Instructions
42-68-165 EN

Electrical Part-Turn Actuators for Continuous Control RHD250...RHD4000 (Contrac)

Rated torque
250...4000 Nm

Content

Legend

Danger
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury

Warning
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury or serious property damage.

Caution
Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.

Important
Indicates useful hints or other special information which, if not observed, could lead to a decline in operating convenience or affect the functionality.

1. Device Identification

1.1 Actuator ID Label

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

1. Actuator type
2. Fabrication no./ No of non-standard version (if applicable)
3. Rated torque- force/ year of manufacture
4. Permissible ambient temperature / protection class
5. min./max. oper. angle / max. speed / heater (if applicable)
6. Filled-in oil type
7. Associated electronic unit
8. free
9. free
10. Free for customer specific entry

2. Application

Use this instruction only together with the instruction for the elctronic unit (42/68-821; 42/68-822) .

3. General

3.1 Proper use

The actuators are intended to be used exclusively for actuating 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.

3.2 Safety and precautions

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

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

4. Storage

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 / plug: . . . . . .under plug connector 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.

4.1 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.

5. Delivery settings

See electronic unit instructions for detailed descriptions.

6. Sub assemblies

1: hand wheel
2: ball and socket joint
3: lever
4: adjustable limit stop
5. shaft
6. gear box
7. hand wheel knob
8. servo motor
9. hand wheel lock
10: position sensor

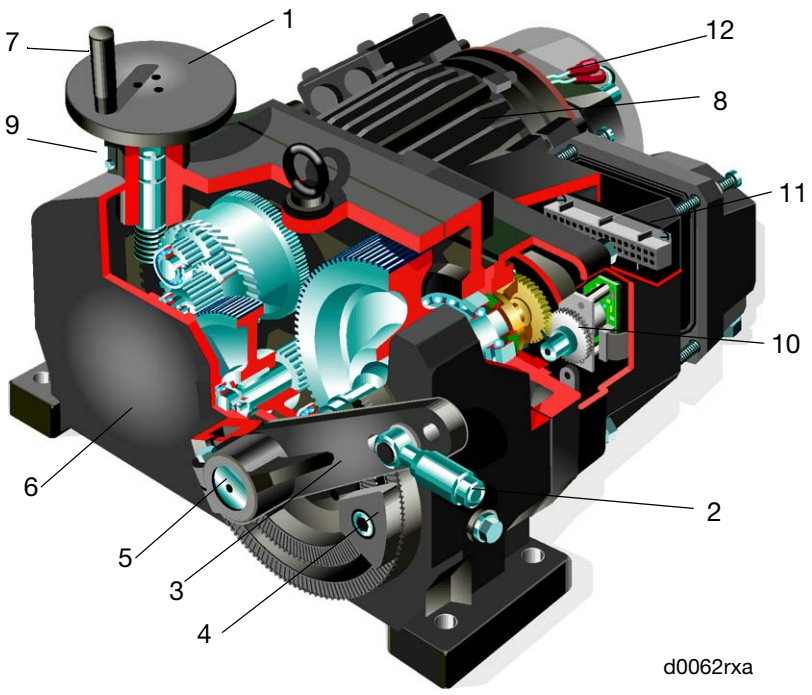

Fig. 1: Sectional view RHD...

6.1 Operation

6.1.1 Automatic / manual mode

The motor (8) triggered by the power electronics drives the output shaft via oil-lubricated spur gears. The output shaft (5) transmits the torque via a lever (3) with ball-and-socket joints (2) and a coupling rod to the final control element. A position sensor (10) measures backlash-free the current shaft position. Adjustable mechanical limit stops (4) absorb potentially occurring torque peaks in the end positions. The brake (8) at the rear motor shaft end acts as a retainer when the power is off.

6.1.2 Hand wheel mode

- Allows you to move the actuator manually when the electrical power is off.
- Press down the hand wheel lock (9).

Consider restoring process forces

- Turn the handwheel to move the part turn actuator to the desired position.
- Release the lock.

7. Technical Data

7.1 Technical Data RHD250 ... RHD800

	RHD250-10	RHD500-10	RHD800-10
Rated torque [Nm]	250	500	800
Starting torque [Nm]	appr. 1.2 x rated torque break-away torque in end positions 2 x rated torque for short time (if configured)		
Required handwheel force for rated torque	37	17	27
Rated speed [°/s] adjustable on power electronic unit	10 ... 900 s/90° (9.0 ... 0.1)		
Motor	MCS 71 BA		MCS 80 BA
Weight	approx. 45 kg	approx. 90 kg	
Associated electronics For field mounting: For rack mounting:	 EBN853 EBS852		
Power supply (on electronics)	115 V AC (94 V ... 130 V) or 230 V AC(190 V ... 260 V); 47.5 ... 63 Hz		
Maximum current ($I_{max.}$) at 115/230 V AC [A]	1.8 / 0.9	2.2 / 1.1	3.4 / 1.7
Current input in positioning mode	approx. 40 ... 50% of $I_{max.}$, each		

