auma
Solutions for a world in motion

Actuator controls

AUMATIC AC 01.2

Control

Parallel

→ Profibus DP

Modbus

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) AUMATIC AC 01.2/ACExC 01.2 Profibus DP

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   Basic information on safety

Standards/directives

AUMA products are designed and manufactured in compliance with recognised standards and directives. This is certified in a Declaration of Incorporation and a EC Declaration of Conformity.

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: EN 60079 "Electrical apparatus for explosive gas atmospheres" –
    - Part 14: Electrical installations in hazardous areas (other than mines).
    - Part 17: Inspection and maintenance of electrical installations in hazardous areas (other than mines).
- Applicable configuration guidelines for fieldbus applications.

They include among others 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 exclusively by suitably qualified personnel having been 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 are responsible for respect and control of these regulations, standards, and laws.

Commissioning

Prior to commissioning, it is important to 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 the national regulations.

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

Any device modification requires the 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 could result 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 may result in minor or moderate injury. May also be used with property damage.**

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

Arrangement and typographic structure of the warnings

⚠ DANGER   **Type of hazard and respective source!**

Potential consequence(s) in case of non-observance (option)

→   Measures to avoid the danger
→   Further measure(s)

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)

✓   Important information before the next step. This symbol indicates what is required for the next step or what has to be prepared or observed.

M ▷   **Via the menu to parameter**

Describes the path within the menu to the parameter. By using the push buttons of the local controls you may quickly find the desired parameter in the display.

< >   **Reference to other sections**

Terms in brackets shown above refer to other sections of the document which provide further information on this topic. These terms are either listed in the index, a heading or in the table of contents and may quickly be found.

2.   Identification

2.1   Name plate

Each device is equipped with a name plate.

Figure 1:   Arrangement of name plate
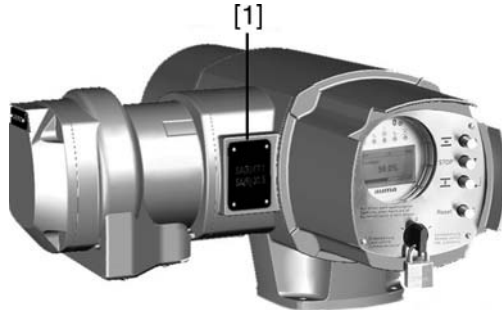
[1]   Controls name plate

Data for identification   Figure 2:   Controls name plate
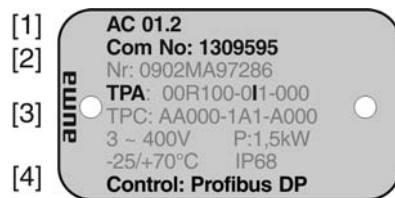
[1]   Type and size of the controls
[2]   Commission number
[3]   Wiring diagram
[4]   Control

Type and size   These instructions apply to the following devices:

Types: AC/ACExC = AUMATIC actuator controls

Size: 01.2

Versions: Intrusive and Non-Intrusive

Commission number   An order-specific commission number is assigned to each device. This commission number can be used to directly download the wiring diagram, inspection records and further information regarding the device from the Internet: **http://www.auma.com**.

Wiring diagram   9th position in the **TPA** wiring diagram: Position transmitter (actuator):

Control unit: electromechanical:

0 = Without position transmitter

A, B, J, K, L, N = Potentiometer

C, D, E, G, H, M = RWG (electronic position transmitter)

Control unit: electronic:

I = MWG (Magnetic limit and torque transmitter)

Control   **Profibus DP** = Control via Profibus DP interface

Profibus DP-V1 = Control via Profibus DP-V1 interface

Profibus DP-V2 = Control via Profibus DP-V1 interface

Profibus DP/24 V DC = Control via Profibus DP interface and parallel interface at 24 V DC

2.2	Short description

Actuator controls

The AUMATIC actuator controls are used to operate AUMA actuators and are supplied ready for use. The controls may be mounted directly to the actuator or separately on a wall bracket.

The functions of the AUMATIC controls include standard valve control in OPEN - CLOSE duty, positioning, process control, logging of operating data, diagnostic functions right through control via fieldbus.

Local controls/AUMA ToolSuite

Operation, setting, and display can be performed directly at the 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 the AUMA ToolSuite software (option), using a computer (laptop or PC). The connection between computer and AUMATIC 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, actuator and controls housings do not have to be opened. For this purpose, the actuator is equipped with an MWG (magnetic limit and torque transmitter), also supplying analogue torque feedback signals/torque indication and analogue position feedback signals/position indication.

3. Operation

NOTICE	**Valve damage due to incorrect basic setting!**
	→ Prior to electrical operation of the actuator, the basic settings i.e. type of seating, torque and limit switching have to be completed.

3.1 Local actuator operation

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

Figure 3:   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!**
	Danger of burns
	→ Check surface temperature and wear protective gloves, if required.

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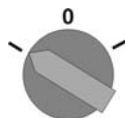
➥ The actuator can now be operated using the push buttons [1 – 3].

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

3.2 Actuator operation from remote

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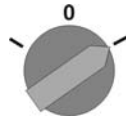
➥ Now, the actuator can be remote-controlled via fieldbus.

Information For actuators equipped with a positioner, it is possible to select between **open-close control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SETPOINT). For further information, please refer to <Selection between open-close control and setpoint control>.

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.
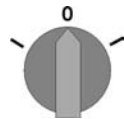
The bottom row of the display [6] serves as navigation support and explains which push buttons [1 – 4] are used for menu navigation.

Figure 7:
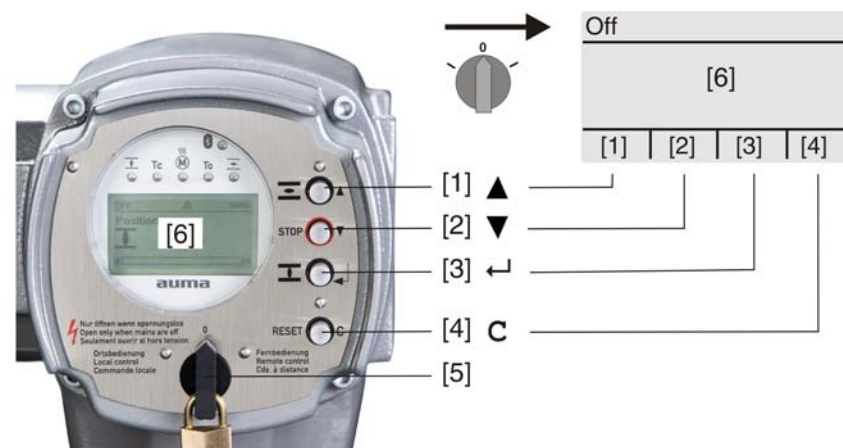
[1–4]   Push buttons or navigation support
[5]   Selector switch
[6]   Display

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

Push buttons	Navigation support on display	Functions
[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. The backlight turns to red under fault conditions.
- 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 8: Groups

[1] Startup menu
[2] Status menu
[3] Main menu

ID Status menu and main menu are marked with an ID.

Figure 9: Marking with ID
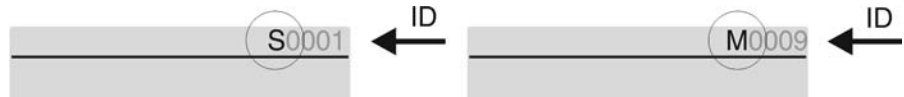
S ID starts with S = status menu
M ID starts with M = main menu

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 10: Select menu groups
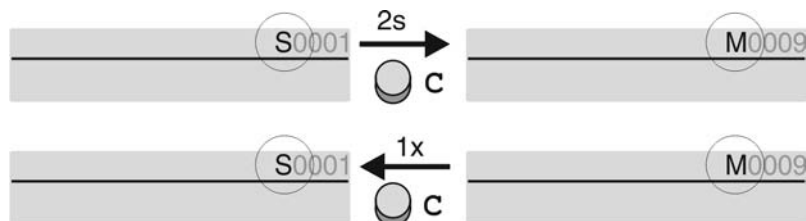
You return to the status menu if:

- 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 11:   Direct display (example)
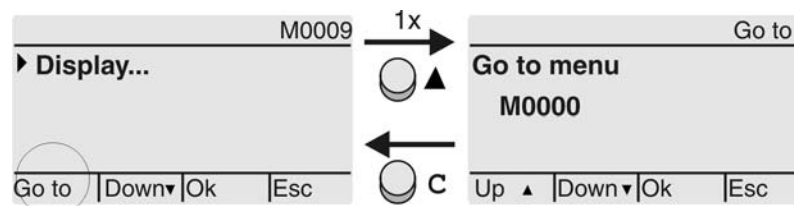
Display indicates in the bottom row: Go to

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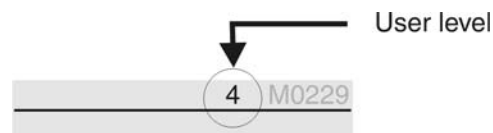
Password   A password must be entered to allow parameter modification. The display indicates: Password 0***

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

3.4.1   Password entry

Display indicates: Password 0***

1. Select desired menu and hold down push button ↵ for approx. 3 seconds.
➡ Display indicates the set user level, e.g Observer (1)
2. Press ▲ Up ▲to select a higher user level and press ↵ Ok to confirm.
➡ Display shows: 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 user level may be changed.

Example: The user is signed in as Specialist (4). This authorises him or her to modify the passwords between user levels (1) to (4).

M ▷   Device configuration   M0053
    Service functions   M0222
     Change passwords   M0229

Menu point Service functions M0222 is only visible if user level has been set to Specialist (4) or higher.

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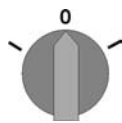
2.   Press push button **C** Setup and hold it down for approx. 3 seconds.

➥   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.

3.5   Language in the display

The AUMATIC display is multilingual.

3.5.1   Change language

M ▷   Display...   M0009
    Language   M0049

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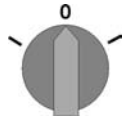
2. Press push button **C** Setup and hold it down for approx. 3 seconds.
➡ Display goes to main menu and indicates: ▸ Display...

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 16:   LED test
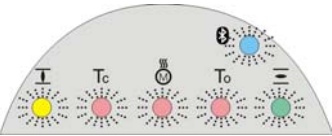
Language selection
During the self-test, the language selection can be activated so that the selected language is immediately indicated in the display. For this, set selector switch [5] to position **0** (OFF).

Activate language selection:

1.   Display indicates in the bottom row: Language selection menu? 'Reset'
2.   Press push button **RESET** and hold it down until the following text is displayed in the bottom line: Language menu loading, please wait.

Figure 17:   Self-test
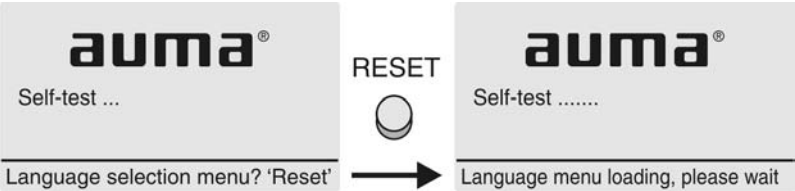
The language selection menu follows the startup menu.

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

Figure 18:   Startup menu with firmware version: 04.00.00–xxxx
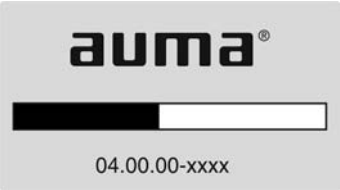
If the language selection feature has been activated during the self-test, the menu for selecting the display language will now be indicated. For further information on language setting, please refer to chapter <Language in the display>.

Figure 19:   Language selection
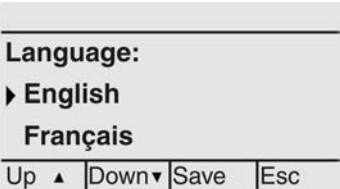
If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

4.2   Indications in the display

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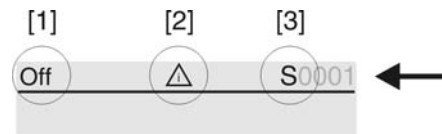
[1]   Operation mode
[2]   Error symbol (only for faults and warnings)
[3]   ID number: S = Status page

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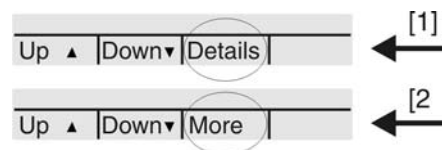
[1]   shows list with detailed indications
[2]   shows further available information

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 indications from actuator and valve

Display indications depend on the actuator version.

