DREHMO
VALVE ACTUATORS

Part-turn actuators

DREHMO i-matic

DPiM 151, DPiM 301, DPiM 601

Operation instructions

Assembly and commissioning

Read operation instructions first.

- Heed 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.

Note:

Please also observe the description of integral controls IMC (383351).

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.

Depending on the device version, this includes:

- Configuration guidelines for the respective fieldbus or network applications

Safety instructions/warnings

All personnel working with this device must be familiar with the safety and warning instructions in this manual and heed 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.
- Heed recognised rules for occupational health and safety.
- Heed 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.
- During operation, accelerating loads up to maximum 15 % of the maximum torque may occur. Higher values might damage the electronics.

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

DREHMO DPiM xx1 part-turn actuators are designed for the operation of industrial valves, e.g. 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.

These operation instructions are only valid for the “clockwise closing”, standard version, i.e. driven shaft turns clockwise to close the valve. For the counterclockwise closing version, also observe End stops in part-turn actuator [▶ 28] and Operation [▶ 34].

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.**

The ⚠ safety symbol warns of a potential personal injury hazard.

The signal word (e.g. DANGER) indicates the level of hazard.

1.4 References and symbols

The following references and symbols are used in these instructions:

The ⓘ symbol stands for the **Information** concept. This text provides important notes and information.

Information: If the **Information** term is part of instruction, the text will give important notes and information to this action step.

Symbol for CLOSED (valve closed)

Symbol for OPEN (valve open)

Result of a process step

Describes the result of a preceding process step.

Action step

Describes one single action step.

Reference to the page number

Refers to the page number for further information. To return from the target to the previous view, it is possible to jump back to the previous view within PDF documents: When using Adobe Acrobat via **Menu > Previous view** or using the key combination **Alt + left**.

2 Short description

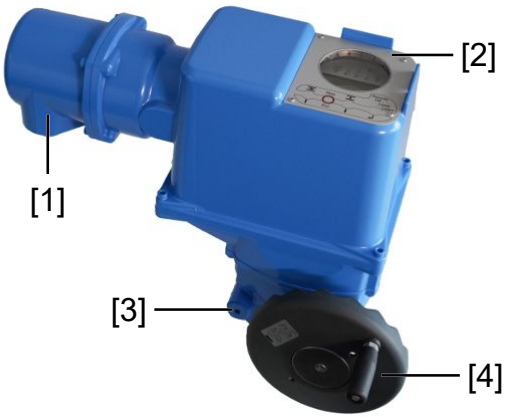
Part-turn actuator

Definition according to ISO 22153:

A part-turn actuators is an actuator which transmits torque to the valve for less than one revolution and does not need to be capable of withstanding operational thrust.

DREHMO part-turn actuator

Figure 1: DREHMO DPiM 301 part-turn actuator



[1]	Plug-in electrical connection	[2]	Local controls
[3]	Screw plug for end stop	[4]	Handwheel

DREHMO DPiM xx1 part-turn actuators are driven by an electric motor. For control in motor operation and for processing the actuator signals, controls are integrated within the housing. A handwheel is provided for occasional manual operation. Manual operation is possible without change-over.

The swing angle is limited by internal end stops. Seating in end positions is either via limit seating or torque seating.

The self-locking of the actuator is ensured by means of the braking function. As soon as the actuator is at standstill, the motor takes over the brake function for the first 20 seconds. This period is defined through a parameter. After this, the locking brake takes over the brake function by disconnection from power and renewed engagement. Brake engagement generates a noise and is part of the standard operating behaviour.

The actuator is equipped with a torque measurement feature. Measurement values are generated during motor operation. No measured value is generated during manual operation. The last measured value remains frozen and is displayed.

App and software

Using the **DREHMO i-matic Explorer 3** software for Windows-based computers (notebooks or tablets) and the **DREHMO i-matic Explorer App**, actuator data can be uploaded and read, settings can be modified and stored. The connection between computer and DREHMO actuator is established via a Bluetooth interface.

DREHMO i-matic Explorer 3

DREHMO i-matic Explorer 3 is a user-friendly setting and operation program for DREHMO actuators.

The i-matic Explorer 3 software is available for free download on our website www.drehmo.com.

DREHMO i-matic Explorer App

The DREHMO i-matic Explorer App enables commissioning, configuration and diagnostics of DREHMO actuators via Bluetooth using either smartphone or tablet.

The DREHMO i-matic Explorer App can be downloaded free of charge from the Play Store (Android) or App Store (iOS).

3 Name plate

Each actuator is equipped with a name plate including information required for unambiguous identification. For commissioning, service and maintenance, additional actuator-relevant data is indicated on the name plates.

Figure 2: Name plate arrangement

[1]	Type designation	[2]	Serial number
[3]	Torque range in direction OPEN/ CLOSE	[4]	Operation mode
[5]	Current type, mains voltage, mains frequency	[6]	Permissible ambient temperature
[7]	CE code	[8]	Manufacturer name and address
[9]	Speed: Operating time range in [s] for a part-turn movement of 90°	[10]	Nominal power and nominal current
[11]	Enclosure protection	[12]	Data Matrix code

Type designation

Table 1: Description of type designation with the example of DPiM 151 - F05 - F10 - N

DPiM	151	F05 – F10	N	
DPiM				DREHMO i-matic part-turn actuator
	151			Size (max. torque in Nm)
		F05 – F10		Flange sizes
			N	Flange surface flat, without spigot

Please always state the device number for any product inquiries. The product can be unambiguously identified using this number and the technical data as well as order-related data pertaining to the device can be requested.

4 Transport, storage and packaging

This section of the operation instructions deals with safe transport, appropriate storage and packaging. The information given shall avoid property damage and personal injury.

4.1 Transport

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

Figure 3: Transport

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.

NOTICE

Damage on display caused by temperatures below permissible level!

- → Ensure that the display of the actuator does not cool down below –30 °C.

Long-term storage

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

1. Prior to storage: Protect uncoated surfaces, in particular output drive parts and mounting surfaces using long-term corrosion protection agents.
2. At an interval of approx. 6 months: Check uncoated surfaces for corrosion. Should traces of corrosion be detected, renew the corrosion protection.

4.3 Packaging

Our products are protected by special packaging for transport when leaving the factory. They consist of environmentally friendly materials which can easily be separated and recycled. We use the following packaging materials: wood, cardboard, paper, and PE foil. For disposal we recommend recycling centres.

5 Assembly

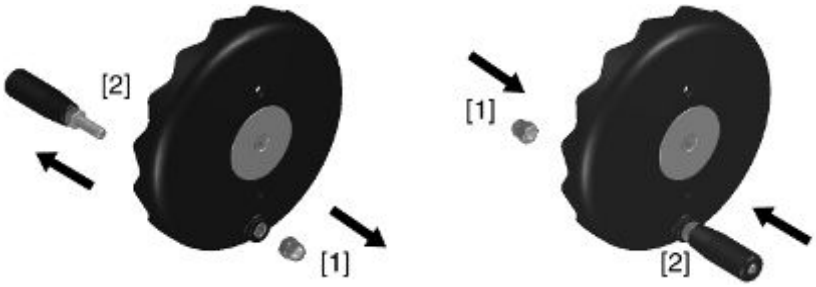
5.1 Mounting position

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

5.2 Fit ball handle to handwheel

To avoid transport damage, the ball handle is mounted upside down at the handwheel.

Prior to commissioning, mount the ball handle in the correct position.



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

When turning the handwheel, the preset position will be changed. On delivery, the position is in end position CLOSED. Both actuator and valve must be in the same position when assembled. Therefore, we recommend refraining from rotating the handwheel several times prior to mounting the actuator to the valve.

5.3 Mount actuator to valve

The actuator is mounted to the valve using a coupling.

NOTICE

Corrosion due to damage to paint finish and condensation!

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

→ After mounting, immediately perform electrical connection of the device to minimise condensation caused by standby current.

5.3.1 Overview on coupling variants

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

Application
- For valve attachments according to EN ISO 5210
- 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).

NOTICE

Threads may neither be modified nor damaged.

Loss of tensile strength of screws when reworking the threads!