Table 1:

7.2 Techical Data RHD1250 ... RHD4000

	RHD1250-12	**RHD2500-10**	**RHD2500-25**	**RHD4000-10**	**RHD4000-40**
Rated torque [Nm]	1250	2500		4000	
Starting torque [Nm]	appr. 1.2 x rated torque (break-away torque in end positions 2 x rated torque for short time)				
Required handwheel force for rated torque	20	40	20	24	29
Rated speed [°/s] adjustable on power electronic unit	7.5 ... 0.1	9.0 ... 0.1	3.6 ... 0.1	9.0 s ... 0.1 s	2.25 s ... 0.1 s
Motor	MCS 80 BA	MC 90 BA	MCS 80 BA	MC 100 BA	MC 90 BA
Weight [kg]	approx. 240	approx. 250	approx. 240	approx. 270	approx. 265 kg
Associated electronic unit For field mounting: For rack mounting:	EBN853 EBS852	EBN861 EBS862	EBN853 EBS852	EBN861 EBS862	EBN853 EBS852
Power supply (on 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	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
Maximum current ($I_{max.}$)at 115/230 V AC [A] at electronic unit	6.0 A / 3.0 A	-- / 5.3 A	4.8 A / 2.4 A	-- / 10.0 A	4.0 A / 2.0 A
During positioning	approx. 40 ... 50% of $I_{max.}$, each				

Table 2:

8. Lubrication

The spur wheel gerings of RHD250 ... RHD4000 are oil lubricated. They contain the max. oil quantity when leaving the manufacturer. Once the actuator is installed replace the uppermost check screw by the separately supplied venting screw.

8.1 Mounting position and filling capacity

8.1.1 Mounting position RHD250 ... RHD2500

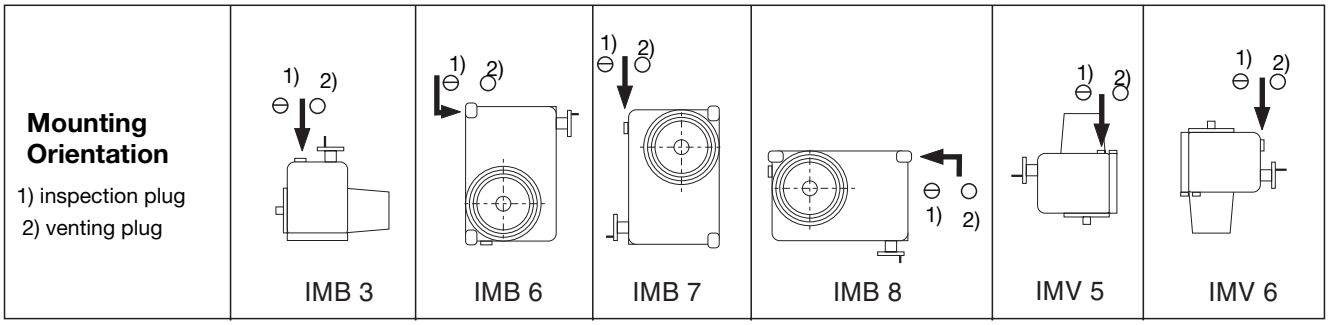

Fig. 2: Mounting position RHD250 ... RHD2500; 1) = inspection screw, 2) = venting screw

Minimum oil quantity; approx. [l]	4.7	4.7	4.7	4.7	4.7	4.7
Min. oil level [mm] under inspection plug	40	12	15	Lower edge of upper oil plug	35	Lower edge of upper oil plug

Table 3: Filling capacity RHD250

Minimum oil quantity; approx. [l]	10	11.5	10	10	10	10
Min. oil level [mm] under inspection plug	57	Lower edge of upper oil plug	55	Lower edge of upper oil plug	37	Lower edge of upper oil plug

Table 4: Filling capacity RHD500 ... RHD800

Minimum oil quantity; approx. [l]	29	32	24	24	33	26,5
Min. oil level [mm] under inspection plug	75	90	200	Lower edge of upper oil plug Caution! Filled with 33 l when supplied!	34	35