Valve position (S0001)

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

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

Figure 22:   Valve position and direction of operation
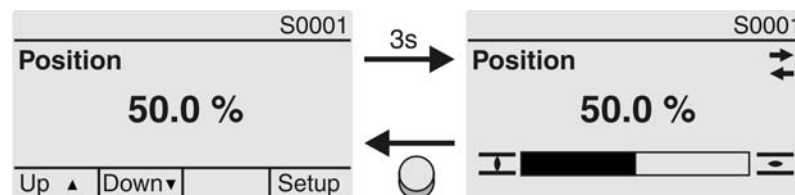
Reaching the preset end positions is additionally indicated via symbols ⊥ (CLOSED)
and ☰ (OPEN).

Figure 23:   End position CLOSED/OPEN reached
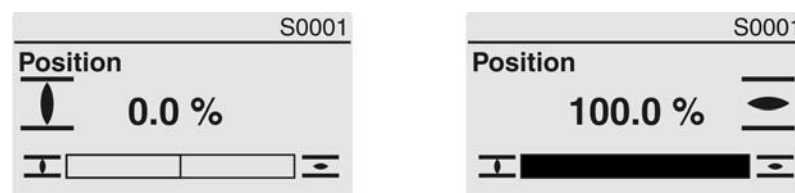
0%   Actuator is in end position CLOSED
100% Actuator is in end position OPEN

Torque (S0002)

The indication is only available if the actuator is equipped with an MWG (magnetic limit and torque transmitter).

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

Figure 24:   Torque
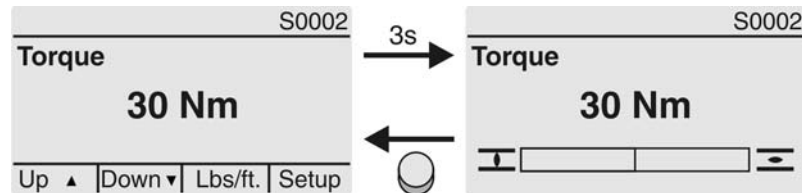
Select unit The push button ↵ allows to select the unit displayed (percent %, Newton metre Nm or pounds per foot Lbs/ft.

Figure 25:   Units of torque
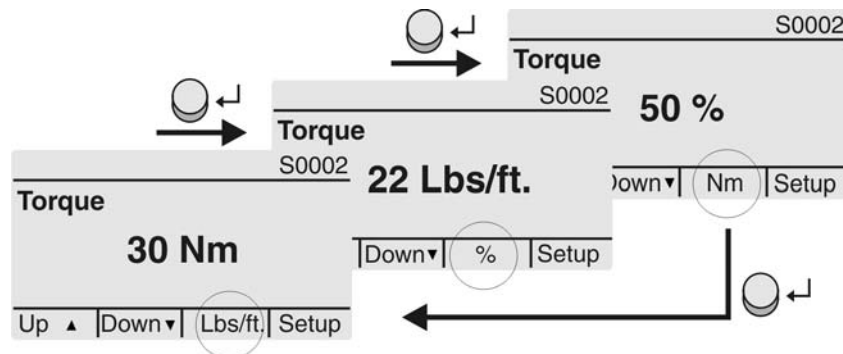
Display in percent 100 % indication equals the max. torque indicated on the name plate of the actuator.

Example: SA 07.5 with 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 bargraph 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 bargraph display. The figure below shows the operation command in direction CLOSE.

Figure 26:   Display for OPEN - CLOSE control
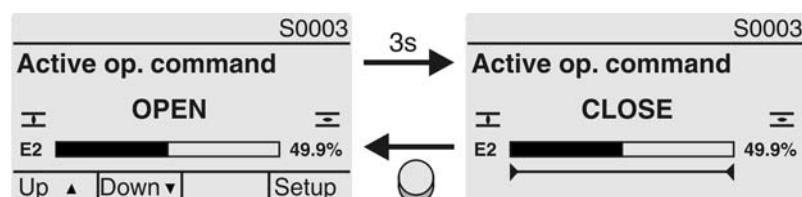
E2   Actual position value

Setpoint control   If the positioner is enabled and activated, the bargraph indication for E1 (position setpoint) is displayed.

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

Figure 27:   Display for setpoint control (positioner)
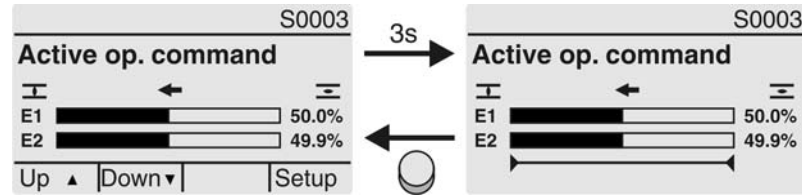
E1   Position setpoint
E2   Actual position value

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 28:   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	–

Multiport valve positions (S0017)

In case of active multiport valve function, the display S0017 indicates a second bargraph display with set positions (valve connections) above the actual position value E2. Positions (P1, P2, ...) are displayed with a black triangle ▼. Push buttons ▲ ▼ are used to select positions. Both positions and the actual position value E2 are displayed in degrees.

Figure 29:   Status indication for multiport valve (example P4 = 180°)

P   (P1, P2, ...) selected position (1, 2, ...)
         (– –) no position selected
E2   Actual position value
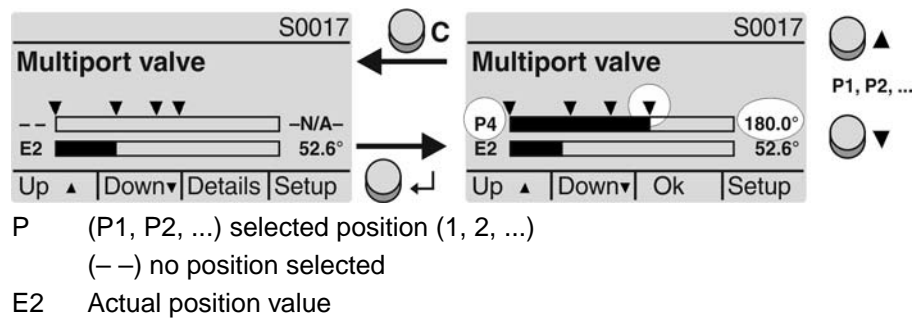
4.2.2   Status indications according to AUMA classification

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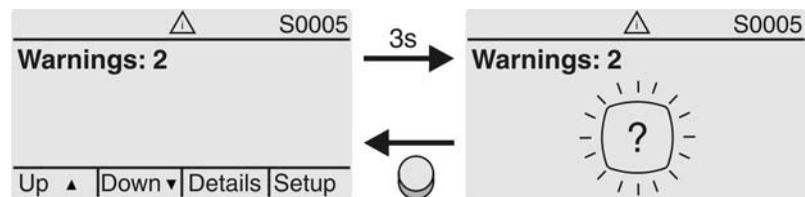
For further information, please also refer to <Corrective action>.

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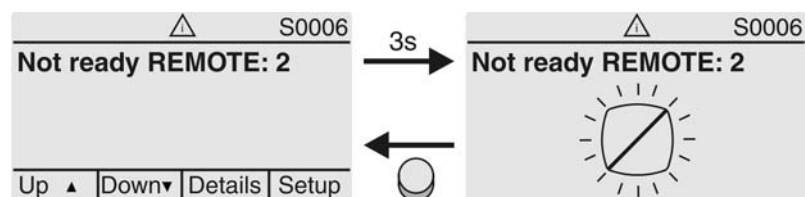
For further information, please also refer to <Corrective action>.

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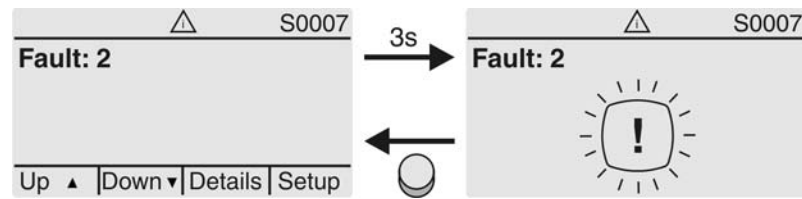
For further information, please also refer to <Corrective action>.

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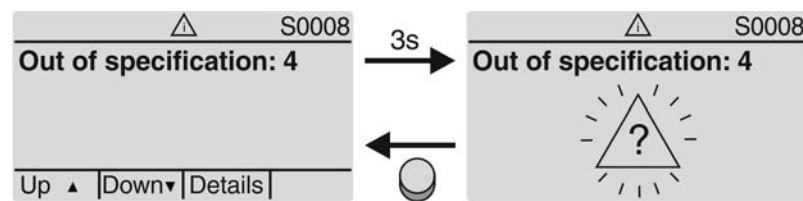
For further information, please also refer to <Corrective action>.

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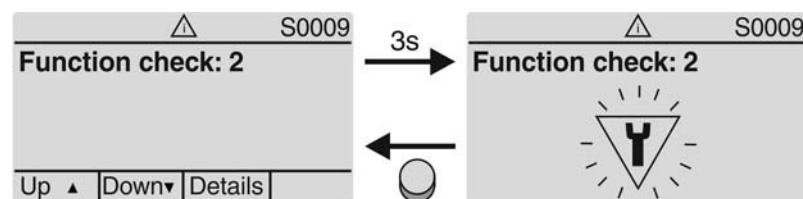
For further information, please also refer to <Corrective action>.

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 oil can after approx. 3 seconds

Figure 35:   Maintenance required
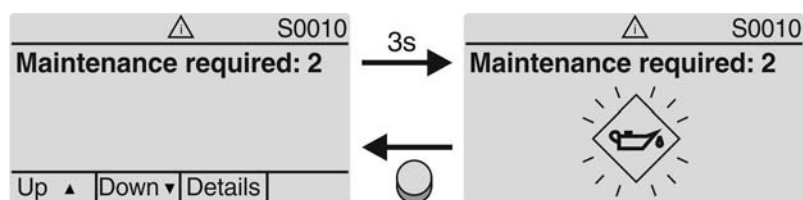
For further information, please also refer to <Corrective action>.

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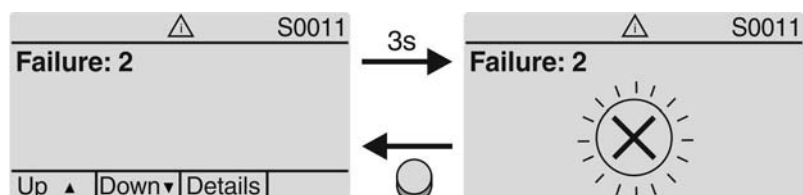
For further information, please also refer to <Corrective action>.

4.3   Indication lights

Figure 37:   Arrangement and signification of indication lights

[1]   Marking with symbols (standard)
[2]   Marking with figures 1 – 6 (option)
1 ⊥   End position CLOSED reached (blinking: for operation in direction CLOSE)
2 Tc   Torque fault CLOSE
3 Ⓜ   Motor protection tripped
4 To   Torque fault OPEN
5 ☰   End position OPEN reached (blinking: for operation in direction OPEN)
6 ❈   Bluetooth connection

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

— Option —

User level required to make changes: AUMA (6)

M ▷   Device configuration M0053
        Local controls M0159

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

5.   Signals

5.1   Signals via fieldbus

Feedback signals via fieldbus can be configured. Configuration is possible for both data structure and data contents.

Configuration is defined via the GSD file only.

Information   If required, download the GSD file (General Station Description) from the Internet:

www.auma.com

For information on the feedback signals via fieldbus and the configuration of the parameters via fieldbus interface, refer to Manual (Device integration fieldbus) Profibus DP.

5.2   Status signals via output contacts (digital outputs)

— (Option) —

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   Encoding of outputs

The output signals DOUT 1 – 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

Required user level: Specialist (4) or higher.

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

Default values for DOUT 1 – 6: High active

5.3 Configurable status signals

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

Failure (Cfg) signal can be configured as user-specific fault signal. The signal may both be sent to a digital output (output contact) and assigned to an indication light (LED).

Required user level: Specialist (4) or higher.

M ▷   Device configuration M0053
   Config. of signals M0860
    Failure (Cfg) M0879

Default values:

☑ Warning (Cfg) (activated)

☑ Fault (Cfg) (activated)

☑ Not ready REMOTE (Cfg) (activated)

Each signal contains further signals which can be activated or deactivated.

