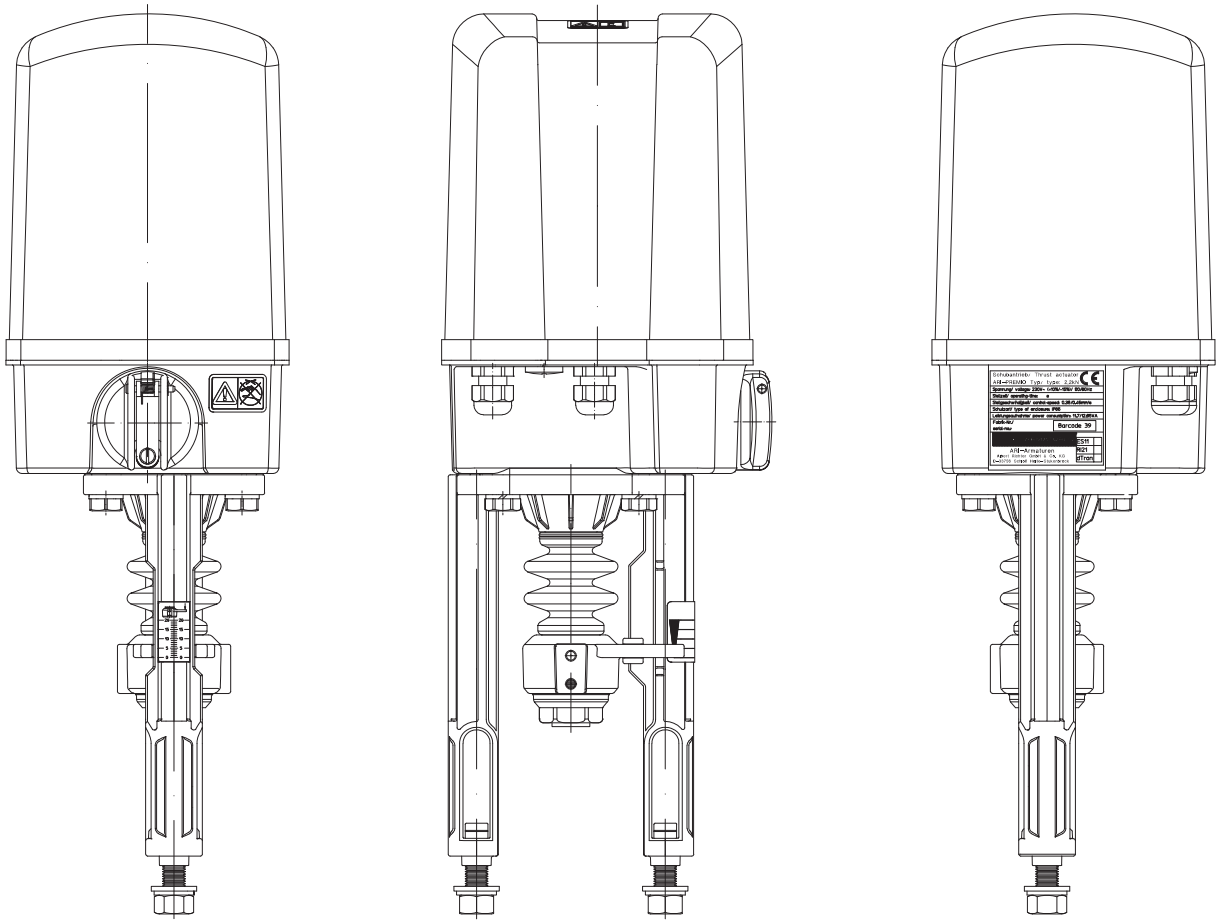
Operating and Installation Instructions

Thrust actuator ARI-PREMIO®



Contents

Rev. 0040501000 3116 englisch

1.0 General information on operating instructions

These operating instructions provide information on mounting and maintaining the thrust actuators. Please contact the supplier or the manufacturer in case of problems which cannot be solved by reference to the operating instructions.

They are binding on the transport, storage, installation, start-up, operation, maintenance and repair. The notes and warnings must be observed and adhered to.

- Handling and all work must be carried out by expert personnel or all activities must be supervised and checked.

It is the owner's responsibility to define areas of responsibility and competence and to monitor the personnel.

- In addition, current regional safety requirements must be applied and observed when taking the fittings out of service as well as when maintaining and repairing them.

The manufacturer reserves the right to introduce technical modifications at any time.

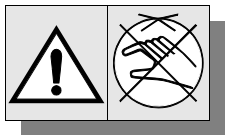
These Operating Instructions comply with the requirements of EU Directives.

2.0 Notes on possible dangers

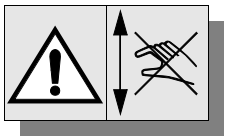
2.1 Significance of symbols

Warning of general danger.

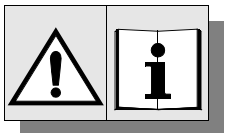
Warning of dangerous voltage.



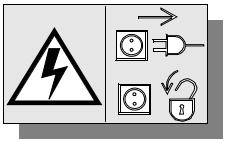
Exposed to injury!
Don't touch the turning handwheel when the motor is running.



Exposed to injury!
Don't put your hand into the up or downwards moving appliance.



Danger when not observing the operating and installation instructions!
Before installing, operating, maintenance or dismantling read and observe the instructions.



Danger though voltage!
Before dismantling the hood, switch of the electrical source and secure against turning on again.

2.2 Explanatory notes on safety information

In these Operating and Installation Instructions dangers, risks and items of safety information are highlighted to attract special attention.

Information marked with the above symbol and "***ATTENTION !*** " describe practices, a failure to comply with which can result in serious injury or danger of death for users or third parties or in material damage to the system or the environment. It is vital to comply with these practices and to monitor compliance.

All other information not specifically emphasised such as transport, installation, operating and maintenance instructions as well as technical data (in the operating instructions, product documentation and on the device itself) must also be complied with to the fullest extent in order to avoid faults which in turn can cause serious injury to persons or damage to property.

3.0 Storage and transport

ATTENTION !

- Valve mountings such as drives, handwheels, hoods must not be used to take external forces, e.g. they are not designed for use as climbing aids, or as connecting points for lifting gear.
Non-compliance may lead to death, injury or damage to property due to persons falling or parts being dropped.

- Suitable materials handling and lifting equipment should be used.
See "4.4 Technical data" for weights.

- At -20° to +70°C dry, free from dirt.
- Do not unpack thrust drive or setting equipment assembly prior to installation.
- Protect against external force (impact, vibration etc.).
- Do not soil or damage type identification plate and wiring diagram on the controller.

4.0 Description

4.1 Field of application

ARI-PREMIO® linear thrust actuators are employed to actuate control or shut-off valves requiring a nominal linear stroke distance of up to 80 mm and thrust from 2.2 kN to 15 kN. The thrust actuators are set to the thrust forces specified in the technical data. If supplied with the valve, the lift of the thrust actuator will be set to the stroke distance of the valve.
Selection of the proper actuator version in alignment with the corresponding fitting as well as use of the thrust actuator in accordance with the specified technical data is the responsibility of the systems engineer.
See data sheet for areas of application, application limits and potential.
Any use of the thrust actuator beyond the specified technical data or improper use of the actuator is deemed to be not for the intended purpose.

The ambient conditions have to be conform to the actual electromagnetic compatibility directives. Additional the compatibility to this directives has to be maintained in case of expansion or other changing of the ambient conditions.

4.2 Method of functioning

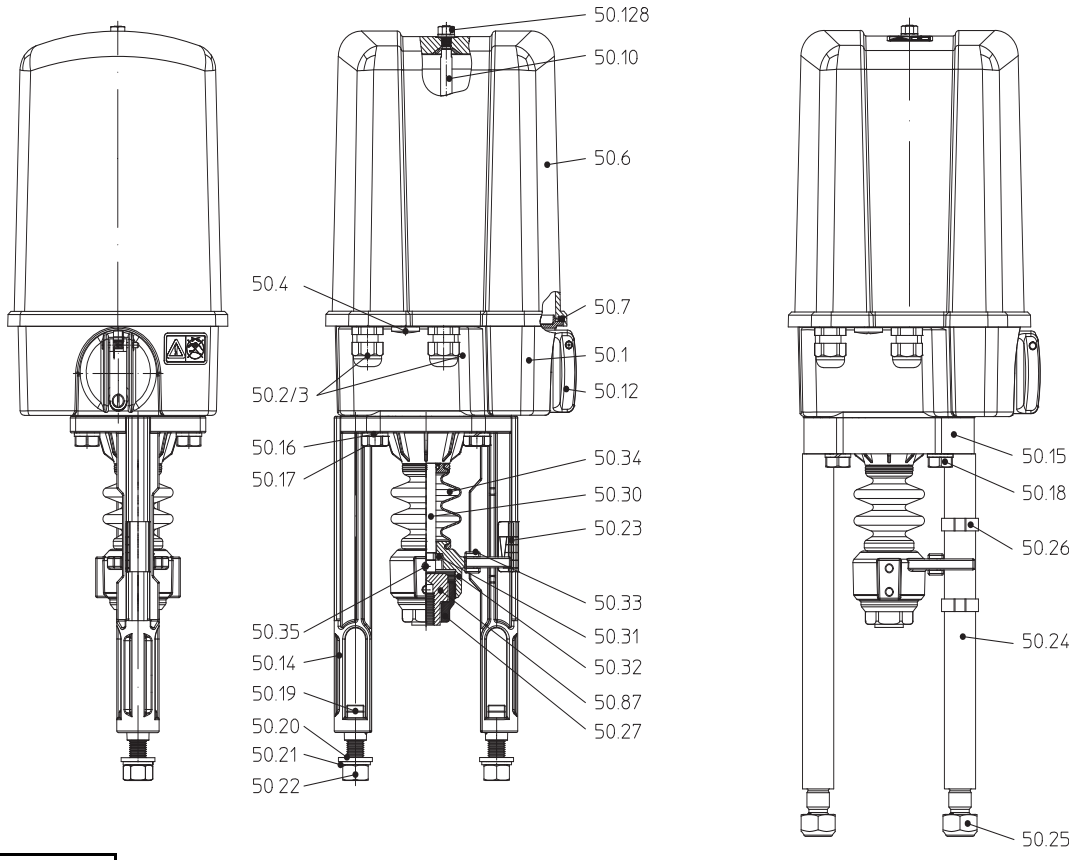
The thrust actuator, fitted with a yoke or columns, is mounted to the valve.
Transfer of force is effected via a coupling safeguarded against torsion.
The torsion safeguarding feature also serves as a lift indicator.
The lift settings can be read off on a lift dial attached to the yoke or between the 2-ear clamps mounted to the column.

The electrical components are accommodated separately from the gearbox underneath a sealed hood, thus being protected against operating and environmental effects.
Following removal of the hood, easy access is provided to the switchgear and indicating feature.
The rotary motion of the motor is transmitted to the spindle nut by means of spur gear.
The drive spindle, which is safeguarded against torsion, screws its way into the spindle nut and thus performs a pull or push motion depending on the sense of rotation.
In the final positions of the valve, the spindle nut is pressed against a set of springs so as to produce closing force.
The motor is switched-off by means of two load-dependent switches and one stroke-dependent switch. For the function of the stroke-dependent travel switch (S3), an optionally available trip slide is necessary. The load-dependent switches will also switch-off the motor if foreign bodies have lodged themselves between the valve seat and cone.
The load-dependent switches serve to protect the valve and thrust actuator against damage.

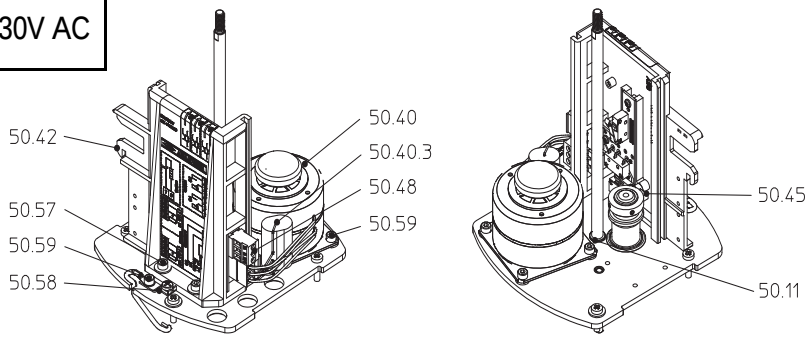
4.3 Diagram

4.3.1 ARI-PREMIO® 2,2 - 5 kN

Yoke Version **Column Version**



Synchronous motor
115V AC - 230V AC



BLDC motor
24V AC/DC

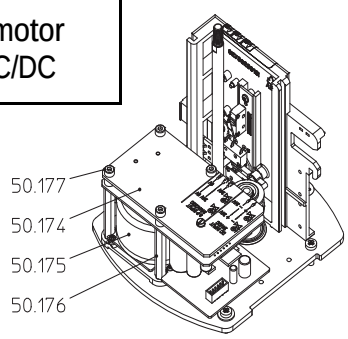
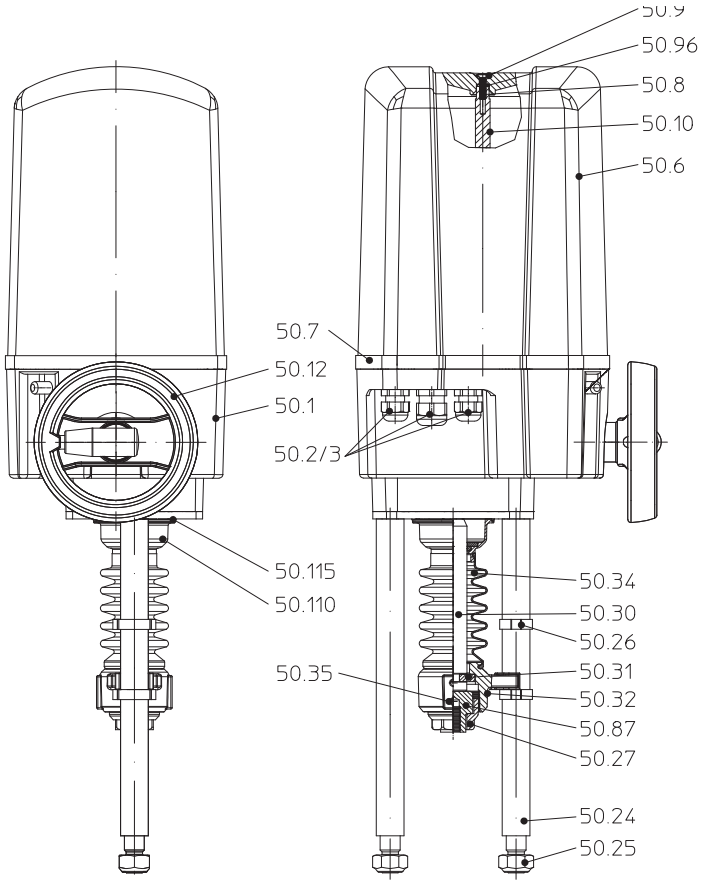
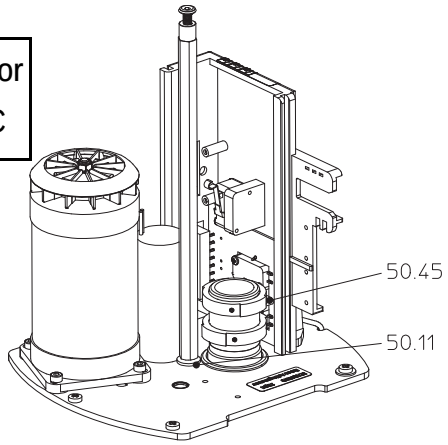


