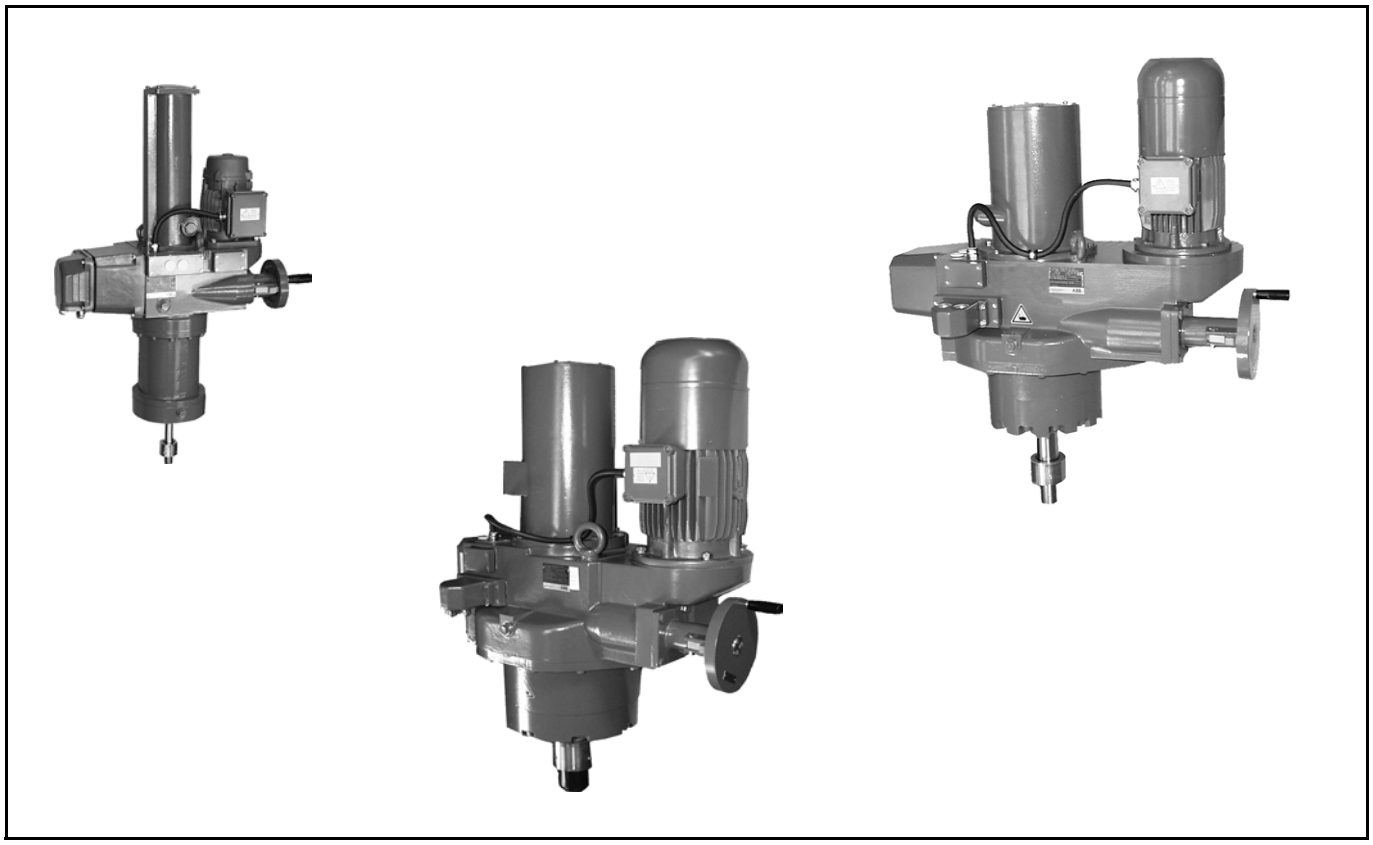
Electrical Linear Actuators for Continuous Modulating Control

RSD 10 ... RSD 200

Positioning Force
10 ... 200 kN

Instructions

42/68-285EN Rev. 1



Content

Legend

ELECTRICAL WARNING

.An instruction with reference to electrical components or equipment. It draws attention to the risk of injury or death to persons or damage to the product, process or surroundings

WARNIG

General instruction that draws attention to the risk of injury or death to persons or damage to the product, process or surroundings

INFORMATION

Further reference for more detailed information or technical details.

1. Device Identification

1.1 Actuator ID Label

1	**Antrieb / Actuator: CONTRAC ....**				
2	F-Nr./No	NL			Made in Germany
3	F =	Jahr/Year	CE		
4	t =	IP 66			
5	min.....max.	max.			
6	Öl / Oil:				
7	Mit / With Elektronik/Electronics EBN ... / EBS ...				
8					
9					
10					
	Automation D-32425 Minden				

1. Actuator type
2. Device number / No. of non-standard version
3. Rated force / Year of manufacture
4. Permissible ambient temperature
5. Min./max. positioning travel / Min./max. speed
6. Filled-in oil type
7. Associated electronics
8. Not used
9. Not used
10. Available for customer-specific information

2. General

2.1 Proper use

Linear actuators for continuous positioning are intended to be used exclusively for actuating final control elements (valves, vanes, etc.). 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.

2.2 Safety and precautions

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

- Linear 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 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 its electronics always observe the locally valid accident prevention regulations and the regulations concerning the construction of technical installations.

3. Storage

Linear 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
Interior areas of the actuator with risk of condensation are protected by desiccant placed in the following locations:
Motor: . . . . . under brake cover
Position sensor: . . . . . under position sensor cover
Electronics (delivered separately): . . . . in terminal enclosure

The desiccant guarantees sufficient protection for approximately 150 days. It can be regenerated at a temperature of 90° C within 4 h.
The desiccant must be removed prior to commissioning the actuator or the electronics.

3.1 Long-time storage

If you intend to store or transport the device for a longer time, we recommend to wrap it in plastic foil and add desiccant. Regularly check if the desiccant is still active.
In the case of standstill periods of more than 6 months with extended thrust rod, the chromated spindle surface must be treated with a corrosion inhibitor. Prior to re-commissioning the unit clean the thrust rod to avoid damage to the stripper and thrust rod gasket.

4. Delivery settings

If not otherwise specified by the customer, linear actuators are delivered with the following standard configuration:

Behavior in 0/100% position:	Shut-off with rated torque
Setpoint function:	Linear; setpoint = positioning value
Input (setpoint): [1)]	4 ... 20 mA
Function:	Positioner, parameter: setpoint
Output (actual value):	4 ... 20 mA 1)
Digital inputs: [1)]	DI 1 switch-over manual/automatic and v.v. DI 2 / DI 3 manual control +/-
Digital outputs: [1)]	DO 1 ready to operate, DO 2/3 end position signalling

The configuration of your actuator may differ from the standard configuration specified above. It can be called up for display using the configuration program.