5.4 Analogue signals

— (Option) —

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. The AC is equipped with up to two analogue outputs AOUT1 and AOUT2.

.

5.4.1 Assignment of analogue output 1

Designation in the wiring diagram: AOUT 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 AOUT 1 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: Position transmitter MWG installed in the 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 100 % of the nominal output torque, 0 or 4 mA are indicated in direction CLOSE, and 20 mA are indicated in direction OPEN.

Figure 38:   Actual torque value
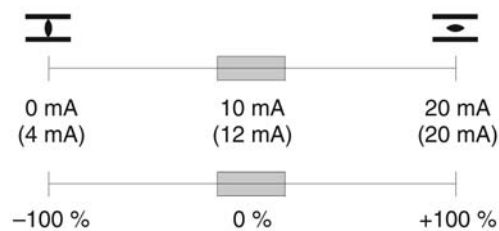
−100%= maximum nominal torque in end position CLOSED reached

+100%= 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.

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 AOUT 1 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.

5.4.3   Adjustment of analogue output 1

The initial values and end values of the signal range can be corrected by ± 1 mA.

Example: Parameter Signal range AOUT 1 = 4 - 20 mA

The initial value (4 mA) can be adapted within a range of 3 mA to 5 mA.

The end value (20 mA) can be adapted within a range of 19 mA to 21 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: −100 ... 100 (− 1.00 to + 1.00 mA)

5.4.4 Assignment of analogue output 2

Designation in the wiring diagram: AOUT2.

Required user level: AUMA (6).

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 AOUT 2 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.

5.4.6 Adjustment of analogue output 2

Initial values and end values of the signal range can be corrected by ± 1 mA

Example: Parameter Signal range AOUT 1 = 4 - 20 mA

The initial value (4 mA) can be adapted within a range of 3 mA to 5 mA.

The end value (20 mA) can be adapted within a range of 19 mA to 21 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: –100 ... 100 (–1.00 to +1.00 mA)

6.   Operation

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

Figure 39:   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).
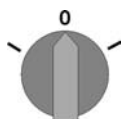
Characteristics
- The indication in the top row of the display shows: Off
- Electric operation is not possible (not even EMERGENCY operation).
- The controls remain fully operative as far as signalling is concerned (controls' power supply is maintained).
- Push buttons ▲ ▼ ↵ C can be used for menu navigation via the display.

6.2   Operation mode Local

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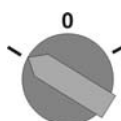
Characteristics
- The indication in the top row of the display shows: Local
- In motor operation, the actuator can be controlled locally via the push buttons ⊥ (OPEN), STOP, ⊆ (CLOSE).
- Faults and warnings without automatic reset can be confirmed with the push button RESET.

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

The parameter Self-retaining LOCAL M0076 determines the operation behaviour of the actuator to operation commands via the push buttons of the local controls.

M ▷   Customer settings   M0041
          Local controls   M0075
             Self-retaining LOCAL   M0076

Default value: OPEN and CLOSE

Setting values:

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

Actuator only runs in direction 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 STOP 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.

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

Direct reversal of operation direction without STOP command is possible.

Information   Hold down push buttons ⊥ (OPEN) or ☰ (CLOSE) for more than 2 seconds to activate self-retaining, press STOP to reset the operation mode to push-to-run operation.

6.3 Operation mode Remote

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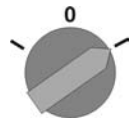
Characteristics   The indication in the top row of the display shows the set source of the operation commands:

- Remote (parallel interface)
- Remote II (parallel interface, operation 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 100 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 and Self-retaining Remote II M0101 determine the operation behaviour of the actuator to binary operation commands (OPEN, STOP, CLOSE) from Remote.

The two parameters have no influence on the operation commands transmitted via fieldbus. Setting will only be required if, in addition to the fieldbus interface, digital inputs (OPEN, STOP, CLOSE) are available for control.

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

Default value: Off (push-to-run op.)

Setting values:

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

Actuator only runs in direction 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 STOP 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.

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.

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
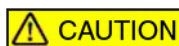
The actuator can start immediately when switching on!

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

— Option —

See also: Failure function <EMERGENCY stop function>

Condition   EMERGENCY Stop switch (via AUMA electrical connection)

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 controls (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 the operation mode EMERGENCY stop is cleared using a Reset command.
- Analogue operation commands (e.g. 0/4 – 20 mA) or operation commands via fieldbus are immediately 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 4:   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 the ToolSuite service software is required. AUMA service uses this software (e.g. during commissioning or maintenance) to perform settings at the AUMATIC.

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 AUMATIC 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 CLOSE, the following can be set individually:

Limit seating

The 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 controls.

Figure 43:   Limit seating
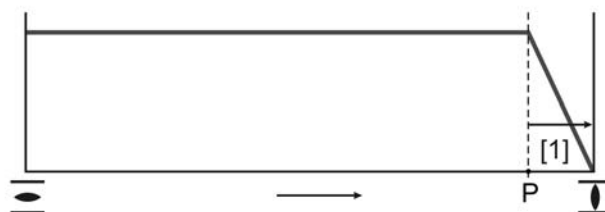
P   Tripping position
[1]   Overrun

Torque seating

The controls switch off the actuator in the end positions via torque switching.

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. As soon as the set tripping torque is reached, the controls automatically switch off the actuator.

In this context, the limit seating is used to signal that the limit switching will 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 must suit 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
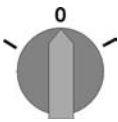
Default value: Limit

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)

Log on user   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. Select new setting ▲ ▼ Up ▲ Down ▼ resulting in the following significations:
➥   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 in the actuator (Intrusive version), the torque switching is set as
described in the operation instructions.

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 Lbs/ft.

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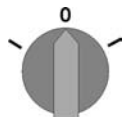
2.   Press push button **C** Setup and hold it down for approx. 3 seconds.
➥   Display goes to main menu and indicates: ▸ Display...

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.   Select via ▲▼ Up ▲ Down ▼:
      →   ▸ 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

Log on user 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 sent if the set torque is reached **in mid-travel**:

•   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 OPEN
    -   For Torque fault CLOSE : Operation command in direction CLOSE

2. or, in case the torque applied is lower than the preset tripping torque:
    -   via the push button**RESET** in selector switch position **Local control** (LO-CAL).
    -   or via the Profibus, command reset (process representation output: byte 1, bit 3).

7.3   Limit switching

Conditions   MWG in actuator (Non-intrusive version).

For torque switches in the actuator (Intrusive version), the limit switching is 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

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

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

→   Allow for overrun when selecting limit seating.

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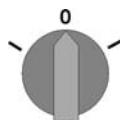
2. Press push button **C** and hold it down for approx. 3 seconds.

➥   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. Use ▲▼ Up ▲ Down ▼ to select:

→ ▸ 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 14

- Specialist (4) → continue with step 6

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

➥ 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 14

Set end position CLO- 9. Re-set end position CLOSED:
SED CMD0009

9.1 For large strokes: Set selector switch in position **Local control** (LOCAL)

and operate actuator in motor operation via push button ⊥̄ (CLOSED) in
direction of the end position.
Information: Stop actuator **before** reaching end of travel (press push
button **STOP**) to avoid damage.

9.2 Engage manual operation.

9.3 Turn handwheel until valve is closed.

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

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

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

10. Press ↵ Yes to accept new end position setting.

➥ 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.
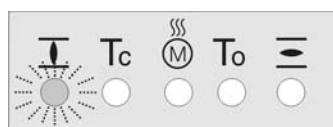
Set end position OPEN 12. Re-set end position OPEN:
CMD0010

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 push button **STOP**) to avoid damage.

12.2 Engage manual operation.

12.3 Turn handwheel until valve is open.

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

12.5 Set selector switch to position **0** (OFF).
   ➥   Display indicates: Set end pos. OPEN? Yes No

13. Press ↵ Yes to accept new end position setting.

➥ Display indicates: End pos. OPEN set!

➥ The right LED is illuminated (standard version) and thus indicates that the end position setting is complete.
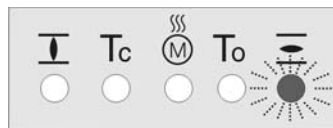
14. Make selection:
   →   Edit → back to step 9: Set end position OPEN "once again"
   →   Esc → back to step 4; either set end position CLOSED or exit the menu.

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

7.4 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.

• For Profibus DP-V2 control, data and time can be synchronised using the fieldbus.

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

Lbs/ft. Indication in pounds per foot

% 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

7.6 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 AC 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 Intermediate positions (pivot points)

— Option —

Conditions The actuator is equipped with a position transmitter.

Characteristics
- With the AC, up to 8 intermediate positions (pivot points) 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.

8.1.1 Intermediate positions (pivot points): determine

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 % to 100.0 % of the travel (from OPEN to CLOSED)

Information The pivot points are also valid for the functions <Operation profile> and <Operation to position>.

8.1.2 Signal behaviour of intermediate positions: set

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

The signal behaviour of the different pivot points may be set individually.

M ▷ Customer settings M041
  Intermediate positions M0143
    Signal behaviour M0266
      Signal behaviour 1 M0269

Default value: No signal

Setting values:

No signal	A: Signal behaviour Off. Intermediate position is not signalled.
C_____|‾‾‾‾‾‾‾O	B: Signal is active from reaching the intermediate position to end position OPEN.
C‾‾‾‾‾‾‾‾|_____O	C: Signal active from end position CLOSED to reaching the intermediate position.
C_____|‾|_____O	D: When passing the intermediate position, a pulse signal is sent. The pulse range (range +/– around the pivot point) depends on the set hysteresis.

Figure 49:   Signal behaviour of intermediate positions
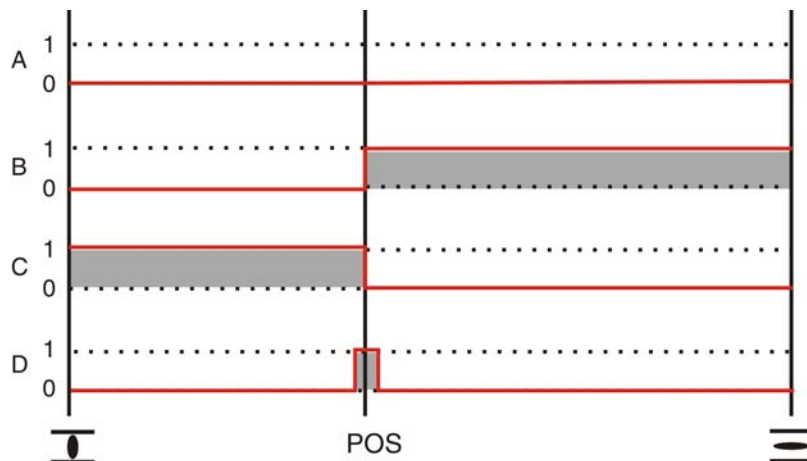
8.1.3   Hysteresis for intermediate positions: set

The hysteresis determines the tripping point.

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

Parameter Hysteresis 6 M0253 is set to 1.0 % of the travel.

Figure 50:   Switching behaviour for signalling behaviours B, C, D and hysteresis 1 %
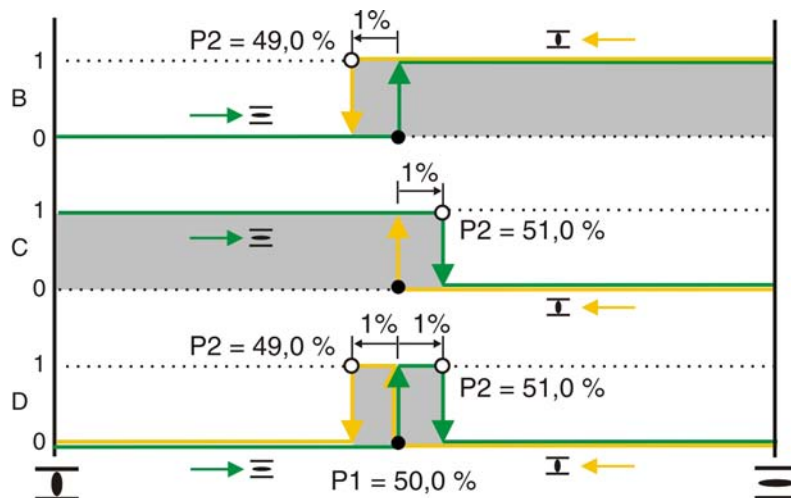
P1   Switch-on point (●)
P2   Tripping point (○)

Required user level: AUMA (6).

