Operating Instructions

42/68-167-EN

Electrical Part Turn Actuator RHDE250 ... 4000 (Contrac)

Rated torque

250 … 4000 Nm (185 ... 2950 lbf-ft)

In explosion-proof design

HART FIELD COMMUNICATIONS PROTOCOL

PROFIBUS

Electrical Part Turn Actuator
RHDE250 ... 4000 (Contrac)

Operating Instructions

42/68-167-EN

10.2007

Rev. B

Manufacturer:

ABB Automation Products GmbH
Schillerstraße 72
32425 Minden
Germany
Tel.: +49 551 905-534
Fax: +49 551 905-555
CCC-support.deapr@de.abb.com

1 Safety 5
1.1 General Safety Information 5
1.2 Technical limits 5
1.3 Warranty provision 6
1.4 Labels and symbols 6
1.4.1 Symbols and warnings 6
1.4.2 Name plate 7
1.5 Operator liability 7
1.6 Personnel qualification 7
1.7 Returning devices 8
1.8 Disposal 8
1.8.1 Information on WEEE directive 2002/96/EC (Waste Electrical and Electronic Equipment) 8
1.9 Transport safety information 8
1.10 Storage conditions 9
1.11 Installation safety information 9
1.12 Electrical installation safety information 9
1.13 Operating safety information 10
1.14 Maintenance safety information 10
2 Explosion-protection safety precautions 11
2.1 Operation via frequency transformer 11
2.2 Preventing electrostatic charging 11
3 Design and function 12
4 Installation 13
4.1 Actuator check 13
4.2 Mounting position 13
4.3 Installation instructions 14
4.4 Assembly with the valve 14
4.4.1 Preparation 14
4.4.2 Adjusting the stops in dependence of the travel 15
4.4.3 Adjusting the stops in dependence of the torque 15
4.5 Mounting examples 16
4.5.1 Fastening elements 16
4.5.2 Mounting with lever 17
4.5.3 Installation with additional drive elements 17
4.6 Dimensioned drawings 19
4.6.1 Lever for RHDE250 19
4.6.2 Lever for RHDE500 ... RHDE800 21
4.6.3 Lever for RHDE1250 / RHDE2500 23
4.6.4 Lever for RHDE4000 25

5 Electrical connection 27
5.1 Cable shield 28
5.1.1 Signal part 28
5.1.2 Motor 28
5.2 Terminal connection diagrams 29
5.2.1 Power Electronic Unit EBN853 (Contrac) 29
5.2.2 Power Electronic Unit EBN861 (Contrac) 31
5.2.3 Power Electronic Unit EBS852 (Contrac) / EBS862 (Contrac) 33
6 Operation 34
6.1 Automatic / manual mode 34
6.2 Manual operation 34
7 Maintenance 35
7.1 Inspection and overhaul 35
7.2 Brake adjustment 36
7.3 Oil change 36
7.4 Filling capacity 37
8 Trouble shooting 38
8.1 Electrical test values 38
9 Technical data 39
9.1 General information 39
9.2 Technical Data RHDE250 39
9.3 Technical data RHDE500 ... RHDE800 40
9.4 Technical data RHDE1250 ... RHDE2500 40
9.5 Technical data RHDE4000 41
9.6 Technical data for the cable set (for Ex-relevant range) 42
10 Appendix 43
10.1 Permits and certifications 43
11 Index 45

1 Safety

1.1 General Safety Information

The “Safety” chapter provides an overview of the safety aspects to be observed for the operation of the device.

The device is built based on state-of-the-art technology and is operationally safe. It was tested and left the factory in a proper state. The requirements in the manual as well as the documentation and certificates must be observed and followed in order to maintain this state for the period of operation.

The general safety requirements must be complied with completely during operation of the device. In addition to the general information, the individual chapters of the manual contain descriptions about processes or procedural instructions with specific safety information.

Only the observance of all safety information enables the optimal protection of personnel as well as the environment from hazards and the safe and trouble-free operation of the device.

The actuators are used for operating final control elements (valves, vanes, etc.). They may only be operated using the appropriate Contrac electronic unit for field or rack installation. Do not use these actuators for any other purpose. Otherwise, a hazard of personal injury or of damage to or impairment of the operational reliability of the device may arise. In addition to these operating instructions, the relevant documentation for the electronic unit and software tools must be observed.

Repairs, alterations and enhancements or the installation of replacement parts is only permissible as far as described in the manual. Further actions must be verified with ABB Automation Products GmbH. Excluded from this are repairs performed by ABB-authorized specialist shops.

1.2 Technical limits

The device is designed for use exclusively within the stated values on the name plate and in the technical specifications (see "Technical Specifications” chapter and/or data sheet). These must be complied with accordingly, e.g.:

- The maximum operating temperature may not be exceeded.
- The permitted operating temperature may not be exceeded.
- The housing protection system must be observed.

1.3 Warranty provision

A use contrary to the device's stipulated use, disregarding of this manual, the use of under-qualified personnel as well as unauthorized alterations excludes the manufacturer of liability from any resulting damages. The manufacturer's warranty expires.

1.4 Labels and symbols

1.4.1 Symbols and warnings

Danger – <Serious damage to health / risk to life>

One of these symbols in conjunction with the "Danger" warning indicates an imminent danger. If it is not avoided, death or serious injury will result.

Warning – <Bodily injury>

The symbol in conjunction with the "Warning" message indicates a possibly dangerous situation. If it is not avoided, death or serious injury could result.

Caution – <Slight injuries>

The symbol in conjunction with the "Caution" message indicates a possibly dangerous situation. If it is not avoided, slight or minor injury can result. May also be used for property damage warnings.

Notice – <Property damage>!

The symbol indicates a possibly damaging situation. If it is not avoided, the product or something in its area can be damaged.

Important

The symbol indicates operator tips or especially useful information. This is not a message for a dangerous or damaging situation.

1.4.2 Name plate

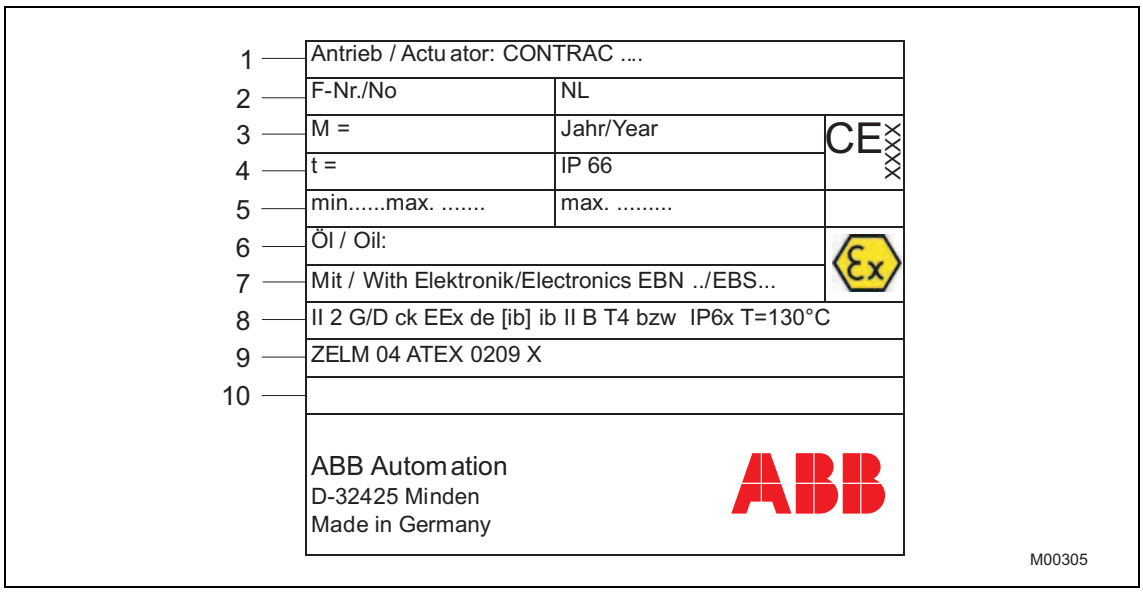

Fig. 1

1 Complete model name

2 Fabrication no./ NL no. (no. of non-standard version)

3 Output torque / Year of manufacture

4 Permissible ambient temperature and protection class / CE mark with information about the monitoring authority

5 min./max. crank angle and min./max. actuating speed

6 Filled oil types

7 Associated Contrac electronic unit

8 Explosion protection class

9 Certification authority

10 Free for customer-specific entry

1.5 Operator liability

The operators must strictly observe the applicable national regulations in their countries with regards to installation, function tests, repairs, and maintenance of electrical devices.

1.6 Personnel qualification

The installation, commissioning and maintenance of the device may only be carried out through trained specialist personell authorized by the plant operator. The specialist personnel must have read and understood the manual and comply with its instructions.

1.7 Returning devices

Use the original packaging or a suitably secure packaging for returning the device for repair or for recalibration. Include the properly filled out return form (see attachment) with the device.

According to EC guidelines for hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for its shipping:

All delivered devices to ABB Automation Products GmbH must be free from any hazardous materials (acids, alkali, solvents, etc.).

1.8 Disposal

ABB Automation Products GmbH actively promotes environmental consciousness and has an operational management system in accordance with DIN EN ISO 9001:2000, EN ISO 14001:2004 and OHSAS 18001. Our products and solutions should have minimum impact on the environment and persons during manufacture, storage, transport, use and disposal.

This includes the environmentally friendly use of natural resources. Through its publications ABB conducts an open dialog with the public.

This product/solution is manufactured from materials that can be reused by specialized recycling companies.

1.8.1 Information on WEEE directive 2002/96/EC (Waste Electrical and Electronic Equipment)

This product/solution is not subject to the WEEE directive 2002/96/EC and relevant national laws (e.g., ElektroG in Germany).

Dispose of the product/solution directly in a specialized recycling facility and do not use the municipal garbage. Only privately used products may be disposed of in the municipal garbage according to the WEEE directive 2002/96/EC. Proper disposal prevents negative effects on people and the environment, and supports the reuse of valuable raw materials.

If it is not possible to dispose of old equipment properly, ABB Service can accept and dispose of returns for a fee.

1.9 Transport safety information

Check the devices for possible damage that may have occurred from improper transport. Damages in transit must be recorded on the transport documents. All claims for damages must be claimed without delay against the shipper and before the installation.

1.10 Storage conditions

The actuators may be stored under moist and aggressive condition for a short time. The equipment is protected against external corrosive influences. However, direct exposure to rain, snow, etc., must be avoided.

Actuators, equipped with an anti condensation heater, are additionally protected by desiccant, which is placed in the following locations:.

Position sensor:	in connection chamber
electronic unit (separately supplied):	electrical connection area

The desiccant guarantees sufficient protection for approximately 150 days. It can be regenerated at a temperature of 90 °C (114 °F) within 4 h.

Important

Remove the desiccant prior to commissioning the actuator or the electronic unit.

If you intend to store or transport the device for a longer time, we recommend that you wrap it in plastic foil and add desiccant. Regularly check whether the desiccant is still active.

1.11 Installation safety information

- The actuators perform movements for positioning vanes and valves, etc.
- Only qualified specialists who have been trained for these tasks are authorized to mount and adjust the control actuator, and to make the electrical connection.
- When working on the actuator itself or the electronics always observe the locally valid accident prevention regulations and the regulations concerning the construction of technical installations.
- The eyebolt at the top of the actuator may only be used to lift or lower the actuator vertically.
- Do not use the handwheel to lift or to lower the actuator..
- Do not use it if the actuator is mounted at the valve! Make sure that the final control element is not exposed to process forces.

1.12 Electrical installation safety information

The electrical connection may only be performed by authorized specialist personnel according to the electrical plans.

Observe the electrical connection information in the manual, otherwise the electrical protection can be affected.

The secure isolation of contact-dangerous electrical circuits is only guaranteed when the connected devices fulfil the requirements of the DIN VDE 0106 T.101 (basic requirements for secure isolation).

For secure isolation, run the supply lines separated from contact-dangerous electrical circuits or additionally isolate them.

1.13 Operating safety information

Warning - risk of injury!

Note that the actuator position may be changed accidentally by the repelling power of the valve when the brake is released!

Before switching on, ensure that the specified environmental conditions in the “Technical Specifications” chapter or data sheet are complied with and that the power supply voltage corresponds with the voltage of the actuator.

When there is a chance that safe operation is no longer possible, put the device out of operation and secure against unintended operation.

When mounting the actuator in areas which may be accessed by unauthorized persons, take the required protective measures.

- Lock the handwheel with a cotter pin in order to a void unintentional manual actuator operation. Switch-off the power supply to the motor prior to any manual operation.

1.14 Maintenance safety information

- When changing the oil of the actuator, thoroughly remove any oil that may have run down on the floor during the procedure to avoid accidents.
- Dispose of the waste oil in compliance with the respective local regulations. Make sure that no oil reaches the water cycle.
- Switch off the supply voltage for the power electronic unit and separate anti-condensation heater (option) when working on the actuator or related subassemblies and take precautions to prevent unintentional switch-on.
- Make sure that any oil leaking from the device cannot come into contact with hot parts

2 Explosion-protection safety precautions

Important
Technical modifications to the actuator or motor cancel the explosion protection.

- Before installing the actuator, review the information on the ID label regarding device class, Ex category, Ex zone and temperature class to make sure the actuator is approved for operation in the relevant hazardous area. In the event of deviations, the actuator may not be put into operation.
- Check the oil level and mounting position prior to commissioning the device in explosive atmospheres.
- Only use levers for the shaft that are specified by the manufacturer. Use of other levers requires ATEX certification.

