Service Instruction

43/68-14 EN

Electrical Linear Actuators for Continuous Modulating Control RSD10 ... RSD200 (Contrac)

Rated Force 10 ... 200 kN
(2250...45000 lbf)

PROFI BUS PROCESS FIELDBUS

HART® FIELD COMMUNICATIONS PROTOCOL

ABB

Electrical Linear Actuators for Continuous Modulating Control RSD10 ... RSD200 (Contrac)

Service Instruction

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1 Important information

1.1 General

Read and save all instructions prior to installing, operating, and servicing this product. If any of the instructions are not understood, contact your ABB representative for clarification.

1.2 Symbols

In order that you can make the best use of this document and to ensure safety during commissioning, operation and maintenance of the equipment, please note the following explanation of the symbols used.

Explanation of the symbols used:

Symbol	Signal Word	Definitions
	**DANGER**	DANGER indicates an **imminently hazardous** situation which, if not avoided, **will result** in death or serious injury. (High level of risk.)
	**WARNING**	WARNING indicates a **potentially hazardous** situation which, if not avoided, **could result** in death or serious injury. (Medium level of risk.)
	**CAUTION**	CAUTION indicates a **potentially hazardous** situation which, if not avoided, **could result** in minor or moderate injury. (Low level of risk.)
	**NOTICE**	NOTICE indicates a **potentially harmful** situation which, if not avoided, **may result** in damage of the product itself or of adjacent objects. (Damage to property)
	**IMPORTANT**	IMPORTANT indicates useful hints or other special information which, if not observed, could lead to a decline in operating convenience or affect the functionality. (Does not indicate a dangerous or harmful situation.)

As well as the instructions in this document, you must also follow the generally applicable accident prevention and safety regulations.

If the information in this document is insufficient in any situation, please contact our service department, who will be happy to help you.

Please read this document carefully before installation and commissioning

To ensure proper performance, use qualified personnel who have been trained, qualified and certified by ABB to install, operate, update, tune, and maintain the actuator, the electronic units and the wiring.
ABB will not take any responsibilty for personal injuries or material damages which were caused by non-trained, non-qualified or non-certified personnel.

1.3 Transport and storage

Carefully inspect for shipping damage. Damage to the shipping carton is usually a good indication that it has received rough handling. Report all damage immediately to the freight carrier and your ABB representative. Verify that the items on the packing list or bill of lading agree with your own.

2 Introduction

This service instruction refers to the ABB linear actuators RSD10... RSD200. It amends and deepens the routine maintenance description in the standard instruction, which we strongly recommend also be available for all maintenance work.

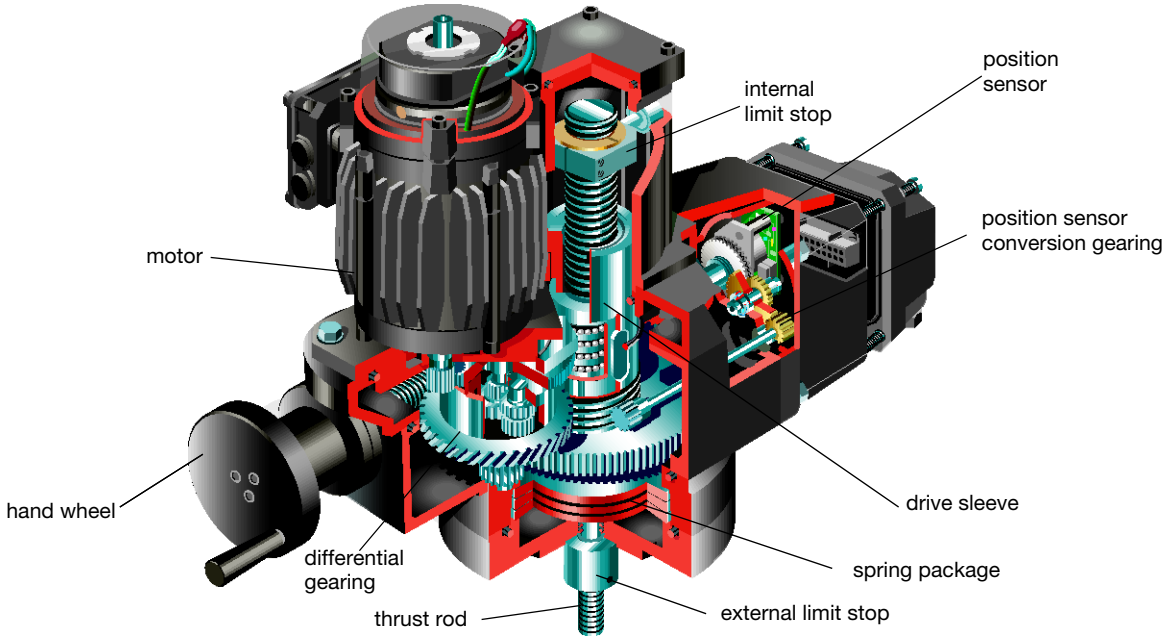


Fig. 1: RSD...; main components

2.1 Safety and precautions

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

STOP

- The actuators perform movements for positioning vanes and valves. Handle properly and with care. Otherwise, a hazard of bruise injuries may arise.
- 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 waste oil reaches the water cycle.
- Only qualified specialists who have been trained, qualified and certified by ABB for these tasks are authorized to mount and adjust the actuator and to make the electrical connection. ABB will not take any responsibility for personal injuries or material damages which were caused by non-trained, non-qualified or non-certified personnel.
- 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.
- Use the eye bolt at the actuator to lift or lower it. Only load it vertically. Do not lift or lower the actuator when it is mounted on a valve or similar final control element.
- Switch-off the voltage supply; make sure that unintentional switching on is not possible.
- Make sure that switching off the power supply does not affect the plant process.
- Make sure that the final control element is not exposed to process forces.
- Refill the oil and check all mechanical and electrical interfaces for proper connection once the installation, commissioning, service or maintenance work is done.
- Consider the weight of the components.
- Exclusively use genuine spare parts supplied by the ABB service organization.

2.2 Tools

IMPORTANT

Maintenance at CONTRAC actuators requires tools which are usually available in a workshop. Please consider that all dimensions are based on the metric system. This applies also for the wrench sizes, threads etc. Using improper tools may damage the actuator or its components. Use appropriate sleeves for the installation of the sealing rings (see chpt. 4 for details).

3 Lubrication

The spur wheel gearings of RSD10... RSD200 are oil lubricated. They contain the max. oil quantity when they leave the manufacturer. In order to avoid any overpressure in the gearbox (e. g. due to thermal influence) replace the uppermost check screw by the separately supplied venting screw once the actuator is installed.

Standard actuators are delivered with a venting screw with a metal cap. Actuators which are equipped with an anti-condensation heater are delivered with a venting screw with a plastic cap.

3.1 Mounting position and filling capacity

CAUTION

If the actuator has been used, stored or transported in an other position than the installation position, the oil level needs some time to settle. This may take up to 2 days for big actuators at cold temperatures. Leave enough time before you measure the oil level.

If the actuator operating position is going to be changed from IMV1 position (motor at the top) to another position, change the motor shaft sealing ring before.

3.1.1 RSD10... RSD20

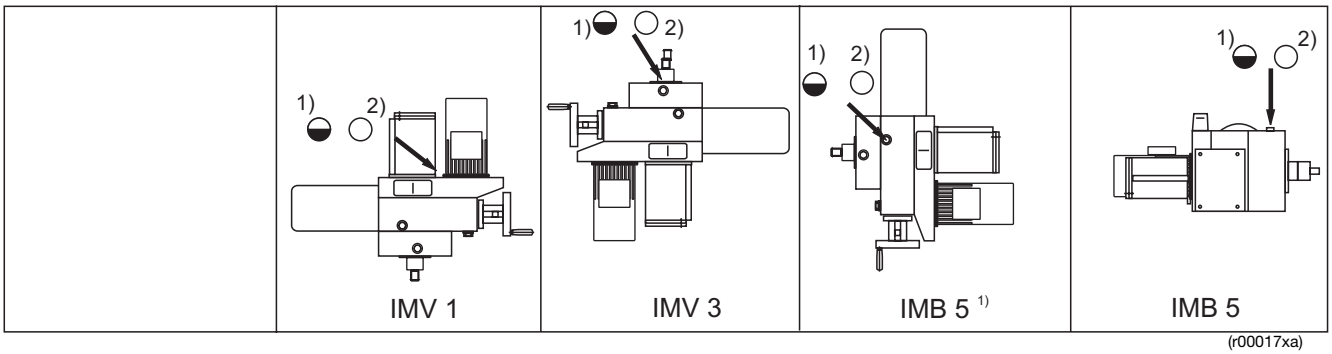


Fig. 2: oil level; 1) = inspection screw, 2) = venting screw

Type	RSD10 / RSD20	RSD10 / RSD20	RSD10 / RSD20	RSD10 / RSD20
oil quantity, approx. [ltr] max. stroke 100 mm max. stroke 300 mm	 3.8 6.4	 5.4 8.8	 3.8 6.4	 3.8 6.7
oil level [mm] below inspection screw with fully retracted thrust rod	40	0	28	75

Table 1: Filling capacity RSD10 / RSD20

3.1.2 RSD50

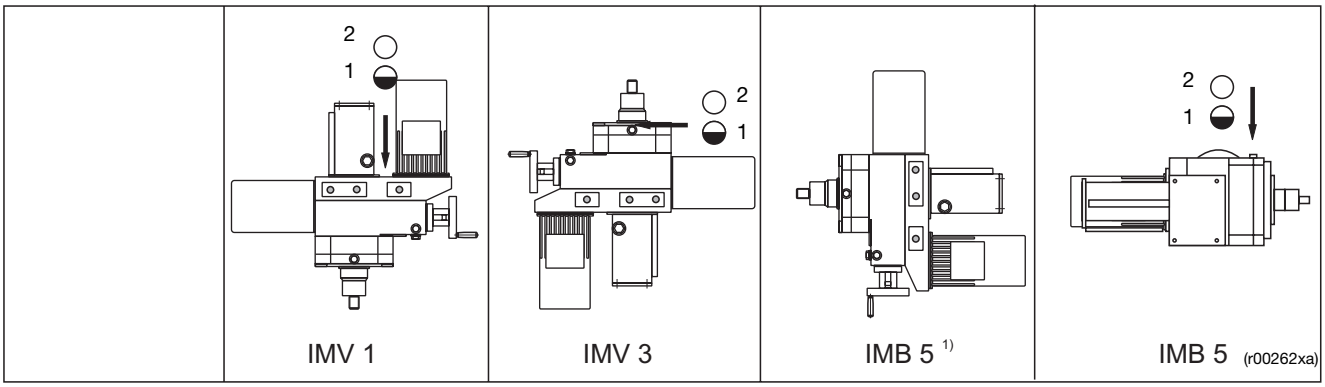


Fig. 3: oil level; 1) = inspection screw, 2) = venting screw

Type	RSD 50	RSD 50	RSD 50	RSD 50
oil quantity, appr. [ltr] max. stroke 120 mm max. stroke 300 mm	 7 10	 10 12	upon request	 7 12
oil level [mm] below inspection screw with fully retracted thrust rod	49	0 (150 at 300 mm stroke)	upon request	35

Table 2: Filling capacity RSD50

3.1.3 RSD100

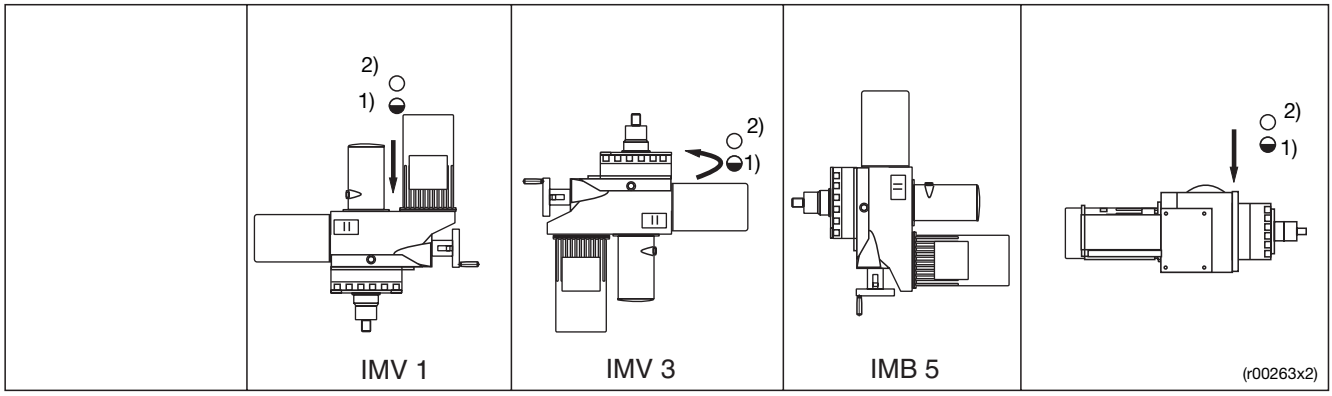


Fig. 4: oil level; 1) = inspection screw, 2) = venting screw

oil quantity, approx. [ltr] max. stroke 150 mm max. stroke 300 mm	 11 15	 18 23	upon request	 13 19
oil level [mm] below inspection screw with fully retracted thrust rod	47	15 (150 mm stroke) 130 (300 mm stroke)	upon request	43

Table 3: Filling capacity RSD100

3.1.4 RSD200

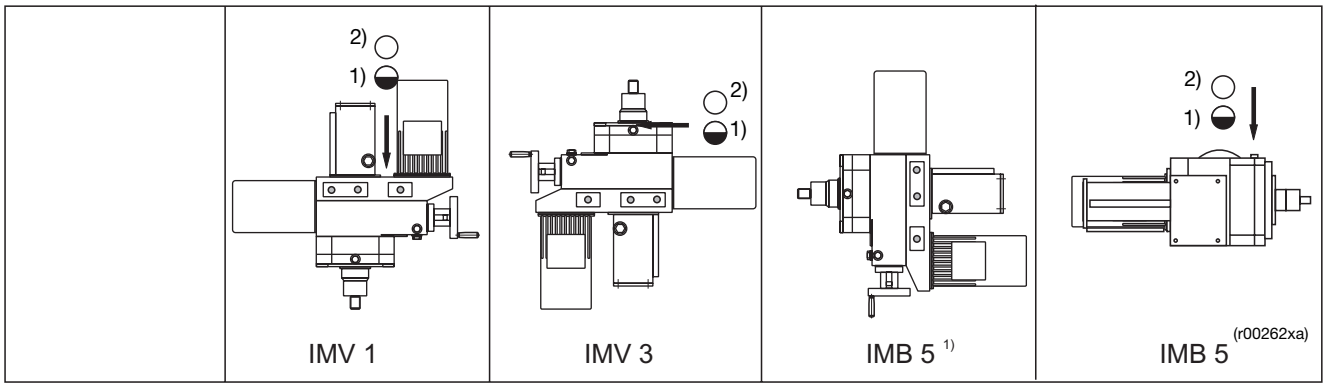


Fig. 5: oil level; 1) = inspection screw, 2) = venting screw

oil quantity, approx. [ltr] max. Hub 180 mm max. Hub 300 mm	15.5 19.5	23 28.5	upon request	18 24
oil level [mm] below inspection screw with fully retracted thrust rod	48	0 (180 mm stroke) 30 (300 mm stroke)	upon request	100

Table 4: Filling capacity RSD200

3.2 Oil specifications

	Oil specification	
Ambient temperature	Oil type used by manufacturer for first filling	Possible other oil types
+ 1°C... + 85°C 1)	Mobil SHC 632	--
- 10°C... + 65°C	ESSO Spartan EP 220 (L-CKC to ISO TR 3498)	Aral Degol BMB 220 BP Energol GR-XP 220 Shell Omala 220 Mobilgear 630
- 30°C... + 50°C	Mobil SHC 629	--

Table 5:

1) only available as non-standard solution

3.2.1 Oil change

Use the lowermost plug to drain the oil. If the actuator basement does not allow to put an appropriate catchment device under the lowermost drain plug keep this one closed and open the uppermost drain plug. Push the pipe of a hand pump through this opening until the end reaches the bottom. Use the hand pump to get the oil manually out into the catchment device.