[1)] Not with fieldbus communication

5. Assemblies

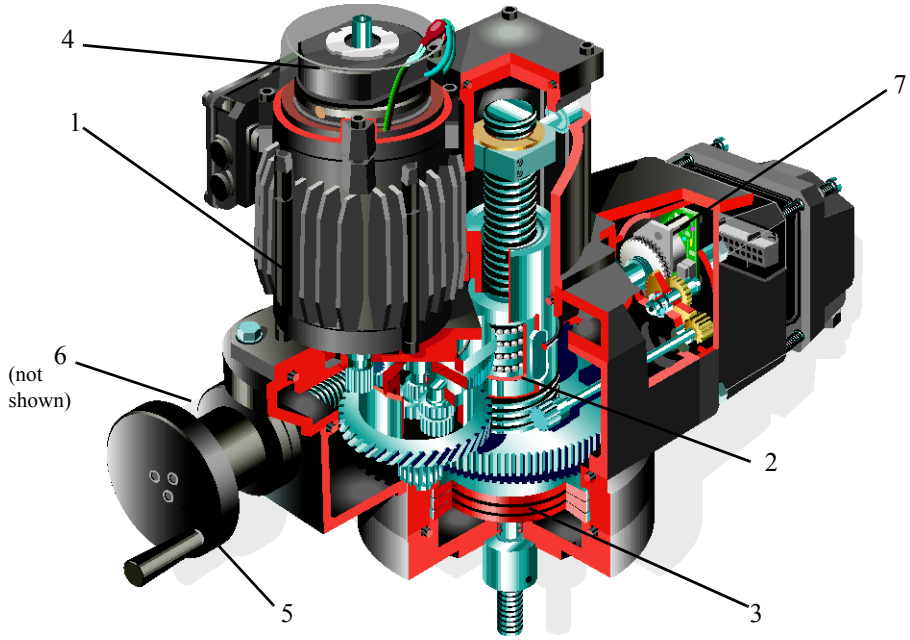


Fig. 1: Basic design of RSD ..

5.1 Standard operation

The motor (1) triggered by the power electronics controls the axially fixed drive sleeve /nut assembly via oil-lubricated spur gears. A ball bearing screw (see Figure 2) radially fixed by an anti-twist arrester converts the rotary motion to a linear one. The screw (2) is the upper part of the thrust rod (3) and has an adjustable mechanical stop. The brake (4) built in the motor acts as a retainer when the power is off.

Fig. 2: Ball bearing screw with nut, sectional drawing

5.2 Handwheel mode

The handwheel (5) allows you to move the actuator manually when the electrical power is off. It acts on the drive sleeve, via a spiral-toothed gear wheel and a transmission gear. In order to move the thrust rod, press down the handwheel lock (6) and hold it down while your are turning the handwheel. This does not disengage the motor.

The handwheel transmission ensures that at least the rated force can be generated!

5.2.1 Direction of action:

- Turning the handwheel clockwise extends the thrust rod (3).

6. Technical Data

6.1 RSD 10 ... RSD 20

	RSD 10-5,0	**RSD 10-10,0**	**RSD 20-5,0**	**RSD 20-7,5**
Rated pos. force [kN]	10		20	
Stand still force [kN]	aprox. 1.2 x rated force (break-away for a short time in end positions 2 x rated force)			
Positioning speed [mm/s]	5.0	10.0	5.0	7.5
Servo motor	MCS 71 BA	MCS 71 BA	MCS 71 BA	MCS 80 BA
Weight: max stroke 100 mm max. stroke 300 mm	 approx. 57 kg approx. 82 kg	 approx. 65 kg approx. 90 kg	 approx. 57 kg approx. 82 kg	 approx. 61 kg approx. 86 kg
Electronic unit For field installation: For rack instalation:	 EBN 853 EBS 852			
Voltage supply	AC 115 V (94 V ... 130 V) or AC 230 V (190 V ... 260 V); 47,5 ... 63 Hz			
max. current (AC 115/230 V): [A] (at electronic unit)	3.4 A / 1.7 A	3.8 A / 1.9 A	4.8 A / 2.4 A	3.8 A / 1.9 A
Current during positioning	approx. 40% ... 50% of I_{max}.			

Table 1:

6.2 RSD 50 ... RSD 100

	RSD 50-3,0	RSD 50-10,0	RSD 100-1,5	RSD 100-10,0
Rated pos. force [kN]	50		100	
Stand still force [kN]	aprox. 1.2 x rated force (break-away for a short time in end positions 2 x rated force)			
Positioning speed [mm/s]	0.1 ... 10.0	0.1 ... 10.0	0.1 ... 1.5	0.1 ... 10.0
Servo motor	MC 90 BA	MC 100 BA	MC 90 BA	MC 112 BA
Weight: max stroke 120 mm (150 mm at RSD 100 max. stroke 300 mm	 approx. 130 kg approx. 155 kg	 approx. 146 kg approx. 171 kg	 approx. 240 kg approx. 275 kg	 approx. 242 kg approx. 273 kg
Electronic unit for field installation for rack installation	 EBN 853 EBS 852	 EBN 861 EBS 862	 EBN 853 EBS 852	 EBN 861 EBS 862
Voltage supply	AC 115 V (94 V ... 130 V) or AC 230 V (190 V ... 260 V); 47.5 ... 63 Hz	AC 230 V (190 V ... 260 V); 47.5 ... 63 Hz	AC 115 V (94 V ... 130 V) or AC 230 V (190 V ... 260 V); 47.5 ... 63 Hz	AC 230 V (190 V ... 260 V); 47.5 ... 63 Hz
max. current (AC 115/230 V): [A] (at electronic unit)	4.0 A / 2.0 A	-- / 6.4 A	4.4 A / 2.2 A	-- / 12.5 A
Current during positioning	approx. 40% ... 50% von $I_{max.}$		approx. 40% ... 50% von $I_{max.}$	

Table 2:

6.3 RSD 200

	RSD 200-0,7	RSD 200-5,0
Rated pos. force [kN]	200	
Stand stil force [kN]	aprox. 1.2 x rated force (break-away for a short time in end positions 2 x rated force)	
Positioning speed [mm/s]	0.1 ... 0.7	0.1 ... 5.0
Servo motor	MC 90 BA	MC 112 BA
Weight: max stroke 180 mm max. stroke 300 mm	 approx. 400 kg approx. 460 kg	 approx. 400 kg approx. 460 kg
Electronic unit for field installation for rack installation	 EBN 853 EBS 852	 EBN 861 EBS 862
Voltage supply (at electronic unit)	AC 115 V (94 V ... 130 V) or AC 230 V (190 V ... 260 V); 47.5 ... 63 Hz	AC 230 V (190 V ... 260 V); 47.5 ... 63 Hz
max. current (AC 115 /AC 230)V at electronic unit: [A]	5.0 A / 2,5 A	-- / 13.5 A
Current during positioning	approx. 40% ... 50% of $I_{max.}$	

Table 3:

7. Lubrication

7.1 Mounting position and oil level

Prior to delivery the actuator is filled with the oil quantity specified for orientation IMV 1. When mounting the actuator in another orientation, fill in the missing oil.