Important
Read the information in chapter **Installation with additional drive elements**, page 17.

2.1 Operation via frequency transformer

- The frequency converter (electronic unit) may not installed or used within the hazardous area.
- Check whether the electronic unit is loaded with the parameters of the actuator it is connected to.
- Check the electronic unit for proper connection to the correct actuator.
- Setpoint monitoring is activated as default setting when the electronic unit leaves the manufacturer. Do not de-activate this setting.
- Rapid traverse mode is not allowed on Ex actuators, and the feature cannot be activated from the user interface.
- The Contrac power electronic unit must be upstream from the motor temperature monitoring unit SD241B or similar, certified tripping unit.

2.2 Preventing electrostatic charging

Due to potential unallowed charging of the housing, the effects of high voltage sources on the equipment must be prevented.

Important
Clean coated surfaces with a damp towel.

3 Design and function

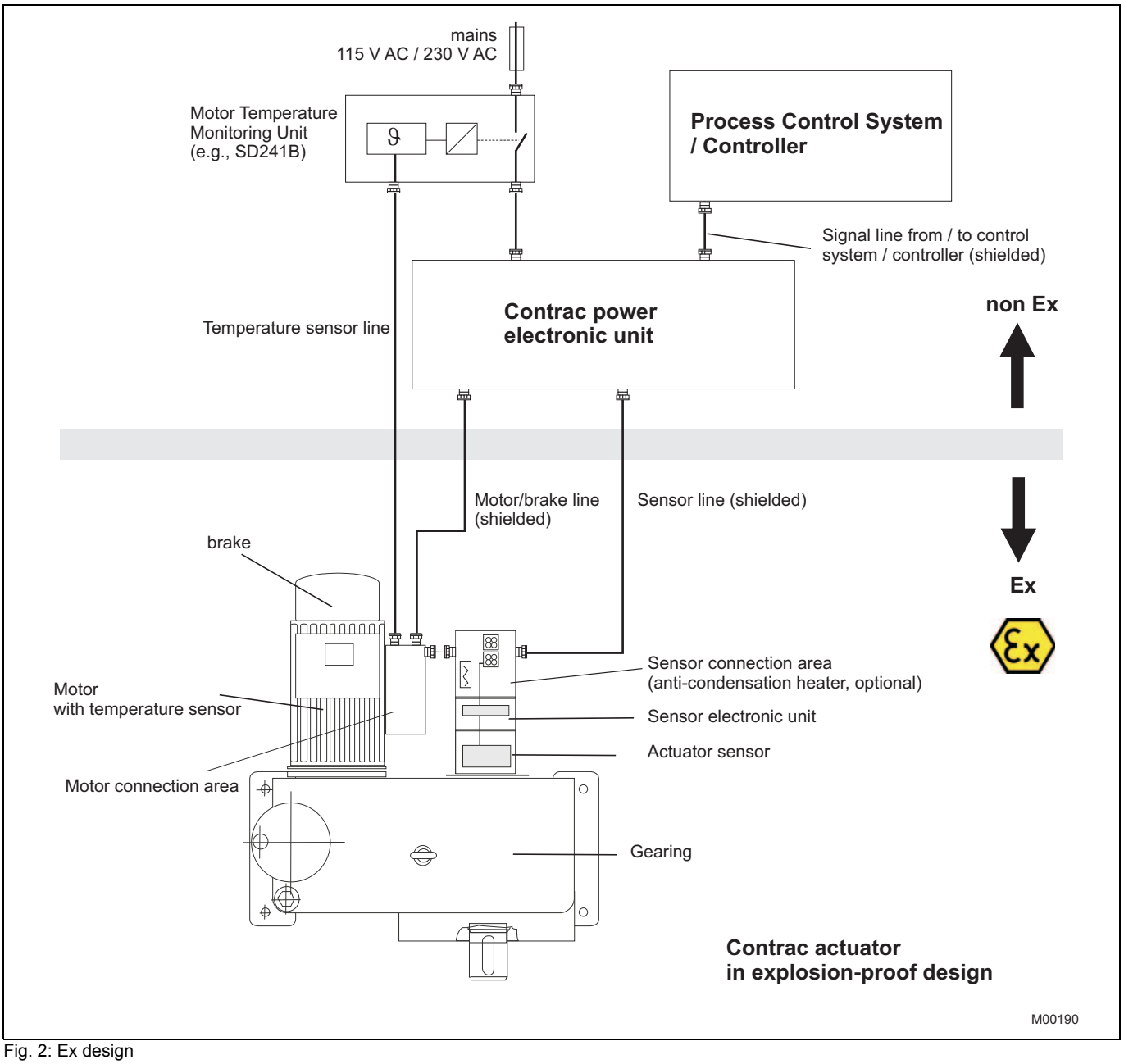

Fig. 2: Ex design

4 Installation

4.1 Actuator check

Before you start to install the actuator make sure that the delivery status corresponds to the ordered status and to the intended use.

- Check the oil level when installing the device in positions other than IMB 3.
- Did you fasten the separately delivered venting plug (spare part no. 9287338) in the uppermost bore (depending on the mounting orientation)?
- Make sure that the motor and the connection chambers are free of dirt, moisture and corrosion.

4.2 Mounting position

The spur gears of the actuator RHDE250 ... 4000 (Contrac) are oil lubricated. They contain the max. oil quantity when leaving the manufacturer. Once the actuator is installed replace the uppermost check plug by the separately supplied venting plug.

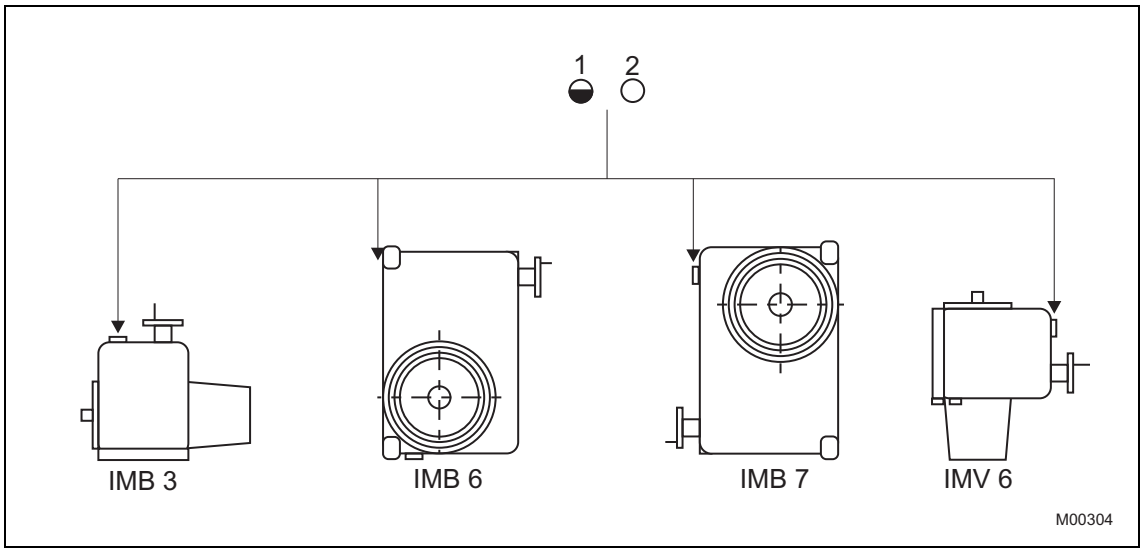

Fig. 3

1 Inspection plug 2 Venting plug

All mounting orientations shown in fig. Fig. 3 are permissible. To facilitate mounting and maintenance, however, it is recommended to use orientation IMB 3. For each mounting position, check the oil level prior to commissioning.

In order to ensure sufficient ventilation and space for the motor de-/installation allow for the following min. space to the motor hood:

Actuator	Space
RHDE250	60 mm (2.36 inch)
RHDE500/800	60 mm (2.36 inch)
RHDE1250/2500	80 mm (3.15 inch)
RHDE4000	80 mm (3.15 inch)

4.3 Installation instructions

- Make sure that the actuator is accessible from all sides to ensure convenient handwheel operation, electrical connection, and replacement of assemblies.
- Avoid direct exposure to rain, snow and other environmental influences.
- The actuators can withstand vibration loadings up to 150 Hz and max. 2 g acc. to EN 60068-2-6, table C2.
- Exclusively mount the actuator on a rigid, non-vibrating support to avoid relative motions between the actuator and the valve.
- Spring couplings or vibration absorbers in the coupling rod may cause additional load. The drive elements (lever, coupling rod) may not cause additional vibration loadings, which exceed the rated torque more than twice.
- The maximum rated torque of the actuator may not be permanently exceeded. A short-term overload (up to twice the rated torque) is possible.
- When mounting the actuator close to heat sources use an insulating layer or shielding.
- The ambient temperature may not exceed 60 °C (140 °F) or 40 °C (104 °F) . If necessary, use an appropriate roof to avoid heat radiation.
- The maximum tilt angle of 140° may not be exceeded.

4.4 Assembly with the valve

4.4.1 Preparation

Warning – Electrical voltage risk!
When working on the actuator or the related subassembly, switch off the supply voltage for the power electronic unit and separate anti-condensation heater (option), and take precautions to prevent unintentional switch-on.

1. Make sure that the shaft and lever bore surface are clean and free of grease.
2. Determine the length of the coupling tube (not included in the scope of delivery).
3. Move the valve to the "CLOSED" position.
4. Use the handwheel to move the actuator into the proper end position. Observe the permissible angle.
5. Refer to the dimensioned drawings for the required length of the connection pipe.
6. Drill a cone bore into the valve lever for mounting the second ball-and-socket joint, as shown in the dimensioned drawings section.
7. Insert the ball-and-socket joint, and secure with crown nut and split-pin.
8. Remove the welding bushings and weld them to the coupling tube.
9. Insert the link rod between the two ball-and-socket joints and screw it in.
10. If required adjust “L” by turning the link rod.
11. When all adjustment steps are finished, fasten the counter nuts.

4.4.2 Adjusting the stops in dependence of the travel

1. Move the output lever / valve to the position requiring fine adjustment.
2. Put the stop onto the toothing as close to the output lever as possible and fasten it with screws.
3. The mechanical limit stops may not be fixed within the adjusted operating range.
4. Move the output lever towards the stop using the handwheel; turn the coupling rod for fine adjustment.
5. Fasten the counter nuts.
6. Fasten the stop in the other mounting position close to the end position, depending on the toothing.

4.4.3 Adjusting the stops in dependence of the torque

1. First proceed as described above for travel-dependent adjustment.
2. Prior to re-fastening the counter-nut provide pretension in the valve’s "CLOSED" position.
3. Lock the hand wheel.
4. Turn the coupling tube or slightly shift the limit stops to get a small gap between lever and limit stop.
5. The procedure and gap size depend on the stiffness of the linkage arrangement.
6. Tighten the counter-nuts and limit stop screws.

4.5 Mounting examples

4.5.1 Fastening elements

	RHDE250	RHDE500 RHDE800	RHDE1250 RHDE2500	RHDE4000
clamping screws for mech. limit stop tightening torque:	79 Nm (58 Lbf-ft)	95 Nm (144 Lbf-ft)	670 Nm (494 Lbf-ft)	670 Nm (494 Lbf-ft)
lever clamping screw tightening torque:	79 Nm (58 Lbf-ft)	195 Nm (144 Lbf-ft)	390 Nm (288 Lbf-ft)	390 Nm (288 Lbf-ft)
Mounting screw (property class 8.8) tensile strength: tensile strength: Yield strength	12 mm (0.47 inch) ≥ 800 N/mm^2 (≥ 116032 pounds/square inch) ≥ 640 N/mm^2 (≥ 93550 pounds/square inch)	18 mm (0.71 inch) ≥ 800 N/mm^2 (≥ 116032 pounds/square inch) ≥ 640 N/mm^2 (≥ 93550 pounds/square inch)	20 mm (0.78 inch) ≥ 800 N/mm^2 (≥ 116032 pounds/square inch) ≥ 640 N/mm^2 (≥ 93550 pounds/square inch)	20 mm (0.78 inch) ≥ 800 N/mm^2 (≥ 116032 pounds/square inch) ≥ 640 N/mm^2 (≥ 93550 pounds/square inch)