NOTICE

Do not mix oil for different temperature ranges. Dispose of the waste oil in compliance with the respective local regulations. Make sure that no waste oil reaches the water cycle.

Proceed as follows to drain or change the oil (consider previous hints):

- Provide a container which is capable to take the expected oil quantity acc. to table 1 to 4.
- Open or undo the venting screw (fig. 2 ... fig. 5).
- Unscrew the lowermost inspection screw and use it to drain the oil.
- Make sure that all of the oil is out of the actuator.
- Take a new sealing ring before you screw in and tighten the drain screw.
- Complete other maintenance work (if required).
- Refill the appropriate amount of oil and tighten the venting screw.
- Check the oil level. See CAUTION hint in chpt. 3.1 for details.

4 Maintenance

Contrac actuators feature a robust construction. As a result, they are highly reliable and require only little maintenance. The maintenance intervals depend upon the effective load.

The built-in microprocessor evaluates the actual load factors (e.g. torques, movements, temperatures, etc.) and derives the remaining operating time until the next routine maintenance is required. Use the configuration program for viewing this information.

CAUTION

All maintenance work must be carried out by qualified specialists who have been trained for this task.

Apart from the load dependent maintenance intervals determined by the microprocessor we recommend routine maintenance; at least every 10 years.

4.1 Thrust rod sealing ring and scraper ring

Firmly bonded deposits on the thrust rod may damage the scraper and sealing rings in the actuator flange. In order to change these components proceed as follows (procedure implies the actuator disconnected from any electrical supply, removed from the valve and safely placed):

STOP

The spring package may save some energy, if it had been compressed. In order to avoid that the suddenly releasing springs throw the flange throw the workshop when you take the flange screws out, firstly loosen the screws slightly. Then make sure that the springs are completely released (e. g. knock with a rubber hammer on the actuator housing). In the next step loosen the flange screws completely, take them out and pull the flange from the housing.

4.1.1 RSD10 / RSD20

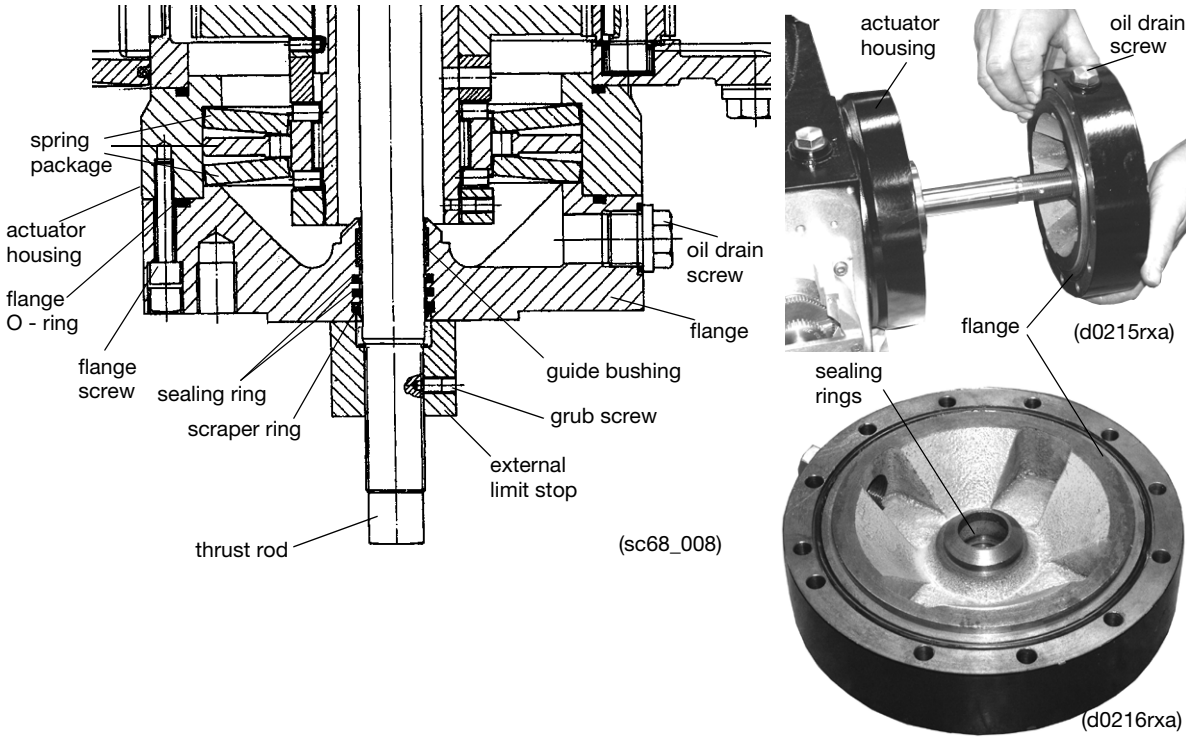


Fig. 6:

- Drain the oil.
- Undo the grub screw in the external limit stop and take the limit stop apart.
- Undo the flange srews and pull the flange apart.
- Pull the flange from the shaft.
- Replace scraper rings, sealing rings and O-rings; see fig. 6 for mounting position.
- Check guide bushing and flange O-ring; replace if necessary.
- Cover the lower, threaded part of the thrust rod properly in order to avoid any damage of the sealing rings when pushing the flange over the thrust rod when reassembling.
- Reassemble the actuator in reverse order.
- Tighten the flange screws crosswise; see table for torque values.

	RSD10/	RSD20
flange screw M8 x 90	20 Nm (14.75 lbf-ft)	20 Nm (14.75 lbf-ft)
flange screw M8 x 40	23 Nm (17 lbf-ft)	23 Nm (17 lbf-ft)

Table 6:

4.1.2 RSD50...RSD200

The scraper ring, O-rings and the guide bushing for the actuator types RSD 50 ... RSD200 are placed in a additional sealing flange, which is mounted in the housing flange. This facilitates the exchange / replacements of these components, since there is no need to remove the housing flange.

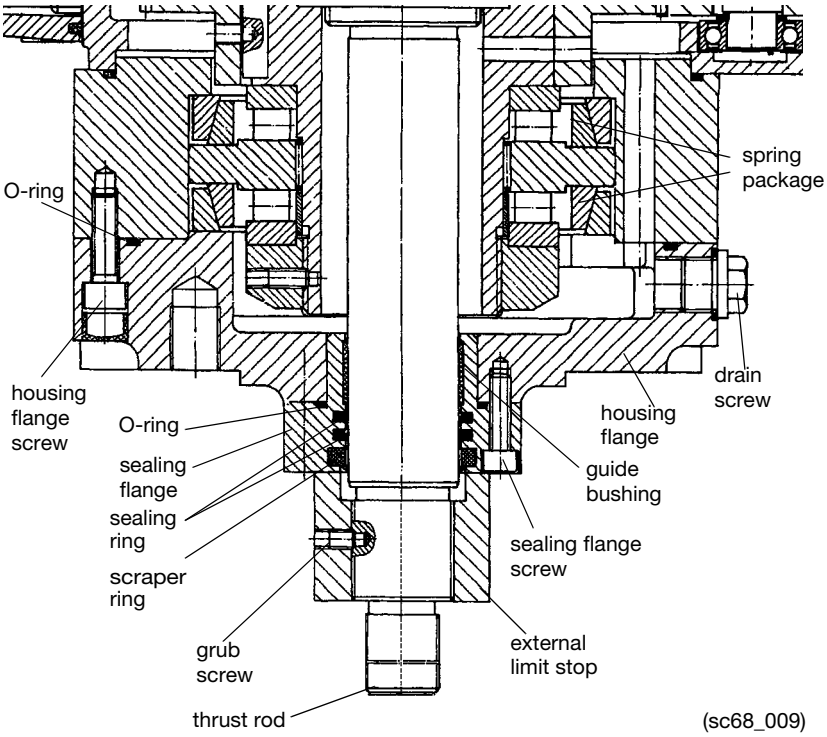


Fig. 7:

STOP

If the housing flange must be removed for any reason, make sure that the internal spring package is properly released.

- Drain the oil.
- Undo the grub screw in the external limit stop and take the limit stop apart.
- Undo the sealing flange srews and pull the sealing flange out.
- Pull the flange from the shaft.
- Replace scraper rings, sealing rings and O-rings; see fig. 7 for mounting position.
- Check guide bushing and flange O-ring; replace if necessary.
- Cover the lower, threaded part of the thrust rod properly in order to avoid any damage of the sealing rings when pushing the flange over the thrust rod when reassembling.
- Reassemble the actuator in reverse order.
- Tighten the flange screws crosswise; see table for torque values.

	RSD50	RSD100	RSD200
sealing flange screw	23 Nm (17 lbf-ft)	23 Nm (17 lbf-ft)	23 Nm (17 lbf-ft)
housing flange screw	40 Nm (29.5 lbf-ft)	70 Nm (52 lbf-ft)	

Table 7:

4.2 Sealing ring of hand wheel drive / hand wheel shaft

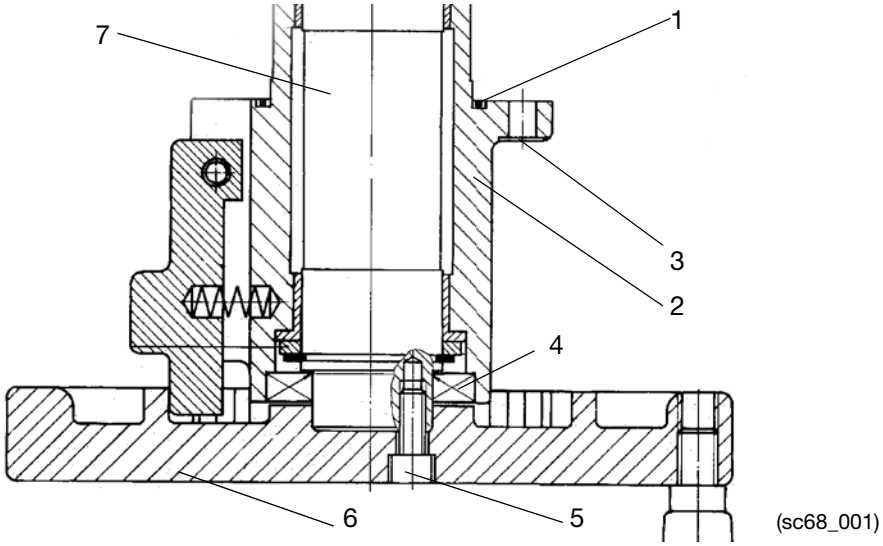


Fig. 8: Handwheel

STOP

Restoring process forces may move the actuator when you release the handwheel!

In order to change the handwheel O-ring (1) of the drive proceed as follows:

- Make sure that the oil level is below the O-ring (1).
- Drain the oil if necessary (see chpt. 3.2.1 for details).
- Turn flange screws (3) out.
- Pull entire hand wheel drive assembly out of the gearing engagement.
- Replace the O-ring (1).
- If additionally the shaft sealing ring (4) needs to be replaced, turn the wheel fastening screws (5) out and put the hand wheel (6) aside.
- Take the shaft sealing ring (4) out.
- Grease the new the shaft sealing ring (4) slightly with oil and put it into the groove; consider the exemplary hints and illustration of chpt. 4.1.
- Fasten the hand wheel (6) and re-install the entire assembly; tightening torque for the screws (3) = 20 Nm (15 ft-lbs).

4.3 Motor

By the time of printing this document, Contrac actuators use 2 basic motor series.
Motor type MC..71..... MC..100 of the series 1 feature a „C“ at the end of the name code, motor type MC..71..... MC..100 of the series 2 feature a „D“.

Motor type MC..112 of the series 1 features a „B“ at the end of the name code, motor type MC..112.... of the series 2 features a „C“. See 4.3.1 for details.

Both series differ in minor details which are named where applicable.

4.3.1 Motor assignment and tightening torque

Actuator	Motor	Tightening torque
RSD10-5,0	MCS 71 BA / MCSS 71 BA	40 Nm (29.5 lbf-ft)
RSD10-10,0	MCS 71 BA / MCSS 71 BA	40 Nm (29.5 lbf-ft)
RSD20-5,0	MCS 71 BA / MCSS 71 BA	40 Nm (29.5 lbf-ft)
RSD20-7,5	MCS 80 BA / MCSS 80 BA	40 Nm (29.5 lbf-ft)
RSD50-3,0	MC 90 BA	40 Nm (29.5 lbf-ft)
RSD50-10,0	MCS 100 BA	69 Nm (51 lbf-ft)
RSD100-1,5	MC 90 BA	40 Nm (29.5 lbf-ft)
RSD100-10,0	MC 112 BA	69 Nm (51 lbf-ft)
RSD200-0,7	MC 90 BA	40 Nm (29.5 lbf-ft)
RSD200-5,0	MC 112 BA	69 Nm (51 lbf-ft)

Table 8: Tightening torque for motor screws

4.3.2 Motor removal

STOP

Note that the actuator position may be changed accidentally by the repelling power of the valve when the brake is released or the motor is removed.

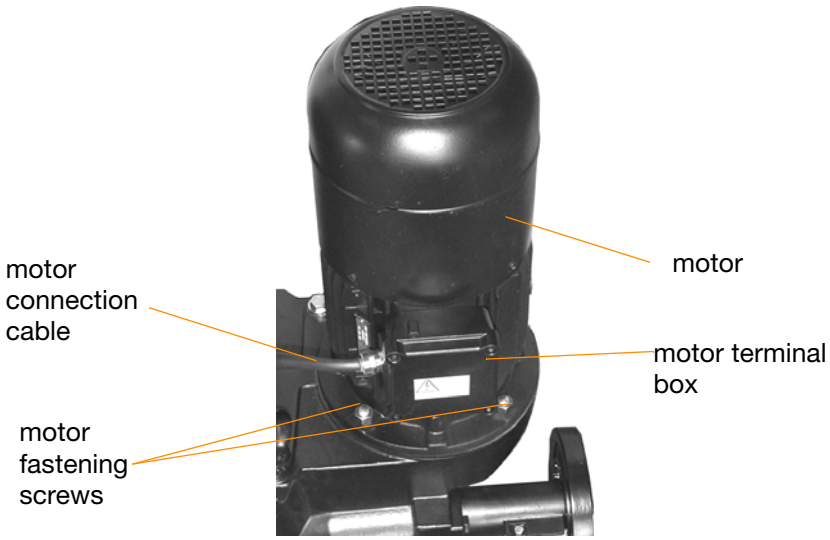


Fig. 9: Rear motor view (exemplified; motor series 1)

- Disconnect the motor / actuator from any electrical supply.
- Disconnect motor connection cable in the motor terminal box.
- Drive the actuator via the handwheel slightly out of the end position inorder to release the internal tension of the spring package.
- Drain the oil.
- Undo the 4 motor fastening screws.
- Pull the motor carefully out.
- Once the motor overhaul is finished, replace the motor sealing ring in any case.
- Install the motor in reverse order. See table 8 for motor screw tightening torque.