7.1.1 RSD 10 / RSD 20

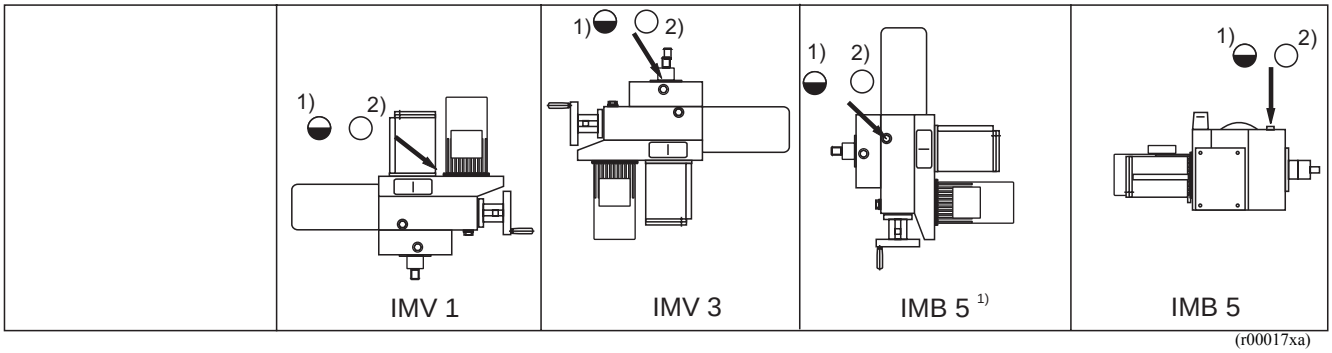


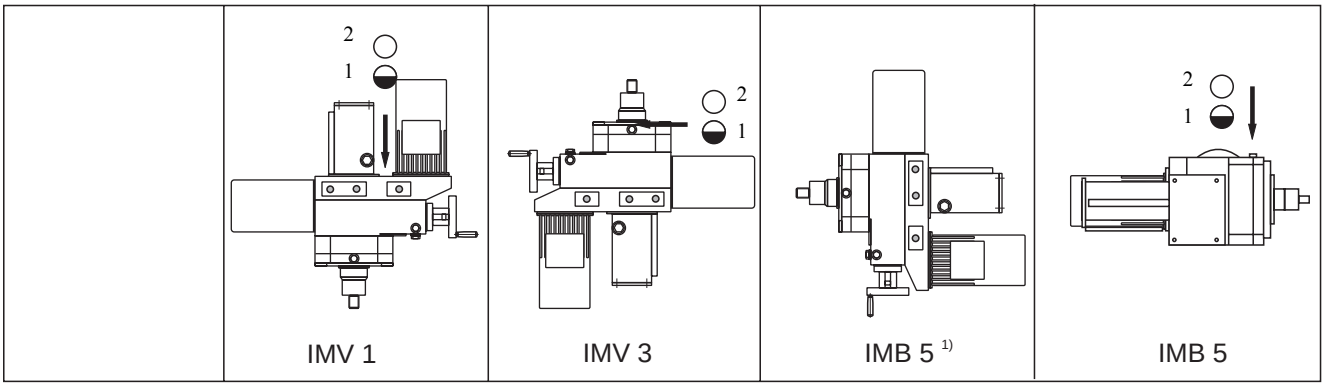
Fig. 3: oil level; 1) = inspection screw, 2) = venting screw.

Tabelle 4:

Type	RSD 10 / RSD 20	RSD 10 / RSD 20	RSD 10 / RSD 20	RSD 10 / RSD 20
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)	0	28	75

Table 5:

7.1.2 RSD 50



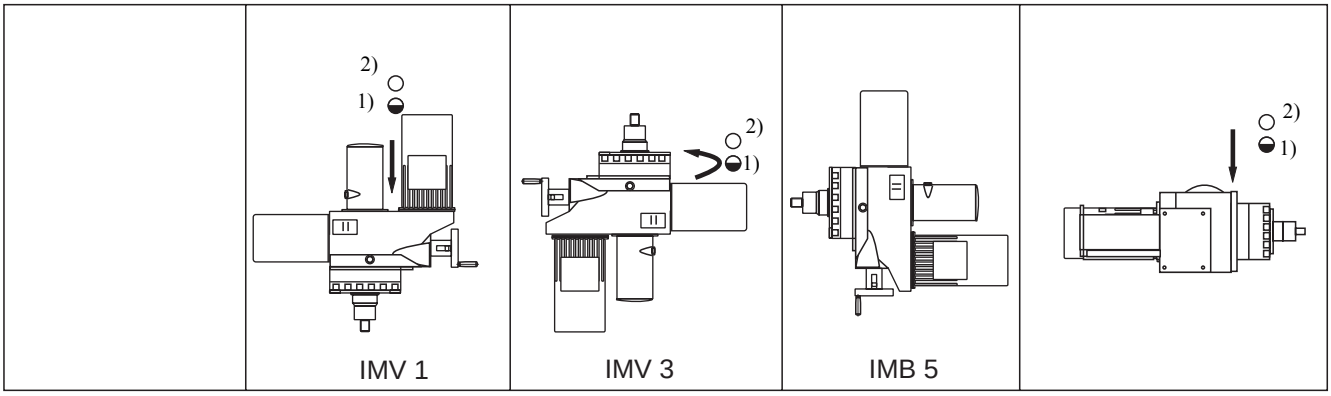
(r00262xa)

Fig. 4: 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 6:

7.1.3 RSD 100



(r00263x2)

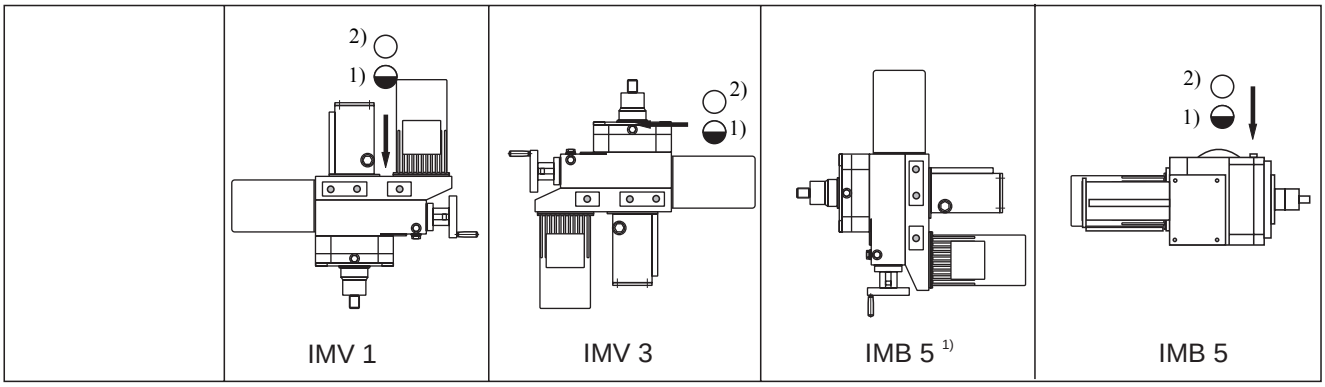
Fig. 5: oil level; 1) = inspection screw, 2) = venting screw

Tabelle 7:

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 8: .

7.1.4 RSD 200



(r00262xa)

Fig. 6: oil level; 1) = inspection screw, 2) = venting screw

Tabelle 9:

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 10:

After having mounted the actuator, replace the highest inspection screw with the separately delivered vent screw.