Table 5: Filling capacity RHD1250 ... RHD2500

8.1.2 Mounting position RHD4000

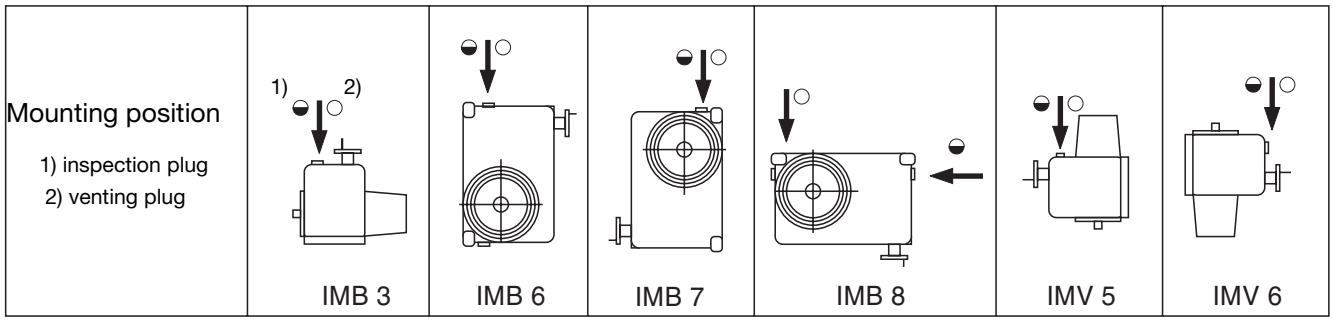

Fig. 3: Mounting Position RHD4000; 1) = inspection screw, 2) = venting screw

Minimum oil quantity; approx. [l]	29	32	24.5	22.5	34	26.5
Min. oil level [mm] under inspection plug	75	90	200	Lower edge of upper oil plig Caution! Filled with 34 l when supplied!	34	35

Table 6: Filling capacity RHD4000!

8.2 Oil specifications

	Oil specification	
Ambient temperature	Oil type used by manufacturer for first filling	Possible other oil types
- 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 7:

8.3 Oil change

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:

- provide a container capable to take the expected oil quantity acc. to table 3 to 6
- open or undo the venting screw (fig. 3)
- unscrew the lowermost inspection screw and use it to drain the oil
- make sure that the entire oil is out of the actuator
- screw in and tighten the drain screw
- complete other maintenance work (if required)
- refill the appropriate amount of oil and tighten the venting screw

9. Mounting

9.1 Actuator check

- Is the actuator filled with the appropriate oil type?
- Is enough oil in the actuator?
- Did you fasten the separately delivered vent plug in the highest bore (depending on the mounting orientation)?

9.2 Mounting orientation

All mounting orientations shown in Figure 2 and 3 are permissible. To facilitate mounting and maintenance, however, it is recommended to use orientation IMB 3.

9.3 Mounting 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. Select the mounting site accordingly or install a shelter.
- Exclusively mount the actuator on a rigid, non-vibrating support to avoid relative motion between the actuator and the valve.
- When mounting the actuator close to heat sources use an insulating layer or shielding.

9.4 Mounting the actuator to the valve

9.4.1 Preparing the equipment

- Make sure that the shaft and lever bore surface are clean and free of grease.
- Determine the length of the coupling tube (not included in the scope of delivery).
- Move the valve to the “CLOSED“ position.
- Move the actuator to the corresponding end position. Use the handwheel for the last few degrees. Observe the permissible angle.
- Refer to figure 5 ... 8 for the required length of the link tube.
- Drill a cone bore into the valve lever for mounting the second ball-and-socket joint, as shown in figure 5 ... 8.
- Insert the ball-and-socket joint, secure with crown nut and split-pin.
- Remove the welding bushings (Material: C 15 to DIN 17210) and weld them to the coupling tube.
- Insert the link rod between the two ball-and-socket joints and screw it in.
- If required adjust “L” by turning the link rod.
- When all adjustment steps are finished, fasten the counter nuts.

9.4.2 Adjusting the stops in dependence of the travel

- Move the output lever / valve to the position requiring fine adjustment.
- Put the stop onto the toothing as close to the output lever as possible and fasten it with screws.
- Move the output lever towards the stop using the handwheel; turn the coupling rod for fine adjustment.
- Fasten the counter nuts.
- Fasten the stop in the other mounting position close to the end position, depending on the toothing.

9.4.3 Adjusting the stops in dependence of the torque

- First proceed as described above for travel-dependent adjustment.
- Prior to re-fastening the counter-nut provide a pretension in the valve’s „Closed“ position. Lock the hand wheel and turn the coupling tube or optionally shift the limit stops to get a small gap between lever and limit stop. The procedure (turning the tube or using the gap) and the gap size depend on the stiffness of the linkage arrangement.
- Tighten the counter-nuts and limit stop screws.

