auma®
Solutions for a world in motion

Multi-turn actuators
PROFOX
PF-M25 – PF-M100

Control

→ Parallel

Profibus DP

Modbus RTU

Operation instructions

Assembly and commissioning

Read operation instructions first.

- Observe safety instructions.
- These operation instructions are part of the product.
- Store operation instructions during product life.
- Pass on instructions to any subsequent user or owner of the product.

Target group:

This document contains information for assembly, commissioning and maintenance staff.

Table of contents

1. Safety instructions

1.1. Prerequisites for the safe handling of the product

Standards/directives

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

Safety instructions/ warnings

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

Qualification of staff

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

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

Commissioning

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

Operation

Prerequisites for safe and smooth operation:

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

Protective measures

The end user or the contractor are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.

Maintenance

To ensure safe device operation, the maintenance instructions included in this manual must be observed.

Any device modification requires prior written consent of the manufacturer.

1.2. Range of application

AUMA multi-turn actuators are designed for the operation of industrial valves, e.g. globe valves, gate valves, butterfly valves and ball valves.

Other applications require explicit (written) confirmation by the manufacturer.

The following applications are not permitted, e.g.:

- Industrial trucks according to EN ISO 3691
- Lifting appliances according to EN 14502
- Passenger lifts according to DIN 15306 and 15309
- Service lifts according to EN 81-1/A1
- Escalators
- Continuous duty

- Buried service
- Continuous underwater use (observe enclosure protection)
- Potentially explosive atmospheres
- Radiation exposed areas in nuclear power plants

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.

Information These operation instructions are only valid for the "clockwise closing" standard version, i.e. driven shaft turns clockwise to close the valve.

1.3. Warnings and notes

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

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

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

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

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

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

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

1.4. References and symbols

The following references and symbols are used in these instructions:

Information The term **Information** preceding the text indicates important notes and information.

Symbol for CLOSED (valve closed)

Symbol for OPEN (valve open)

`Wiring diagram` **Texts extracted from other documents**

Texts extracted from other documents are highlighted in a different font. For example `Wiring diagram`.

➥ **Result of a process step**

Describes the result of a preceding process step.

2. Short description

Multi-turn actuator

Definition in compliance with EN 15714-2/EN ISO 5210:

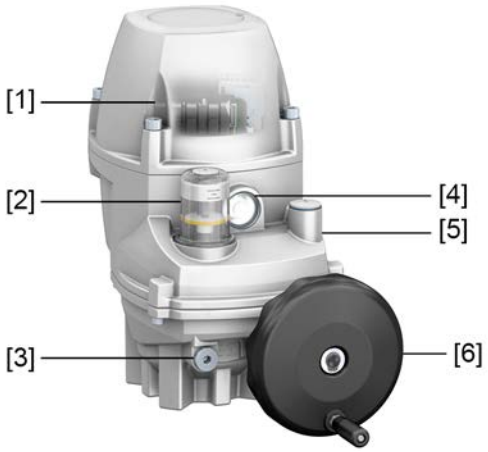
A multi-turn actuator is an actuator which transmits torque to a valve for at least one full revolution. It is capable of withstanding thrust.

AUMA multi-turn actuators PF-M25 – PF-M100 are driven by an electric motor. For control in motor operation and for processing the actuator signals, controls are integrated within the housing. Push buttons allow for local actuator operation. For manual operation, a handwheel is provided. Manual operation is possible without change-over.

Switching off in end positions may be either by limit or torque seating.

AUMA part-turn actuator PROFOX PF-M50

Figure 1: PF-M50



[1] Push buttons
[2] Position indicator
[3] Screw plug
[4] FOX-EYE (indication LED)
[5] Screw plug for manual emergency operation
[6] Handwheel

App and software

Using the **AUMA CDT** software for Windows-based computers (notebooks or tablets) and the **AUMA Assistant App** for Android-based devices, actuator data can be uploaded and read, settings can be modified and stored. The connection between computer and AUMA actuator is established wireless via Bluetooth interface. With the **AUMA Cloud**, we provide an interactive platform to collect and assess e.g. detailed device data of all actuators within a plant.

Figure 2: Communication via Bluetooth

AUMA CDT

AUMA CDT is a user-friendly setting and operation program for AUMA actuators.

Connection between computer (notebook, tablet) and actuator is wireless via Bluetooth interface.

AUMA CDT software can be downloaded free of charge from our website www.auma.com.

AUMA Cloud

The AUMA Cloud is the driving element of the digital AUMA world, acting as interactive platform for efficient maintenance of AUMA actuators at moderate cost. The AUMA Cloud collects all device data of all actuators within one site and provides a clear overview at a glance. Detailed analysis provides valuable information on potential maintenance requirements. Additional functions foster smooth asset management.

AUMA Assistant App

The AUMA Assistant App enables commissioning, configuration and diagnostics of AUMA actuators via Bluetooth using either Android smartphone or Android tablet.

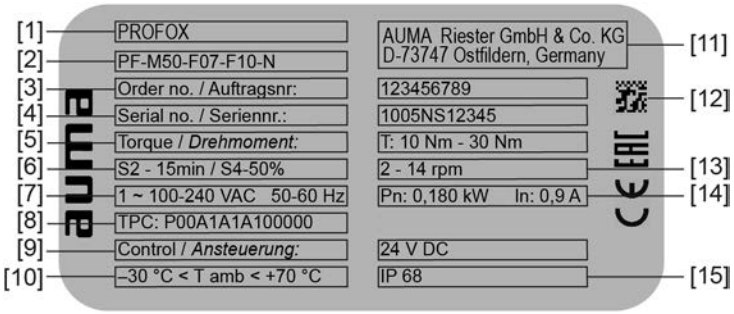
The AUMA Assistant App is available on Google Play Store for free download.

Figure 3: Link to Google Play Store

3. Name plate

Figure 4: Name plate arrangement

Figure 5: PROFOX name plate (example)



[1] Product name
[2] **Type designation**
[3] **Order number**
[4] **Actuator serial number**
[5] Torque range in direction OPEN/CLOSE
[6] Type of duty
[7] Current type, mains voltage, mains frequency
[8] Wiring diagram
[9] Control
[10] Permissible ambient temperature
[11] Manufacturer name and address (manufacturer logo: auma)
[12] **Data Matrix code**
[13] Speed range (rpm)
[14] Nominal power and nominal current
[15] Enclosure protection

Descriptions referring to name plate indications

Type designation

Table 1:

Description of type designation (with the example of PROFOX PF-Q150-F07-F10)					
PROFOX	PF	M	50	F07–F10	
PROFOX					Product name
	PF				Type (abbreviation **P**RO**F**OX)
		M			Type of movement: Multi-turn actuator
			50		Size (max. torque in Nm)
				F07–F10	Flange sizes

Order number

The product can be identified using this number and the technical data as well as order-related data pertaining to the device can be requested.

Please always state this number for any product inquiries.

On the Internet at **http://www.auma.com** > Service & Support > myAUMA, we offer a service allowing authorised users to download order-related documents such as wiring diagrams and technical data (both in German and English), inspection certificate and the operation instructions when entering the order number.

Serial number Actuator

Table 2:

Description of serial number (example of 0520NS12345)			
05	20	NS12345	
05	Positions 1+2: Assembly in week = week 05		
	20	Positions 3+4: Year of manufacture = 2020	
		NS12345	Internal number for unambiguous product identification

Data Matrix code

When registered as authorised user, you may use our **AUMA Assistant App** to scan the Data Matrix code and directly access the order-related product documents without having to enter order number or serial number.

Figure 6: Link to AUMA Assistant App:

For further Service & Support, software/apps/... refer to www.auma.com.

4. Transport and storage

4.1. Transport

For transport to place of installation, use sturdy packaging.