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

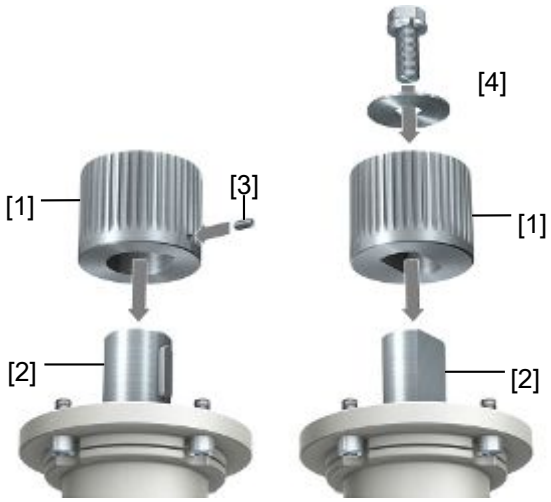
a) Recommended mounting position for **butterfly valves**: End position CLOSED.
b) Recommended mounting position for **ball valves**: End position OPEN.

We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.

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]. Observe dimensions X, Y or L. Refer to following picture and table Mounting positions for coupling.

Figure 4: Examples: Fit coupling



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

Figure 5: Mounting positions for coupling

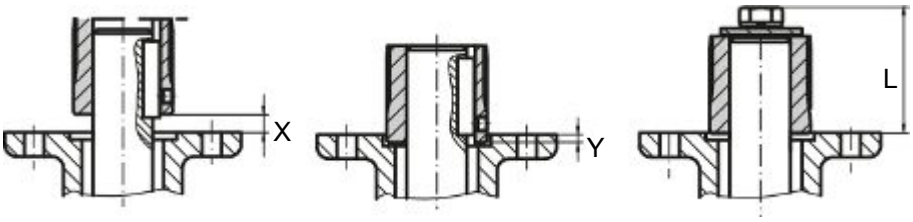


Table 2: Mounting position of the coupling within fitting dimensions according to DREHMO definition

Dimensions [mm]	DPiM 151	DPiM 301	DPiM 601
EN ISO 5211	F05/F07/F10	F07/F10	
X max.	3	4.5	
Y max.	2	4.5	
L max.	38/40[1)]	50	

1) 38 mm (height of coupling without retaining screw) / 40 mm (height of coupling with retaining screw)

5. Apply non-acidic grease at splines of coupling (e.g. Gleitmo by Fuchs).
6. Apply a thin film of sealing agent (e.g. Marston Durapress) at sealing faces of output mounting flange prior to assembly.
7. **NOTICE! Ensure that the spigot (if provided) fits uniformly and that the flanges are in complete contact.** Fit actuator. If required, slightly turn actuator until splines of coupling engage.

Figure 6: Fit actuator

8. If flange bores do not match the threads: Slightly rotate handwheel until bores line up.
9. If the bores do not align even after rotating the handwheel, shift the actuator by one tooth on the coupling, if required.
10. Fasten actuator with screws.
11. Fasten screws crosswise. For tightening torques, refer to Tightening torques for screws [▶ 40] chapter.

6 Electrical connection

6.1 Basic information

⚠WARNING

Electric shock due to the presence of hazardous voltage!

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

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

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

⚠CAUTION

Risk of immediate actuator operation when connecting to mains!

Risk of personal injuries or damage to the valve.

→ Check operation signals and operation behaviour prior to switching on the mains voltage.

→ Ensure that the tripping conditions for the failure behaviour are not fulfilled when switching on.

→ Ensure that the tripping conditions for the EMERGENCY behaviour are not fulfilled when switching on.

Reasons for immediate operation:

- The signal and fieldbus cables are connected and a respective operation command has been issued.
- The “fail safe” function was configured as to ensure that this state results in an operation once the mains voltage is applied. The “Reaction” fail safe parameter is the relevant setting.
- The “Emergency shutdown (ESD)” function was configured as to ensure that this state results in an operation once the mains voltage is applied. The ”Emerg. shutdown (ESD)” parameter is the relevant setting.

Wiring diagram/terminal plan	The pertaining wiring diagram/terminal plan (in German and English) is attached to the device in a weather-proof bag, together with these operation instructions.
Permissible networks (supply networks)	The actuators are suitable for use in TN and TT networks. For IT networks, a suitable, approved insulation monitor is required, e.g. an insulation monitor measuring the pulse code.
Current type, mains voltage, mains frequency	Type of current, mains voltage and mains frequency must match the data on the name plate, Name plate [▶ 8].
Protection and sizing on site	For short-circuit protection and for disconnecting the actuator from the mains, fuses and disconnect switches or circuit breakers have to be provided by the customer.
Corrosion protection	A thin layer of synthetic long-term grease (e.g. Klüber ISOFLEX Topas NB5051) is to be applied to possible uncoated sealing surfaces within the electrical connection prior to closing the connection.
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 applicable for the place of installation.
Connecting cables, cable glands, reducers, screw plugs	• We recommend using connecting cables and connecting terminals according to nominal current (I_N). Refer to Name plate [▶ 8] or electrical data sheet. • For device insulation, appropriate (voltage-proof) cables must be used. Specify cables for the highest occurring rated voltage. • To avoid contact corrosion, we recommend the use of sealing agents for cable glands and screw plugs made of metal. • Use connecting cable with appropriate minimum rated temperature.

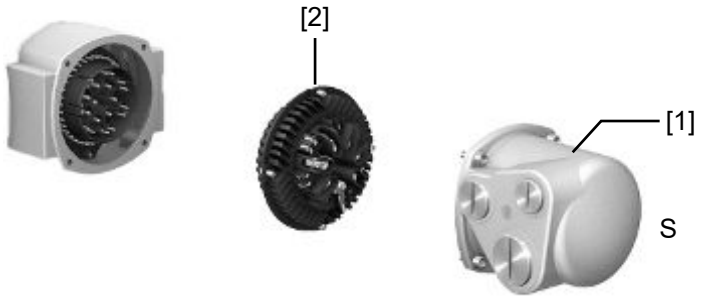
- For connecting cables exposed to UV radiation (outdoor installation), use UV resistant cables.
- For connecting fieldbus cables or network cables, respect the cable recommendations for the respective fieldbus connection or network connection. Further information is provided in the short instructions for fieldbus connection or network connection (as far as available).
- For cable glands (including screw plugs!) make sure that the required IP enclosure protection is guaranteed and suitable for connecting cables.

Cable installation in accordance with EMC

- Lay cables susceptible to interference or cables as sources of interference at a large distance from each other.
- Lay cables in areas subject to low interference.
- Avoid parallel paths with little cable distance of cables being either susceptible to interference or interference sources.
- To ensure the immunity level (EMC) of the actuator, we recommend shielding all connecting cables of the actuator with the exception of the mains supply.
- If the DREHMO actuators are operated with separately mounted controls, the connecting cables between actuators and separately mounted controls must be shielded in any case.
- Heed twisted signal cable pairs according to wiring diagram.

6.2 S electrical connection (compact plug/socket connector)

Figure 7: S electrical connection



[1] Cover

[2] Socket carrier with screw-type terminals

Short description

Plug-in electrical connection with screw-type terminals for pins for motors and pins for controls.

S version (standard) with three cable entries. For cable connection, remove the compact plug/socket connector and the socket carrier from cover.

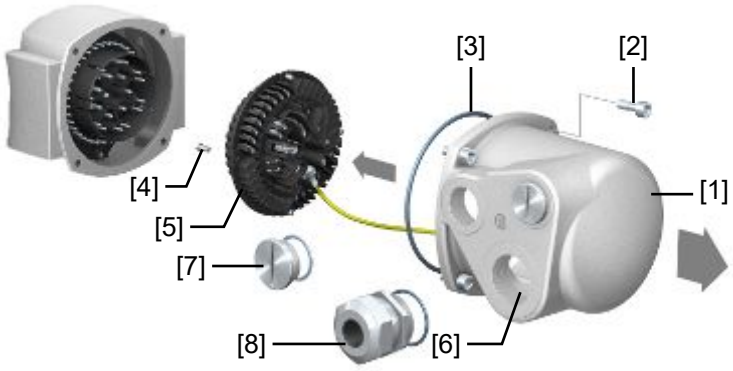
Technical data

Table 3: Electrical connection with compact plug/socket connector

	Power contacts	Control contacts
No. of contacts max.	6 (3 equipped) + protective earth conductor (PE)	26 pins/sockets (50 as an option)
Designations	U1, V1, W1, U2, V2, W2, PE	1 to 50
Connection voltage max.	750 V	250 V
Nominal current max.	25 A	16 A
Type of customer connection	Screw connection	Screw connection
Connection diameter max.	6 mm^2 (flexible) 10 mm^2 (solid)	2.5 mm^2 (flexible or solid)

6.2.1 Open terminal compartment

Figure 8: Open terminal compartment



[1]	Cover (figure shows S version)	[2]	Screws for cover
[3]	O-ring	[4]	Screws for socket carrier
[5]	Socket carrier	[6]	Cable entry
[7]	Screw plugs	[8]	Cable glands (not included in scope of delivery)

DANGER

Electric shock due to the presence of hazardous voltage!