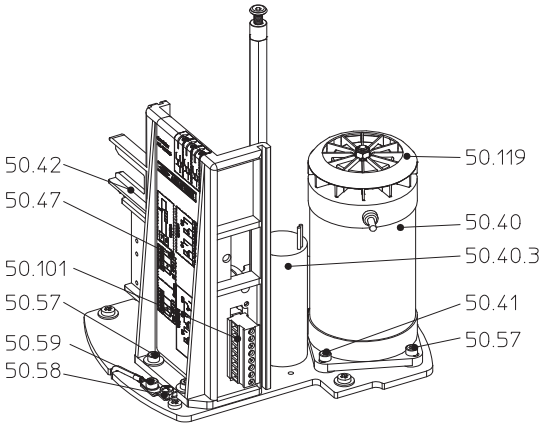
Fig. 1

4.3.2 ARI-PREMIO® 12 - 15 kN



Synchronous motor
115V AC - 230V AC





BLDC motor
24V AC/DC

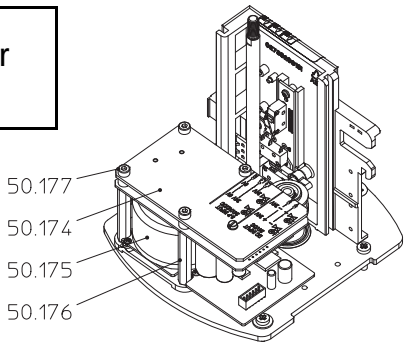


Fig. 2

4.3.3 Parts list

Pos.	Designation
50.1	Gearbox
50.1.1	Gearbox cover plate
50.2/3	Cable gland 2 x M16x1,5 / 1 x M20x1,5
50.4	Sealing plug 1 x M16x1,5
50.6	Hood
50.7	Hood seal
50.8	Counter-sunk screw DIN EN ISO 10642 - M5x20
50.9	Sealing washer DIN EN ISO 7089 -5,3
50.10	Column
50.11	Conical spring washer
50.12	Handwheel
50.12.1	Turning handle of handwheel
50.14	Yoke
50.15	Flange
50.16	Spring washer DIN 128-A10
50.17	Hexagon head screw DIN EN ISO 4017 - M10x40
50.18	Hexagon head screw DIN EN 4017-M10x55
50.19	T-head bolt DIN 261-M12x40
50.20	Washer DIN EN ISO 7089
50.21	Spring washer DIN 128-A12
50.22	Hexagon nut DIN EN ISO 4032 - M12
50.23	Lift dial
50.24	Distance column
50.25	Hexagon nut DIN EN ISO 7042 - V-M16
50.26	2-ear clamp (stroke indicator)
50.27	Coupling
50.30	Driving spindle
50.31	Spindle safety feature
50.32	Torsion safety feature

Pos.	Designation
50.33	Bellow
50.34	Grub screw DIN ISO 4766 - M6
50.35	Set collar
50.36	Grub screw DIN 913-M3x5
50.37	Synchronous motor, complete
50.40	Motor capacitor
50.40.3	Head cap screw DIN EN ISO 4762-M4 - 18
50.41	Board support
50.42	Standard board
50.43	Directional switch (valve – up) S3
50.43.1	Torque switch
50.43.2	Bellow
50.44	Self-tapping screw
50.45	Shift lever
50.46	Washer
50.47	Wiring diagram sticker, standard
50.48	Connector, 3-pole (standard)
50.57	Head cap screw DIN EN ISO 4762 - M4x10
50.58	Protective conductor terminal
50.59	Head cap screw DIN EN ISO 4762 - M4x6
50.87	Threaded bush
50.96	O-ring DIN 3771 – 4 x 1.8
50.101	Connector, 8-pole
50.110	Gear cap
50.115	O-ring DIN 3771 - 52x2.5
50.119	Fan wheel
50.128	Flange nut Seal lock M6
50.174	AC/DC board
50.175	BLDC motor
50.176	Distance bolt M4x45
50.177	Head cap screw M4x18

4.4 Technical data

Type		ARI-PREMIO®					
Thrust force	kN	**2,2**	**5,0**		**12,0**		**15,0**
Control speed	mm/sec.	0,38	0,38	1,0	0,38	0,79	0,38
Stroke distance max.	mm	50			80		
Duty classification acc. to EN 60034-1		S3 80% ED / max.1200 c/h		S3 50% ED / max. 1200 c/h			
Supply voltage		230V - 50Hz / 60Hz [1]			230V - 50Hz		
Motor type		Synchronous motor					
Power consumption	W	21	33	75	69	85	69
		For power consumption of other voltages and frequencies refer to type plate or on request.					
Torque switch		2 pcs., permanently wired, switching capacity 10A, 250V~			2 pcs., permanently wired switching capacity 16A, 250V~		
Travel switch [2]		1 pcs., permanently wired, switching capacity 10A, 250V~			1 pcs., permanently wired switching capacity 16A, 250V~		
Enclosure EN 60529		IP 65					
Max. storage temperature		-40 °C ... +85 °C					
Max. permissible ambient temperature		-20 °C ... +70 °C					
		For operation outside or at freezing temperature a heating is recommended.					
Handwheel		Yes (rotating during operation)			Yes (engageable)		
Operation		3-step					
Max. cable cross section		3-step input: 2,5 mm2					
Mounting position		Any. Exception: motor must not be suspended downwards					
Gear lubricant		Klüber Isoflex Topas NB152			Molyduval Valenzia H2		
Weight	kg	5,4	6,0	6,5	10,5		

[1] Control speed and power consumption are 20% higher at frequency of 60 Hz

[2] Option trip slide necessary

Additional voltages / frequencies

Synchronous motor

Type		ARI-PREMIO®					
Thrust force	kN	**2,2**	**5,0**		**12,0**		**15,0**
Control speed	mm/s	0,38	0,38	1,0	0,38	0,79	0,38
Supply voltage	V - Hz	115 V - 50/60 Hz [1)] 3~400 V - 50/60 Hz [1)]		115V - 50/ 60Hz [1)] 3~400V - 50/60Hz [1)]	115V - 50Hz / 115V - 60Hz [1)] 230V - 60Hz [1)] 3~400 V - 50 Hz / 3~400 V - 60 Hz [1)]		
Duty classification acc. to EN 60034-1		115V - 230 V: S3 80% ED / max. 1200 c/h 400 V: S3 50% ED / max. 1200 c/h		S3 50% ED / max. 1200 c/h			
Power consumption		refer to type plate or on request					

BLDC-Motor (Brushless DC motor)

Type		ARI-PREMIO®					
Thrust force	kN	**2,2 kN**	**5,0 kN**		**12,0 kN**		**15,0 kN**
Control speed	mm/s	0,38	0,38	1,0	0,38	0,79	0,38
Supply voltage	V - Hz	24 V - AC / DC (further information refer to point 5.5.12 AC/DC-Version)					
Duty classification acc. to EN 60034-1		S3 80% ED / max. 1200 c/h					
Power consumption	VA max.	53	53	72	60	72	60

[1)] Control speed and power consumption are 20% higher at frequency of 60 Hz

Accessories

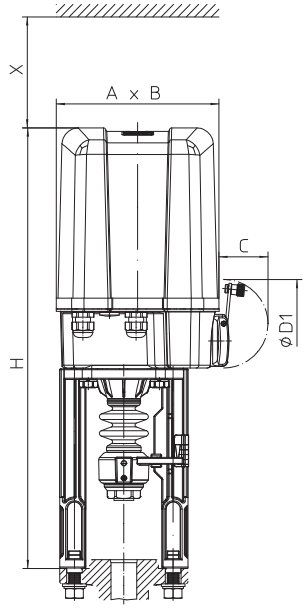
Type		ARI-PREMIO® 2,2 kN - 15 kN	
Trip slide		Necessary for operation: - for actuating travel switch S3 / retracting spindle (the travel switch S3 exists already in the standard version of the actuator) - for potentiometer - for additional position switches S4 / S5	
Options trip slide necessary	**Additional intermediate position switches** S4, S5 [3)]	**Type Standard**	- 2 pcs., zero potential, switching capacity 10A, 250V~
		Type low voltage	- 2 pcs., zero potential, with gold contacts, switching capacity max. 0,1A, 4-30V
	Potentiometer	**Conductive plastic** (max. 2 only)	- 1000, 2000, 5000 Ohm; 1 Watt Wiper current < 10mA
		Wire (max. 2 only)	- 100, 200 Ohm; 0,5 Watt Wiper current < 35mA
		TÜV-approved potentiometer (max. 2 only)	- TÜV tested conductive plastic for use as a sensor for position feedback of control devices in electronic systems for controlling and monitoring of fuel, air and gas streams in combustion plants - 5000 Ohm - or on request: 100, 200, 1000 Ohm; 1 Watt; Wiper current < 10mA - No retrofitting possible!

Options trip slide necessary	**Electronic position controller** (for controling the actuator with an analog control signal)	**Type ES11**	- Input signals 0(2)...10V oder 0 (4)...20mA; galvanically separation between power supply and control signal - incl. potentiometers (note max. number of potentiometers)
		Type ARI-PREMIO®-Plus 2G (refer to seperate data sheet / operating instructions)	- Input signals: 3-Punkt, 0-10V oder 4-20mA; - self-adaptation; - optional position feedback; - galvanically separation between power supply and control signal
	Electronic position indicator (for position feedback with an analog control signal)	**RI21** (only for AC)	- analogue output for position feedback 0(4)...20mA changeable to 0(2)-10V, invertable; galvanically separation between power supply and control signal - active - incl. potentiometers (note max. number of potentiometers)
		RI32	- analogue output for position feedback 2... 10V; 4... 20 mA - compact design; 2 (passive) or 4 wire technology (active) - Power supply: 24V AC/DC - incl. potentiometers (note max. number of potentiometers)
Heating		**Heating resistor**	- (automatic switching circuit) 230 V AC, 115V AC, 24V AC/DC, 15 Watt
Connection board 2 Torque- and 1 Travel switch, all switch contacts are guided on terminals [3)]		**Type Standard PA**	- zero potential, switching capacity 10A, 250V~ - (At 12/15kN already possible with the standard version)
		Type low voltage NA	- zero potential, with gold contacts, switching capacity max. 0,1A, 4-30V
(Process-) controller		**Type Processcontroller dTRON 316** (only for AC)	- Mounted in the actuator - 3-point stepping controller with 2 solid state relay outputs outputs for direct control of the ARI-PREMIO® actuators with a 3-point signal - for resistance thermometers and thermocouples (**provided by the customer**) or standard signals, - Pre-configured for temperature control: control range from -200°C up to +850°C (resistance thermometer) - Not compatible with the ES11!

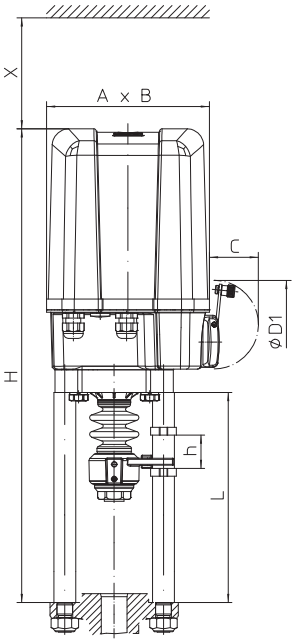
[3)] For low switching capacities and at aggressive atmosphere gold contacts should be used

Special voltage 24 V AC/DC	
Board support for pole-changing at 24V DC	- For the control of the BLDC motor with pole-changing (2-wire technology) - By reversing the polarity of the supply voltage, the motor rotation direction is changed (ON/ OFF)
Special voltage 3~ 400 V	
Integrated reversing contactor	- Only 1 electronic module possible! - At 2,2 kN - 5kN is no electronic in the actuator possible

4.5 Dimensions

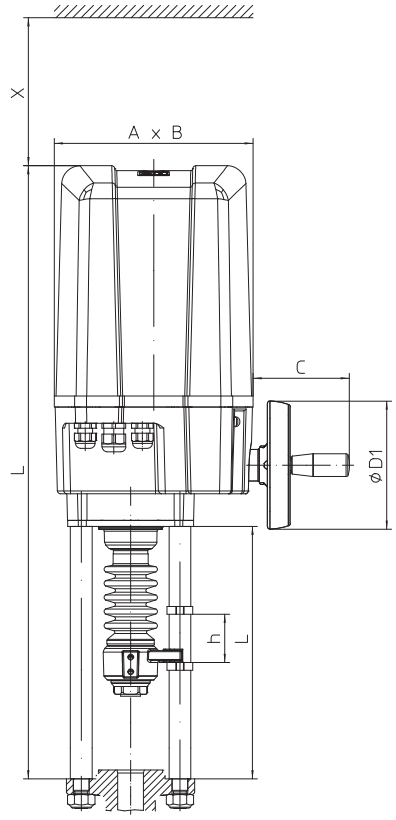


2,2 - 5 kN
Nominal stroke
max. 30 mm



2,2 - 5 kN
Nominal stroke
> 30 mm - 50 mm

		2,2 - 5 kN	
A	(mm)	171	
B	(mm)	156	
C	(mm)	50	
Ø D1	(mm)	90	
X	(mm)	150	
H	(mm)	447	480
h (Nominal stroke)	(mm)	max. 30	max. 50
L (Column)	(mm)	--	199



12 - 15 kN
Nominal stroke
max. 80 mm

		12 - 15 kN		
A	(mm)	210		
B	(mm)	184		
C	(mm)	97		
Ø D1	(mm)	130		
X	(mm)	200		
H	(mm)	622	637	652
h (Nominal stroke)	(mm)	max. 50	max. 65	max. 80
L (Column)	(mm)	234	249	264

Fig. 3

5.0 Installation

ATTENTION !

- Work on electrical systems or equipment must only be carried out by qualified electricians or by trained individuals under the guidance and supervision of a qualified electrician in compliance with regional electrical safety requirements and regulations.

- Valve mountings such as drives, handwheels, hoods must not be used to take external forces, e.g. they are not designed for use as climbing aids, or as connecting points for lifting gear.
Non-compliance may lead to death, injury or damage to property due to persons falling or parts being dropped.

- Actuator components which rotate or move during operation are coloured red. Crushing and injury hazard!

