DREHMO
VALVE ACTUATORS

x-matic
(i-matic Ex)

Electric actuators with integral
controls according to ATEX, IECEx and CCC

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:

Depending on the electrical version, please also observe the description of integral controls IM (383347) or IMC (383352)!

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1 Safety

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:

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

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

Electrostatic charging

Highly efficient charge generating processes (processes more efficient than manual friction) on the device surface must be excluded at any time. Highly efficient charge generating processes will lead to brush discharges or propagating brush discharges and therefore to ignition of a potentially explosive atmosphere. This safety instruction also applies to fireproof coatings or covers available as an option.

When using a stem protection tube, any type of charge generating processes must be excluded at its protective cap as well as the V-seal (e.g. only wipe with a damp cloth). Otherwise, ignitable electrostatic discharges might occur.

Ignition hazards

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

Commissioning

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

Operation

Prerequisites for safe and smooth operation:

- Correct transport, proper storage, mounting and installation, as well as careful commissioning.
- Only operate the device if it is in perfect condition while observing these instructions.
- Immediately report any faults and damage and allow for corrective measures.
- 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.

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

The devices described are approved for use in the potentially explosive atmospheres of zones 1 and 2. The described devices may also be used in potentially explosive atmospheres of zones 21 and 22 in case of appropriate ATEX approval.

If temperatures are to be expected at the valve flange or the valve stem, which exceed the permissible ambient temperatures, (e.g. due to hot media), please consult the manufacturer. 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 (S1)
- Buried service
- Continuous underwater use (observe enclosure protection)
- Potentially explosive areas of zones 0 and 20
- Potentially explosive atmospheres of group I (mining)
- 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 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.**

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

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

2 Identification

The following section describes the characteristics allowing identification of the respective DREHMO actuator.

2.1 Name plates

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

Figure 1: Actuator name plate

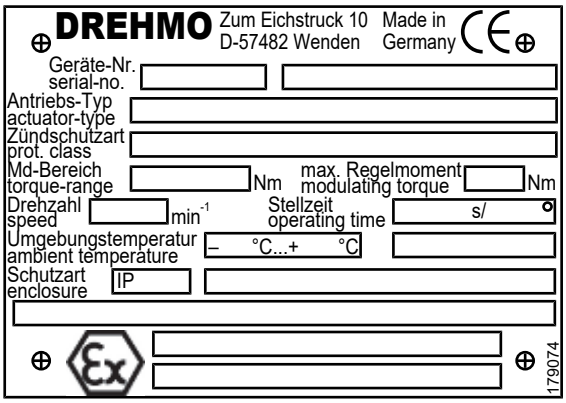
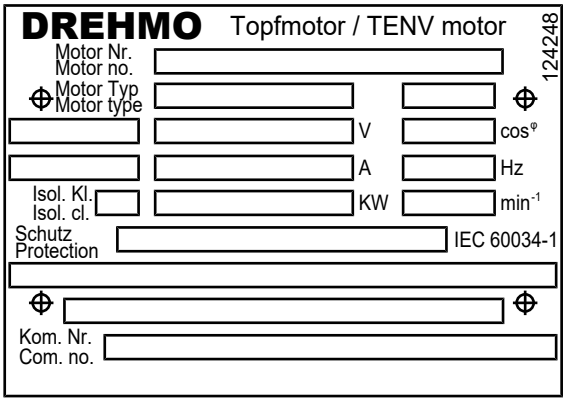


Figure 2: Motor name plate



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.

2.2 Actuator designation

Table 1: Type code

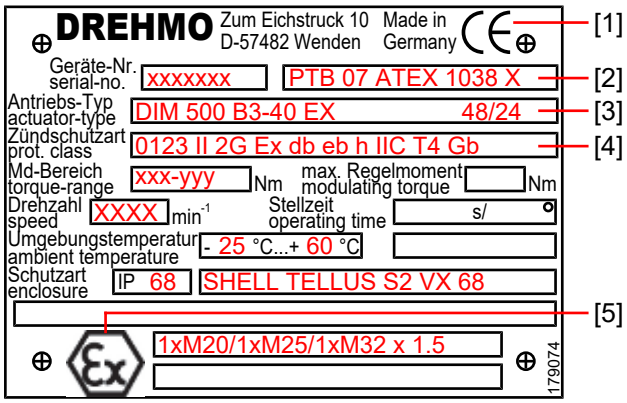
Value range	D	*	*	*	*	-	*	-	*		*
Position	1	2	3	4	5	6	7	8	9	10	11

Position	Value range	Signification
1	D	DREHMO actuator
2		Multi-turn actuator
	P	Part-turn actuator
3	iM	Actuator with i-matic or i-maticC controls
4		Actuator for open-close operation, type of duty S2 ≤ 15 min
	R	Type of duty for modulating actuator: S4 max. 35 % on time
5	30 – 2,000	Nominal torque in Nm for multi-turn actuators

Position	Value range	Signification
	75 – 1,800	Nominal torque in Nm for part-turn actuators
6	-	Line
7	A, AF, B, B1, B2, B3, B3DO, B4, C, D, DO, DOU, DSTO, DSTU, E, EDO	Valve attachment types for multi-turn actuators according to EN ISO 5210/DIN 3338
	B, V, W, L/D, H, FH, FW	Valve attachment types for part-turn actuators according to EN ISO 5211/DIN 3210
8	-	Line
9	5 – 160 (50 Hz)	Output speed in rpm for multi-turn actuators
	6 – 192 (60 Hz)	Output speed in rpm for multi-turn actuators
	8 – 60 (50 Hz)	Operating time for 90° in seconds for part-turn actuators
	6 – 50 (60 Hz)	Operating time for 90° in seconds for part-turn actuators
10		Blank
11	Ex	Explosion-proof actuator

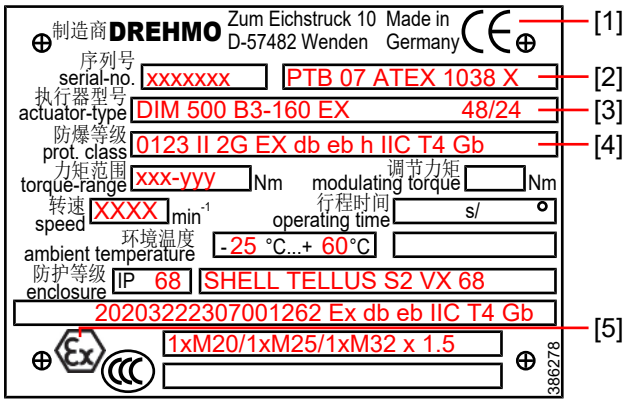
2.3 Description of the marking according to ATEX and IECEx

Figure 3: Ex marking (in our example according to ATEX)



[1]	CE code	[2]	Type examination certificate
[3]	Assembly week/Year of manufacture	[4]	Ex marking (refer to description)
[5]	Ex symbol		

Figure 4: Name plate Ex marking according to CCC



[1]	CE code	[2]	Type examination certificate
[3]	Assembly week/Year of manufacture	[4]	Ex marking (refer to description)
[5]	Ex symbol		

Table 2: Ex marking

Marking	Signification
0123	ID number of the notified body
II	Group
2G	Device category
Ex	Ex followed by protection type
db	Flameproof enclosure: Motor, controls compartment and terminal compartment as an option
eb	Increased safety: Intermediate terminal box and terminal compartment (default)
h	Constructional safety: Actuator gearings and pertaining output drives
IIC	Explosion group
T4	Temperature class
Gb	Equipment protection level

3 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.

3.1 Transport

DANGER

Suspended load!

Death or serious injury.

- → Do NOT stand below suspended load.
- → Fix ropes or slings around housing, NOT to handwheel, stem protection cover or motor eyebolt.
- → 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.
- → Secure load against falling, sliding or tilting.
- → Perform lift trial at low height to eliminate any potential danger e.g. by tilting.

Please refer to the illustration below for appropriate actuator transport.

Figure 5: Transport

3.2 Storage

Mounting or storage in humid environments requires appropriate actions for avoiding condensation inside the actuator. If the actuator is equipped with an externally supplied additional heater, this heater should be predominantly used. Otherwise, switch on the operating voltage.

NOTICE

Danger of corrosion due to inappropriate storage!

- → Store in a well-ventilated, dry and closed room.
- → Protect against dampness from the floor and ambient humidity.
- → Cover to protect against dust and dirt.
- → Apply suitable corrosion protection agent to uncoated surfaces.
- → If there is no external additional heater, switch on integral controls.

NOTICE

Damage on display caused by temperatures below permissible level!

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

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

- Prior to storage: Protect uncoated surfaces, in particular output drive parts and mounting surfaces using long-term corrosion protection agents.
- At an interval of approx. 6 months: Check uncoated surfaces for corrosion. Should traces of corrosion be detected, renew the corrosion protection.
- Ensure that actuators are fully operational by performing a test run every 6 months.

3.3 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.

4 Valve attachment

This section deals with mounting the actuator on a valve, while detailing the specialities of the different version. Always check the actuator for damage first. Replace damaged parts by original spare parts.

Parts relevant to flameproof enclosure are to be replaced by the manufacturer.

DREHMO actuators can be mounted in any position. If the perpendicular valve shaft is freely accessible, this requires the least effort. To fix the DREHMO actuator to the final element (valve), threaded holes are provided at the actuator mounting flange. The dimensions of the actuator mounting flange with output drive types comply with EN ISO 5210/DIN 3338 (multi-turn actuators) or EN ISO 5211/DIN 3210 (part-turn actuators) standards.

a) DREHMO actuators are self-locking up to output speeds of 80/96 rpm (@ 50/60 Hz).

b) Actuators with speeds of 120/160 rpm @ 50 Hz, or 144/192 rpm @ 60 Hz are not self-locking and therefore not suitable for pulling loads.

c) For more information on actuators with brakes, refer to Types of duty for different versions [▶ 44].

4.1 Handwheel operation

Both actuator or valve can be operated manually at any time via the handwheel in case of power failure. Switching between motor operation and handwheel operation is not required. Clockwise rotation of the handwheel results in clockwise rotation of the output drive (view on the motor name plate).

NOTICE

Damage to actuator and mounted elements by handwheel operation!

→ The set tripping torques do not limit the forces applied by the handwheel.

→ Operation via handwheel only.

→ Power drive for handwheel operation is only available on request with the manufacturer.

→ Use of levers of any type is not permitted.

4.2 Dismantling and mounting of the stem nut (output drive type A)

For output drive type A, make sure that the unbored stem nut (delivered unbored if not stated otherwise in the order) must be provided with a thread bore in compliance with the available stem, prior to mounting the DREHMO actuator onto the valve.

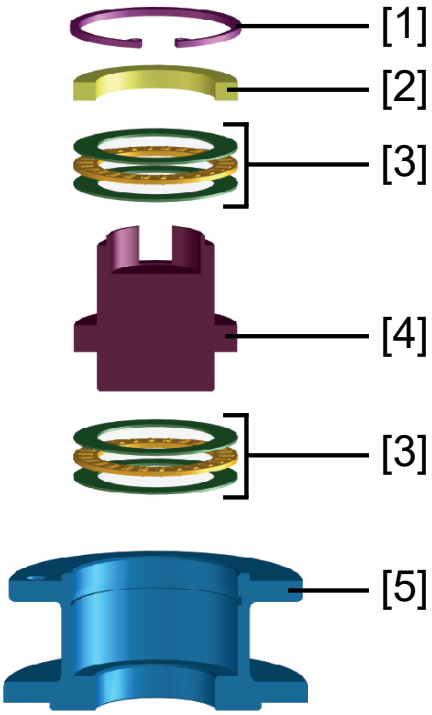
NOTICE

Lubrication of bearing points required!

→ Apply sufficient Lithium soap EP multi-purpose grease to axial needle roller and cage assemblies and contact bearing faces when mounting stem nut A.

→ Ensure that all hollow spaces of the bearings are filled with grease.