DANGER

Suspended load!

Death or serious injury.

→ Do NOT stand below suspended load.

→ Attach ropes or hooks for the purpose of lifting by hoist only to housing and NOT to handwheel.

→ Actuators mounted on valves: Attach ropes or hooks for the purpose of lifting by hoist to valve and NOT to actuator.

→ Actuators mounted to gearboxes: Attach ropes or hooks for the purpose of lifting by hoist only to the gearbox using eyebolts and NOT to the actuator.

→ Respect total weight of combination (actuator, gearbox, valve)

→ Secure load against falling down, sliding or tilting.

→ Perform lift trial at low height to eliminate any potential danger e.g. by tilting.

4.2. Storage

NOTICE

Danger of corrosion due to inappropriate storage!

→ Store in a well-ventilated, dry room.

→ Protect against floor dampness by storage on a shelf or on a wooden pallet.

→ Cover to protect against dust and dirt.

→ Apply suitable corrosion protection agent to uncoated surfaces.

Long-term storage

For long-term storage (more than 6 months), observe the following points:

1. Prior to storage:
   Protect uncoated surfaces, in particular the output drive parts and mounting surface, with long-term corrosion protection agent.
2. At an interval of approx. 6 months:
   Check for corrosion. If first signs of corrosion show, apply new corrosion protection.

5. Assembly

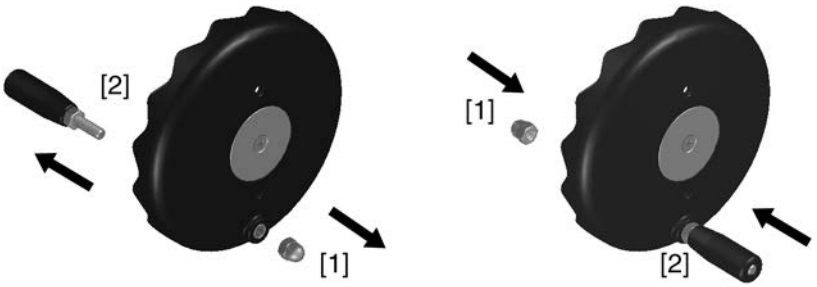
5.1. Mounting position

The product described in this document can be operated without restriction in any mounting position.

5.2. Fit ball handle to handwheel

To avoid damage during transport, the ball handle is fitted at the rear of the handwheel.

Prior to commissioning, mount the ball handle into correct position:



1. Remove cap nut [1] and pull out ball handle [2].
2. Insert ball handle [2] in correct position and fasten with cap nut [1].

Information The end position detection can be modified by rotating the handwheel even if the actuator is not mounted to a valve. Therefore, we recommend refraining from rotating the handwheel several times prior to mounting the actuator to the valve.

5.3. Mount actuator to valve

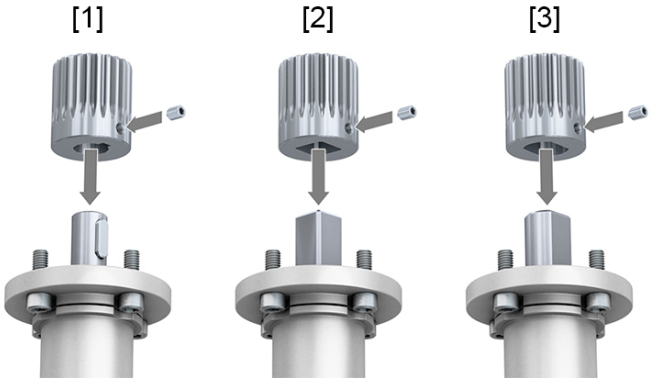
NOTICE

Corrosion due to damage to paint finish

→ Touch up damage to paint finish after work on the device.

5.3.1. Overview on coupling variants

Design Figure 7: Coupling variants



[1] Bore with keyway
[2] Square bore
[3] Bore with two-flats

Application

- For valve attachments according to EN ISO 5211
- For rotating, non-rising valve stem

5.3.2. Mount actuator (with coupling)

Unbored couplings or couplings with pilot bore must be machined to match the valve shaft prior to mounting the actuator to the valve (e.g. with bore and keyway, two-flat or square bore).

Assemble valve and actuator in the same end position. As standard, the actuator is supplied in end position CLOSED.

→ Recommended mounting position for **butterfly valves**: End position CLOSED.

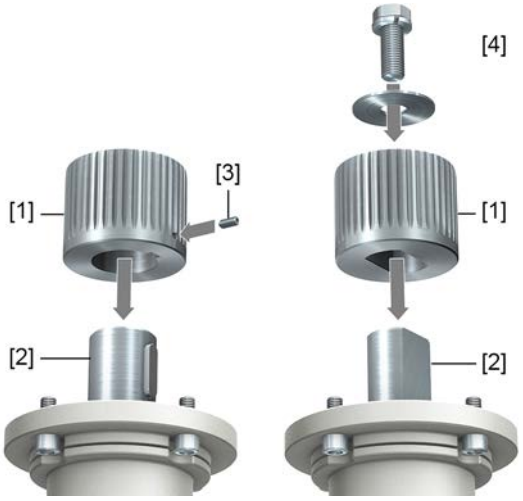
→ Recommended mounting position for **ball valves**: End position OPEN.

Assembly steps

1. If required, move actuator in same end position as valve using the handwheel.
2. Clean mounting faces, thoroughly degrease uncoated mounting surfaces.
3. Apply a small quantity of grease to the valve shaft [2].

4. Place coupling [1] onto valve shaft [2] and secure against axial slipping by using a grub screw [3] or a clamping washer and a screw with curved spring lock washer [4]. Thereby, ensure that dimensions X, Y or L are observed (refer to figure and table <Mounting positions for coupling>).

Figure 8: Examples: Fit coupling



[1] Coupling
[2] Valve shaft
[3] Grub screw
[4] Clamping washer and screw with curved spring lock washer

Figure 9: Mounting positions for coupling

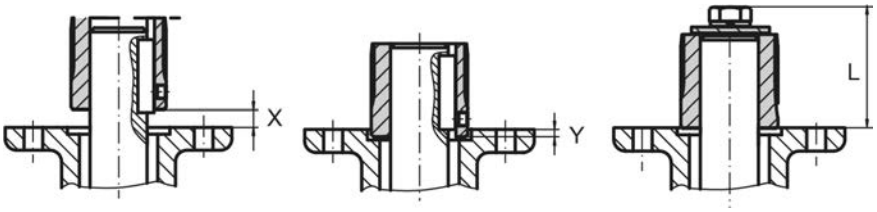


Table 3:

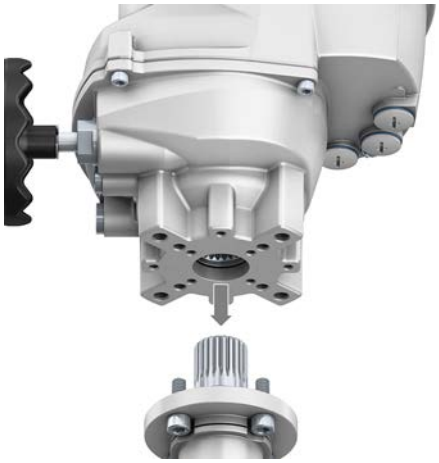
Mounting position of the coupling within fitting dimensions according to AUMA definition								
Dimensions [mm]	M25			M50			M100	
EN ISO 5211	F05	F07	F10	F05	F07	F10	F07	F10
X max.	3	3	3	3	3	3	4.5	4.5
Y max.	2	2	2	2	2	2	4.5	4.5
L max.	38[1)]/40	38[1)]/40	38[1)]/40	38[1)]/40	38[1)]/40	38[1)]/40	50	50

1) Thread with grub screw

5. Apply non-acidic grease at splines of coupling (e.g. Gleitmo by Fuchs).

6. Fit actuator. If required, slightly turn actuator until splines of coupling engage.

Figure 10: Mounting the actuator onto valve



Information Ensure complete contact of flanges.