5.1 General installation data

In addition to general installation guidelines, the following points are required to be observed:

- Planners / construction firms and operators are responsible for positioning and installing the products

ATTENTION !

- A voltage is induced in the thrust actuator motor. This induction voltage may be higher than the operating voltage.

- For this reason relays and electronic load relays for thrust actuator control require a protective circuit. The contacts of unprotected relays may stick after a while.

- This may result in reversed directions of rotation or defective switch-off

Recommended safety circuit for relays and electronic load relays:
Connect a varistor or RC module parallel to each relay point.
Varistor S10K385 to S10K460
RC module 100 Ohm / 100nF

Where relay points and electronic load relays are **particularly sensitive** a coil should be connected in series additionally to each relay point

Recommended coil:
Toroidal coil 2mH / 2A

- Contactors of 16A and upwards do not need a safety circuit.
- Check thrust actuator for damage prior to fitting.
  Damaged parts must be replaced by original spares
- Existing operating instructions for valve
- Complete valve with crossarm.
- Valve cone approximately in mid lift position - on no account supported inside a seat!
- Electrical installation in accordance with current regional regulations.
- Conductor cross-section selected to correspond to the given drive power and existing line length.
- Mains fuse rating max. 6A.
- Circuit breakers in the plant to cut off the mains supply to the actuator.
- Conformity of technical data on thrust actuator with field conditions.
- Mains voltage in accordance with data specified on rating plate of thrust actuator.
- Thrust actuator complete with yoke or distance columns and coupling parts intended for mounting to the corresponding valve.

- Ease of access to installation site.
- Adequate clearance space above the thrust actuator for removing the hood (refer to point 4.5 Dimensions).
- Install where there is protection against high-energy heat radiation.
- The ambient temperature must be between -20°C and +70°C.
- If several 3-point actuators with a single-phase capacitor motor are to be operated via a control contact (actuators connected in parallel), they must be electrically isolated from one another (e.g. with cut-off relays).

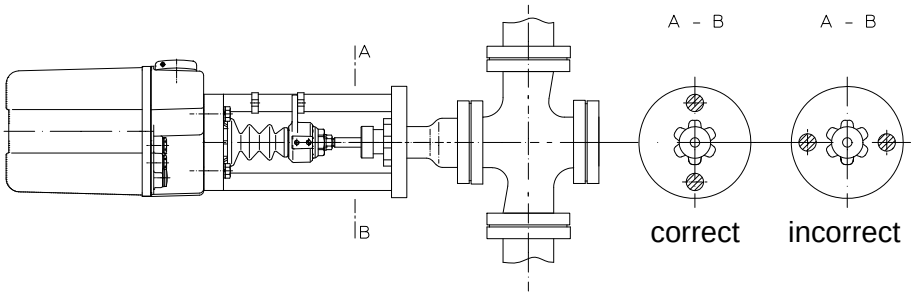
If installed outdoors, the thrust actuator must be provided with an additional cover to protect against:

- rain
- direct insulation
- dust.

In case of widely fluctuating ambient temperatures, high atmospheric humidity and temperatures below the freezing point, your are recommended to install a heating resistor to minimise condensation buildup in the actuator.

- Thrust actuator mountable in any position except in downward suspended position.

If installed with a horizontal connecting rod, the thrust actuator must be mounted so both yoke legs or columns are on top of one another in the vertical plane (see Fig. 4).



ATTENTION !

ARI-PREMIO®/-Plus 9kN with fail-safe function must be supported!

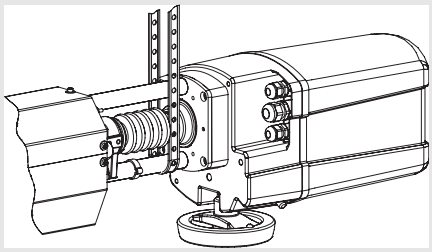


Fig. 4

5.2 Manual operation

5.2.1 ARI-PREMIO® 2,2 - 5 kN

ATTENTION !

- The handwheel always rotates during motor-driven operation (running indicator). Never activate manual operation while the motor is running. Injury hazard!

- In the manual operating mode pay careful attention in the final positions that the handwheel is only turned to the point where the torque switch trips (audible click) as otherwise damage will be caused to the thrust actuator! Since the handwheel always follows during motor-driven operation (running indication), never operate by hand while the motor is running - potential injury hazards!

With the motor in the stationary state, the thrust actuator can be run in the retracted and extended state with the handwheel firmly meshed with the gear.

Proceed as follows:

- Swing out lever (pos. 50.12.1) from handwheel (Pos. 50.12).
- Turning in clockwise direction --> extending spindle.
- Turning in counter-clockwise direction --> retracting spindle.

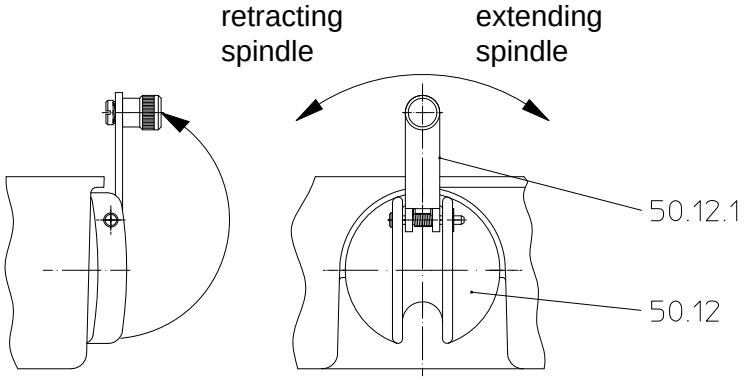


Fig. 5

5.2.2 ARI-PREMIO® 12 - 15 kN

ATTENTION !

- Do not attempt to engage manual operation until the motor has stopped. Switching over while the motor is running may damage the thrust actuator.

- In the manual operating mode pay careful attention in the final positions that the handwheel is only turned to the point where the torque switch trips (audible click) as otherwise damage will be caused to the thrust actuator!

With the motor in the stationary state, the thrust actuator can be run in the retracted and extended state with the engageable handwheel.

Proceed as follows:

- Fold the turning handle out of the handwheel (A)
- Turn the handwheel slightly and push in the engaging button for manual mode (B)
  --> the button engages
- Turning in clockwise direction --> extending spindle
- Turning in counter-clockwise direction --> retracting spindle

The motor is no longer in mesh when the handwheel is engaged. The handwheel is automatically disengaged when the motor starts and the motor is once more in mesh

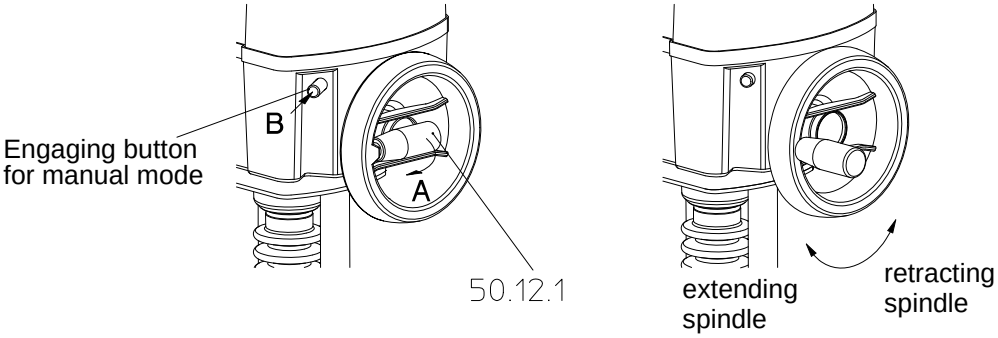
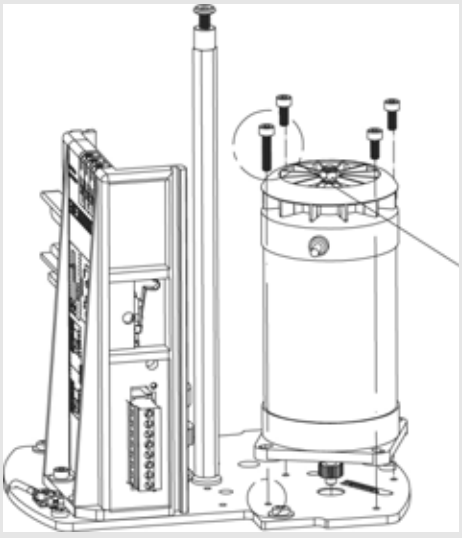


Fig. 6



ATTENTION !

When changing the motor, it's necessary to observe for a correct function of the manual operating device, that the head-cap screw M4x18 is screwed in the right place.

5.3 Installation instructions for mounting to valves

5.3.1 Mounting for valve-lift up to 30 mm (yoke version)

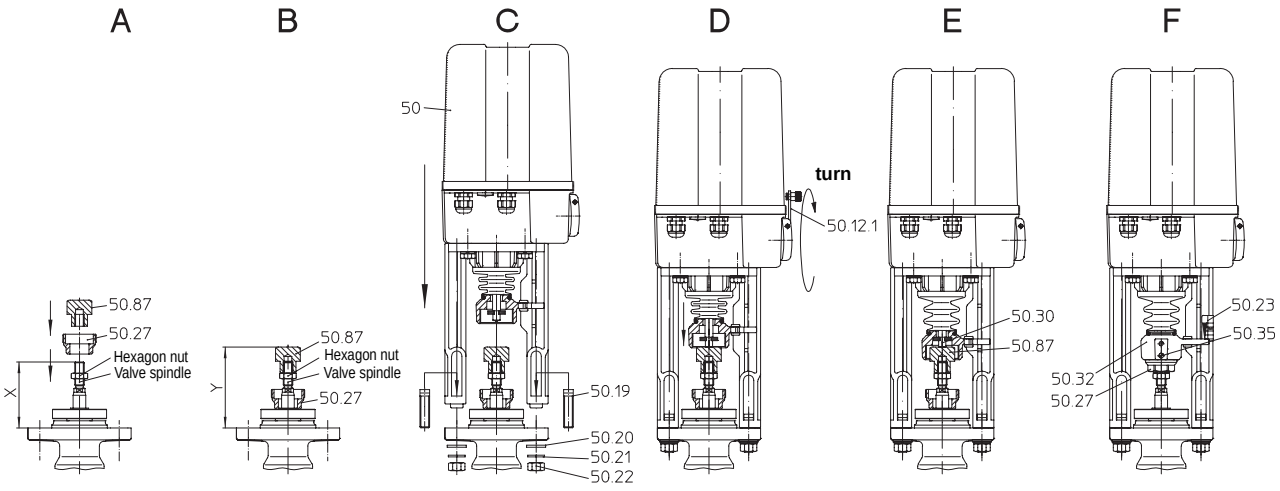


Fig. 7

To mount the thrust actuator to a valve having a nominal lift of up to 30mm, proceed as follows:

- Screw coupling (pos. 50.27) out of torsion safety feature (pos. 50.32) of thrust actuator (pos. not illustrated).
- Position valve cone approximately in mid lift position.

Fig. A:
- Turn flat hexagon nut if not present on valve spindle.

Fig. A-B:
- Slip coupling (pos. 50.27) over valve spindle.
- Screw threaded bush (pos. 50.87) matching the valve onto the valve spindle in accordance with setting dimension (Y) and lock with hexagon nut.

> ***ATTENTION !***
>
> *Setting dimension (Y) and fitting-projection (X) are measured with inserted valve spindle. This means for*
>
> *- 2-way valves at closed valve,*
>
> *- 3-way valves with mixing plug at closed way B,*
>
> *- 3-way valves with diverting plug at closed way A*
>
> *After measuring put the valve plug back in the mid lift position!*

- Setting dimension (Y) for fitting-projection (X) 60 and 83mm = 102mm.

Fig. C:
- Place thrust actuator (pos. 50) on valve.
- Mount thrust actuator (pos. 50) on fitting with two T-head bolts (pos. 50.19), two washers (pos. 50.20), two spring washers (pos. 50.21), two hexagon nuts (pos. 50.22).

Fig. D/E:
- Swing out handwheel lever (pos. 50.12.1) and use it to move out the thrust actuator until the driving spindle (pos. 50.30) comes to rest on the threaded bush (pos. 50.87).

Fig. F:

- Screw the coupling (pos. 50.27) firmly into the torsion safety feature (pos. 50.32) and secure in place using grub screw M6 (pos. 50.35).
- Run valve to lowest position.
- Clip lift dial (pos. 50.23) onto yoke in such a way that top edge of torsion safety feature is in alignment with tip of arrow mark on lift dial.
- Run valve to both final positions and check to ensure that these are safely reached.
- Carry out electrical connection (see point 5.4).
- Set travel switch S3 (see point 5.5.3.2)

5.3.2 Mounting for valve lift over 30 mm to 80 mm (column version)

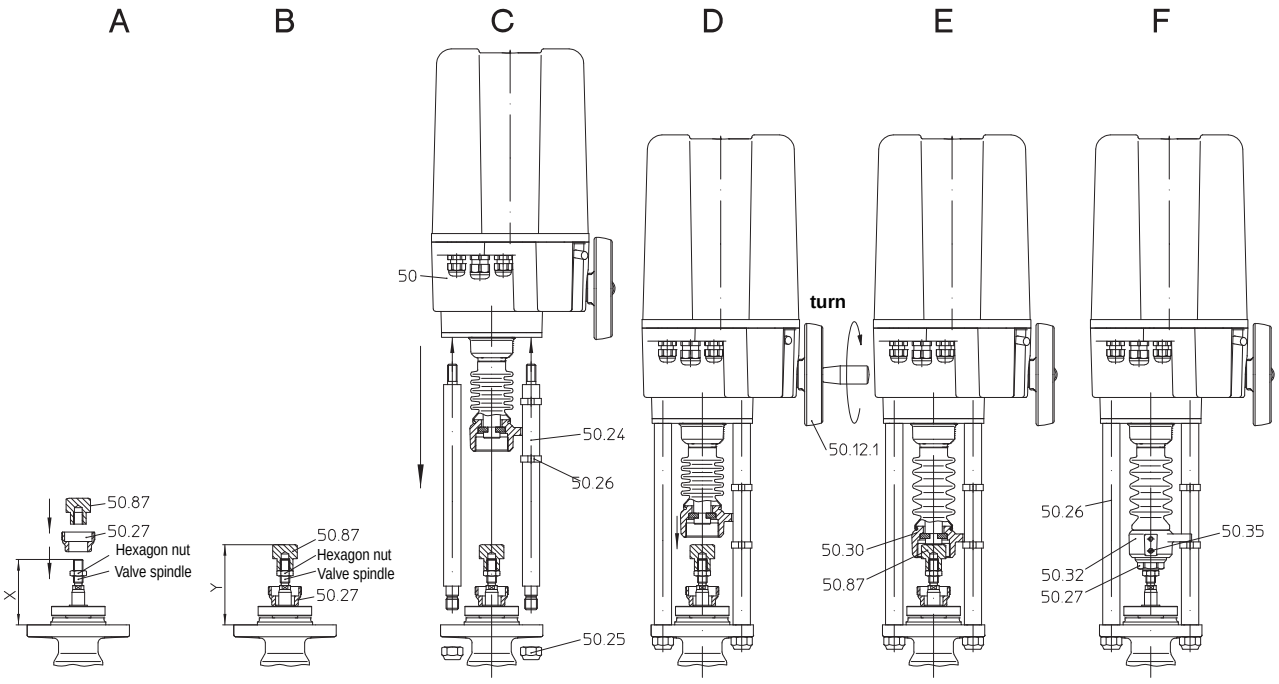


Fig. 8

To mount the thrust actuator to a valve having a nominal lift of over 30mm to 50mm, proceed as follows:

- Screw coupling (pos. 50.27) out of torsion safety feature (pos. 50.32) of thrust actuator (not illustrated).
- Position valve cone approximately in mid lift position.