M ▷   Customer settings M041
   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)

8.2   Operation profile (operation behaviour) for intermediate positions

— Option —

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.

8.2.1   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.

8.2.2   Off times 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 the 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 the 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 the 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 interrupted 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.

8.2.3   Off times for intermediate positions (pivot points): set

An off time can be defined for each pivot point.

Once a pivot point with the operation behaviour Off time in OPEN , Off time in CLOSED or Off time in OPEN & CL. is reached, the AC generates the Operation pause active indication during the off time.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M041
   Intermediate positions M0143
     Off times M0268
       Off time 1 M0285

Default values: 1 s

Setting ranges: 1 to 1,800 seconds

8.3   Two-wire control

— Option —

Conditions	• <Additional inputs> or additional <parallel interface>
	• Operation mode Remote (Selector switch = position **Remote control**).
Characteristics	With the function <Two-wire control>, the actuator can be operated to end position OPEN or CLOSED via **a** digital input.
Information	In this function, the actuator only reacts to commands via the input OPEN/CLOSE. Other inputs to which 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 two-wire control, a digital input for the signal OPEN/CLOSE has to be available and configured.

Required user level: AUMA (6)

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.

8.4   Positioner (operation mode Remote SETPOINT)

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

- Electronic control unit with MWG (Non-Intrusive version)
- Potentiometer
- Electronic position transmitter 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 the setpoint position E1 and the actual position value E2.
- If the status indication S0003 only shows the actual position value E2, OPEN - CLOSE control is active: 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.

8.4.1   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.

8.4.2   Adaptive behaviour: switch on or off

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 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 Positioner hyst. OPEN M0598 or Positioner 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 51:   Positioner positioning behaviour
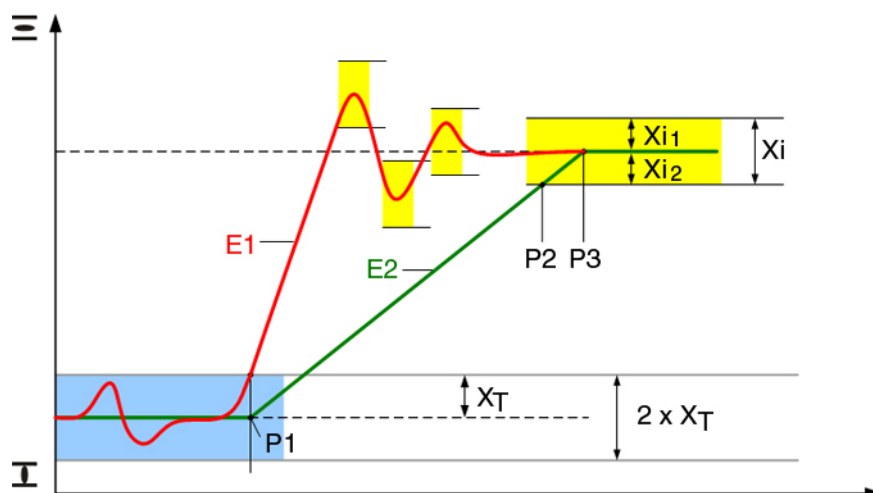
E1   Setpoint
E2   Actual value
P1   Switch-on point
P2   Switch-off point in OPEN direction
P3   Setpoint reached
X_T Max. error (outer dead band)
Xi_1 Overrun in direction OPEN (inner dead band OPEN)
Xi_2 Overrun in direction CLOSE (inner dead band CLOSE)

8.4.3   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 CLOSED

Setting ranges: 0.0 – 10.0 % for dead band OPEN and CLOSED

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.

              .

8.4.4   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 nominal value is higher than the max. error variable determined by the outer dead band.

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

M ▷   Customer settings M0041
        Positioner M0145
          Outer dead band M0148

Default value: 1.0 %

Setting range: 0.1 – 10.0 %

8.4.5 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: 0.5 s

Setting range: 0.2 – 60.0 s (seconds)

Information It must be ensured via the controls 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.

8.4.6 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 M041
    Positioner M0145
        Positioner hyst. OPEN M0598
        Positioner hyst. CLOSE M0599

Default values: 0.5 % for OPEN and CLOSED

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

8.4.7 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.

Information The tolerance ranges are not effective if the operation commands are transferred to the actuator as fieldbus telegrams. In this case the actuator runs completely CLOSED as soon as it receives the nominal value 0.0 % and completely OPEN as soon as it receives the nominal value 100.0 %.

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 %

8.4.8 Limit setting range

Travel 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 52:   Limitation of setting range
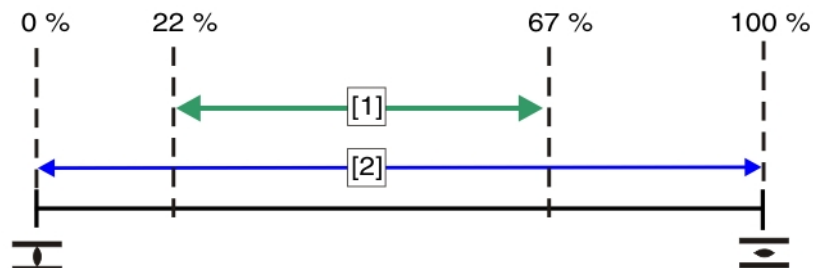
[1]   Permissible actuator travel for setpoint control
[2]   Permissible actuator travel for OPEN - CLOSE control

Activate limitation

M ▷   Customer settings M0041
  Positioner M0145
    Limit positioner range M0845

Default value: Function not active

Setting values:

Function not active   Limitation deactivated.

Function active   Limitation activated.

Set limits

M ▷   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 travel

8.4.9   Change-over between OPEN - CLOSE control and setpoint control

For actuators equipped with a positioner, it is possible to select 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 signal MODE has to be available and configured for change-over.

Configuration of digital input

Required user level: AUMA (6).

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 input MODE 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.

8.4.10 Input of setpoint position

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

Configuration (process representation) is defined via the GSD file only.

Information If required, download the GSD file (General Station Description) from the Internet: www.auma.com

AC with two additional inputs

— Option —

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 available at the I/O INTERFACE input(refer to wiring diagram).

8.4.11 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 Profibus DP version, the input range for setpoint position is set to 0.0 % ... 100.0 %.

AC with two additional inputs

— Option —

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 M0
            High limit AIN 1 M0

Default values:

Low limit AIN 1 = 0 mA

High limit AIN 1 = 20 mA

Setting values: 0 … 20 mA

8.5	Process controller

— Option —

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

- Electronic control unit with MWG (non-intrusive version)
- Potentiometer
- Electronic position transmitter 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 E1 and the actual process value E4 (e.g. from a sensor). On the basis of both values, the process controller calculates the position setpoint E7 for positioner [3]. In turn, the positioner [3] compares this target setpoint with the position feedback E2 of the valve and issues the operation commands (OPEN - CLOSE) for the actuator.

Figure 53:   Process controller function
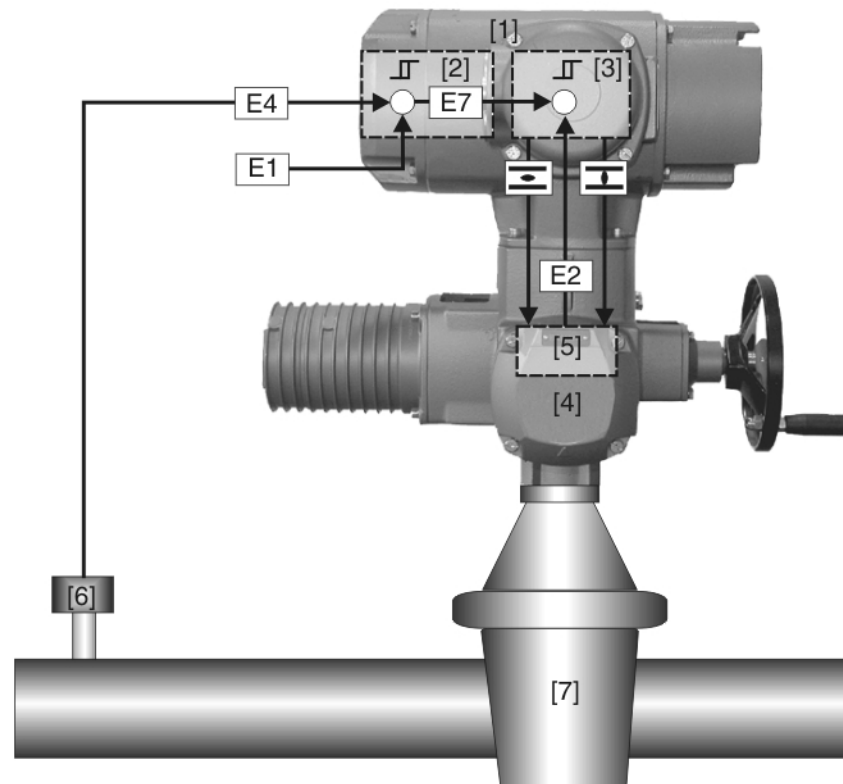
[1]   Actuator controls AUMATIC
[2]   Process controller
[3]   Positioner
[4]   Actuator
[5]   Positioner e.g. RWG/MWG
[6]   Sensor
[7]   Valve
E1   Process setpoint
E2   Actual position value
E4   Actual process value
E7   Position setpoint (internal)

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

8.5.1   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.

8.5.2   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 controller immediately reacts to a control deviation (i.e. actively) and amplifies the input signal (error variable) proportionally to the set amplification. Setting parameter: Proport. gain Kp M0744

Figure 54:   Step response of P controller
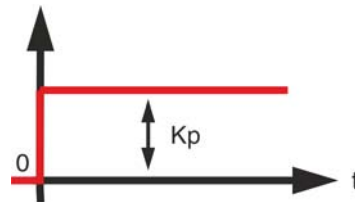
P controller application   For uncritical closed-loop applications allowing to accept continuous error variables in the event of failures, e.g. pressure, flow, filling level and temperature control.

PI controller   PI controllers consist of a P fraction immediately reacting to a control deviation 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 55:   Step response of PI controller
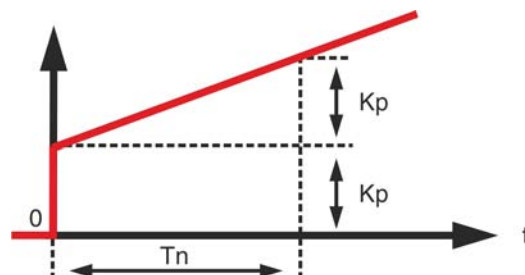
PI controller application   Quick control circuits not allowing continuous error variables, e.g. pressure, temperature and ratio control.

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 control deviations with large output values. Parameter for setting the D fraction: Rate time Td M0746

Figure 56:   Step response of PID controller
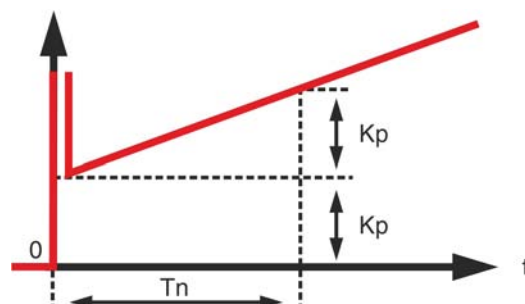
PID controller use   For precise and highly dynamic control not allowing a continuous error variable.

8.5.3   Setpoint source (input for process setpoint)

M ▷   Customer settings M0041
      Process controller M0742

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	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.

8.5.4 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, controls switch to the internal setpoint 1. Parameter Internal setpoint 1 M0749
Internal setpoint 2	In case of process setpoint signal loss, 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

8.5.5 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.

8.5.6 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 %

8.5.7	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 P controller, i.e. set the parameters as follows:
- Proportional gain Kp = 1
- Reset time Ti = 1,000 s
- Rate time Td = 0
- Derivative gain Kd = 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 rate time Td until the error variable equals zero.

8.5.8	Proportional amplification 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

8.5.9	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
- Starting value for slow processes (e.g. temperature): 1,000

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

Default value: 1,000 s (seconds)

Setting range: 1 ... 1,000 s

8.5.10	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

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

Default value: 0 s (seconds)

Setting range: 1 ... 100 s

8.5.11 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 fieldbus.