Death or serious injury.

→ Disconnect from mains before opening.

NOTICE

Corrosion by ingress of humidity when using unsuitable cable glands/ screw plugs!

→ Use suitable cable glands/screw plugs according to the IP enclosure protection specified on the name plate.

How to proceed

1. Loosen screws [2] and remove cover [1].
2. Loosen screws [4] and remove socket carrier [5] from cover [1].
3. Insert cable glands [8] suitable for connecting cables.
4. Seal unused cable entries [6] with suitable screw plugs [7].
5. Tighten cable glands [8] and screw plugs [7] at the housing. Respect torques according to manufacturer's specifications.

6.2.2 Cable connection

Table 4: Terminal cross sections and terminal tightening torques

Designation	Terminal cross sections	Tightening torques
Power contacts (U1, V1, W1, U2, V2, W2)	1.0 – 6 mm² (flexible) 1.5 –10 mm² (solid)	1.2 – 1.5 Nm
PE connection	1.0 – 6 mm² (flexible) with ring lugs 1.5 – 10 mm² (solid) with loops	1.2 – 2.2 Nm
Control contacts (1 to 50)	0.25 – 2.5 mm² (flexible) 0.34 – 2.5 mm² (solid)	0.5 – 0.7 Nm

⚠WARNING

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

Electrical shock, risk of injuries or death.

→ Connect all protective earth conductors.

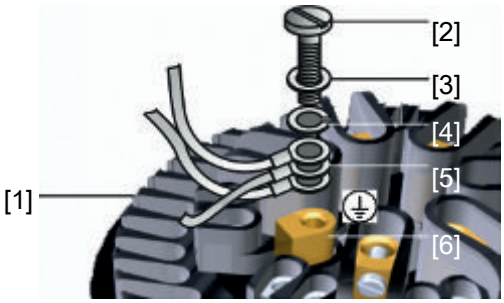
→ Connect PE connection to external protective earth conductor of connection cable.

→ Power the device only once the protective earth conductor has been connected.

How to proceed

1. Remove cable sheathing.
2. Insert the wires into the cable glands.
3. Fasten cable glands with the specified torque to ensure required enclosure protection.
4. Strip wires: Controls approx. 6 mm, motor approx. 10 mm.
5. For flexible cables: Use wire end sleeves according to DIN 46228.
6. Connect cables according to order-related wiring diagram.
7. Tighten PE conductors firmly to PE connection using ring lugs (flexible cables) or loops (solid cables).

Figure 9: Protective earth connection

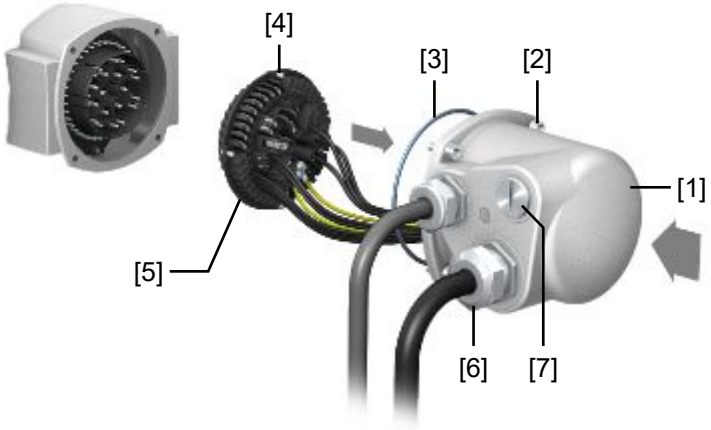


[1]	Socket carrier	[2]	Screw
[3]	Washer	[4]	Lock washer
[5]	PE conduction with ring lugs/loops	[6]	Protective earth connection

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

6.2.3 Close terminal compartment

Figure 10: Close terminal compartment



[1]	Cover (figure shows S version)	[2]	Screws for cover
[3]	O-ring	[4]	Screws for socket carrier

[5]	Socket carrier	[6]	Cable gland (not included in scope of delivery)
[7]	Screw plugs		

⚠WARNING

Short-circuit due to pinching of cables!

Risk of electrical shock and malfunctions.

→ Carefully insert socket carrier to avoid pinching of wires.

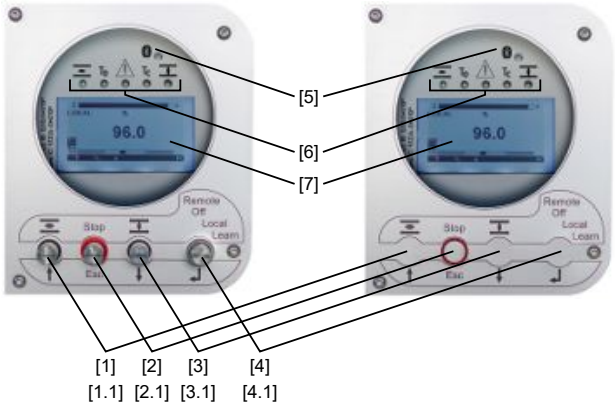
How to proceed

1. Insert the socket carrier [5] into the cover [1] and fasten with screws [4].
2. Clean sealing faces of cover [1] and housing.
3. Check whether O-ring [3] is in good condition, replace by new O-ring if damaged.
4. Slightly grease the O-ring with acid-free grease (e.g. petroleum jelly) and insert them correctly.
5. Apply Klüber Isoflex Topas NB5051 to the sealing faces between the housing parts.
6. Fit cover [1] and fasten screws [2] evenly crosswise.
7. Fasten cable glands and screw plugs applying the specified torque to ensure the required enclosure protection.

7 Local controls

The actuators are equipped with local controls containing the graphic display and display elements for local control or menu operation as well as a wireless parametrisation and diagnostic access via Bluetooth technology (BT). The actual version of the control unit with display at the actuator may differ with regard to the interface, the operation elements and the display version.

Figure 11: Version of local controls



[1]	OPEN	[1.1]	Up /increase value
[2]	STOP	[2.1]	Escape/back
[3]	CLOSE	[3.1]	Down/decrease value
[4]	Operation modes	[4.1]	Enter/selection
[5]	Parametrisation and diagnostic access via BT technology	[6]	Local indication lights
[7]	Display		

7.1 Local indication lights

These indication lights are used to display certain actuator states.

Table 5: Significance of local indication lights

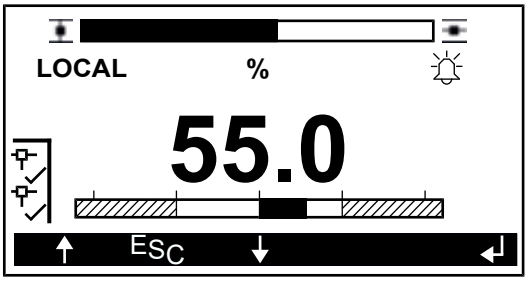
Symbol	Signification
	End position/running indication OPEN
To	Torque OPEN
	Failure
Tc	Torque CLOSE
	End position/running indication CLOSE

The failure to be displayed can be set via the parametrisation of the integral controls. For the actual procedure and the available options, refer to the description of the integral controls.

7.2 Operation

Once the integral controls have booted, the basic screen is displayed. It shows essential information on position, torque, operation mode, the available fieldbus status, if applicable, as well as pending failures and warnings. Data structure can differ depending on firmware and hardware.

Figure 12: Basic display screen after system start.