Fig. A: - Turn flat hexagon nut if not present on valve spindle.

Fig. A-B: - Slip coupling (pos. 50.27) over valve spindle.

- Screw threaded bush (pos. 50.87) matching the valve onto the valve spindle in accordance with setting dimension (Y) and lock with hexagon nut

> ***ATTENTION !***
> *Setting dimension (Y) and fitting-projection (X) are measured with inserted valve spindle. This means for*
> *- 2-way valves at closed valve,*
> *- 3-way valves with mixing plug at closed way B,*
> *- 3-way valves with diverting plug at closed way A*
> *After measuring put the valve plug back in the mid lift position!*

- Setting dimension (Y) for fitting-projection (X) 83mm = 102mm.
- Setting dimension (Y) for fitting-projection (X) 98mm = 116mm.

Fig. C:
- Slip 2-ear clamp (pos. 50.26) onto a distance column (pos. 50.24) press on very lightly.
- Screw distance column with 2-ear clamps on opposite side of handwheel into the flange in such a way that one of the 2-ear clamps is situated above the torsion safety feature (pos. 50.32) and the other below.
- Screw the other distance column into the flange likewise.
- Place thrust actuator (pos. 50) with distance columns onto valve and fix into position with two self-locking hexagon nuts (pos. 50.25).

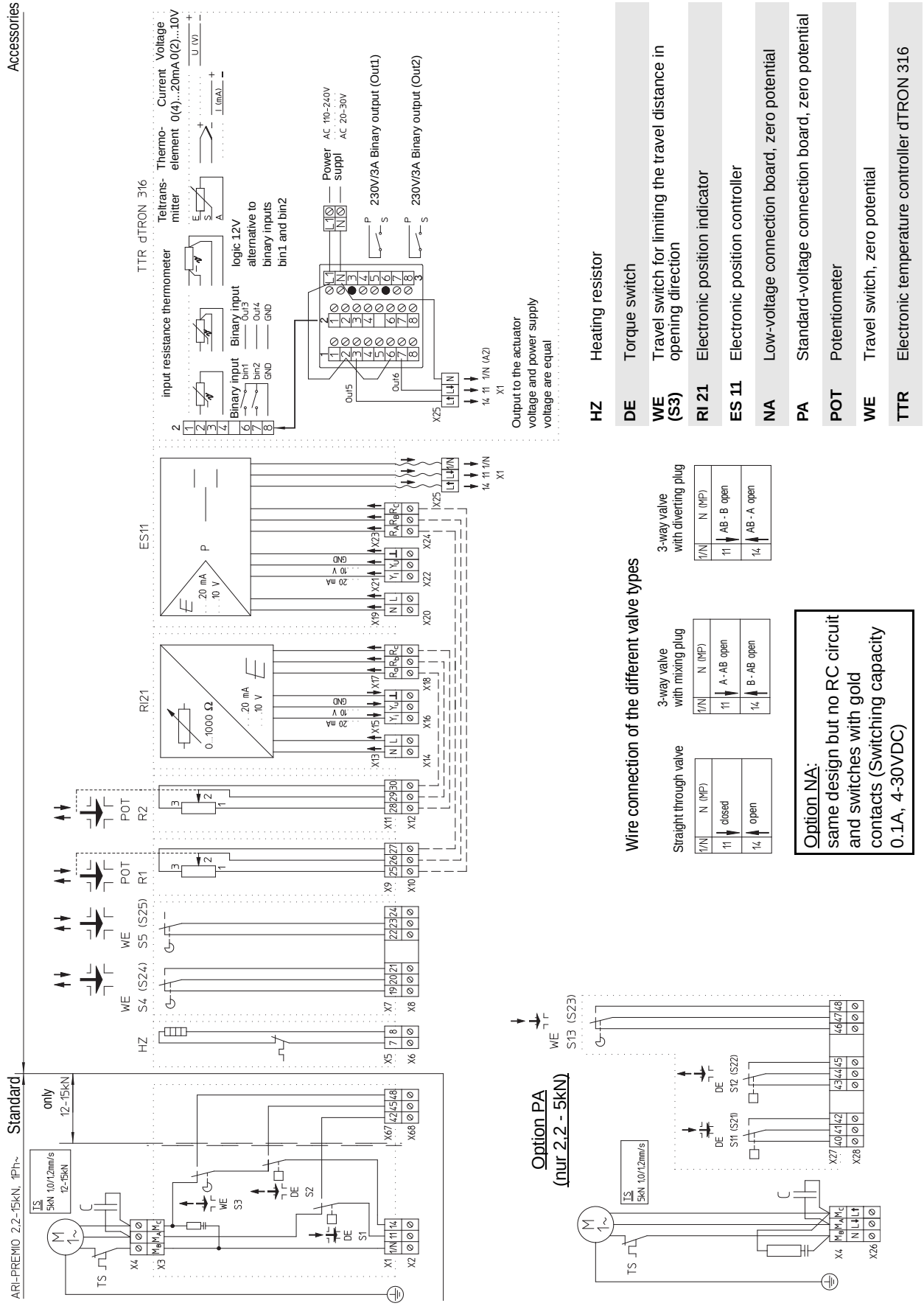
Fig. D/E:
- Fold out turning handle of handwheel (pos. 50.12.1), slightly turn the handwheel and press in the engaging button for manual mode (only 12 - 15 kN) (button engages). Having done this, move out the thrust actuator until driving spindle (pos. 50.30) comes into contact with threaded bush (pos. 50.87).

Fig. F:
- Screw coupling (pos. 50.27) firmly into torsion safety feature (pos. 50.32) and secure using grub screw M6 (pos. 50.35).
- Move the valve to the lowest position.
- Press 2-ear clamps (pos. 50.26) into position according to the stroke so they cannot slip, with the bottom clamp in the lowest valve position located directly below torsion safety feature (pos. 50.32) and the top clamp in the highest valve position located directly above the torsion safety feature.
- Move the valve to both travel positions and check that it reaches them reliably.
- Fold turning handle of handwheel (pos. 50.12.1) back in.
- Make the electrical connection (see point 5.4) . The engaging button for manual mode (only 12 - 15 kN) disengages when the motor starts up.
- Set standard travel switch S3 (see point 5.5.3.2).

5.4 Electrical connection

5.4.1 Wiring diagram ARI-PREMIO® 2,2 - 15 kN 1Ph~

5.4.1.1 ARI-PREMIO® 2,2 - 15 kN Standard



HZ	Heating resistor
DE	Torque switch
WE (S3)	Travel switch for limiting the travel distance in opening direction
RI 21	Electronic position indicator
ES 11	Electronic position controller
NA	Low-voltage connection board, zero potential
PA	Standard-voltage connection board, zero potential
POT	Potentiometer
WE	Travel switch, zero potential
TTR	Electronic temperature controller dTRON 316

Fig. 9

5.4.1.2 ARI-PREMIO® 2,2 - 15 kN 24V AC/DC / 24V DC pole-changing

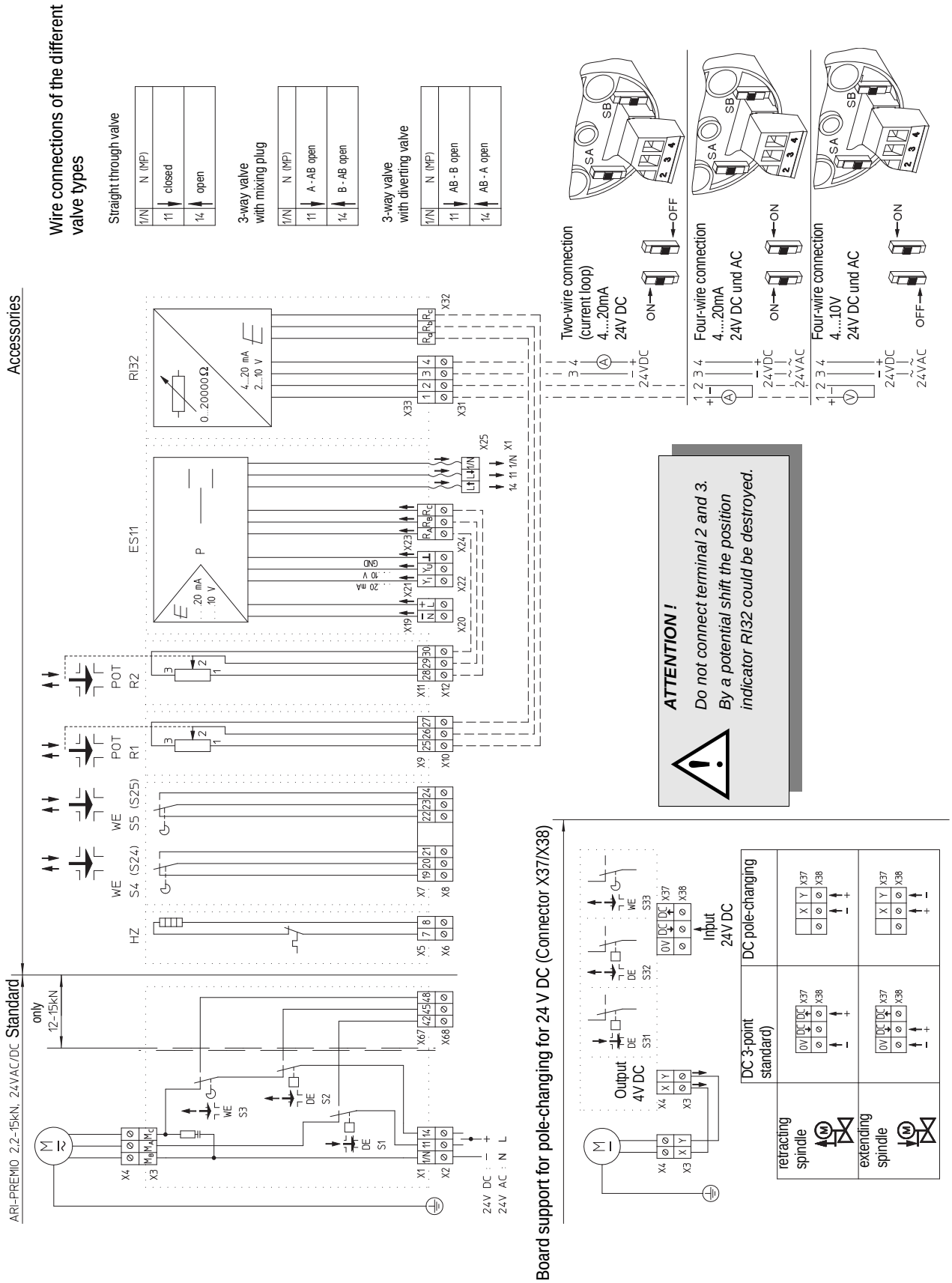


Fig. 10

5.4.2 Wiring diagram ARI-PREMIO® 2,2 - 15 kN 3Ph~

5.4.2.1 ARI-PREMIO® 12 - 15 kN 3 Ph~ with reversing contactor / external reversing contactor

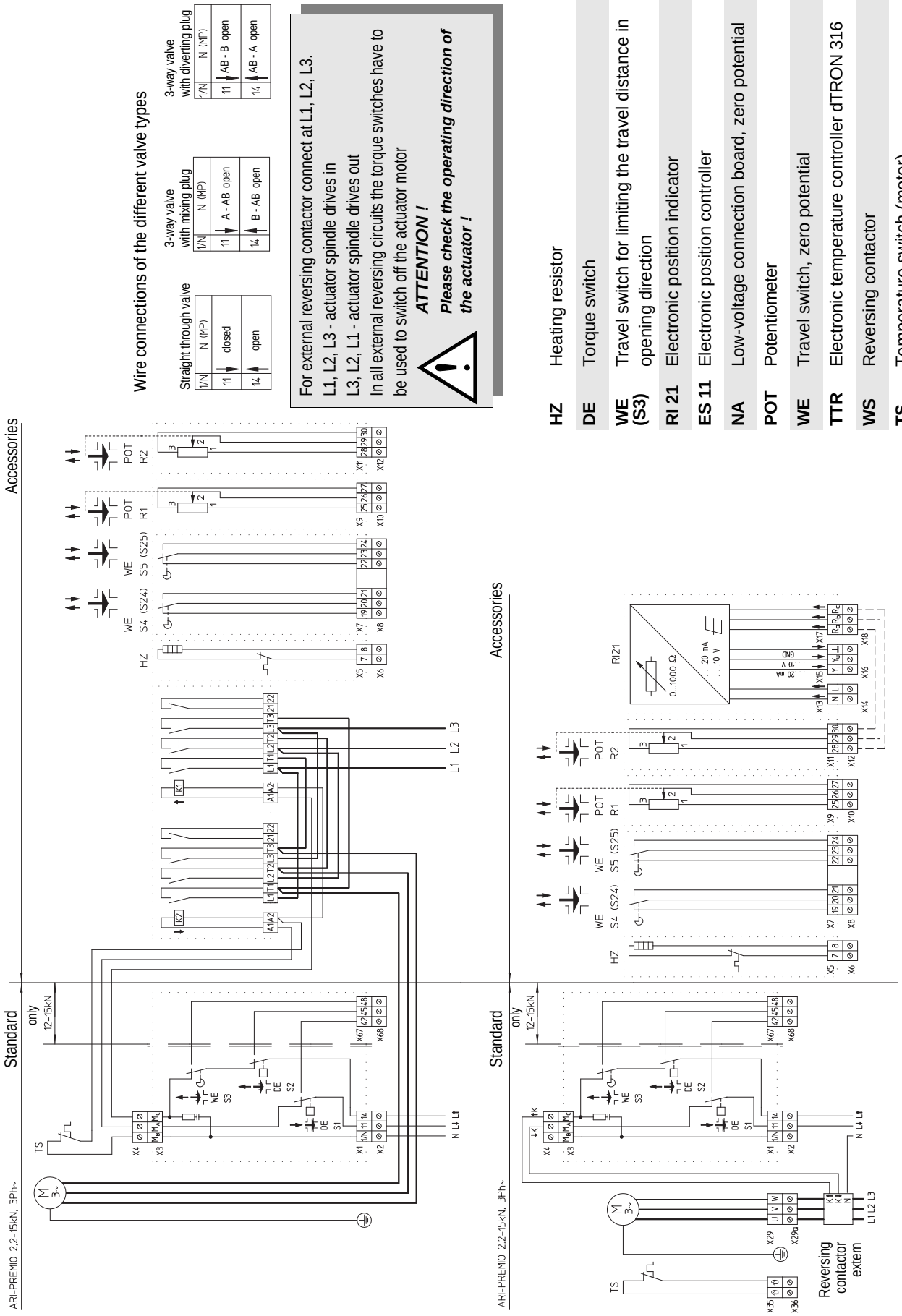


Fig. 11

5.4.3 Connection

ATTENTION !

