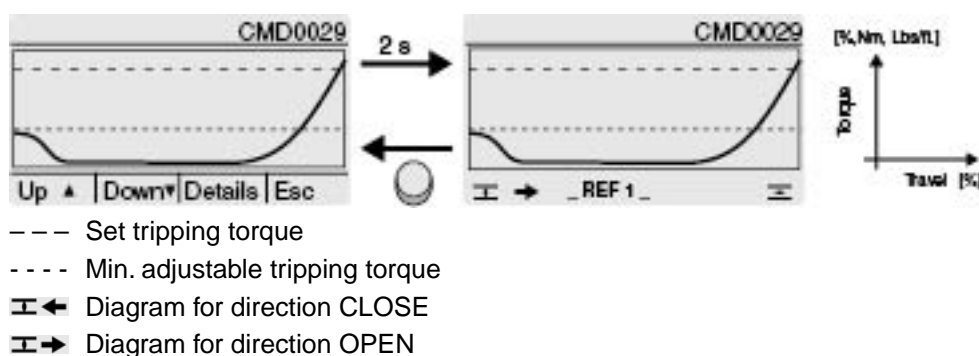
The displayed characteristics are records which were previously saved.

The following further information is saved with the characteristic (can be requested via push button Details)

- Saving date: Time of last torque measurement
- Starting date: Time of first torque measurement
- Scaling: Y-axis (torque)
- Tripping torque: Set torque in direction OPEN/CLOSE
- Min tripping torque: Min. adjustable tripping torque
- Max. value: Max. measured torque value
- Mean value: Calculated mean value

Characteristics recording procedure

1. Reset characteristic (clear buffer)
2. Change characteristic designation
3. Record characteristic: Perform operation (e.g. CLOSE-OPEN-CLOSE)
4. Save characteristic

Reset characteristic

This parameter is used to reset the data in the buffer (RAM).

Required user level: Specialist (4) or higher.

M ▷   Asset Management   M1231
 Characteristics   M0313
  Torque-travel   M1229
   Reset characteristic   M0656

After resetting the buffer, new characteristics can be recorded and saved.

Change characteristic designation

Each of the three characteristics can be named with an additional 20 characters.

Required user level: Specialist (4) or higher.

M ▷   Asset Management   M1231
 Characteristics   M0313
  Torque-travel   M1229
   Tag torque-position 1   M0658
   Tag torque-position 2   M0659
   Tag torque-position 3   M0660

Record characteristic: Perform operation (e.g. CLOSE-OPEN-CLOSE)

Set selector switch to position **Local control** (LOCAL) or **Remote control** (REMOTE) to record the characteristic.

Save characteristics

3 characteristics can be saved.

Each characteristic consists of two charts (direction OPEN and direction CLOSE).

When saving, data is transferred from the buffer (RAM) to the read-only memory (ROM).

Required user level: Specialist (4) or higher.

M ▷   Asset Management M1231
    Characteristics M0313
     Torque-travel M1229
      Save characteristic 1 M0652
      Save characteristic 2 M0653
      Save characteristic 3 M0654

15.3.2. Position-time characteristic

Conditions
- Actuator of the type range SA 07.2 – SA 16.2/SAR 07.2 – SAR 16.2
- MWG position transmitter in actuator

Properties   During recording, the current position, for modulating actuators also the setpoint position, within an adjustable time interval (between 1 second and 1 hour).

Application   By assessing the position-time characteristics, the control behaviour can be assessed or insights on the use of the actuator can be gained.

Display position-time characteristics

M ▷   Asset Management M1231
    Characteristics M0313
     Position-time M0806

Each characteristic has a designation:

ACTUAL-POSITION = actual position

NOMINAL-POSITION = setpoint position (modulating actuators only)

Use push buttons ▲▼ Up ▲Down ▼ to change between characteristics.

Figure 61: Example of position-time characteristic
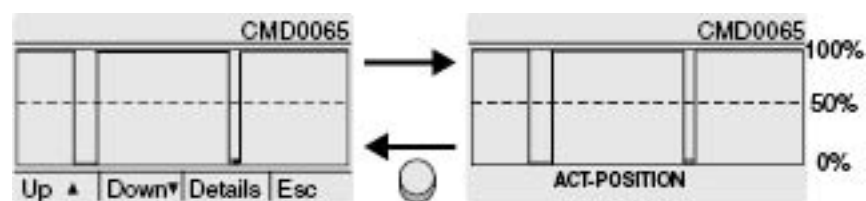
– – – 50 % (position between OPEN = 100 % and CLOSED = 0 %)

The following further information is saved with the characteristic (can be requested via push button Details).

- Saving date: Time of last position measurement
- Starting date: Time of first position measurement
- Scaling: Y-axis (position)

Set resolution (time interval)

Actuator controls records 10,000 measured values. Set resolution of e.g. approx. 1 second (parameter Interval position-time = 1 [s]) results in a recording time of 2.7 hours (10 000 seconds). Once this value has been exceeded, the former positions will be overwritten (ring buffer)

Required user level: Specialist (4) or higher.

M ▷   Asset Management M1231

Characteristics M0313
   Interval position-time M0805

Default value: 10 [s]

Setting values: 1 ... 3600 [s]

15.3.3. Temperature-time characteristic

Properties   Up to four temperature-time characteristics can be recorded unless the devices are fitted with suitable sensors.

Conditions   • For recording the temperature within the control unit:
MWG (magnetic limit and torque transmitter)

• For recording the temperature within the motor:
additionally temperature sensor (PT 100) in the motor

• For recording the temperature within the gear housing:
additionally temperature sensor (PT 100) in the gearing

Application   Evaluation of the temperature-time characteristics allows to gain knowledge about the service conditions (ambient temperatures) of the actuator.