8.6 Stepping mode

— **Option** —

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

- MWG (Non-Intrusive version)
- Potentiometer
- Electronic position transmitter 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 57: Stepping mode
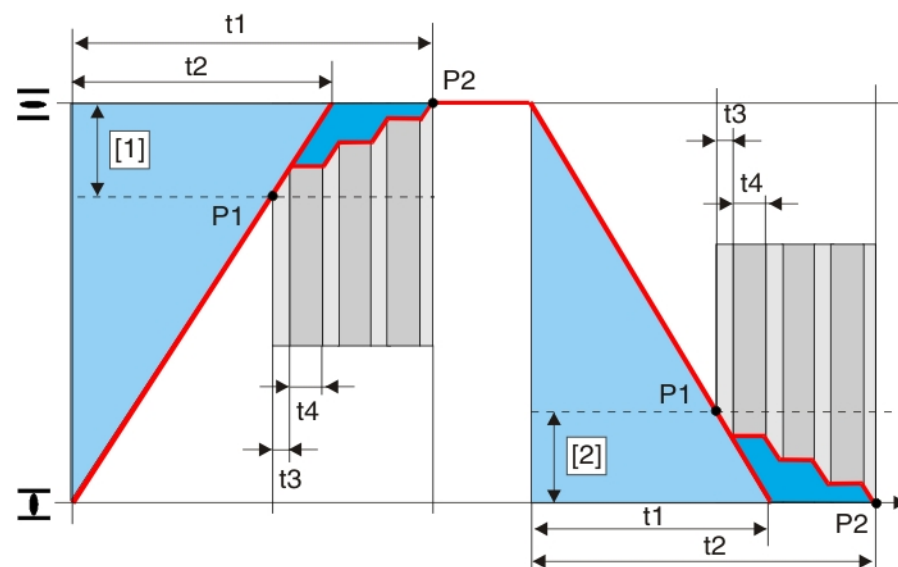
[1]	Stepping range OPEN
[2]	Stepping range CLOSE
P1	Start of stepping mode
P2	End of stepping mode
t1	Operating time for normal operation
t2	Operating time for stepping mode
t3	Running time
t4	Off time

8.6.1   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.

8.6.2   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>.

8.6.3   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 %

8.6.4   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: 5.0 s (for all on and off times)

Setting ranges: 1 ... 1,800 s (for all on and off times)

8.7   Profibus DP interface

8.7.1   Bus address (slave address)

The bus address can be entered manually via push buttons at the local controls according to the description below. For information on how to set the bus address via fieldbus, refer to Manual Device integration Profibus DP.

M ▷   Customer settings   M0041
    Profibus DP   M0016
      DP1 slave address   M0098
      DP2 slave address   M0295

Default value: 126

Setting range: 0 ... 126

Information   Parameter DP2 slave address is only available for some redundancy options.

8.7.2   Redundancy

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

M ▷   Device configuration   M0054
    Profibus   M0799
      Redundancy   M0601

Default value: None

Setting values:

None	No redundancy
DP-V2 (SR)	DP-V2 (system redundancy)
DP-V2 (FR)	DP-V2 (flying 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

Information   For detailed information on redundancy types, refer to Manual Device integration Profibus.

8.7.3   Response telegrams for AUMA redundancy II

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

M ▷   Device configuration   M0054
    Modbus   M0799
      Behaviour Tx   M0801

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. |

8.8 Additional bus inputs

— Option —

AC controls with fieldbus interface can be equipped with additional digital and analogue inputs. Depending on the version, up to 6 digital inputs (standard: 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, a digital input has to be available and configured between fieldbus and parallel interface.

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

Configuration of additional inputs

Required user level: AUMA (6).

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 interface`)

| 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):
  The AC only reacts to operation commands via fieldbus.
- Input I/O interface = **high level** (standard: +24 V DC):
  The AC reacts to additional input signals only.
  Irrespective of the signal assignment of the additional inputs, the fieldbus communication with the DCS will remain intact.

8.9 Combination of fieldbus-parallel interface

— Option —

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

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, a digital input has to be available and configured between fieldbus and parallel interface.

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

Configuration of I/O interface inputs

A digital input for the I/O interface signal has to be configured for change-over.

Required access level: AUMA (6).

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 (wiring diagram designation: `I/O interface`)

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):
  The AC only reacts to operation commands via fieldbus.
- Input I/O interface = **high level**
  AC reacts 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.

8.10 Auto change-over I/O (during bus failure)

— **Option** —

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

Characteristics
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>.

Auto change-over I/O: activate

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 (during bus failure)> function deactivated.

Function active <Auto change-over I/O (during bus failure)> function activated.

8.11 By-pass function

— **Option** —

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
- <EMERGENCY behaviour> function is enabled and activated.
- <Additional inputs> or additional <Parallel interface>.

Function
Two MOVs – one main valve and a by-pass valve – are linked via release signals By-pass Sync In and By-pass Sync Out. Operation commands can only be executed if one of the two actuators sends the release signal to the other. Release 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.
- The by-pass valve can only be operated in direction CLOSE if the main valve is in end position CLOSED. However, it can always be operated in direction OPEN.

Figure 58: Function
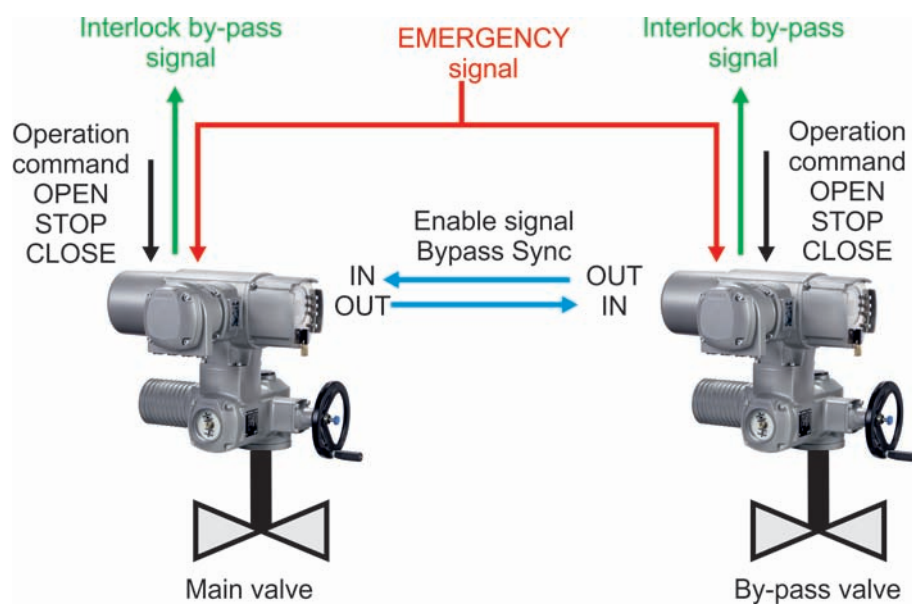
Table 5: Main valve reaction to by-pass valve position.

By-pass valve		Main valve
Position	Sends enable signal Bypass Sync OUT	Release (available operation commands)
End position OPEN	High level (Default: +24 V DC	in directions OPEN and CLOSE
other position than end position OPEN	Low level (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 6: By-pass valve reactions to main valve position

Main valve		By-pass valve
Position	Sends enable signal Bypass Sync OUT	Release (available operation commands)
End position CLOSED	High level (Standard: +24 V DC)	in directions OPEN or CLOSE
Other position than end position CLOSED	Low level (0 V DC or input open-circuit):	in direction OPEN only[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 characteristics as the <EMERGENCY behaviour> function with the following differences:

In an EMERGENCY situation, both 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: AUMA (6) or higher.

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

Example

Use input DIN4 for signal By-pass 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 input

Required user level: Specialist (4) or higher.

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

Example

Use output DOUT6 for signal By-pass Sync Out:

Parameter: Signal DOUT 6 M0111

Setting value: By-pass Sync Out (wiring diagram designation: BYPASS SYNC OUT)

8.11.1 Bypass 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.

8.11.2   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.

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 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.

Characteristics   The reversing 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 value: 0.3 s seconds

Setting range: 0.1 … 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.

Information   The failure function can only be set off when the watchdog function is activated within the master.

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

9.2.1 Failure behaviour initiation on loss of signal

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  Failure behaviour M0378
    Failure behaviour 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   **The actuator can start immediately when switching on!**

Risk of personal injuries or damage to the valve.

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

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

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

M ▷ Customer settings M0041
　Failure behaviour M0378
　　Failure source M0385

Default value: Active interface

Setting values:

Fieldbus interface	The failure behaviour is initiated in case of bus communication loss.
I/O interface	The failure behaviour is initiated in case of loss of setpoints.

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

For a setpoint range of 0 – 20 mA , monitoring is not possible.

Active interface	The failure behaviour is initiated in case of bus communication loss and/or loss of setpoints/actual values.

Possible failure reasons in case of bus communication loss

- The connection to the master is interrupted.
- The master goes into Clear state and sends:
  - either global control telegrams with the content Clear
  - or data telegrams of the length 0 (FailSafe mode).

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

The failure operation determines 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 predetermined position. Conditions:

- The function <Positioner> is activated.
- Parameter Failure 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.

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 handwheel operation, the selector switch must be set to position **Local control** (LOCAL) or **0** (OFF) before operating the handwheel.

9.2.4 Failure position: define

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

Required access level: Specialist (4) or higher.

M ▷ Customer settings M0041
Failure behaviour M0378
Failure position M0387

Default value: 50.0 %

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

9.2.5 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: 3.0 s

Setting range: 0.0 ... 1,800.0 s seconds

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: AUMA (6).

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
           EMERGENCY 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	**The actuator can start its 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). The motor operation can only be interrupted in this selector switch position.
	→ Should the actuator start unexpectedly: Immediately set selector switch to position **0** (OFF).

9.3.2   EMERGENCY failure behaviour

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
       EMCY behaviour M0198
         Failure reaction EMCY 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: In case of a binary EMERGENCY input from +24 V DC to 0 V. This prevents the <EMERGENCY behaviour> from being initiated immediately once the AC is 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 has to have a high level before switching on the AC; 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 failure 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 performed.

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
   EMCY behaviour
      EMCY operation

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 predetermined position.

9.3.6 EMERGENCY position

If the EMERGENCY operation Approach EMCY pos. is set, the actuator moves to the EMERGENCY position entered here.

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 Torque switching: by-pass

If the EMERGENCY signal initiates an EMERGENCY operation, the torque switching 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

9.3.8 Motor protection: by-pass

If the EMERGENCY signal initiates an EMERGENCY operation, 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.

9.3.9 Stepping mode: by-pass

If the EMERGENCY signal initiates an EMERGENCY operation, the 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.

9.3.10   Operation profile: by-pass

If the EMERGENCY signal initiates an EMERGENCY operation, the set operation profile (operation behaviour) can be by-passed during this operation.

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.

9.3.11   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.

9.3.12   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   M0668

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.

9.3.13   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: Specialist (4) 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 Local controls: enable

— Option —

Application
- Protection against unauthorised operation via local controls
- Protection against unauthorised parameter setting via local controls

Characteristics The selector switch functions LOCAL and/or OFF may be enabled or disabled.

Enable/disable local controls via fieldbus command

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 = enable:
  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 to enable/disable the local controls.

Assigment of digital input

Required user level: AUMA (6).

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

Example Use input DIN 5 for signal Enable LOCAL:

Parameter: 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 there is no enable signal present, local operation via push buttons is disabled and the controls generates the indication: Disabled.

Sel. sw. Local + Off   Disabling or enabling is effective in operation modes LOCAL and OFF (selector switch positions **Local control** and **0**). If there is no enable signal present, local operation via push buttons is disabled and the controls generates the indication: Disabled.

In case the bus fails, the local controls allow no actuator operation via the push buttons, because there is no enable signal present.

9.5   Priority REMOTE

— Option —

Characteristics   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 via 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.

Assignment of digital input

Required user level: AUMA (6).

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

Example   Use input DIN 5 for signal Enable LOCAL:

Parameter: 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 functions (LOCAL, OFF) require 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, the actuator can be controlled from REMOTE and the controls indicate the ⌀ symbol 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, the actuator can be controlled from REMOTE and the controls indicate the ⌀ symbol in the status line of the display (menu S0001).

9.5.3 Fieldbus auto enable

— Option —

Characteristics	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: Sel. sw. Local

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 (enable operation commands)

— Option —

Characteristics
- An operation command will only be executed if an additional release 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 command:

For control via fieldbus interface, the command for enabling the local controls is done via fieldbus command `Fieldb. enable OPEN`.