4.3.3 Motor flange O-ring

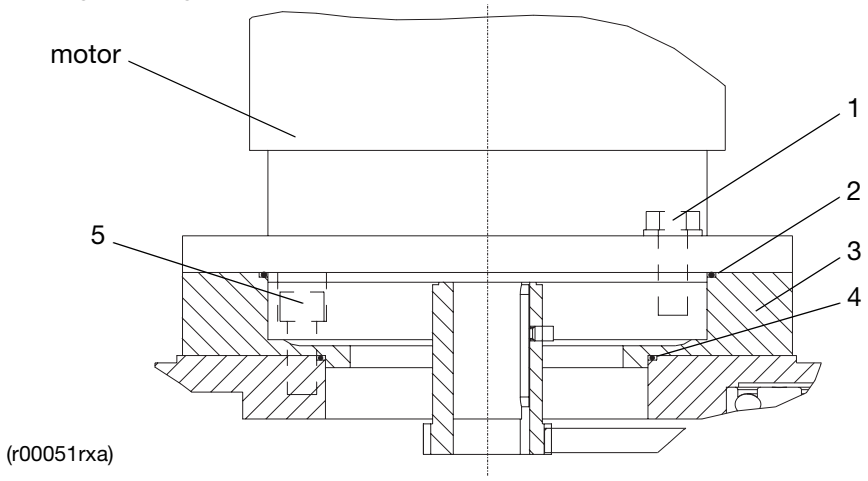


Fig. 10: Exemplary depiction of motor connection; additional flange (3) not used for all motors

In order to change the flange O-ring proceed as follows:

- Make sure, that the oil level is below the O-ring (4).
- Drain the oil (if required) acc. to instruction.
- Disconnect the electrical power supply prior to any maintenance.
- Disconnect the cables in the motor terminal box.
- Turn the motor screws (1) out and put the motor aside; remove O-ring (2).
- Turn the screws (5) of the add. flange out and put the flange (3) aside; remove O-ring (4).
- Replace O-ring (4).
- Mount the additional flange (3) at the actuator housing and fasten it with the flange screws (5).
- Put new O-ring (2) into the flange groove and fasten the motor with the screws (1); consider tightening torque.

4.3.4 Motor disassembly / assembly

4.3.4.1 Motors without fan on rear shaft end

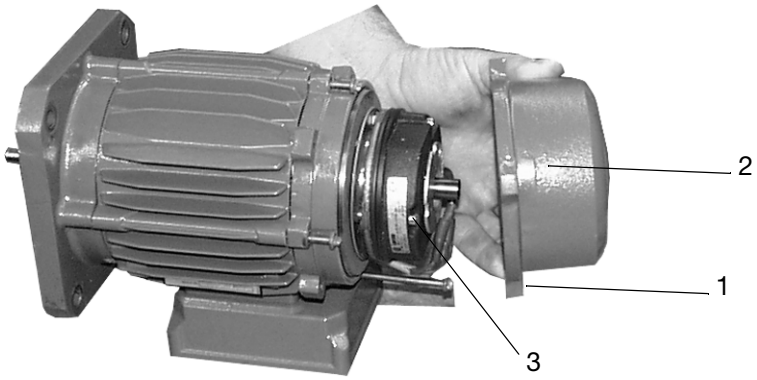


Fig. 11: Brake cover removal (I)

Additionally remove the brake for motor ball bearing replacement.

- Undo brake cover screws (1) and put cover (2) aside.
- Disconnect the two cables.
- Undo the brake fastening screws (3) and put brake body with disk aside.

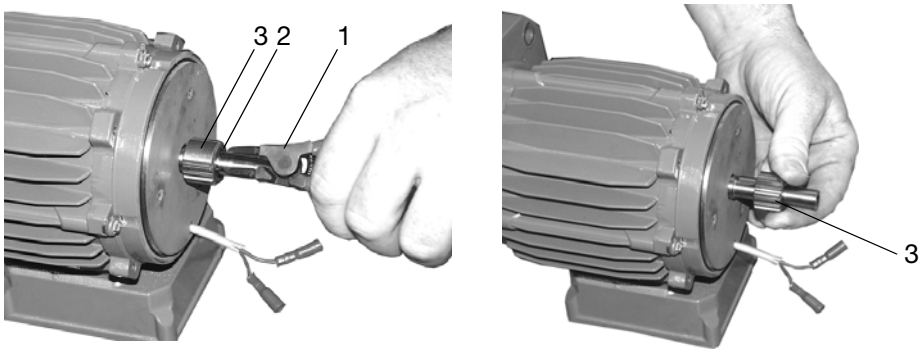


Fig. 12: Brake removal (II)

- Use appropriate retaining ring pliers (1) to get the retaining ring (2) for the brake pinion (3) out.
- Pull the brake pinion (3) from the shaft.

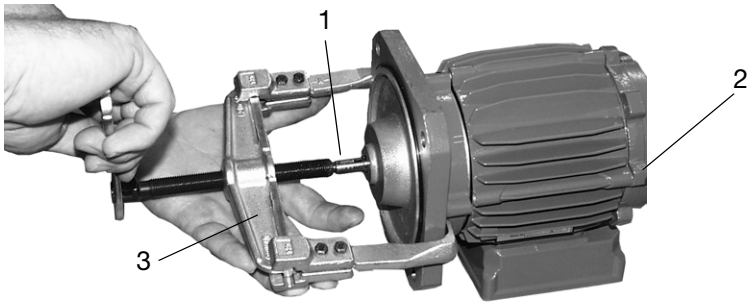


Fig. 13: Removal of the motor flange

- Firstly pull the key (1) out of the motor shaft.
- Undo motor flange screws (2).

NOTICE

- Use an appropriate extraction tool to pull the flange from the stator housing (see fig. 13 for details)

4.3.4.2 Motors with fan on rear shaft end

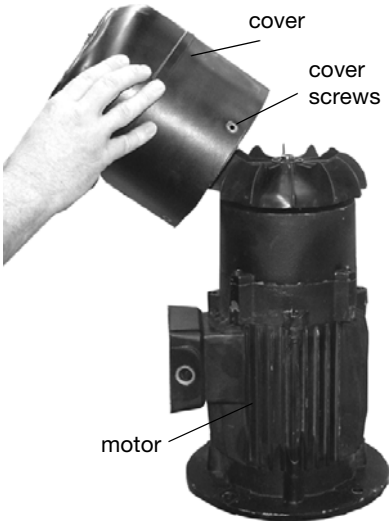


Fig. 14: Cover removal

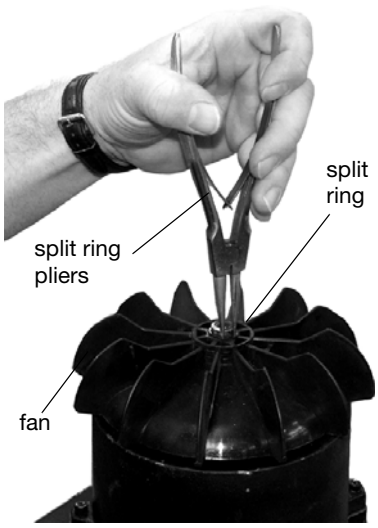


Fig. 15: Split ring removal

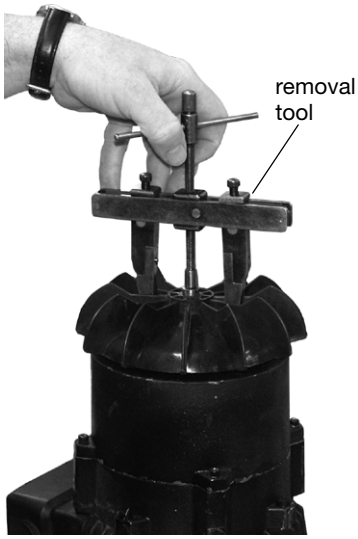


Fig. 16: Removal tool

- Undo cover screws and remove the cover.
- Use appropriate split ring pliers and removal tool to remove the split ring and the fan.
- Remove fan.
- Undo brake cover screws.

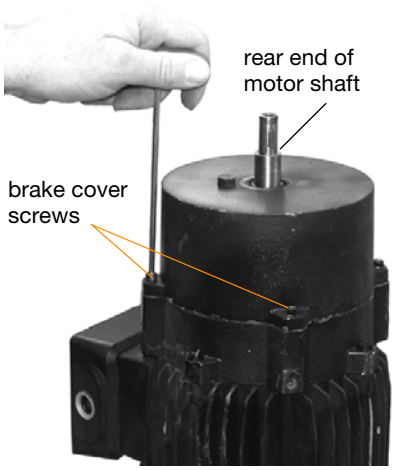


Fig. 17: (example; motor series 1)

Fig. 18: (example; motor series 1)

- Remove brake cover.

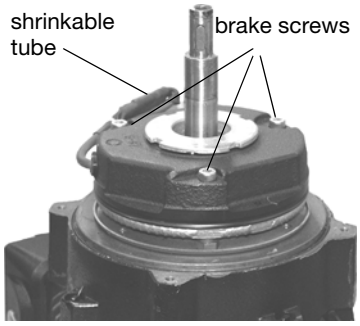


Fig. 19: Brake (example; motor series 1)

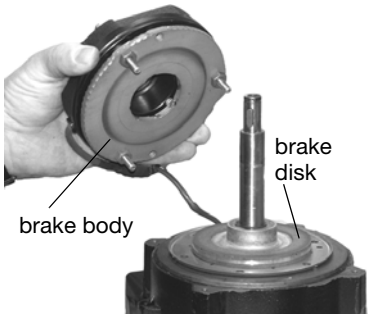


Fig. 20: Brake body removal (example; motor series 1)

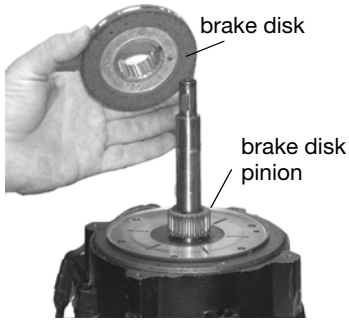


Fig. 21: Brake disk removal (example; motor series 1)

- Undo brake screws.
- Open shrinkable tube and disconnect cable.
- Take brake body apart.
- Take brake disk apart.
- Remove retaining ring from brake disk pinion and pull the pinion from the shaft; see also fig. 12 (r. h.); (see chpt. 4.4 for brake adjustment).
- Undo pinion screw (use appropriate glue to secure the screw when re-assembling).

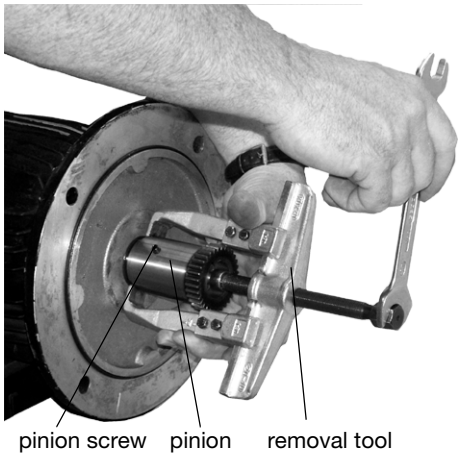


Fig. 22: pinion removal

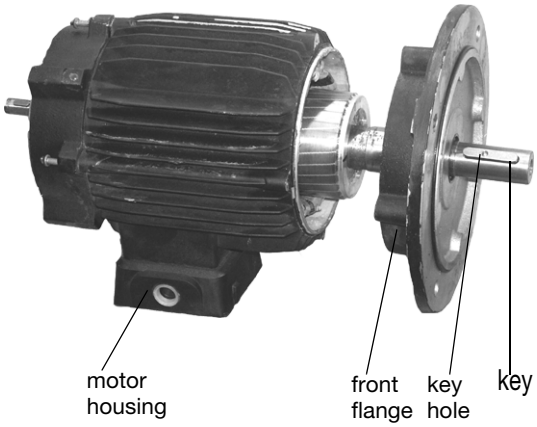


Fig. 23:

- Use appropriate removal tool to pull the pinion from the shaft.
- Do not damage the threaded center hole.
- Remove the key; note the key position (key hole) before you take it out of the shaft groove.
- Pull front flange with motor shaft out of the housing.

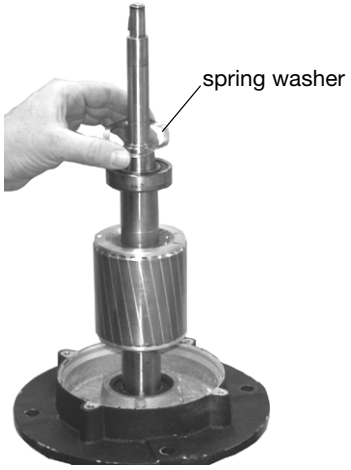


Fig. 24: pinion removal

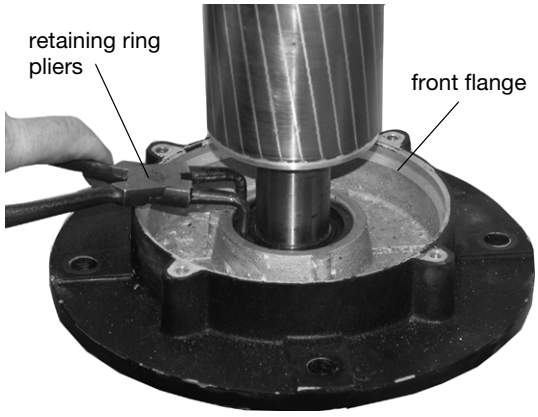


Fig. 25:

- Remove bearing support washer (spring washer); take care to place it properly when re-assembling the motor.
- Use appropriate retaining ring pliers to remove the bearing retaining ring out of the front flange.
- Pull the shaft out of the flange.

4.3.5 Exchange of motor bearings

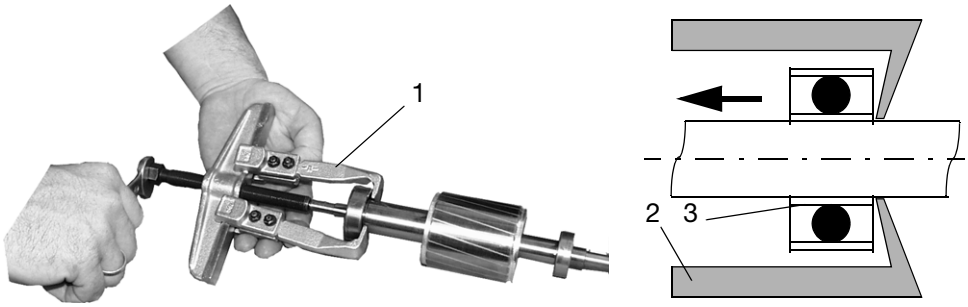


Fig. 26: Removal of motor ball bearing (exemplified; illustration applies to all motors)

- Use an appropriate extraction tool (1) for bearing removal.
- Make sure that the extraction tool claws (2) pull at the inner ball bearing ring (3).