Display temperature-time characteristic

M ▷   Asset Management M1231
   Characteristics M0313
     Temperature-time M0714

Up to four characteristics are shown in the display.

CONTROLS TEMPERATURE = temperature within the control unit

MWG TEMPERATURE = MWG temperature

MOTOR TEMPERATURE = temperature within the motor

GEAR TEMPERATURE = within the gear housing

Use push buttons ▲▼ Up ▲Down ▼ to change between available characteristics.

Figure 62: Example of temperature-time (within the control unit)
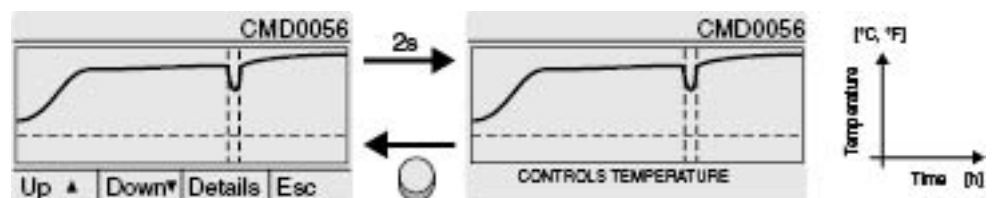
- - -   0° line

¦   Recording interrupted e.g. due to power failure

The actuator controls display shows temperature evolution during one week. AUMA CDT software reads out the evolution during an entire year.

The following further information is saved with the characteristic (can be requested via push button Details)

• Saving date: Time of last temperature measurement

• Starting date: Time of first temperature measurement

• Scaling: Y-axis (temperature)

• Min. value: Minimum measured value

• Max. value: Maximum measured value

15.4. Histograms

15.4.1. Motor running time-position (histogram)

Conditions   • Actuators of the type range SA 07.2 – SA 16.2/SAR 07.2 – SAR 16.2

Properties
The entire travel (from 0 – 100 %) is divided into 20 segments for recording the motor running time. When passing a segment, the counter, shown as bar graph, increments. The histogram is cyclically saved once a minute, in case a change has occurred.

Application
The motor running time position histogram shows the travel range within which the actuator is predominantly operated. This allows to draw conclusions for the sizing of the valve.

Display motor running time-position

M ▷ Asset Management M1231
      Histograms M0712
        Motor RunTime-Position M0713

Figure 63: Example of a motor running time position histogram
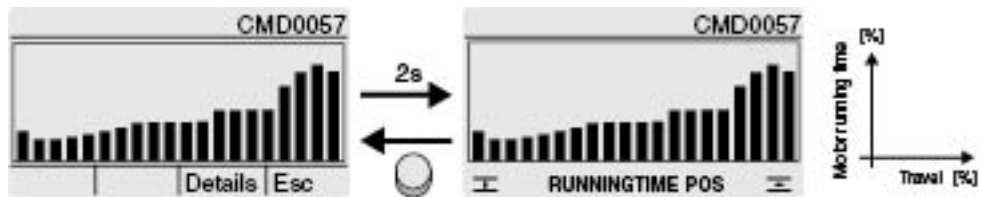
The following detailed information is saved with the histogram (may be called up via push buttons Details)

- Starting date:; date of first running time measurement
- Saving date:; date of last running time measurement
- Scaling:Y-axis (motor running time)

15.4.2. Motor running time-temperature (histogram)

Conditions
- MWG position transmitter in actuator
- Temperature sensor in the motor (option)

Properties
The motor temperature is divided into the following segments:

< –20°C to –10°C, > –10°C to 0°C, > 0°C to 10°C, ..., 120°C to 130°C, > 130°C to 140°C, > 140°C.

During each operation, the counter of the segment corresponding to the current motor temperature will be incremented. The result is shown in a bar chart. The histogram is cyclically saved once a minute in case of change.

Application
The histogram indicates the ambient conditions (temperatures) at which the actuator motor was predominantly operated.

Display motor running time-temperature

M ▷ Asset Management M1231
      Histograms M0712
        Motor RunTime-Temp. M0715

Figure 64: Example of motor running time - motor temperature histogram
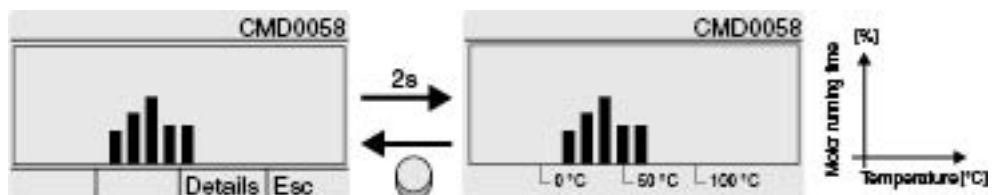
The following further information is saved with the histogram (can be requested via push button Details)

- Starting date: Date of first running time measurement
- Saving date: Date of last running time measurement
- Scaling: Y-axis (motor running time)

15.4.3. Motor running time-torque (histogram)

Conditions MWG position transmitter in actuator

Properties The torque scale is divided into the following segments for both directions (OPEN/CLOSE):

from 0 – 30 %

from 30 – 110 % (8 segments with a width of 10 % each)

more than 110 %

During each operation, the counter of the segment corresponding to the currently required torque will be incremented. The result is shown in a bar chart. The histogram is cyclically saved once a minute, in case a change has occurred.

Application The motor running time-torque histogram indicates the actuator load during service life.

Display motor running time-torque

M ▷ Asset Management M1231
 Histograms M0712
  Motor TunTime-Torque M0830

Figure 65: Example of motor running time-torque histogram
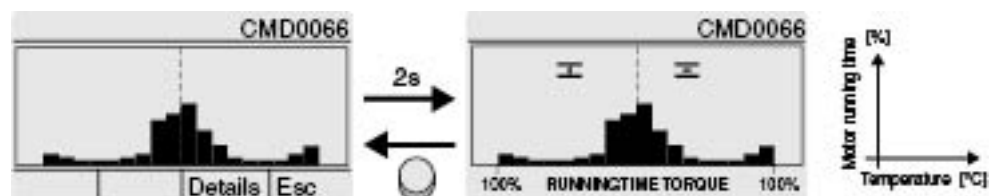
The following further information is saved with the histogram (can be requested via push button Details)

- Starting date:.
- Saving date:.
- Scaling:.