7. If flange bores do not match thread:
   7.1 Slightly rotate handwheel until bores line up.
   7.2 If required, shift actuator by one tooth on the coupling.
8. Fasten actuator with screws.
   Information: We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.
9. Fasten screws crosswise to a torque according to table.

Table 4:

Tightening torques for screws	
Threads	Tightening torque [Nm]
	Strength class A2-80/A4–80
M6	10
M8	24
M10	48
M12	82
M16	200
M20	392

6. Electrical connection

6.1. Basic information

⚠ WARNING

Electric shock due to presence of hazardous voltage!

Failure to observe this warning can result in death, serious injury, or property damage.

→ The electrical connection must be carried out exclusively by suitably qualified personnel.

→ Prior to connection, observe basic information contained in this chapter.

Wiring diagram/terminal plan

The pertaining wiring diagram/terminal plan (in German or English) is attached to the device in a weather-proof bag, together with these operation instructions. It can also be requested from AUMA (state order number, refer to name plate) or downloaded directly from the Internet (http://www.auma.com).

Permissible networks (supply networks)

The actuators are suitable for use in TN and TT networks. For IT network, a suitable, approved insulation monitor measuring the pulse code is required.

Current type, mains voltage, mains frequency

Type of current, mains voltage and mains frequency must match the data on the name plate.

For short-circuit protection and for disconnecting the actuator from the mains, circuit breakers with the following sizing/characteristics have to be provided by the customer:

Number of actuators	Sizing/ characteristics
1	B06
2	B10
4	C13
10	D16

Potential of customer connections

All input signals (control inputs) must be supplied with the same potential.

All output signals (status signals) must be supplied with the same potential.

Safety standards

Safety measures and safety equipment must comply with the respectively valid national on site specifications. All externally connected devices shall comply with the relevant safety standards for the place of installation.

Connecting cables
Cable glands
Reductions
Blanking plug

- We recommend using connecting cables and connecting terminals according to rated current (I_N) (refer to motor or electrical data sheet).
- For device insulation, appropriate (voltage-proof) cables must be used. Specify cables for the highest occurring rated voltage.
- Use connecting cable with appropriate minimum rated temperature.
- For connecting cables exposed to UV radiation (outdoor installation), use UV resistant cables.
- For the connection of position transmitters, screened cables must be used.

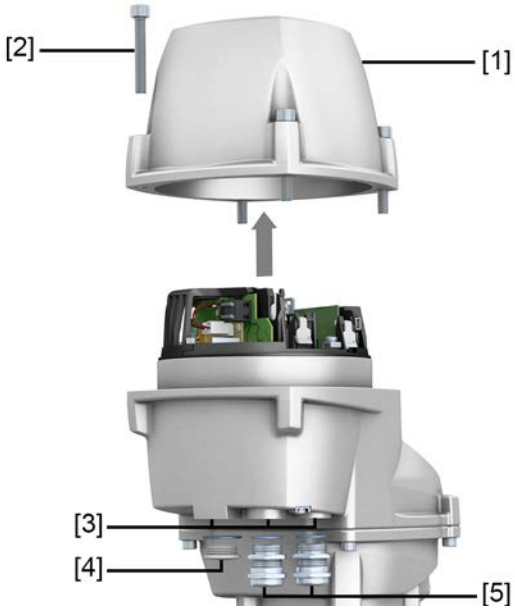
Cable installation in accordance with EMC

Signal and fieldbus cables are susceptible to interference. Motor cables are interference sources.

- Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other.
- The interference immunity of signal and fieldbus cables increases if the cables are laid close to the earth potential.
- If possible, avoid laying long cables and make sure that they are installed in areas being subject to low interference.
- Avoid parallel paths with little cable distance of cables being either susceptible to interference or interference sources.

6.2. Open terminal compartment

Figure 11: Terminal compartment: open



[1] Cover
[2] Screws
[3] Cable entry
[4] Blanking plug
[5] Cable gland (not included in scope of delivery)

DANGER

Electric shock due to presence of hazardous voltage!

Failure to observe this warning results in death or serious injury.

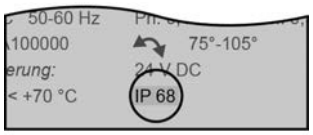
→ Disconnect device from the mains before opening.

→ Wait for 60 seconds after power cut-off prior to opening the housing.

1. Loosen screws [2] and remove cover [1].
2. Insert cable glands [5] suitable for connecting cables.

➥ The enclosure protection IP… stated on the name plate is only ensured if suitable cable glands are used.

Figure 12: Example: Name plate for enclosure protection IP68



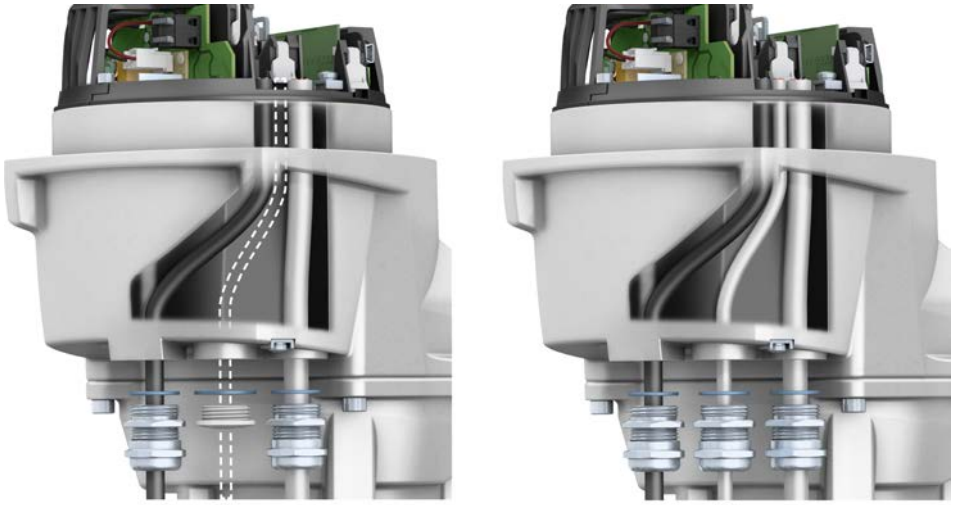
3. Seal unused cable entries [3] with appropriate and approved blanking plugs [4] suitable for the enclosure protection.

6.3. Cable connection

Cable arrangement

Cable arrangement depends on the number of cables connected in addition to the mains cable. There are two options:

Figure 13: Cable arrangement



[1] Cable arrangement for one mains cable and one signal cable

[2] Cable arrangement for one mains cable and two additional cables

For better accessibility, we recommend heeding the following order.

1. Insert signal cable into cable gland on the right and push upward until the cable is visible.
2. In case a further signal cable is connected: Insert second signal cable into middle cable gland and push upward until the cable is visible.
3. Insert mains cable into left cable gland and also push upward until the cable is visible.

Connection of mains and signal cables

4. Remove cable sheathing.
5. Strip wires.
   → Controls approx. 6 mm, power supply unit approx. 10 mm
6. For flexible cables: Use wire end sleeves according to DIN 46228.
7. Connect mains cable according to order-related wiring diagram.