4.3.6 Exchange of motor shaft sealing ring

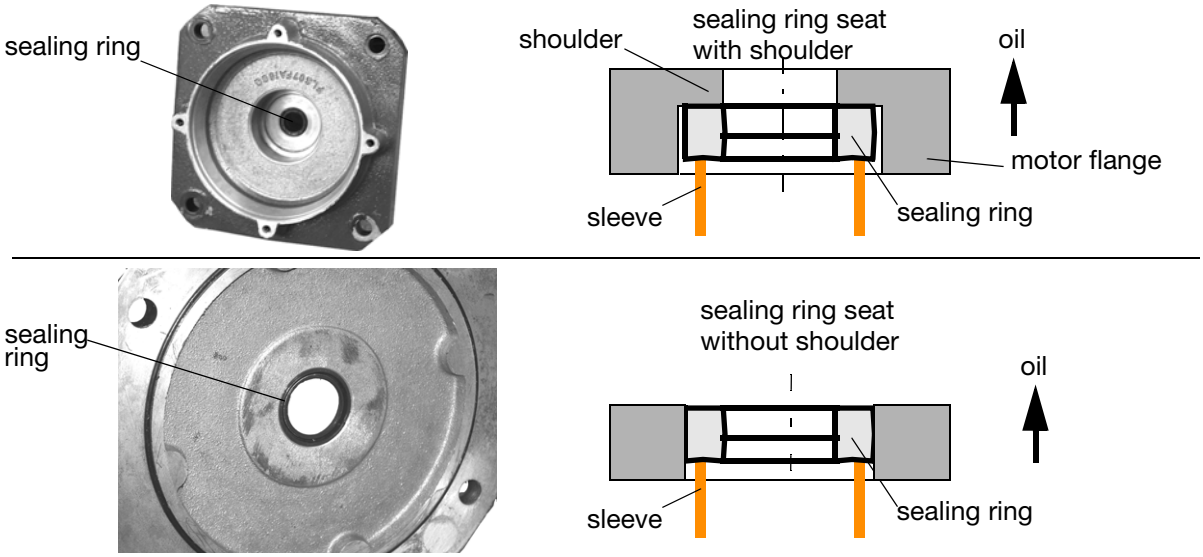


Fig. 27: Inside of the motor flange

- Take the old sealing ring out.
- Grease the new sealing ring and press it in the flange as shown in fig. 27; make sure that the „open“ part of the sealing ring points towards the oil (when the motor is mounted to the actuator); see fig. 27.
- Assemble in reverse order; use a customary sealant for both motor flanges.
- Check the brake gap after re-assembly; see chpt. 4.4 for details.

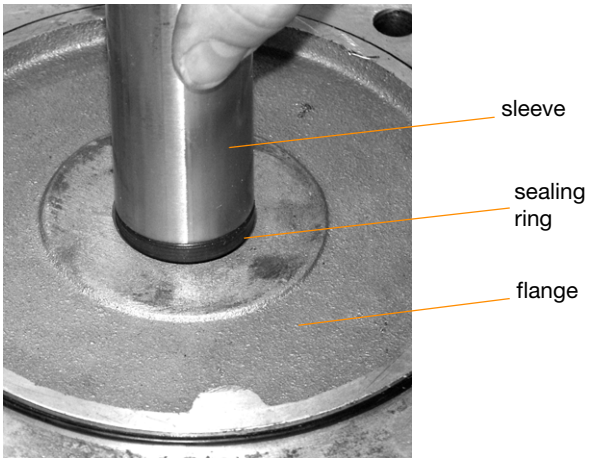


Fig. 28: Mounting the sealing ring

4.4 Brake adjustment

4.4.1 Brake of motor series 1

STOP

Note that the actuator position may be changed accidentally by the external load on the drive when the brake is released or the motor is removed.
Do not turn the slotted nut (1). It preloads the brake spring. Any disadjustment may reduce the brake force and thus disable the brake to hold the actuator in position!

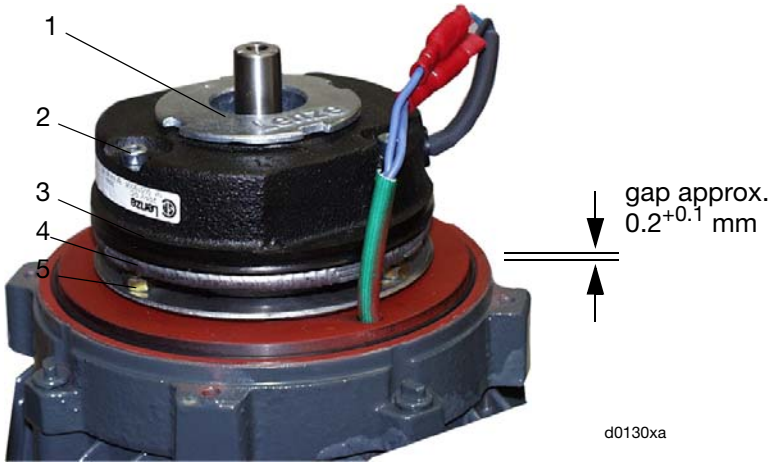


Fig. 29: Brake

In automatic mode the brake is permanently released. Therefore, it is not exposed to wear and does usually not require any re-adjustment. The gap between coil body and brake disk should be approx. $0.2^{+0.1}$ mm (0.008“ ... 0.012“). To check the gap switch-off the voltage supply and put a thickness gauge between the coil body (3) and the brake disk (4). If the brake requires an adjustment (e. g. after replacement) proceed as follows:

- disconnect the voltage supply
- remove the brake cover
- loosen the socket head screws (2)
- put a thickness gauge (0.2 mm) between the coil body (3) and the thrust plate (4)
- turn the counter nuts (5) until the thickness gauge is tautly between coil body (3) and thrust plate (4)
- tighten the socket head screws (2) evenly

4.4.2 Brake of motor series 2

STOP

Note that the actuator position may be changed accidentally by the external load on the drive when the brake is released or the motor is removed.

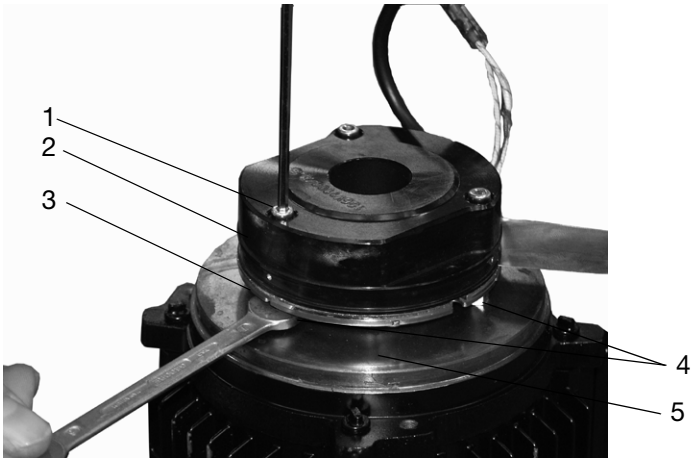


Fig. 30: Brake for motors; series 2

In automatic mode the brake is permanently released. Therefore, it is not exposed to wear and does usually not require any re-adjustment. The gap between coil body and brake disk should be approx. $0.2^{+0.1}$ mm (0.008“ ... 0.012“). To check the gap switch-off the voltage supply and put a thickness gauge between the coil body (2) and the brake disk (4). If the brake requires an adjustment (e. g. after replacement) proceed as follows:

- disconnect the voltage supply
- remove the brake cover
- turn the socket head screws (1) completely out
- take the brake body (2) off
- turn the hexagon nuts (4) cw until they are in touch with the brake body (2)
- put the brake body (2) onto the shaft and tighten the screws (1); hand screwed
- turn the hexagon nuts (4) ccw until they are in touch with the base plate (5)
- evenly turn the socket head screws (1) approx 1/3 turn ccw (approx 120°); this also lifts the hexagon nuts (4)
- turn the hexagon screws (4) until they are in touch with the brake body (5)

check the gap between brake body (2) and thrust plate (3) using a thickness gauge $0.2^{+0.1}$ mm (0.008“ ... 0.012“)

5 Electrical Connection

5.1 General

The cable between actuator and electronic unit is connected to the electronic unit via terminals and to the actuator via a plug. The plug housing may contain a carrier for terminals or for the cable ends with crimp sockets.

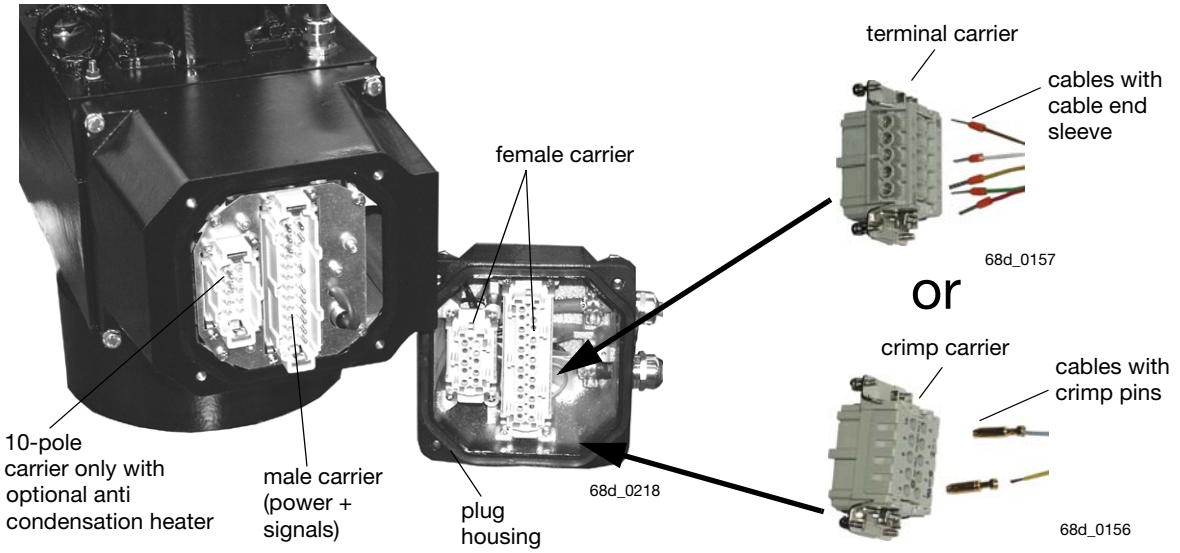


Fig. 31: Exemplary illustration of cable connection to the actuator; plug housing may contain alternatively a terminal carrier or a crimp carrier.

CAUTION

Disconnect the actuator and electronic unit from the mains supply before you start working at the electrical components. Make sure that switching off the actuator does not affect the process!

5.1.1 Covers

Terminal covers and other components at the Contrac actuators and electronic units are fastened with 4 or more screws (only 2 screws for local control panel cover). In some cases they are additionally sealed with a soft rubber gasket. In order to avoid a gap between the housing and the cover (or the other component) tighten these screws evenly crosswise according to the order in the basic sketch in fig. 32 to get an even load

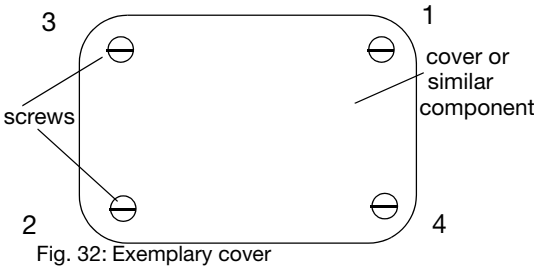


Fig. 32: Exemplary cover

Start with one screw and tighten it slightly. Then tighten the 2nd, opposite screw in the same manner. Continue with the remaining screws. Finally tighten the screws in the same order. This will ensure a tight seal.

5.2 Wiring diagrams

5.2.1 EBN853 / EBN861 / EBS862 (HART)

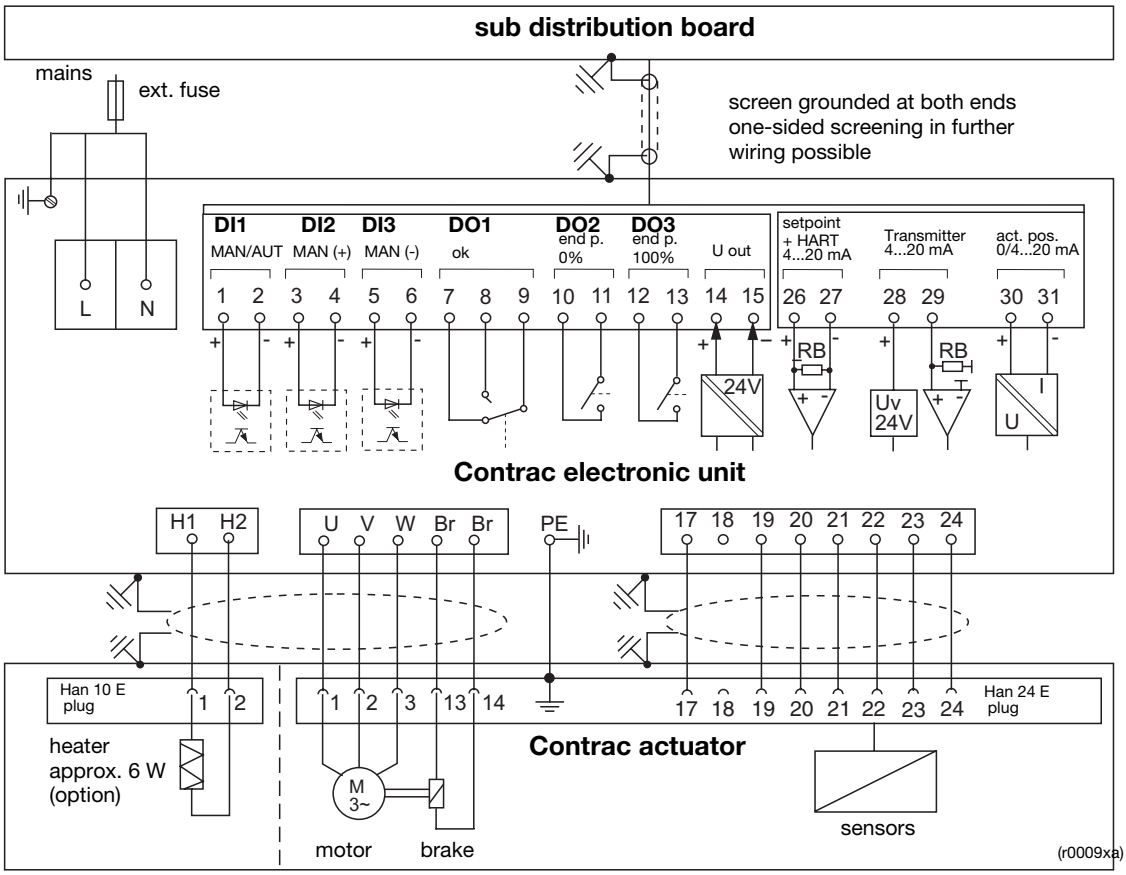


Fig. 33: Wiring diagram for EBN853 / EBN861 / EBS862 (HART)

5.2.2 EBN853 / EBN861 (PROFIBUS DP)

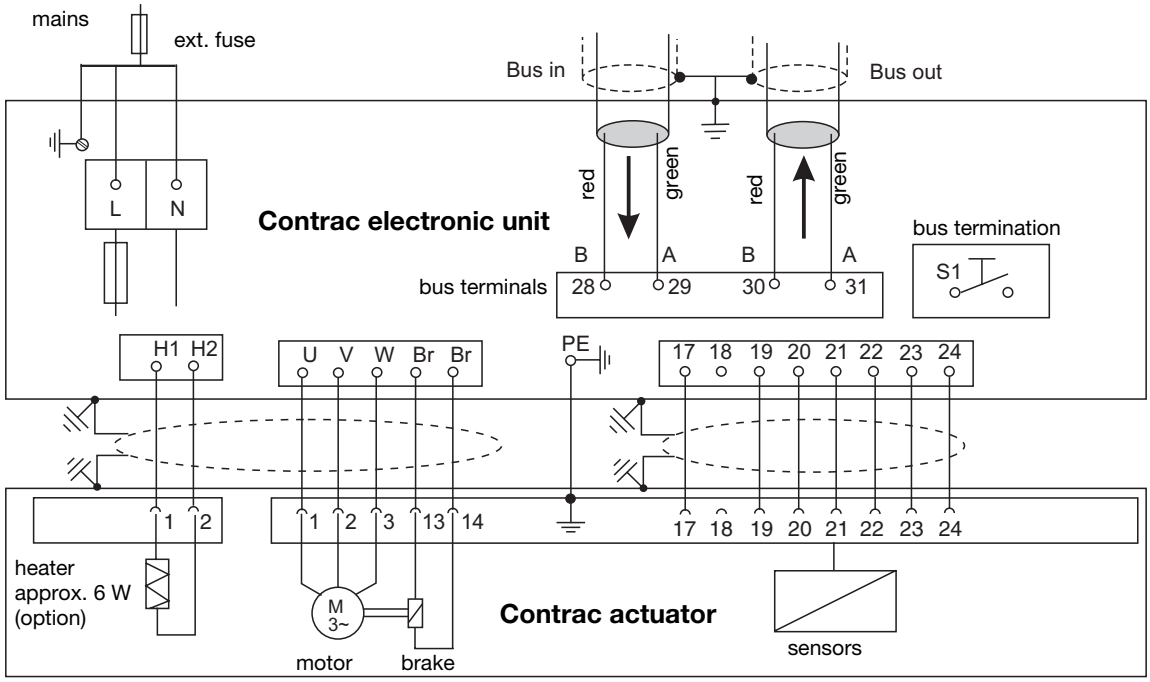


Fig. 34: Wiring diagram for EBN853 / EBN861 / EBS862 (PROFIBUS DP)