4.5.2 Mounting with lever

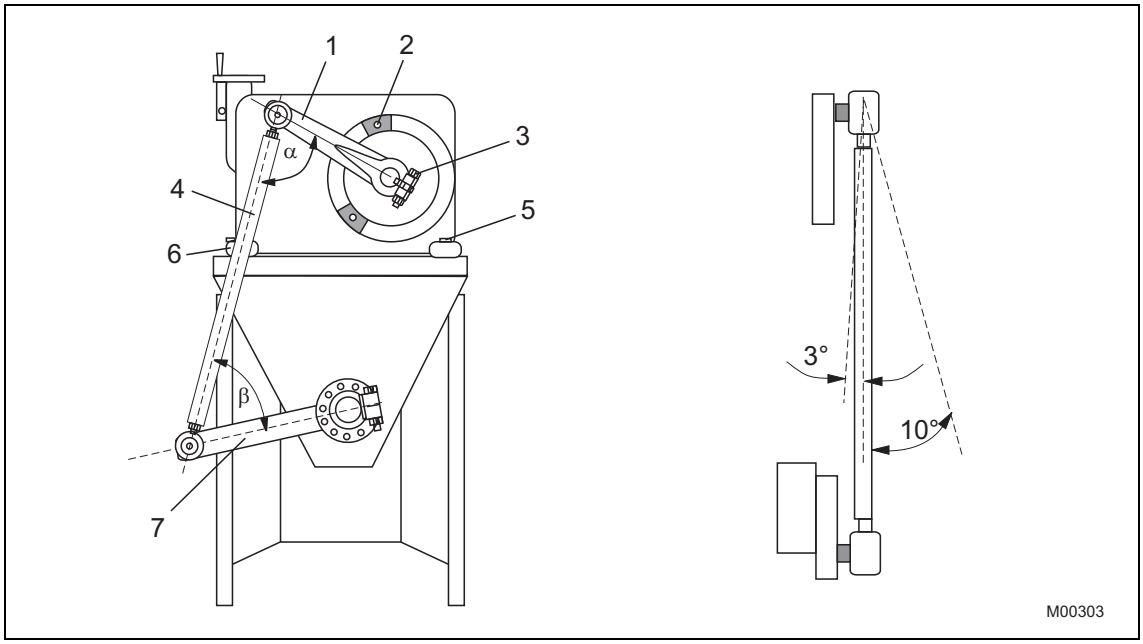

Fig. 4

1 Output lever
2 mech. limit stop with clamping screws
3 lever clamping screw
4 coupling tube
5 Mounting screws
6 rigid, level support
7 Flap lever

$\alpha \geq 15°$ ($\geq 20°$ for RHDE800 ... 4000)

β based on requirements of the valve manufacturer

4.5.3 Installation with additional drive elements

When mounting an additional drive element instead of the standard lever, the following installation conditions must be observed:

Max. perm. temperature of shaft:

Type	radial force at distance x N (lbf)	Distance x from shaft edge mm (inch)	axial force N (lbf)	max. output torque
RHDE250	1767 (397.24)	40 (1.57)	310 (69.69)	A short-term overload up to double the rated torque is possible
RHDE500	7542 (1695.51)	35 (1.38)	1310 (294.50)	A short-term overload up to double the rated torque is possible
RHDE800	7542 (1695.51)	35 (1.38)	1310 (294.50)	A short-term overload up to double the rated torque is possible
RHDE1250	10100 (2270.57)	50 (1.97)	1750 (393.42)	A short-term overload up to double the rated torque is possible
RHDE2500	10100 (2270.57)	50 (1.97)	1750 (393.42)	A short-term overload up to double the rated torque is possible
RHDE4000	14142 (3179.25)	55 (2.17)	2455 (551.91)	A short-term overload up to double the rated torque is possible

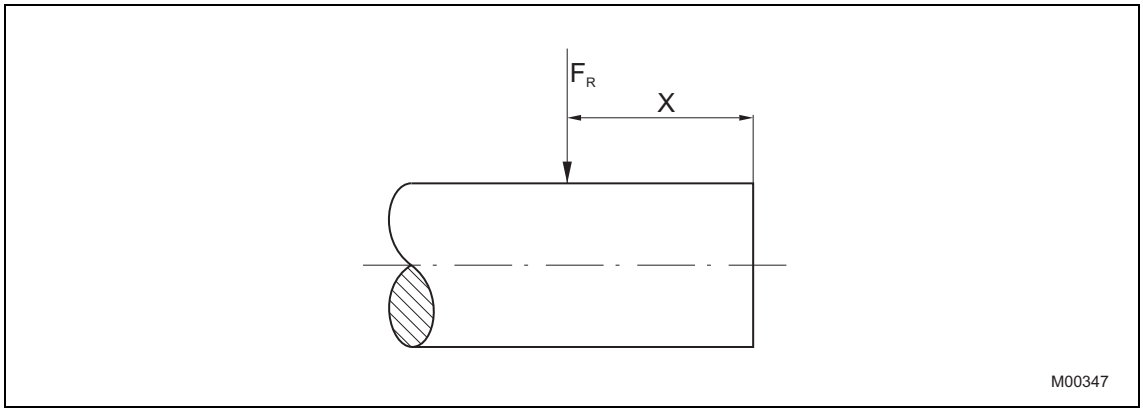

Fig. 5: Stub shaft

Configuring the drive element hub

The new drive element is mechanically connected to the drive shaft via a hole with feather key groove . This connection must be constructed so that the rated torque and any possible output torque is transmitted accurately. The drive element must be mounted securely on the drive shaft with suitable measures to prevent axial shift. For the new drive element, you can use the current mechanical stops.

The following parameters must be observed:

Type	bore diameter mm (inch)	Key width mm (inch)	Hub length mm (inch)	Minimum yield strength of hub Rp 0.2 N/mm^2 (pounds/square inch)
RHDE250	30 +0,033 (1.18 +0.0013)	8 -0,015/-0,051 (0.31 -0.0006/-0.0020)	50 (1.97)	320 (46412.80)
RHDE500	50 +0,039 (1.97 +0.0015)	14-0,018/-0,061 (0.55 -0,0007/-0.0024)	70 (2.76)	320 (46412.80)
RHDE800	50 +0,039 (1.97 +0.0015)	14-0,018/-0,061 (0.55 -0,0007/-0.0024)	70 (2.76)	320 (46412.80)
RHDE1250	70 +0,075/+0,030 (2.76 +0,0030/+0,0012)	20-0,022/-0,074 (0.79 -0.0311/-0.0029)	100 (3.94)	320 (46412.80)
RHDE2500	70 +0,075/+0,030 (2.76 +0,0030/+0,0012)	20-0,022/-0,074 (0.79 -0.0311/-0.0029)	100 (3.94)	320 (46412.80)
RHDE4000	85 +0,090/+0,036 (3.35 +0.0035/+0.0014)	25-0,018/-0,061 (0.98 -0,0007/-0.0024)	140 (5.51)	320 (46412.80)

4.6 Dimensioned drawings

4.6.1 Lever for RHDE250

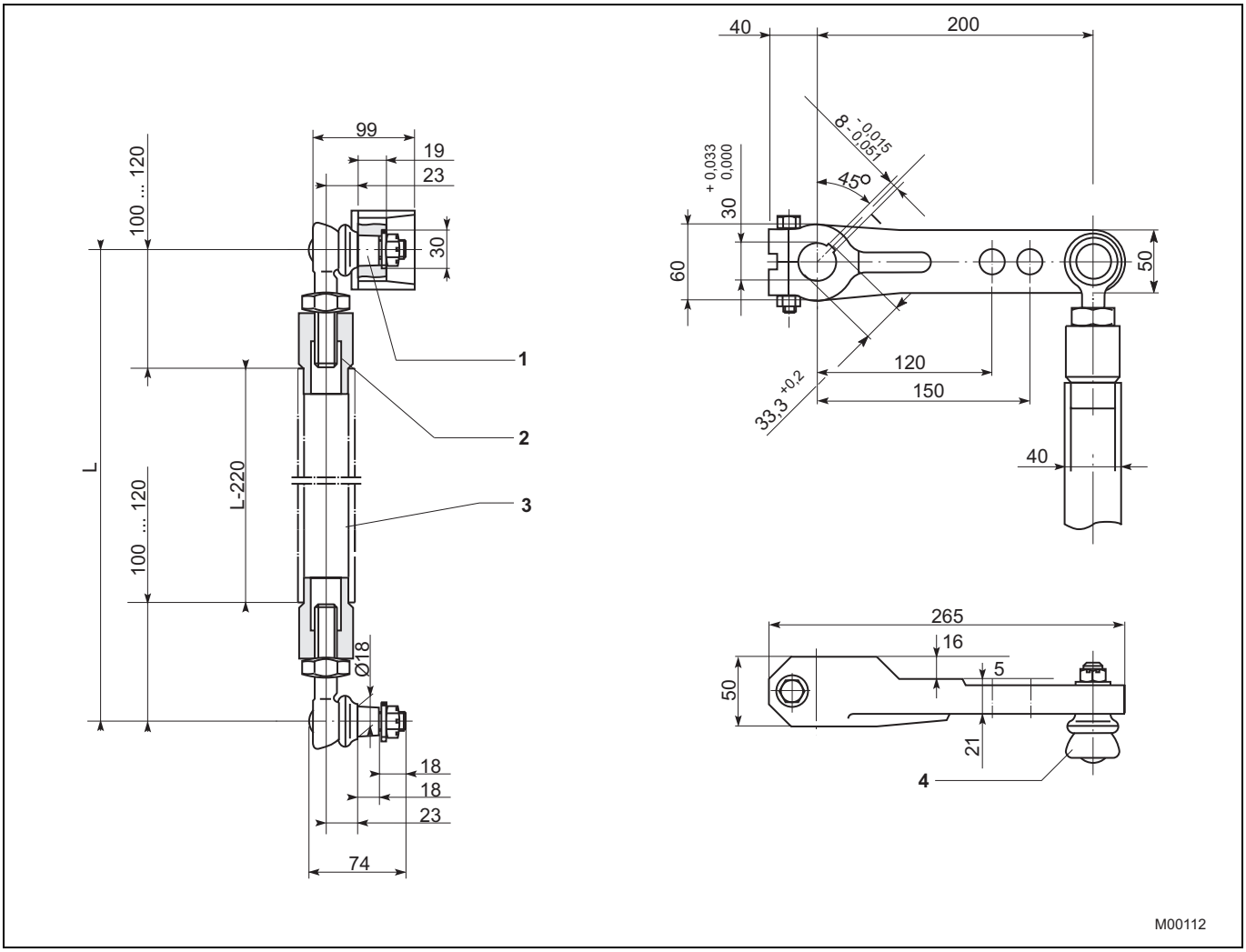

Fig. 6: Dimensions in mm

1 Cone 1 : 10
2 Welding bushings are part of shipment
3 Connection pipe 1 1/4” DIN 2440 resp. 1 1/4” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.
4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

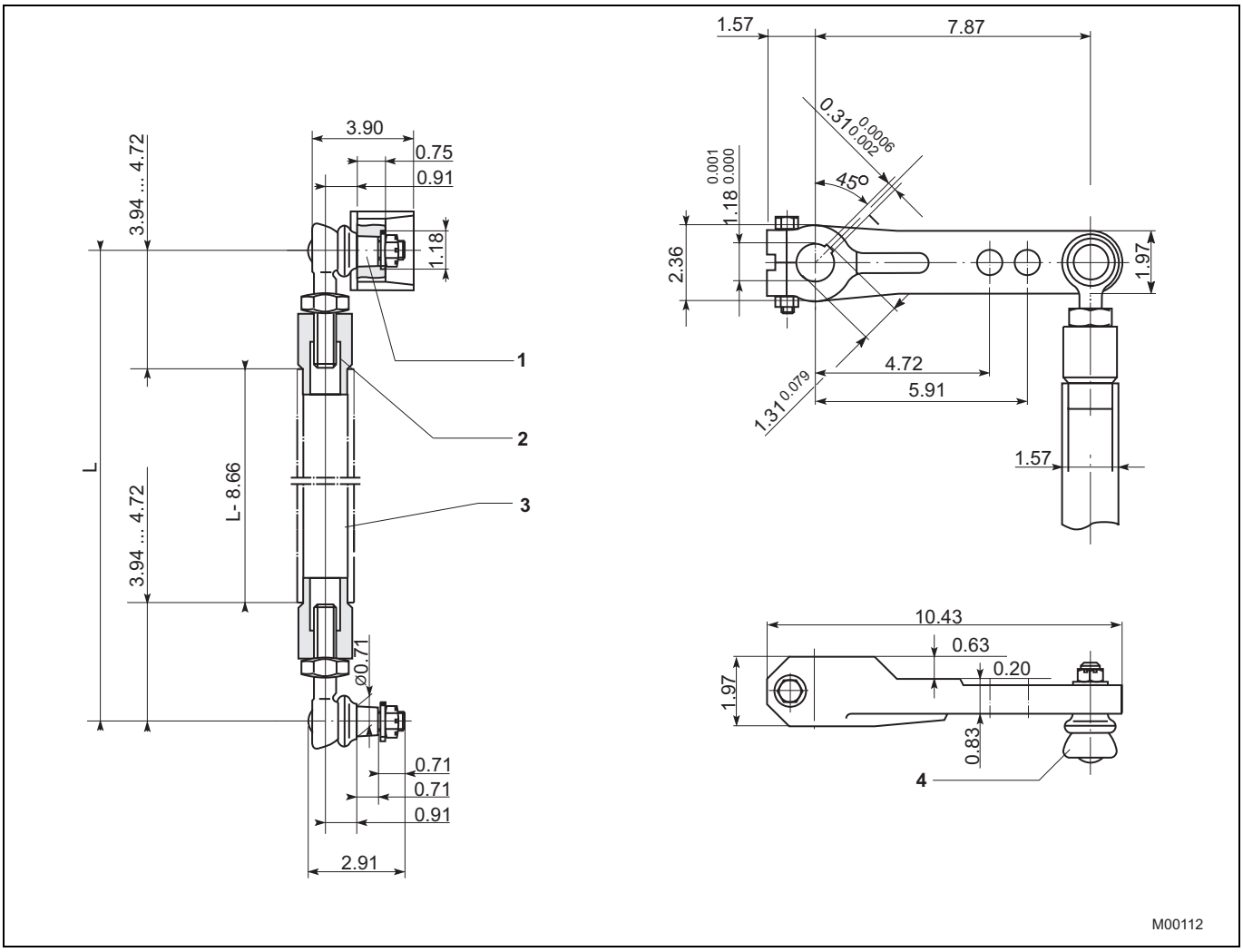

Fig. 7: Dimensions in Inch

1 Cone 1 : 10
2 welding bushings are part of shipment
3 Connection pipe 1 1/4” DIN 2440 resp. 1 1/4” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.
4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