Table 5:

Terminal cross sections			
Designation	Wire type	Cross section	
		min. [mm²]	max. [mm²]
Mains cable	solid wire/ stranded	0.08	2.5
	AWG	AWG 28	AWG 12

8. Connect signal cables in push-in technology according to order-related wiring diagram.

Figure 14: Connect signal cables

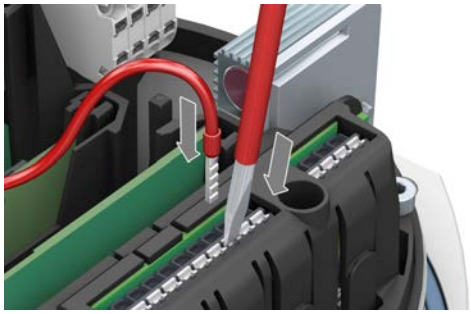


Table 6:

Terminal cross sections			
Designation	Wire type	Cross section	
		min. [mm²]	max. [mm²]
I/O signal cable	solid	0.2	1.5
	flexible	0.2	1.5
	flexible with wire end sleeve without plastic sleeve	0.2	1.5
	AWG	AWG 24	AWG 16

PE connection

WARNING

In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

Risk of electric shock.

→ Connect all protective earth conductors.

→ Connect PE connection to external protective earth conductor of connecting cables.

→ Start running the device only after having connected the protective earth conductor.

9. Fasten PE using spade lugs or wire end sleeves at protective earth connection (⏚) as shown. Do not completely loosen screw!

Figure 15: PE connection

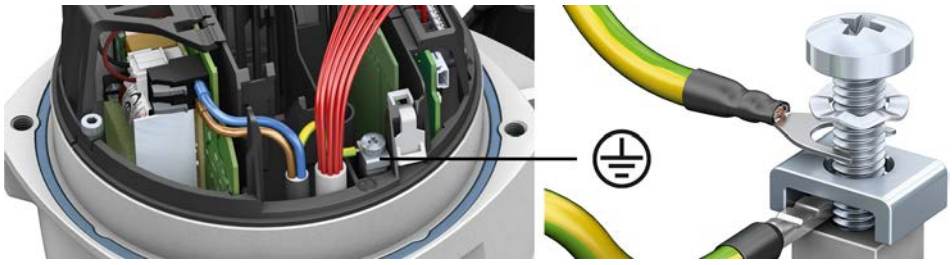


Table 7:

Terminal cross sections and tightening torques of PE connection		
Designation	Terminal cross sections	Tightening torques
Protective earth connection ⏚ (PE)	1.0 – 6 mm^2 (flexible) with ring lugs 1.5 – 10 mm^2 (solid) with loops	1.2 – 2.2 Nm

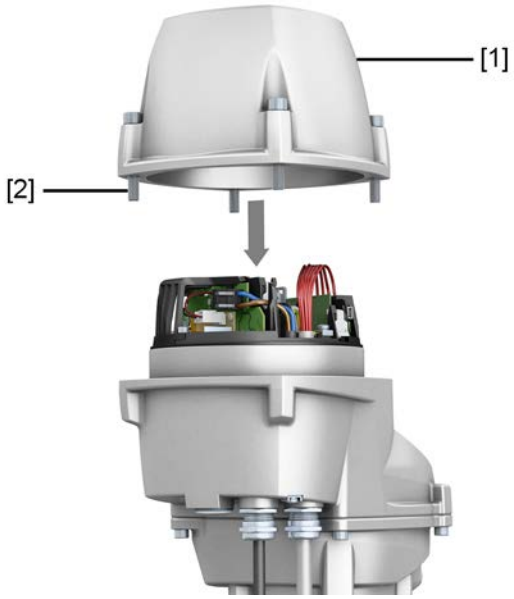
10. For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).

11. Fasten cable glands with the torque as specified by the manufacturer to ensure respect of required enclosure protection.
12. Connect power supply.

If commissioning is directly performed following electrical connection: Do not close cover!

6.4. Close terminal compartment

Figure 16: Terminal compartment: close



[1] Cover
[2] Screws

WARNING

Short-circuit due to pinching of cables!

Risk of electric shock and functional failures.

→ Carefully assemble cover to avoid pinching the cables.

1. Clean sealing faces of cover [1] and housing.
2. Fit cover [1] and fasten screws [2] evenly crosswise.

6.5. External earth connection (option)

WARNING

Hazardous voltage due to insulating impact of powder coating!

Risk of electric shock.

→ Strip powder from actuator surface (file down).
→ Connect all protective earth conductors.
→ Connect PE connection to external protective earth conductor of connection cable.
→ Power the device only once the protective earth conductor has been connected.

Figure 17: Earth connection

Application External earth connection (U-bracket) for connection to equipotential compensation.

Table 8:

Terminal cross sections and earth connection tightening torques		
Conductor type	Terminal cross sections	Tightening torques
Solid wire and stranded	2.5 mm² to 6 mm²	3 – 4 Nm
Fine stranded	1.5 mm² to 4 mm²	3 – 4 Nm
For fine stranded (flexible) wires, connection is made via cable lugs/ring terminals. When connecting two individual wires with a U-bracket, cross sections have to be identical.		

7. Commissioning

Commissioning is made in three steps:

1. End position setting
2. Position indicator setting
3. Configuration of further parameters

Besides end position settings, all other settings have already been made in the factory in compliance with the order.

If correctly ordered, only end position setting is required.

The following table shows the most important parameters and how they can be configured.

Step	Setting	Parameter/designation	At the actuator	AUMA Assistant App	AUMA CDT	Page
End position setting	Positions	End position CLOSED setting	Yes	Yes	Yes	page 22, Set end position CLOSED
		End position OPEN setting	Yes	Yes	Yes	page 23, Set end position OPEN
Position indicator setting	Indication for the end positions	Indication end position CLOSED	Yes	No	No	page 24, Position indicator setting
		Indication end position OPEN	Yes	No	No	
Configuration of further parameters	Type of seating	End position CLOSED	No	Yes	Yes	—
		End position OPEN	No	Yes	Yes	
	Torque switching	Tripping torque CLOSE	No	Yes	Yes	
		Tripping torque OPEN	No	Yes	Yes	
	Speeds	Speed	No	Yes	Yes	page 25, Speed setting

Many further parameters can be configured using the AUMA Assistant App or AUMA CDT.

7.1. End position setting (via push buttons)

In case of torque seating: Check factory torque setting!

The end positions may also be set using the AUMA Assistant App or the AUMA CDT software.

NOTICE

Valve damage at valve/gearbox due to incorrect setting!

→ When setting with motor operation: Interrupt operation in time **prior** to reaching the end stop.

→ Heed overrun when selecting actuator seating via positions.

7.1.1. Set end position CLOSED

DANGER

Electric shock due to presence of hazardous voltage!

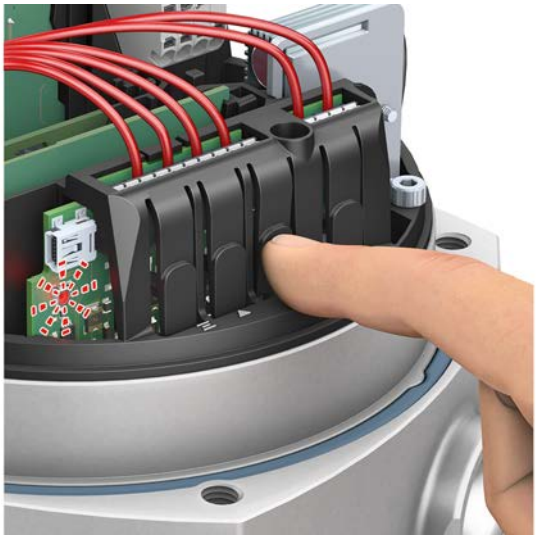
Failure to observe this warning results in death or serious injury.

→ Electrical connection and commissioning must be carried out exclusively by suitably qualified personnel if circuit is live.