15.5. Maintenance (information and signals)

Properties Actuator controls monitor various parameters set in the factory which have an impact on the wear of the actuator. Once one of these parameters exceeds a determined limit, the actuator controls generate a signal:

- Status indication: S0005 Warnings (AUMA category)
  - Details: Maintenance required

- Status indication: S0010 Maintenance required (NAMUR category)
  - Details: shows the parameter(s) for which the limit was exceeded, causing the Maintenance required signal.

Apart from the parameter monitoring preset in the factory (MT lifetime mechanics/seals/lubricant), a fixed maintenance interval can additionally be configured, triggering the same signal when exceeding the configured time.

The current maintenance status of the monitored parameters is represented in a bar chart.

Once maintenance is complete, the parameter initiating maintenance must be reset to zero.

Application Maintenance on demand, i.e. the function can be used to perform maintenance depending on the intensity and load of the actuator.

Activate maintenance signals

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053

Application functions M0178
  Activation M0212
    Maintenance signals M1136

Default value: Function not active

Setting values:

Function not active
<Maintenance signals> function deactivated.

Function active
<Maintenance signals> function activated.

Activate maintenance interval

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Application functions M0178
    Activation M0212
      Maintenance interval M1137

Default value: Function not active

Setting values:

Function not active
<Maintenance interval> function deactivated.

Function active
<Maintenance interval> function activated.

Display maintenance information

M ▷ Maintenance signals M1231
  Maintenance M1644
    Maintenance informat. M1037

Figure 66: Example of bar chart
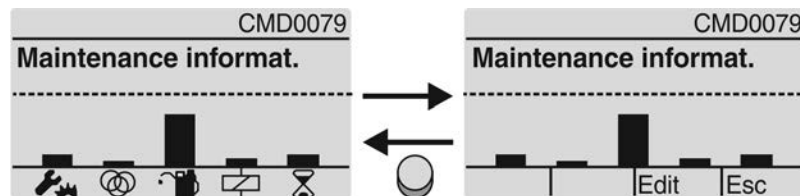
The bar charts indicates the current consumption of the following lifetime accounts:

Lifetime mechanics

Lifetime seals (O-rings)

Lifetime lubricants

Lifetime contactors (only for actuator controls which are not provided with variable speed function)

Maintenance interval (adjustable)

Once a bar reaches the threshold (- - -), maintenance will be required.

Reset parameter

Once maintenance is complete, the parameter initiating the request must be reset.

Starting from Maintenance informat. M1037 indication, you can change via Edit to the reset mode.

Required user level: Specialist (4) or higher.

M ▷ Device configuration M0053
  Application functions M0178
    Activation M0212

Figure 67:

```
                              CMD0079
Maintenance informat.
      ⊓      ⊓      ⊓      ⊓      ⊓
     🔧     ⊚     📦    ⛨     ⌛
                          ▲
Up ▲ │Down ▼│Reset │Esc
```
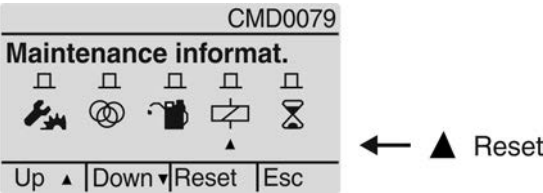
←── ▲ Reset

Use push buttons Up ▲ Down ▼ to select the desired parameter. The arrow below the symbols shows the selected parameter. Pressing push button Reset resets the lifetime account of the selected parameter to zero.

Set maintenance interval

Parameters for setting a defined maintenance interval. Once the set time has elapsed, a maintenance signal is issued.

Required user level: Specialist (4) or higher.

M ▷   Maintenance signals M1231
    Maintenance M1644
      Maintenance interval M1233

Default value: 10 years

Setting range: 1 month... 10 years

15.6. Operating times display

Characteristics   The actuator controls automatically determine the operating time for an operation between two end positions. For both directions (from OPEN to CLOSE and from CLOSE to OPEN), the last determined value is saved within a parameter.

Application   Operating time measurement indicated how an actuator installed in plant or a combination of actuator/gearbox/valve behave with regard to inertia without performing an operation and measuring the time manually.

Display measured operating times

M ▷   Asset Management M1231
    Operating time M1232
      Operating time CLOSE M1234
      Operating time OPEN M1235

Indications:

Operating time CLOSE	Indicates the measured operating time for the last operation in direction CLOSE
Operating time OPEN	Indicates the measured operating time for the last operation in direction OPEN

15.7. Device temperature display

Required user level: Specialist (4) or higher.

M ▷   Asset Management M1231
    Device temperatures M0524

Indications:

Temp. controls	Indication of current temperature in actuator controls housing
Temp. control unit	Indication of current temperature in control unit of the actuator (actuator housing)

16. Corrective action

16.1. Primary fuses

The actuator controls have to be opened to exchange the primary fuses. For detailed information, refer to operation instructions for actuator.

16.2. Fault indications and warning indications

Faults interrupt or prevent the electrical actuator operation. In the event of a fault, the display backlight is red.

Warnings have no influence on the electrical actuator operation. They only serve for information purposes. The display remains white.

Collective signals include further indications. They can be displayed via the ↵ Details push button. The display remains white.