Local control is performed via four operating elements, either as mechanically operable spring-loaded push buttons or as hidden magnetic buttons (refer to Local controls [▶ 20]). For operation, magnetic buttons require a special magnetic pen available as separate accessory.

Magnetic pens with retaining cord (article number 387745) are available as accessory. One end of the retaining cord is electrically conductive and screwed to the magnetic pen. The other end of the retaining cord is fitted with an eyelet for fixing to the actuator whereby electrical connection for charge equalisation is ensured.

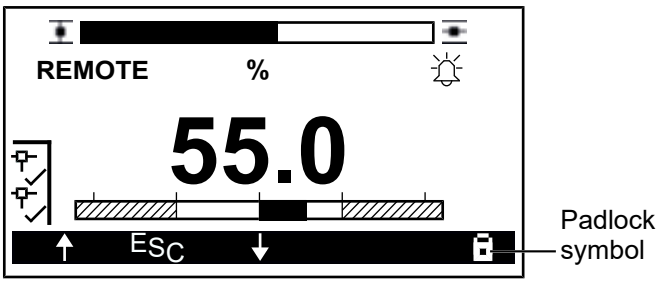
Standard functional assignment of buttons is indicated on the provided face plate of local controls. Furthermore, the lower display status indication shows the current function assignment which might vary depending on sub-menu operation.

If LOCAL or LEARN is shown on the display, the actuator can be operated with the two arrow buttons (refer to [1] and [3] Local controls [▶ 20]). This is not possible if the display indicates OFF or REMOTE.

If a padlock symbol is displayed, the local controls are disabled due to a missing enable signal from REMOTE (refer to “Lock display unit” parameter in the separate description of the integral controls). The actuator can only be operated from REMOTE. To be able to operate the local controls, enable signal has to be sent from REMOTE.

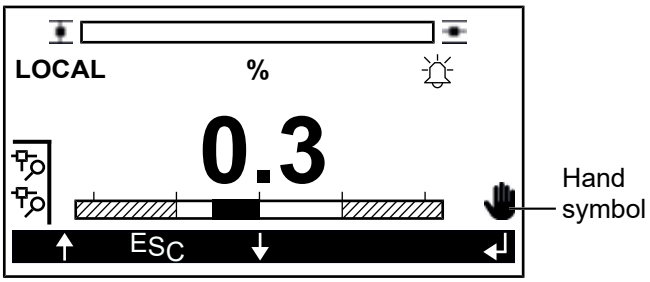
If the local controls are not disabled, use the Enter button (refer to Local controls [▶ 20]) to access the menu in which operation mode LOCAL can be set.

Figure 13: Display unit disabled



If a hand symbol is displayed, the local controls are temporarily disabled due to an automatic keylock. The temporary lock can be unlocked by simultaneously operating push buttons OPEN and CLOSE (refer to Local controls [▶ 20]). The push buttons must be held down for a defined duration (refer to the “Auto keylock” parameter in the separate description of the integral controls.

Figure 14: Automatic keylock



If one or several faults are signalled, a message appears asking whether the fault is to be displayed. This request can be acknowledged with the ESC button (refer to [2] Local controls [▶ 20]). Thus, the main menu can be accessed and the operation mode or the parametrisation can be changed.

The arrow buttons (refer to [1] and [3] Local controls [▶ 20]) are used for scrolling through the menu group selections and the individual menu items. To change the value of the parameter or a character of the parameter (e.g. for text fields), the two arrow buttons are used for entering a parameter.

To change to the selected menu group or to terminate the input, use the Enter button (refer to [4] Local controls [▶ 20]). When entering parameters consisting of several characters, use the Enter button to go to the next character. Text entry is terminated by pressing again the Enter button after the last text character (always one space).

To jump from a menu group to the next higher level, press the Enter button. To cancel an entry without adopting the newly entered value, use the ESC button when entering a parameter. When entering parameters consisting of several characters, use the ESC button to go to the previous character. When pressing the ESC button and the cursor is still on the first character, the entry is terminated without saving the newly entered value.

Messages can also be displayed during actuator operation. An error message during operation always requires a confirmation with the Enter button before being able to resume operation.

The following fault messages are possible:

- To edit this parameter, you require user level x
  Remedy: Log in to the required user level.
- The new value must be within limit 1 and limit 2.
  Remedy: Enter a new value for the parameter which is within the allowed range.
- Parameters can only be edited in OFF and LEARN mode! Now switch to operation mode OFF?
  Remedy: When confirming with Enter, the actuator is directly switched to operation mode OFF.
- This parameter is read only!

7.3 Access protection of local controls

Access of local controls can be controlled either by mechanical locking of local controls or by implementing software access protection. Respective actuator functions can be disabled by means of various user levels accessible to the customer. These user levels include: Nobody, User and Maintenance staff. If password protection is already activated for the user, no action can be performed at the actuator without the correct password. Logging in is the only option. For details on password protection, refer to the operation instructions of the integral controls.

Mechanical locking of local controls in combination with mechanically operable spring-loaded push buttons is as follows: The Enter push button (refer to [4] Local controls [▶ 20]) can be locked with a suitable commercial padlock (shackle diameter max. 3 mm) so that the operation mode cannot be changed. Depending on the requirements, individual keys and lock systems can be provided while indicating the number of keys per lock.

7.4 Language selection

To select the language, proceed as follows:

How to proceed

1. Set operation mode to OFF.
2. Navigate to LANGUAGE menu item.
3. Activate the parameter for editing via Enter button.
4. Use buttons [1] and [3] (refer to Local controls [▶ 20]) to select the desired language.

5. Confirm selection with the Enter button.
6. The selected language is immediately activated!

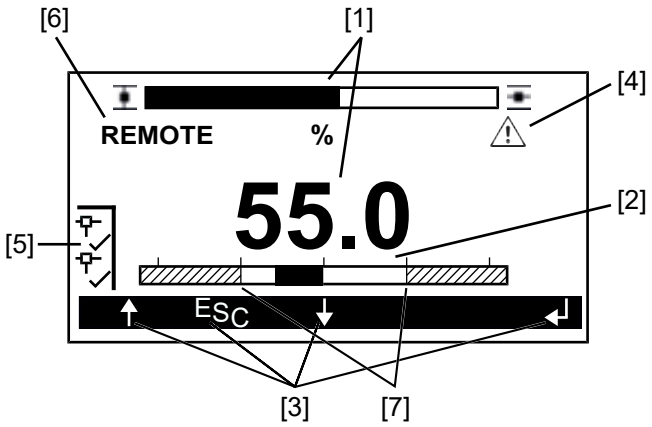
If your desired language is not available within the actuator, please contact our service.

Starting from the main screen, the language can be changed temporarily. After the next system reset, the original setting will automatically be restored. For this, operate the ESC button for approx. 5 seconds. Then confirm the language selection (always English) with the Enter button. For permanent language selection, please use the configuration as indicated above.

7.5 Display elements

After switching on, the main screen is displayed and all local indication lights (refer [6] Local controls [▶ 20]) are activated for approx. 3 seconds. The main screen displays the most important data.

Figure 15: Display elements



[1]	Actual value for actuator position	[2]	Torque indication (here: torque in direction CLOSE of approx. 55 % is available)
[3]	Currently assigned button function	[4]	Information symbol (bell or warning triangle)
[5]	Fieldbus status (here: two channels are available and in the data exchange status)	[6]	Display of mode of operation
[7]	Set tripping torques		

Actuator position is displayed as bar graph and in figures according to the configured position unit [1]. As standard, end position CLOSED corresponds to a position of 0 % (bar completely empty) and end position OPEN to a position of 100 % (bar completely filled).

The available torque is shown in the actual value indication [2]. This indication element represents two different details:

1. the current torque
2. the set tripping torques

The bar at the lower screen visualises the current function assignment of buttons [3]. The actuator operation mode is shown in the upper left [6].

Table 6: Operation modes

Operation mode	Description
OFF	The actuator can no longer be controlled from LOCAL or REMOTE. **Caution:** The ESD command can be programmed as to ignore operation mode OFF.