- Work on electrical systems or equipment must only be carried out by qualified electricians or by trained individuals under the guidance and supervision of a qualified electrician in compliance with regional electrical requirement and regulations.

- When connecting the thrust actuator the supply line must be disconnected from the mains (not live) during connection work. It must be impossible to switch the power on unintentionally while the mains are disconnected in this way. Failure to comply may result in death, serious injury or substantial damage to property.

To connect the thrust actuator up to the electrical power supply, proceed as follows:

- Run the thrust actuator a few mm out of the lower final position applying the manual mode.
- Loosen collar nut / countersunk screw on hood, carefully remove hood in upward direction.
- Remove blind plug fom the cable connection.
- Insert the connection line through this cable inlet until sufficient conductor length is available up to the corresponding terminals; then tighten the cable connection until the connecting cable is clamped in place inside it.
- Strip connecting cable approx. 1-1.5 cm above cable inlet.
- Strip the individual conductors approx. 5mm away from the end and fit with conductor end sleeves.
- Connect protective conductor of connecting cable up to protective conductor terminal of thrust actuator.
- Connect neutral N/MP conductor of connecting cable up to terminal 1/N of thrust-actuator terminal strip.
- Connect pulse line for move-out connecting rod up to terminal 11 of thrust-actuator terminal strip.
- Connect pulse line for move-in connecting rod up to terminal 14 of thrust-actuator terminal strip.
- Place hood on carefully from above and mount firmly onto thrust actuator with collar nut / countersunk screw and rubber gasket.
- Connect supply line to mains and run thrust actuator to each of the final positions so as to check whether the final-position travel switches effect switching off, also checking to see whether the direction of movement on the thrust actuator corresponds to the desired direction.
- If the directions of movement are contrary to those desired, the pulse lines governing the move-in and move-out connecting rod will need to be exchanged.

5.5 Options and settings

ATTENTION !

- The thrust actuator may only be operated for a short time without the hood for unavoidable setting operations to the potentiometers, travel switches and the electrical options. While these operations are in progress, the thrust actuator has hazardous, live, uninsulated parts exposed as well as moving and rotating parts.

- Improper execution of the setting operations or lack of care may cause death, grievous bodily injury or substantial property damage.

- Operation of the thrust actuator without the hood for any purpose other than that described above is strictly prohibited.

5.5.1 Torque and travel switches

The thrust actuators are equipped with a load-dependent travel switch for the retracting direction (S1), a load-dependent travel switch for the extending direction (S2) and a stroke-dependent travel switch for the retracting direction (S3).
The load-dependent travel switches (S1, S2) switch-off the motor as soon as the factory-set thrust force is attained.

ATTENTION !

- The settings of the load-dependent travel switches must on no account whatsoever be changed!

- For the function of the stroke-dependent travel switch (S3), an optionally available trip slide is necessary.

The stroke-dependent travel switch (S3) switches off the motor as soon as the lift or stroke is attained. If the thrust actuator is supplied on a straight through valve, the stroke-dependent travel switch S3 is set in such a way that the motor of the thrust actuator is switched off as soon as the maximum valve-lift is attained.
If the thrust actuator is supplied on a three-way valve, the trip cam belonging to travel switch S3 is set in the retracting direction in the trip slide to such a downward extent that the upper final position of the valve is attained prior to travel switch S3 being reached, thus causing the load-dependent travel switch S2 to switch-off the motor.
For this function, all three switches reveal interlock-controlled circuitry on the board.
If the standard travel switches are to be integrated directly into the facility control system, the standard board can be replaced by optional boards PA or NA (only 2.2-5kN).

5.5.2 Connection boards PA (only 2,2 - 5 kN) or NA (2,2 - 15 kN)

On connection boards PA or NA, the standard travel switches S11/S21, S12/S22 and S13/S23 do not reveal interlock-controlled circuitry and can be integrated individually into the facility control system.
The 3 contacts on each of the switches S11/S21, S12/S22 and S13/S23, designed as double-throw contacts, are - in the case of these boards - brought out on terminals 40-48 and can be freely connected.
The switches on the PA optional board (standard-voltage connection board) are designed for switching capacities of up to 10A, 250V AC.
The switches on the NA optional board (low-voltage connection board) are designed for switching capacities of up to 0.1A, 4-30V (gold contacts).

The optional boards may only be installed at the factory due to the switching points of the load-dependent switches having to be reset following installation of these boards!

ATTENTION !

- When using optional boards PA or NA, it must be warranted - due to the operator's individual circuitry- that, when switching the load-dependent travel switches S11/21, S12/S22 and S13/S23 the motor of the thrust actuator comes to a standstill without delay.
This function is not provided for on the optional boards PA and NA in the supplied state!

5.5.3 Travel switch

The thrust actuators can be equipped with an additional stroke-switch board containing two travel switches (double-throw contact S4 and S5).
These switches can be set on infinitely variable lines over the entire stroke distance in both lift directions and integrated at will into the facility control system (no interlock-controlled circuitry).
The maximum switching capacity of the switches (see point 4.4 Technical data) must not be exceeded.
For low voltage (see point 4.4 Technical data) the additional travel switches are supplied with gold contacts (option: low-voltage travel switch).

NOTE !

- The internal torque switches (S1 and S2) are not switched synchronously to the additional limit switches (S4 and S5) in the end position!

As construction continues, the actuator travels at the end-position into a plate spring package and thus builts the actuators force. There is no travel further on, so the additional limit switches signalise the end position already, before the actuator has built the actuator force.
Only after the actuating force has been reached, the motor will be switched-off by the internal torque switch.

ATTENTION !

- If the motor is switched-off by the additional limit switches S4 or S5, then the actuator builds no force. The valve does not close tightly!

In order to switch-off the motor by limit switches S4 and S5 in the end position

- either the motor has to be provided with a release delay from min. 10 s after the additional limit switches were switched,
- or the torque switches have ot be queried directly. For this, the optional PA or NA-connection board are required. Please observe notes at „5.5.2 Connection boards PA (only 2,2 - 5 kN) or NA (2,2 - 15 kN)“.

5.5.3.1 Installation of additional travel switches

To install additional travel switches, proceed as follows:

- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- Loosen collar nut / countersunk screw on hood, carefully remove hood.
- Disconnect motor plug and mains connection plug from board.
- If a trip slide is present, carefully ease open the spring (pos. 50.56) at the opening with a screwdriver while pulling the trip slide (pos. 50.50) upwards off of the spindle and out of the board support (pos. 50.42).
- Loosen head cap screws (pos. 50.57) on board support and remove this from gearbox (only necessary on 5kN / 1mm/s thrust actuator).
- Insert stroke-switch board (pos. 50.61) in board support (pos. 50.42) and fix in place using the supplied screws (pos. 50.44).
- Mount board support loosely on gearbox cover plate with two head cap screws (pos. 50.57) (only necessary on 5kN).
- Push trip slide (pos. 50.50) back into board support (pos. 50.42) from above and onto the guide spindle (pos. 50.38).
- Align board support (pos. 50.42) on gearbox cover plate in such a way that the guide spindle (pos. 50.38) is centrally situated in the borehole of the trip slide (pos. 50.50); then screw down tightly on gearbox cover plate (only necessary on 5kN).
- Mount the trip slide (pos. 50.50) so that the spring (pos. 50.56) clips into the groove of the guide spindle (pos. 50.38).
- Insert 6-pole connector (pos. 50.62) in jack strip of stroke-switch board.
- Proceed to strip the connecting cable that has been led in through the cable inlet and fastened, and connect the individual conductors to the terminal strip in accordance with the desired circuitry and the wiring diagram.
- Set switch points on travel switches in accordance with section 5.5.3.3 Setting the additional travel switches (S4/S5 and S24/S25)
- Insert motor connection plug in jack strip (pos. 50.43.4) provided for the purpose.
- Insert mains connection plug in jack strip (pos. 50.43.3) provided for the purpose.
- Carefully place hood onto gearbox and mount firmly on thrust actuator with collar nut /rubber gasket and countersunk screw

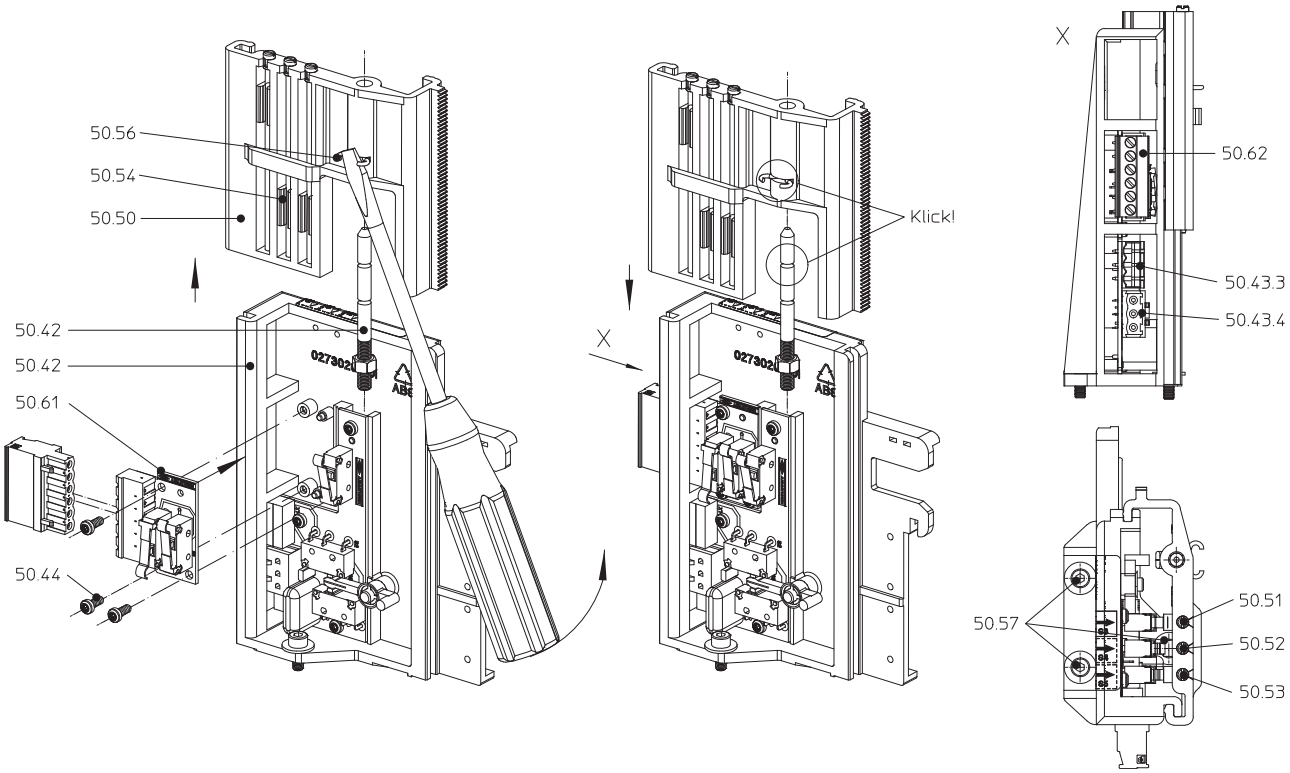


Fig. 12: Switchgear and indicating feature ARI-PREMIO® 2,2 - 5 kN

Pos.	Designation
50.38	Guide spindle
50.42	Board support
50.43.3	Jack strip for mains connection
50.43.4	Jack strip for motor connection
50.44	Self-tapping screw
50.50	Trip slide (option)
50.51	Setting spindle for switch S3

Pos.	Designation
50.52	Setting spindle for switch S4
50.53	Setting spindle for switch S5
50.54	Trip cam
50.56	Spring
50.57	Head cap screws DIN EN ISO 4762 - M4x10
50.61	Stroke-switch board
50.62	Connector, 6-pole (option: travel switch)

5.5.3.2 Installation of trip slide and setting of the travel switch (S3)

To retrofit guide spindle and trip slide for the travel switch, proceed as follows:

- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- Loosen collar nut / countersunk screw on hood, carefully remove hood.
- Disconnect motor plug and mains connection plug from board.
- Screw the hexagon nut M5 (pos. 50.39) approx. 6mm on the guide spindle (pos. 50.38).
- Screw the guide spindle in accordance with setting dimension (see Fig. 13a / b) into the drive spindle (pos. 50.30) and counters with the hexagon nut M5.
- Lubricate trip slide (pos. 50.50) at the bearing surface ends with grease
- Push trip slide (pos. 50.50) into board support (pos. 50.42) from above and onto the guide spindle (pos. 50.38).
- Mount the trip slide (pos. 50.50) so that the guide spindle (pos. 50.38) is centrally situated in the borehole of the trip slide and the spring (pos. 50.56) clips into the groove of the guide spindle.
- Insert motor connection plug in jack strip (pos. 50.43.4) provided for the purpose.
- Insert mains connection plug in jack strip (pos. 50.43.3) provided for the purpose.
- Carefully place hood onto gearbox and mount firmly on thrust actuator with collar nut / rubber gasket and countersunk screw.

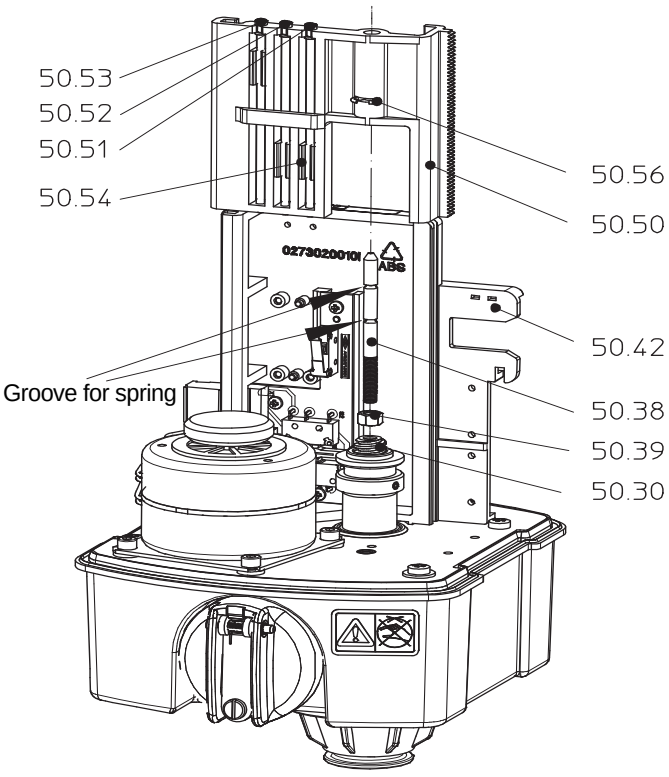


Fig. 13: Spindle and trip slide installation

2,2 / 5 kN:

Lock the trip slide in the groove according to the actuator type.