7.2 Lubricants

Do not pollute or mix the synthetic oil Mobil SHC 629 with mineral oit. Clean the gearing carefully before a possible change of oil type!

	Ölsorten	
ambient temperature	factory filling when delivered	alternative oil
- 10°C ... + 65°C	ESSO Spartan EP 220 (L-CKC acc. 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 11:

8. Mounting

8.1 Actuator check

Prior to mounting the actuator please verify if the device has been delivered in the configuration specified in your order and if it is suitable for the intended purpose. Check:
- if the positioning travel is sufficient for the valve stroke
- if it is filled with the proper oil type, see section 7.2 or oil label on actuator for details.
- if the proper oil quantity has been filled in

Fasten the separately delivered venting screw in the highest bore (depending on the mounting orientation).

8.2 Mounting orientation

All mounting orientations seen in Figure 3 to 6 are permissible. To facilitate mounting and maintenance, however, it is recommended to use orientation IMV 1.

8.3 Mounting to the final control element

- 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. Select the mounting site accordingly.
- When mounting the actuator close to heat sources use an insulating layer or shielding.

8.3.1 Valve design requirements

- Consider end position forces of up to 2.5 x the rated force when designing/selecting the valve.

8.4 Adapting the actuator stroke to the valve stroke

In factory, the stroke $^{+3...5\ mm}$ specified on the actuator ID label is set. If it should be necessary to readjust the stroke (observe the minimum and maximum stroke specified in section “Technical Data“) proceed as described below:

- When mounting the actuator in an orientation other than IMV 1, refill oil according to the specifications.
- Fully extend the thrust rod using the handwheel until the internal stop is in contact with the drive sleeve.
- Undo the screws of the thrust rod hood cover and remove the cover.
- Undo the screw plug in the thrust rod hood.
- The two Allen screws can now be accessed through the opening. Undo the screws.
- Retract the thrust rod using the handwheel until the actuator stroke matches the specified valve stroke.
- Turn the internal stop (slotted ring nut) clockwise using a screw driver, until the stop gets in contact with the drive sleeve. Then re-turn acround 3 times.
- Refasten the two Allen screws with the specified torque
  RSD 10 / RSD 20: 26 Nm
  RSD 50: 26 Nm
  RSD 100: 40 Nm
  RSD 200: 69 Nm
- Fasten the cover of the thrust rod hood, refasten the lateral screw plug, fill in the oil.

8.5 Mounting the actuator to the valve

- Completely retract the actuator thrust rod and put the actuator on the valve yoke.
- Make sure the valve stem is centrically aligned with the bore and at right angles to the actuator seat (permissible parallel deviation < 0.1 mm referred to total stroke).
- Fasten the actuator to the yoke with screws of property class 8.8 (tensile strength 800 N|mm^2; yield strength 640 N/mm^2)
- Use the handwheel to extend the thrust rod, link the rod with the valve stem via the clutch.
- Manually retract the thrust rod to check whether or not the external stop of the actuator is on the housing flange before the valve cone gets in touch with the cover.
- If required, adjust with the clutch (only possible within certain limits!)

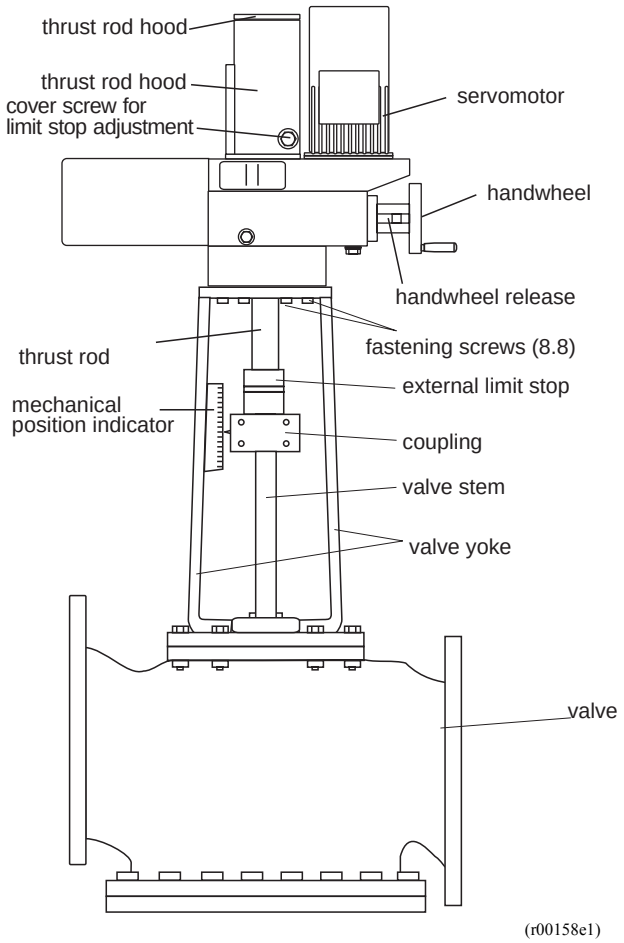


Fig. 7: Mounting RSD ... (example)