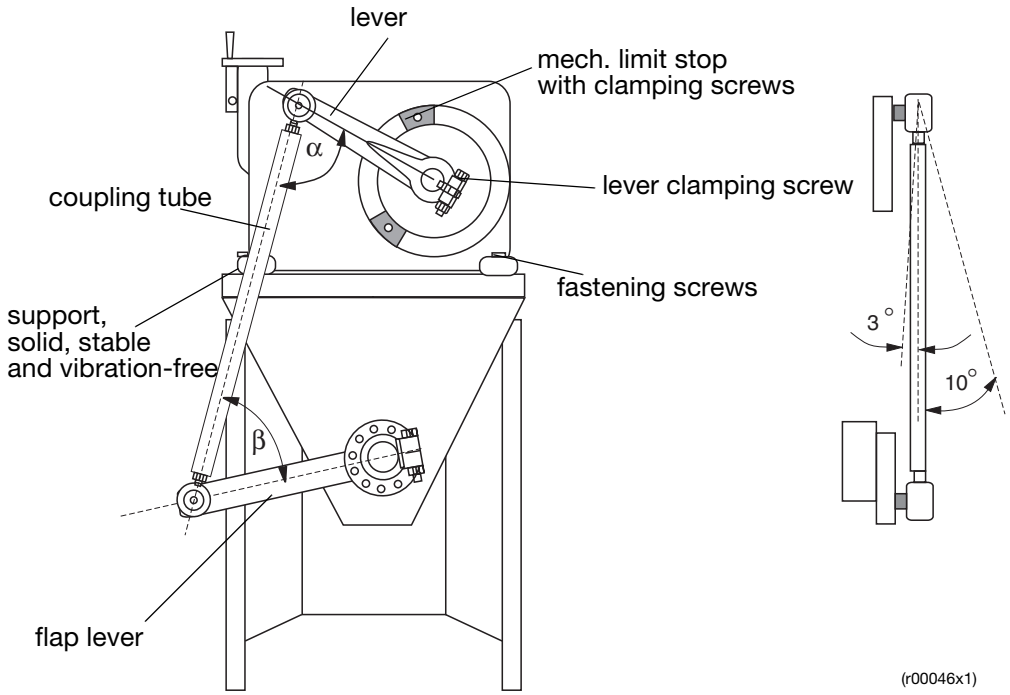

Fig. 4: Mounting RHD... (example)

$\alpha \geq 15°$ ($\geq 20°$ for RHD800 ... RHD4000)
β according to dimensions specified by the valve manufacturer

9.4.4 Mechanical settings

	RHD250	**RHD500 RHD800**	**RHD1250 RHD2500**	**RHD4000**
clamping screws for mech. limit stop tightening torque:	79 Nm	195 Nm	670 Nm	670 Nm
lever clamping screw tightening torque:	79 Nm	195 Nm	390 Nm	390 Nm
fastening screw boring diameter: tensile strength:	12 mm ≥ 400 N/mm^2	18 mm ≥ 400 N/mm^2	20 mm ≥ 400 N/mm^2	20 mm ≥ 400 N/mm^2

Table 8:

9.5 Lever dimensions

9.5.1 Lever for RHD250

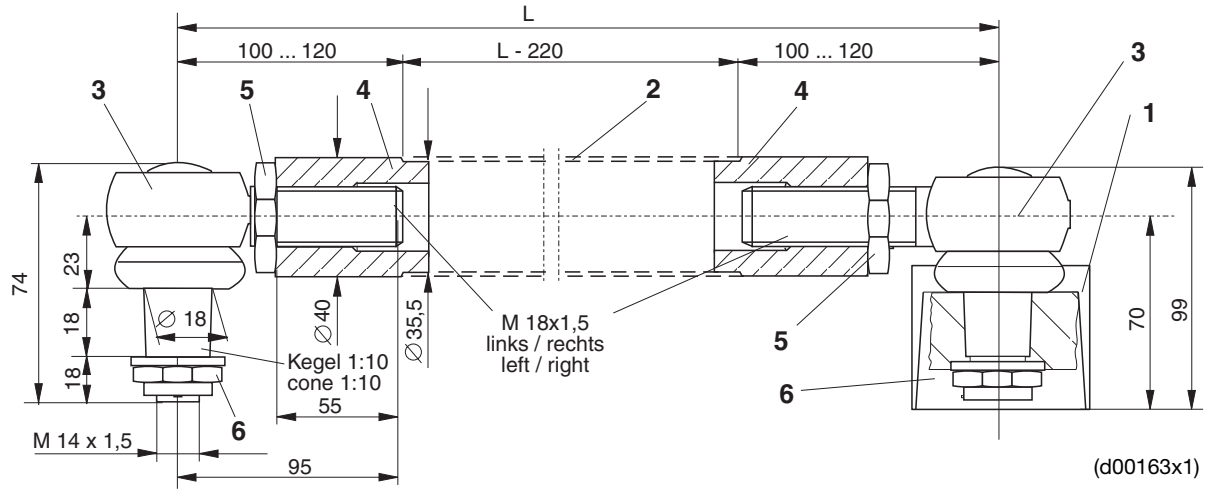

Fig. 5: lever RHD250

1. Output shaft
2. Link tube
3. Ball-and-socket joint
4. Welding bushings (C15 to DIN 17210)
5. Counter nuts
6. Crown nuts