Figure 6: Stem nut A



[1]	Retaining ring	[2]	Shim washer
[3]	Axial bearing with two bearing washers	[4]	Stem nut
[5]	Output mounting flange		

How to proceed

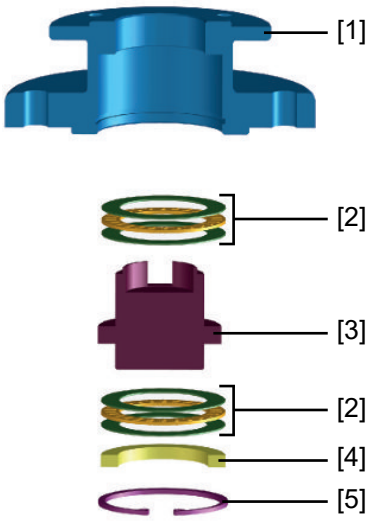
1. Dismantle output mounting flange [5] from actuator.
2. Remove retaining ring [1].
3. Remove stem nut [4] including shim washer [2] and axial bearing with the two bearing washers [3].
4. Drill threaded hole.
5. Fit stem nut in reversed order while greasing the bearings.
6. Apply a thin film of sealing agent (e.g. Marston Durapress) at sealing faces of output mounting flange [5] prior to assembly.

4.3 Dismantling and mounting of the modified stem nut (output drive type A-HP)

For better distinction, each of the new stem nuts is marked with a turned marking groove at the shoulder circumference.

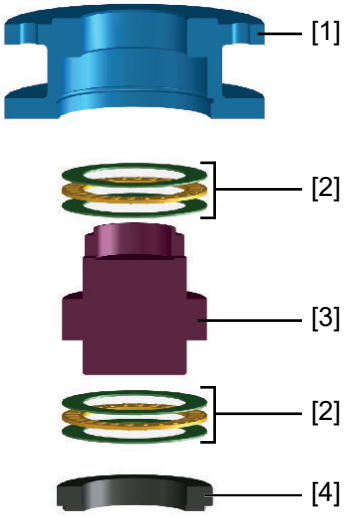
NOTICE! Lubrication of bearing points required!

Figure 7: Stem nut A-HP with retaining ring



[1]	Output mounting flange	[2]	Axial bearing with two bearing washers
[3]	Stem nut	[4]	Shim washer
[5]	Retaining ring		

Figure 8: Stem nut A-HP with locking nut



[1]	Output mounting flange	[2]	Axial bearing with two bearing washers
[3]	Stem nut	[4]	Locking nut

How to proceed

1. Remove retaining ring [5]/locking nut [4].
2. Take out stem nut [3] and axial bearing with two bearing washers [2].
3. If it is an output drive with retaining ring, also remove the shim washer [4].
4. Drill threaded hole.
5. Fit stem nut in reversed order while greasing the bearings.

4.4 Insulating flange

When using an insulating flange, heed the length of the screws used. They must not be too long; otherwise, the insulating caps within the flange or even the flange as such will be damaged. We therefore recommend using studs according to DIN 938 with a depth of thread of 1 x D (refer to figure Insulating flange [▶ 15]). A remaining width of joint of 0 mm must not be fallen short of.

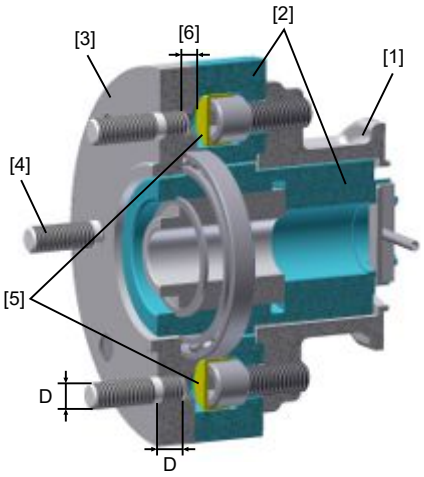
Caution: Isolating spark gaps for lightning conditions between multi-turn actuator and pipeline are not included in the delivery! A potential supplier is the DEHN company, product TFS (Trennfunkenstrecke, German for isolation spark gaps).

NOTICE

Risk of damage at insulating flanges when using motors with mounted terminal box (standard motors) and horizontal mounting position!

→ Due to the restricted permissible force at the insulating flange, horizontal mounting is not permissible for actuators with standard motors (with separate terminal box) and with TM2 or TB2 pot-type motors.

Figure 9: Insulating flange

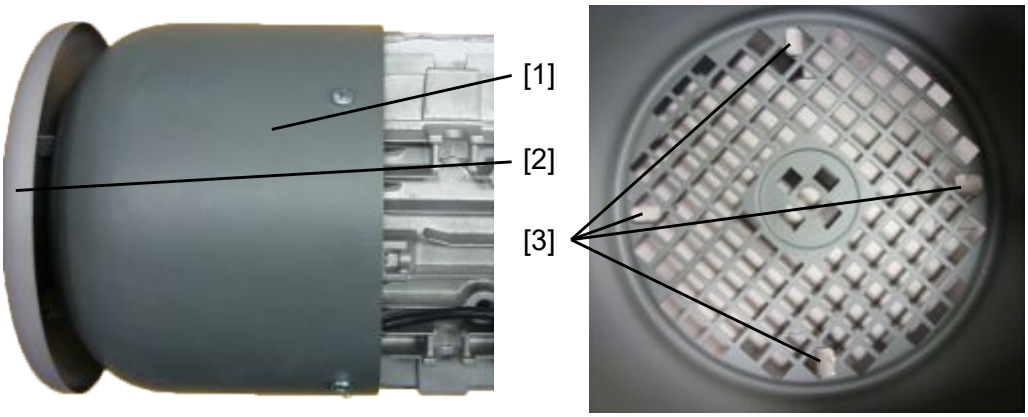


[1]	Input mounting flange	[2]	Insulating body
[3]	Output drive flange	[4]	Stud
[5]	Insulating caps	[6]	Remaining width of joint (> 0 mm)

4.5 Rain protection hood

For HEW-RUF motors, the rain protection hood [2] is always used in combination with the fan cover [1] (refer to Rain protection hood [▶ 15]). This is the responsibility of the supplier! The hood must only be disassembled at the customers' for upward mounted shafts (protection hood points downward). For this, the fan cover [1] must be disassembled first. After this, the rain protection hood [2] with positive connection can be removed. For this, straighten the four lugs [3] using appropriate universal pliers or similar. Finally, the fan cover [1] must be refitted.

Figure 10: Rain protection hood



[1]	Fan cover	[2]	Rain protection hood
[3]	Lugs		

4.6 Assembly

Direct mounting

For direct mounting, the actuator is fitted without intermediate gearing to the valve. For this, multi-turn actuators are equipped with output drive type B3 as a standard. On request, output drive types A, B1, B2, B4, C, D and E are also available.

Align actuator on valve, then rotate the device until fixing holes of actuator and valve align and the output drive is correctly placed on the valve flange. If required, use handwheel to operate actuator to a suitable position. Fasten actuator crosswise to valve using appropriate screws.

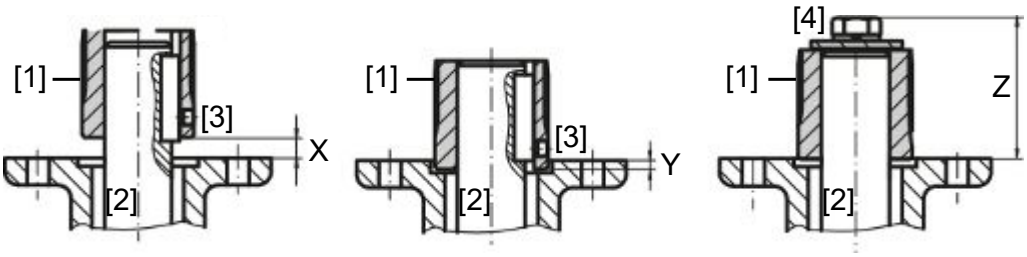
Output drive type A is an exception. First fasten output drive on the stem until it is flush on the valve. Rotate the drive assembly down the valve shaft to mate with the valve flange. Align the fixings and attach loosely, rotate the drive coupling to take up the free play and ensure close coupling of the flanges, before fastening tightly. Then the actuator is placed on the drive assembly and can be rotated to the correct position via the handwheel. Finally screw the flange tightly to the actuator.

Table 3: Tightening torques

Screw strength class 8.8 ($\mu_G \approx 0.12$)										
Threads	M6	M8	M10	M12	M14	M16	M18	M20	M30	M36
Tightening torques in Nm	10	25	49	85	135	210	300	425	1,450	2,600

Part-turn actuators are equipped with an unbored output drive plug sleeve as a standard. The output drive plug sleeve has splines at the outer diameter. Apply suitable grease to the splines prior to mounting to the valve. The output drive plug sleeves can be inserted into the actuator with an offset at certain angles. Heed the fitting dimensions according to Assembly [▶ 17].

Figure 11: Sectional view of various couplings



[1] Coupling
[2] Valve shaft
[3] Grub screw
[4] Screw

Increased fastening torque for powder coated flanges possibly required!

a) Thanks to powder coating on flange surfaces and flange threads, we achieve top quality and permanent corrosion protection. However, this can lead to an increased fastening torque of up to 2 Nm across all screw dimensions. Consequently, tools might already be required when fasting the screws (typically a socket is sufficient). This was considered when specifying the screw connection and is totally uncritical in practice.

How to proceed

1. Operate actuator with handwheel to mechanical end stop.
2. Valve and part-turn actuator must be in the same position CLOSE/CLOSE or OPEN/OPEN.
3. Thoroughly degrease the bearing faces of the output mounting flanges and apply a suitable sealing agent (e.g. Marston Durapress).
4. Apply a small quantity of grease to the valve shaft [2].
5. Place coupling [1] onto valve shaft [2] and secure against axial slipping by using a grub screw [3], a retaining ring or a screw [4]. Observe dimensions X, Y or Z.

Table 4: Coupling fitting dimensions

Type, size, output mounting flange	X_{max} in mm	Y_{max} in mm	Z_{max} in mm
DP…(R) 75/150/299-F05/07	3	2	40
DP…(R) 75/150/299-F10	3	2	66
DP…(R) 300/450-F10	4	5	50
DP…(R) 300/450-F12	4	5	82
DP…(R) 600/900-F12	5	10	62
DP…(R) 600/900-F14	5	10	102
DP…(R) 1200/1800-F14	8	10	77
DP…(R) 1200/1800-F16	8	10	127

6. Apply acid-free grease to splines on coupling.
7. Fit part-turn actuator.
8. Should the flange bores not match with the threads.
   ⇨ Slightly rotate handwheel until bores line up.
   ⇨ If required, shift actuator by one tooth on the coupling.
9. Fasten actuator with suitable screws.

We recommend glueing in the screws using thread sealing agent. Tighten screws crosswise with a torque according to Tigthening torques [▶ 16].

Indirect mounting

For indirect mounting, DREHMO actuators can be supplied with base and lever or base and shaft. Connection between actuator and valve is provided by the customer (e.g. via lever arrangement).

4.7 End stops for part-turn actuators

The end stop screws are mechanical limits for manual operation and may not be approached during motor operation!

The internal end stops limit the swing angle. They protect the valve in manual 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

Caution: The end stop setting sequence depends on the valve. We recommend starting with end stop CLOSED for butterfly valves and with end stop OPEN for ball valves.

Turn handwheel clockwise to mechanical stop, then slowly rotate one turn counterclockwise.

Apply a thin film of sealing agent (e.g. Marston Durapress) at output mounting flanges prior to assembly. Adjust actuator in accordance with the possible angular steps and slide it carefully onto the output drive plug sleeve.

In case the dog of the hollow shaft does not engage into the respective keyway of the output drive plug sleeve, rotate the handwheel until hollow shaft engages. Slowly rotate handwheel until flange bores align, then fasten actuator using flange screws. If more than one handwheel turn is required, put the actuator to the initial position, lift it and place it again onto the output drive plug sleeve by moving one indent.