4.6.2 Lever for RHDE500 ... RHDE800

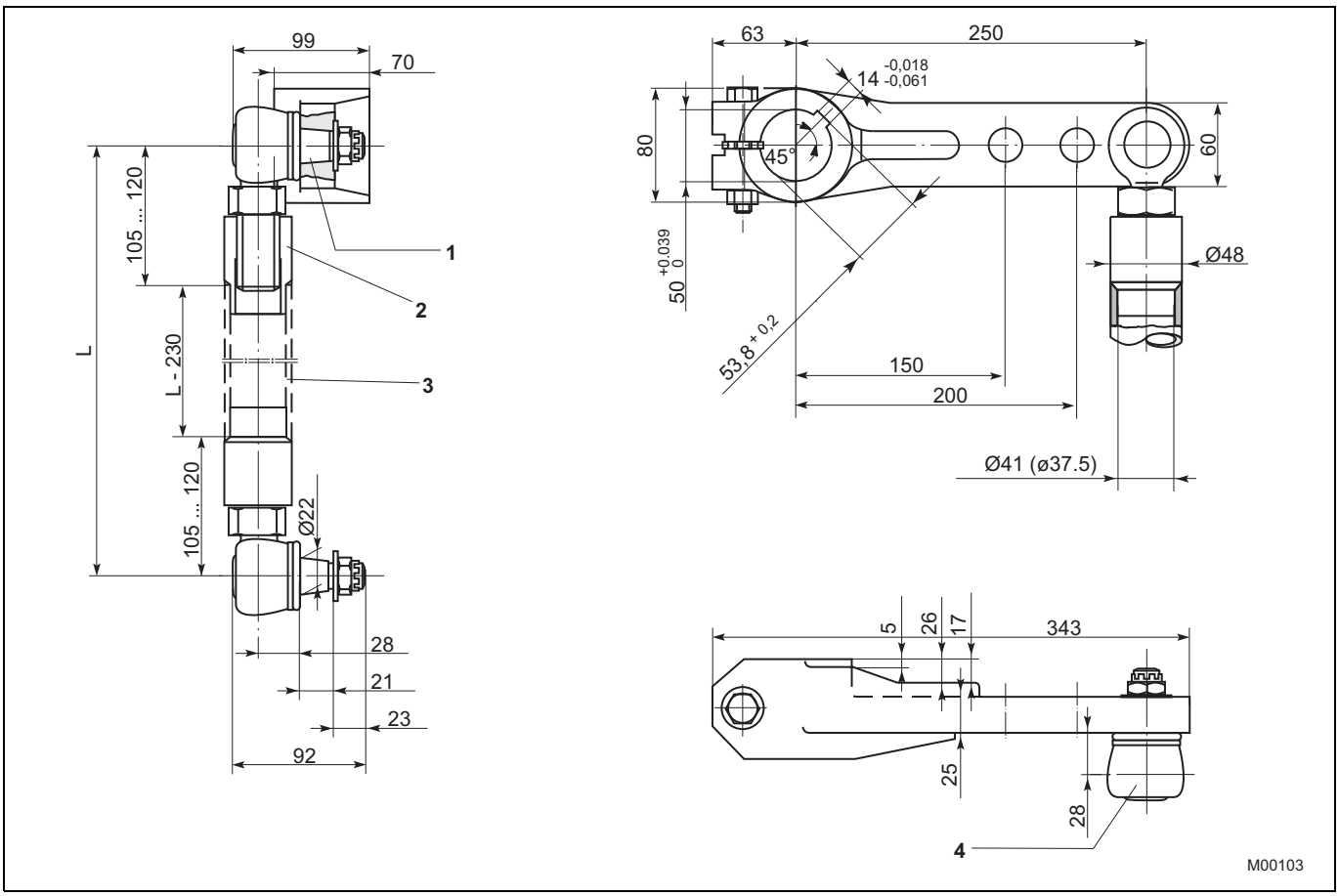

Fig. 8: Dimensions in mm

1 Cone 1 : 10
2 welding bushings are part of shipment
3 Connection pipe 1 1/2” DIN 2440 resp.1 1/2” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.
4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

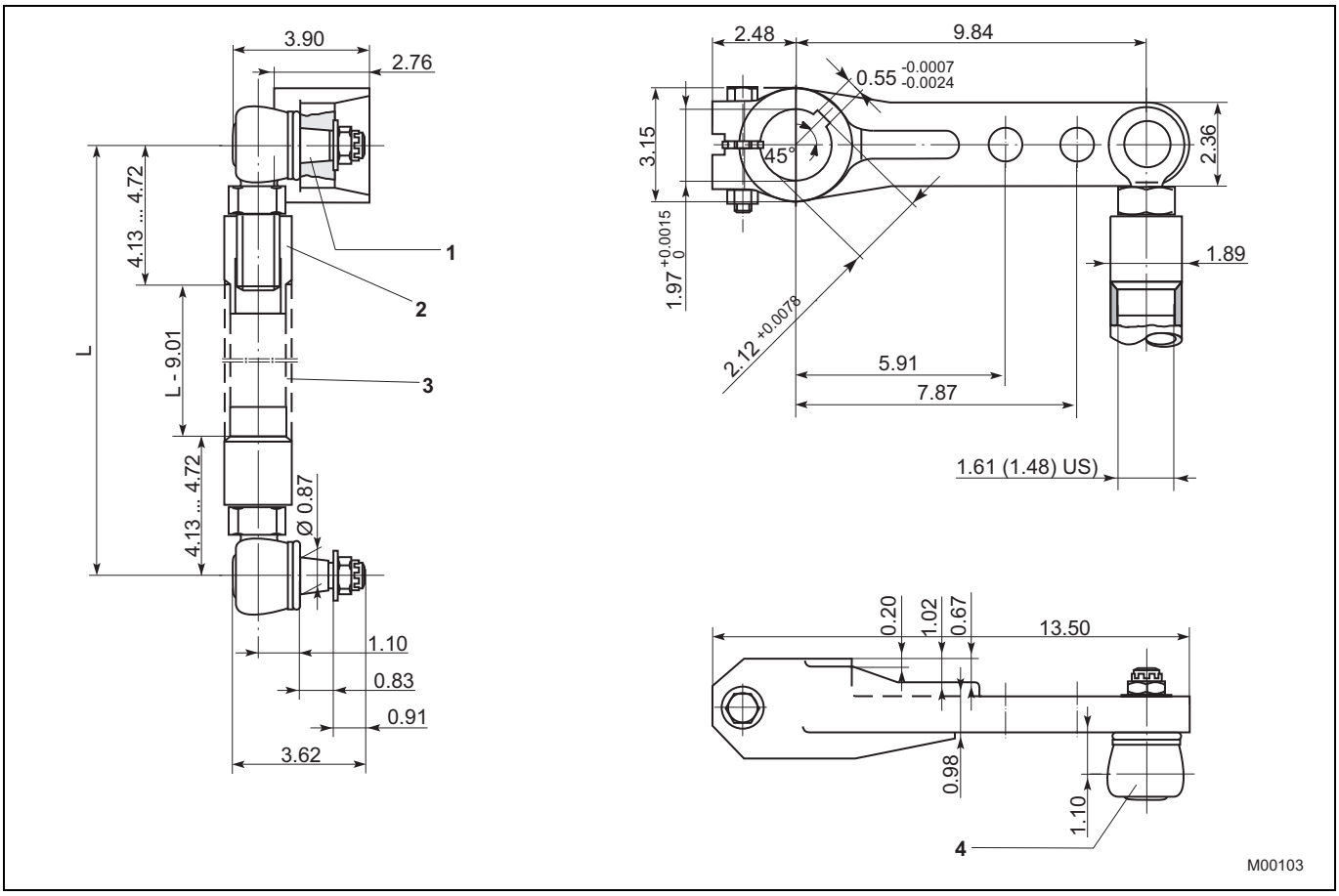

Fig. 9: Dimensions in Inch

1 Cone 1 : 10
2 welding bushings are part of shipment
3 Connection pipe 1 1/2” DIN 2440 resp.1 1/2” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.
4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

4.6.3 Lever for RHDE1250 / RHDE2500

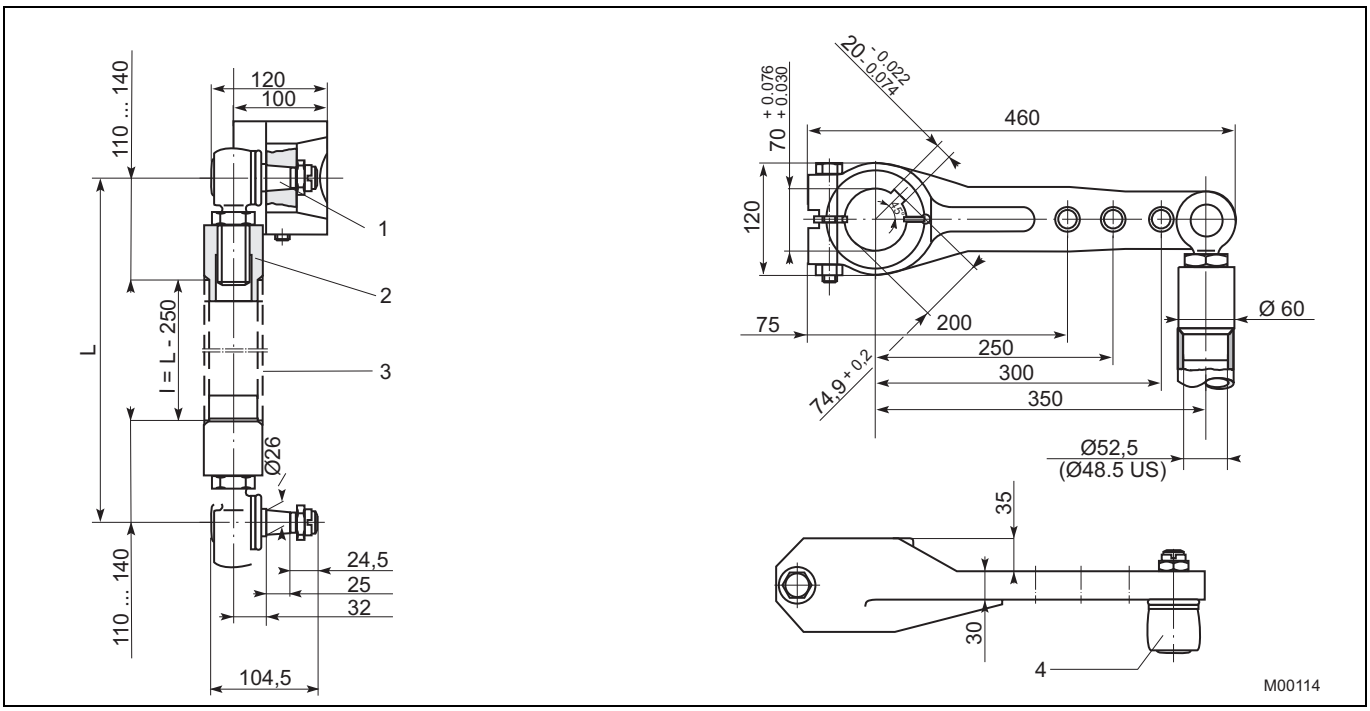

Fig. 10: Dimensions in mm

1 Cone 1 : 10
2 Welding bushings are part of shipment
3 Connection pipe 2” DIN 2440 resp. 2” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.
4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

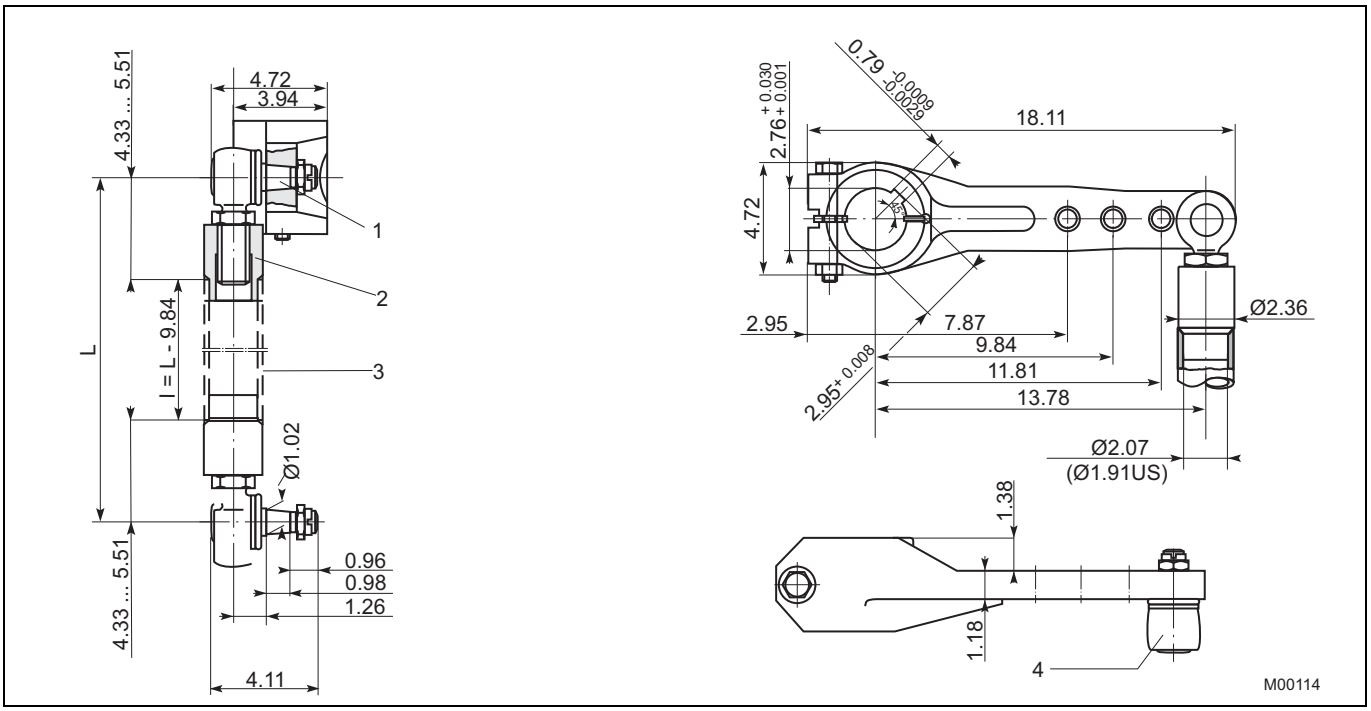

Fig. 11: Dimensions in Inch

1 Cone 1 : 10
2 welding bushings are part of shipment
3 Connection pipe 2” DIN 2440 resp. 2” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.
4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