9. Electrical Connection

9.1 Wiring Diagram EBN 853 (Standard)

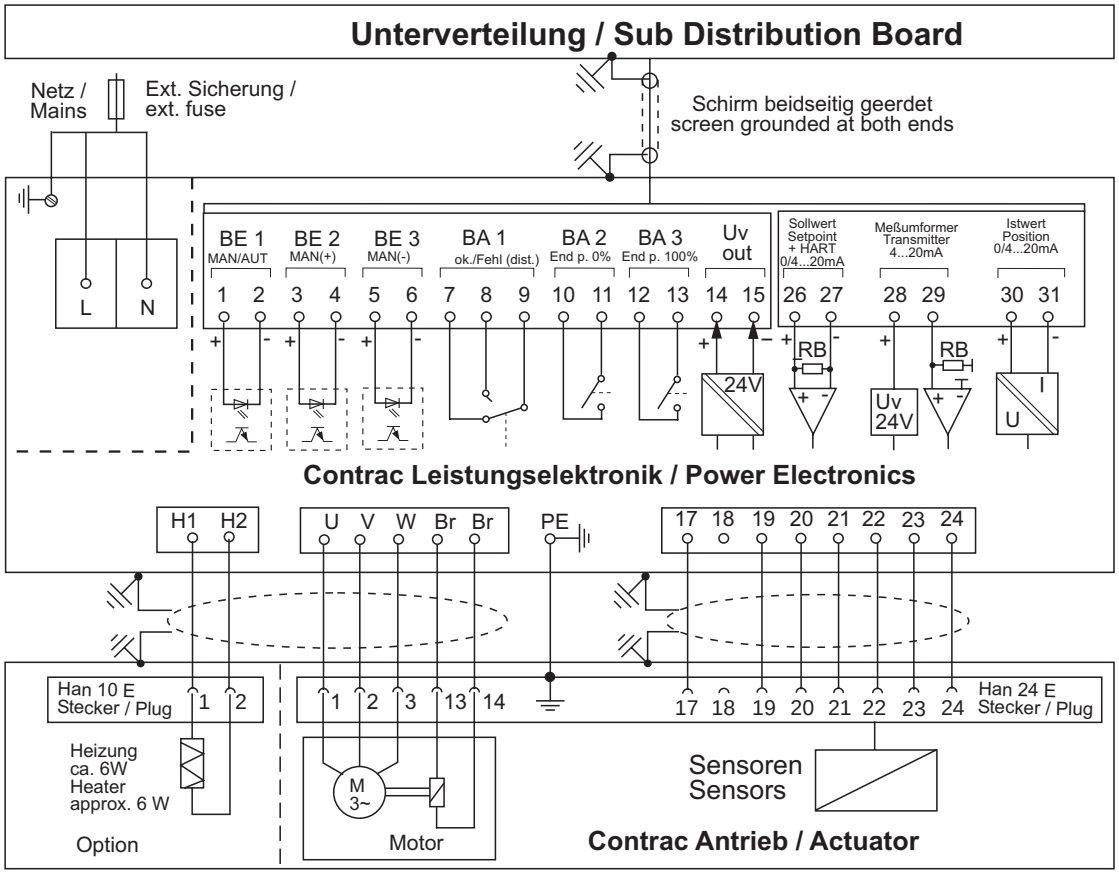


Fig. 6: Wiring diagram for standard triggering of of EBN 853 (optional with heater)

9.2 Wiring Diagram EBN 861 (Standard)

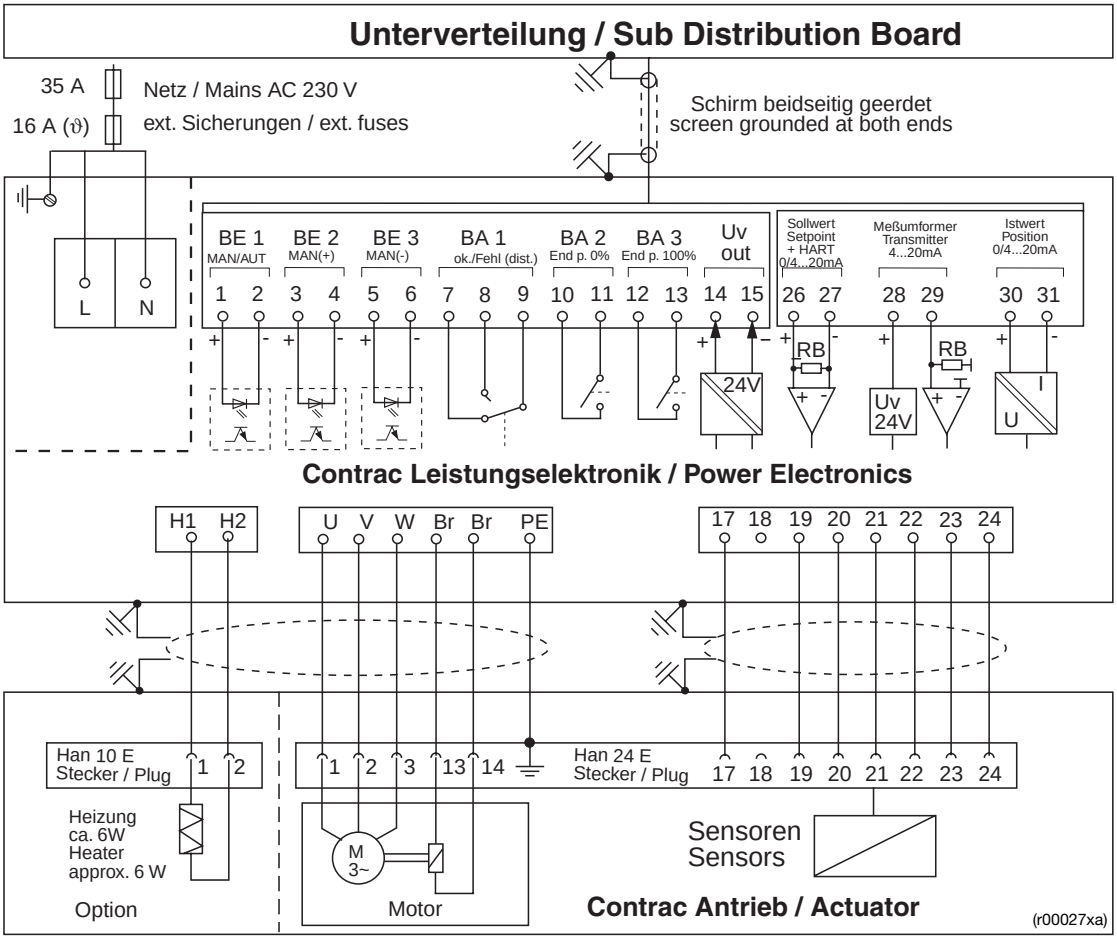


Fig. 7: Wiring diagram for standard triggering of of EBN 861 (optionally with heater)

The following steps must be performed to switch the actuator to automatic mode (AUT):

- Activate digital inputs DI 1, DI 2 and DI 3 via the configuration program.
- Make sure that the supply voltage is available on digital input 1 (DI 1).
- Activate AUT mode via the configuration program.

9.3 **Signal input and output** (conventional control)

9.3.1 Standard

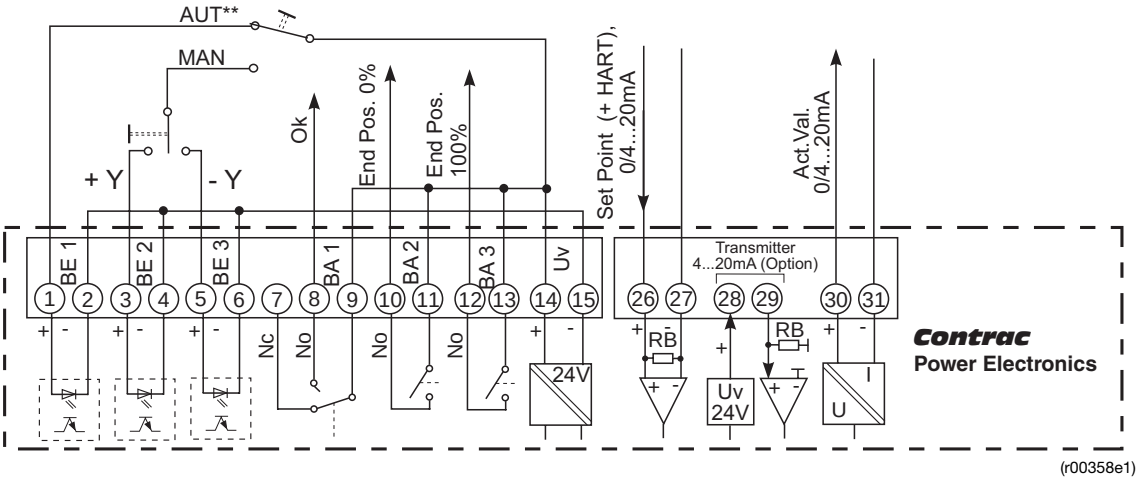


Fig. 8:

** Write-protected when applying +24 V DC to DI 1.

9.3.2 Behind a step controller

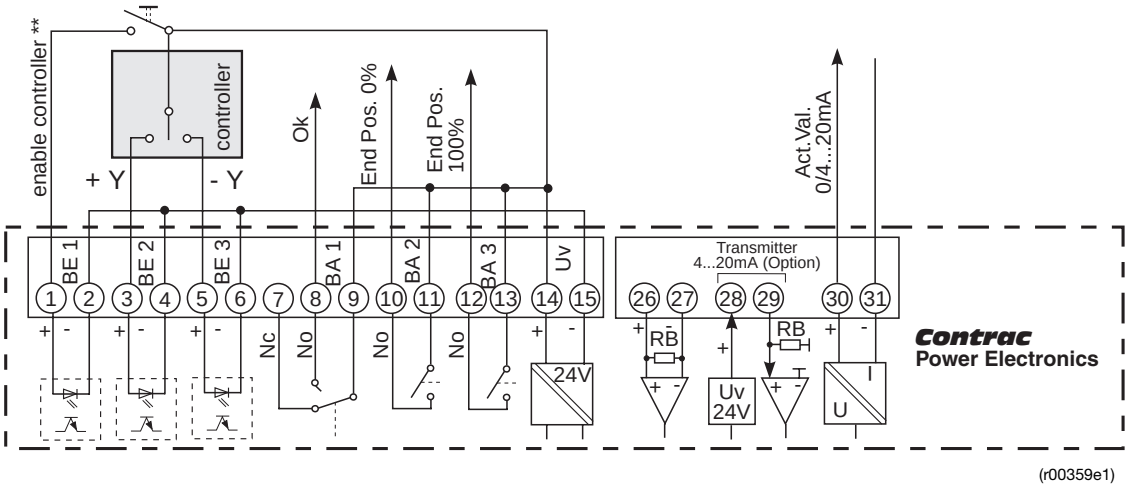


Fig. 9:

** Write-protected when applying +24 V DC to DI 1.
Refer to Operating Instructions 42/68-820 (Power Electronics for Field-Mounting) and 42/68-821 (Rack-Mounting Electronics) for installation details.