Table 22:

Faults and warnings via status indications in the display		
Indication on display	Description/cause	Remedy
S0001	Instead of the valve position, a status text is displayed.	For a description of the status texts, refer to <Status texts in Menu S0001>.
S0005 Warnings	Collective signal 02: Indicates the number of active warnings.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Warnings and Out of specification> table.
S0006 Not ready REMOTE	Collective signal 04: Indicates the number of active signals.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
S0007 Fault	Collective signal 03: Indicates the number of active faults. The actuator cannot be operated.	For indicated value > 0: Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.
S0008 Out of specification	Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal operation conditions.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Warnings and Out of specification> table.
S0009 Function check	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
S0010 Maintenance required	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance.	For indicated value > 0: Press push button ↵ Details to display a list of detailed indications.
S0011 Failure	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid	For indicated value > 0: Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.

Table 23:

Warnings and Out of specification		
Indication on display	Description/cause	Remedy
Config. warning	Collective signal 06: Possible cause: Configuration setting is incorrect. The device can still be operated with restrictions.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to <Individual signals> table/ Config. warning (collective signal 06).
Internal warning	Collective signal 15: Device warnings The device can still be operated with restrictions.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to <Individual signals> table/ Internal warning (collective signal 15).
24 V DC external	The external 24 V DC voltage supply of the controls has exceeded the power supply limits.	Check 24 V DC voltage supply.
Wrn op.mode run time	Warning on time max. running time/h exceeded	• Check modulating behaviour of actuator. • Check parameter Perm. run time M0356, re-set if required.
Wrn op.mode starts	Warning on time max. number of motor starts (starts) exceeded	• Check modulating behaviour of actuator. • Check parameter Permissible starts M0357, re-set if required.
Failure behav. active	The failure behaviour is active since all required setpoints and actual values are incorrect.	Verify signals: • Setpoint E1 • Actual value E2 • Actual process value E4 • Check connection to master.
Wrn input AIN 1	Warning: Loss of signal analogue input 1	Check wiring.
Wrn input AIN 2	Warning: Loss of signal analogue input 2	Check wiring.
Wrn setpoint position	Warning: Loss of signal setpoint position Possible causes: For an adjusted setpoint range of e.g. 4 – 20 mA, the input signal is 0 (signal loss). For a setpoint range of 0 – 20 mA , monitoring is not possible.	Check setpoint signal.
Op. time warning	The set time (parameter Perm.op. time, manual M0570) has been exceeded. The preset operating time is exceeded for a complete travel from end position OPEN to end position CLOSED.	The warning indications are automatically cleared once a new operation command is executed. • Check valve. • Check parameter Perm.op. time, manual M0570.
Wrn controls temp.	Temperature within controls housing too high.	Measure/reduce ambient temperature.
Time not set	Real time clock has not yet been set.	Set time.
RTC voltage	Voltage of the RTC button cell is too low.	Replace button cell.
PVST fault	Partial Valve Stroke Test (PVST) could not be successfully completed.	Check actuator (PVST settings).
PVST abort	Partial Valve Stroke Test (PVST) was aborted or could not be started.	Perform RESET or restart PVST.
Wrn no reaction	No actuator reaction to operation commands within the set reaction time.	• Check movement at actuator. • Check parameter Reaction time M0634.
Wrn FOC[1]	Optical receiving signal (channel 1) incorrect (no or insufficient Rx receive level) or RS-485 format error (incorrect bit(s))	Check/repair FO cables.
Wrn FO cable budget[1]	Warning: FO cable system reserve reached (critical or permissible Rx receive level)	Check/repair FO cables.
Wrn FOC connection[1]	Warning FO cable connection is not available.	Fit FO cable connection.
Torque wrn OPEN	Limit value for torque warning in direction OPEN exceeded.	Check parameter Wrn torque OPEN M0768, re-set if required.

Warnings and Out of specification

Indication on display	Description/cause	Remedy
Torque wrn CLOSE	Limit value for torque warning in direction CLOSE exceeded.	Check parameter Wrn torque CLOSE M0769, reset if required.
PVST required	Execution of PVST (Partial Valve Stroke Tests) is required.	
Maintenance required	Maintenance is required.	

1) For actuator controls with FOC connection

Table 24:

Faults and Failure

Indication on display	Description/cause	Remedy
Configuration error	Collective signal 11: Configuration error has occurred.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to <Individual signals> table/ Configuration error (collective signal 11).
Config. error REMOTE	Collective signal 22: Configuration error has occurred.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to <Individual signals> table/ Config. error REMOTE (collective signal 22).
Internal error	Collective signal 14: Internal error has occurred.	AUMA service Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to <Individual signals> table/ Internal error (collective signal 14).
Torque fault CLOSE	Torque fault in direction CLOSE	Perform one of the following measures: • Issue operation command in direction OPEN. • Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**. • Execute reset command via fieldbus.
Torque fault OPEN	Torque fault in direction OPEN	Perform one of the following measures: • Issue operation command in direction CLOSE. • Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**. • Execute reset command via fieldbus.
Phase fault	• 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 AC system: One of the phases L1, L2 or L3 is missing.	Test/connect phases.
Thermal fault	Motor protection tripped	• Cool down, wait. • If the fault indication display persists after cooling down: - Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**. - Execute reset command via fieldbus. • Check fuses.
Fault no reaction	No actuator reaction to operation commands within the set reaction time.	Check movement at actuator.
Poti Out of Range	Potentiometer is outside the permissible range.	Check device configuration: Parameter Low limit Uspan M0832 must be less than parameter Volt.level diff. potent. M0833.
Wrn input AIN 1	Loss of signal analogue input 1	Check wiring.
Wrn input AIN 2	Loss of signal analogue input 2	Check wiring.