→ Do not touch any cables.

1. Remove cover from actuator.
2. Operate in direction CLOSE via push button ▼ until complete valve closing.

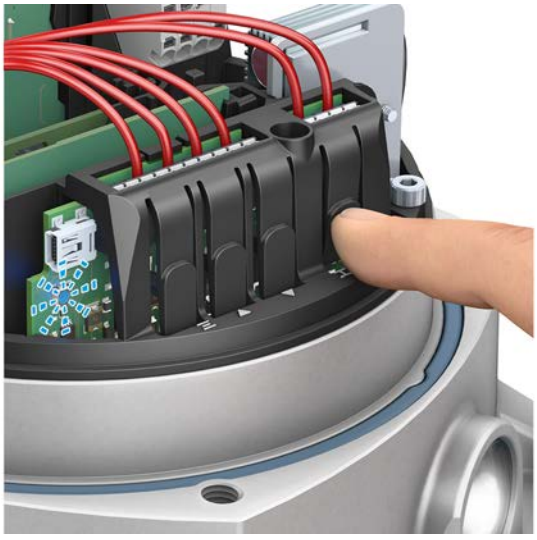
➥ The operation in direction CLOSE is signalled by the LED flashing in red.



3. Once the desired end position CLOSED has been reached, release the push button ▼.

➥ The LED continues flashing in blue for approx. 10 seconds. This time span allows for end position setting.

4. While LED is flashing in blue, hold down push button ⊼ for at least two seconds until the LED is illuminated in red.



➥ The end position CLOSED setting has been successfully completed.

7.1.2. Set end position OPEN

DANGER

Electric shock due to presence of hazardous voltage!

Failure to observe this warning results in death or serious injury.

→ Electrical connection and commissioning must be carried out exclusively by suitably qualified personnel if circuit is live.

→ Do not touch any cables.

1. Remove cover from actuator.
2. Operate in direction OPEN via push button ▲ until complete valve opening.

➥ The operation in direction OPEN is signalled by the LED flashing in green.

3. Once the desired end position OPEN has been reached, release the push button ▲.

➥ The LED continues flashing in blue for approx. 10 seconds. This time span allows for end position setting.

4. While LED is flashing in blue, hold down push button ⎓ for at least two seconds until the LED is illuminated in green.

➥ The end position OPEN setting has been successfully completed.

7.2. Position indicator setting

The position indicator shows the valve position by means of a yellow position indication disc moving up and down. The white end position indication ring shows the end position OPEN and the bottom final point of the position indication shows the end position CLOSED.

Figure 18: Mechanical position indicator

[1] End position indication ring with symbol for OPEN

[2] Position indication disc

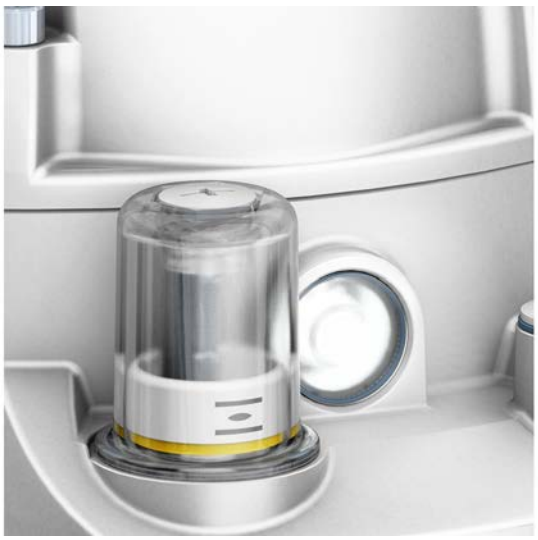
NOTICE

Risk of valve damage in case of incorrect selection of stem pitch!

→ Order position indicator suitable for the valve.

The position indication is auto-adjusting during commissioning. Upon delivery, both the yellow position indication disc and the white end position indication ring are flush with the housing.

Figure 19: Delivery setting



During first operation in direction OPEN, the yellow position indication disc pushes the white end position indication ring until reaching the end position.

Figure 20: Operation in direction OPEN

During operation in direction CLOSE, only the yellow position indication disc is moving. The white end position indication ring remains in end position OPEN.

After having changed the end position OPEN, it is possible to open the position indicator and readjust the white end position indication ring using a screwdriver.

7.3. Configuration of further parameters

Either the AUMA Assistant App or AUMA CDT software is required to use the complete range of configuration options.

The user level defines which parameters are displayed or can be changed.

Information For further information relating to user levels and passwords, please refer to page 29, Table 12.

7.3.1. Speed setting

The speeds are determined by the motor speed. The motor speed and thus the actuator speed can be modified using the AUMA Assistant App or AUMA CDT.

Setting is made via a percentage within the range of 10 % to 100 %, whereby 100 % corresponds to the maximum actuator speed.

The speeds can be individually set for the following functions:

- Standard speed for operations in directions OPEN and CLOSE and back (parameter: Motor speed 1).
- Alternative standard speed if different speeds are required for operation in directions OPEN and CLOSE or if continuous changes between two specified are required (parameter: Motor speed 2).
- Speeds for “Failure behaviour” and “EMERGENCY behaviour” functions:
  - for operation in direction CLOSE (parameter: Mot. sp.FB+EMCY CL)
  - for operation in direction OPEN (parameter: Mot. sp.FB+EMCY OP)

Variable speeds

for standard operations between directions OPEN and CLOSE and back: Defined by an analogue input signal or fieldbus. The analogue input must be configured to interpret this signal. For fieldbus operation, a respective field within the process representation is available.

The speeds are programmed in %.

Table 9: Example values for M25 size setting

	Speed in % of the maximum motor speed	
Output drive speed in rpm	50 W	25 W
0.6	—	10 %
1	—	17 %
1.4	10 %	—
1.5	—	25 %
2.5	18 %	42 %
3	21 %	50 %
3.5	25 %	58 %
4	29 %	67 %
5	36 %	83 %
6	43 %	100 %
7	50 %	—
10	71 %	—
14	100 %	—

Table 10: Example values for M50 size setting

	Speed in % of the maximum motor speed	
Output drive speed in rpm	50 W	25 W
0.3	—	10 %
0.5	—	17 %
0.6	10 %	—
1	17 %	33 %
1.5	25 %	50 %
2.5	42 %	83 %
3	50 %	100 %
3.5	58 %	—
4	67 %	—
5	83 %	—
6	100 %	—

Table 11: Example values for M100 size setting

	Speed in % of the maximum motor speed	
Output drive speed in rpm	50 W	25 W
0.15	—	10 %
0.3	10 %	—
0.5	17 %	33 %
1	33 %	67 %
1.5	50 %	100 %
2.5	83 %	—
3	100 %	—

8. Operation

8.1. Manual operation

For purposes of setting and commissioning, in case of motor or power failure, the actuator may be operated manually.

The handwheel does not rotate during motor operation. Change-over from motor operation to manual operation is not required.

1. Close valve: Turn handwheel clockwise.

➥ Drive shaft (valve) turns clockwise in direction CLOSE.

2. Open valve: Turn handwheel counterclockwise.

➥ Drive shaft (valve) turns counterclockwise in direction OPEN.

Information

Turning the handwheel during motor operation extends or reduces the operating time, depending on the direction of rotation.

8.2. Motor operation

NOTICE

Valve damage due to incorrect settings!