Operation mode	Description
LOCAL/LOCAL OFF	The actuator can only be operated locally. Operation commands from REMOTE are not executed. Remote disabling of local controls can be performed via device parametrisation. Local control will only be possible if a digital enable signal is present from REMOTE. When selecting operation mode LOCAL without enable signal from REMOTE, the operation mode displayed on the screen in position [6] is LOCAL OFF. **Caution:** The ESD command can be programmed as to ignore operation mode LOCAL/LOCAL OFF.
REMOTE	The actuator can only be operated via the connected DCS. Operation commands via local controls are not executed. **Caution:** In combination with connection monitoring to the DCS, unexpected actuator operations may occur within the framework of the actuator fail safe behaviour.
Force LOCAL	In this mode, separately mounted local controls can be simulated via the digital inputs at the actuator.
LEARN	Significant functions of commissioning can only be performed in this operation mode. The actuator can only be operated locally. Operation commands from REMOTE are not executed. Emergency shut down function of the actuator is inactive.

The Force LOCAL function is intended for simulation of separately mounted local controls. The respective signals are defined via the binary inputs.

Table 7: Commands of the Force LOCAL mode

Command	Description
Force LOCAL	The actuator is changed over from the OFF, LOCAL and REMOTE modes to the Force LOCAL mode. The feedback signal of the operation mode via fieldbus and parallel interface changes from the set operation mode to LOCAL.
Force LOCAL OPEN/Force LOCAL CLOSE	Via the Force LOCAL OPEN and Force LOCAL CLOSE inputs, the actuator can be operated into the respective direction in Force LOCAL mode.
Force LOCAL STOP	If an input has been assigned the Force LOCAL STOP signal, the Force LOCAL OPEN and Force LOCAL CLOSE inputs function as self-retaining commands. Otherwise, they will be controlled in push-to-run operation. The Self-retaining LOCAL parameter is not relevant for this. If the signal is activated, the actuator will be stopped.

The Enable LOCAL, Enable OPEN and Enable CLOSE commands are also active in the Force LOCAL mode.

⚠CAUTION

Activation of emergency shut down in operation modes OFF and LOCAL!

Unexpected motor start without local operation.

→ These parameters are used to select actuator emergency shut down (ESD) even if the actuator is set to operation modes OFF or LOCAL.

→ Check the parametrisation for this setting prior to performing any work on the actuator.

→ Heed that the emergency shut down command is not issued by mistake.

The display unit may be completely locked. In this case, a lock is displayed instead of the Enter symbol.

Either a bell or a warning triangle [4] is used as information symbol. These faults can be parametrised. The pertaining parameters are listed under the “Collective fault 1“ menu item. For further information on the parametrisation of the actuator, refer to the description of the integral controls.

When using a fieldbus interface, the respective symbols are shown on the left margin [5]. The hardware used as well as the available redundancy are automatically detected. Therefore, the display symbols differ depending on the fieldbus interface version. Depending on the hardware detected, those parameters will be available under “DCS” “Interface”, which can be used for configuration of the respective fieldbus interface. The “Actual values/Diagnosis” → “Interface” menu item is used to check the fieldbus interface status. For further information, refer to the operation instructions to the respective fieldbus interface.

7.6 Contrast setting

The contrast can be set in the main screen. For this, use the arrow buttons when holding down both the ESC button and one of the UP and DOWN buttons. Holding down the ESC button and the UP button increases the contrast. Holding down the ESC button and the DOWN button decreases the contrast.

7.7 Parametrisation and diagnostic interfaces

Bluetooth

All DREHMO i-matic actuators are equipped with a Bluetooth interface. For access, special parameters for identification purposes and password protection are available. The i-matic Explorer 3 can be used as parametrisation tool on your computer. The i-matic Explorer App is available for Android and iOS systems.

NOTICE

Activation/deactivation is possible via parametrisation!

→ Access via Bluetooth interface can be disabled via parametrisation.

NOTICE

Access can be disabled via DCS!

→ Access via the interfaces can be disabled by means of the DCS.

→ The effects of the signal for disabling the interfaces may be configured.

Figure 16: Display and indication elements of the local controls

8 Commissioning

⚠WARNING

Risk of immediate motor start when connecting the power supply!

Accidental operation of the mounted valve. Risk of personal injury or property damage.

→ For conventional interfaces, link the STOP command to the respective actuator input (refer to terminal plan).

→ For fieldbus interfaces, set the STOP command via the DCS.

→ Do not apply the automatic command for fieldbus interfaces.

→ For commissioning, set the actuator to the LEARN mode using the commissioning selection.

→ Prior to separating an actuator from the mains, switch to operation mode OFF.

NOTICE

Damage to the electronics for temperatures below –25 °C!

→ The actuators may only be commissioned at temperatures above –25 °C.

For electronic commissioning, the following steps are required:

- Verification of actuator power supply and adapting the pertaining parameters as required.
- Valve-specific basic settings such as:
  - Closing direction
  - Tripping torques
  - End position setting
  - Switch-off behaviour
- Parametrisations for:
  - Local indication
  - Local operation
  - Connection to DCS

8.1 Connection of the power supply

⚠CAUTION

Risk that output drive torque of actuator exceeds the max. permissible input torque of gearbox/linear thrust unit or valve!

Irreversible damage to the mounted components.

→ Check whether the actuator output torque falls below the max. permissible input torque of gearbox/linear thrust unit or valve.

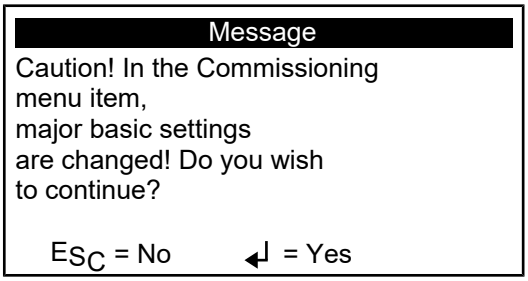
→ If required, imperatively adapt the specifications in the electronic name plate.

Prior to connecting the power supply, check if the supply complies with the name plate data and if the protection facilities are sufficient. Refer to “Parameters” → “Power supply” menu item for the respective parameters.

8.2 Valve-specific basic setting

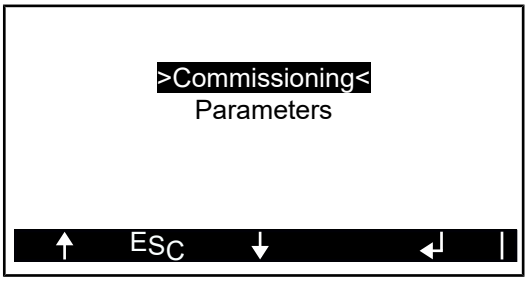
For commissioning, set the actuator to the “Commissioning” mode. To activate Commissioning mode, at least the “Maintenance” user level is required. A list of and explanations to the respective user levels can be found in the separate description of the integral controls. The following message appears:

Figure 17: Display indication 1



After confirming with the Enter button, the following screen appears:

Figure 18: Display indication 2



At this level, you may either select the actuator commissioning menu or the actuator parameters menu. In a first step, the valve-specific parameters within the parameter menu (closing direction, type of seating and torques) are to be checked and adapted if required.

For information on the individual parameters, refer to the separate description within the integral controls. If the required breakaway torque into the opposite direction exceeds the set tripping torque, activating the torque bypass in the end positions might be necessary for motor operation (when leaving limit positions OPEN or CLOSED). Commissioning can be performed via the commissioning menu once the previous steps are complete.

Set the limit positions of the respective actuator as the next step.

NOTICE

Observe maximum input torque of the valve!

Valve damage.

When activating the torque bypass, the set torque is bypassed by up to 127 % and the actuator tries to operate the valve.

8.3 End stops in part-turn actuator

The internal end stops limit the swing angle. They protect the valve in case of limit switching failure during motor operation and serve the purpose as limitation for manual operation via handwheel. They may not be used for torque tripping in end positions during standard operation.

End stop setting is generally performed by the valve manufacturer **prior** to installing the valve into the pipework.

⚠CAUTION

Exposed, rotating parts (discs/balls) at the valve!

Pinching and damage by valve or actuator.