4.8 Setting the mechanical end stop screw for part-turn actuators

DP…(R) 75 – 1800 (with planetary gearing)

⚠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 $T_{min.}$

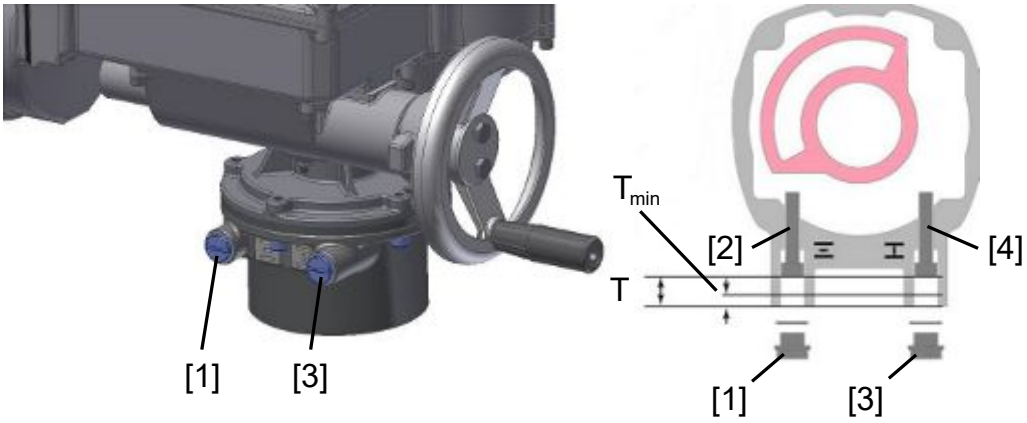
On delivery, unfasten both screws for the end stop to allow alignment of actuator to valve. The minimum and maximum dimensions indicated in the table below must not be exceeded. When setting up the actuator, the valve must be in position CLOSED.

Table 5: Setting limits of the stop screws for planetary gearings

Actuator type 90°	T	T_{min}
DP…(R) 75/150/299 Ex	17 mm	11 mm
DP…(R) 300/450 Ex	20 mm	12 mm
DP…(R) 600/900 Ex	23 mm	13 mm
DP…(R) 1200/1800 Ex	23 mm	12 mm

Caution: The end stop setting sequence depends on the valve. We recommend starting with end stop CLOSED for butterfly valves and with end stop OPEN for ball valves.

Figure 12: Cross section of compartment for end stop screws



[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

4.8.1 Set end stop CLOSED

How to proceed

1. Remove screw plug [3].
2. Move valve to end position CLOSED with handwheel.
3. If the valve end position is not reached:
   - ⇨ Slightly turn setting screw [4] 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.
4. Turn setting screw [4] clockwise until end stop is reached, then turn in opposite direction by one turn.
5. Check O-ring in screw plug and replace if damaged.
6. Fasten and tighten screw plug [3].

Now, end stop CLOSED setting is complete and end position CLOSED setting can be performed. Having completed this procedure, end stop OPEN can be immediately set.

4.8.2 Set end stop OPEN

How to proceed

1. Remove screw plug [1].
2. Move valve to end position OPEN with handwheel.
3. If the valve end position is not reached:
   - ⇨ Slightly turn setting screw [2] 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.
4. Turn setting screw [2] clockwise until end stop is reached, then turn in opposite direction by one turn.
5. Check O-ring in screw plug and replace if damaged.
6. Fasten and tighten screw plug [1].

Now, end stop OPEN setting is complete and end position OPEN setting can be performed.

5 Electrical connection

This section deals with the electrical connection of DREHMO actuators. Safety critical aspects and information for installation and modification of the electrical connection are presented.

5.1 Important notes

DANGER

Electric shock due to presence of hazardous voltage if the PE conductor is NOT connected!

Death or serious injury.

→ Connect all protective earth conductors (if required use external earth connection).

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

WARNING

Electric shock due to 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.

→ Connection to electrical voltage is only permitted if all housing covers are appropriately closed! All housing parts must be free of damage!

Work on the electrical system or equipment and electrical installation work on actuators must only be carried out by skilled electricians themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

When setting up and operating the actuator in potentially explosive atmospheres, heed the provisions in compliance with IEC/EN 60079-14 for gas explosive atmospheres.

In addition, heed the following points:

- Observe indications on name plate.
- Compare mains voltage.
- The actuator is connected in compliance with the terminal plan supplied. Should the terminal plan not be available, please request another copy from the manufacturer indicating the device number.
- 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.
- For cable glands (including screw plugs!) make sure that the required IP enclosure protection is guaranteed and suitable for connecting cables.
- The connecting cables must comply with the requirements in terms of electrical connection data and load (mechanical, thermal and chemical).
- Appropriate fuses for cable protection must be installed in front of each actuator. Fuse specifications must be calculated on the basis of published motor data.

WARNING

Danger of explosion for explosion-proof applications!

Death or serious injury.

→ Before opening, ensure that there is no explosive gas and no voltage.

⚠WARNING

Risk of explosion in case of damage to flameproof enclosure!

Risk of death or serious injury

→ Covers and housing parts must be free of damage.

→ Flameproof joints must neither be damaged nor soiled in any way.

→ Do not jam cover during fitting.

⚠WARNING

Danger of explosion by impermissible heating up of the motor.

Death or serious injury.

→ Plan and implement the required protective measures within the system.

→ When using a solid-state relay (SSR), one of the three phases is always connected to the motor and is therefore not switched. Consequently, there is a risk of motor overheating in case of fault. This can be prevented by an all-pole disconnection provided by the customer.

⚠WARNING

Loss of explosion protection!

Death or serious injury.

→ Unless ordered otherwise, the actuator will be supplied with non-Ex certified screw plugs. Replace these screw plugs by suitable screw connections prior to commissioning to ensure explosion protection.

For explosion-proof actuators, additionally heed the points below:

- According to IEC/EN 60079-14, actuators and the pertaining switching and distribution devices have to be considered within the framework of the protective actions for the connected mains.
- The Ex approval has to be legible.
- Motor windings are protected by means of PTC thermistors according to DIN 44082 and a certified dripping device which has been subjected to function test.
- When deploying the actuator in potentially explosive atmospheres, use cable glands and screw plugs with certification for the respective application.
- Electrical connection of explosion-proof actuators is exclusively made via appropriately certified connection terminals in compliance with the terminal plan supplied.
- To ensure required equipotential bonding, connect actuators via the outer earth terminal to the equipotential compensation system, provided that no fixed and secured metallic contacts with construction parts are available which are in turn connected to the equipotential compensation system.

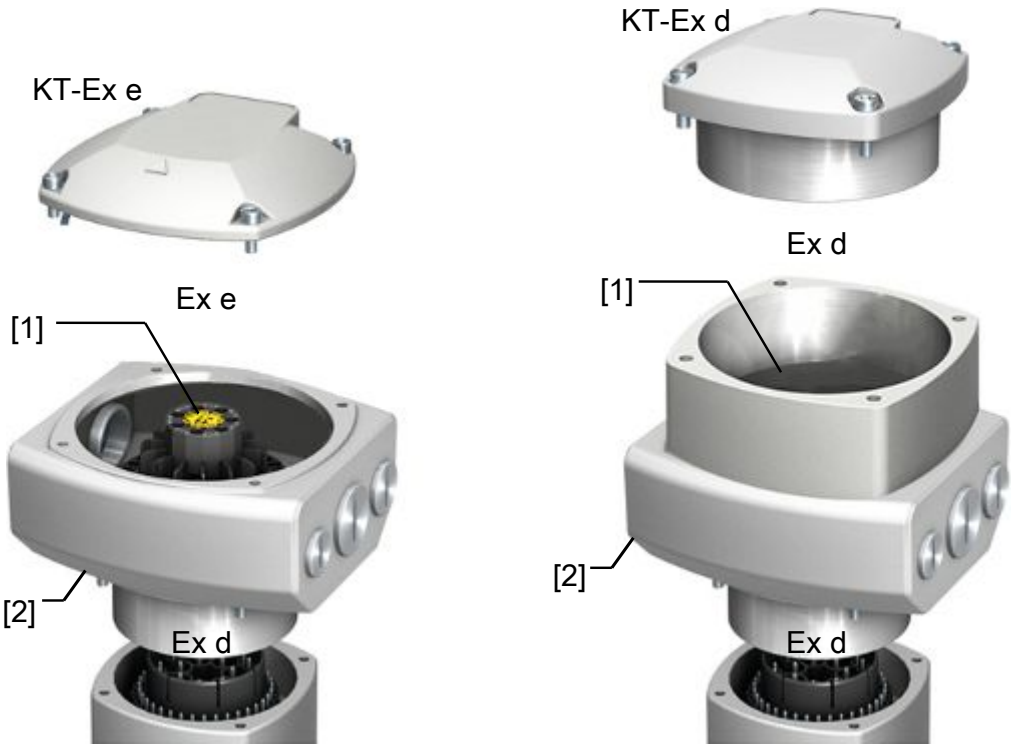
DREHMO actuators are not equipped with an internal protective device against failures within the power circuit.

5.2 Connection terminals

Various options are available for actuator connections. For precise indications relating to possible cable cross sections and, if applicable, pertaining tightening torques, refer to Technical data overview [▶ 42].

5.3 KT/KM/KL electrical connection

Figure 13: Electrical connection for KT/KM/KL (figure shows KT version)



[1] Terminal carrier with screw-type/spring clamp terminals

[2] Connection frame

Short description

KT plug-in electrical connection with screw-type terminals for power connection and spring clamp terminals for control contacts.

KM version with additional support terminals (terminal blocks) via terminal carrier. KL version with additional mounting frame for connection boards.

All three versions (KT, KM and KL) are available with terminal compartment in protection type Ex e (increased safety) as well as in protection type Ex d.

Plug-in connection is made via the connection frame. Removing the cover is sufficient for connecting the cables. Thereby, the connection frame with the cable entries remains at the device. The flameproof interior of the connected devices remains sealed.

Technical data

Table 6: KT/KM/KL electrical connection

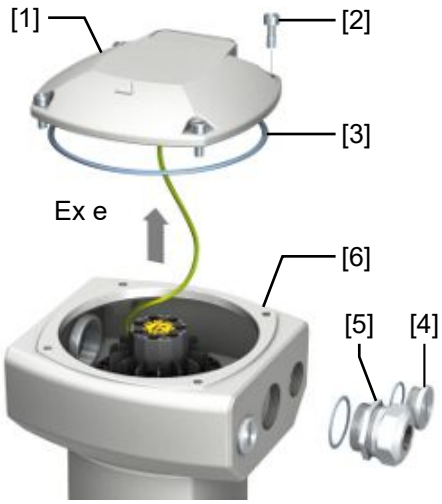
	Power contacts	Control contacts
No. of contacts max.	6 + PE conductor [1]	50
Designations	U1, V1, W1, U2, V2, W2, ⏚	1 to 36, 37 to 50
Support terminals max.	3	12
Connection voltage max.	1,000 V	250 V
Nominal current max.	25 A	5 A[2]
Type of customer connection	Screw connection PE = Ring lug/U-bracket	Spring clamp terminals
Connection diameter max.	10 mm^2	2.5 mm^2

1) Four protective earth connections within frame

2) The sum of the currents of all control contacts must not exceed 50 A.

5.3.1 Open terminal compartment

Figure 14: Open terminal compartment



[1]	Cover (illustration shows KT version in type of protection Ex e)	[2]	Screws for cover
[3]	O-ring	[4]	Screw plug
[5]	Cable gland (example)	[6]	Connection frame (in our example KT-Ex e)

DANGER

Electric shock due to presence of hazardous voltage!

Death or serious injury.

→ Disconnect from mains before opening.

WARNING

Risk of explosion in case of non-respect of the protection type!

Risk of death or serious injury!

→ During commissioning, replace supplied screw plugs with cable glands or screw plugs with Ex approval, suitable for the type of protection. Thread types and thread sizes are specified on the name plate.