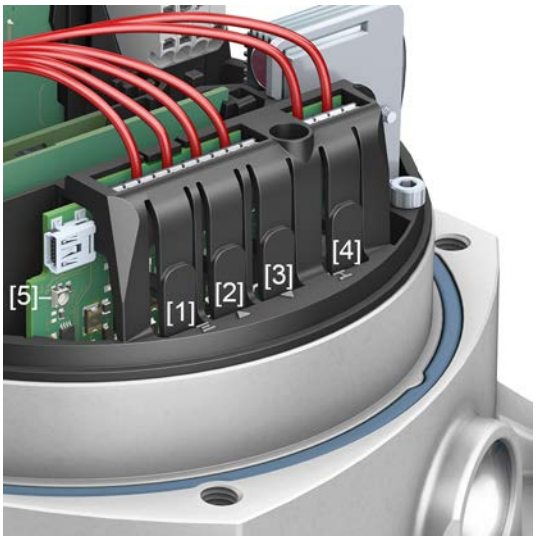
→ Check the parameters configured in the factory prior to electrical actuator operation.

→ In case of deviations, adapt the parameters according to the valve and application requirements.

8.2.1. Actuator operation via push buttons

The actuator can be locally operated by means of four push buttons.

Figure 21: Push buttons



[1] Set end position OPEN push button
[2] Set operation in direction OPEN ▲ push button
[3] Set operation in direction CLOSE ▼ push button
[4] Set end position CLOSED push button
[5] LED

CAUTION

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

Risk of burns

→ Verify surface temperature and wear protective gloves.

1. Run actuator in direction OPEN: Press push button [2].

➥ The LED flashes in green during operation in direction OPEN.

2. Run actuator in direction CLOSE: Press push button [3].

➥ The LED flashes in red during operation in direction CLOSE.

8.2.2. Actuator operation via AUMA Assistant App

Functions

Alternatively, actuator operation is possible via the “AUMA Assistant” smartphone App. The following table shows a functional overview of the AUMA Assistant App.

Function	Description
Diagnostics	Display of all available warnings and faults including respective details. Actuator diagnostics and detailed diagnostics
Operation function	Operation in direction of end positions Resetting the fault log
Setting end positions	Setting the positions for end positions CLOSED and OPEN
Device ID	Device designation Order number, serial number
Configuration	Configuration of all parameters
Service functions	Factory settings Rebooting the actuator

User level

User level (1), (2), (3), ... defines which menu items or parameters can be displayed or modified by the active user.

6 different users/user levels are available. User level (1), (2), (3), ... is indicated in the top display row.

Figure 22: User level display (example user level 4)

Password

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

Table 12: User level and password

User levels and authorisations	
User (user level)	Authorisation/password
Observer (1)	Verify settings No password required
Operator (2)	Change configuration parameters (low level) Factory password: 000000
Maintenance (3)	Reserved for future use
Specialist (4)	Change configuration parameters (high level) e.g. type of seating, assignment of output contacts Factory password: 000000
Service (5)	Service staff Change configuration parameters (service level)
AUMA (6)	AUMA administrator

8.2.3. Actuator operation from Remote

Operation mode Remote

For remote control, actuator operation mode must be set to **Remote**. The operation mode can be modified via AUMA Assistant App or AUMA CDT software in “Operation function” and “Set end positions”.

Default setting: Operation mode = Remote

Activate operation mode Remote via AUMA Assistant App:

→ Set parameter 555 (virtual selector switch) to REMOTE.

➥ Now, it is possible to operate the actuator via remote control, via operation commands (OPEN, STOP, CLOSE) or analogue setpoints (e.g. 0/4 – 20 mA).

Change-over between OPEN - CLOSE control and setpoint control

For actuators equipped with positioner, it is possible to select between **OPEN - CLOSE control** (REMOTE OPEN-CLOSE) and **setpoint control** (REMOTE SETPOINT).

- MODE input: + 24 V DC = REMOTE OPEN-CLOSE
  Control is made via digital operation commands OPEN, STOP, CLOSE.
- MODE input: 0 V (or input open-circuit) = REMOTE SETPOINT
  Control takes place via an analogue signal (e.g. 0/4 – 20 mA).

EMERGENCY operation:

- An EMERGENCY operation is initiated by a signal at the EMERGENCY input.
- The actuator moves to a predefined EMERGENCY position (i.e. end position OPEN or end position CLOSED).
- During EMERGENCY operation, the actuator does not react to other operation commands such as Remote OPEN/Remote CLOSE or Remote SETPOINT.

9. FOX-EYE indication light and status indication

Figure 23: FOX-EYE LED colours

[1] FOX-EYE indication light
[2] Position indicator

FOX-EYE indication light

Table 13: FOX-EYE indication light (default setting)

Colour/state	Signification	Description
illuminated in red	End position CLOSED	The actuator is in end position CLOSED.
illuminated in green	End position OPEN	The actuator is in end position OPEN.
Illuminated in white	Ready to operate	The actuator is ready to operate and out of any end position.
Illuminated in blue	Bluetooth	The actuator is connected via Bluetooth.
blinking in red	Operation in direction CLOSE	The actuator runs in direction CLOSE.
blinking in green	Operation in direction OPEN	The actuator runs in direction OPEN.
flashing in red (fast)	Fault	Refer to Corrective action chapter.

Position indicator

Mechanical position indicator:

- Independent of power supply
- continuously indicates the valve position
- indicates whether the actuator is moving (running indication)
- indicates that end positions have been reached

Table 14: Position indicator

Position indication disc	Signification	Description
Resting at the bottom	CLOSED	The actuator is in end position CLOSED.
Resting at the end position indication ring	OPEN	The actuator is in end position OPEN.
Resting in the middle	Intermediate position	The actuator is not in any of the end positions.

10. Corrective actions

10.1. Faults during commissioning

Table 15:

Faults during operation/commissioning		
Faults	Description/cause	Remedy
Actuator operation is either too fast or to slow.	Speed setting is incorrect.	Change speed.
Actuator suddenly stops in end positions.	Speed reduction switched off or incorrectly set before reaching end positions.	Set speed reduction and/or adapt parameter.
Mechanical position indicator stops; however, the actuator continues operation. This can cause the position indicator to break.	Incorrect position indicator selection when placing the order.	Replace position indicator.
Actuator exceeds the end position.	Overrun due to excessive speed.	Advance electronic end position switch by the overrun margin or adapt the parameters to an extended speed reduction curve in the “Speed red.pr.end pos.” [speed reduction prior to end position] section.
Actuator repeatedly corrects the setpoint position during positioning.	Overrun due to excessive speed.	Adapt the speed reduction prior to setpoint position parameters to an extended speed reduction curve in the positioner menu or adjust optimally the parameters for the positioner.

10.2. Fault indications

Faults interrupt or prevent the electrical actuator operation. If a fault occurs, the FOX-EYE indication light is quickly flashing in red.

Warnings have no influence on the electrical actuator operation. They only serve for information purposes. The FOX-EYE remains white.

Collective signals include further indications. The FOX-EYE remains white.

Faults and warnings may exclusively be read via AUMA Assistant App or AUMA CDT software.