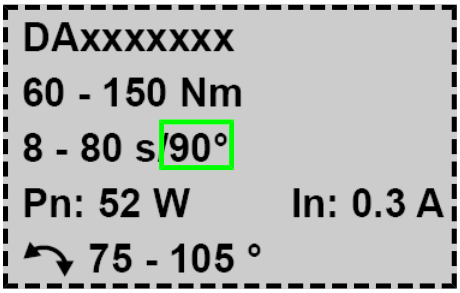
→ End stops should be set by suitably qualified personnel only.

→ Never completely remove the setting screws [2] and [4] to avoid grease leakage.

→ Observe dimension $T_{min...}$

The operating time range (speed) in [s] for a swing movement of 90° is specified on the name plate:

Figure 19: Swing angle (example)

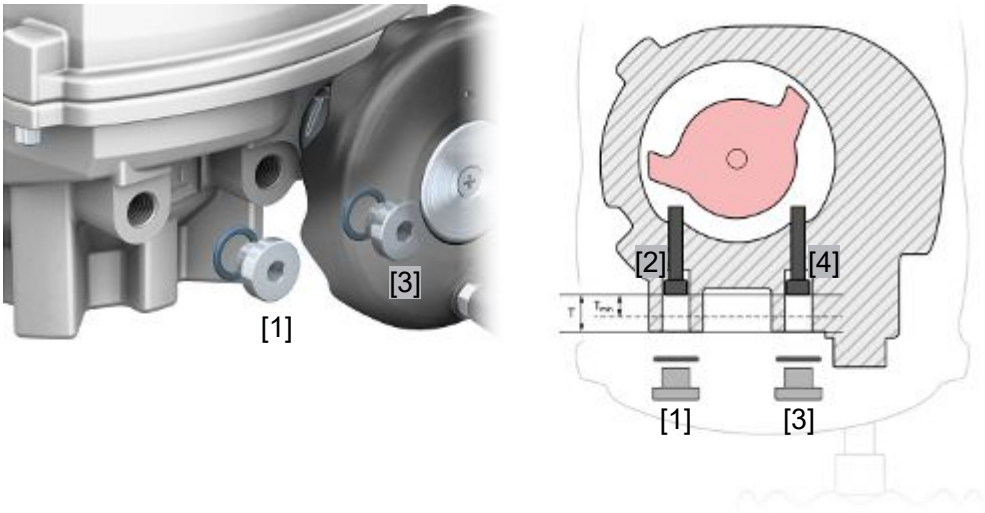


The setting sequence depends on the valve:

- Recommendation for **butterfly valves**: Set end stop CLOSED first.
- Recommendation for **ball valves**: Set end stop OPEN first.

The positions of the settings screws are exchanged for the “counterclockwise closing” special version. This can also be identified by the label affixed to the actuator.

Figure 20: End stops



[1]	Screw plug for end stop OPEN	[2]	Setting screw for end stop OPEN
[3]	Screw plug for end stop CLOSED	[4]	Setting screw for end stop CLOSED

Table 8: Dimensions/size (mm)

Dimensions/size (mm)	DPiM 151	DPiM 301	DPiM 601
T (for 90°)	14.5	18.5	18.5
$T_{min.}$	9	11	11

8.3.1 Set end stop CLOSED

With fitted handwheel: Dismantle handwheel prior to end stop CLOSED setting!

How to proceed

1. Remove screw plug [3].
2. Move valve to end position CLOSED with fitted handwheel.
3. If the valve end position is not reached: Slightly turn setting screw counterclockwise until valve end position CLOSED can be correctly set.
   ⇨ Turning the setting screw [4] clockwise decreases the swing angle.

⇨ Turning the setting screw [4] counterclockwise increases the swing angle.

Figure 21: End stop screws DPiM

4. Turn setting screw [4] clockwise to the stop.
   ⇨ This completes the setting of end stop CLOSED.
5. Turn handwheel one rotation counterclockwise.
6. Check O-ring of screw plug for seat and condition, replace if damaged.
7. Fasten and tighten screw plug [3].
   → **DPiM 151:** 13 Nm (M12)
   → **DPiM 301 – DPiM 601:** 13 Nm (M16)

Having completed this procedure, the end position detection CLOSED can be set immediately.

8.3.2 Set end stop OPEN

In general, the end stop OPEN does not have to be set.

How to proceed

1. Remove screw plug [1].
2. Move valve to end position OPEN with fitted handwheel.
3. If the valve end position is not reached: Slightly turn setting screw counterclockwise until valve end position OPEN can be correctly set.
   ⇨ Turning the setting screw [2] clockwise decreases the swing angle.
   ⇨ Turning the setting screw [2] counterclockwise increases the swing angle.

Figure 22: Direction of rotation of setting screws

4. Turn setting screw clockwise to the stop.
   ⇨ This completes the setting of end stop OPEN.
5. Turn handwheel one rotation clockwise.
6. Check O-ring of screw plug for seat and condition, replace if damaged.
7. Fasten and tighten screw plug [1].

After this procedure, the end position detection OPEN can be set immediately.

8.4 Set end positions

NOTICE

Damage at valve/gearbox due to incorrect setting!

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

→ Heed overrun when selecting actuator seating via positions

In case the actuator is switched off in torque seating: Check tripping torque set in the factory.

If the actuator is to be switched in one of the two directions via a torque value, set the respective limit positions prior to reaching the tripping torque.

On delivery, the actuator is in end position CLOSED. End positions are preset in the factory. The adjustment range of the output drive is recorded by potentiometer.

For actuators with a swing angle of 90°, the operating range between end positions corresponds to a potentiometer operating range between 24 % and 76 %.

For actuators with a swing angle of 120°, the operating range between end positions corresponds to a potentiometer operating range between 14 % and 86 %.

To reset end positions, the preset end positions must first be deleted and then reset. For end position CLOSED or end position OPEN, this should be done one after the other and not simultaneously.

The setting sequence depends on the valve:

- Recommendation for **butterfly valves**: Set end position CLOSED first
- Recommendation for **ball valve**: Set end position OPEN first

8.4.1 Setting limit position CLOSED

To set limit position CLOSED, proceed in compliance with the following step sequence:

How to proceed

1. Navigate to and select “Commissioning” menu item.
2. Navigate to the “Change limit positions” menu item.
3. Via the “Clear position CLOSED” item, the end position calibration is deleted.
4. Select the “Set position CLOSED” menu item. The adjustment range is displayed. Approach limit position CLOSED using the handwheel.
   The percentage value stands for the current potentiometer position.
5. Confirm limit position setting. The end position calibration is saved.
6. Leave the commissioning menu by pressing the ESC button several times until the start screen with the operation mode LEARN appears.
7. Briefly operate actuator out of limit position CLOSED using the display unit.
8. Check limit seating on reaching the limit position when returning into limit position CLOSED.
9. If required, correct actuator position and repeat steps 1 through 8.

The set end position can be overrun!

The output drive can run against the end stop.

8.4.2 Setting limit position OPEN

To set limit position OPEN, proceed in compliance with the following step sequence:

How to proceed

1. Navigate to and select “Commissioning” menu item.
2. Navigate to the “Change limit positions” menu item.
3. Via the “Clear position OPEN” item, end position calibration is deleted.
4. Select the “Set position OPEN” menu item. The adjustment range is displayed. Approach limit position OPEN using handwheel.
   The percentage value stands for the current potentiometer position.
5. Confirm limit position setting. The end position calibration is saved.
6. Leave the commissioning menu by pressing the ESC button several times until the start screen with the operation mode LEARN appears.
7. Briefly operate actuator out of limit position OPEN using the display unit.

8. Check limit seating on reaching the limit position when returning into limit position OPEN.
9. If required, correct actuator position and repeat steps 1 through 8.

The set end position can be overrun!

The output drive can run against the end stop.

8.4.3 Manual adaptation of analogue position signal

After having set both limit positions, the 4 – 20 mA signal is automatically adapted to the travel setting. Readjustment of the analogue signal in “Value 0 %” and “Value 100 %” menu items can be performed if higher precision is required.