4.6.4 Lever for RHDE4000

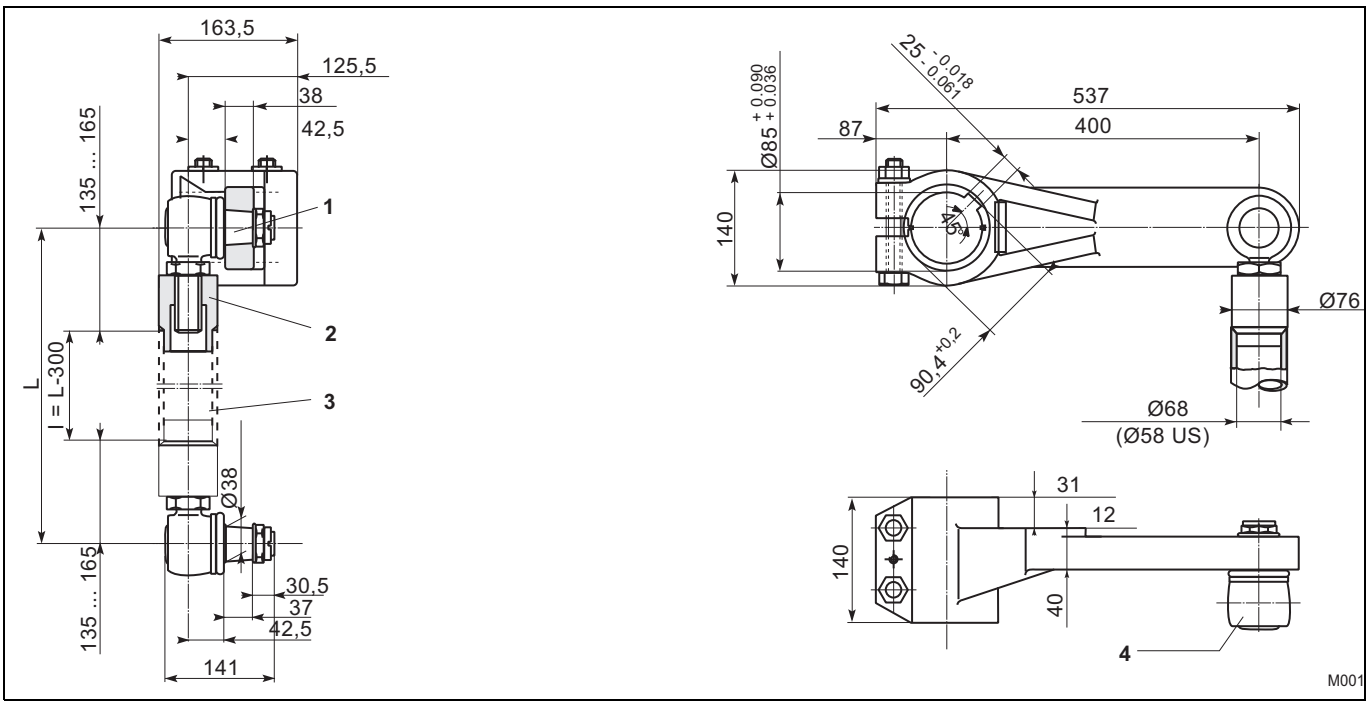

Fig. 12: Dimensions in mm

1 Cone 1 : 10

2 Welding bushings are part of shipment

3 Connection pipe 2 1/2” DIN 2440 resp. 2 1/2” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.

4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

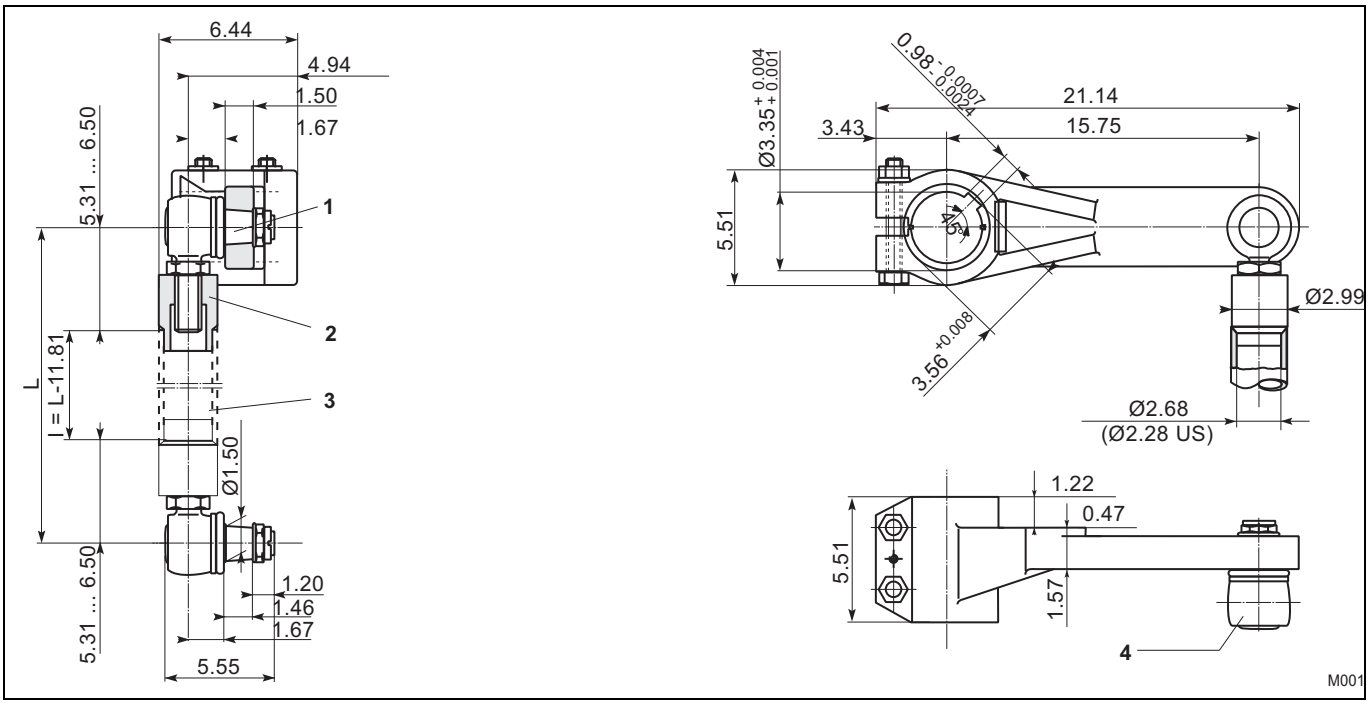

Fig. 13: Dimensions in Inch

1 Cone 1 : 10
2 welding bushings are part of shipment
3 Connection pipe 2 1/2” DIN 2440 resp. 2 1/2” schedule 80 pipe size “L” acc. to requirements. The pipe is not included in shipment.
4 Angular deflection of ball and socket joint:
Pointing towards the actuator: max. 3°
Pointing away from the actuator: max. 10°

5 Electrical connection

Each actuator requires a Contrac electronic unit which is loaded with the type specific-software. Carefully consider the instructions for the electronic unit and compare the data labels of the actuator and the electronic unit in order to ensure a proper hard- and software assignment.

The cable between the actuator and the electronic unit is connected to terminals.

Instructions regarding use in Ex applications

The electrical connection between the Contrac electronic unit and the Contrac actuator can be established using the cable set (order code 695). The cable harness is not part of the Ex prototype test certificate and must therefore be tested for safety-relevant functionality within the complete installation by the installer or operator.

Consider the following issues:

- Consider the local regulation concerning the setup of electrical devices within hazardous areas. This applies particularly to EN 60079-14 for the setup of the screen and the potential compensation between the actuator, the electronic unit and the motor protection unit (see 1) in chapter **Cable shield**, page 28 and chapter **Terminal connection diagrams**, page29 ff.
- For the connection of the motor and the position transmitter only use ATEX certified EEx e cable glands with IP 66 acc. to EN 50019.
- Use a cable socket or a solid wire, bended to a "U", to connect the motor cable.
- Ensure a proper strain relief for all cable connections.
- Protect all cables in the connections chambers against contact with metal components. Ensure a gap of at least 6 mm between all conductive components.
- Remove the desiccant in motor and position sensor.
- Do not change the factory-set position of the motor terminal chamber.
- Seal all not used cable entries with ATEX certified IP 66 plugs.
- Use a certified cut-off unit for the thermal motor monitoring. Permitted units are, e.g.:

  - ABB motor temperature monitoring unit SD 241 B

  - 3 RN 1011-1 CK 00 , Ex II (2) GD , PTB 01 ATEX 3218, Siemens

5.1 Cable shield

5.1.1 Signal part

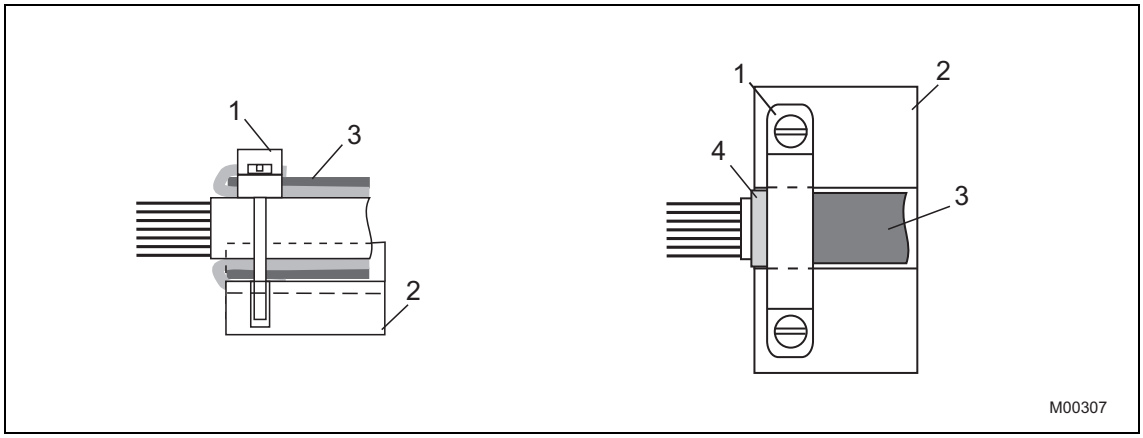

Fig. 14: Fitting the shield

1. Remove approx. 2 cm of cable sheathing (3) from the end of the cable.
2. Separate the shield and peel it back to its inner sheathing (4).
3. Push the cable through the cable gland and fasten with clamp (1).
4. Make sure that the shielding is touching the clamp and the electronic unit housing (2).

5.1.2 Motor

The cable shield must be connected to the motor in a proper manner.

5.2 Terminal connection diagrams

5.2.1 Power Electronic Unit EBN853 (Contrac)

5.2.1.1 Analog / digital

Important
The electrical connection is provided by terminals on the actuator and on the electronic unit.