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.

For shielded cables: Use EMC cable glands.

How to proceed

1. Loosen screws [2] and remove cover [1].
2. Insert cable glands [5] suitable for connecting cables.
3. Seal unused cable entries with approved screw plugs [4] suitable for the required protection type.
4. Tighten cable glands [5] and screw plugs [4] at the housing. Consider torques according to manufacturer's details.

5.3.2 Cable connection

Table 7: Customising the cables

Terminal designation	Type	Wires per terminal	Terminal cross sections	Dismantling length[1]		Type of connection and (tightening torque)
				Without wire end sleeve	With wire end sleeve according to DIN 46228; length of wire end sleeve insulated (without insulation)	
Power contacts (U1, V1, W1, U2, V2, W2) PE connection	solid	1	0.25 – 10.0 mm^2	12 mm	not permissible	Screw-type terminals[2] (M = 1.2 – 1.5 Nm)
	flexible	1	up to 2.5 mm^2 up to 4 mm^2 up to 10 mm^2	not permissible	8 (8) mm 10 (10) mm 12 (12) mm	
	flexible	2[3]	0.25 – 6 mm^2	not permissible	12 (12) mm	
Control contacts (1 to 36, 37 to 50)	solid	1	0.25 – 2.5 mm^2	10 mm	not permissible	Spring clamp terminals[4]
	flexible	1	0.25 – 1.0 mm^2 up to 1.5 mm^2 up to 2.5 mm^2	10 mm	10 (6) mm 10 (7) mm 10 (10) mm	
	flexible	2[3]	0.25 – 0.75 mm^2	not permissible	10 (10) mm	
Protective earth connections within frame (customer connection)	solid	2	1.5 mm^2 – 10 mm^2	10 mm	not permissible	U-bracket (M = 3 – 4 Nm)
	flexible	2	1.5 mm^2 – 10 mm^2	not permissible	10 (10) mm with M6 ring lug as an alternative[1]	

1) For dismantling length, refer to manufacturer's specifications for wire end sleeve or ring lug
2) Flexible cables for screw-type terminals with wire end sleeves
3) For two wires per terminal, a twin wire end sleeve must be used
4) Flexible cables for spring clamp terminals permissible even without wire end sleeves. Dismantling: 10 mm

⚠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.

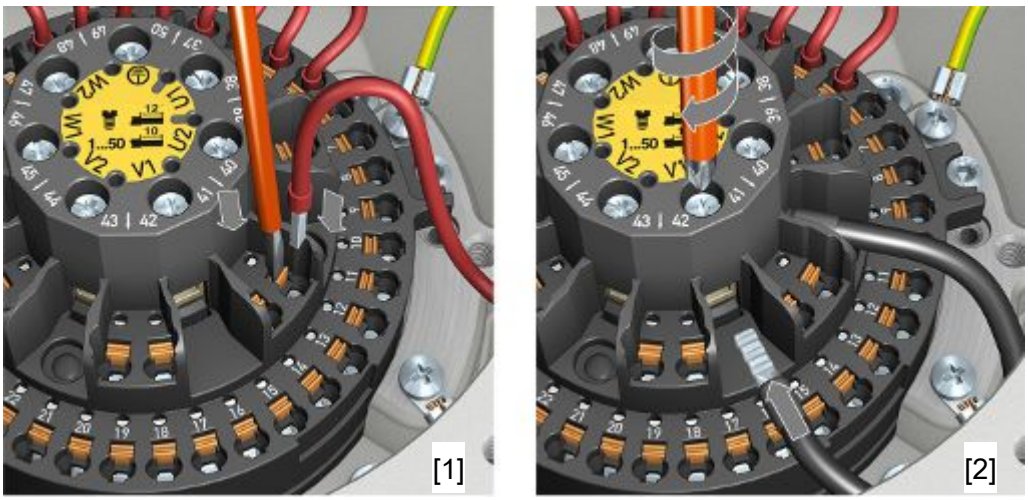
→ Connect PE connection to external protective earth conductor of connection cable.

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

How to proceed

1. Remove cable sheathing in a length of 250 – 300 mm.
2. Insert the wires into the cable glands.
3. Fasten cable glands with the specified torque to ensure required enclosure protection.
   Information: For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).
4. Strip wires.
   For dismantling lengths, refer to Customising the cables [▶ 24] table.
5. Connect cables according to order-related wiring diagram.
   Information: Each spring clamp terminal is equipped with a test contact for service purposes which is located above the numbering.
   Information: For flexible cables: for screw-type terminals, use wire end sleeves according to DIN 46228. For spring clamp terminals, connection is possible without wire end sleeves.

Figure 15: Connect cables to terminal carrier.

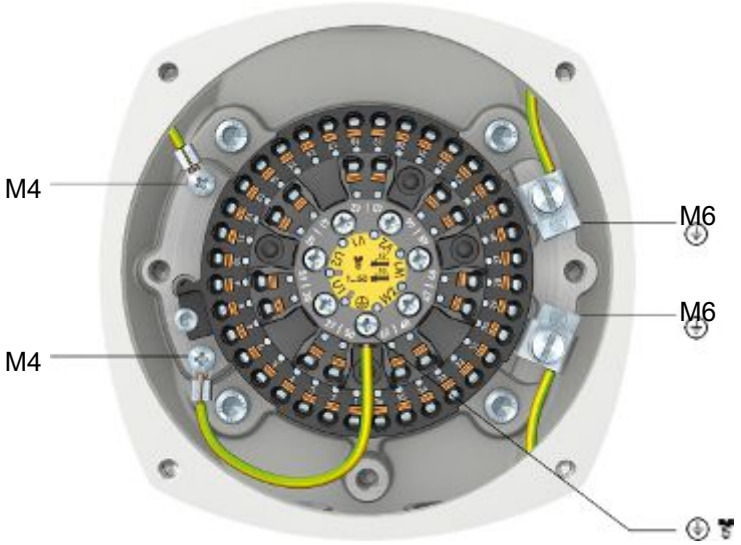


[1] Fitting control cables into spring clamp terminals

[2] Tightening power terminals

6. Firmly tighten protective earth to PE connection (M6 ⏚).
   WARNING! In case of fault: Hazardous voltage while protective earth conductor is NOT connected!

Figure 16: Protective earth connections within connection frame



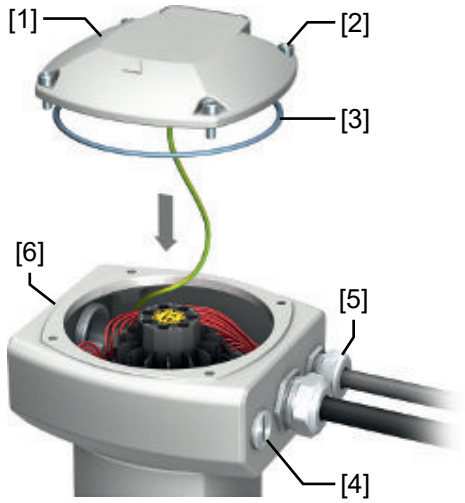
M6 Customer protective earth connection for M6 ring lug or with U-bracket for up to two wires.

M4 Internal protective earth connections via M4 ring lug (to cover and terminal carrier) connected in the factory

⏚ Protective earth connection to terminal carrier (cable terminals); already connected in the factory

5.3.3 Close terminal compartment

Figure 17: Close terminal compartment



[1]	Cover (illustration shows KT version in type of protection Ex e)	[2]	Screws for cover
[3]	O-ring	[4]	Screw plug
[5]	Cable gland (example)	[6]	Connection frame (KT-Ex e)

For version in flameproof enclosure (Ex d), heed the following:

⚠WARNING

Risk of explosion in case of damage to flameproof enclosure!

Risk of death or serious injury

→ Covers and housing parts must be free of damage.

→ Flameproof joints must neither be damaged nor soiled in any way.

→ Do not jam cover during fitting.

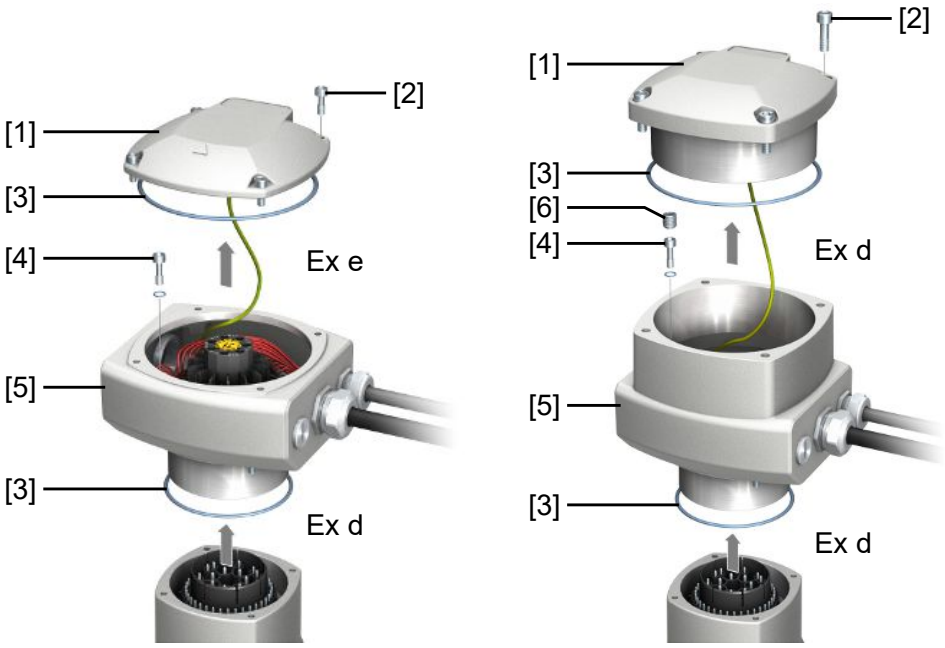
How to proceed

1. Clean sealing faces of cover [1] and connection frame [6].
2. For design in flameproof enclosure (Ex d): Preserve joint surfaces with an acid-free corrosion protection agent.
3. Check whether O-ring [3] is in good condition, replace if damaged.
4. Slightly grease the O-ring with acid-free grease (e.g. petroleum jelly) and insert them correctly.
5. Fit cover [1] and fasten screws [2] evenly crosswise.
   WARNING! Risk of explosion in case of damage to flameproof enclosure!
6. Fasten cable glands [5] and screw plugs [4] applying the specified torque to ensure the required enclosure protection.

5.3.4 Disconnection from the mains

If the device is dismantled for service purposes, it can be isolated from the mains without having to remove the wiring at the electrical connection.

Figure 18: KT/KM electrical connection



[1]	Cover	[2]	Screws for cover
[3]	O-ring	[4]	Screws (with gaskets) within connection frame
[5]	Connection frame	[6]	Grub screws within connection frame

⚠WARNING

Ignition of potentially explosive atmospheres caused by sparks.

Risk of death or serious injury

→ Before opening the flameproof enclosure, ensure absence of gas and voltage.

→ Handle cover and housing parts with care.

→ The flameproof joints must neither be damaged nor soiled in any way.

→ Do not jam cover during fitting.

Remove plug/socket connector

1. Loosen the screws [2].
2. Remove cover [1].
3. For versions with terminal compartment in Ex d (flameproof enclosure): Remove grub screws [6] inside the connection frame.
4. Loosen screws [4] inside the connection frame.
5. Remove electrical connection.