5.2.3 EBS852 (HART)

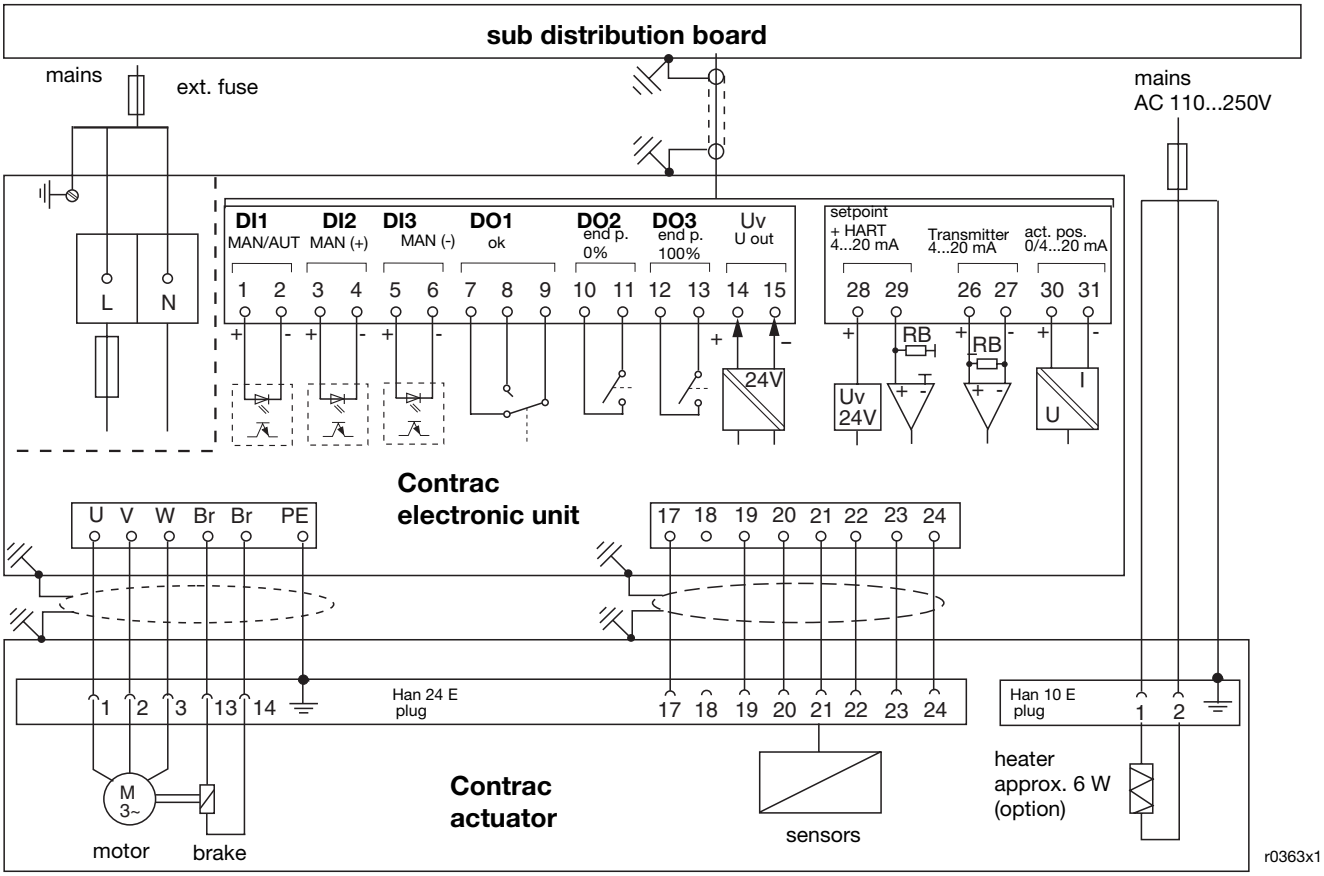


Fig. 35: Wiring diagram for EBS852 (HART)

5.3 Fuses

5.3.1 Electronic unit for field installation

Electronic Unit	Fuse type	Fuse dimens.	Location	U = 115 V	U = 230 V [1]
EBN853	External fuse	--	external	16 A, slow	
	Mains fuse	5 x 20 mm	in connection chamber	12.5 A, slow	10 A, slow
	Analogue setpoint input	5 x 20 mm	in connection chamber	40 mA; fast	
	Motor brake	5 x 20 mm	power board	0.315 A; medium	
	Intermediate circuit fuse	6.3 x 32 mm	power board	10 A, super-fast	
	Anti condensation heater	5 x 20 mm	in connection chamber	2 A; slow	
EBN861	External fuses[1)]	--	external	--	35 A fuse 16 A thermal safety cutout
	Motor brake	5 x 20 mm	on board (power section)	--	0.315 A, medium
	Intermediate circuit fuse	6.3 x 32 mm	power board	--	16 A, super fast
	Fuse f. DO1, DO2, DO3	5 x 20 mm	in connection chamber	-----	3 x 0.2 A; medium

Table 9:

[1)] The 35 A fuse and the thermal safety cutout (16 A) are included in the scope of delivery. They ensure safe operation for the special switching conditions of power electronic units EBN861. Note that the cable cross-sectional area between the fuse and the electronics must be at least 2.5 mm^2 (#13 AWG).

5.3.2 Electronic units for rack installation

Electronic Unit	Fuse type	Fuse dimens.	Location	U = 115 V	U = 230
EBS852	External fuse	--	external	16 A, slow	
	Mains fuse	5 x 20 mm	connection chamber	12.5 A slow	10 A slow
	Motor brake	5 x 20 mm	power board	315 mA; medium	
	Intermediate circuit fuse	6.3 x 32 mm	power board	10 A; super fast	
	Fuse f. DO1, DO2, DO3	5 x 20 mm	connection chamber	200 mA; medium	
EBS862	External fuses[1)]	--	external	--	35 A fuse 16 A thermal safety cutout
	Motor brake	5 x 20 mm	on board (power section)	--	0.315 A, medium
	Intermediate circuit fuse	6.3 x 32 mm	power board	--	16 A, super fast
	Fuse f. DO1, DO2, DO3	5 x 20 mm	in connection chamber	-----	3 x 0.2 A; medium

Table 10:

[1)] The 35 A fuse and the thermal safety cutout (16 A) are included in the scope of delivery. They ensure safe operation for the special switching conditions of power electronic units EBS862. Note that the cable cross-sectional area between the fuse and the electronics must be at least 2.5 mm^2 (#13 AWG).

5.3.3 Fuse location EBN853

NOTICE

Remove the cover of the connection chamber carefully in order to avoid any damage of the fuses or the fuse holder.

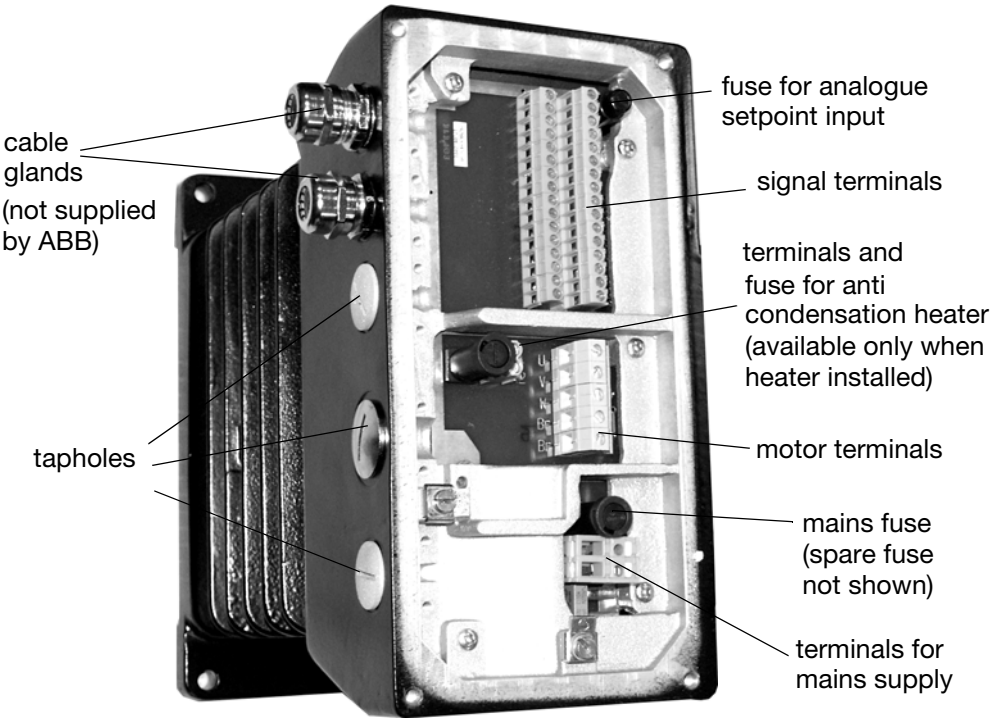


Fig. 36: Fuses in connection-housing part

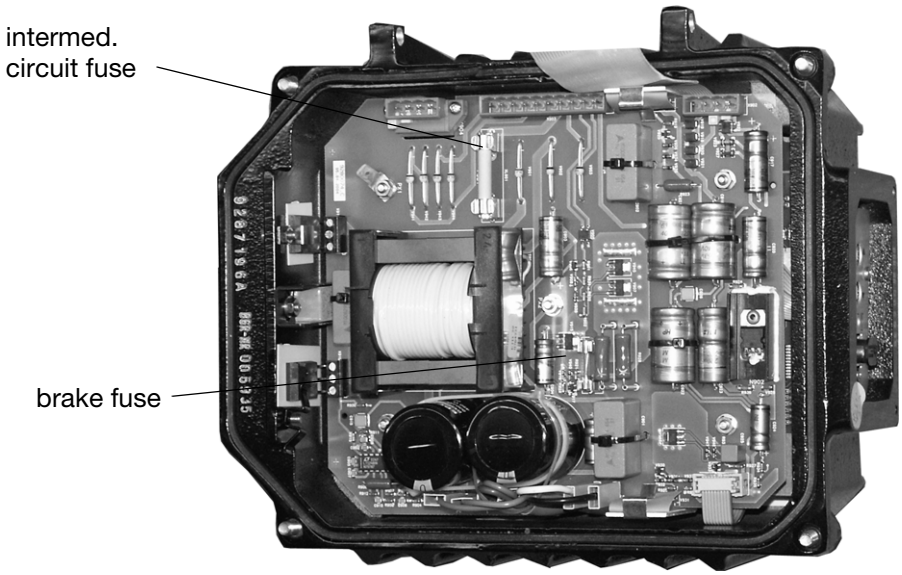


Fig. 37: Fuses in control-housing part

5.3.4 Fuse location EBN861 / EBS862

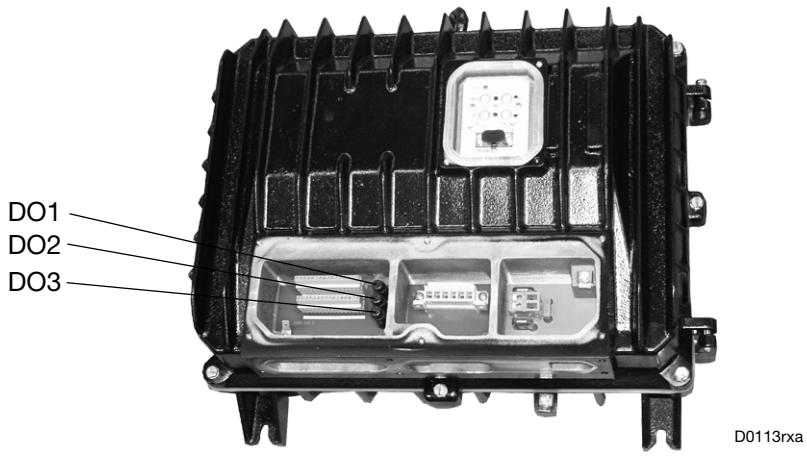


Fig. 38:

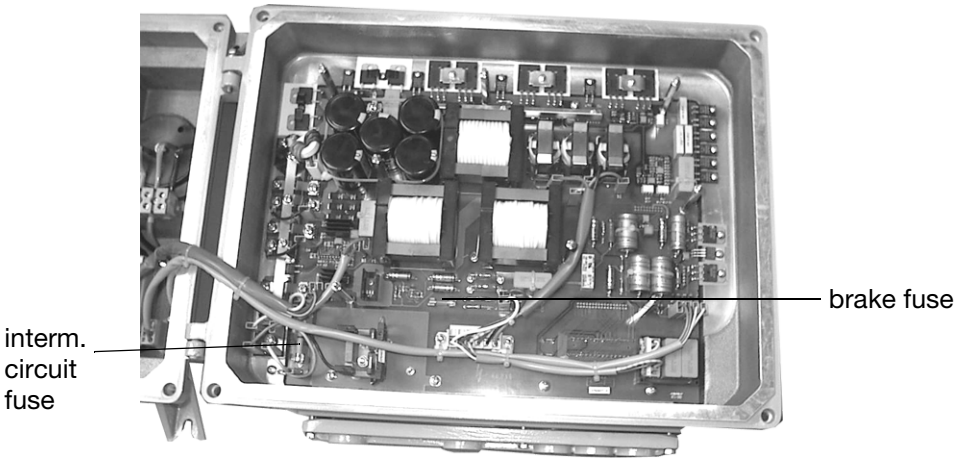


Fig. 39: Fuses in EBN861 / EBS 862

5.3.5 External fuses for EBN861 / EBS862

One 35 A fuse and the 16 A thermal circuit breaker are supplied together with the electronic unit EBN861 / EBS862. They ensure a safe operation with respect to the switch-on characteristic of these electronic units. The wire cross section must be at least 2.5 mm^2 (#13 AWG).

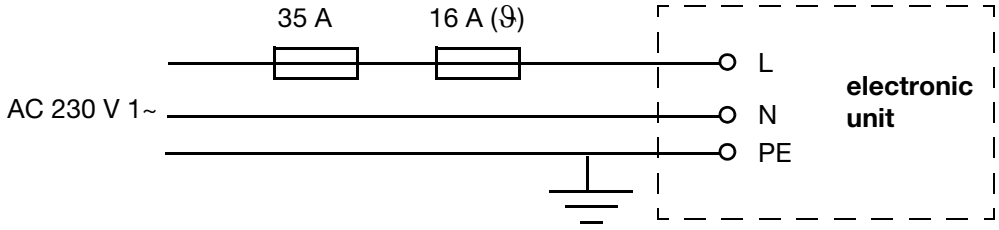


Fig. 40: External fuses

Fig. 41: External fuse; 35 A

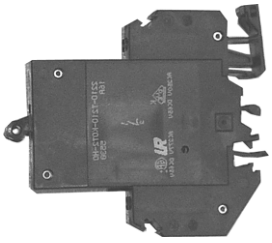


Fig. 42: Thermal circuit breaker; 16 A

5.3.6 Fuse location in EBS852

NOTICE

Remove the cover of the connection chamber carefully in order to avoid any damage of the fuses or the fuse holder.