9.4 Wiring diagram EBN 853 (field bus communication)

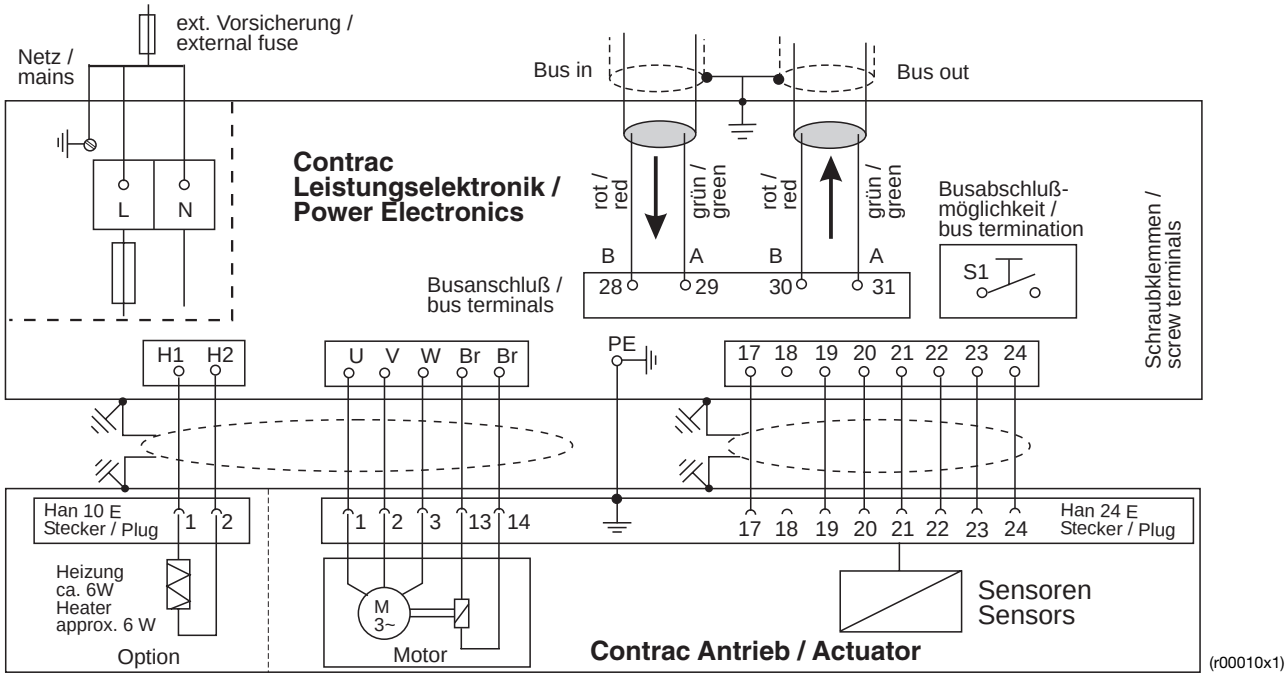


Fig. 10: Wiring diagram for EBN 853

9.5 Wiring diagram EBN 861 (field bus communication)

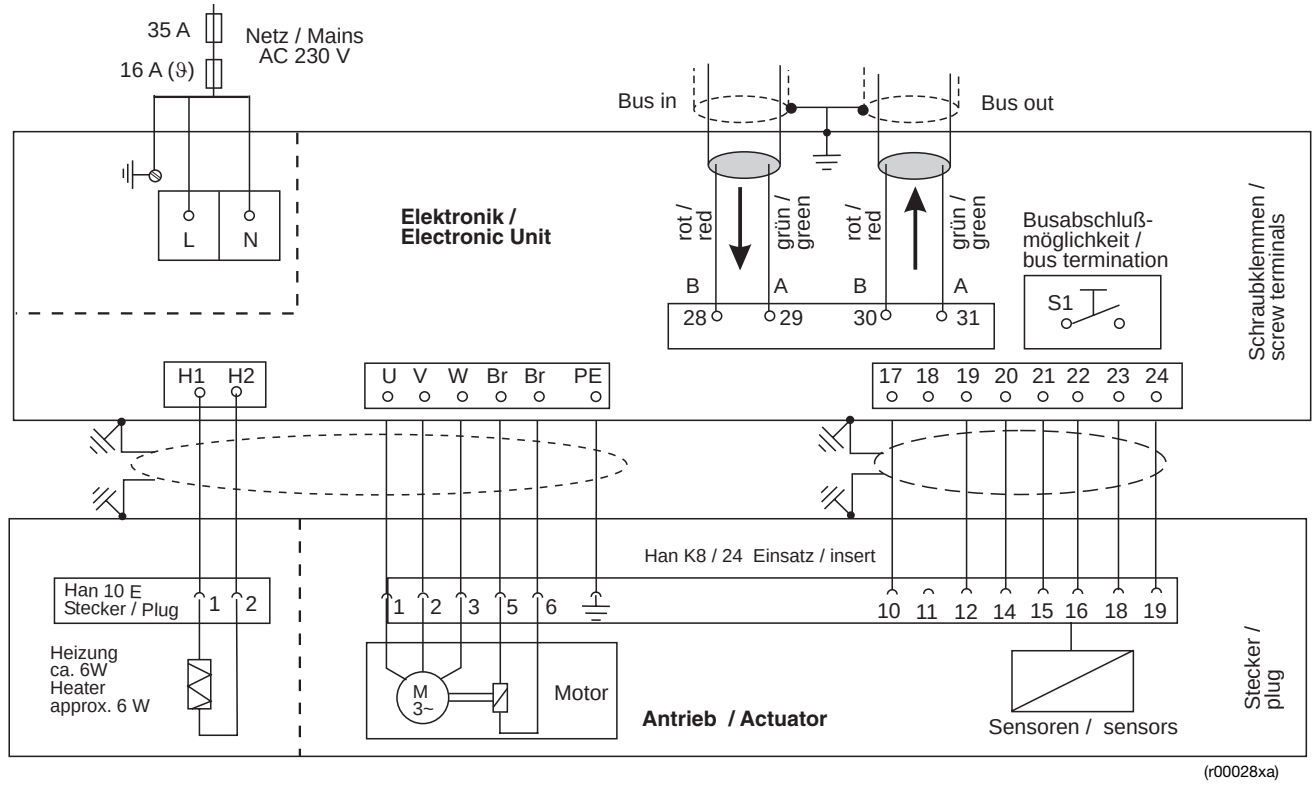


Fig. 11: Wiring diagram for EBN 861

9.6 Wiring diagram for electronics in mounting rack

See instructions 42/68-821EN for detailed information.

9. Setup

The basic settings (definition of end positions) can be made via the **L**ocal **C**ontrol **P**anel (LCP). It is used for adapting the actuator to the operating range and the effective direction without a PC. The actuator can be set up and configured completely using the appropriate configuration program.

The commissioning and service field is located on the electronics!

9.1 Setup via LCP

9.1.1 Operating elements

1.	Write-protect switch	(Default setting: OFF)
2.	LED for 100% position	Indication if adjustment procedure, saved position, or fault by different flash frequencies.
3.	Drive buttons	Press to cause drive motion
4.	Reset button	Press to restart processor and clear any 0% and 100% values.
5.	Power LED	Indicates available mains supply
6.	RS 232 socket	Connection socket to PC
7.	Potential toggle switch	Connection of reference potential to the system or protective earth (by default set to system)
8.	LED for 0% position	Indication if adjustment procedure, saved position, or fault by different flash frequencies..
9.	Accept button (0%)	Press to define current position as 0%; simultaneously press push button 11 to complete the adjustment procedure.
10.	Accept button (100%)	Press to define current position as 100%; simultaneously press push button 10 to complete the adjustment procedure

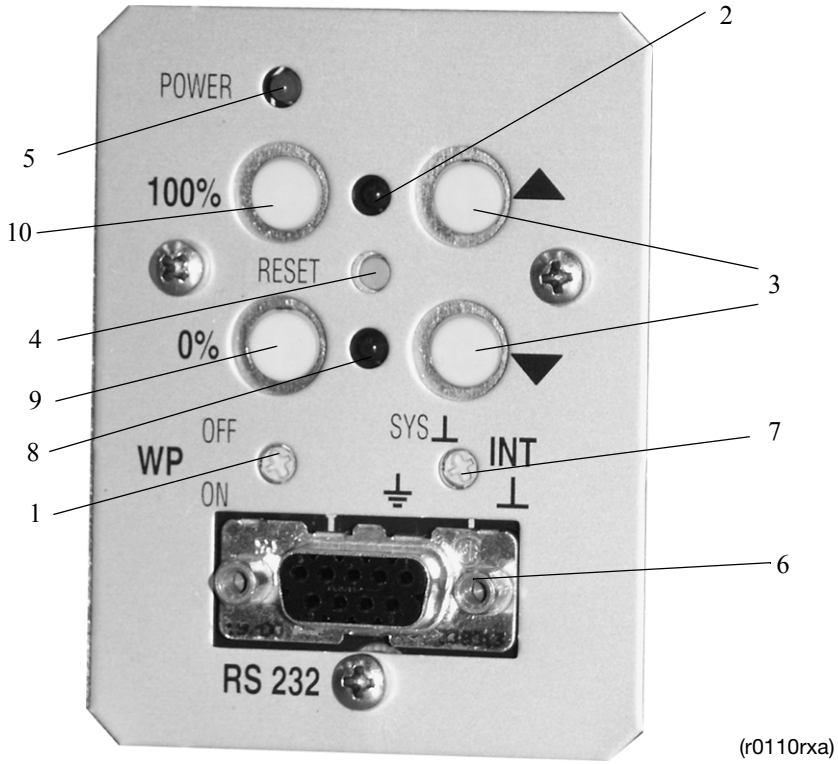


Figure 9: **L**ocal **C**ontrol **P**anel (LCP)

The actuator range is not preset in factory!

9.1.2 Initial situation

- Electronics connected to power supply and actuator
- Write-protect switch (1) set to “OFF” position
- Electronics in operating mode “MAN” (no signal on DI 1)
- No fault (if a fault occurs, both LEDs flash alternately at 4 Hz)

9.1.3 Setup procedure

- Undo the screws of the LCP cover
- Swing the cover to the side

9.1.3.1 “Setting” mode

- Set electronics to “setting” mode by pressing push buttons (3) and (5) simultaneously for approx. 5 seconds, until both LEDs (2 + 9) are flashing synchronously at approx. 4 Hz.

9.1.3.2 Defining first position (0% or 100%)

- Move to desired position by pressing push button (3) or (5).
- To accept the position, press push button (10) or (11); the associated LED flashes at approx. 1 Hz when value is correctly accepted, the other continues to flash at approx. 4 Hz

(Higher precision in 2nd position)

9.1.3.3 Defining second position (0% or 100%)

- Move to second position by pressing push button (3) or (5).
- To accept the position, press push button (10) or (11); both LEDs (2) and (9) are flashing at approx. 1 Hz when value is accepted correctly.

9.1.3.4 Saving the settings

- The settings are accepted by simultaneously pressing the push buttons (10 + 11); the LEDs (2 + 9) extinguish after a short time, and the adjustment procedure is completed.
- If the selected range is too small for the actuator, both LEDs will flash again at 4 Hz. Repeat the adjustment procedure a larger value (min. positioning travel). (See positioning travel specification on actuator ID label)

9.1.3.5 Correction after setup

- If the setting is to be corrected after accepting the first value, first press the Reset button (4) and then repeat the setting.
- If the correction is to be done after saving the settings, the entire adjustment procedure must be repeated.

9.2 Adjustment using the configuration program

Context-sensitive help information is available in the configuration program at all times. For basic handling and installation instructions refer to the associated manual, number 41/68-001.

A conductive ground connection is established between the PC and the CONTRAC electronics with the RS 232 communication cable. If the PC is grounded, this may cause a ground loop in the installation.