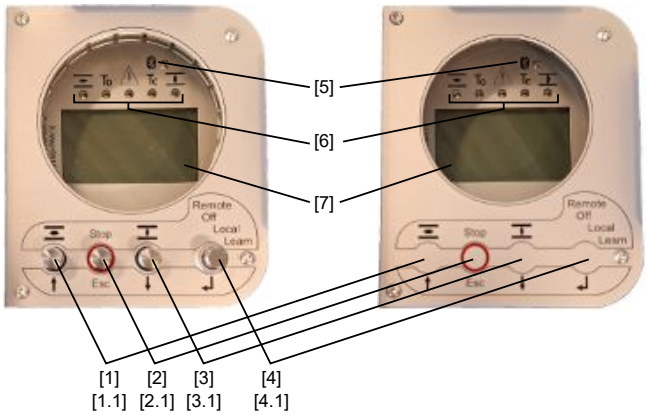
Fit plug/socket connector

6. Clean sealing faces of plug/socket connector, cover and housing.
7. Preserve joint surfaces with an acid-free corrosion protection agent.
8. Check whether O-rings [3] are in good condition, replace if damaged.
9. Slightly grease the O-rings with acid-free grease (e.g. petroleum jelly) and insert them correctly.
10. Fit electrical connection (connection frame) and fasten screws [4] (with gaskets) evenly crosswise.
11. For versions with terminal compartment in Ex d (flameproof enclosure): Fasten grub screws [6] (tightening torque approx. 10 Nm).
    Information: The flameproof enclosure is only guaranteed, provided the grub screws are fastened [6].
12. Fit cover [1] and fasten screws [2] evenly crosswise.

6 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 19: 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		

6.1 Local indication lights

These indication lights are used to display certain actuator states.

Table 8: Significance of local indication lights

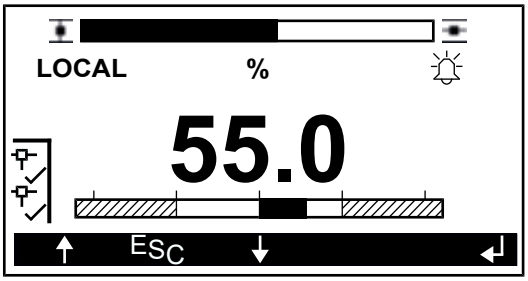
Symbol	Signification
	End position/running indication OPEN
To	Torque OPEN
⚠	Failure
Tc	Torque CLOSE
	End position/running indication CLOSE

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.

6.2 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 20: Basic display screen after system start.



WARNING

Danger of explosion caused by sparks!

Risk of death or serious injury!

→ Do not use magnetic pen without equipotential bonding in explosive atmospheres.

→ Ensure absence of gas.

The magnetic pens have no own Ex approval and may only be used in the absence of gas. If the magnetic pen remains within the potentially explosive atmosphere, equipotential bonding must be ensured since there is a risk of electrostatic charging.

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 [▶ 28]). For operation, magnetic buttons require a special magnetic pin available as separate accessory.

Magnetic pens with retaining cord (article number 387745). 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.

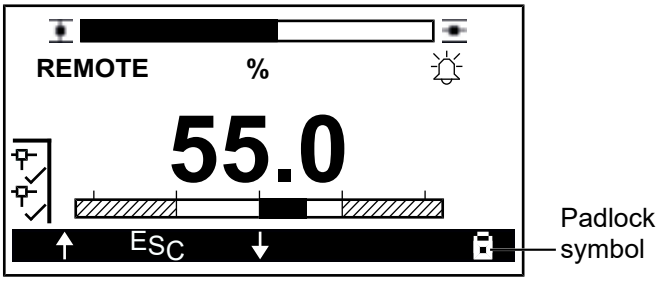
Standard functional assignment of buttons is indicated on the provided face plate of local controls. Furthermore, the lower display status indication shows the current function assignment which might vary depending on sub-menu operation.

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 [▶ 28]). 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.

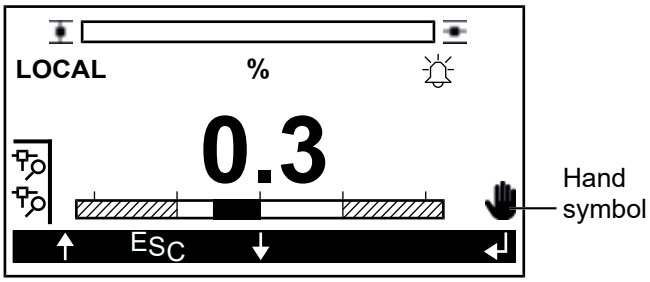
If the local controls are not disabled, use the Enter button (refer to Local controls [▶ 28]) to access the menu in which operation mode LOCAL can be set.

Figure 21: 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 [▶ 28]). 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 22: 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 [▶ 28]). 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 [▶ 28]) 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 [▶ 28]). 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!

6.3 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 [▶ 28]) 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.

6.4 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 [▶ 28]) to select the desired language.
5. Confirm selection with the Enter button.
6. The selected language is immediately activated!

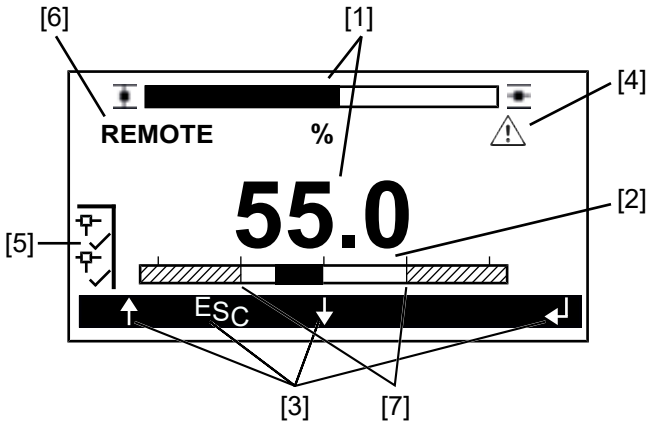
If your desired language is not available within the actuator, please contact our service.

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.

6.5 Display elements

After switching on, the main screen is displayed and all local indication lights (refer [6] Local controls [▶ 28]) are activated for approx. 3 seconds. The main screen displays the most important data.

Figure 23: 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 9: 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.
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] as 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 10: 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 parameter Self-retaining LOCAL 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 board” menu item is used to check the fieldbus interface status. For further information, refer to the operation instructions to the respective fieldbus interface.

6.6 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.

6.7 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 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 24: Display and indication elements of the local controls

7 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

7.1 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. Power supply adaptations can be performed via parameters “Phase correction” and “Phase failure monitoring”, if required.

An automatic phase sequence detection is available for 3-phase networks within the range of 220 V and 690 V.

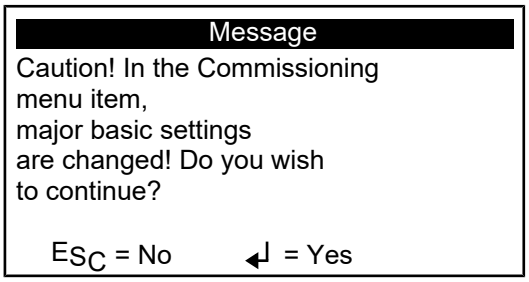
Risk of failure of automatic rotary field detection in presence of disturbed, asymmetric mains. In this instance, configure the rotary field direction applied as available. For DC supplies or 1-phase AC versions, configure the clockwise rotary field.

Phase failure monitoring is used to monitor the individual phases and issue a signal in case of failure. Set this parameter to **deactivated** for operation with 1-phase AC networks or DC networks. For verification purposes, the values measured can be checked in the “Actual values/Diagnosis” → “Power supply” menu item. For more detailed information, refer to the description of the integral controls.

7.2 Valve-specific basic setting

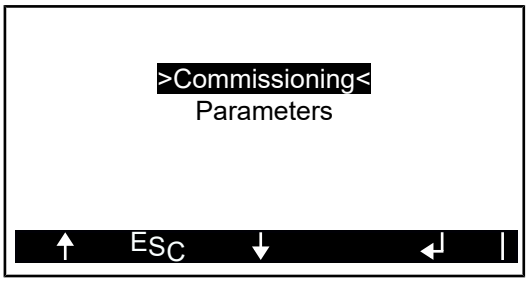
For commissioning, set the actuator to the “Commissioning” mode. To activate Commissioning mode, at least the “Maintenance” user level is required. A list of and explanations to the respective user levels can be found in the separate description of the integral controls. The following message appears:

Figure 25: Display indication 1



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

Figure 26: 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

Valve damage!

→ Observe the valve-specific requirements for the respective end position seating.

On delivery, the actuator is set to 50 % of the preset travel with ±90 actuator output drive turns. To reach a limit position outside the preset range, approach the preset limit position first. Then delete this position. Consequently, the limit position is shifted by 90 turns in direction of the respective direction. If required, repeat the extension of the preset range until the desired limit position has been reached. The maximum travel which can be set between OPEN and CLOSED amounts to 1,440 actuator output drive turns.

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.

7.2.1 Setting limit position CLOSED

As standard, the actuator is mounted onto a valve in end position CLOSED. We recommend setting this end position first. 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 setting can be reset to the default value.
4. Select the “Set position CLOSED” menu item. In this menu item, the actuator can be motor-driven to the limit position (both operation directions are possible).
5. Confirm limit position setting.
6. Briefly operate actuator out of limit position CLOSED using the display unit.
7. Check limit seating on reaching the limit position when returning into limit position CLOSED.
8. If required, correct actuator position and repeat steps 2 through 7.

7.2.2 Setting limit position OPEN

If limit position CLOSED is set, proceed with limit position OPEN setting. For this, complete the following steps:

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, the setting can be reset to the default value.
4. Select the “Set position OPEN” menu item. In this menu item, the actuator can be motor-driven to the limit position (both operation directions are possible).
5. Confirm limit position setting.
6. Briefly operate actuator out of limit position OPEN using the display unit.
7. Check limit seating on reaching the limit position when returning into limit position OPEN.
8. If required, correct actuator position and repeat steps 2 through 7.

7.2.3 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.

7.2.4 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 tripping torque OPEN or CLOSE.
4. Set the required value by means of arrow buttons.

5. Confirm selection with the Enter button.
6. Check the “Torque warning OPEN” and “Torque warning CLOSE” sub-items (they must not exceed the tripping torques).
7. Select the torque warnings to be changed.
8. Set the required value by means of arrow buttons.
9. 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.

7.2.5 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.

7.2.6 Reversing delay

Significant motor delay time is detected under weak load or no load. When changing the direction of rotation of the motor during delay time, 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. If the actuator is equipped with a brake motor, reversing delay of 0.4 s is sufficient, provided the actuator load amounts to minimum 15 % of the nominal torque. Otherwise, the reversing delay can amount up to 2 s. 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!

7.3 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.

7.4 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 Servicing and maintenance

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

8.1 Maintenance

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

- Replace handwheel
- Replace output drive
- Check oil level

In any case, the actuator has to be restored to the original state prior to continue using it.

⚠WARNING

Explosion hazard due to inexpert repair of flameproof joints!

Death or serious injury.

→ Repairs on flameproof joints must only be performed by the manufacturer.

⚠WARNING

Explosion protection due to inexpert handling of housing parts with flameproof joints!

Death or serious injury.

→ Opening of the mechanical interfaces available at the device with flameproof joints may only be performed by the manufacturer or staff trained by the manufacturer.

NOTICE

Leaking of the actuator due to excessive lubricant!

→ The actuators are lubricated for life.

→ A fixture for permanent stem lubrication (output drive type A and A-HP) can be requested from the manufacturer.

Correct commissioning is a prerequisite for reliable actuator operation. We recommend checking the fixing screws between actuator and valve or gearbox for tightness once a year.

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.

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

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 DREHMO Service. Have the device number ready. The device number can be found on the actuator name plate. Only overhaul defective actuators in the factory of the manufacturer or an authorised workshop.

8.2 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.

8.3 Oil filling

The actuator oil filling is specified for the actuator lifetime. It is indispensable part of the non-electrical explosion protection of the device. For this reason, only oils approved by DREHMO GmbH may be used for the actuators. Actuators for ambient temperatures ranging from –25 °C to +60 °C are filled with oils according to the table below. The indicated oil filling applies to open-close and modulating actuators.

⚠WARNING

Danger of explosion due to impermissible heating up caused by oil leakage!

Death or serious injury.

→ The seals must be replaced in case of leakage.

→ Refill the correct quantity of oil.