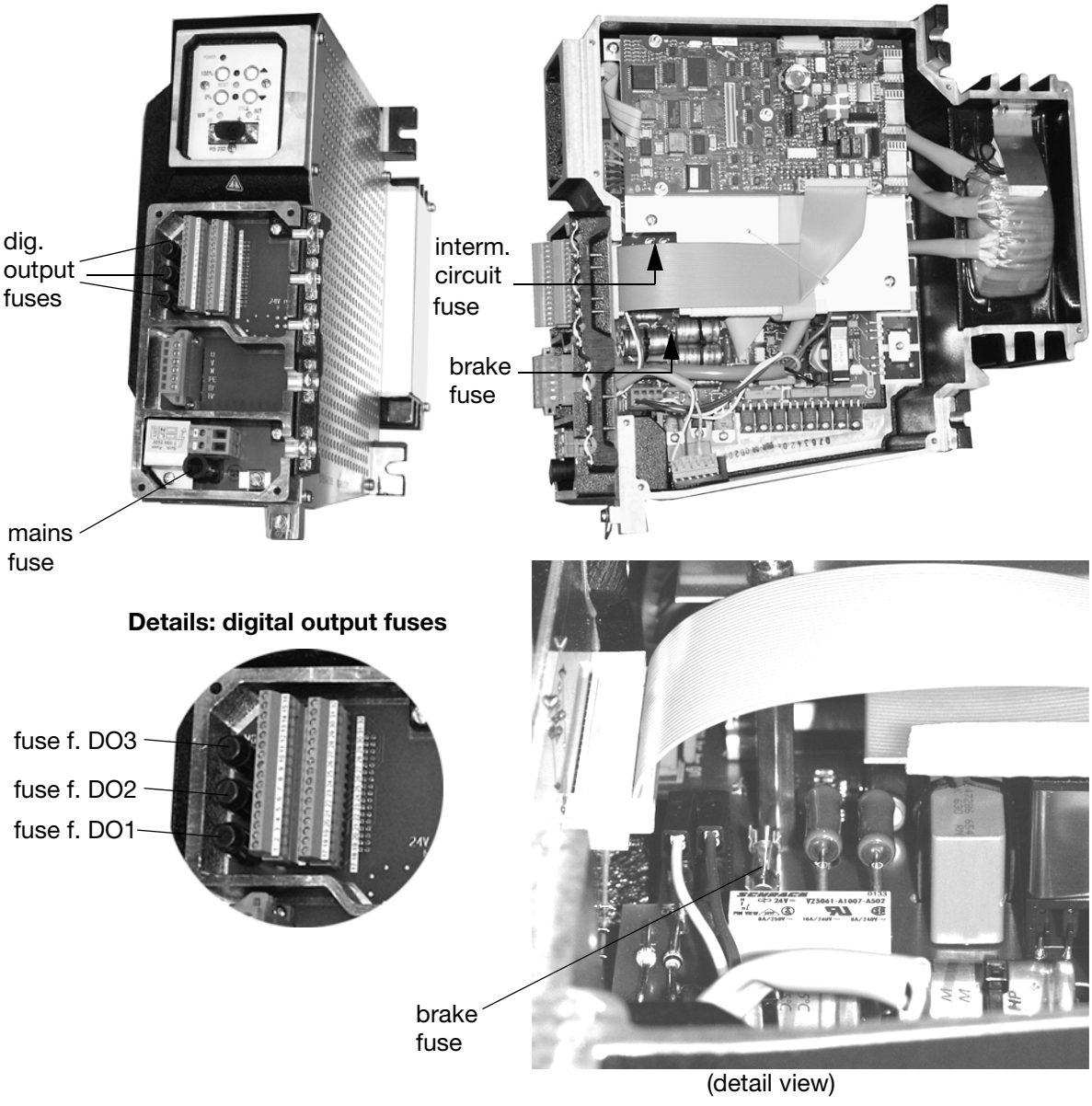


Fig. 43: Fuses in EBS852; connection area (left) and main pcb (right)

6 Exchange of position sensor

6.1 Dismounting

- Drive actuator into 50% position (referred to rated actuator operating range).
- Delete the current position settings by pressing the 2 drive buttons on the LCP for at least 5 sec until both LED on the local control panel of the electronic unit flash.
- Switch-off the voltage supply and disconnect the plug (supply cables).
- Remove position transmitter hood and male connector carrier.
- Loosen both fastening screws of position sensor (fig. 45) and take the sensor out.
- Detach plug from sensor pcb.

6.2 Mounting

The toothed gear pair of the position sensor is held in place by a tension spring (1), to ensure backlash-free motion when the direction of rotation is reversed.

- Set the stop pin to the center position, as shown in Figure 44.
- Align the sensor and its gears with the actuator; set the first toothed gear in 03:00 o'clock position (fig. 45) onto the gear of the conversion gearing.
- Slightly move the sensor back and forth to pre-tension the toothed gears with the difference "z" until the second toothed gear snaps in.
- Fasten the screws (2) tightly.
- Fasten sensor cable plug on sensor pcb.

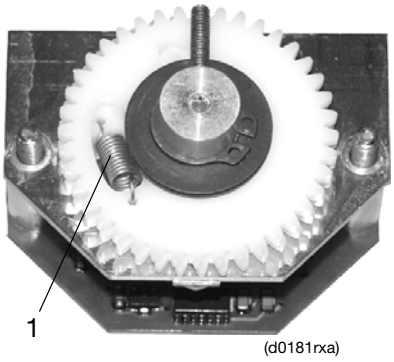


Fig. 44: Position sensor

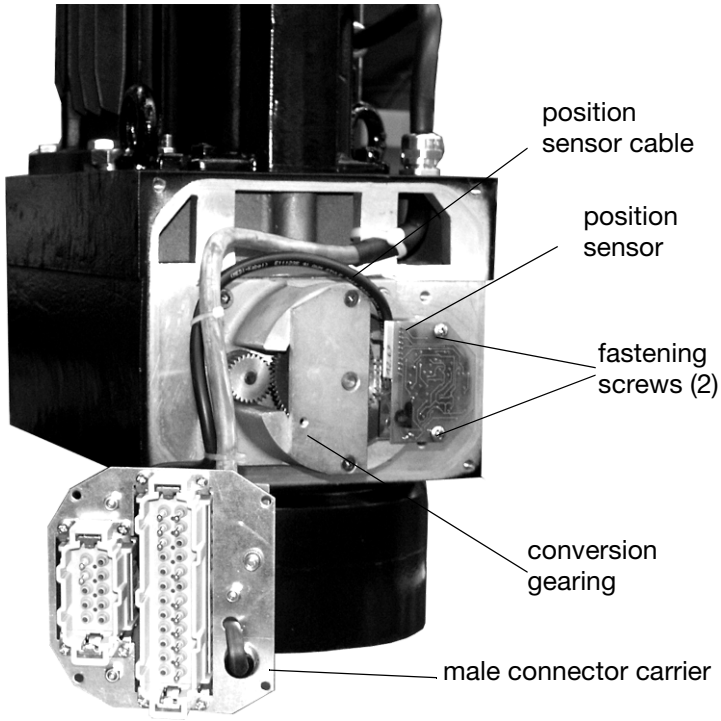


Fig. 45: Mounting position

7 Position sensor conversion gearing

The position sensor shaft is horizontally shifted by 90° to the vertical drive sleeve. A position sensor conversion gearing takes care of this conversion. A spring pre-stresses this gearing internally, in order to avoid any backlash in case the direction of rotation reverses.

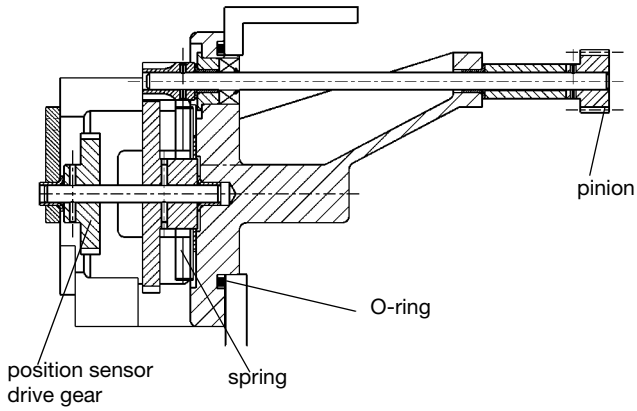


Fig. 46: sectional view

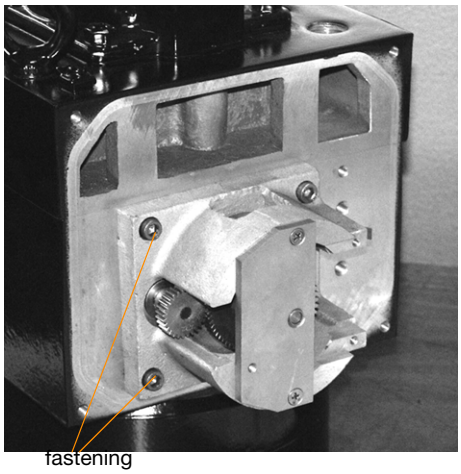


Fig. 47:

7.1 Removal

In order to remove the entire gearing or to change the O-ring proceed as follows:

- Disconnect the actuator from any electrical supply and make sure this does not impact the process.
- Drain the oil.
- Remove the position sensor (see as well 6.1).
- Undo the fastening screws.
- Pull the gearing carefully out.
- Replace the O-ring if necessary.

7.2 Assembly

- Drive the actuator thrust rod completely in before you start the reassembly.
- Fix the sensor drive gear.
- Turn the pinion clockwise until the internal spring is completely pre-stressed.
- Turn the pinion 1/4 turn back.
- Keep the sensor drive gear fixed and push the conversion gearing carefully into its position until the pinion is engaged with the toothing of the drive sleeve.
- Pay attention the O-ring is properly placed.
- Tighten the fastening screws.
- Refill the oil.

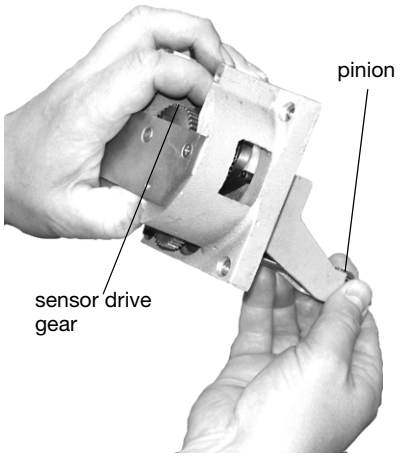


Fig. 48: Pre-stress the spring

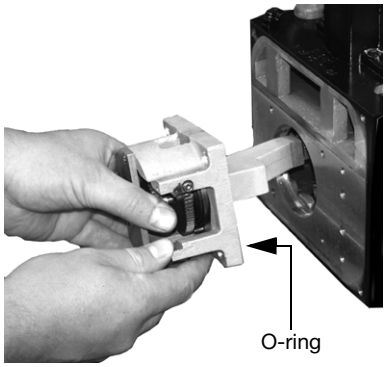


Fig. 49: Mounting the conversion gearing

8 Electrical Test Values

NOTICE *Check wiring and proper terminal connections before you start the test procedure.*

8.1 Test values (position sensor)

The in- / output signals are assigned to terminals of the electronic unit as follows:

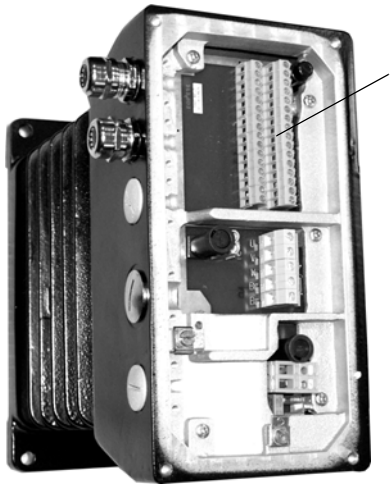


Fig. 50: Signal terminal location; exemplified for EBN853

term. 17: DC +15 V; +/- 15% (supply); refer to term 22
term. 18: not used
term. 19: clock
term. 20: data
term. 21: reference potential for position signal
term. 22: reference potential for temp. signal and supply voltage
term. 23: position proportional voltage signal (0.4... 4.4 V); refer to term. 21; end positions of actuator must be adjusted
term. 24: temperature proportional voltage signal; refer to term. 22;
(Δ V approx. 22.4 mV / °C;
approx. 1.8 V at 20°C)

(see fig. 50 for terminal position)

8.2 Test values

Brake voltage:	DC 135 V with AC 115/AC230 V mains supply
Motor voltage:	check for currents symmetry (i. e. with clip-on ammeter)

8.3 Winding resistance (motor)

CAUTION *Disconnect the voltage supply and the actuator plug prior to any resistance measuring. Make sure that switching off the actuator does not affect the process. Disconnect the cables (no. 1, 2, 3, 5, 6) in the terminal box in order to avoid any measurement error.*

Open the motor terminal box. Refer to the values in table 11 for proper resistance values of motor and brake windings.

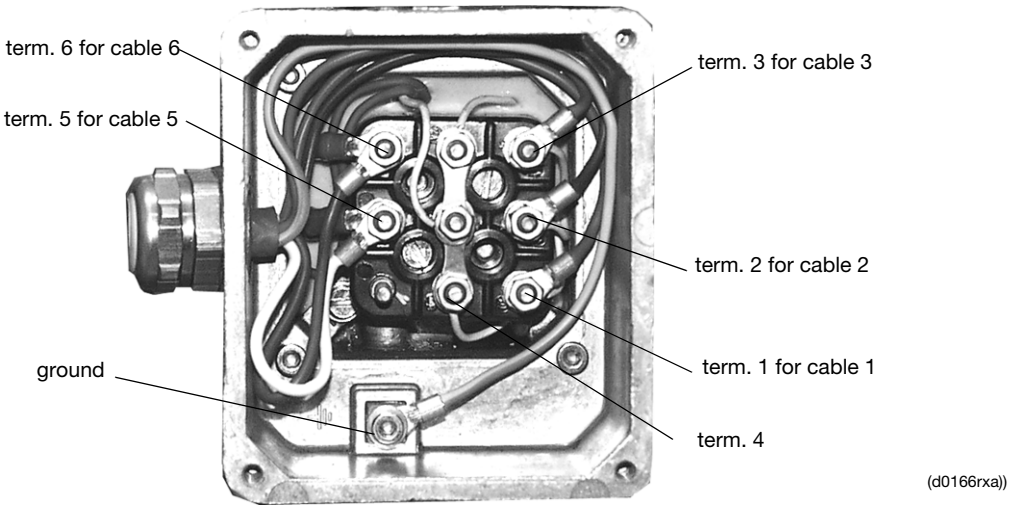


Fig. 51: Motor terminal box for MCS71BA; position of the cable gland may vary; cable numbers are printed on the cable; terminal no. only for reference purpose

.