8.4.4 Checking the torque values

Unless DREHMO actuators of the i-matic type were not ordered otherwise, they are supplied with the minimum adjustable tripping torques. Should adaptations be required, the actuator must be in the OFF mode. In this instance, proceed as described below:

How to proceed

1. Navigate to the “Parameters” menu item.
2. Select “Valve” sub-item.
3. Select the “Basic settings” subfolder.
4. Select tripping torque OPEN or CLOSE.
5. Set the required value by means of arrow buttons.
6. Confirm selection with the Enter button.
7. Check the “Torque warning OPEN” and “Torque warning CLOSE” sub-items (they must not exceed the tripping torques).
8. Select the torque warnings to be changed.
9. Set the required value by means of arrow buttons.
10. Confirm selection with the Enter button.

Adapt the values to be set via “Parameters” → “Valve”. For a detailed description of all setting options, refer to the description of the integral controls.

8.4.5 Internal positioner and stepping mode

The actuator can be equipped with an internal positioner as an option. The availability of the internal positioner is registered in the electronic name plate of the integral controls. Positioner activation is made via an external signal or set by means of parametrisation. Both positioner function and stepping mode are available. For using this function, adaptation of special parameters in “Parameters“ → “Process“ is required.

For modulating applications, the permissible frequency in numbers of starts may not be exceeded. Limit values can be defined in “Operation data logging”→ “Operation data”. This data is monitored during active operation and fault indications are generated if applicable.

8.4.6 Reversing delay

Significant motor follow-up movement is existing under weak load or no load. When changing the direction of rotation of the motor during follow-up movement, current peaks might occur risking to damage the power unit. For motor and power unit protection, it is possible to set a reversing delay between 0.4 s to 3 s within the integral electronics. To avoid damage to the power unit, the plant operator has to ensure sufficient delay. Heed the type of duty of the actuator in any case!

8.5 Parameter settings

Unless ordered otherwise, all i-matic actuators are supplied with default parameter assignment. For the default parameter assignment, refer to the separate documentation of the integral controls. On request, the actuator can be supplied with customer-specific parameter assignment. The actuator parameter assignment is saved at the manufacturer's as factory setting and can be requested with the service department, if required.

For actuators equipped with fieldbus, changes can also be made via the pertaining fieldbus interface if required. For details refer to the pertaining operation instructions of the individual fieldbus interfaces. Specific parametrisation tools or fieldbus-specific drivers (Electronic Device Description - EDD, Device Type Manager DTM) can be downloaded from our website www.drehmo.com or are available on request.

8.6 Fault signals

The actuator continuously monitors both data and hardware. Exceeding limit values as well as electronics errors can be issued as separate indications. Furthermore, two collective fault signals are available whereby collective signal 1 represents faults and collective signal 2 represents warnings. Collective fault signals can be configured in “DCS” menu item. Indications are recorded in the error log as pending errors. For more information, refer to the description of the integral controls.

8.7 Configuration of further parameters

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

8.7.1 Output speed

The output speed is defined in the electronic motor name plate by parametrisation of nominal target speed.

The following tables indicate the values for determining the output speed per size.

DPIM 151								
Time/90° [s]	8	11	16	22	32	63	72	80
Nominal output speed [rpm]	3,162	2,300	1,581	1,150	791	402	351	316

DPIM 301								
Time/90° [s]	22	45	63	72	90	125	150	160
Nominal output speed [rpm]	3,072	1,502	1,073	939	751	541	451	422

DPIM 601										
Time/90° [s]	45	63	72	90	125	150	180	210	250	320
Nominal output speed [rpm]	3,091	2,208	1,932	1,546	1,113	927	773	662	556	435

Variable speeds

Furthermore, the speed can be reduced within the range of 10 % and 100 % of the motor speed via the speed functions in the actuator parameter scope.

Table 9: Example values of settings for size DPiM 151 (maximum 8 s/90° = 100 %)

	Speed in % of the maximum motor speed
Operating time Output drive	**8 s – 80 s**
8 s	100 %
11 s	73 %
16 s	50 %
22 s	36 %
32 s	25 %
45 s	18 %
63 s	13 %

	Speed in % of the maximum motor speed
Operating time Output drive	8 s – 80 s
72 s	11 %
80 s	10 %

Table 10: Example values of settings for size DPiM 301 (maximum 22 s/90° = 100 %)

	Speed in % of the maximum motor speed
Operating time Output drive	22 s – 220 s
22 s	100 %
32 s	69 %
45 s	50 %
63 s	35 %
72 s	31 %
90 s	24 %
125 s	18 %
150 s	15 %
180 s	12 %
210 s	10 %
220 s	10 %

Table 11: Example values of settings for size DPiM 601 (maximum 45 s/90° = 100 %)

	Speed in % of the maximum motor speed
Operating time Output drive	45 s – 450 s
45 s	100 %
63 s	71 %
72 s	63 %
75 s	60 %
90 s	50 %
125 s	36 %
150 s	30 %
180 s	25 %
210 s	21 %
250 s	18 %
320 s	14 %
450 s	10 %

8.7.2 Torque setting

The tripping torques can be set within a certain range by pertaining parametrisation. The tripping torques can be set separately for directions CLOSE and OPEN.

Table 12: Torques according to size

Size	Setting range for the tripping torque
DPiM 151	60 – 150 Nm
DPiM 301	120 – 300 Nm
DPiM 601	240 – 600 Nm

9 Operation

9.1 Manual operation

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

Clockwise closing (standard version)

How to proceed

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.

Counterclockwise closing (special version)

Turning the handwheel counterclockwise results in a valve movement in direction CLOSE.

A marking on the actuator handwheel indicates the inverted direction of rotation for closing. However, this is often ignored during operation. For this reason, a special note should be attached within the plant to catch the user's attention.

How to proceed

3. Close valve: Turn handwheel counterclockwise.

4. Open valve: Turn handwheel clockwise.

Manual operation

For purposes of setting and commissioning, in case of motor or power failure, the actuator may be operated manually. The handwheel is used to move the output drive. The handwheel is permanently engaged and prioritised over motor operation if both handwheel and motor are simultaneously operated. Otherwise, the handwheel does not rotate during motor operation.

Torque seating

During manual operation, the torque cannot be measured but the last measured value remains valid (motor operation) and thus constant.

9.2 Motor operation

⚠CAUTION

Motor operation with open cover is only permitted during commissioning.

Danger of burns when touching the motor.

NOTICE

Damage at valve 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.

10 Servicing and maintenance

In this section, information is provided to be followed for maintenance, cleaning and disposing of DREHMO actuators.

⚠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. We recommend contacting our service for any interventions.

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

Service & Support

DREHMO offers extensive service such as servicing and maintenance as well as customer product training. Contact addresses are indicated on our website www.drehmo.com.

10.1 Maintenance

We recommend participation in the regular training for performing maintenance tasks. Basic special knowledge in electrical installation and mechanical engineering is sufficient (in Germany: industrial training - apprenticeship). Permitted maintenance work:

- Replace handwheel
- Replace output drive

All other work not listed may only be performed by the manufacturer or by personnel authorised by the manufacturer.

Correct commissioning is a prerequisite for reliable actuator operation. We recommend performing the checks below annually:

- Carry out visual inspection:

  Cable entries, cable glands, screw plugs, etc. have to be checked for correct tightness and sealing. If required, tighten cable glands and screw plugs with torque in compliance with the manufacturer's specifications.

  Check actuator for damage as well as for grease or oil leakage.
- When rarely operated: Perform test run.

Check open-close actuators for wear after a cumulated operating time of 150 hours, modulating actuators, however, at the latest after 10^6 starts! For safe and reliable service, we recommend – especially if infrequently operated – performing an actuator test run every 6 months.

Integral controls issue supporting information for maintenance in “Operation data logging” menu item. The so-called dynamic maintenance indications show basic information on the actuator.

For technical questions, please contact the service. Have the device number ready. The device number can be found on the actuator name plate. Only have defective actuators overhauled in the factory of the manufacturer or an authorised workshop.

Lubrication

Within the device lifecycle, no additional lubrication of the gear housing is required during operation.

Seals, maintaining the IP protection degree

Preventive actions to ensure the IP protection degree. Seals between outer housing parts should be replaced within a period of 4 – 8 years:

- After 4 years: In case of outdoor installation (frequent changes of temperature and humidity, extreme weather)
- After 8 years: In case of indoor installation (constant or virtually constant environmental conditions)

Apply Klüber Isoflex Topas NB5051 to the sealing faces between the housing parts.