Table 11: Oil filling

Actuator type	Quantity [l]	Oil type
DPiM(R) 75…1800 Ex	1.6	Shell Tellus S2 VX 68
DiM(R) 30/59 Ex	1.6	Shell Tellus S2 VX 68
DiM(R) 60/120/249 Ex	2.6	Shell Tellus S2 VX 68
DiM(R) 250/500/1000 Ex	3.2	Shell Tellus S2 VX 68
DiM(R) 250/500/1000 Ex[1)] Speed [rpm @ 50 Hz]: 81, 121, 161, 201	3.7	Shell Tellus S2 VX 68
DiM(R) 250/500/1000 Ex[1)] Speed [rpm @ 60 Hz]: 97, 145, 193	3.7	Shell Tellus S2 VX 68
DiM 2000 Ex[1)]	9	Shell Omala S2 GX 100

1) Applies to actuators with planetary gearing and brake motor.

For other temperature ranges, the oil filling may deviate. The pertaining data can be requested from the manufacturer.

Ensure leak tightness of the device by inspections at regular intervals. Pay special attention to the following issues:

- Oil leakage at handwheel hub
- Oil leakage at joints of the housing
- Oil leakage at seals of hollow shaft

8.4 Cleaning

Clean the actuator using conventional soap solutions (alkaline solutions). To avoid heat accumulation or excessive surface temperatures, motor cooling fins must never be covered.

⚠WARNING

Risk of explosion by electrostatic discharge!

Death or serious injury.

→ All outer actuator parts e.g. painted surfaces, indicator glass, labels, etc. may only be cleaned using a moist cloth.

→ The device must be equipped with an appropriate label which must be readable at all times!

⚠WARNING

Danger of explosion due to impermissible heating up caused by wet painting layer!

Death or serious injury.

→ It is not permitted to repaint the actuator!

NOTICE

Residues of conductible foreign particles within the actuator!

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

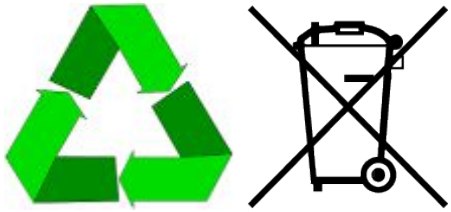
Warning instructions on the device must neither be removed nor covered by paint!

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

8.5 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.

9 Technical data

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

9.1 Contact and water protection

The enclosure protection (IP...) is marked on the name plate of the actuator. In standard version, the actuator is suitable for outdoor installation and 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.

⚠WARNING

Danger of explosion due to incorrect screw connections and cable conduits!

Death or serious injury.

→ Use of cable glands and screw plugs with certification for the respective application.

⚠WARNING

Danger of explosion due to excessive heating up by direct exposure to sunlight!

Death or serious injury.

→ For places of installation with direct exposure to sunlight, ensure respect of permissible operating temperatures (ensure appropriate shading if required).

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.

→ For K5 corrosion protection, use plastic cable glands to prevent damage to the protection layer.

NOTICE

Damage to display due to direct sunlight!

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

9.2 Technical data overview

Table 12: Technical data overview

Rated voltage	Refer to indications on motor name plate in V ±5 %.
Rated current consumption	Refer to indications on motor name plate in A
Mains frequency	Refer to indications on motor name plate in Hz ±2 %.
Rated power	Refer to indications on motor name plate in kW
Insulation strength	Overvoltage class II according to EN 61010-1
Electrical connection	Determine cable cross section on the basis of motor data, cable length and the regional regulations! Terminal compartment in Ex e: For available cable cross sections as well as pertaining tightening torques, refer to table Approved connection terminals [▶ 44]. KT/KM/KL electrical connection in Ex e/Ex d: Refer to KT/KM/KL electrical connection [▶ 22]

Fuses	F4/F5 to 500 V: Glass tube safety fuse 500 V/ M 1.25 A Tripping characteristic M = medium-blow Size 5x30 mm F6/F7: Glass tube miniature fuse 250 V/T 1.6 A Tripping characteristic T = slow-blow Size 5x20 mm Tripping characteristics according to IEC 60127-2/3 Electrical version IMC F3 instead of F7: Miniature fuse 250 V/ T 1 A Tripping characteristic T = slow-blow
Contact load (resistive load) Overvoltage category I	Output contacts for electrical version IM: max. 230 V AC 0.3 A; 30 V DC 2 A Gold plated contacts: Voltage: 5 – 30 V; 4 – 400 mA current; 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 for electrical version IMC: max. 240 V AC 6 A; 30 V DC 6 A
Electrical load	≤ 300 Ω
Motor temperature class	Refer to indications on name plate
Explosion protection	ATEX type examination certificate, IECEx Certificate of Conformity or CCC Certificate for China Compulsory product certification. For respective marking, refer to name plate.
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 – 100 Hz with 2 g (high cross-over frequency according to IEC 60068-2-6)
Installation altitude	≤ 2 000 m above sea level > 2,000 m above sea level on request

9.3 Types of duty for different versions

It is imperative to heed the types of duty even if the running times per valve cycle (OPEN and CLOSED) exceed the limited operating times. The type of duty depends upon the temperature range on the actuator name plate. Type of duty S2-xx min (short-time duty) for multi-turn actuators and S4-xx % (periodic intermittent duty with influence on starting procedure) for modulating actuators are to be considered.

With S2 duty rating, the maximum operating time of the actuator is indicated. Once this time has expired, the actuator has to pause until it has cooled down to ambient temperature +2 Kelvin. In S4 type of duty, the on-time value indicates the permitted running time with reference to the switching cycle. A switching cycle is defined as time between actuator start and next start (sum of actuator running time and pause time).

Modulating actuators are generally limited to a maximum of 1,200 starts per hour (marked on the name plate as c/h) (for reversing contactors 300 c/h) (refer to IEC 60034-1). Multi-turn actuators are limited to max. S2 - 15 min.

⚠WARNING

Excessive temperature when exceeding the max. permissible number of starts (danger of explosion!)

Death or serious injury.

→ The maximum number of starts must not exceed 1,200 c/h for modulating applications. Depending on the actuator type and the ambient temperature range, it is imperative to heed the restriction indicated on the name plate.

⚠WARNING

Risk of explosion when not respecting the type of duty!

Death or serious injury.

→ Adhere to any restrictions (refer to name plate) applicable for the actuators!

⚠WARNING

Danger of explosion caused by sparks!

Death or serious injury.

→ When selecting the adapted moving elements of valves in combination with the output drive of the actuator, make sure that the material pairs are not subject to potential forming of sparks (according to EN ISO 80079-37).

⚠CAUTION

Pulling loads

→ A brake motor is used for the following actuators:
D 250/500/1000
- Speed [rpm @ 50 Hz]: 81, 121, 161, 201
- Speed [rpm @ 60 Hz]: 97, 145, 193
D 2000 all speeds

→ For TB motors:
The brake including connection is designed as spring-applied brake. Stopping for pulling loads can be guaranteed up to a torque effective at the output drive of 300 Nm.

→ For standard motors:
The brakes of standard motors are generally not designed for stopping pulling loads.

9.4 Approved connection terminals

Table 13: Connection terminals

Manufacturer	Designation	Cross sections	Dismantling length	Torque
Weidmüller	WDU 4N	1) 0.5 – 6 mm²/1.5 – 6 mm² 2) 0.5 – 4 mm²/0.5 – 4 mm²	11 mm	0.5 – 1.0 Nm
Weidmüller	WPE 4N	1) 0.5 – 6 mm²/1.5 – 6 mm² 2) 0.5 – 4 mm²/0.5 – 4 mm²	10 mm	0.5 – 1.0 Nm
Wago	264 – 120	0.5 – 4 mm²	8 – 9 mm	Label for handling
Wago	264 – 220	0.5 – 4 mm²	8 – 9 mm	Label for handling
Phoenix	MUT 4	1) 0.2 – 6 mm² 2) 0.2 – 6 mm²/0.25 – 4 mm²	9 mm	0.6 – 0.8 Nm
Phoenix	MSLKG 6	1) 0.5 – 6 mm² 2) 0.5 – 6 mm²/0.5 – 6 mm²	10 mm	1.5 – 1.8 Nm
Phoenix	MUT 2.5	1) 0.2 – 4 mm² 2) 0.2 – 2.5 mm²/0.25 – 2.5 mm²	9 mm	0.5 – 0.6 Nm
Phoenix	USLKG 10N	1) 0.5 – 10 mm²/0.5 – 10 mm² 2) 0.5 – 10 mm²/0.5 – 6 mm²	10 mm	1.5 – 1.8 Nm
Phoenix	UK 6 N	1) 0.2 – 10 mm² 2) 0.2 – 6 mm²	10 mm	1.5 – 1.8 Nm
Phoenix	UK 10 N	1) 0.5 – 16 mm² 2) 0.5 – 10 mm²/0.5 – 6 mm²	10 mm	1.5 – 1.8 Nm

1. solid wire/stranded
2. fine stranded/fine stranded with wire end sleeve

9.5 Weights and maximum tripping torques

In the table below, weights, speeds and maximum run torques of the actuators are indicated.

⚠WARNING

Excessive temperature when exceeding the max. permissible number of starts (danger of explosion!)

Death or serious injury.

→ Ensure that the run torque of the valve does not exceed 50 % of the maximum permissible device torque unless there are further restriction applicable for the different versions.

Table 14: Technical data

Actuator type	Output speed/operating speed	Maximum run torque	Average weight in kg
DiM 30 Ex	5 – 160	15	23
DiMR 30 Ex	5 – 40	15	23
DiM 59 Ex	5 – 160	30	25
DiMR 59 Ex	5 – 40	30	25
DiM 60 Ex	5 – 160	30	29.5
DiMR 60 Ex	5 – 40	30	29.5
DiM 120 Ex	5 – 160	60	33.5
DiMR 120 Ex	5 – 40	60	33.5
DiM 249 Ex	5 – 80	125	33.5
DiM 249 Ex[1)]	120	100	33.5
DiM 250 Ex	5 – 50	125	69.5
DiM 250 Ex	80 – 160	125[2)]	69.5
DiMR 250 Ex	5 – 40	125	69.5
DiM 500 Ex	5 – 80	250	80.5
DiM 500 Ex	120	250[2)]	80.5
DiM 500 Ex	160	200[2)]	80.5
DiMR 500 Ex	5 – 40	200	80.5
DiM 1000 Ex	5 – 50	500[2)]	90.5
DiM 1000 Ex	80	400[2)]	90.5
DiMR 1000 Ex	5 – 10	500	90.5
DiM 2000 Ex	40 – 80	1,000	220
DiM 2000 Ex[3)]	160	300	220
DPiM(R) 75 Ex	8 – 34	33.5	38
DPiM(R) 150 Ex	8 – 34	75	38
DPiM(R) 299 Ex	8 – 34	150	38
DPiM(R) 300 Ex	8 – 34	150	40
DPiM(R) 450 Ex	8 – 34	225	40
DPiM(R) 600 Ex	8 – 68	300	46
DPiM(R) 900 Ex	8 – 68	450	46
DPiM 1200 Ex	7 – 75	600	51
DPiM(R) 1200 Ex	18 – 75	600	51
DPiM 1800 Ex	7 – 75	900	51
DPiM(R) 1800 Ex	18 – 75	900	51

1) 200 Nm maximum tripping torque.

2) For these devices, the gearing heats up more than the motor. The heating up is not detected by the actuator. It is therefore imperative to heed the maximum run torque and the type of duty.

3) For this version, the maximum tripping torque is restricted to 1 000 Nm.

10 Externally fixed notes

Warning and service instructions, which must be visibly attached to the actuator for the entire lifetime, are listed in this chapter. It is not permitted to apply a top coat on these warnings.