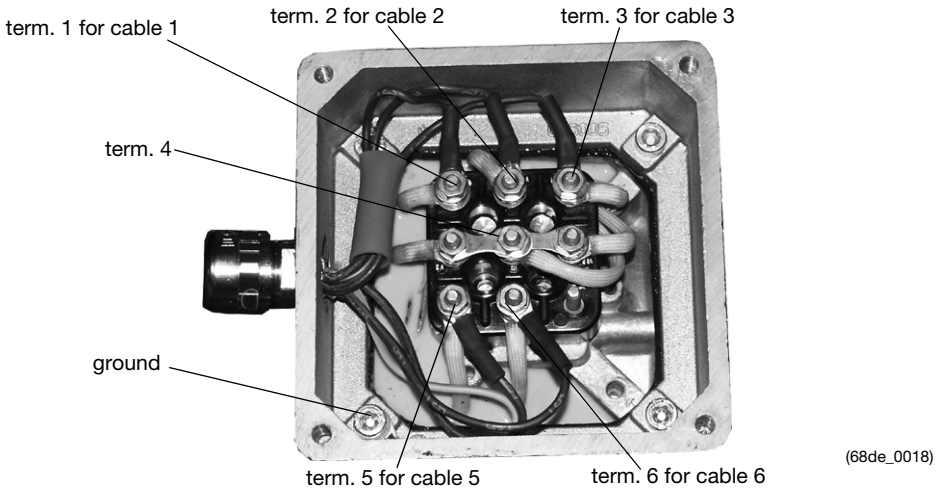


Fig. 52: Motor terminal box for; MCS80BA, MC90BA, MC100BA; position of the cable gland may vary; cable numbers are printed on the cable; terminal no. only for reference purpose

	MCS 71 BA	MCS 80 BA	MC 90 BA	MC 100 BA	MC 112 BA
Winding resistance ± 5% at 20° C (motor); term. 4 - 1; 4 - 2; 4 - 3	21 Ohm	7.7 Ohm	3.7 Ohm	3.7 Ohm	1.4 Ohm
Winding resistance ± 5% at 20° C (brake); term. 5 - 6	2180 Ohm	1660 Ohm	1290 Ohm	1079 Ohm	1020 Ohm

Table 11: Winding resistance

WARNING *If you loosen the motor terminal box for whatever reason use an appropriate liquid sealing compound for the sealing surface (e. g. Elastosil E41) in addition to the rubber gasket before you fasten the box.*

9 Failure detection

9.1 LED signals at the local control panel

Provided the electronic unit is supplied with voltage (green LED on LCP „ON“), the red LED on the local control panel provide some basic status information:

both LED are „OFF“	actuator is ok
both LED are „ON“	actuator is in bootstrap mode (e. g. during data loading procedure); in this case the actuator is not available for the positioning loop
both LED flash simultaneously	actuator end positions are not set; actuator does not accept commands to the digital inputs and can only be moved via drive buttons on the local control panel (see also electronic unit instruction)
both LED flash alternatively	actuator failure (e. g. out of adjusted range); actuator can not be moved via command buttons or commands from the process control system; reset is only possible once the failure reason is eliminated. „Out of range“ may require re-centering the position sensing potentiometer (see section 6).

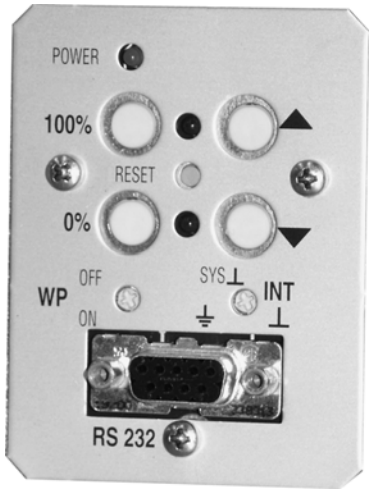


Fig. 53: **L**ocal **C**ontrol **P**anel (LCP)

10 Trouble Shooting

NOTICE *Check wiring, polarity and all plug and terminal connections before you start detailed trouble shooting.*

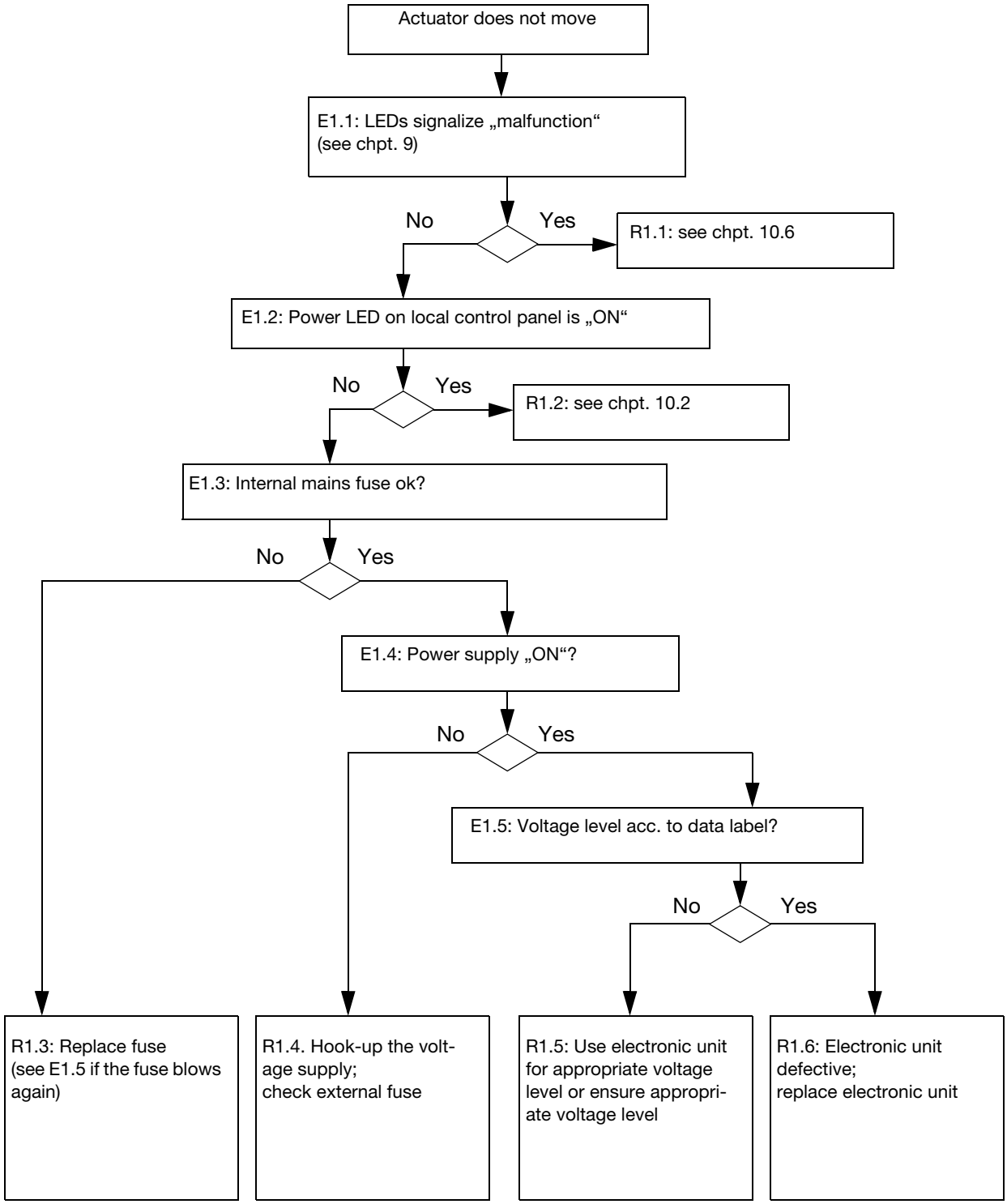
The following chapter specifies various possible failure events or conditions, which should be checked. Follow the block diagrams to find the associated reason, result or measure to solve the malfunction.

The following chapter specifies various possible failure events or conditions, which should be checked. Follow the block diagrams to find the associated reason, result or measure to solve the malfunction.

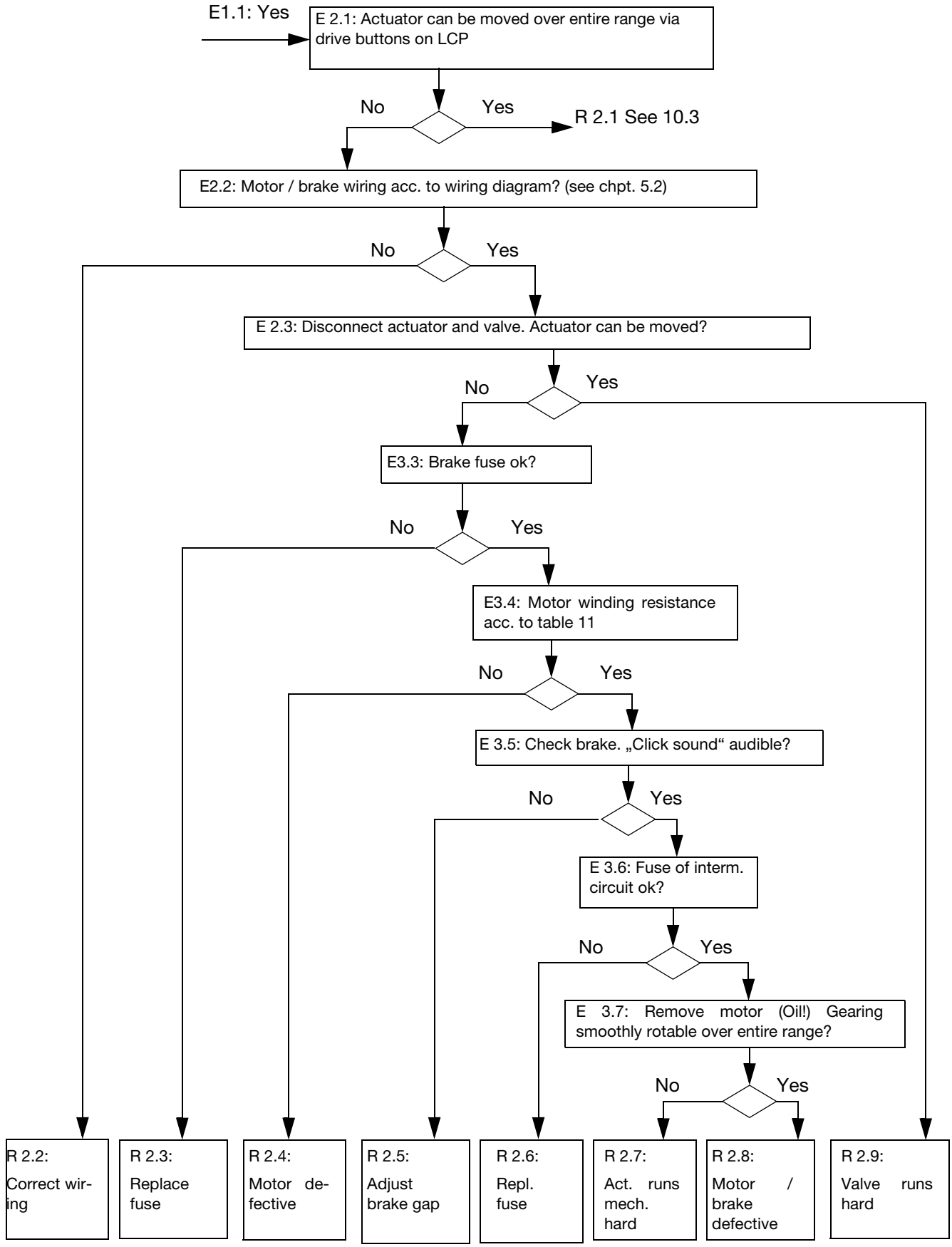
Example:

condition:	E6.1	LED signal: Failure
possible failure:	E6.3	sensor memory failure
one reason / measure to solve the malfct.	R6.2	replace sensor; see chpt. 6 (in this case the user will find more detailed information about the sensor replacement in chapter 6)

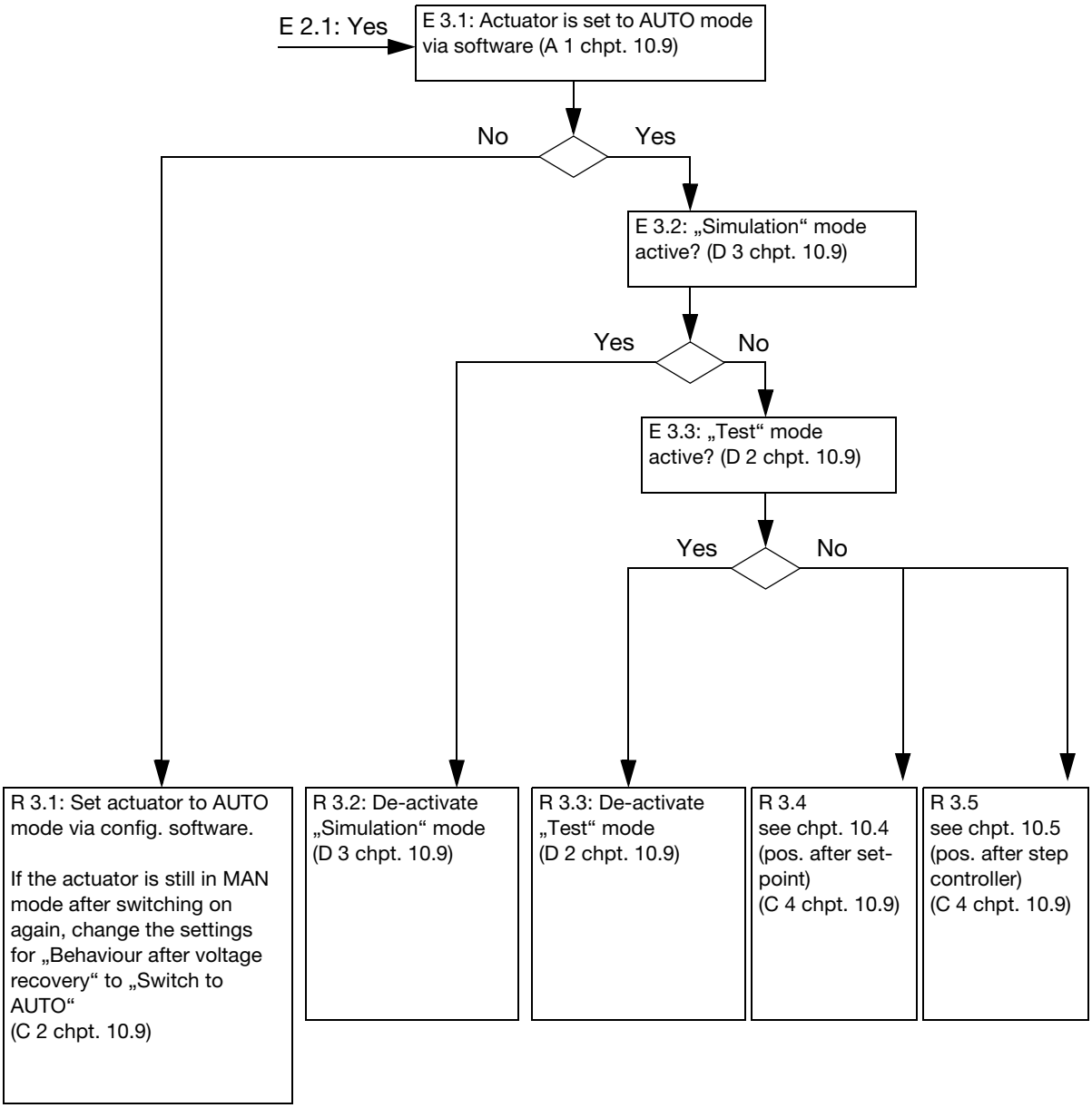
10.1 General


Actuator does not move
E1.1: LEDs signalize „malfunction“ (see chpt. 9)
No
Yes
R1.1: see chpt. 10.6
E1.2: Power LED on local control panel is „ON“
No
Yes
R1.2: see chpt. 10.2
E1.3: Internal mains fuse ok?
No
Yes
E1.4: Power supply „ON“?
No
Yes
E1.5: Voltage level acc. to data label?
No
Yes
R1.3: Replace fuse (see E1.5 if the fuse blows again)
R1.4. Hook-up the voltage supply; check external fuse
R1.5: Use electronic unit for appropriate voltage level or ensure appropriate voltage level
R1.6: Electronic unit defective; replace electronic unit