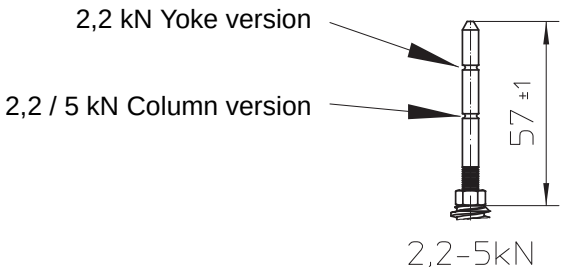
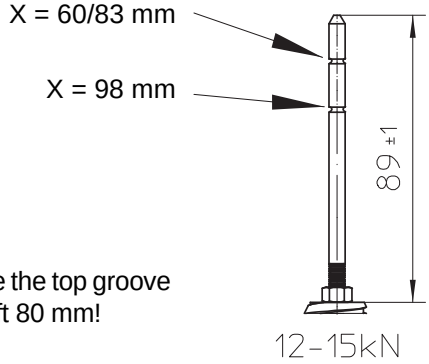


Fig. 13a

12 / 15 kN:

Lock the trip slide in the groove according to the fitting projection X.



Note:
Please use the top groove for valve lift 80 mm!

Fig. 13b

Pos.	Benennung		Pos.	Benennung
50.30	Drive spindle		50.51	Setting spindle for switch S3
50.38	Guide spindle		50.52	Setting spindle for switch S4
50.39	Hexagon nut DIN EN ISO 4034 - M5		50.53	Setting spindle for switch S5
50.42	Board support		50.54	Trip cam
50.50	Trip slide (option)		50.56	Spring ARI-PREMIO® for trip slide

Installing the thrust actuator on a straight through valve, the travel switch S3 needs to be set as follows:

- Move valve out of the lowest position so as to run valve-lift to up position.
- Using a screw driver, proceed to turn setting spindle for switch S3 (pos. 50.51) until the trip cam (pos. 50.54) arriving from below trips the switch (audible click).
- Run thrust actuator briefly in extending direction and then in retracting direction once more, checking to see whether the thrust actuator is switched off at the desired point (nominal lift).
- If need be, correct the setting as described.

Installing the thrust actuator on a three-way valve, the travel switch S3 needs to be set as follows:

- Run valve in both final positions and check in each final position whether the valve switches off via the load-dependent switch.
- Carry out a check in the top final position the see whether, after switching off the thrust actuator, the trip cam (pos. 50.54) of the travel switch S3 is situated below switch S3 and has not tripped the latter. If the trip cam (pos. 50.54) is situated above the travel switch S3 or trips the same, the setting spindle governing the travel switch S3 (pos. 50.51) needs to be turned until the trip cam is situated below travel switch S3 without tripping it.
- Run the thrust actuator in both final positions once more and check whether thrust actuator switches off in both final positions via the load-dependent switches.
- If need be, correct the setting as described above.

5.5.3.3 Setting the additional travel switches (S4/S5 and S24/S25)

The two additional travel switches can be freely set in both lift directions for indicating certain valve positions.

To do this, proceed as follows:

- Run valve to desired position due to be indicated by the corresponding switch.
- Proceed to turn the setting spindle belonging to the appurtenant switch until the switch is tripped (audible click).
- Run thrust actuator briefly in both directions, checking and, if need be, correcting the setting.

The actuating feature on the travel switches is designed in such a way that both travel switches can be overrun in both directions.

Standard design:
For that reason, care should be taken on additional travel switches to see that the actuating state of the switches remains active only for a short time while the thrust actuator continues to run and that switching back takes place afterwards.
The actuating state of the travel switches remains in force over a lift of 4 mm.

Special design:
At additional travel switches with extended switch levers, the actuating state of the travel switches remains in force over a lift of 49 mm.

5.5.4 Potentiometers

The potentiometers are used for electrical position acknowledgement on the facility control system or for the options - electronic position controller ES11 or electronic position indicator RI21

A maximum of 2 potentiometers can be installed (= 1 double potentiometer).
The potentiometers can be supplied with different resistance values
(see point 4.4 Technical data).

For the electronic position controller ES11 and the electronic position indicator RI21 use must be made solely of 1000 ohm potentiometers.

Conversion of the relevant valve-lift to the potentiometer angle of rotation is effected by means of transmission determined in respect of each valve-lift between the toothed rack on the trip slide and the pinion on the potentiometer shaft.
Use must only be made of the pinion specified for the valve-lift.

If the thrust actuator is supplied with the valve and built-in potentiometer, the potentiometer is assembled and set ready for operation.

To achieve optimal electromagnetic compatibility it is recommended to use shielded cables for connecting potentiometers or standardized active current or voltage signals.

5.5.4.1 Installing the potentiometer

If retrofitting the potentiometer, proceed as follows:

- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- Loosen collar nut / countersunk screw on hood, carefully remove hood.
- Insert the potentiometer into the guide in the way that the pinion (pos. 50.73) of the potentiometer meshes with the gear stick of the trip slide.
- With a valve lift up to 30 mm, hook spiral spring (pos. 50.70) into the left-hand window of board support (pos. 50.42) above the potentiometer guide, insert into the guide between the slide block and the potentiometer guide and hook into the cut-out below the potentiometer.
  With a valve lift between 30 mm and 50mm, hook spiral spring (pos. 50.70) into the right-hand window (for 12 - 15kN middle window) above the potentiometer guide, insert into the guide between the slide block and the potentiometer guide and hook into the cut-out below the potentiometer.
  With a valve lift between 50 mm and 65 mm, hook spiral spring (pos. 50.70) into the middle window in board support (pos. 50.42) above the potentiometer guide, insert into the guide between the slide block and the potentiometer guide and hook into the cut-out below the potentiometer.
- Check to see whether pinion (pos. 50.73) is pressed into toothed rack by spiral spring (pos. 50.70) and is positioned free from backlash.
- If this is not the case, remove spiral spring (pos. 50.70), readjust by bending a little, and place back in position again.
- Screw jack strip of connecting cable (pos. 50.68) to board support (pos. 50.42) with two self-tapping screws (pos. 50.69) (single potentiometer connectors 25-27).
- Insert additional 3-pole connector (pos. 50.74) in jack strip of connecting cable (pos. 50.68).
- Set potentiometer (see point 5.5.4.2).
- Place hood carefully onto thrust actuator and fasten it on the actuator with collar nut / rubber gasket and countersunk screw.

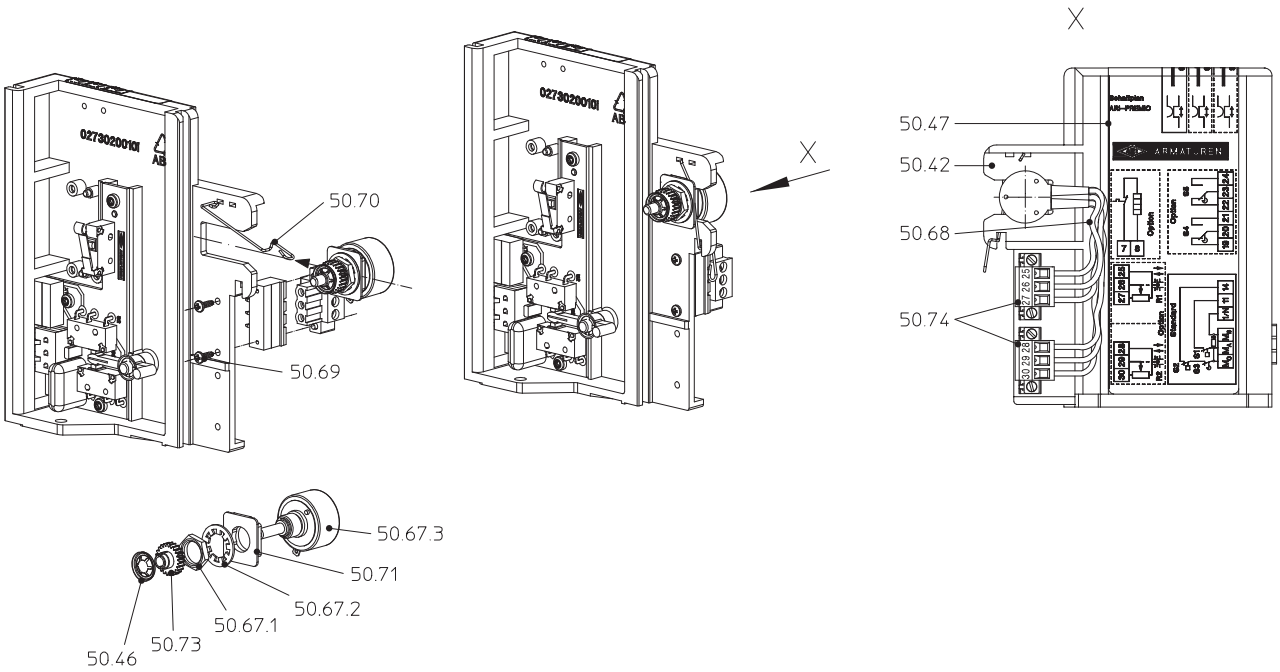


Fig. 14: Switchgear and indicating feature ARI-PREMIO® 2,2 - 5 kN

Pos.	Designation
50.42	Board support
50.46	Washer
50.47	Circuit-diagram sticker
50.67.1	Hexagon nut
50.67.2	Tooth lock washer
50.67.3	Potentiometer

Pos.	Designation
50.68	Connecting cable for option: potentiometer
50.69	Self-tapping screw
50.70	Spiral spring (option: potentiometer)
50.71	Slide block (option: potentiometer)
50.73	Pinion (selection depends on valve-lift 20, 30, 50, 65 or 80 mm)
50.74	Connector, 3-pole (option: potentiometer)

5.5.4.2 Setting the potentiometer

To set the potentiometer, proceed as follows:

- Move thrust actuator to extended position.
- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- Turn potentiometer shaft in counter-clockwise direction until reaching the travel stop. This places the potentiometer in the initial position (approx. 0 ohm).
- For checking purposes, the resistance of the potentiometer needs to be measured using an ohmmeter.
- Measure resistance on potentiometer 1 between terminals 25 and 26.
- Measure resistance on potentiometer 2 between terminals 28 and 29.
- In this position of the actuator, the measured value should be approx. 0 ohm.
- Run thrust actuator to upper final position and read off corresponding resistance value on ohmmeter.
- The resistance values thus measured need to be taken into account for the settings to the facility control system.

5.5.5 FError-proof potentiometer for single-channel, error-proof position feedback

The TÜV certified potentiometer on conductive plastic basis is used for single-channel, error-proof position feedback in connection with error-proof, electronic group monitoring systems for the regulation of fuel -, air and exhaust gas streams.

A maximum of 2 potentiometers can be installed (=1 double potentiometer).
The potentiometers can be supplied with different resistance values (see point „4.4 Technical data“).

For the electronic position controller ES11 use must be made solely with 1000 ohm potentiometers

The conversion of the relevant valve-lift to the potentiometer angle of rotation is effected by the transmission between the toothed rack on the trip slide and the pinion on the potentiometer shaft.

The pinion and the potentiometer shaft are firmly connected.

If the thrust actuator is supplied with the valve and built-in potentiometer, the potentiometer is assembled and set ready for operation.

The potentiometer is with the options „Heating“ and “position indicator RI21“ not combinably.

To use for the electromagnetic compatibility, shielded lines are recommended for potentiometers and electrical unit signals.

Don`t lay signal lines parallel to the main line!

ATTENTION !

- In order to achieve as high a life span as possible with maximum accuracy, potentiometers on conductive plastic basis are not as adjustable pre-resistors to begin but as read-free voltage dividers!

- An additional installation of the option „Error-proof potentiometer“ is not permitted for safety reasons.

5.5.5.1 Setting the TÜV-approved potentiometer on conductive plastic basis

To set the potentiometer, proceed as follows:

- Move thrust actuator to extended position.
- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- For checking purposes, the resistance of the potentiometer needs to be measured using an ohmmeter.
- Measure resistance on potentiometer 1 between terminals 25 and 26.
- Measure resistance on potentiometer 2 between terminals 28 and 29.
- Loose the potentiometer by unscrewing the 2 screws and remove it incl. pinion from the toothed rack.
- Turn potentiometer shaft (angle of rotation mech. 360°, electr. 320° without stop) and by means of ohmmeter bring the potentiometer in initial position (approx. 0 Ohm).
- Bring the potentiomter and the pinion back in contact with the toothed rack and fasten the screws.
- Subsequently, the screws are to be provided again with locking lacquer.
- Run thrust actuator to upper final position and read off corresponding resistance value on ohmmeter.
- The resistance values thus measured need to be taken into account for the settings to the facility control system.

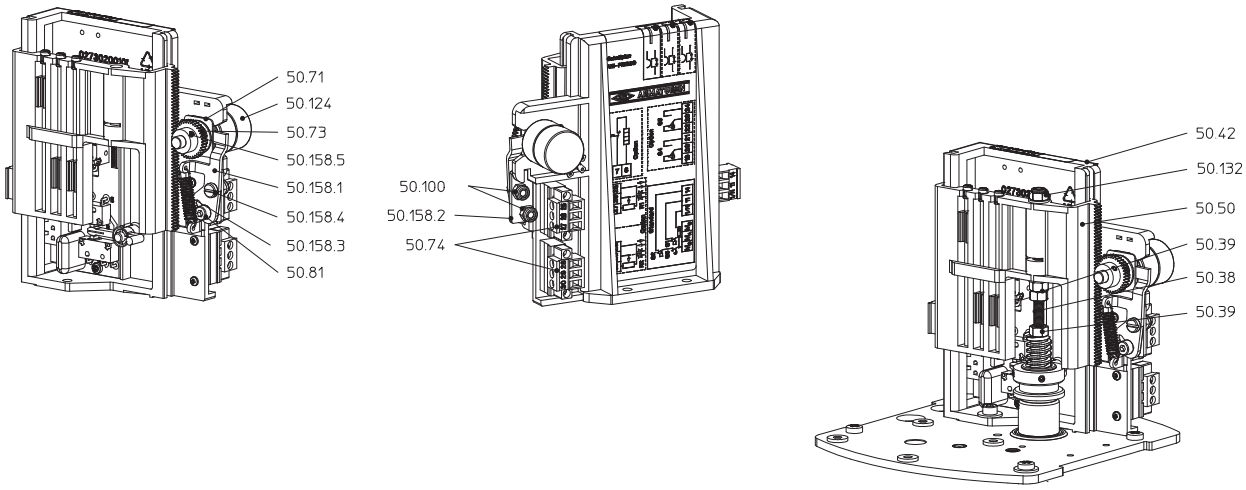


Fig. 15: TÜV-approved potentiometer ARI-PREMIO® 2,2 - 5 kN

Pos.	Designation
50.38	Guide spindle
50.39	Hexagon nut
50.42	Board support
50.50	Trip slide (option)
50.67	TÜV-approved potentiometer
50.71	Slide block (option: potentiometer)
50.73	Pinion (travel 50 mm)
50.74	3-pole connector (option: potentiometer)

Pos.	Designation
50.81	Head cap screw
50.158.1	Lever
50.158.2	Metal sheet
50.158.3	Tension spring
50.158.4	Pan-head screw
50.158.5	Straight pin, slotted
50.100	Hexagon nut M4, self-locking
50.132	Hexagon nut M5, self-locking nut

5.5.6 Heating

A heating resistor should be fitted as a means of protection against the formation of condensation water in cases involving widely varying ambient temperatures, high atmospheric humidity (outdoor use) and temperatures below the freezing point. The heating resistor is self-regulating so that a continuous supply of current merely needs to be connected up.