Figure 27: Label with address of the manufacturer

Figure 28: Label for pertaining version

Figure 29: Label for explosion-proof version

Exclude any kind of charge-generating processes (e.g. only wipe with a damp cloth, not with leather), as they can lead to ignitable electrostatic discharges. High charge generating processes are processes stronger than manual friction, e.g.:

- Particles moving fast along the surface of the device
- Pneumatic transport of dust
- Spraying of charges in an electrostatic coating process

Figure 30: Label with warning of hazardous voltage

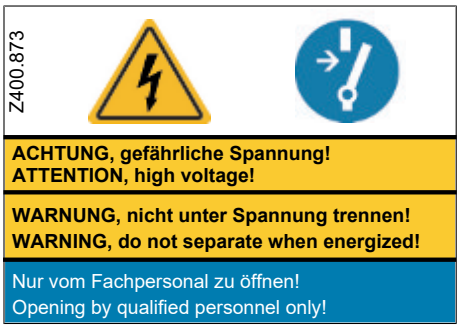


Figure 31: Label for ATEX version

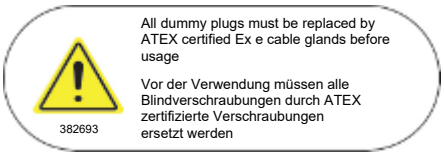
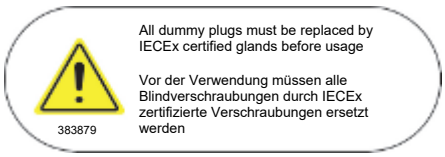


Figure 32: Label for ATEX/CCC version

Figure 33: Label for IECEx version



11 Certificates

The following section contains the Declarations of Conformity and Incorporation as well as the Type Examination Certificates and any further certificates if applicable for the actuator type range described in these operation instructions.

NOTICE

The printed documents are up to date to the date of publication of these operation instructions.

→ The latest version of the respective document can be downloaded from our website www.drehmo.com.

Refer to

- EU Declaration of Conformity [▷ 49]
- EU-Type-Examination Certificate [▷ 50]
- Certificate for China Compulsory Product Certification [▷ 54]
- IECEx Certificate of Conformity [▷ 58]

DREHMO GmbH
Zum Eichstruck 10
57482 Wenden/Germany

DREHMO
VALVE ACTUATORS

CE

EU Declaration of Conformity / Declaration of Incorporation in compliance with Machinery Directive

As the manufacturer DREHMO GmbH hereby declare that electro-mechanical DREHMO® actuators and accompanying components from the following series:

i-Matic

DiM(R) 30 Ex - DiM(R) 2000 Ex
DPiM(R) 75 Ex - DPiM(R) 1800 Ex

comply with the fundamental requirements of the ATEX Directive (2014/34/EU), the Electromagnetic Compatibility Directive (2014/30/EU), the Low Voltage Directive (2014/35/EU) and the Machinery Directive (2006/42/EC).

EU Declaration of Conformity according to the Council Directive on the approximation of laws of the member states relating to the ATEX Directive (2014/34/EU), the Electromagnetic Compatibility Directive (2014/30/EU) and the Low Voltage Directive (2014/35/EU).

Notified body:	TÜV SÜD Product Service GmbH - Zertifizierstelle -
Identification number:	0123
Address:	TÜV SÜD Ridlerstraße 65; 80339 München
Certification number:	TPS 23 ATEX Q 078524 0008
Type approval test certificates:	PTB 07 ATEX 1038 X

The following harmonised standards in terms of the specified directives have been applied:

ATEX Directive (2014/34/EU)

EN IEC 60079-0:2018
EN IEC 60079-7:2015/A1:2018
EN ISO 80079-36:2016
EN 1127-1:2019
EN 60079-1:2014
EN 60079-31:2014
EN ISO 80079-37:2016

Electromagnetic Compatibility Directive (2014/30/EU)

EN 61000-6-2:2005/AC:2005
EN 61000-3-2:2014
EN 61000-6-4:2007/A1:2011
EN 61000-3-11:2000

Low Voltage Directive (2014/35/EU)

EN 61010-1:2010/A1:2019
EN 60034-1:2010/AC:2010

Declaration of Incorporation in terms of EC Machinery Directive (2006/42/EC) Appendix II B

The following harmonised standards in terms of the Machinery Directive (2006/42/EC) have been applied:

EN ISO 12100:2010

DREHMO® actuators are intended for assembly with valves. The commissioning phase should only be implemented if it has been ensured that the final machinery in which the DREHMO® actuators are installed complies with the regulations of the EC Machinery Directive (2006/42/EC).
DREHMO® as manufacturer declares herewith, that the above mentioned linear thrust units meet the following basic requirements of the EC Machinery Directive (2006/42/EC):
Appendix I, articles: 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.1, 1.3.7, 1.5.1, 1.6.3, 1.7.1, 1.7.3, 1.7.4
The manufacturer is obliged to electronically submit the documents for the partly completed machinery to national authorities on request. The relevant technical documents pertaining to the machinery according to Appendix VII part B have been complied.
Person responsible for documentation:
Dr. Rüdiger Stenzel, Zum Eichstruck 10, 57482 Wenden/Germany

Wenden, 2023-10-19

K. Ewald, General Manager

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(1) # EU-TYPE EXAMINATION CERTIFICATE

(Translation)

(2) Equipment or Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

PTB 07 ATEX 1038 X **Issue: 3**

(4) Product: Actuator type D*iM**-*-* Ex

(5) Manufacturer: Drehmo GmbH

(6) Address: Zum Eichstruck 10, 57482 Wenden, Germany

(7) This and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 25-12074.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN IEC 60079-0:2018/A11:2024, EN 60079-1:2014+AC:2018 , EN IEC 60079-7:2015+A1:2018, EN 60079-31:2014, EN ISO 80079-36:2016, EN ISO 80079-37:2016

(10) If the sign "X" is placed after the certificate number, it indicates that the is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of . These are not covered by this certificate.

(12) The marking of the shall include the following:

II 2 G Ex db eb h IIC T3…T4 Gb or Ex db eb h IIB T3…T4 Gb

II 2 D Ex tb h IIIC T130°C Db

ZSEx001e d

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, January 20, 2025
On behalf of PTB:

Dr.-Ing. S. Essmann
Technischer Oberregierungsrat

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig • GERMANY

(13) # S C H E D U L E

(14) **EU-Type Examination Certificate Number PTB 07 ATEX 1038, Issue: 3**

(15) Description of Product

The actuator, type D****-*-* Ex, consists of the following components:

- Enclosure accommodating a planetary gear. For part-turn actuators an additional planetary gear “SQ”. Optionally mounted valve attachment.
- Flange-mounted motor of Flameproof Enclosure "db" type of protection.
- Optionally flange-mounted – separately certified – motor of Flameproof Enclosure "db" type of protection or Increased Safety "eb" type of protection.
- Motor terminal compartment of Increased Safety "eb" type of protection cast to the enclosure, with – separately certified – terminals. It is connected to the motor and the electronics compartment by means of – separately certified – wire bushings.
- An electronics compartment of Flameproof Enclosure "db" type of protection cast to the enclosure, provided with an inspection window.
- A terminal box of Increased Safety "e" type of protection, with – separately certified – terminals.
- Optionally a – separately certified - plug connector type KP, KPH and KES (DEKRA 11 ATEX 0008X) of Increased Safety "e" type of protection.
- Optionally a - separately certified - terminal compartment type KES-Exd in the type of protection flameproof enclosure "d" (DEKRA 11 ATEX 0008X).
- Optionally a - separately certified - plug connector type K.Exe and K.Exd (DEKRA 17 ATEX 0033U) in the types of protection Increased Safety "eb" and Flameproof Enclosure "db".
- Optionally an external control system. The control system may be outside the potentially explosive area (no ex-protection) or in an explosion protected design, inside the potentially explosive area. The electronics compartment of the actuator in the type of protection Flameproof Enclosure will in this case be filled with packing material.

SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 07 ATEX 1038, Issue: 3

Technical data

Rated voltage	up to 690 V
Rated current	max. 27 A *)
Rated cross section	max. 16 mm^2
Ambient temperatures	-25 °C to +40 °C (standard) -30 °C to +40 °C (IIC, T4) -30 °C to +60 °C (IIC, T4) -30 °C to +65 °C (IIB, T3)
Ingress protection	IP66 in accordance with EN 60529

*) may be higher for separately certified motors

The electrical data are based on the connected motor as well as the electric components accommodated in the electronics compartment.

Nomenclature

D	*	iM*	*	*	-	*	-	*		Ex
1	2	3	4	5	6	7	8	9	10	11

Position	Range of values	Significance
1	D	DREHMO actuator
2		Multi-turn actuator
	P	Part-turn actuator
3	iM	Actuator with i-matic or i-matic C controls
4		Actuator for open-close operation, type of duty S2
	R	Actuator for modulating operation, type of duty S4
5	30 to 2000	Tripping torque in Nm for multi-turn actuator
	75 to 1800	Tripping torque in Nm for part-turn actuator
6	-	Dash
7		Without valve attachment (output drive)
	A, AF, B, B1, B2, B3, B3DO, B4, C, D, DO, DOU, DSTO, DSTU, E, EDO, …	Valve attachment for multi-turn actuators according to EN ISO 5210
	B, V, W, L/D, H, FH, FW, …	Valve attachment for part-turn actuators according to EN ISO 5211
8	-	Dash
9	5 to 200 (50Hz)	Output speed in rpm (Multi-turn)
	6 to 192 (60Hz)	
	7 to 75 (50HZ)	Operating time for 90° in seconds (Part-turn)
	6 to 63 (60Hz)	
10		Blank
11	Ex	Explosion-proof actuator

ZSEx001e d

If components are attached to the drive, all necessary information for the operation and montoring of these components must also be provided. The operation of a standstill heater requires a separate back-up fuse to intercept faulty operating states.

Changes with respect to previous edition

The mechanical explosion protection is supplemented
The maximum output speed is up to 200 rpm.
The name Markrolon is changed to Exolon

(16) Test Report PTB Ex25-12074

(17) Specific conditions of use

Repair and overhaul of the flameproof gaps are only allowed according constructive information given from the original manufacturer. A repair according the values given in Table 1 or Table 2 of IEC 60079-1 is not permitted.

Danger due to electrostatic discharge. The actuator must be cleaned with a damp cloth only. Please refer to operation manual.

(18) Essential health and safety requirements

Met by compliance with the aforementioned standards.

中国国家强制性产品认证证书

证书编号：2020322307001262

认证委托人名称：	德国德瑞模有限公司北京代表处
认证委托人地址：	北京市朝阳区来广营西路5号院5号楼15层1501
生产者名称：	德国德瑞模有限公司
生产者地址：	Zum Eichstruck 10,57482 Wenden Germany
生产企业名称：	德国德瑞模有限公司
生产企业地址：	Zum Eichstruck 10,57482 Wenden Germany
产品名称：	DREHMO 德瑞模电动执行机构
系列、规格、型号：	D****-*-* Ex
标准：	GB/T 3836.1-2021、GB/T 3836.2-2021、GB/T 3836.3-2021

认证模式：型式试验+初始工厂检查+获证后监督

上述产品符合 CNCA-C23-01:2019 《强制性产品认证实施规则 防爆电气》的要求，特发此证。
产品相关信息详见附件。

发证日期：2022年12月05日　　有效期至：2025年09月11日

首次发证日期：2020年09月12日

证书有效期内本证书的有效性依据发证机构的定期监督获得保持。

本证书的相关信息可通过国家认监委网站 www.cnca.gov.cn 查询

批准：

上海仪器仪表自控系统检验测试所有限公司

S 0007671

CERTIFICATE FOR CHINA COMPULSORY PRODUCT CERTIFICATION

CERTIFICATE NO: 2020322307001262

APPLICANT:	Germany DREHMO GmbH Beijing Representative Office
ADDRESS:	Rm 1501, Tower 5, Cheng Ying Centre, Yard 5 Laiguangying West Road, Chao Yang District, Beijing-100012, China
MANUFACTURER:	DREHMO GmbH
ADDRESS:	Zum Eichstruck 10,57482 Wenden Germany
FACTORY:	DREHMO GmbH
ADDRESS:	Zum Eichstruck 10,57482 Wenden Germany
PRODUCT:	DREHMO Actuators
SERIES,SPECIFICATION,MODEL:	D****-*-* Ex
STANDARDS:	GB/T 3836.1-2021、GB/T 3836.2-2021、GB/T 3836.3-2021

Type of Certification: Type test + Initial inspection + Surveillance inspection
This is to certify that the above mentioned product(s)complies with the requirements of implementation rules for compulsory certification (REFNO. CNCA-C23-01:2019).
Refer to the attachment for detailed information.