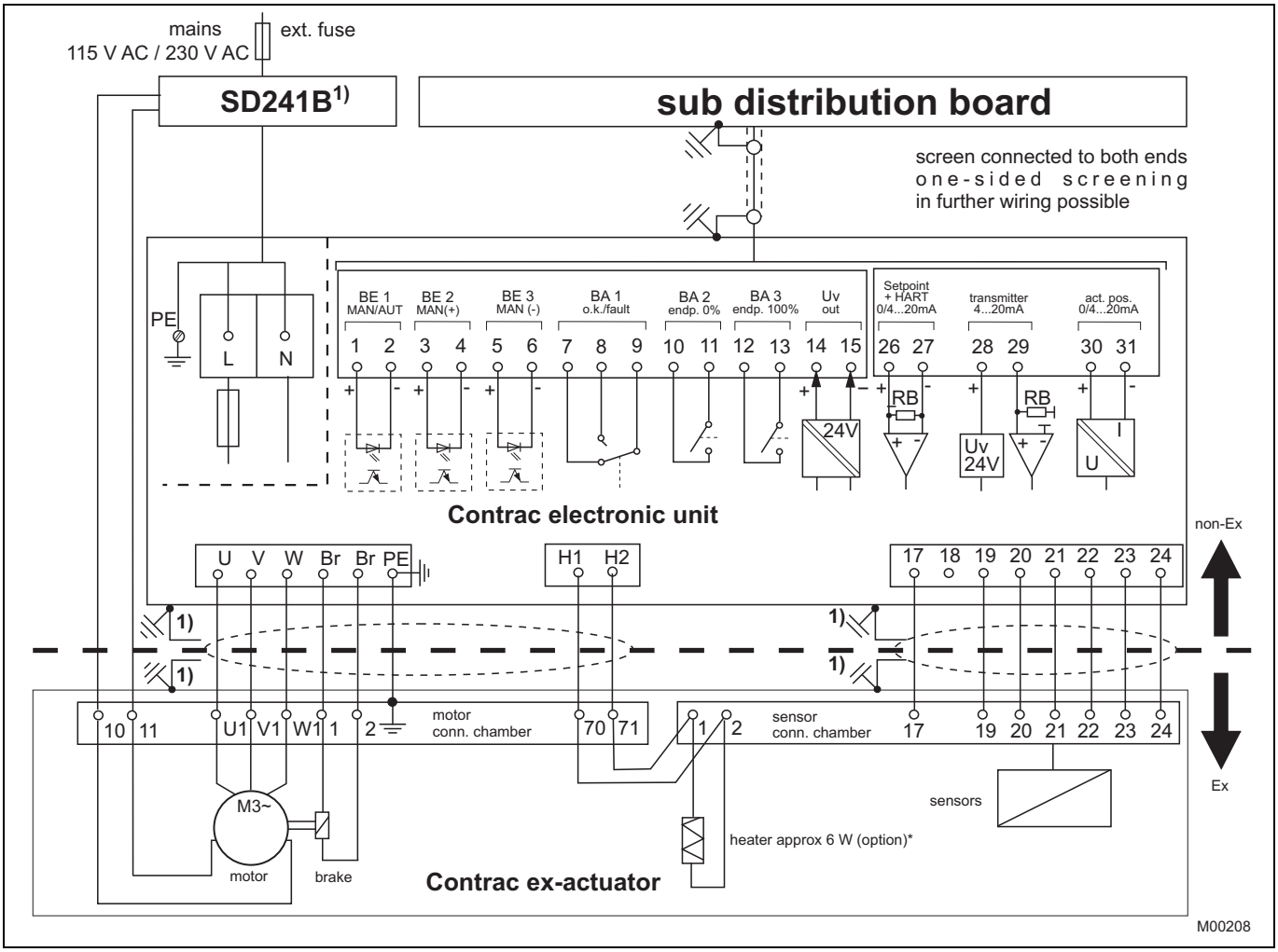

Fig. 15: Electrical connection: Ex actuator analog / digital

5.2.1.2 PROFIBUS DP

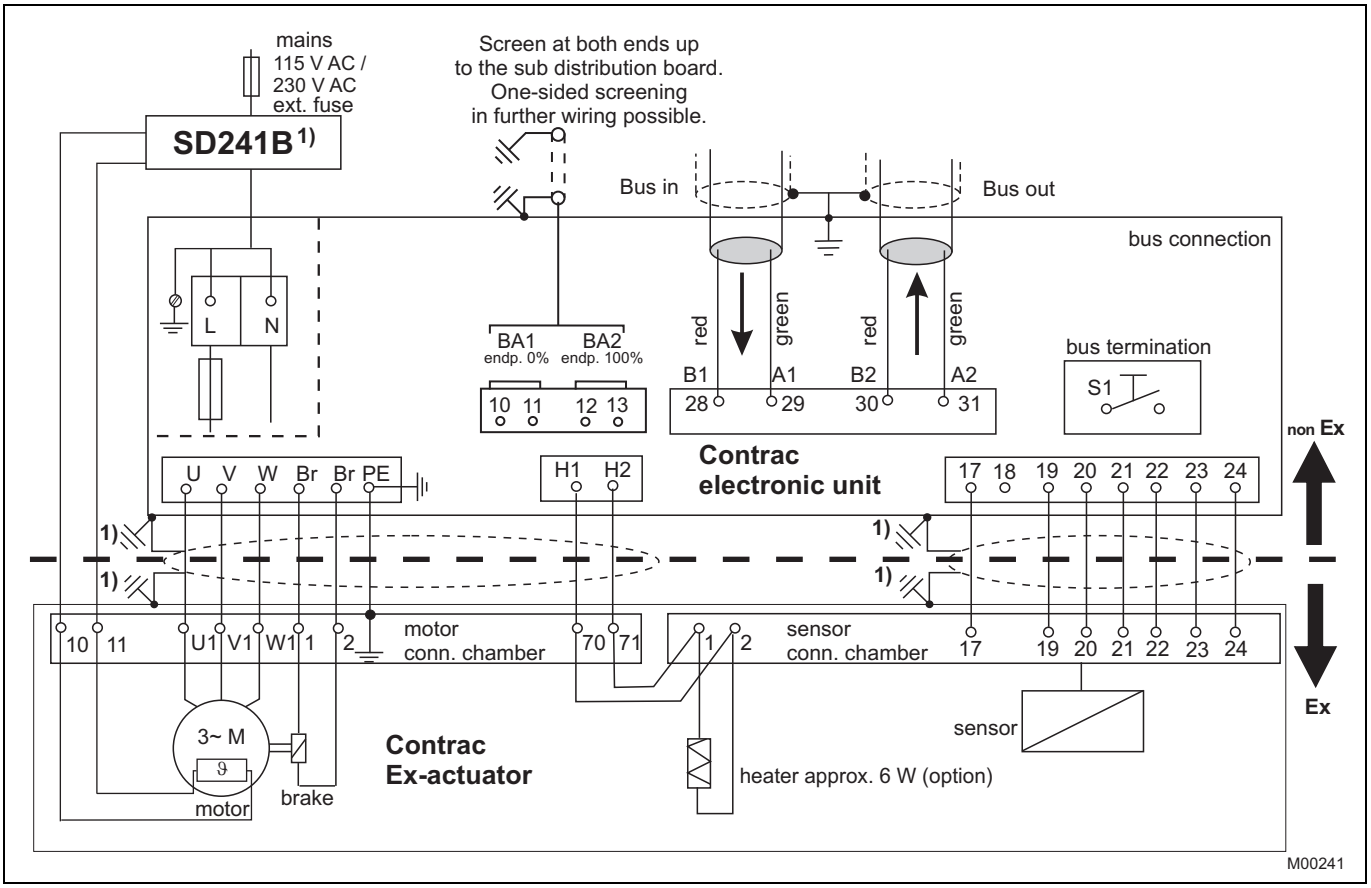

Fig. 16: Electrical connection: PROFIBUS DP option

5.2.2 Power Electronic Unit EBN861 (Contrac)

5.2.2.1 Analog / digital

Important
The electrical connection is provided by terminals on the actuator and on the electronic unit.

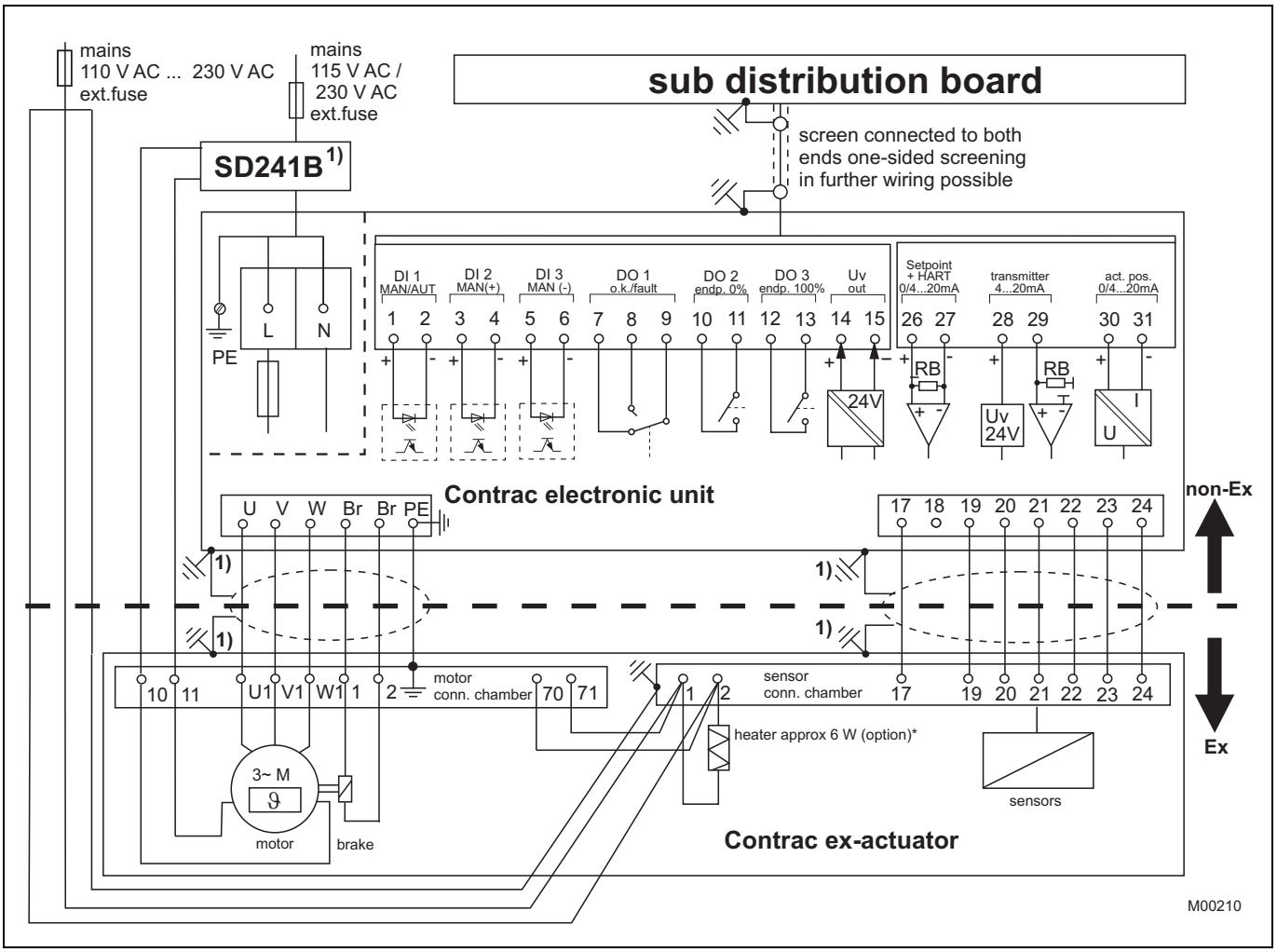

Fig. 17: Electrical connection: Ex actuator analog / digital

Important
* For separate heat supply, protect the heater with 2 … max. 6 A medium time-lag fuses (e.g., Neozed D01CE14).

5.2.2.2 PROFIBUS DP

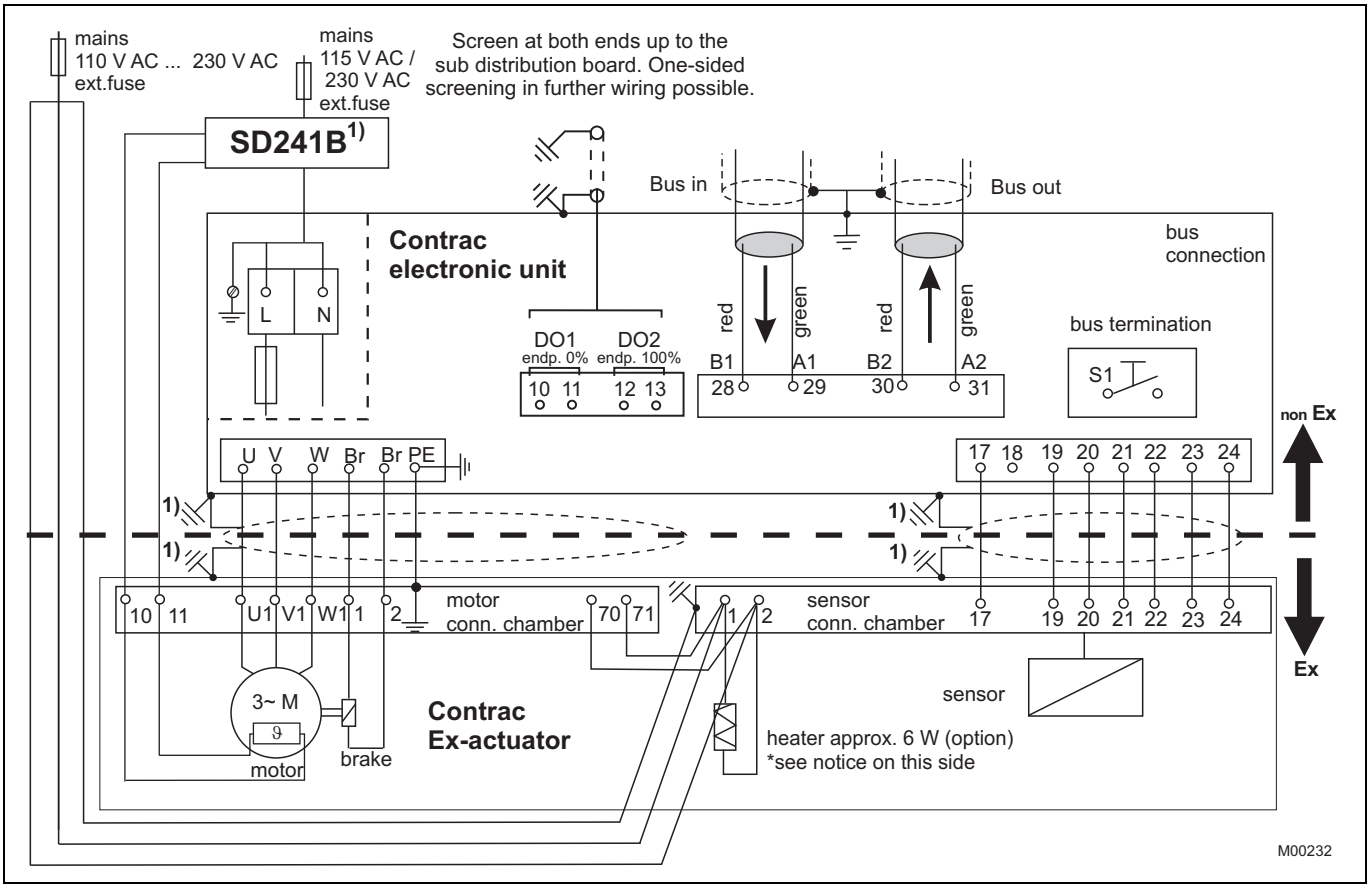

Fig. 18: Electrical connection: PROFIBUS DP option

Important

* For separate heat supply, protect the heater with 2 … max. 6 A medium time-lag fuses (e.g., Neozed D01CE14).