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 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 to enable/disable the local controls.

Configuration of digital input

Required user level: `AUMA (6)`.

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 operation commands via digital input:

Switching- behaviour for coding `High active`:

- Input `Enable OPEN` or `Enable CLOSE` = **low level** (0 V DC or input open):
  Operation command enabled.
- Input `Enable OPEN` or `Enable CLOSE` = **high level** (standard: +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   Operation mode Interlock

The additional release 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 ist aus.
Remote	Interlock is active in operation modes: Remote Remote 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

9.6.3   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 release signal is only required for operation commands in direction OPEN.
CLOSE	The release signal is only required for operation commands in direction CLOSE.
OPEN and CLOSE	The release signal is required for operation commands in directions OPEN and CLOSE.

9.7   Local Stop

— Option —

Characteristics
- 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, and 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

— **Option** —

Conditions An EMERGENCY stop button is located on the electrical connection

Characteristics
- In an emergency, the EMERGENCY stop button can be used to interrupt the power supply of the motor control (contactors or thyristors). Possibly present operation commands with self-retaining will be reset
- The indication in the top row of the display shows: EMCY stop

Figure 59: EMERGENCY stop button on the electrical connection

Information
- The EMERGENCY stop button is intended for operation in an emergency. For maintenance work, the mains supply of the AC has to be switched off and protected against accidental switching on.
- The EMERGENCY stop button is not available for the ACExC, but only for the weatherproof versions of the AC.

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)

— **Option** —

Characteristics The Partial Valve Stroke Test (PVST) is used to check the function of both actuator and 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 test, controls operate the actuator to its initial position.

Requirements
- Position transmitter in the actuator
- Function <Positioner> activated.

- 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. It cannot be performed for setpoint control (modulating duty).

Perform 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.

Assignment of digital input

Required user level: AUMA (6).

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

Example   Use input DIN 5 for Execute PVST signal :

Parameter: 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 local controls

Required user level: Specialist (4) or higher.

M ▷   Device configuration M0053
    Service functions M0222
      Execute PVST M0850

The actuator is within the set stepping range. The initial position depends on the settings of the following parameters: PVST behaviour M0853, PVST stroke M0854

9.9.1   PVST: activate

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   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, based on operation via defined stroke (PVST stroke).

Operating time   Operating time controlled PVST, based on operation via defined stroke (PVST stroke).

9.9.3   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.

9.9.4   Partial stroke for PVST: set

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 %

9.9.5   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 ... 05:00.0 min:s (minutes:seconds)

9.9.6   PVST operating time: set

M ▷ Customer settings   M0041
    PVST   M0852
      PVST operating time   M0890

Default value: 20.0 s

Setting range: 1.0 ... 60.0 s (seconds)

9.9.7   PVST reverse time: set

Waiting time during PVST prior to returning to initial position.

M ▷ Customer settings M0041
  PVST M0852
    PVST reverse time M0891

Default value: 20.0 s

Setting range: 1.0 ... 60.0 s (seconds)

9.9.8 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: OPEN

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)

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.

The controls generate a fault indication if:

- the excessive torque occurs **between** end positions
- the excessive torque occurs **in** the end positions **and** limit seating is set.

The fault indication is shown in the display

- Status indications: 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 Profibus command Fieldbus RESET (process representation output: 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

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 jammed 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.

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 ... 5.0 s seconds

10.2 Motor protection monitoring (thermal monitoring)

In order to protect against overheating and impermissibly high temperatures at the actuator, PTC thermistors or thermoswitches are embedded in the motor winding. The thermoswitch is tripped as soon as the max. permissible winding temperature has been reached.

The actuator is switched off and the following signals are given:

- LED 3 (motor protection trippped) on the local controls is illuminated.
- Status indication: S0007 Fault or S0011 Failure
  - Details: Thermal fault

The motor has to cool down before the operation can be resumed.

Depending on the parameter setting, the fault signal is either automatically reset or the fault signal has to be acknowledged.

The acknowledgement is made:

- via the **RESET** push button in selector switch position **Local control** (LOCAL).
- or via fieldbus, reset command, byte 1 bit 3 of output data (for this, the selector switch must be set to REMOTE).

In addition, the AC cyclically (once per day) checks the motor protection monitoring for its proper function. If this check fails, the 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 ACExC 01.2

Reset Manual reset.

The acknowledgement is made:

• via the push button **RESET** in selector switch position LOCAL.

• or via the fieldbus, command reset.

If required the thermal overload relay has to be reset manually. To this end, remove the cover on the back of the AC 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, 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 on time starts

• Status indications: S0005 or S0008
  - Details: Wrn on time running

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 ▷ Diagnostic M0022
  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, the AC issues 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 60:   Example
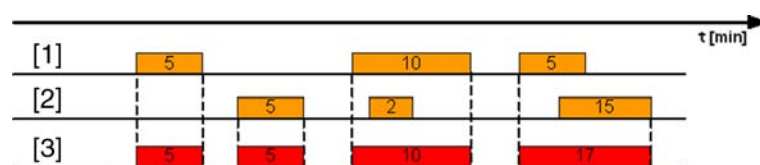
[1]   Running time/h
[2]   Starts/h
[3]   On-time warning

Activate on-time monitoring

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
  On time monitoring M0355
    On time 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
    On time monitoring M0355
    Permissible starts/h M0357

Default value: 1,200

Setting range: 1 ... 1,800 starts/h

Set permissible running time/h

M ▷   Customer settings M0041
    Positioner M0145
    Perm. running time/h M0356

Default value: 15

Setting range: 10 ... 60 minutes

10.4   Operation 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 signalled (the actuator is not stopped):

• Status indication S0005 Warnings
    - Details: Op. time warning

• Via fieldbus: Bit: 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 switched on. The permissible operation time is set via parameter Perm.op. time, manual M0570.

Set permissible operation time manually

Required user level: Specialist (4) or higher.

M ▷   Customer settings M0041
    Oper. time monitoring M0568
    Perm.op. time, manual M0570

Default value: 10

Setting range: 0 ... 3,600 seconds (0 seconds to 1 hour)

10.5   Reaction monitoring

The AUMATIC monitors whether the actuator moves after 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 indications: S0005 Warnings or S0008 Out of specification
  - Details: Wrn no reaction

- Status indications: 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:

- via the **RESET** push button in selector switch position **Local control** (LOCAL).
  - or via the Profibus command Fieldbus RESET (process representation output: byte 1, bit 3).

In case of operation from an intermediate position, reaction monitoring will only be performed if the actuator is equipped with a position feedback.

Activate switching off for reaction time error

Required user level: Specialist (4) or higher.

M ▷   Customer settings   M0041
     Reaction monitoring   M0632
       Wrn controls temp.   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

Setting range: 15 … 300 seconds (0 seconds to 30 minutes)

10.6   Motion detector

— Option —

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   Motion detector: activate

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

Setting range:

Detect. time dt for potentiometer/RWG in actuator, setting in %

Detect. time dt (MWG) for MWG in actuator, setting in ms

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

Setting range:

Travel diff. dx for potentiometer/RWG in actuator

Travel diff. dx (MWG) for MWG in actuator

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: 1.000 s (seconds)

Setting range: 0.001 ... 65.535 s

10.7 Monitoring of electronics power supply

The AUMATIC monitors the following voltages and signals 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 controls and in the actuator)
- External 24 V DC supply of the electronics (option)

10.8 Temperature monitoring

Characteristics If the respective sensors are installed in the devices, the AUMATIC monitors 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 in the control unit of the actuator: additionally 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

Display current device temperatures

Required access level: Specialist (4) or higher.

M ▷ Diagnostic M0022
  Device status M0592
    Device temperatures M0524

Indications:

Temp. controls	Indication of current temperature in controls housing
Temp. control unit	Indication of current temperature in control unit of the actuator (actuator housing)
Temp. motor	Indication of current temperature in motor winding For further information refer to <Motor protection monitoring (thermal monitoring)>
Temp. gearbox	Indication of current temperature in actuator gear housing

10.9 Verification of sub-assemblies

Conditions
- Actuators of the type range SA 07.2 – SA 16.2/SAR 07.2 – SAR 16.2
- MWG position transmitter in actuator

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.

10.10 Phase failure monitoring

Conditions: The 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.

Characteristics The AUMATIC monitors phase L2. If phase L2 is missing for a certain time interval, the AUMATIC still can send and receive signals and generates a fault indication. Since the AUMATIC is supplied via phases L1 and L3, the two phases cannot be monitored. In case L1 or L3 fails, the AUMATIC is inoperable and the actuator stops.

Information In case of phase L2 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 torque is sufficient for valve operation, the missing phase L2 is only detected when switching off (e.g. in an end position) and the fault signal Phase fault is generated.

Configuration of the 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.

10.11	Phase sequence detection and correction of the direction of rotation

Conditions: The phase sequence detection is only valid for connections to 3-phase AC power supplies. For versions with 1-phase AC or DC, phase sequence detection is not possible.

Characteristics Exchanging any two phase conductors in the 3-phase mains changes the direction of phase rotation. Should the phases L1, L2 and L3 be connected in the wrong sequence, this is detected and corrected by the AUMATIC, preventing the actuator from turning into the wrong direction.

Activate phase sequence detection and correction of direction of rotation

M ▷   Device configuration M0053
    Phase monitoring M0170
      Adapt rotary dir. M0171

Default value: Function active

Setting values:

Function active   Function <Phase sequence detection and correction of direction of rotation> is activated.

Function not active   Phase sequence detection and correction of direction of rotation is deactivated.

11. Functions: activate and enable

11.1 Activate functions

Via menu Activation 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.

Function	Menu	Enabling required
EMERGENCY behaviour	M0589	No
Timer CLOSE	M0156	No
Timer OPEN	M0206	No
Positioner	M0158	Yes
Operation profile	M0294	No
Process controller	M0741	Yes
Profibus DP-V2	M0857	No
Bluetooth	M0573	No
Enable LOCAL	M0631	Yes
Priority REMOTE	M0770	Yes
Auto change-over I/O	M0790	Yes
Interlock	M0663	Yes
Torque Wrn	M0796	Yes
PVST	M0851	Yes
By-pass function	M0941	Yes

11.2 Enable functions

Via menu Enabling 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

Function	Menu for user level	
	Specialist (4)	AUMA (6)
Positioner	M0217	M0209
Process controller	M0219	M0338
Profibus DP-V1	M0340	M0339
Enable LOCAL	M0629	M0630
Priority REMOTE	M0772	M0771
Auto change-over I/O	M0791	M0789
Interlock	M0662	M0661
Torque wrn	M0798	M0797
PVST	M0857	M0856
By-pass function	M0939	M0940

Information In user level Specialist (4), an additional activation password (works number specific) is required for enabling the function. The activation password can only be assigned and generated by the AUMA service.

12. 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.

12.1 Direction of rotation

Characteristics

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 AUMATIC 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 is stored in the electronic device ID (parameter Wiring diagram actuator M0060). The ID has to be adapted to the new designation once the conversion is complete.
  - The actuator mounted to the 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).

12.2 Factory setting

The factory setting corresponds to the delivery state of the AUMATIC.

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.

12.3 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

12.4 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

12.5 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

12.6 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

12.7 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 using AUMA ToolSuite software on a laptop computer or PDA
2. via an SD card (card slot in local controls)
3. via Profibus DP (using AUMA ToolSuite)

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

12.8 Service software AUMA ToolSuite (Bluetooth)

AUMA ToolSuite is a user-friendly setting and operation program for AUMA actuator controls AC 01.2.

The connection between computer (PC, laptop, PDA) and local controls is established wireless via Bluetooth interface.

Activate 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 ▷   Diagnostic M0022
     Bluetooth M0244
       Device tag M0423
       Bluetooth address M0422
       Bluetooth add.partner M0576

13.   Diagnostics

Diagnostics comprise information (indications, signals, reports and characteristic curves) for support during commissioning, maintenance or corrective action.

13.1   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 7:   Information on device identifications

Identification M0026		
Indication on display	**Description**	**User level required for modification**
Device designation M0072	AUMATIC device designation	Service (5)
Device tag M0070	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)
Controls M0028	Information on the identification of the AUMATIC	Menu
Com. no. controls M0055	Commission number (order number) of AUMATIC	Service (5)
Works no. controls M0056	Works number of AUMATIC	Service (5)
Wiring diagram M0059	Wiring diagram number of AUMATIC	Service (5)
Date of manufacture M0063	Date of manufacture of controls	Service (5)
Actuator M0029	Information on the identification of actuator	Menu
Com. no. actuator M0057	Commission number of actuator	Service (5)
Works no. actuator M0220	Works number of actuator	Service (5)
Wiring diagram actuator M0060	Wiring diagram number of actuator	Service (5)

Table 8:   Information on device version

Version M0062	
Indication on display	**Description**
Firmware M0077	Firmware version
Language M0565	Language version
Firmware details 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))

13.2   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 operating data

Two counters are available, a lifetime counter and a resettable counter.