9.3 Indication at LCP

Function	Indication
Adjustment	
Change-over to adjustment mode: Press and hold both drive switches for approx. 5 seconds	Both LEDs flash synchronously at approx 4 Hz after time has expired.
Moving to an end position Use respective drive button on CSF	Both LEDs continue to flash at 4 Hz while driving.
Saving the first end position Press button 0% or 100%	The associated LED flashes at approx. 1 Hz, the other continues at 4 Hz.
Saving the second end position Press button 0% or 100%	The associated LED flashes at approx. 1 Hz synchronously to the first one.
Terminate adjustment Press 0% and 100% buttons simultaneously	Both LEDs are briefly lit together and then extinguish.
Operation	
Normal operation: MAN / AUT	LED off
Driving with button on CSF Priority over control system	LED off
Fault (both LEDs flash alternately at 4 Hz)	
Reset: Resets fault indications	If no other fault conditions exist, both LEDs extinguish.
Reset if operating range is exceeded; press and hold both drive button for 5 seconds, then press Reset button	After approx. 5 seconds the flash rhythm is briefly interrupted. After “Reset” the electronics switch to adjustment mode.

Table 3:

11. Maintenance

Linear actuators of the RSD... series feature a robust design. As a result, they are highly reliable and require only little 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, temperatures, etc.) and derives the remaining operating time until the next routine maintenance is required. Use the configuration program for viewing this information.

11.1 Motor and Gears

All maintenance work must be carried out by qualified specialists who have been trained for this task. As a rule, perform the following routine maintenance works:

- Check the shafts and gears
- Check the drive rod surface for damage
- Check the motor pinion gear and the respective mating gear.
- Replace the motor's rotary shaft seal and ball bearings.
- Check the position sensor.
- Change the oil; then make a visual check and check for proper operation.

11.2 Adjusting the Brake

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

In automatic mode the brake is permanently released. Therefore, it is not exposed to wear and does not require any re-adjustment.

11.3 Replacing the Position Sensor

11.3.1 Dismounting

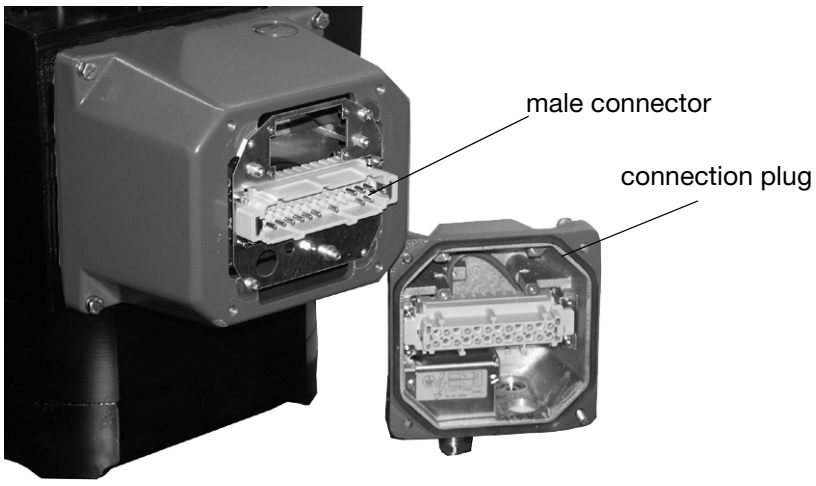


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Figure 14:

- drive actuator into 50% position (refered to rated actuator stroke)
- delete the current position settings by pressing the 2 drive buttons on the LCP for at least 5 sec
- switch-off the voltage supply
- disconnect electrically
- remove male connector
- loosen both fastening screws (1) of position sensor (fig.) and take sensor out
- detach plug from sensor pcb

11.3.2 Mounting

The toothed gear pair of the position sensor is held in place by a tension spring (3), to ensure sufficient free motion when the direction of rotation is reversed.

- fasten sensor cable plug on sensor pcb
- set the stop pin to the center position, as shown in Figure 15
- align the sensor and its gears with the actuator; set the first toothed gear in 03:00 o'clock position (see Figure 16) onto the drive shaft gear (4)
- 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 (1) tightly
-)

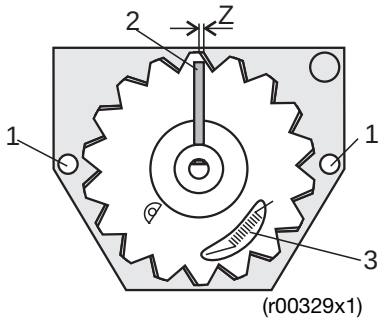

Figure 15: Position sensor SP 1

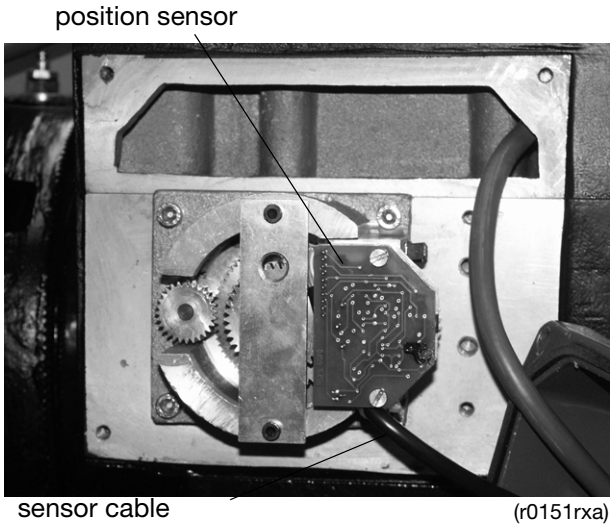

Figure 16: Mounting position of SP 1

After mounting is completed readjust the actuator range as described in setup section of this manual.

12. Troubleshooting

This section only describes how to handle hardware errors. Refer to the configuration program's online help for errors related to the software.

Error	Possible reason	Measures to be taken
Valve cannot be moved by actuator	Malfunction of actuator or valve (e.g. cable gland fastened too tightly)	Disconnect the actuator from the valve. If the actuator is working properly then, the valve is likely to be defective. Otherwise, the actuator seems to be the error source.
Actuator does not react	No communication	Set up communication using the configuration program
	Motor / brake is defective	Check the winding resistances of the motor and brake. Check the brake fuse.
	Digital input of electronics are not connected	Connect input
	Brake does not release (no audible "click" noise)	Check the air gap (should be around 0.25 mm) and the electrical connection of the brake. Check the winding resistance of the brake coil.
Actuator does not work in automatic mode, although "AUT" has been selected in the configuration program	Digital input 1 (DI 1) has not been connected.	Connect DI 1.
LEDs on the commissioning and service field are flashing simultaneously	Actuator has not been adjusted properly	Adjust the actuator.
Fault when approaching an end position	Actuator is working in the limit range of the position sensor	- Move the actuator either manually or with the CSF buttons to a position beyond the end position [1] (disconnect from valve if required). - Move actuator back. If required, reconnect to to the valve (if applicable) - Adapt actuator to new operating range

Table 13:

[1] If actuator end position = valve end position, mount the sensor as described in section 11.3.2.

12.1 Electrical test values

	MCS 71 BA	MCS 80 BA	MC 90 BA	MC 100 BA	MC 112 BA
winding resistance ± 5% at 20° C (motor)	21 Ohm	8 Ohm	3.7 Ohm	3.7 Ohm	1,4 Ohn
winding resistance ± 5% at 20° C (brake)	2180 Ohm	1730 Ohm	1290 Ohm	1079 Ohm	1020 Ohm

Table 14:

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