9.5.2 Lever for RHD500 / RHD800

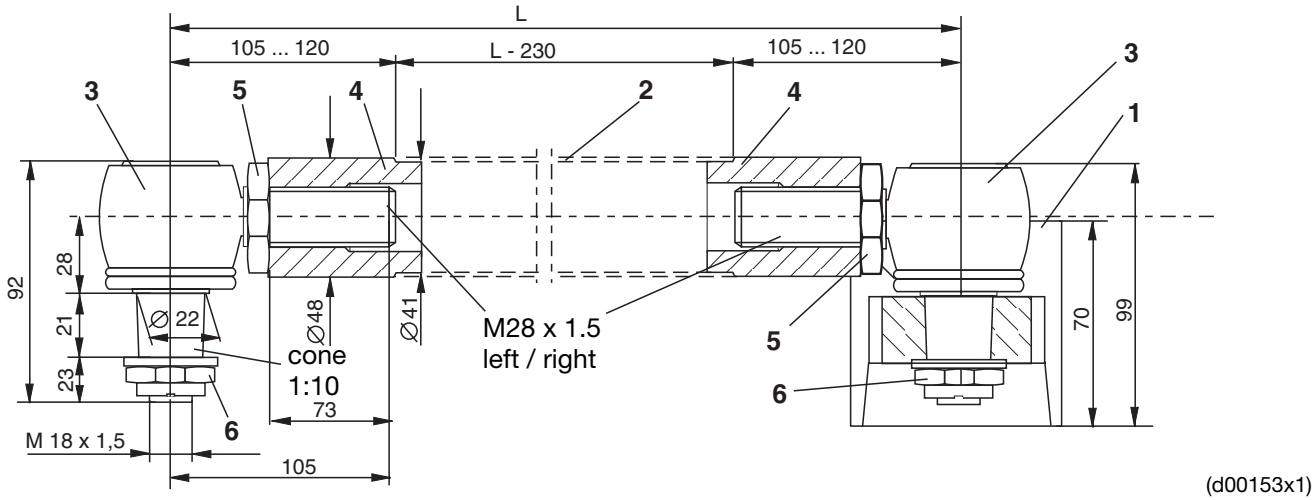

Fig. 6: lever RHD500 / RHD800

1. Output shaft
2. Link tube
3. Ball-and-socket joint
4. Welding bushings (C15 to DIN 17210)
5. Counter nuts
6. Crown nuts

9.5.3 Lever for RHD1250 / RHD2500

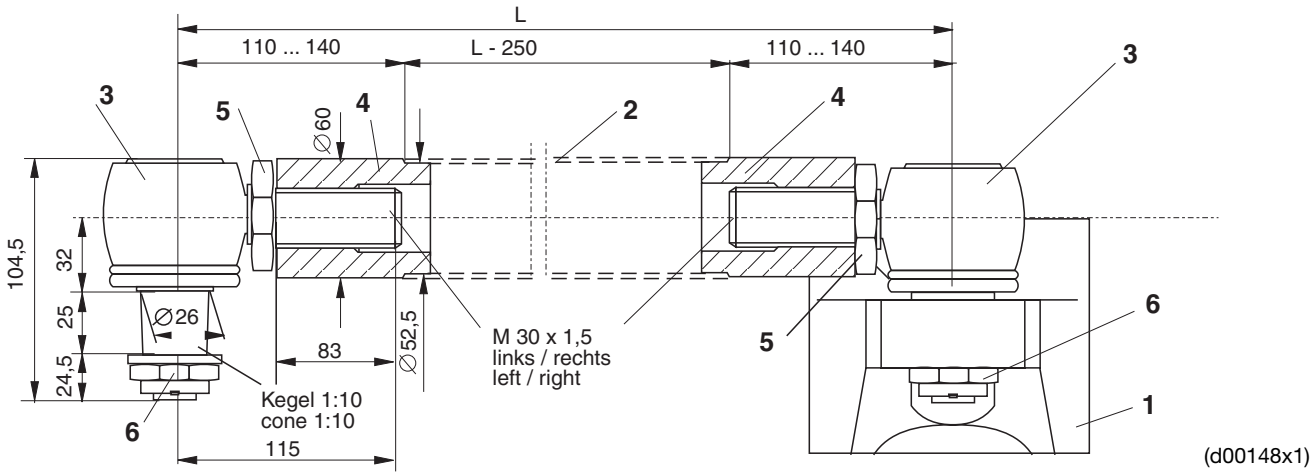

Fig. 7: lever for RHD1250 / RHD2500

1. Output shaft
2. Link tube
3. Ball-and-socket joint
4. Welding bushings (C15 to DIN 17210)
5. Counter nuts
6. Crown nuts