Table 16:

Faults and Failure		
Display (App or CDT)	Description/cause	Remedy
Torque fault CLOSE	The actuator has reached the preset tripping torque in direction CLOSE.	Perform one of the following measures: • Issue an operation command in direction OPEN either via push buttons or AUMA Assistant App. • Reset the fault signal either via AUMA Assistant App or AUMA CDT software “Diagnostics” menu.
Torque fault OPEN	The actuator has reached the preset tripping torque in direction OPEN.	Perform one of the following measures: • Issue an operation command in direction CLOSE either via push buttons or AUMA Assistant App. • Reset the fault signal either via AUMA Assistant App or AUMA CDT software “Diagnostics” menu.
Thermal fault	The motor exceeds the maximum permissible temperature.	The fault can be configured for both types of behaviour 1. Fault reset must be performed manually. 2. The fault is automatically reset once the motor temperature falls below the maximum permissible value. For explosion-proof actuators, only the second type of behaviour is permissible.
Incorrect rotary direct.	The actual direction of rotation does not match the controls’ direction of rotation.	Check the Rot. dir. motor parameter whether it is suitable for the gearbox. The fault may only occur after modification of the actuator/gearbox.
Fault no reaction	No actuator reaction to operation commands within the set reaction time.	Check movement at actuator.
Internal error	Collective signal 14: Internal error has occurred. Different causes can be the reason: Memory overflow in firmware, firmware error, electronic sub-assembly defective.	Use AUMA Assistant App or AUMA CDT to visualise the individual signals by means of the Diagnostics menu. If a memory overflow occurs, reboot the actuator. Otherwise, please contact the AUMA Service.
Configuration error	Collective signal 11: A configuration fault has occurred preventing actuator operation.	Use AUMA Assistant App or AUMA CDT to visualise the individual signals by means of the Diagnostics menu. Check the applicable configuration parameters. Contact AUMA service if appropriate.
Config. error REMOTE	Collective signal 22: Configuration error has occurred. The additional fieldbus or I/O board fails either due to incorrectly set configuration parameters or caused by defective hardware.	Use AUMA Assistant App or AUMA CDT to visualise the individual signals by means of the Diagnostics menu. Check the configuration parameters for the sub-assembly. In case the problem persists: Contact AUMA Service.
Fault motor controls	Collective signal 28: Hardware or software faults of motor or motor controls	Contact AUMA service.

11. Servicing and maintenance

⚠ CAUTION

Damage caused by inappropriate maintenance!

→ Servicing and maintenance must be carried out exclusively by suitably qualified personnel having been authorised by the end user or the contractor of the plant. Therefore, we recommend contacting our service.

→ Only perform servicing and maintenance tasks when the device is switched off.

AUMA Service & Support

AUMA offers extensive service such as servicing and maintenance as well as customer product training. For the contact addresses, refer to our website (www.auma.com).

11.1. Preventive measures for servicing and safe operation

The following actions are required to ensure safe device operation:

6 months after commissioning and then once a year

- Check fastening screws between actuator and gearbox/valve for tightness. If required, fasten screws while applying the tightening torques as indicated in chapter <Assembly>.
- When rarely operated: Perform test run.

For enclosure protection IP68

After submersion:

- Check actuator.
- In case of ingress of water, locate leaks and repair. Dry device correctly and check for proper function.

11.2. Maintenance

Recommendation for grease change and seal replacement:

- The gearboxes are virtually maintenance-free. Without visual grease leakage, neither grease change nor seal replacement nor relubrication is required.

Recommendation for maintenance:

- Generally after 4 to 6 years for modulating duty.
- Generally after 6 to 8 years if operated frequently (open-close duty).
- Generally after 10 to 12 years if operated infrequently (open-close duty).

Additional lubrication of the gear housing is not required during operation.

11.3. Disposal and recycling

Our devices have a long lifetime. However, they have to be replaced at one point in time. The devices have a modular design and may, therefore, easily be separated and sorted according to materials used, i.e.:

- electronic scrap
- various metals
- plastics
- greases and oils

The following generally applies:

- Greases and oils are hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the national regulations for waste disposal.

12. Technical data

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

12.1. Technical data Multi-turn actuators with integral actuator controls for open-close and modulating duty

Features and functions		
Type of duty	Open-close duty	Classes A and B according to EN 15714-2, short-time duty S2 - 15 min
	Modulating duty	Class C according to EN 15714-2, intermittent duty S4 - 50 % with maximum number of starts: • PF-M25 – 1,200 starts/hour • PF-M50 – 1,200 starts/hour • PF-M100 – 1,200 starts/hour
	For nominal voltage and +40 °C ambient temperature and at charge with running torque (open-close duty) or modulating torque (modulating duty). The type of duty must not be exceeded.	
Motor	Variable speed, brushless motor	
Insulation class	F, tropicalized	
Motor protection	Via calculated temperature value	
Self-locking	Yes, at standstill with spring-applied brake	
Turns / stroke	Standard:	1 – 27 turns/stroke
	Option:	27 – 400 turns/stroke
Limit switching	Via hall sensors	
Torque switching	Via electronic current measurement. Tripping torques adjustable in 8 steps	
Mechanical position indicator	Standard:	Continuous indication. Versions: 1 – 9 turns/stroke 9 – 14 turns/stroke 14 – 27 turns/stroke
	Option:	Without mechanical position indicator
Manual operation PF-M25 – PF-M100	Standard:	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation.
	Option:	Without manual operation, this means handwheel and handwheel shaft are obsolete.
Coupling	Standard:	Coupling unbored
	Options:	• Coupling unbored extended • Finish machining of coupling (standard or extended) - Bore according to EN ISO 5211 with 1 keyway according to DIN 6885-1 - Square bore according to EN ISO 5211 - Two-flat according to EN ISO 5211
Valve attachment	Standard:	Dimensions according to EN ISO 5211
	Options:	• With output drive type A • With LE linear thrust unit • With GS worm gearbox

Features and functions		
Power supply	Standard voltages: 1-phase AC current: 100 – 240 V / 50 – 60 Hz Permissible variation of mains voltage: ±10 % Permissible variation of mains frequency: ±5 % For current consumption, refer to Electrical data for PROFOX Part-turn actuators	
Overvoltage category	Category III according to IEC 60364-4-443	
Power electronics	With integral motor controller (current consumption in standby mode 3 W)	
Control (input signals)	3 digital Inputs	3 digital inputs (via opto-isolator, with one common) • Control voltage 24 V DC, current consumption: approx. 15 mA per input • Minimum pulse duration for shortest operation pulse: 100 ms • All digital inputs must be supplied with the same potential • All inputs can be configured as required • Standard assignment: OPEN, STOP, CLOSE • Assignment for option with positioner: OPEN, CLOSE, MODE
	Analogue input (option)	• 0/4 – 20 mA or 0 – 10 V • No galvanic isolation • Used as input signal for position setpoint (in combination with positioner) or as input signal for motor speed.
Status signals (output signals)	3 digital Outputs	• Freely configurable semi-conductor output contacts, per contact max. 24 V DC, 100 mA (resistive load) • Outputs can be configured as required • Standard assignment: End position OPEN, end position CLOSED, collective fault signal
	Analogue output	• Position feedback 0/4 – 20 mA (load 500 Ω) or 0 – 10 V • No galvanic isolation
Voltage output (option)	Auxiliary voltage 24 V DC, max. 40 mA for supply of control inputs, without galvanic isolation.	
Functions	Standard:	• Switch-off mode adjustable: Limit or torque seating for end positions OPEN and CLOSED • Torque monitoring across the whole travel • Torque by-pass • Programmable EMERGENCY behaviour: - Digital input low active, - Reaction can be selected: Stop, run to end position CLOSED, run to end position OPEN • Speed control - Ramps - Program operation profiles - Program either specific speed for OPEN and CLOSE operations or one digital input
	Option:	• Positioner (always included for fieldbus versions) - Position setpoint via analogue input E1 = 0/4 – 20 mA or 0 – 10 V - Programmable behaviour on loss of signal - Automatic adaptation of dead band (adaptive behaviour selectable) - Selection between open-close duty and modulating duty via digital MODE input
Bluetooth Communication interface	Bluetooth class II chip, with a range min. 3 m in industrial environments, supports the SSP Bluetooth profile (Serial Port Profile). Required accessories: • AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) • AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)	
Electrical connection	Cable entry: 3 x M20 threads for cable glands. Inside rail with spring clamp terminals for wire connection.	
Wiring diagram (basic version)	Refer to name plate	