Valid from: December 5, 2022 **Valid until:**September 11, 2025

Date of original certification: September 12, 2020

The validity of this certificate is subject to positive result of the periodic surveillance by issuing certification body until the expiry date.

This certificate is available through CNCA's website: www.cnca.gov.cn

APPROVAL:

Guo AiHua

上海仪表自控系统检验测试所有限公司

Shanghai Inspection and Testing Institute of Instruments and Automation Systems Co., Ltd.

http://www.sitiias.com.cn Building 9,103 Cao Bao Road, Shanghai 200233,China Tel: +86 21 64510844

S 0006216

中国国家强制性产品认证证书

证书编号：2020322307001262

附　件

产品名称：　DREHMO德瑞模电动执行机构

型号规格：　D *a* *b* *c* *d* -*e* Ex:

其中：*a*表示产品型式，可为空缺（多回转）或P（部分回转）；

*b*表示控制单元，可为空缺或iM；

*b*表示工作制式，可为空缺（S2）或R（S4）；

*c*表示输出转矩，可为30～2000（多回转）或30～1800（部分回转）；

*d*表示连接接口，与防爆无关；

*e*表示输出转速/调节时间，可为5~160（50Hz），6~192（60Hz）（多回转）或7~75（50Hz），6~63（60Hz）（部分回转）

防爆标志：　Ex db eb IIC T4 Gb，Ex db eb IIB T3 Gb

电气参数：　$U_n \leq 690V$，$I_n \leq 27A$

相关报告编号：　2020S17402-001238，2022S17402-009168

使用条件：　1. 特殊（限制）使用条件：

1）. 涉及隔爆接合面的维修须联系产品制造商

2）. 使用环境温度范围、防爆等级和温度组别关系如下：

批　准：

上海仪器仪表自控系统检验测试所有限公司

中国国家强制性产品认证证书

证书编号：2020322307001262

附　件

使用环境温度	防爆等级	温度组别
-25℃～+40℃	默认使用环境温度范围	
-30℃～+40℃	IIC	T4
-30℃～+60℃	IIC	T4
-55℃～+40℃	IIC （带加热器）	T4
-30℃～+65℃	IIB	T3

2. 产品外壳防护等级：IP66。

批　准：

上海仪器仪表自控系统检验测试所有限公司

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification System for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: **IECEx PTB 15.0033X**

Page 1 of 5

Certificate history:
Issue 2 (2021-05-10)
Issue 1 (2018-01-22)
Issue 0 (2016-01-19)

Status: **Current**

Issue No: 3

Date of Issue: 2025-01-20

Applicant: **DREHMO GmbH**
Zum Eichstruck 10
57482 Wenden
Germany

Equipment: **Actuator type D **** - * - * Ex**

Optional accessory:

Type of Protection: **"db", "eb", "h"**

Marking: Ex db eb h IIC T3...T4 Gb or Ex db eb h IIB T3...T4 Gb

Approved for issue on behalf of the IECEx Certification Body: **Dr.-Ing. Stefan Essmann**

Position: **Head of Department "Explosion Protection in Energy Technology"**

Signature:
(for printed version)

Date:
(for printed version)

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting www.iecex.com or use of this QR Code.

Certificate issued by:

Physikalisch-Technische Bundesanstalt (PTB)
Bundesallee 100
38116 Braunschweig
Germany

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

IECEx Certificate of Conformity

Manufacturer: **DREHMO GmbH**
Zum Eichstruck 10
57482 Wenden
Germany

Manufacturing locations:

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements.This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended

STANDARDS :
The equipment and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards

IEC 60079-0:2017 Edition:7.0	Explosive atmospheres - Part 0: Equipment - General requirements
IEC 60079-1:2014 Edition:7.0	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
IEC 60079-7:2017 Edition:5.1	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
ISO 80079-36:2016 Edition:1.0	Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic methods and requirements
ISO 80079-37:2016 Edition:1.0	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres - Non electrical type of protection constructional safety "c", control of ignition source "b", liquid immersion "k"

This Certificate **does not** indicate compliance with safety and performance requirements other than those expressly included in the Standards listed above.

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in:

Test Reports:

DE/PTB/ExTR15.0038/03 DE/PTB/ExTR15.0041/00

Quality Assessment Report:

DE/TPS/QAR15.0004/08

IECEx Certificate of Conformity

EQUIPMENT:
Equipment and systems covered by this Certificate are as follows:

Description

The actuator, type D****-*-* Ex, consists of the following components:

- Enclosure accommodating a planetary gear. (i-matic and standard)

- Flange-mounted motor of Flameproof Enclosure "db" type of protection. (i-matic and standard)

- Optionally a flange-mounted – separately certified – motor of Flameproof Enclosure "db" type of protection or Increased Safety "eb" type of protection. (i-matic and standard)

- Optionally motor terminal compartment of Increased Safety "eb" type of protection cast to the enclosure, with – separately certified – terminals. It is connected to the motor and the electronics compartment by means of – separately certified – wire bushings. (always on i-matic)

- Optionally an electronics compartment of Flameproof Enclosure "db" type of protection cast to the enclosure, provided with an inspection window. (always on i-matic)

- A terminal box of Increased Safety "e" type of protection, with – separately certified – terminals (i-matic and standard)

- Optionally a – separately certified - plug connector type KP, KPH and KES in the type of protection Increased Safety "eb" (IECEx DEK 12.0022X). (i-matic).

- Optionally a - separately certified - terminal compartment type KES-Exd in the type of protection flameproof enclosure "d" (IECEx DEK 12.0022X). (i-matic).

- Optionally a - separately certified - plug connector type K.Exe and K.Exd in the type of protection Increased Safety "eb" and Flameproof Enclosure "db" (IECEx DEK 17.0012U).(i-matic).

- Optionally an external control system. The control system may be outside the potentially explosive area (no ex-protection) or in the type of protection Increased Safety "eb" and Flameproof enclosure "db", inside the potentially explosive area. The electronics compartment of the actuator of Flameproof Enclosure type of protection will in this case be filled with packing material. (i-matic).

Technical data and Nomenclature see Attachment.

SPECIFIC CONDITIONS OF USE: YES as shown below:

Repair and overhaul of the flameproof gaps are only allowed according constructive information given from the original manufacturer. A repair according the values given in Table 1 or Table 2 of IEC 60079-1 is not permitted.

Danger due to electrostatic discharge. The actuator must be cleaned with a damp cloth only. Please refer to operation manual.

IECEx Certificate of Conformity

Equipment (continued):

- Optionally a – separately certified - plug connector type KP, KPH and KES in the type of protection Increased Safety "e" (IECEx DEK 12.0022X). (i-matic).

- Optionally a - separately certified - terminal compartment type KES-Exd in the type of protection flameproof enclosure "d" (IECEx DEK 12.0022X). (i-matic).

- Optionally a - separately certified - plug connector type K.Exe and K.Exd in the type of protection Increased Safety "eb" and Flameproof Enclosure "db"
(IECEx DEK 17.0012U).

- Optionally an external control system. The control system may be outside the potentially explosive area (no ex-protection) or in the type of protection Increased Safety "eb" and Flameproof enclosure "db", inside the potentially explosive area.
The electronics compartment of the actuator of Flameproof Enclosure type of protection will in this case be filled with packing material. (i-matic).

Technical data and Nomenclature see Attachment.

IECEx Certificate of Conformity

DETAILS OF CERTIFICATE CHANGES (for issues 1 and above)

- The mechanical explosion protection is supplemented.
- The maximum output speed is up to 200 rpm.
- The name Markrolon is changed to Exolon

Annex:

COCA150033X-03_1.pdf

Applicant: DREHMO GmbH
Zum Eichstruck 10
57482 Wenden
Germany

Electrical Apparatus: Actuator type D **** - * - * Ex

Description of equipment

The actuator, type D****-*-* Ex, consists of the following components:

- Enclosure accommodating a planetary gear. (i-matic and standard)
- Flange-mounted motor of Flameproof Enclosure "db" type of protection. (i-matic and standard)
- Optionally a flange-mounted – separately certified – motor of Flameproof Enclosure "db" type of protection or Increased Safety "eb" type of protection. (i-matic and standard)
- Optionally motor terminal compartment of Increased Safety "eb" type of protection cast to the enclosure, with – separately certified – terminals. It is connected to the motor and the electronics compartment by means of – separately certified – wire bushings. (always on i-matic)
- Optionally an electronics compartment of Flameproof Enclosure "db" type of protection cast to the enclosure, provided with an inspection window. (always on i-matic)
- A terminal box of Increased Safety "e" type of protection, with – separately certified – terminals (i-matic and standard)
- Optionally a – separately certified - plug connector type KP, KPH and KES in the type of protection Increased Safety "eb" (IECEx DEK 12.0022X). (i-matic).
- Optionally a - separately certified - terminal compartment type KES-Exd in the type of protection flameproof enclosure "d" (IECEx DEK 12.0022X). (i-matic).
- Optionally a - separately certified - plug connector type K.Exe and K.Exd in the type of protection Increased Safety "eb" and Flameproof Enclosure "db" (IECEx DEK 17.0012U).(i-matic).
- Optionally an external control system. The control system may be outside the potentially explosive area (no ex-protection) or in the type of protection Increased Safety "eb" and Flameproof enclosure "db", inside the potentially explosive area. The electronics compartment of the actuator of Flameproof Enclosure type of protection will in this case be filled with packing material. (i-matic).

Electrical data

Rated voltage	up to 690 V
Rated current	max. 27 A *)
Rated cross section	max. 16 mm^2
Ambient temperatures	-25 °C to +40 °C (standard) -30 °C to +40 °C (IIC, T4) -30 °C to +60 °C (IIC, T4) -30 °C to +65 °C (IIB, T3)
Ingress protection	IP66 in accordance with EN 60529
*) may be higher for separately certified motors	

The electrical data are based on the connected motor as well as the electric components accommodated in the electronics compartment.

Nomenclature

D		*	*	*	*	-	*	-	*		Ex
1		2	3	4	5	6	7	8	9	10	11

Position	Range of values	Significance
1	D	DREHMO actuator
2		Multi-turn actuator
	P	Part-turn actuator
3		Actuator without control unit (standard)
	iM	Actuator with i-matic or i-matic C controls
4		Actuator for open-close operation, type of duty S2
	R	Actuator for modulating operation, type of duty S4
5	30 to 2000	Tripping torque in Nm for multi-turn actuator
	30 to 1800	Tripping torque in Nm for part-turn actuator
6	-	Dash
7		Without valve attachment (output drive)
	A, AF, B, B1, B2, B3, B3DO, B4, C, D, DO, DOU, DSTO, DSTU, E, EDO, …	Valve attachment for multi-turn actuators according to EN ISO 5210
	B, V, W, L/D, H, FH, FW, …	Valve attachment for part-turn actuators according to EN ISO 5211
8	-	Dash
9	5 to 200 (50Hz)	Output speed in rpm (Multi-turn)
	6 to 192 (60Hz)	
	7 to 75 (50HZ)	Operating time for 90° in seconds (Part-turn)
	6 to 63 (60Hz)	
10		Blank
11	Ex	Explosion-proof actuator

If components are attached to the drive, all necessary information for the operation and monitoring of these components must also be provided. The operation of a standstill heater requires a separate back-up fuse to intercept faulty operating states.

Physikalisch-Technische Bundesanstalt (PTB)
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www.drehmo.com

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