9.5.4 Lever for RHD4000

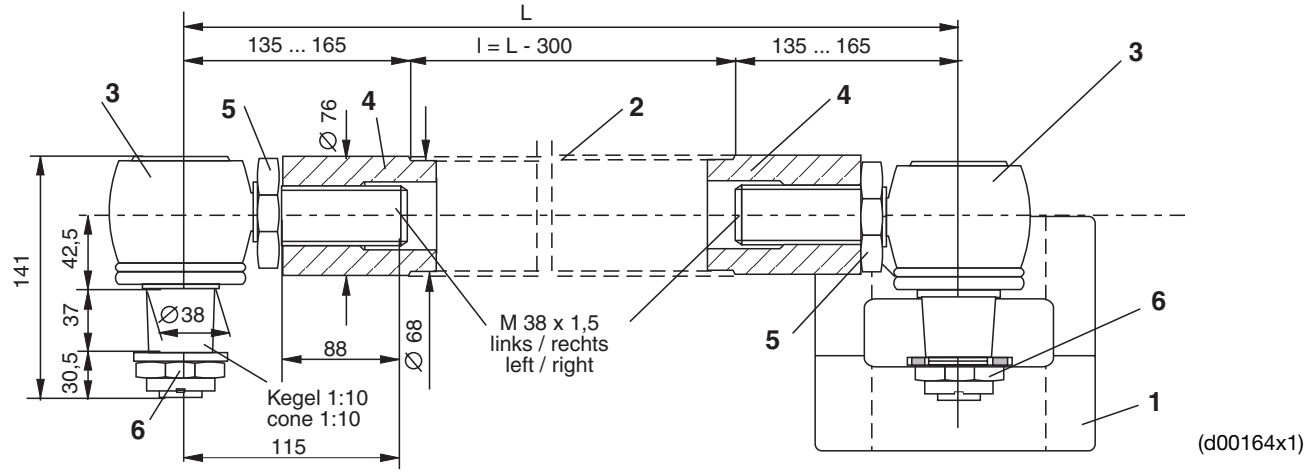

Fig. 8: lever for RHD4000

1. Output shaft
2. Link tube
3. Ball-and-socket joint
4. Welding bushings (C15 to DIN 17210)
5. Counter nuts
6. Crown nuts

10.Electrical connection

Each actuator requires a Contrac electronic unit. Proper actuator operation requires an actuator specific software loaded in the associated electronic unit. See electronic unit instructions for details. Compare the data labels on both, electronic unit and actuator, in order to ensure a correct hardware and software assignment.
The electrical connection is done with a combined plug on the actuator and with screw terminals on the electronics.
See instructions 42/68-821 for wiring diagram for electronic units for mounting rack installation.