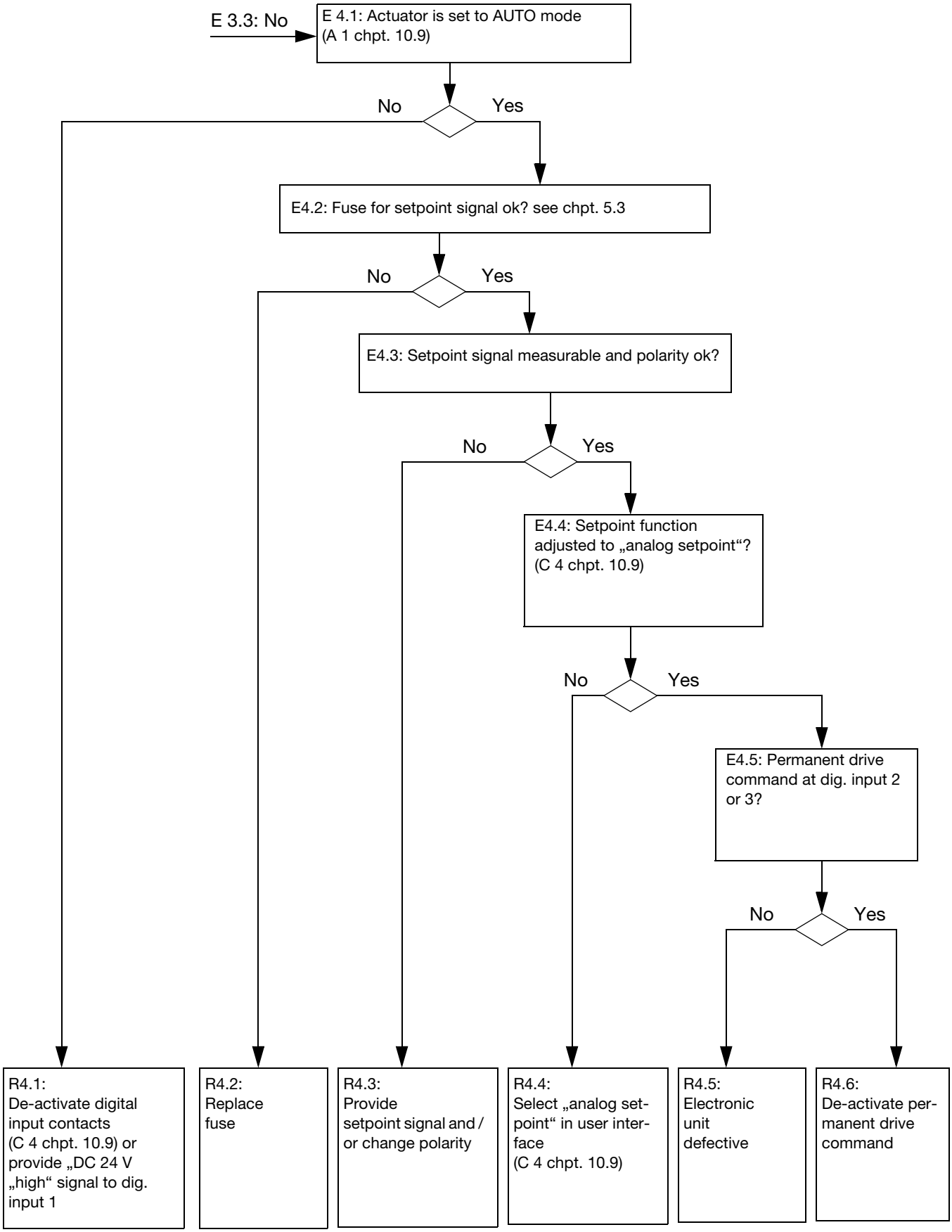
10.2 Failures at brake, fuse or wiring



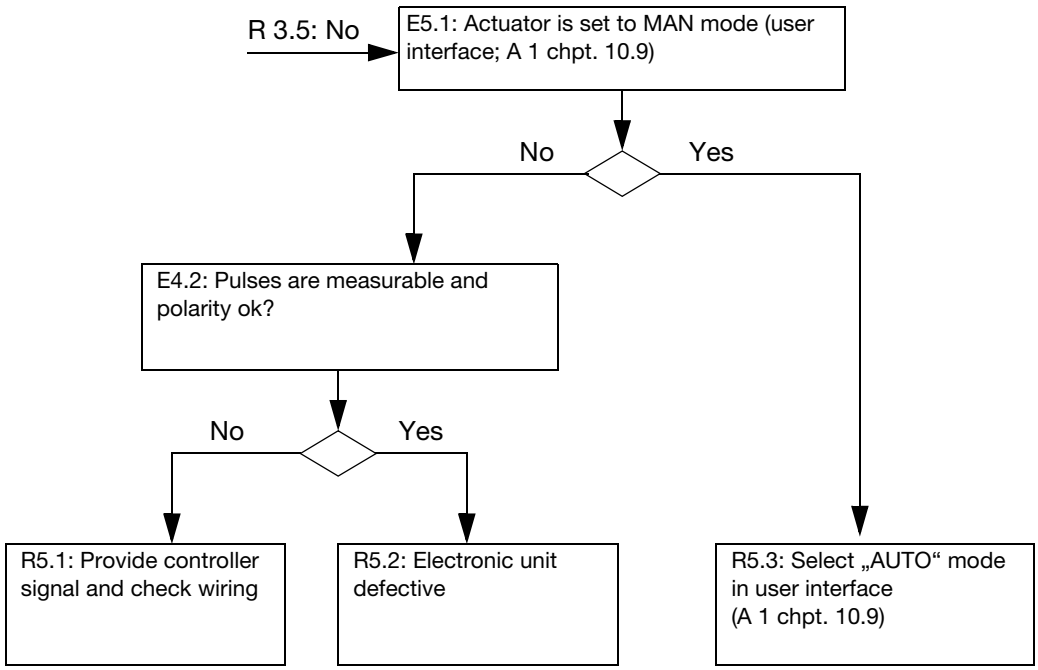
10.3 Operation mode (MAN / AUT)



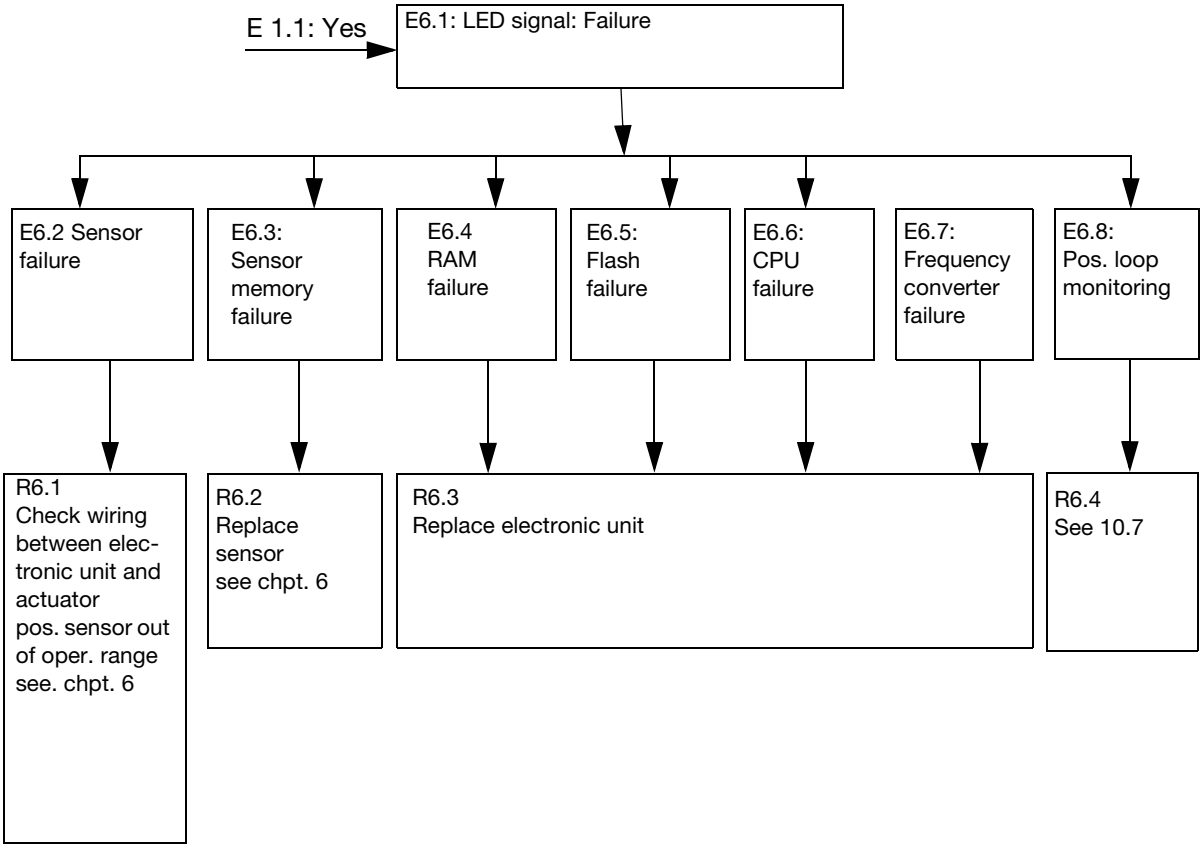
10.4 Input configuration



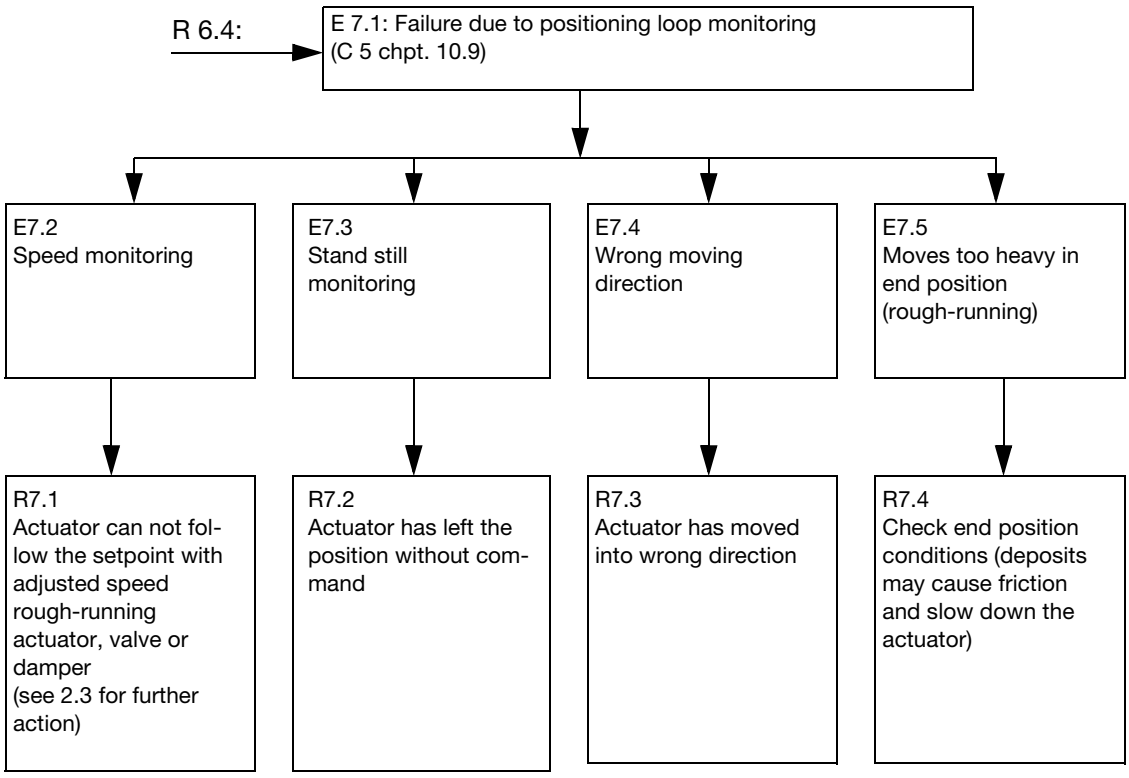
10.5 Operation behind step controller



10.6 Failure Diagram



10.7 Failure due to response of positioning loop monitoring



10.8 General

Actuator runs with creeping speed in one or both end positions

- check the software settings for leaving the end position; if „break-away“ is activated, the actuator moves with increased torque / force but with reduced speed

Imprecise behaviour in step-control mode

- use graphical user interface to check function assignment of digital input settings; select „step controller“

Actuator over-runs end position(s)

- change the software settings for the end position behaviour to „Position-dependent switch-off“ and enter the associated switch-off position
- adjust the mechanical limit stops in order to avoid an end position over-run

Actuator moves into an end position once it reaches a set point

- de-activate „close tight“ in the software settings for modulating control near the end position

Actuator position does not correspond to setpoint although the position signal corresponds to the setpoint

- de-activate the progammable set point in the software settings for the setpoint characteristic

Actuator follows the setpoint only within a limited range

- de-activate „split range“ in the software settings for the setpoint characteristic

10.9 User Interface Menus

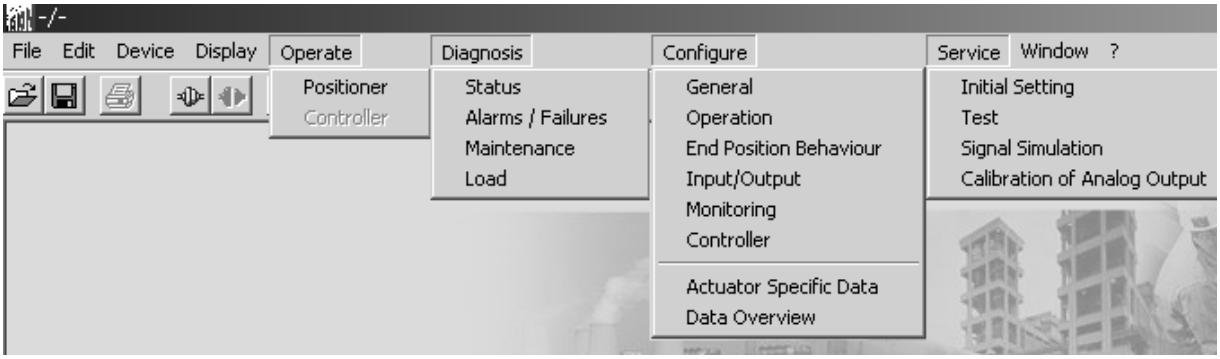


Fig. 54: Trouble shooting related menus in the user interface (digitally manipulated screen shot)

The following table represents the first 2 menu levels (see also fig. 54) of the graphical user interface as far as the trouble shooting is concerned. Some of the subjects in chpt. 10 refer to the user interface. Use the numbering in table 12 to facilitate the navigation. The user interface software. does not use any numbering in the menus.

A Operate	B Diagnosis	C Configure	D Service
A 1 Positioner	B 1 Status	C 1 General	D 1 Initial setting
A 2 Controller	B 2 Alarms / Failures	C 2 Operation	D 2 Test
	B 3 Maintenance	C 3 End position behaviour	D 3 Signal Simulation
	B 4 Load	C 4 Input / Output	D 4 Calibration of anal. output
		C 5 Monitoring	
		C 6 Controller	
		C 7 Actuator specific data	
		C 8 Data overview	

Table 12: Trouble shooting related menus of the user interface

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