Faults and Failure

Indication on display	Description/cause	Remedy
Incorrect rotary direct.	Contrary to the configured direction of rotation and the active operation command, the motor turns into the wrong direction.	Check operation command control. For 3-phase AC current mains, activate phase monitoring (parameter Adapt rotary dir. M0171). Check device configuration setting (parameter Closing rotation M0176). To delete the fault indication: Disconnect actuator controls from the mains and perform reboot.
Rectifier fault	Motor protection: Fault within converter	
DMF fault OPEN[1]	The torque in direction OPEN, measured at the output drive shaft using the torque measurement flange, is too high.	Check DMF trip torque OP parameter. Check DMF fault level parameter.
DMF fault CLOSE[1]	The torque in direction CLOSE, measured at the output drive shaft using the torque measurement flange, is too high.	Check DMF trip torque CL parameter. Check DMF fault level parameter.

[1]   For actuators equipped with torque measurement flange (DMF)

Table 25:

Not ready REMOTE and Function check (collective signal 04)

Indication on display	Description/cause	Remedy
Wrong oper. cmd	Collective signal 13: Possible causes: • Several operation commands (e.g. OPEN and CLOSE simultaneously, or OPEN and SET-POINT operation simultaneously) • A setpoint is present and the positioner is not active	• Check operation commands (reset/clear all operation commands and send one operation command only). • Set parameter Positioner to Function active. • Check setpoint. Press push button ↵ Details to display a list of individual indications. For details, refer to <Individual indications> table.
Sel. sw. not REMOTE	Selector switch is not in position REMOTE.	Set selector switch to position REMOTE.
Service active	Operation via service interface (Bluetooth) and AUMA CDT service software.	Exit service software.
Disabled	Actuator is in operation mode Disabled.	Check setting and status of function <Local controls enable>.
EMCY stop active	The EMERGENCY stop switch has been operated. The motor control power supply (contactors or thyristors) is disconnected.	• Enable EMERGENCY stop switch. • Reset EMERGENCY stop state by means of Reset command.
EMCY behav. active	Operation mode EMERGENCY is active (EMERGENCY signal was sent). 0 V are applied at the EMERGENCY input.	• Detect cause for EMERGENCY signal. • Verify failure source. • Apply +24 V DC at EMERGENCY input.
I/O interface	The actuator is controlled via the I/O interface (parallel).	Check I/O interface.
Handwheel active	Manual operation is activated.	Start motor operation.
FailState fieldbus	Fieldbus connection available, however no process data transmission by the master.	Verify master configuration
Local STOP	A local STOP is active. Push button STOP of local controls is operated.	Release push button STOP.
Interlock	An interlock is active.	Check interlock signal.
Interlock by-pass	By-pass function is interlocked.	Check states of main and by-pass valve.
PVST active	Partial Valve Stroke Test (PVST) is active.	Wait until PVST function is complete.

Table 26:

Individual indications	
Indication on display	**Remedy**
Config. warning (Collective signal 06)	
Wrn Setpoint Source	Configure analogue inputs AIN 1 or AIN 2, refer to <Input for setpoint position>
Wrn dead bands	Check positioner setting.
Wrn Fieldbus config.	Check fieldbus interface configuration.
Torque config. CLOSE	Verify torque switching setting.
Torque config. OPEN	Verify torque switching setting.
DIN 1 configuration – DIN 10 configuration	Signal assignment for the indicated digital input (DIN 1 – DIN 10) is incorrect. Reconfigure digital input.
Configuration EMCY	Check configuration.
Config. operat. profile	Check configuration.
FO configuration	Check configuration.
Heat.monitor.config.	Check configuration.
Fail.beh. config.	Check configuration.
Config. PID controller	Check configuration.
Configuration error (Collective signal 11)	
IE MCM	Check hardware equipment/article number MCM.
IE PSO	Check hardware equipment/article number PSO.
IE config. pos. transm.	Check hardware equipment/article number position transmitter.
IE parameter config.	Check position transmitter parameters.
IE SIL config.	The configuration for the SIL function is invalid.
IE FQM	The configuration for the FQM (fail safe) unit is invalid.
Configuration FUP	The configuration for the function plan is invalid. Check configuration.
MPV and CW closing	Multiport valve and clockwise closing.
Config.fault speed prof.	• Pivot points were not defined in ascending order. • Positions of neighbouring pivot points were defined with identical positions. • No pivot points have been activated for the individual directions • Verify positions (order) of the pivot points. • Verify activation of the pivot points.
Hydraulics fault (Collective signal 12)	
Phase fault	When connecting to a 3-phase network: One of the phases L1, L2 or L3 is missing. Test/connect phases.
Thermal fault	Motor protection tripped • Cool down, wait. • If the fault indication display persists after cooling down: - Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**. - Execute reset command via fieldbus. • Check fuses.
Wrong oper. cmd (Collective signal 13)	
Incorr. cmd REMOTE1	Correct operation command, i.e. delete and set anew.
Incorr. cmd REMOTE2	Correct operation command, i.e. delete and set anew.
Command fieldbus	Correct operation command.
Setpoint pos. disabled	Verify availability of function (parameter Activation M0212)
Internal error (Collective signal 14)	

Individual indications

Indication on display	Remedy
IE mot. prot. monitor	Check motor protection monitoring.
IE selector switch	Replace selector switch.
IE phase monitoring	Check power supply.
IE 24 V AC	Internal error: The internal 24 V AC voltage supply of the controls has exceeded the power supply limits. The 24 V AC voltage supply is used to control the reversing contactors, to assess the thermoswitches, to supply the internal actuator heater and, as an option, to generate the 115 V AC supply for the customer. • Check power supply (level and wiring). • Check power supply unit.
IE output defective	Check switchgear control.
IE position transmitter	Check actuator.
IE logic	Check logic.
IE fieldbus	Check fieldbus interface.
IE MWG	Check MWG.
IE LC	Check local controls.
IE Hall 1 calibration – IE Hall 5 calibration	Internal error: Calibration of Hall sensor 1 – 5 of the MWG is incorrect. Check MWG.
IE MWG calibration	Check MWG.
IE version	Check device configuration.
IE EEPROM	Check device configuration.
IE parameter	Check device configuration.
IE file access	Check device configuration.
IE reserve backup	Check device configuration.
IE registration	Check device configuration.
IE startup FB	Check device configuration.
IE startup sub-assy	Check device configuration.
IE LC exception	Check device configuration.
IE logic exception	Check device configuration.
IE MWG exception	Check device configuration.
IE bus exception	Check device configuration.
IE MWG end positions	Check device configuration.