Operation and Display			
Basic at actuator	Status indication	FOX-EYE (indication LED) Status indications: OK, end positions, faults and “Bluetooth connection active”.	
	Set end positions	4 buttons and 1 LED are located below the hood. Run actuator in directions OPEN and CLOSE. Set end position once mounted to the valve	
Smart Via Bluetooth using AUMA Assistant App or AUMA CDT software in the latest version	Set end positions	Run actuator in directions OPEN and CLOSE. Set end position once mounted to the valve.	
	Configuration	Basic settings for operation:	• Rotation speed • Type of seating for end positions, Torque switching • Assignment of signal inputs and outputs • Fieldbus parameter (if fieldbus option has been selected). • etc.
		Additional functions:	For applications, safety and service, including: • Positioner • EMERGENCY behaviour • Torque by-pass • Failure behaviour • Signal configuration • etc.
	Diagnostics	Monitoring key figures and measured values for preventive maintenance and consequently increasing process safety. Limit values can be set. Deviations generate warning signals which can be transmitted to the DCS via binary outputs or fieldbus.	
		Actuator:	Temperature value within actuator Key figures regarding lifetime of mechanics, grease, electronics, and motor.
		Actuator and valve:	Method for identifying changes in torque requirement: Perform reference operation and save torque as reference profile. Define tolerance range. Perform comparative operation if required. Values outside tolerance initiate a signal which is communicated as described above.
		Further key figures:	In basic version, the actuator monitors and records further figures and conditions. The generated fault and warning signals are saved within the event log. These signals can be configured as requested. An overview in the AUMA Assistant App or the CDT software shows all available fault/warning signals with option to enter the details.

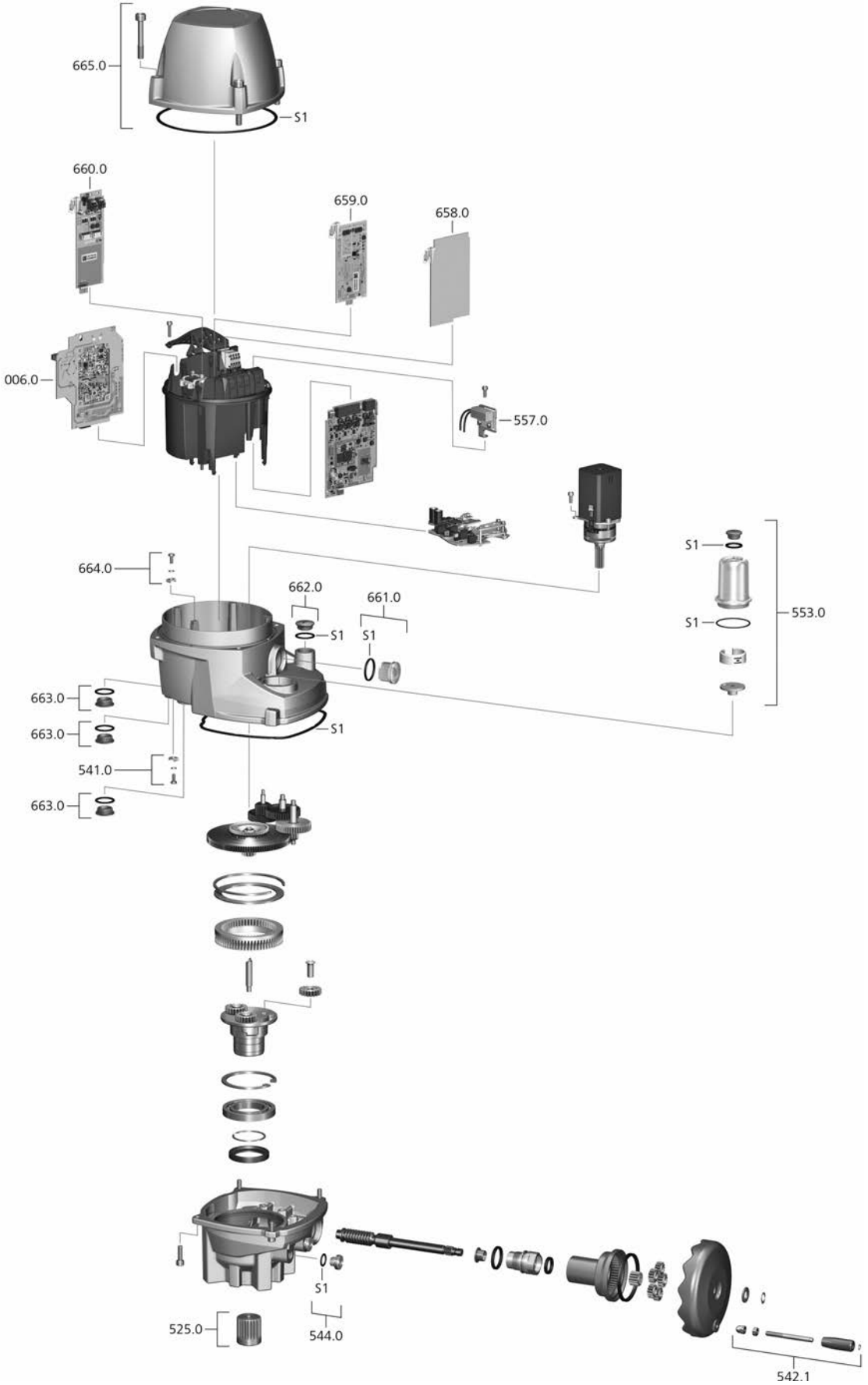
Service conditions		
Mounting position	Any position	
Installation altitude	≤ 2,000 m above sea level > 2 000 m above sea level on request	
Ambient temperature	–30 °C to +70 °C	
Humidity	Up to 100 % relative humidity across the entire permissible temperature range	
Enclosure protection according to EN 60529	Standard:	IP67
	Option:	According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: maximum 8 m head of water • Duration of continuous immersion in water: Max. 96 hours • Up to 10 operations during immersion • Modulating duty is not possible during immersion
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)	
Vibration resistance according to IEC 60068-2-6	2 g, from 10 Hz to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Not valid in combination with gearboxes.	

Service conditions		
Corrosion protection	Standard:	KS Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option:	KX Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
Coating	Double layer powder coating Two-component iron-mica combination	
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Available colours on request
Lifetime	Open-close duty:	10,000 operating cycles OPEN - CLOSE - OPEN One operation cycle consists of 25 turns in both directions (OPEN-CLOSE-OPEN)
	Modulating duty:	1.8 million modulating steps
	The lifetime depends on the load and the number of starts. A high starting frequency will rarely improve the modulating accuracy. To reach the longest possible maintenance and fault-free operating time, the number of starts per hour chosen should be as low as permissible for the process.	

Further information	
EU Directives	Electromagnetic Compatibility (EMC): (2014/30/EU) Low Voltage Directive: (2014/35/EU) Machinery Directive: (2006/42/EC)
Reference documents	Dimensions PF-M50 – PF-M100 Electrical data PF-M25 – PF-M100

13. Spare parts

13.1. Multi-turn actuators PF-M25 – PF-M100



Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

Ref. no.	Designation	Type
006.0	Power supply unit	Sub-assembly
525.0	Coupling	
541.0	External protective earth connection	Sub-assembly
542.1	Ball handle	Sub-assembly
544.0	Screw plug for end stop	
553.0	Mechanical position indicator	Sub-assembly
557.0	Heater	
658.0	I/O board as option	
659.0	Fieldbus board	
660.0	Industrial Ethernet board	
661.0	Lens	Sub-assembly
662.0	Screw plug for manual emergency operation	Sub-assembly
663.0	Screw plug for cable gland	Sub-assembly
664.0	Internal protective earth connection	Sub-assembly
665.0	Cover for electronics housing	Sub-assembly
S1	Seal kit, large	Set

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