10.1 EBN853 / EBN861 (Standard)

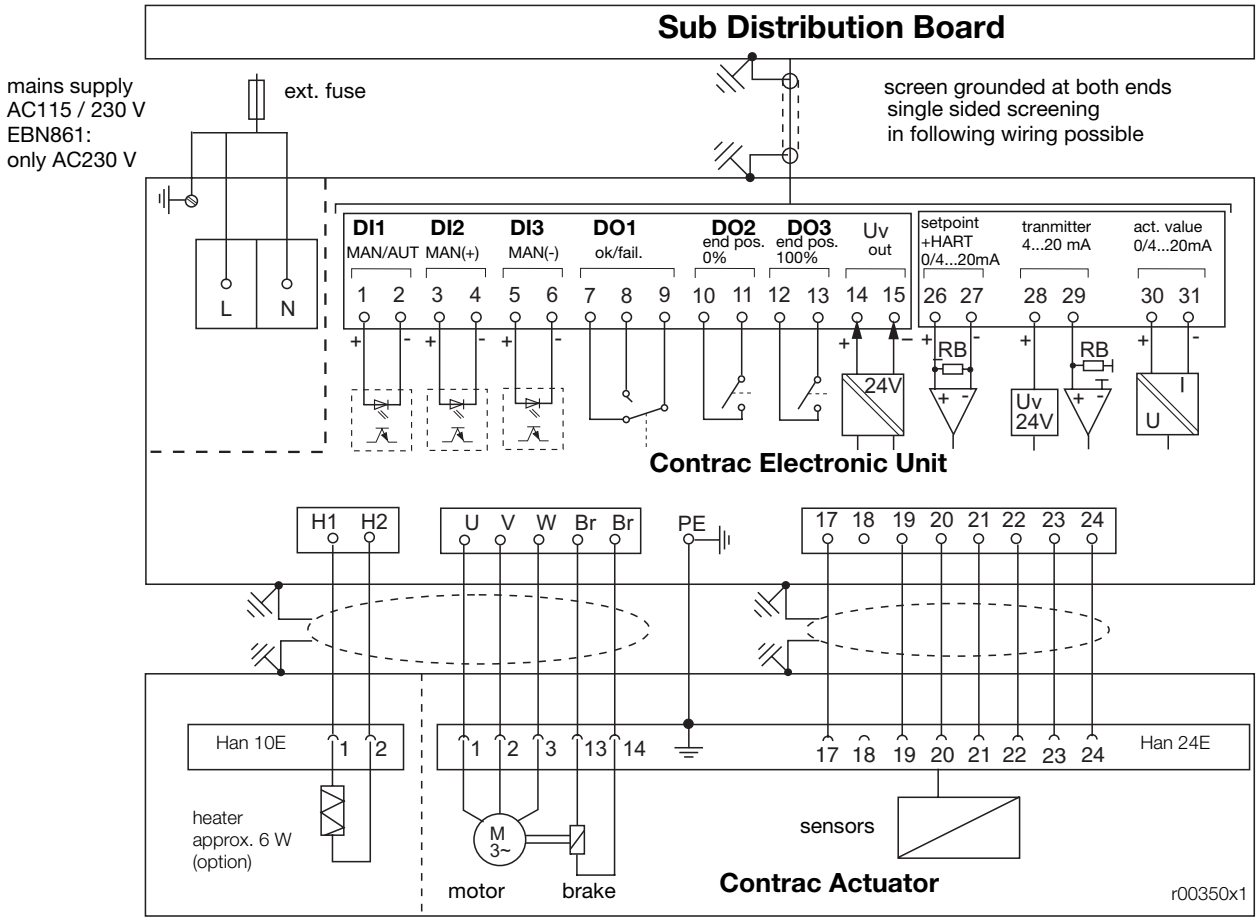

Fig. 9: Wiring diagram EBN853 / EBN861

10.2 EBN853 / EBN861 (field bus communication)

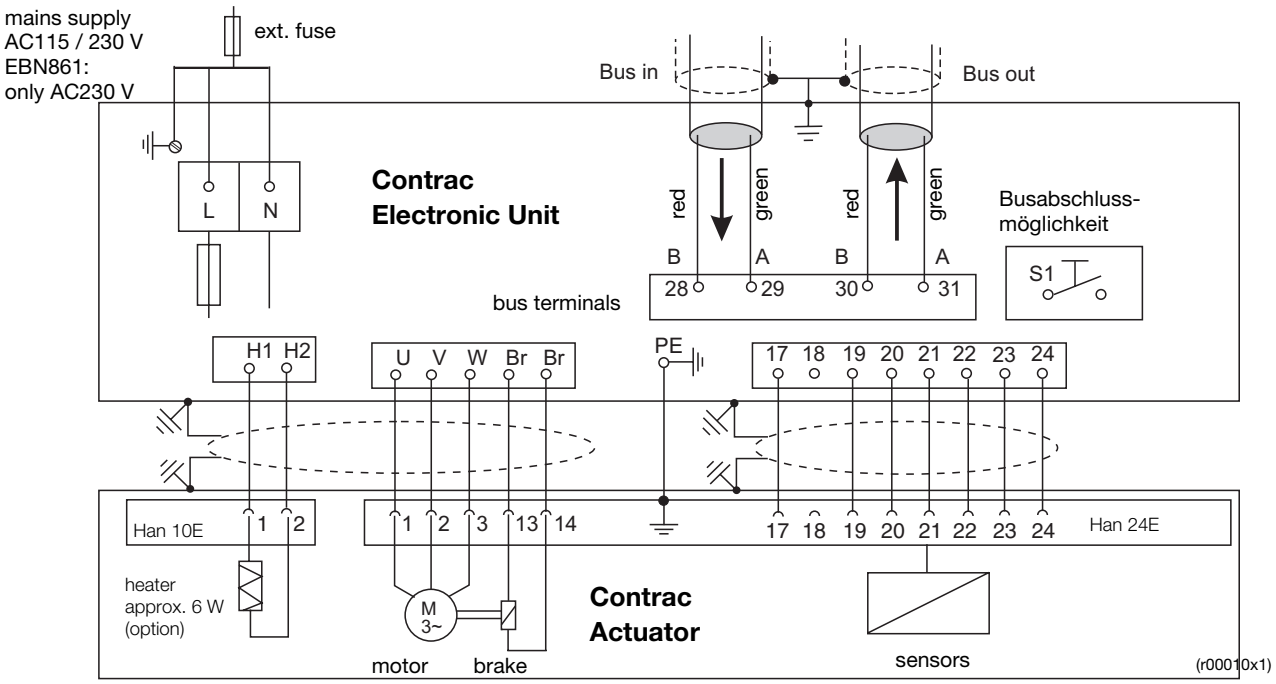

Fig. 10:

11.Maintenance

Contrac actuators have a robust construction. 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, movements, temperatures, etc.) and derives the remaining operating time until the next routine maintenance is required. Use the configuration program for viewing this information.
All maintenance work must be carried out by qualified specialists who have been trained for this task.

11.1 Motor and gears

As a common rule, perform the following routine maintenance works as calculated by the micro processor; latest after 10 years:
- Check the shafts and gears.
- Check the motor pinion gear and the respective mating gear.
- Replace the motor's rotary shaft seal, the flange seal and the ball bearings.
- Check the position sensor.
- Change the oil and check the venting screw.
- Provide visual check of all screw connections and oil tightness.
- 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! The gear is not self-locking!

In automatic mode the brake is permanently released. Therefore, it is not exposed to wear and does not require any re-adjustment under normal conditions. Check for proper function e. g. using the „Test Function“ of the configuration software.