For enclosure protection IP68

After immersion:

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

10.2 Troubleshooting and corrective actions

A functional test is required after corrective maintenance. Commissioning of actuator/ valve must be performed if tripping parameters, valve or additional gearing have been changed.

10.3 Cleaning

Clean the actuator using conventional soap solutions (alkaline solutions).

NOTICE

Residues of conductible foreign particles within the actuator!

→ Use of compressed air for cleaning the actuator is not permitted!

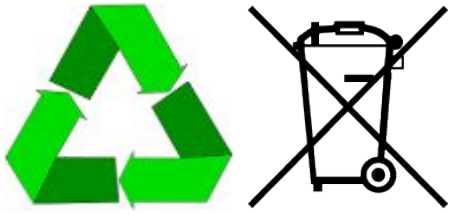
Warning instructions on the device must neither be removed nor covered by paint!

Use of any cleaning agents inside the actuator is not permitted. Any contamination may be removed using lintless cloths free of any contamination. Use of compressed air is not permitted.

10.4 Disposal

During decommissioning and disassembly of actuators, observe any potential installation-specific hazards. If required, appropriate disposal can be offered by the manufacturer. Actuators can easily be separated and sorted according to materials used:

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



The following generally applies:

- Generally, 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.
- Heed the national regulations for waste disposal.

11 Technical data

This section comprises the summary of all technical data of DREHMO actuators described in these operation instructions.

11.1 Contact and water protection

The enclosure protection (IP...) is marked on the name plate of the actuator. In the standard version, the actuator is suitable for outdoor installation. It is completely protected against dangerous contact, ingress of dust and harmful ingress of water for temporary immersion in water (enclosure protection IP68 (5 m for 24 hours) in compliance with EN 60529 / IEC 60529). Further IP enclosure protection types are available on request as options.

NOTICE

Enclosure protection not guaranteed!

→ Ensure use of proper cable glands while observing the enclosure protection and the cable diameters.

→ Seal unused cable entry openings with suitable screw plugs.

NOTICE

Damage to display due to direct sunlight!

→ Protect the LC display against direct sunlight (temperatures above 85 °C) by mounting a sunshade.

11.2 Technical data Part-turn actuator

Features and functions		
Operation mode	Open-close duty:	Classes A and B according to ISO 22153, short-time duty S2 - 15 min
	Modulating duty:	Class C according to ISO 22153, intermittent duty S4 - 50 %, with maximum number of starts up to 1,200 starts/h
	For nominal voltage and +40 °C ambient temperature and at load of 35 % of the maximum torque. The type of duty must not be exceeded.	
Motor	Variable speed, brushless motor Soft start/soft stop. The progress characteristics can be configured as requested.	
Insulation class	F (motor winding)	
Motor protection	Via short-circuit protection and current measurement; thermal detector	
Self-locking	At standstill with spring-applied brake	
Swing angle	Standard:	90° ±15° adjustable between min. and max. values (with mechanical end stops)
	Option:	120° ±15° adjustable between min. and max. values (with mechanical end stops)
Limit switching	Via potentiometer	
Torque switching	Via electronic current measurement. Tripping torques are infinitely adjustable via Bluetooth. 8 levels can be selected when placing the order.	
Manual operation	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. The end stops are included except version with swing range 45° – 360°.
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	Dimensions according to EN ISO 5211 without spigot	

Features and functions		
Power supply	Standard voltages: 1-phase AC current: 230 – 500 V/50 – 60 Hz The voltage range may be exceeded or undercut by maximum 10 %. The frequency range may be exceeded or undercut by maximum 5 %.	
Overvoltage category	Category III according to IEC 60364-4-44	
Power electronics	With integral motor controller (current consumption in standby mode < 3 W)	
Electrical connection	Compact plug/socket connector Ø100 mm Available cross sections: Signal cables: 0.25 – 2.5 mm^2 (flexible) 0,34 – 2.5 mm^2 (solid) Tightening torque 0.5 – 0.7 Nm Power: 1.0 – 6 mm^2 (flexible) 1.5 – 10 mm^2 (solid) Tightening torque 1.2 – 1.5 Nm The following applies for signal and cable connections: When using flexible cables, use wire end sleeves according to DIN 46228. PE conductor 1.0 – 6 mm^2 (flexible) with ring lugs 1.5 – 10 mm^2 (solid) with loops Tightening torque 1.2 – 2.2 Nm	
Contact load (resistive load) Overvoltage category I	Gold-plated contacts Voltage: 5 – 30 V; current: 4 – 400 mA; U x I ≤ 0.12 VA Optional output contacts (monostable and bistable): max. 230 V AC 0.3 A, 30 V DC 2 A Output contacts: max. 240 V AC 6 A, 30 V DC 6 A	
Electrical load	≤ 300 Ω	
With base and lever (option)		
Swing lever	Made of spheroidal cast iron with two or three bores for fixing a lever arrangement. Considering the installation conditions, the lever may be mounted to the output shaft in any desired position.	
Ball joints (option)	Two ball joints matching the lever, including lock nuts and two welding nuts, suitable for pipe according to dimension sheet.	
Fixing	Base and four holes for fastening screws	
Service conditions		
Ambient temperature range	Refer to indications on name plate in °C	
Enclosure protection	Refer to indications on name plate	
Pollution degree	Within the actuator, pollution degree 1 (IEC 60664-1) Outside the actuator, pollution degree 2	
Vibration	The actuators are designed for a vibration range of 10 – 200 Hz with 2 g (high cross-over frequency according to IEC 60068-2-6). However, a fatigue strength may not be derived from this.	
Installation altitude	≤ 2,000 m above sea level > 2,000 m above sea level on request	
Lifetime	Open-close duty:	10,000 operating cycles OPEN - CLOSE - OPEN An operating cycle is based on an operation from CLOSED to OPEN and back to CLOSED, at a respective rotary movement of 90°.
	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.	
Sound pressure level	< 70 dB (A)	
Further information		
EU Directives	Machinery Directive 2006/42/EC Low Voltage Directive 2014/35/EU EMC Directive 2014/30/EU RoHS Directive 2011/65/EU	

NOTICE

Pinching by moving parts for actuators equipped with base and lever!

Pinching of limbs.

→ Do not reach into area between lever and base flange.

→ Check whether space is sufficient prior to assembly. The actuator and other parts must not enter the swing range of the lever.

→ Attach protective fixtures.

11.3 Mechanical data Part-turn actuator

Type	Operating times for 90° in seconds[1] (selection of 9 levels)[2]	Torque range[3]	Modulating torque[4]	Valve attachment	Valve shaft			Handwheel		Weight[5]
DPiM		Max. [Nm]	Max. [Nm]	Standard EN ISO 5211	Cylindrical max. [mm]	Square max. [mm]	Two-flat max. [mm]	Ø [mm]	Turns for 90°	approx. [kg]
151	8 – 80	60 – 150	75	F05/F07/F10	20	17	17	100	20.2	8
301	22 – 160	120 – 300	150	F07/F10	38	30	27	160	16.3	11
601	45 – 320	240 – 600	300	F07/F10	38	30	27	160	16.3	11

1) The values for operating times refer to an operation across 90° of travel at a load of 70 % of the maximum torque. Operating times without considering soft start/soft stop. Soft start/soft stop is preselected for the factory settings.

2) Operating times can be selected in 9 levels when placing the order. Otherwise, the fastest speed is selected as default value in the factory. Settable via Bluetooth in steps of 1 % within the range.

3) The tripping torque is adjustable for directions OPEN and CLOSE within the indicated torque range. The “Torque bypass” function (can be activated) allows increasing the pre-set tripping torque to 127 % (unseating torque). This increase only applies during actuator start for an adjustable time period. This allows unseating blocked valves.

4) Maximum permissible torque for modulating duty. The values from the “Torque range” column still apply as tripping torques.

5) Specified weight includes part-turn actuator, unbored coupling and handwheel.

11.4 Tightening torques for screws

Table 13: Tightening torques for screws

Threads	Tightening torque [Nm]	
	Strength class	
	A2-70/A4-70	A2-80/A4-80
M4	2.2	3
M5	4.3	5.7
M6	7.4	10
M8	18	24
M10	36	48
M12	61	82
M16	150	200
M20	294	392
M30	1,015	1,057
M36	1,769	2,121

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