5.2.3 Power Electronic Unit EBS852 (Contrac) / EBS862 (Contrac)

5.2.3.1 Analog / digital

Important
The electrical connection is provided by terminals on the actuator and on the electronic unit.

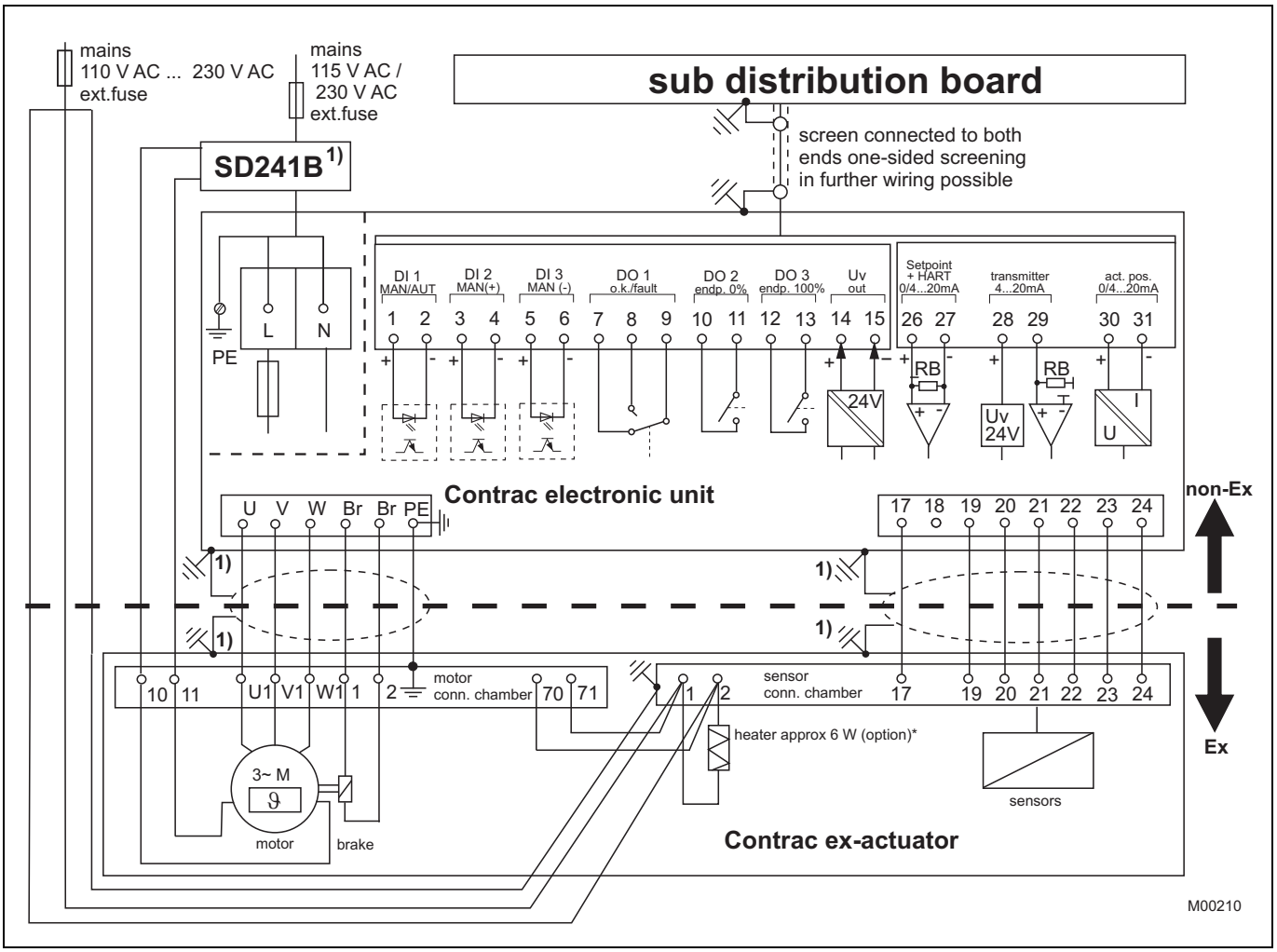

Fig. 19: Electrical connection: Ex actuator analog / digital

Important
* For separate heat supply, protect the heater with 2 … max. 6 A medium time-lag fuses (e.g., Neozed D01CE14).

6 Operation

Important

The actuator is supplied with activated positioning loop monitoring in the power electronic unit as default settings. Do not de-activate this setting.

6.1 Automatic / manual mode

The motor triggered by the power electronics controls the drive shaft via oil-lubricated spur gears. This transmits the torque to the valve via a lever with ball-and-socket joints and a coupling rod. A position sensor detects backlash-free the current position of the drive shaft.

Adjustable limit stops prevent overloading of the valve in the event of an operating error. The motor brake locks the actuator in the current position if the power suplly is cut off.

6.2 Manual operation

Manual mode allows you to move the actuator manually when the electrical power is off.

Warning - risk of injury!

Note that the actuator position may be changed accidentally by the repelling power of the valve when the brake is released!

1. Remove the cotter pin.
2. Press the hand wheel lock.
3. Turn the handwheel to move the part-turn actuator to the desired position.
4. Release the lock.
5. Insert the cotter pin.

7 Maintenance

Important

All maintenance activities may only be performed by properly qualified persons.

Contrac actuators feature a robust construction. As a result, they are highly reliable and require minimal maintenance. The maintenance intervals depend upon the effective load and are therefore not specified here.

The built-in microprocessor evaluates the actual load factors (e.g. torques, forces, temperatures, etc.) and derives the remaining operating time until the next routine maintenance is required.

Use the configuration program to view this information.

7.1 Inspection and overhaul

- Only use genuine spare parts such as ball bearings, gaskets and oil may be used to overhaul the actuators.
- Proceed acc. to table when performing maintenance activities.
- Inspection or maintenance is due after the time specified in the table.

Overhaul intervals:

Interval	Measures
1 x per year	Visual check of the gaskets for leaks, change if necessary.
every 2 years	Functional check: drive the actuator 2 x through the entire stroke range and check for correct speed reduction.
every 4 years	Check oil level
max. every 10 years, preferably after the expiry of the calculated remaining service life	Change oil, roller bearings and gaskets on motor and gearing. Check gear wheels for wear; replace if necessary.

Don’t drive the actuator during the oil check.

Make sure that no chippings or other material get into the gearbox during the maintenance work.

If the actuators are used within a II2D classified area, clean the surfaces regularly in order to avoid dirt deposits of more than 5 mm (0.20 inch). In order to avoid electrostatic charging use a damp cloth to clean the lacquered surfaces.

7.2 Brake adjustment

Warning - risk of injury!
Note that the actuator position may be changed accidentally by the repelling power of the valve when the brake is released!

Since the brake is permanently released in AUT mode it is not exposed to mechanical wear. Any readjustment is not necessary. Enables users to test the configuration software of the brake.

7.3 Oil change

Important
Oils for different temperature ranges may not mixed. Dispose of old oil according to local regulations. Make sure that the oil does not enter the water cycle.

Proceed as follows to drain or change the oil:

1. Provide a container capable of holding the expected oil quantity acc. to chapter Filling capacity.
2. Open and remove the ventilation plug, see Fig. 3.
3. Unscrew the lowermost inspection plug and drain the oil.
4. Make sure all the oil is out of the actuator.
5. Screw in and tighten the oil drain plug.
6. Fill the container with the proper volume of oil and tighten the venting plug.

Ambient temperature	Oil types (default oil filled with delivery)
-25 ... 60 °C (-13 ... 140 °F)	Mobil SHC 629
-30 ... 40 °C (-22 ... 104 °F)	Mobil SHC 626

7.4 Filling capacity

Filling capacities RHDE250				
Installation position:	IMB 3	IMB 6	IMB 7	IMV 6
Minimum oil quantity, approx.:	4,7 l (1.24 gal.[1)])	4,7 l (1.24 gal.[1)])	4,7 l (1.24 gal.[1)])	4,7 l (1.24 gal.[1)])
Min. oil level [mm] under inspection plug:	40 mm (1.57 inch)	12 mm (0.47 inch)	15 mm (0.59 inch)	Lower edge of upper oil plug

Filling capacities RHD500 ... RHDE800				
Installation position:	IMB 3	IMB 6	IMB 7	IMV 6
Minimum oil quantity, approx.:	10 l (2.65 gal.[1)])	11,5 l (3.04 gal.[1)])	10 l (2.65 gal.[1)])	10 l (2.65 gal.[1)])
Min. oil level [mm] under inspection plug:	57 mm (1.24 inch)	Lower edge of upper oil plug	15 mm (2.17 inch)	Lower edge of upper oil plug

Filling capacities RHDE1250 ... 2500				
Installation position:	IMB 3	IMB 6	IMB 7	IMV 6
Minimum oil quantity, approx.:	29 l (7.67 gal.[1)])	32 l (8.47 gal.[1)])	24 l (6.35 gal.[1)])	26,5 l (7.01 gal.[1)])
Min. oil level [mm] under inspection plug:	75 mm (2.95 inch)	90 mm (3.54 inch)	200 mm (7.87 inch)	35 mm (1.38 inch)

Filling capacities RHDE4000				
Installation position:	IMB 3	IMB 6	IMB 7	IMV 6
Minimum oil quantity, approx.:	29 l (7.67 gal.[1)])	32 l (8.47 gal.[1)])	24,5 l (6.48 gal.[1)])	26,5 l (7.01 gal.[1)])
Min. oil level [mm] under inspection plug:	75 mm (2.95 inch)	90 mm (3.54 inch)	200 mm (7.87 inch)	35 mm (1.38 inch)

[1)] US liquid gallon

8 Trouble shooting

This chapter only covers failures caused by the hardware. Use the online-help of the configuration software for an extended troubleshooting.

failure pattern	possible reason	troubleshooting
actuator can not move the valve	failure either at the actuator or at the final control element (e.g., stuffing box tightened too much)	detach actuator from valve if the actuator moves the valve is the possible cause if the actuator does not run, the actuator is the possible cause
actuator does not react	incorrect electronic unit or incorrect data set	Compare the nameplate data on the actuator and electronic unit.
	Incorrectly configured electronic unit	Check/update the settings for the parametrization software
	no communication with the control system	Check wiring
	incorrect wiring between actuator and electronic unit	Check wiring
	motor / brake faulty	Check the winding resistance of the motor and brakes Check the brake lock
	Binary inputs on the electronic unit are not wired	Make connection
	Brake does not release (no mechanical "click")	Check the brake air gap (approx. 0.25 mm) and electrical connection to the brake check winding resistance of the brake coil
actuator does not run in AUT mode, although “AUT” is selected in the user interface	Binary input 1 (BE 1) not wired	Make connection Check the software settings for the binary inputs
LEDs in the commissioning and service panel (CSP) flash synchronously	Actuator is not adjusted properly	Adjust actuator
LEDs flash alternately	Electronic unit / drive failure	drive the actuator beyond the adjusted end position (either manually or using the push buttons on the CSP); <:hr>(if necessary disconnect from valve or damper) drive the actuator back into the operating range and connect it to the valve / damper re-adjust the operating range
failure when approaching the end position	Actuator in limit range of positioning sensor	

8.1 Electrical test values

	BD 80 K-4B	BD 80 L-4B	BD 90 L2-4B	BD 100 L2-4B
Winding resistance ± 5 % at 20 °C (68 °F)				
motor	18,2 Ω	8,04 Ω	3,88 Ω	2,57 Ω
brake	910 Ω	910 Ω	648 Ω	575 Ω

9 Technical data

9.1 General information

	RHDE250 ... 4000 (Contrac)
Operating mode	S9; stallproof acc. to IEC 60034-1 / EN 60034-1
Protection class	IP 66; explosion proof
Moisture	≤ 95% average; condensation not permitted
Ambient temperature	-25 … 60 °C (-13 … 140 °F) -30 … 40 °C (-22 … 104 °F) (Reduced positioning speed at rated load and below -10 °C (14 °F))
Transport- and storage temperature	-30 ... 60 °C (-22 … 140 °F)
Installation position	IMB3, IMB6, IMB7, IMV6; preferably IMB3 acc. to IEC 60034-7 / EN 60034-7
Coating	2-layer component epoxy (RAL 9005, black)
Anti condensation heater	Motor winding Directly from the electronic unit. Signal space: Separate heating resistor; separate power supply or power feed from Contrac electronic unit.
Electrical connection	terminals in EEx e connection chamber; separately for motor and signals connecting cable electronics – actuator optional (see ordering information of electronics)
Power supply for motor and sensors	Only via Contrac electronic unit (refer to the data sheet for the electronic unit)