Internal warning (Collective signal 15)	
Wrn heater	Check heater.
24 V DC customer	The 24 V DC customer auxiliary supply to control the digital inputs has failed. Check 24 V DC inputs (DIN).
24 V DC internal	The internal 24 V DC power supply of the controls used to provide the electronics components (sub-assemblies within the AC 01.2 controls and in the actuator) has exceeded the power supply limits . Check internal 24 V DC voltage supply.
Wrn res. data in use	Reboot AUMATIC.
Wrn ref.actual position	Operate actuator fully in end positions OPEN and CLOSED.
Wrn range act.pos.	Verify primary reduction gearing settings within the actuator.
Wrn sign.loss act.pos.	Check position feedback.
Wrn event mark	Check system configuration.
Wrn Tm mark	Check system configuration.

Config. error REMOTE (Collective signal 22)	
IE I/O interface	• Check I/O interface M0139 parameter. The setting must correspond to the wiring diagram. • Check wiring. • Check I/O interface.

Individual indications	
Indication on display	Remedy
IE remote interface	Check configuration.
IE remote Prm Config	Check configuration.

Table 27:

Status texts in menu S0001		
Indication on display	Description/cause	Remedy
Sensor failure	Hardware is either defective or not available: • for potentiometer, RWG, EWG = signal loss • for MWG = calibration active or Hall sensor defective	Check or replace hardware.
Not referenced	For potentiometer, RWG, EWG: end positions not set	Set end positions and perform reference operation.
Calibration	Calibration active	
Out of range	Outside the value range • for potentiometer = insufficient stroke between the set end positions • for RWG, EWG = end position OPEN = end position CLOSED • for MWG = excessive stroke between the set end positions	Set valid stroke.
Invalid command	Invalid command	
Replacement value	Substitute value	
PCB failure	Sub-assembly failure	
Commlost	Communikation between MWG and logic is interrupted. Possible causes: problem with contacts	AUMA service Replace MWG

17. Appendix

17.1. Selection overview for output contacts and indication lights (digital outputs DOUT)

Depending on the version, the actuator controls are equipped with up to 6 output contacts (digital outputs).

Table 28:

Signal	Description
Not used	–
End position CLOSED	End position CLOSED reached Indication depends on the type of seating and means either • limit seating, end position CLOSED reached, or • torque seating, end position CLOSED reached
End position OPEN	End position OPEN reached Indication depends on the type of seating and means either • limit seating, end position OPEN reached, or • torque seating, end position OPEN reached
End p. CLOSED, blink	End position CLOSED reached or intermediate position reached (The intermediate position is only indicated if parameter Signal interm. pos. M0167 = OPEN/CLOSED = On.) Signal blinking: Actuator runs in direction CLOSE.
End p. OPEN, blink	End position OPEN reached or intermediate position reached. (The intermediate position is only indicated if parameter Signal interm. pos. M0167 = OPEN/CLOSED = On.) Signal blinking: Actuator runs in direction OPEN.
Setpoint pos.reached	The position setpoint is within maximum error variable (outer dead band). Is only signalled if Modbus master has set the Fieldbus SETPOINT bit (process representation output).
Running CLOSE	Actuator runs in direction CLOSE.
Running OPEN	Actuator runs in direction OPEN.
Selector sw. LOCAL	Selector switch is in position LOCAL.
Selector sw. REMOTE	Selector switch is in position REMOTE.
Selector sw. OFF	Selector switch is in position OFF.
Limit switch CLOSED	Limit switch operated in direction CLOSE
Limit switch OPEN	Limit switch operated in direction OPEN
Torque sw. CLOSED	Torque in direction CLOSE exceeded
Torque sw. OPEN	Torque in direction OPEN exceeded
NAMUR failure	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid.
NAMUR funct. check	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid.
NAMUR out of spec.	Collective signal 07: Indication according to NAMUR recommendation NE 107 Difference between setpoint and actual value is too important (exceeding the normal operation conditions).
NAMUR mainten. req.	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance.
Fault	Collective signal 03: Contains the result of a disjunction (OR operation) of all faults.
Warning	Collective signal 02: Contains the result of an OR disjunction of all warnings.
Not ready REMOTE	Collective signal 04: Contains the result of a disjunction (OR-operation) of the signals, forming the "Not ready REMOTE" group. The actuator cannot be operated from REMOTE. The actuator can only be operated via the local controls.

Signal	Description
Fault (configurable)	Collective signal 19: This signal can be configured (parameter Fault (Cfg) M0880) and comprises a combination of the following signals: • Configuration error • Config. error REMOTE • Internal error • Torque fault CLOSE • Torque fault OPEN • Phase fault • Incorrect phase seq • Mains quality • Thermal fault • Fault no reaction • Wrn input AIN 1 • Wrn input AIN 2 • Rectifier fault • DMF fault OPEN • DMF fault CLOSE
Warnings (Cgg)	Collective signal 20: This signal can be configured (parameter Warnings (Cfg) M0881) and comprises a combination of the following signals: • Config. warning • Internal warning • 24 V DC external • Wrn op.mode run time • Wrn op.mode starts • Failure behav. active • Wrn input AIN 1 • Wrn input AIN 2 • Wrn setpoint position • Op. time warning • Wrn controls temp. • Time not set • RTC voltage • PVST fault • PVST abort • Wrn no reaction • Wrn FOC • Wrn FO cable budget • Wrn FOC connection • Torque wrn OPEN • Torque wrn CLOSE • PVST required • Maintenance required • AUMA warning 2
Not ready REM (Cfg)	Collective signal 21: This signal can be configured (parameter Not ready REMOTE (Cfg) M0882) and comprises a combination of the following signals: • Wrong oper. cmd • Sel. sw. not REMOTE • Service active • EMCY stop active • EMCY behav. active • I/O interface • Handwheel active • FailState fieldbus • Local STOP • Interlock • Interlock by-pass • PVST active
Operation pause active	Actuator is in pause time of stepping mode.