M ▷ Diagnostic M0022
 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 9:   Operating data

Indication on display	Description
Motor running time	Motor running time
Motor starts	Number of motor starts (starts)
Thermal fault	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.
System starts	Total of AUMATIC system starts

Reset operating data

Required user level: Specialist (4) or higher.

M ▷ Diagnostic M0022
 Operational info M0177
  Reset operation. info M0197

The entries in the operating data logging can be reset (deleted) via this menu.

13.3   Event report

The event report records system events and status signals. The event record can be exported to the external SD card or read via the AUMA ToolSuite software. This allows conclusions on previous operation 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 AUMATIC records system events such as operation commands or modifications on 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 ▷ Diagnostic M0022
 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 AUMATIC records 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 ▷ Diagnostic M0022
  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 ▷ Diagnostic M0022
  Event report M0195
    File size M0330

Default value: 64 [k]

Setting range: 1 ... 1,024 [k]

With the maximum setting range of 1,024 k, at least 10,000 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 ▷ Diagnostic M0022
  Event report M0195
    Buffer size M0332

Default value: 50

Setting range: 10 ... 100

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 ▷ Diagnostic M0022
   Event report M0195
     Save interval M0331

Default value: 50,000

Setting range: 1,000 ... 65 535 [ms]

13.4   Diagnostic interface

Required user level: Specialist (4) or higher.

M ▷ Diagnostic 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 10:   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 61:   Example of DIN 4 and DIN 5
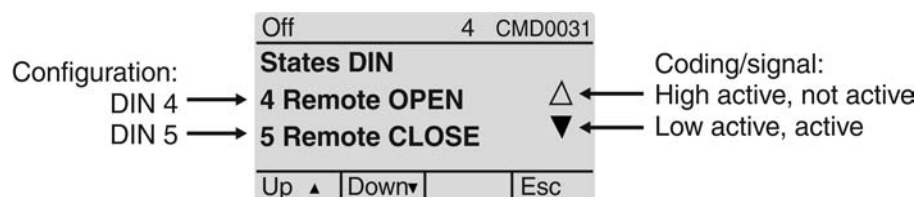
- • Configuration:
  - - DIN 4: Operation command OPEN
  - - DIN 5: Operation command for EMERGENCY behaviour

- 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)
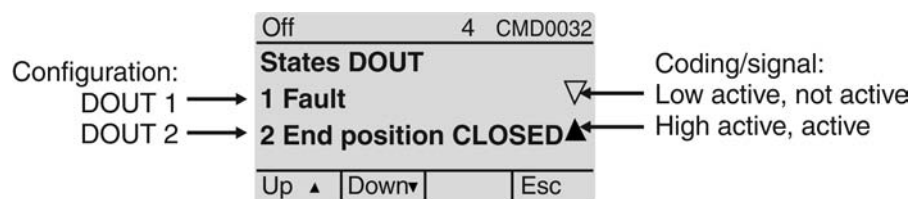   Low level = 0 V = EMERGENCY operation command is available

Diagnostic of digital outputs

For the digital outputs (DOUT), both coding and signal states are indicated at the output by means of symbols.

Table 11:   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	Active	High = 1 (output contact operated)
▼	Low active	Not active	Low = 0 (output contact not operated)

Figure 62:   Example of DOUT 1 and DOUT 2

```
                              Off              4  CMD0032
Configuration:             States DOUT                       Coding/signal:
     DOUT 1 ──→          1 Fault                    ▽◄──── Low active, not active
     DOUT 2 ──→          2 End position CLOSED▲◄──── High active, active
                          Up  ▲ |Down▼|       |Esc
```

- 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)
    Low level = 0 V = No indication (not fault available)
  - DOUT 2: Active (triangle is black)
    Low level = 0 V = indication (end position CLOSED reached)

13.5   Profibus interface: diagnostics

This diagnostics provides information on the current status of the Profibus sub-assemblies.

Required access level: Specialist (4) or higher.

M ▷   Diagnostic M0022
          Profibus DP1 M0240
          Profibus DP2 M0549
          Profibus details M0602

For a detailed description of the indications included these menus refer to Manual (Device integration fieldbus) Profibus DP.

13.6   Bluetooth connection: diagnostic

Menu is only visible if function Bluetooth M0573 is activated.

Required user level: Specialist (4) or higher.

M ▷ Diagnostic M0022
   Bluetooth M0244

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Device tag	M0223	Information for actuator identification within the plant (e.g. KKS designation - Power Plant Classification system) (Can be changed for user level Specialist (4) and higher)
Bluetooth address	M0222	Bluetooth address (BD_ADDR) of controls
Bluetooth add.partner	M0576	Bluetooth address (BD_ADDR) of the Bluetooth partner

13.7 Diagnostic position transmitter potentiometer

Menu is only visible if the actuator is equipped with potentiometer.

Required user level: Observer (1) or higher.

M ▷ Diagnostic M0022
   Position transm. potent. M0831

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Low limit Uspan	M0832	Low limit setting of potentiometer signal range (monitoring the potentiometer span)
Volt.level diff. potent.	M0833	Current voltage level difference of the potentiometer.
Raw val. pos. OPEN	M0999	Raw value end position OPEN
Raw val. pos. CLOSED	M1001	Raw value end position CLOSED
Potent. raw value /mV	M1005	Potentiometer raw value /mV

13.8 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 ▷ Diagnostic M0022
   Position transm. RWG M0996

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Low limit RWG	M1010	Low limit setting of RWG signal for wire break monitoring
Raw val. pos. OPEN	M0997	Raw value end position OPEN
Raw val. pos. CLOSED	M0998	Raw value end position CLOSED
RWG raw value /mA	M1000	RWG raw value /mA

13.9 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 ▷ Diagnostic M0022
   Position transm. MWG M1006

The following states can be checked via diagnostic:

Parameters	Menu ID	Signification
Minimum stroke	M1007	Minimum stroke of MWG
Maximum stroke	M1012	Maximum stroke of MWG
Abs. end pos. OPEN	M1011	Absolute value in end position OPEN
Abs. end pos. CLOSED	M1008	Absolute value in end position CLOSED
Absolute value	M1009	Absolute value of MWG

13.10 Diagnostic positioner

Required user level: Specialist (4) or higher.

M ▷ Diagnostic M0022
   Position transm. RWG M0996

Menu M0996 is only visible if function Positioner M0158 is activated.

The following states can be checked via diagnostic:

Parameters	Menu ID	Bedeutung
Adaptive behaviour	M0626	Setting the adaptive behaviour of the positioner
Setpoint position	M0622	Setpoint position
Actual position	M0623	Actual position
Outer dead band	M0624	Outer dead band
Outer dead b. OPEN	M0625	Outer dead band OPEN
Outer dead b. CLOSE	M1002	Outer dead band CLOSE
Inner dead b. OPEN	M1003	Inner dead band OPEN
Inner dead b. CLOSE	M1004	Inner dead band CLOSE

13.11 Torque-travel characteristic

Conditions
- Actuators with electronic control unit
- Actuator controls AC 01.2 (non-intrusive version) from firmware version 02.03.01

Characteristics Representation of the torque requirement over the entire travel (resolution of 0.1 %)

During each travel, the 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.

The following additional information is saved with the characteristic:

- Commission number
- Works number
- Save date
- Nominal torque in direction OPEN/CLOSE
- Set tripping torque in direction OPEN/CLOSE
- Device tag (20 characters)

Display torque-travel characteristic

M ▷ Diagnostic M0022
   Characteristics M0313
     Torque-position M0546

3 characteristics with two charts each (direction OPEN and direction CLOSE) are shown in the display.

Each characteristic has a designation (e.g. _REF 1_), an arrow indicates the chart for the running direction.

Use push buttons ▲▼ Up ▲ Down ▼ to browse the charts.

Figure 63:   Example of torque-time characteristic

- - -   Set tripping torque
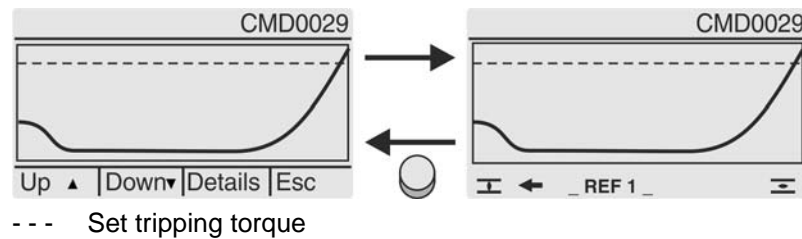
The displayed characteristics are records which were previously saved.

Characteristics recording procedure

1.   Reset characteristics (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 ▷   Diagnostic M0022
        Characteristics M0313
            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 ▷   Diagnostic M0022
        Characteristics M0313
            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 ▷   Diagnostic M0022
        Characteristics M0313
            Save characteristic 2 M0653
            Save characteristic 3 M0654
            Reset characteristic M0656

13.12   Motor running time-position (histogram)

Conditions   •   Actuators of the type range SA 07.2 – SA 16.2/SAR 07.2 – SAR 16.2

**Characteristics**   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.

Indicate motor running time position

M ▷   Diagnostic M0022
 Histograms M0712
  Motor run.time-position M0713

Figure 64:   Example of a motor running time position histogram
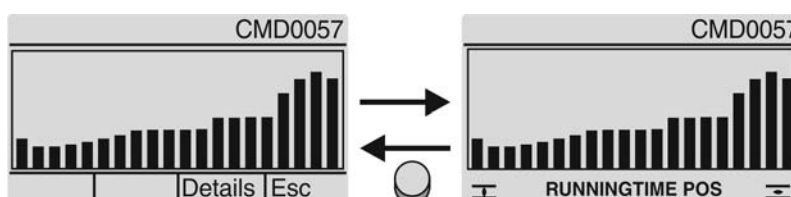
The following detailed information is saved with the histogram (may be called up via push buttons Details)

• Starting date:.
• Saving date:.
• Scaling:.

13.13   Motor running time-temperature (histogram)

Conditions   • MWG position transmitter in actuator
• Temperature sensor in the motor (option)

Characteristics   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.

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 histogram indicates the ambient conditions (temperatures) at which the actuator motor was predominantly operated.

Indicate motor running time-temperature

M ▷   Diagnostic M0022
 Histograms M0712
  Motor run.time-temp. M0715

Figure 65:   Example of motor running time-motor temperature histogram
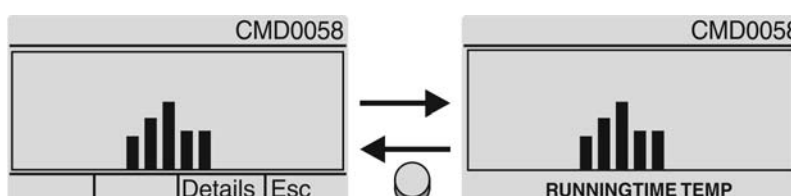
The following further information is saved with the histogram (can be requested via push button Details)

• Starting date:.
• Saving date:.
• Scaling:.

13.14   Motor running time-torque (histogram)

Conditions   MWG position transmitter in actuator

Characteristics   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 %

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-torque histogram indicates the actuator load during service life.

Display motor running time-torque

M ▷   Diagnostic M0022
        Histograms M0712
            Motor run.time-torque M0830

Figure 66:   Example of motor running time-torque histogram
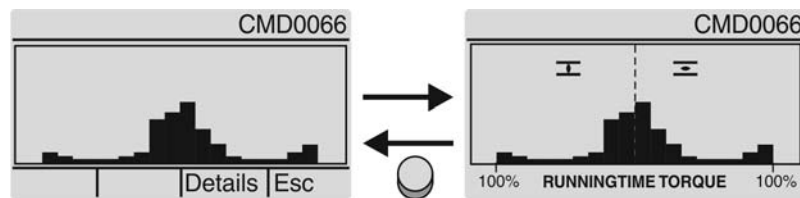
The following further information is saved with the histogram (can be requested via push button Details)

- Starting date:.
- Saving date:.
- Scaling:.