5.5.6.1 Installation of heating

On principle, the heating can be combined with all options. It is completely mounted on a holding bracket.
If electronic system ES11 or RI21 is already installed, unscrew the electronic system from the holding bracket, remove it, install the heating and attach the electronic system to the holding bracket for the heating.

To install the heating proceed as follows:

- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- Loosen collar nut / countersunk screw on hood, carefully remove hood.
- Using the supplied screws, mount complete heating (on holding bracket) at the point on the gearbox cover plate provided for the purpose (Fig. 17).
- Lead continuous-current cable (mains voltage = rated voltage of heating) through cable inlet into thrust actuator and fix in place with inlet.
- Strip continuous-current cable approx. 1-1,5 cm above cable inlet.
- Strip individual conductors approx. 5mm away from the end and provide with conductor end sleeves.
- Lay the individual conductors in such a way that they do not come into contact with moving parts.
- Connect the individual conductors up to the connection terminal block in accordance with the wiring diagram.

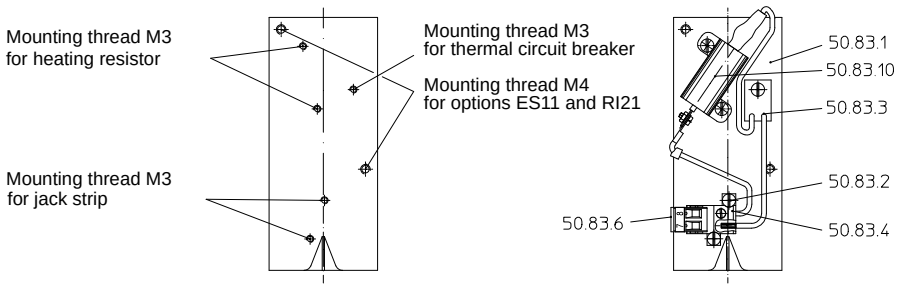


Fig. 16: Heating installation ARI-PREMIO® 2,2-15 kN

Pos.	Designation
50.83.1	Holding bracket (Option: heating)
50.83.2	Head cap screw DIN 84-M3x8
50.83.3	Thermal circuit breaker

Pos.	Designation
50.83.4	Jack strip
50.83.6	Connector, 2-pole
50.83.10	Heating resistor

5.5.7 Electronic position indicator RI21

The electronic position indicator RI21 converts the resistance of the 1000 ohm potentiometer corresponding to the lift into an optional output control signal 0 (2) ...10V DC or 0 (4) ...20mA DC. For installing and setting the electronic position indicator RI21 the operating instructions applicable to this unit must be observed in the appropriate valid version. The corresponding operating instructions are supplied with each unit.

5.5.8 Electronic position controller ES11

The electronic position controller ES11 converts continuous input control signals 0 (2) ...10V DC or 0 (4) ...20mA into a 3-point output signal for the motor, in which case interrogation of the valve position takes place via a 1000 ohm potentiometer. For installing and setting the electronic position controller ES11 the operating instructions applicable to this unit must be observed in the appropriate valid version. The corresponding operating instructions are supplied with each unit

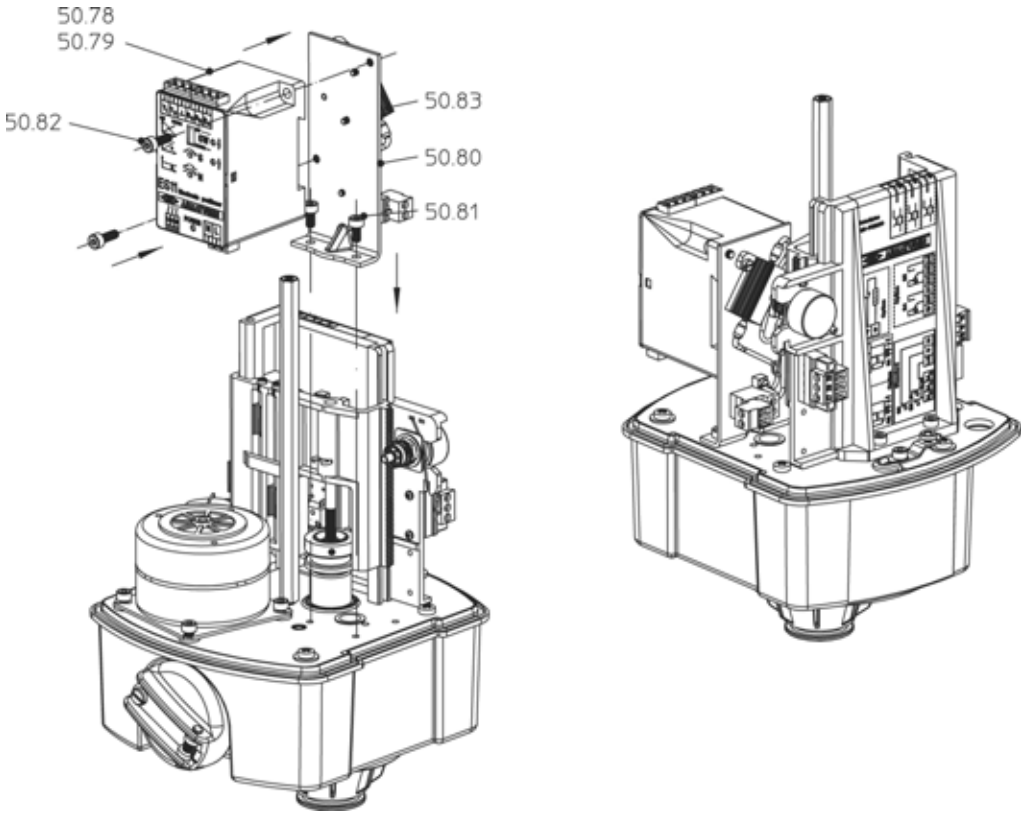


Fig. 17: Installation RI21 / ES11 / heating ARI-PREMIO® 2,2 - 5 kN

Pos.	Designation
50.78/79	Option ES11 or RI21
50.80	Holding bracket
50.81	Head cap screw DIN EN ISO 4762 - M4x8

Pos.	Designation
50.82	Head cap screw DIN EN ISO 4762 - M4x12
50.83	Heating

5.5.9 Electronic position indicator (RI21) and position controller (ES11) together in the actuator

The electronic position indicator RI21 and the electronic position controller ES11 can be build-in together in the ARI-PREMIO® (Except: 5 kN 24V 1,0/1,2 mm/s; 12 kN 24V; 15 kN 24V).

It must be used a double potentiometer with 1000/1000 Ohm.

To install the RI21 and ES11 proceed as follows:

- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- Loosen collar nut / countersunk screw on hood, carefully remove hood.
- Mount RI21 and ES11 with mounting kit according to Fig. 18 / Fig. 19.

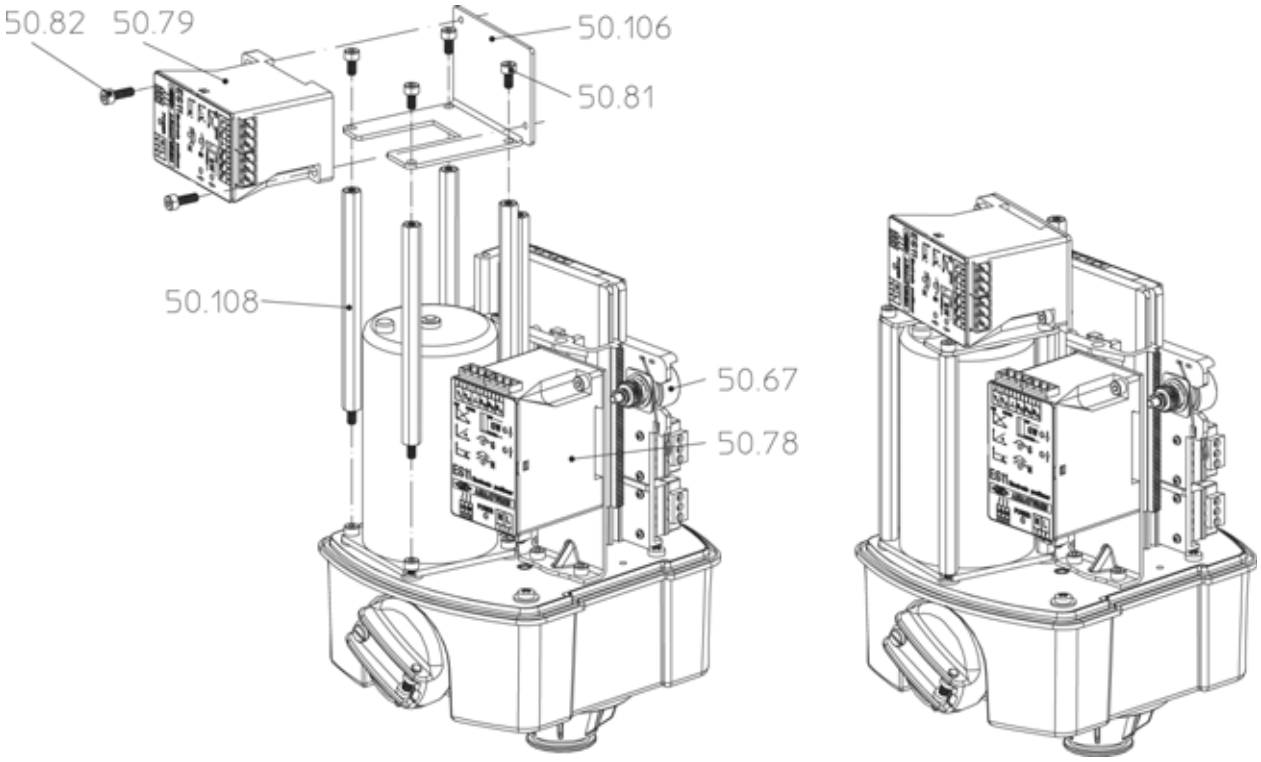


Fig. 18: Simultaneous installation RI21 / ES11 ARI-PREMIO® 2,2 - 5 kN

Pos.	Designation
50.67	Potentiometer
50.78/79	Option ES11 or RI21
50.81	Head cap screw DIN EN ISO 4762 - M4x8

Pos.	Designation
50.82	Head cap screw DIN EN ISO 4762 - M4x12
50.106	Metal sheet ES11 and RI21
50.108	Distance bold

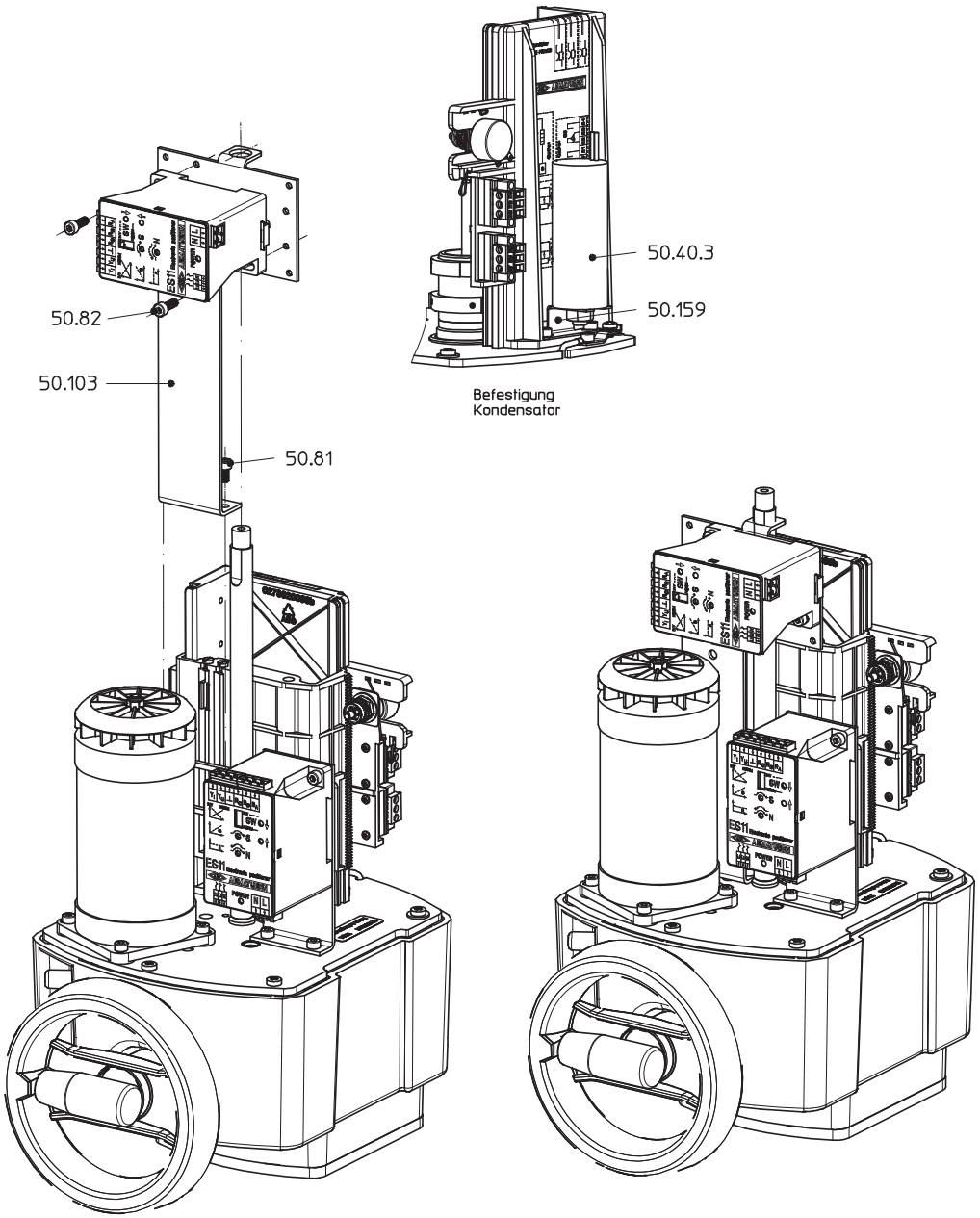


Fig. 19: Simultaneous installation RI21 / ES11 ARI-PREMIO® 12 - 15 kN

Pos.	Designation
50.40.3	Capacitor
50.81	Head cap screw DIN EN ISO 4762 - M4x8
50.82	Head cap screw DIN EN ISO 4762 - M4x12

Pos.	Designation
50.103	Fixing plate
50.159	Capacitor plate

5.5.10 Integrated temperature controller dTRON 316

The integrated temperature controller controls temperatures, which are measured by input-connected temperature sensors, to a manual given setpoint by means of a three-step output connected with the actuator.