12.Exchange of position sensor

12.1 Dismounting

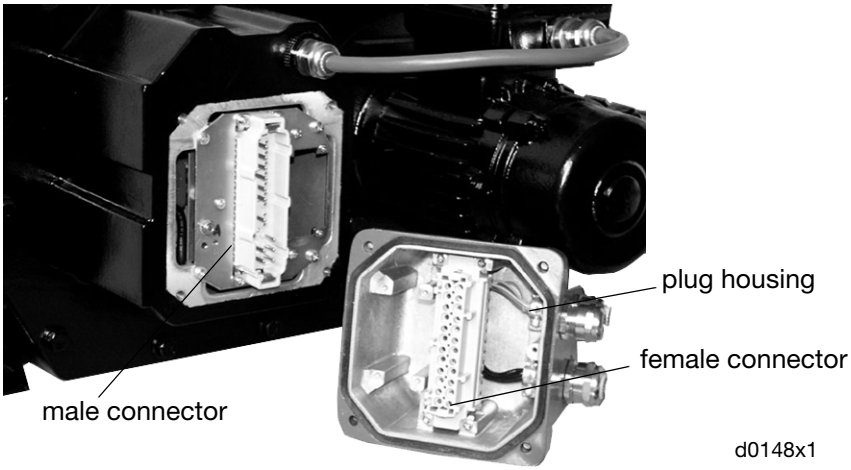

Fig. 11: Example shows RHD500 (without heater)

- 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
- switch-off the voltage supply
- disconnect electrically
- remove male connector
- loosen both fastening screws (1) of position sensor (fig. 12 + 13) and take the sensor out
- detach plug from sensor pcb.

12.2 Mounting

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

- set the stop pin to the center position, as shown in Figure 12.
- align the sensor and its gears with the actuator; set the first toothed gear in 09:00 o'clock position (fig. 13) 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.
- fasten sensor cable plug on sensor pcb

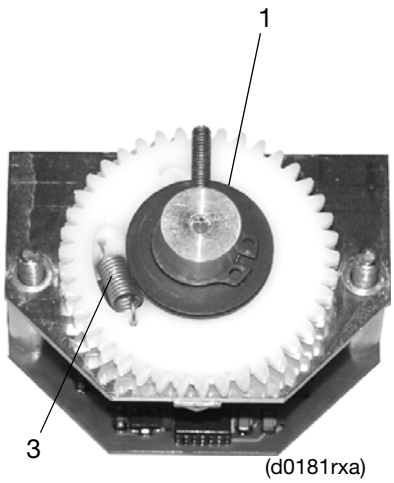

Fig. 12: Position sensor

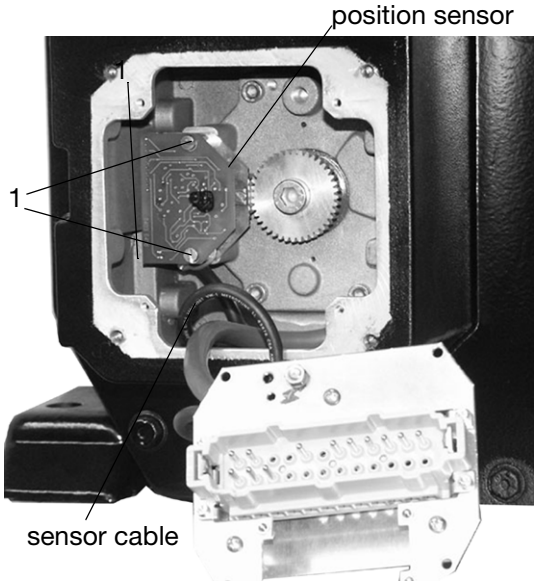

Fig. 13: Mounting position (Example shows RHD500)

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

13.Trouble shooting

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. stuffing box tightened too much)	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	Wrong electronic unit or wrong data	Compare data lables of actuator and electronic unit
	Faulty electronic unit settings	Check / modify settings using the configuration software
	Faulty communication to DCS	Check wiring
	Faulty wiring between electronics and actuator	Check wiring
	Motor / brake is defective	Check the winding resistances of the motor and brake. Check the brake fuse.
	Digital inputs of electronics are not connected	Connect
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 - Check software settings for digital inputs
LEDs on the commissioning and service field are flashing simultaneously	Actuator operating range has not been adjusted properly	Adjust the actuator operating range (see instruction for electronic unit).
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 LCP buttons to a position beyond the end position[1)] (disconnect from valve if required). - Move actuator back. If required, reconnect to the valve (if applicable) - Adapt actuator to new operating range

Table 9:

[1)] If actuator end position = valve end position, mount the sensor as described in section 12.2.

13.1 Electrical test values

	MCS 071 BA	MCS 080 BA	MC 090 BA	MC 100 BA
Winding resistance ± 5% at 20° C (motor)	21 ohms	8,0 ohms	3.6 ohms	4.7 ohms
Winding resistance ± 5% at 20° C (brake)	2134 ohms	1688 ohms	1630 ohms	1377 ohms

Table 10:

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