9.2 Technical Data RHDE250

Model	RHDE250-10
Rated torque	250 Nm (185 lbf-ft), adjustable to 0.5, 0.75 or 1x rated torque
Starting torque	1.2 x rated torque (break-away torque in end positions for short time 2 x rated torque)
Rated time for 90°; adjustable	10 … 900 s
Operating speed; adjustable	9,0 … 0,1°/s
Operating angle	Typically 90° (min. 35°; max. 140°), see manual for reduced angle with lever and limit stop
Weight	61.5 kg (136 lb)
Associated electronic unit (data sheet)	For field installation: EBN853 [1)] For rack installation: EBS852 [2)]
Thermal motor Monitoring	With motor temperature monitoring equipment SD241B[3)] or similarly certified tripping unit for PTC thermistor detectors
Motor	BD 80 K-4B
Sensors	Position and temperature sensor always available

[1)] Data sheet EBN853: 10/68-8.27

[2)] Data sheet EBS852: 10/68-8.24

[3)] Data sheet SD241B: 10/68-8.30

9.3 Technical data RHDE500 ... RHDE800

Model	RHDE500-10	RHDE800-10
Rated torque	500 Nm (370 lbf-ft) (adjustable to 0.5, 0.75 or 1x rated torque)	800 Nm (590 lbf-ft) (adjustable to 0.5, 0.75 or 1x rated torque)
Starting torque	1.2 x rated torque (break-away torque in end positions for short time 2 x rated torque)	
Rated time for 90°	10 … 900 s	10 … 900 s
Operating speed, adjustable	9,0 … 0,1 °/s	9,0 … 0,1 °/s
Operating angle	Typically 90° (min. 35°, max. 140°). See instructions for limited operating angle if actuator is equipped with lever and limit stop.	
Weight	106,5 kg (235 lb)	107 kg (236 lb)
Related electronics	For field installation: Model EBN853 [1] For rack installation: Model EBS852 [2]	
Thermal motor Monitoring	With motor temperature monitoring equipment SD241B[3] or similarly certified tripping unit for PTC thermistor detectors	
Motor (with brake and PTC)	BD80K-4B	BD80L-4B
Sensors	Position and temperature sensor always available.	

[1] Data sheet EBN853: 10/68-8.27
[2] Data sheet EBS852: 10/68-8.24
[3] Data sheet SD241B: 10/68-8.30

9.4 Technical data RHDE1250 ... RHDE2500

Model	RHDE1250-12	RHDE2500-10	RHDE2500-25
Rated torque	1250 Nm (925 lbf-ft) (adjustable to 0.5, 0.75 or 1x rated torque)	2500 Nm (1850 lbf-ft) (adjustable to 0.5, 0.75 or 1x rated torque)	
Starting torque	1.2 x rated torque (break-away torque in end positions for short time 2 x rated torque)		
Rated time for 90°	12 … 900 s	10 … 900 s	25 … 900 s
Operating speed, adjustable	7,5 … 0,1 °/s	9,0 … 0,1 °/s	3,6 … 0,1 °/s
Operating angle	Typically 90° (min. 35°, max. 140°). See instructions for limited operating angle if actuator is equipped with lever and limit stop.		
Weight	282 kg (622 lb)	269.5 kg (594 lb)	282 kg (622 lb)
Related electronics For field installation: For rack installation:	 Model EBN853 [1] Model EBS852 [2]	 Model EBN861 [3] Model EBS862 [4]	 Model EBN853 [1] Model EBS852 [2]
Thermal motor Monitoring	With motor temperature monitoring equipment SD241B [5] or similarly certified tripping unit		
Motor type	BD 80L-4B	BD 90 L2-4B	BD 80 L-4B
Sensors	Position and temperature sensor always available.		

[1] Data sheet EBN853: 10/68-8.27
[2] Data sheet EBS852: 10/68-8.24
[3] Data sheet EBN861: 10/68-8.22
[4] Data sheet EBS862: 10/68-8.25
[5] Data sheet SD241B: 10/68-8.30

9.5 Technical data RHDE4000

Model	RHDE4000-10	RHDE4000-40
Rated torque	4000 Nm (2950 lbf-ft) (adjustable to 0.5, 0.75 or 1x rated torque)	
Starting torque	1.2 x rated torque (break-away torque in end positions for short time 2 x rated torque)	
Rated time for 90°	10 … 900 s	40 … 900 s
Operating speed, adjustable	9,0 … 0,1 °/s	2,25 … 0,1 °/s
Operating angle	Typically 90° (min. 35°, max. 140°). See instructions for limited operating angle if actuator is equipped with lever and limit stop.	
Weight	approx. 296 kg (653 lb)	approx. 284,5 kg (627 lb)
Related electronics For field installation: For rack installation:	 Model EBN861 [1] Model EBS862 [2]	 Model EBN853 [3] Model EBS852 [4]
Thermal motor Monitoring	With motor temperature monitoring equipment SD241B [5] or similarly certified tripping unit for PTC thermistor detectors	
Motor type	BD 100 L2-4B	BD 90 L2-4B
Sensors	Position and temperature sensor always available.	

[1] Data sheet EBN861: 10/68-8.22
[2] Data sheet EBS862: 10/68-8.25
[3] Data sheet EBN853: 10/68-8 27
[4] Data sheet EBS852: 10/68-8 24
[5] Data sheet SD241B: 10/68-8.30

9.6 Technical data for the cable set (for Ex-relevant range)

	Motor connection	motor temperature monitoring	Signal terminal (option)
Wire conductor:	8 x 1.5	2 x 1.5	8 x 0.5
Mat. no.:	9280271		9280183
Manufacturer:	Huber+Suhner	Huber+Suhner	Bröckskes (HeluKabel)
Type:	RX125 S2 B 8g1.5 mm2 BK	RX125 S2 2x1.5 mm2 BK	So-LTG-PUR-8 x 0.5 (HK-So-Li12YC11Y-OB-8 x 0.5)
Sheathing diameter:	14.3 ± 0.4 mm (0.56 ± 0.02 inch)	8.0 ± 0.4 mm (0.31 ± 0.02 inch)	8.5 ± 0.4 mm (0.33 ± 0.02 inch)
Rated voltage Uo/U (Uo applies to wire/shielding):	≥ 600 / 1000 V	≥ 600 / 1000 V	≥ 300 / 500 V
Wire-wire test voltage:	≥ 3.5 kV	≥ 3.5 kV	≥ 1.2 kV
Temperature range:			
moves:	-25 ... 125 °C (-13 ... 257 °F)	-25 ... 125 °C (-13 ... 257 °F)	-40 ... 90 °C (-40 ... 194 °F)
fixed:	-40 ... 125 °C (-40 ... 257 °F)	-40 ... 125 °C (-40 ... 257 °F)	-50 ... 90 °C (-58 ... 194 °F)
Protective conductor:	gnge		
Environment:	UV-resistant and weather-proof	UV-resistant and weather-proof	UV-resistant and weather-proof
Cable gland	13.5 … 18 / M25 x 1.5 Exe	4 … 8.5 / M25 x 1.5 Exe	
Mat. no.:	9287589	9287588	
Manufacturer:	Rabe-System-Technik	Rabe-System-Technik	
Type:	CMDEL-T	ADE 1F	
Item no.:	00222574	00816674	
Cable diameter:	13,5 ... 18 mm (0.53 ... 0.71 inch)	4 ... 8.5 mm (0.16 ... 0.33 inch)	
Material:	Brass nickel-plated	Brass nickel-plated	
Standard seal insert:	Neoprene	Neoprene	
O-ring:	Perbunan	Neoprene	
Temperature range:	-40 ... 100 °C (-40 ...212 °F)	-40 ... 100 °C (-40 ...212 °F)	
Protection class:	IP 68 - 10 bar (140.04 psi)	IP 68 - 5 bar (72.52 psi)	
Certificate:	LCIE 97 ATEX 6008 X	LCIE 97 ATEX 6008 X	
Designation:	Ex II 2 GD, EExe II	Ex II 2 GD, EExe II	
Option			
Manufacturer:	Pflitsch	Pflitsch	
Type:	blue globe ATEX	blue globe ATEX	
Diameter:	M25 x 1.5 KAD20-16/16-11	M20 x 1.5 KAD14-9/9-5	
Item no.:	bg225 msex	bg220 msex	
Temperature range:	-40 … 115 °C (-40 ... 239 °F)	-40 … 115 °C (-40 ... 239 °F)	
Protection class:	IP 68	IP 68	
Certificate:	PTB 06 ATEX 1036 X	PTB 06 ATEX 1036 X	
Designation:	Ex II 2G/D, Ex e II	Ex II 2G/D, Ex e II	

Important
If the specified cable harness does not meet all safety-relevant requirements, the proper installation material must be used.

10 Appendix

10.1 Permits and certifications

	Symbol	Description
CE mark		The CE mark indicates that the device complies with the following directives and their basic safety requirements: • CE mark on the nameplate of actuator. – Conforms with EMC directive 89/336/EWG. – Conforms with the machinery directive 2006/42/EC. By placing the CE mark on its devices, ABB Automation Products GmbH declares its conformance with these directives.
Ex approvals		The symbol indicates devices with an ignition-proof design. For devices in Ex design, according to identification on an additional nameplate, the following also applies: – Conforms with ATEX directive 94/9/EC. By placing the CE mark on its devices, ABB Automation Products GmbH declares its conformance with this directive.

Important

All documentation, declarations of conformity and certificates are available in the download area of ABB Automation Products GmbH.

www.abb.de/aktorik

XXXX = Refer to the device nameplate for the monitoring authority

Statement about the contamination of devices and components

The repair and/or maintenance of devices and components will only be performed when a completely filled out explanation is present.

Otherwise, the shipment can be rejected. This explanation may only be filled out and signed by authorized specialist personnel of the operator.

Customer details:

Company:	
Address:	
Contact person:	Telephone:
Fax:	E-Mail:

Device details:

Type:	Serial no.:
Reason for the return/description of the defect:	

Was this device used for working with substances which pose a threat or health risk?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items)

biological	☐	corrosive/irritating	☐	combustible (highly/extremely combustible)	☐
toxic	☐	explosive	☐	other toxic substances	☐
radioactive	☐				

Which substances have had contact with the device?

1.

2.

3.

We hereby certify that the devices/parts shipped were cleaned and are free from any dangerous or poisonous materials.

City, Date Signature and company stamp

11 Index

A

Actuator check 13
Adjusting the stops in dependence of the torque 15
Adjusting the stops in dependence of the travel....15
Appendix 43
Assembly with the valve 14
AUT mode....36
Automatic / manual mode 34

B

Brake adjustment....36

C

Cable shield....27, 28
CE mark 43
Cleaning....35
Contrac electronic unit 27

D

Design and function 12
Dimensioned drawings 19
Disposal 8
Downloads 43

E

Electrical installation safety information....9
EMC directive....43
Ex applications....27
Explosion-protection safety precautions....11

F

Filling capacities....37
Filling capacity 36, 37
Functional check....35

G

General information 39
General Safety Information....5

I

Ignition protection approvals....43
Ignition-proof design 43
Inspection and overhaul....35
Installation....13
Installation instructions 14
Installation position 37
Installation safety information 9

L

Labels and symbols 6
Lever for RHDE1250 / RHDE2500 23
Lever for RHDE250....19
Lever for RHDE4000....25
Lever for RHDE500 ... RHDE800 21

M

Maintenance 35
Maintenance activities 35
Maintenance intervals....35
Manual operation 34
Motor....28
Mounting position....13

N

Name plate....7

O

Oil change....36
Oil types 36
Operating safety information....10
Operation 34
Operation via frequency transformer 11
Operator liability 7

P

Permits and certifications....43
Personnel qualification....7
Power Electronic Unit EBN853 (Contrac)....29
Power Electronic Unit EBN861 (Contrac)....31
Power Electronic Unit EBS852 (Contrac) / EBS862 (Contrac) 33
Preparation 14
Preventing electrostatic charging....11
PROFIBUS DP....30, 32

R

Repelling power 36
Returning devices 8

S

Safety 5
Spur gearing 13
Storage conditions 9
Symbols and warnings.....6

T

Technical data.....39
Technical limits 5
tensile strength.....16
Terminal connection diagrams.....27, 29
tightening torque 16
Time until next maintenance is required 35
Transport safety information 8
Trouble shooting 38

W

Warranty provision 6
Wear 35
WEEE directive 8

ABB has Sales & Customer Support expertise in over 100 countries worldwide.

www.abb.com/instrumentation

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

Printed in the Fed. Rep. of Germany (10.2007)

3KXE111001R4201

42/68-167-EN Rev. B

ABB Limited
Salterbeck Trading Estate
Workington, Cumbria
CA14 5DS
UK
Tel: +44 (0)1946 830 611
Fax: +44 (0)1946 832 661

ABB Inc.
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB Automation Products GmbH
Schillerstr. 72
32425 Minden
Germany
Tel: +49 551 905-534
Fax: +49 551 905-555
CCC-support.deapr@de.abb.com