14.   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 AUMATIC to check the interface to the DCS and the correct behaviour of the DCS.

14.1   Actuator signals

By simulating the actuator signals, the signal behaviour of the AUMATIC to the DCS can be tested, for example, without having to connect the actuator.

Required user level: Service (5) or higher.

M ▷   Diagnostic 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.

14.2   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 ▷   Diagnostic 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: 1 Fault

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. Corrective action

15.1 Primary fuses

The AUMATIC has to be opened to replace the primary fuses. For detailed information, refer to operation instructions for actuator.

15.2 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.

Collective signals include further indications which can be displayed via the ↵ Details push button.

Table 12: Faults and warnings via status indications in the display

Indication on display	Description/cause	For indicated value > 0:
Warnings S0005	Collective signal 02: Indicates the number of active warnings.	Press push button ↵ Details. For details, refer to <Warnings and Out of specification> table.
Not ready REMOTE S0006	Collective signal 04: Indicates the number of active signals.	Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
Fault S0007	Collective signal 03: Indicates the number of active faults. The actuator cannot be operated.	Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.
Out of specification S0008	Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal operation conditions.	Press push button ↵ Details. For details refer to <Warnings and Out of specification> table.
Function check S0009	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid.	Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
Maintenance required S0010	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance.	Press push button ↵ Details to display a list of detailed indications.
Failure S0011	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid	Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.

Table 13:   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 on time running	Warning on time max. running time/h exceeded	• Check modulating behaviour of actuator. • Check parameter Perm. running time/h M0356, re-set if required.
Wrn on time starts	Warning on time max. number of motor starts (starts) exceeded	• Check modulating behaviour of actuator. • Check parameter Permissible starts/h 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. • Check (clear) status of 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 of actuator setpoint position Possible causes: Input signal for setpoint = 0 (signal loss)	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.
Wrn motor temp.	Temperature within motor winding too high	Check actuator sizing, correct accordingly.
Wrn gearbox temp.	Temperature within actuator gear housing too high	Check actuator sizing, correct accordingly.
RTC not set	Real time clock has not yet been set.	Set time.
RTC button cell	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	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	Warning: FO cable system reserve reached (critical or permissible Rx receive level)	Check/repair FO cables.

Indication on display	Description/cause	Remedy
Wrn FOC connection	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.
Torque wrn CLOSE	Limit value for torque warning in direction CLOSE exceeded.	Check parameter Wrn torque CLOSE M0769, re-set if required.

Table 14:   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 or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.	Test/connect phases.
Incorrect phase seq	The phase conductors L1, L2 and L3 are connected in the wrong sequence. Only applicable if connected to a 3-ph AC system.	Correct the sequence of the phase conductors L1, L2 and L3 by exchanging two phases.

Indication on display	Description/cause	Remedy
Mains quality	Due to insufficient mains quality, the controls cannot detect the phase sequence (sequence of phase conductors L1, L2 and L3) within the pre-set time frame provided for monitoring.	• Check mains voltage. • Check parameter Tripping time M0172, extend time frame if required.

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.

Table 15: 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 SETPOINT operation simultaneously) • A setpoint is present and the positioner is not active • For fieldbus: Setpoint exceeds 100.0 %	• Check operation commands (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 service software AUMA ToolSuite.	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 16:   Individual indications

Indication on display	Description/cause	Remedy
Config. warning (Collective signal 06)		
Wrn Setpoint Source	No setpoint source configured although an operation to a setpoint position is to be performed.	Configure analogue inputs AIN 1 or AIN 2, refer to <Input for setpoint position>
Wrn Dead bands	The inner dead band is larger than the outer deadband (the outer dead band is adapted to the inner dead band).	Check positioner setting.
Wrn Fieldbus config.	The configuration of the fieldbus interface is invalid	Check fieldbus interface configuration.
Torque config. CLOSE	The set tripping torque for direction CLOSE is outside the permissible setting range.	Verify torque switching setting.
Torque config. OPEN	The set tripping torque for direction OPEN is outside the permissible setting range.	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	Configuration of EMERGENCY behaviour is incorrect	Check configuration.
Config. operat. profile	Configuration of operation profile is incorrect.	Check configuration.
FO configuration	FO configuration is incorrect	Check configuration.
Heat.monitor.config.	Configuration of the heater monitoring is incorrect.	Check configuration.
Fail.beh. config.	Configuration of the failure behaviour is incorrect.	Check configuration.
Config. PID controller	Configuration of PID controller is incorrect	Check configuration.
Configuration error (Collective signal 11)		
IE MCM	Available version of the of 'MCM' (Motor Control and Monitoring / A52) electronics sub-assembly does not correspond to the target configuration.	Check hardware equipment/article number MCM.
IE PSO	Available version of the 'PSO' (Power Supply Options / A52.1) electronics sub-assembly does not correspond to the target configuration	Check hardware equipment/article number PSO.
IE config. pos. transm.	Internal error of position transmitter configuration (for actual position recording)	Check hardware equipment/article number position transmitter.
IE parameter config.	Available configuration does not correspond to the target configuration.	Check position transmitter parameters.
Hydraulics fault (Collective signal 12)		
Oil level	Oil level too low	Check oil level.
Oil leakage	Oil leakage occurred	Check hydraulic system.
Motor running time	Permissible running time of the electric motor for hydraulic pump exceeded.	Check hydraulic system.
Pressure rise fault	Pressure rise fault	Check hydraulic system.
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 or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.	Test/connect phases.
Incorrect phase seq	The phase conductors L1, L2 and L3 are connected in the wrong sequence. Only applicable if connected to a 3-ph AC system.	Correct the sequence of the phase conductors L1, L2 and L3 by exchanging two phases.

Indication on display	Description/cause	Remedy

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)

Command REMOTE I	An incorrect operation command is available at I/O interface REMOTE I.	Correct operation command.
Command REMOTE II	An incorrect operation command is available at I/O interface REMOTE II.	Correct operation command.
Command fieldbus	An incorrect operation command is available at the fieldbus interface.	Correct operation command.
Setpoint pos. disabled	Operation commands to setpoint positions are not available (function disabled)	Verify availability of function (Activation M0212 parameter)

Internal error (Collective signal 14)

IE mot. prot. monitor	Motor protetction monitoring is defective	Check motor protection monitoring.
IE selector switch	Internal error selector switch defective	Replace selector switch.
IE phase monitoring	Internal error of 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	Internal error output defective (switchgear control)	Check switchgear control.
IE position transmitter	Internal error position transmitter (for actual position recording)	Check actuator.
IE logic	Internal error of 'Logic' electronics sub-assembly (A2)	Check logic.
IE fieldbus	Internal error of 'Fieldbus' electronics sub-assembly (A1.8)	Check fieldbus interface.
IE MWG	Internal error of 'MWG' (Magnetic Limit and Torque Transmitter / B6) electronics sub-assembly	Check MWG.
IE LC	Internal error of 'LC' (Local Controls / A9) electronics sub-assembly	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	Calibration of MWG is incorrect	Check MWG.
IE version	Internal error, conflict of versions	Check device configuration.
IE EEPROM	Internal error EEPROM	Check device configuration.
IE parameter	Internal error parameter (error during parameter initialisation)	Check device configuration.
IE file access	Internal error file access	Check device configuration.
IE backup	Error when accessing replacement parameters	Check device configuration.
IE registration	Internal error upon process data registration	Check device configuration.
IE startup FB	Internal error upon function block startup	Check device configuration.
IE startup sub-assy	Internal error upon electronics sub-assembly startup	Check device configuration.
IE LC exception	Error in the execution of LC firmware	Check device configuration.

Indication on display	Description/cause	Remedy
IE logic exception	Error in the execution of logic firmware	Check device configuration.
IE MWG Exception	Error in the execution of MWG firmware	Check device configuration.
IE bus exception	Error in the execution of fieldbus interface firmware	Check device configuration.
IE MWG end positions	Error when recording the end positions using the MWG	Check device configuration.
Internal warning (Collective signal 15)		
Wrn heater	Internal warning is active (control unit)	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 Backup in use	Internal warning: Replacement parameters are used as no valid parameters are available (Remedy: Reboot controls/actuator)	Reboot AUMATIC.
Wrn ref.actual position	Actuator position feedback has not yet been referenced to the end positions.	Operate actuator fully in end positions OPEN and CLOSED.
Wrn range act.pos.	The current signal range of the position feedback is outside the permissible range.	Verify primary reduction gearing settings within the actuator.
Wrn sign.loss act.pos.	Loss of signal of the actuator position feedback	Check position feedback.
Wrn event mark	Wrn event mark (internal system warning)	Check system configuration.
Wrn Tm mark	Wrn Tm mark (internal system warning)	Check system configuration.
Hydraulics warning (Collective signal 17)		
Operat. pressure min	Pressure of hydraulic accumulator lower than the minimum value of the set accumulator pressure.	Check hydraulic system
Pump starts	Permissible number of starts of the hydraulic pump has been exceeded.	Check hydraulic system.
Oper. press. config.	Configuration of the accumulator pressure is incorrect.	Check hydraulic system.
Config. error REMOTE (Collective signal 22)		
IE I/O interface	Available version of 'I/O interface' (A1.0) electronics sub-assembly does not correspond to the target configuration.	• Check I/O interface M0139 parameter. The setting must correspond to the wiring diagram. • Check wiring. • Check I/O interface.
IE remote interface	Configuration for function of Remote interface is incorrect.	Check configuration.
IE remote Prm Config	Configuration of Remote interface function is faulty.	Check configuration.

16.   Appendix

16.1   Selection overview for output contacts and indication lights (digital outputs DOUT)

Depending on the version, the AC is equipped with up to 6 output contacts (digital outputs).

Table 17:

Signal	Description
Not assigned	–
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 is within max. error variable (outer dead band). Is only signalled if Profibus DP 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
Failure	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid.
Function check	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid.
Out of specification	Collective signal 07: Indication according to NAMUR recommendation NE 107 Difference between setpoint and actual value is too important (exceeding the normal operation conditions).
Maintenance required	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.
Op. 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	Output drive rotates due to operation command from LOCAL.
Running REMOTE	Output drive rotates due to operation command from REMOTE.
Handwheel operation	Output drive rotates without electric operation command.
In intermed. position	The actuator is in an intermediate position e.g. neither in end position OPEN nor in end position CLOSED.
Intermed. pos. 1	Intermediate position 1 reached
Intermed. pos. 2	Intermediate position 2 reached
Intermed. pos. 3	Intermediate position 3 reached
Intermed. pos. 4	Intermediate position 4 reached
Intermed. pos. 5	Intermediate position 5 reached
Intermed. pos. 6	Intermediate position 6 reached
Intermed. pos. 7	Intermediate position 7 reached
Intermed. pos. 8	Intermediate position 8 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
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 error	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 (Cfg)	This signal can be configured (parameter Failure (Cfg) 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.

Signal	Description
Interlock OPEN	Interlock OPEN is active (enable signal for operation commands in direction OPEN available).
Interlock CLOSED	Interlock CLOSED is active (enable signal for operation commands in direction CLOSE available).
Interlock	The operation mode Interlock is active.
By-pass 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 By-pass Sync Out.

16.2 Selection overview of binary signals for digital inputs (DIN)

— Option —

Conditions: <Additional inputs> or additional <Parallel interface>

Depending on the version, the AC is 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

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

Table 18:

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 position 9	Operation command: Run to intermediate position 9.
Intermediate position 10	Operation command: Run to intermediate position 10.
Intermediate position 11	Operation command: Run to intermediate position 11.
Intermediate position 12	Operation command: Run to intermediate position 12.
CW position 1	Clockwise approach of position 1
CCW position 1	Counterclockwise approach of position 1
CW position 2	Clockwise approach of position 2
CCW position 2	Counterclockwise approach of position 2
CW position 3	Clockwise approach of position 3
CCW position 3	Counterclockwise approach of position 3
CW position 4	Clockwise approach of position 4
CCW position 4	Counterclockwise approach of position 4
CW	Clockwise actuator operation

Signal	Description
CCW	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
Internal PID setpoint 2	Internal PID setpoint
Remote II activation	
Remote II OPEN	
Remote II CLOSE	
Remote II STOP	
Execute PVST	
By-pass Sync In	Enable signal for <By-pass function>
LPV Sync In	
LPV end position CLOSED (SA)	
LPV sel. sw. REM (SA)	
LPV system ok (SA)	
PID setpoint I/O	
PID actual value I/O	

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