Signal	Description
Start stepping mode	The actuator is within the set stepping range.
Actuator running	Actuator is running (output drive is moving). Hard wired collective signal consisting of: • Running LOCAL • Running REMOTE • Handwheel oper.
Running LOCAL	Output drive rotates due to operation command from LOCAL.
Running REMOTE	Output drive rotates due to operation command from REMOTE.
Handwheel oper.	Output drive rotates without electric operation command.
In intermediate pos.	The actuator is in an intermediate position e.g. neither in end position OPEN nor in end position CLOSED.
Intermediate pos. 1	Intermediate position 1 reached
Intermediate pos. 2	Intermediate position 2 reached
Intermediate pos. 3	Intermediate position 3 reached
Intermediate pos. 4	Intermediate position 4 reached
Intermediate pos. 5	Intermediate position 5 reached
Intermediate pos. 6	Intermediate position 6 reached
Intermediate pos. 7	Intermediate position 7 reached
Intermediate pos. 8	Intermediate position 8 reached
Intermediate pos. 9	Intermediate position 9 reached
Intermediate pos. 10	Intermediate position 10 reached
Intermediate pos. 11	Intermediate position 11 reached
Intermediate pos. 12	Intermediate position 12 reached
Intermediate pos. 13	Intermediate position 13 reached
Intermediate pos. 14	Intermediate position 14 reached
Intermediate pos. 15	Intermediate position 15 reached
Intermediate pos. 16	Intermediate position 16 reached
Input DIN 1	A high signal (+24 V DC) is present at digital input 1.
Input DIN 2	A high signal (+24 V DC) is present at digital input 2.
Input DIN 3	A high signal (+24 V DC) is present at digital input 3.
Input DIN 4	A high signal (+24 V DC) is present at digital input 4.
Input DIN 5	A high signal (+24 V DC) is present at digital input 5.
Input DIN 6	A high signal (+24 V DC) is present at digital input 6.
EMCY stop active	Operation mode EMERGENCY stop is active (EMERGENCY stop button has been pressed).
Torque fault CLOSE	Torque fault in direction CLOSE
Torque fault OPEN	Torque fault in direction OPEN
Torque fault	Torque fault in directions CLOSE or OPEN
Thermal fault	Motor protection tripped
Phase fault	One phase missing
Fieldbus DOUT 1	High signal at fieldbus, digital output 1
Fieldbus DOUT 2	High signal at fieldbus, digital output 2
Fieldbus DOUT 3	High signal at fieldbus, digital output 3
Fieldbus DOUT 4	High signal at fieldbus, digital output 4
Fieldbus DOUT 5	High signal at fieldbus, digital output 5
Fieldbus DOUT 6	High signal at fieldbus, digital output 6
Fieldbus DOUT 7	High signal at fieldbus, digital output 7
Fieldbus DOUT 8	High signal at fieldbus, digital output 8
Fieldbus DOUT 9	High signal at fieldbus, digital output 9
Fieldbus DOUT 10	High signal at fieldbus, digital output 10

Signal	Description
Fieldbus DOUT 11	High signal at fieldbus, digital output 11
Fieldbus DOUT 12	High signal at fieldbus, digital output 12
FailState fieldbus	No valid communication via fieldbus (despite available connection).
Handwheel active	Manual operation is active (handwheel is engaged); optional signal.
PVST active	Partial Valve Stroke Test (PVST) is active.
PVST fault	Partial Valve Stroke Test (PVST) could not be successfully completed.
PVST abort	Partial Valve Stroke Test (PVST) was aborted or could not be started. Remedy: Perform RESET or restart PVST.
Failure (configurable)	This signal can be configured (parameter Failure (configurable) M0879) and comprises a combination of the following signals which can also be configured: • Fault (Cfg) M0880 • Warnings (Cfg) M0881 • Not ready REMOTE (Cfg) M0882
Interlock Remote	Function Interlock is active for operation mode REMOTE.
Interlock Local	Function Interlock is active for operation mode Local.
Interlock OPEN	Interlock OPEN is active (enable signal for operation commands in direction OPEN available).
Interlock CLOSE	Interlock CLOSED is active (enable signal for operation commands in direction CLOSE available).
Interlock	The operation mode Interlock is active.
Bypass Sync Out	<By-pass function> enable for operation commands of main or by-pass valves is active.
Interlock by-pass	Operation command executed without enable signal Bypass Sync Out.
Safe ESD	Safe ESD function (Emergency Shut Down) is active.
Safe Stop	Safe STOP function is active.
SIL fault	A SIL fault has occurred (collective signal).
SIL function active	A SIL function is active. Collective signal of both states, Safe ESD or Safe STOP.
System ok	The actuator is switched on and no fault is present
Torque wrn OPEN	
Torque wrn CLOSE	
Maintenance reminder	This signal will be activated if at least on the lifetime accounts (in %) has passed the activation threshold configured for this signal. This signal can be configured (parameter Maintenance required M0871) and comprises a combination of the following signals: • Mainten. mechanics • Mainten. lubricant • Mainten. interval
Disabled	The operation via the push buttons on the local controls is disabled.
Runs_OP/CL+blinker	The actuators runs while the indication light for the respective direction of operation (OPEN/CLOSE) is blinking simultaneously at local controls.

17.2. Selection list of binary signals for digital inputs (DIN)

Conditions: <Additional inputs> or additional <Parallel interface>

Depending on the version, the actuator controls are equipped with up to 10 digital inputs.

The inputs are designed for binary signals (standard input level: +24 V DC) and can be used, for example, to receive operation commands OPEN, STOP, CLOSE, to control intermediate positions or for the EMERGENCY signal.

Configuration of digital inputs

Required user level: Specialist (4).

M ▷   Device configuration M0053
     I/O interface M0139
       Digital inputs M0116

Table 29:

Signal	Description
Not used	Input not assigned
MODE	Change-over between OPEN - CLOSE control and setpoint control
OPEN	Operation command OPEN
CLOSE	Operation command CLOSE
STOP	Operation command STOP
RESET	Reset fault signal
I/O interface	Change-over between fieldbus interface and parallel interface
OPEN / CLOSE	Operation command OPEN/CLOSE for two-wire control
EMERGENCY	Operation mode for EMERGENCY behaviour
Intermediate pos. 1	Operation command: Run to intermediate position 1.
Intermediate pos. 2	Operation command: Run to intermediate position 2.
Intermediate pos. 3	Operation command: Run to intermediate position 3.
Intermediate pos. 4	Operation command: Run to intermediate position 4.
Intermediate pos. 5	Operation command: Run to intermediate position 5.
Intermediate pos. 6	Operation command: Run to intermediate position 6.
Intermediate pos. 7	Operation command: Run to intermediate position 7.
Intermediate pos. 8	Operation command: Run to intermediate position 8.
Intermediate pos. 9	Operation command: Run to intermediate position 9.
Intermediate pos. 10	Operation command: Run to intermediate position 10.
Intermediate pos. 11	Operation command: Run to intermediate position 11.
Intermediate pos. 12	Operation command: Run to intermediate position 12.
Intermediate pos. 13	Operation command: Run to intermediate position 13.
Intermediate pos. 14	Operation command: Run to intermediate position 14.
Intermediate pos. 15	Operation command: Run to intermediate position 15.
Intermediate pos. 16	Operation command: Run to intermediate position 16.
MPV: CW Position 1	Clockwise approach of position 1
MPV: CCW Position 1	Counterclockwise approach of position 1
MPV: CW Position 2	Clockwise approach of position 2
MPV: CCW Position 2	Counterclockwise approach of position 2
MPV: CW Position 3	Clockwise approach of position 3
MPV: CCW Position 3	Counterclockwise approach of position 3
MPV: CW Position 4	Clockwise approach of position 4
MPV: CCW Position 4	Counterclockwise approach of position 4
MPV: CW Position 5	Approach position 5 clockwise
MPV: CCW Position 5	Approach position 5 counterclockwise
MPV: CW Position 6	Approach position 6 clockwise
MPV: CCW Position 6	Approach position 6 counterclockwise
MPV: CW Position 7	Approach position 7 clockwise
MPV: CCW Position 7	Approach position 7 counterclockwise
MPV: CW Position 8	Approach position 8 clockwise
MPV: CCW Position 8	Approach position 8 counterclockwise
MPV: CW Position 9	Approach position 9 clockwise
MPV: CCW Position 9	Approach position 9 counterclockwise
MPV: CW Position 10	Approach position 10 clockwise
MPV: CCW Position 10	Approach position 10 counterclockwise
MPV: CW Position 11	Approach position 11 clockwise
MPV: CCW Position 11	Approach position 11 counterclockwise

Signal	Description
MPV: CW Position 12	Approach position 12 clockwise
MPV: CCW Position 12	Approach position 12 counterclockwise
MPV: CW Position 13	Approach position 13 clockwise
MPV: CCW Position 13	Approach position 13 counterclockwise
MPV: CW Position 14	Approach position 14 clockwise
MPV: CCW Position 14	Approach position 14 counterclockwise
MPV: CW Position 15	Approach position 15 clockwise
MPV: CCW Position 15	Approach position 15 counterclockwise
MPV: CW Position 16	Approach position 16 clockwise
MPV: CCW Position 16	Approach position 16 counterclockwise
MPV DriveCW	Clockwise actuator operation
MPV DriveCCW	Counterclockwise actuator operation
Input DIN 1	Signal for controlling output contact
Input DIN 2	Signal for controlling output contact
Input DIN 3	Signal for controlling output contact
Input DIN 4	Signal for controlling output contact
Enable Local	Enables the selector switch function (LOCAL/OFF) on the local controls
Enable OPEN	Interlock: Enables operation command in direction OPEN
Enable CLOSE	Interlock: Enables operation command in direction CLOSE
PID internal setpoint 2	Internal PID setpoint
Remote2_active	Activation of operation mode Remote II
Remote2_OPEN	Operation command OPEN in operation mode Remote II
Remote_2_CLOSE	Operation command CLOSE in operation mode Remote II
Remote2_STOP	Operation command STOP in operation mode Remote II
Execute PVST	PVST is executed
Bypass Sync In	Enable signal for <By-pass function>
PID setpoint I/O	Change-over of process controller setpoint source between fieldbus interface and I/O interface
PID act. value I/O	Change-over of process controller actual value source between fieldbus interface and I/O interface
RelOPENandCLOSE	Enable signal OPEN/CLOSE
Speed int. sel. bit 0	Signal 1 for external speed selection
Speed int. sel. bit 1	Signal 2 for external speed selection

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AUMA Riester GmbH & Co. KG

P.O. Box 1362
DE 79373 Muellheim
Tel +49 7631 809 - 0
Fax +49 7631 809 - 1250
info@auma.com
www.auma.com

For detailed information on AUMA products, refer to the Internet: www.auma.com