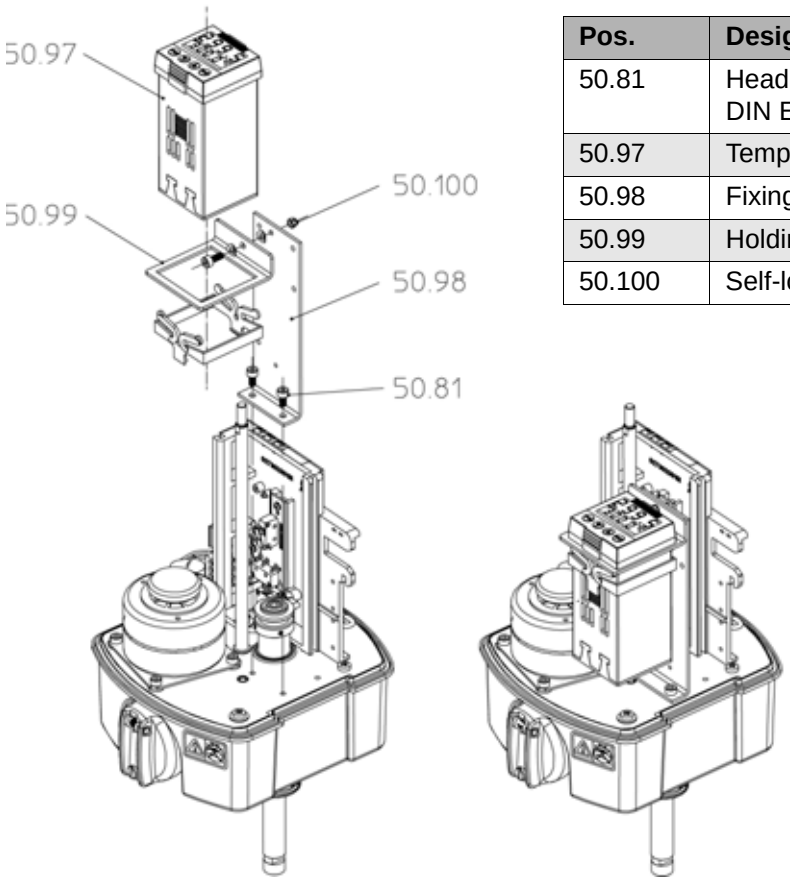
5.5.10.1 Installation of the dTRON 316

The dTRON 316 can be mounted in the ARI-PREMIO® as a complete unit with a mounting kit. It cannot be combined with ES11.

o install the dTRON 316 proceed as follows:

In addition to „5.4.3 Connection“ , the electrical connection of the dTRON 316 has to be done in the following way:

- Mount the temperature controller on the gear plate by using the specific installation kit (Fig. 20).
- Plug in the connector X2 of the dTRON 316 to the plug-in connector X1 (1/N, 11, 14) of the actuator terminal.
- Connect the signal input and the individual wanted additional functions according the wiring diagram to the dTRON 316.
- Connect the power supply L1 and N to the dTRON 316.
- For changing the working direction to heating signal = extending driving spindle, just change the wires on the connectors 11 and 14



Pos.	Designation
50.81	Head cap screw DIN EN ISO 4762 - M4x8
50.97	Temperature controller dTRON 316
50.98	Fixing bracket (option dTRON)
50.99	Holding bracket (option dTRON)
50.100	Self-locking nut (option dTRON)

Fig. 20: Installation dTRON 316 ARI-PREMIO® 2,2 - 5 kN

5.5.11 Integrated reversing contactor

The integrated reversing contactor is actuated using a 3-step input signal.
The reversing contactor swaps over phases L1, L2 and L3 to achieve the desired direction of rotation of the three-phase motor.

5.5.11.1 Installing the reversing contactor

The reversing contactor can be mounted in the ARI-PREMIO® as a complete unit using a mounting kit.
The reversing contactor can only be combined with one of the ES11, RI21 or temperature controller options. It is also possible to install the heating.
Proceed as follows to install the reversing contactor:

Switch-off the mains voltage and take measures to prevent it being switched back on inadvertently

ATTENTION !

- The thrust actuator may be damaged if phases L1, L2 and L3 are wrongly connected!

The electrical connection procedure as described in „5.4.3 Connection“ is supplemented by the following steps:

- Use the mounting kit to attach the reversing contactor to the gear plate (Fig. 21)
- Connect the three-phase connection L1, L2, L3 and the 3-step input signal as shown in Fig. 11 (integrated reversing contactor or external reversing contactor).

5.5.11.2 Electrical connection with ES11 or dTRON 316

Modify the 3P output cable of the ES11 or the dTRON 316 as follows:

- Remove plug X25.
- Strip off the outer cable insulation down to about 18 cm.
- Connect the individual conductors as follows:

black (L↑) - S2/14 brown (L↓) - S1/11 blue (1/N) - K1/A2, K2/A2

Pos.	Designation
50.57	Head cap screw DIN EN ISO 4762 - M4 x 10
50.81	Head cap screw DIN EN ISO 4762 - M4 x 8
50.102	Reversing contactor
50.103	Fixing plate (option reversing contactor)

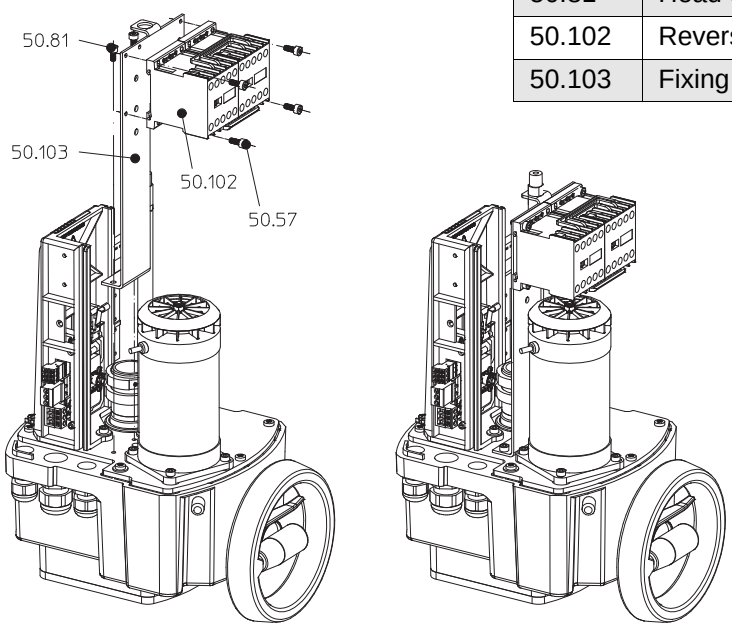


Fig. 21: Installation reversing contactor and phase control relay ARI-PREMIO® 12 - 15 kN

5.5.12 AC/DC-Version

5.5.12.1 Diagram AC/DC-Version with BLDC motor

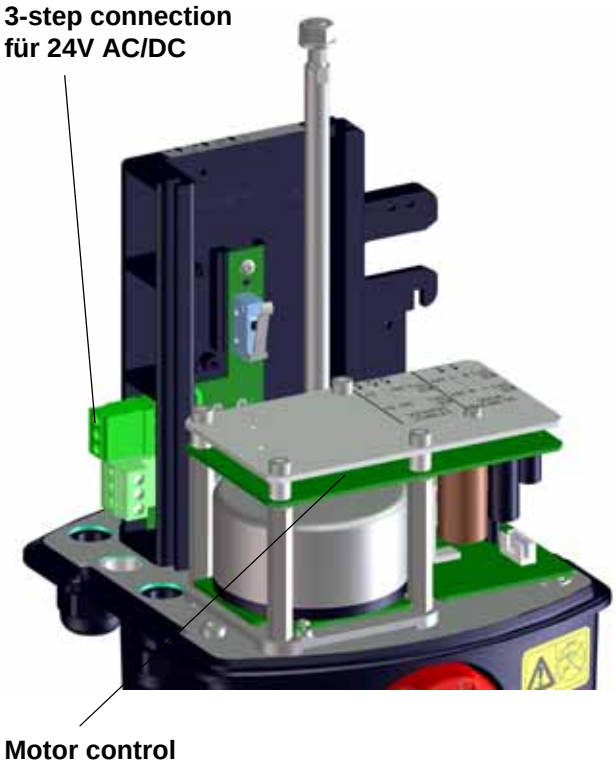


Fig. 22: ARI-PREMIO® 2,2-5kN
3-step-control

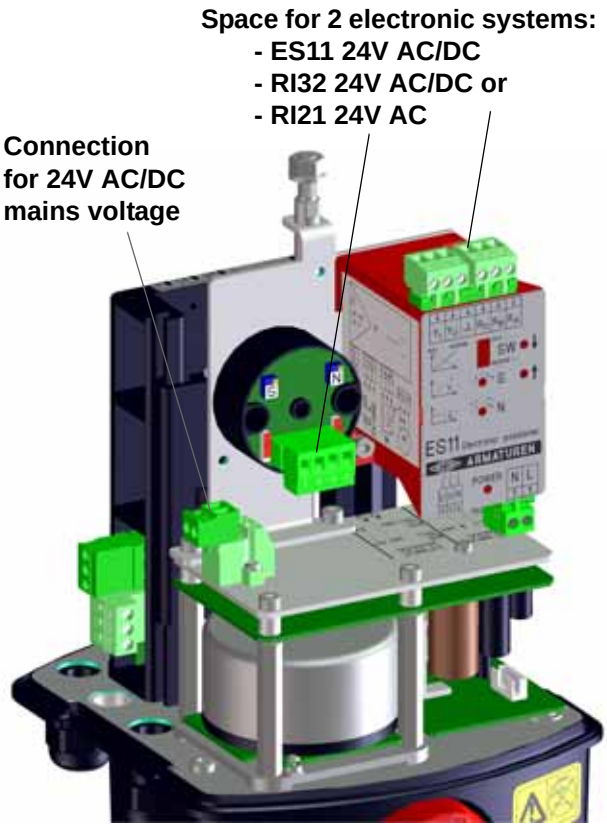


Fig. 23: ARI-PREMIO® 2,2-5kN
with position indicator / controller

About the BLDC motor:

- Brushless DC motor, also referred to as a BLDC, BL or EC (electronically commutated) motor
- Conventional DC motors have carbon brushes. Carbon brushes are subject to wear and cause high-frequency interference owing to the "coal fire".
- BLDC motors work without carbon brushes.
- The motors are non-wearing and no disturbances are produced. The coils are electronically controlled by an integrated electronic control system.

5.5.12.2 Optional board support with pole changing for 24V DC

DC actuators can be controlled using different methods.

The most widespread method is 3-step control – our standard technology.

As with the AC variants, the driving spindle is extended or retracted by means of the energised terminal.

If 24V DC voltage is present at terminals 0V and DC?, for example, the spindle is moved in; if there is voltage at terminals 0V and DC?, it is moved out

In older plants / actuators the direction of motor rotation is normally changed with the help of a pole changing device. Here, power is applied to terminals X and Y. The actuator extends or retracts the driving spindle according to the polarity of the supply voltage.

This method of control can be implemented with the optional board support for pole changing (Fig. 25). An electronic system that converts the signals for this purpose is mounted on the board in addition to the travel switches. Thanks to the optional board support for pole changing, the actuator can now be operated both with a three-step signal and with pole changing.

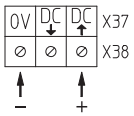
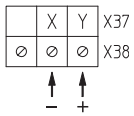
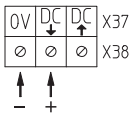
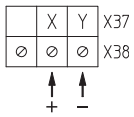
Comparison:	DC 3-step (standard)	DC-pole changing
Open spindle retracted 		
Close spindle extended 		

Fig. 24: Pole changing and 3-step control compared

Fig. 25

NOTE !

*- The **optional board support for pole changing** should always be used when you are not sure whether 24V DC three-step or pole changing control is required! The support is suitable for both types of control.*

5.5.13 Electronic position indicator RI32

The RI32 electronic indicator transforms a resistance change into a 4...20mA or 2...10V standardised control signal.
The RI32 position indicator can be operated by 24V AC/DC voltage.
It is possible to link into a current loop without an additional power supply.

5.5.13.1 Useful range of the linear motion potentiometer

Linear motion potentiometers R1 or R2 are connected in a three-conductor connection.
Here the RI32 position indicator is also suitable for conductive plastic potentiometers.

The diagram on the right will help when adjusting the RI32 position indicator to the stroke distance of the linear motion potentiometer.
It is important that the mechanical stroke distance of the control actuator is smaller than the stroke distance of the linear motion potentiometer.

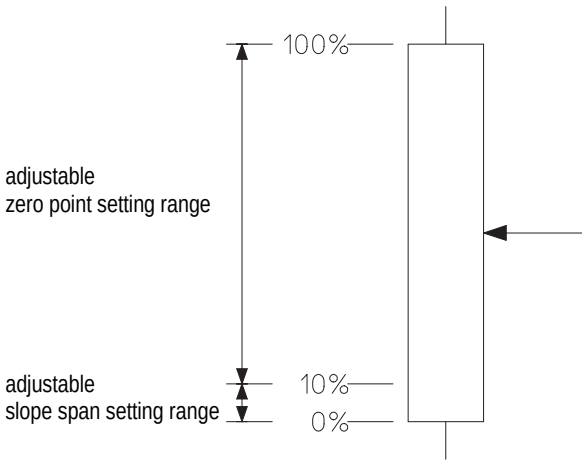


Fig. 26: Linear motion potentiometer

5.5.13.2 Installing the RI32 electronic position indicator in the ARI-PREMIO®

- The RI32 position indicator is fitted to the ARI-PREMIO® as illustrated.
- Screw fixing bracket (pos. 50.98) to gearbox cover plate with head cap screw (pos. 50.81).
- Then fit position indicator (pos. 50.121) to fixing bracket (pos. 50.98) with the head cap screws (pos. 50.59) and washers (pos. 50.122).

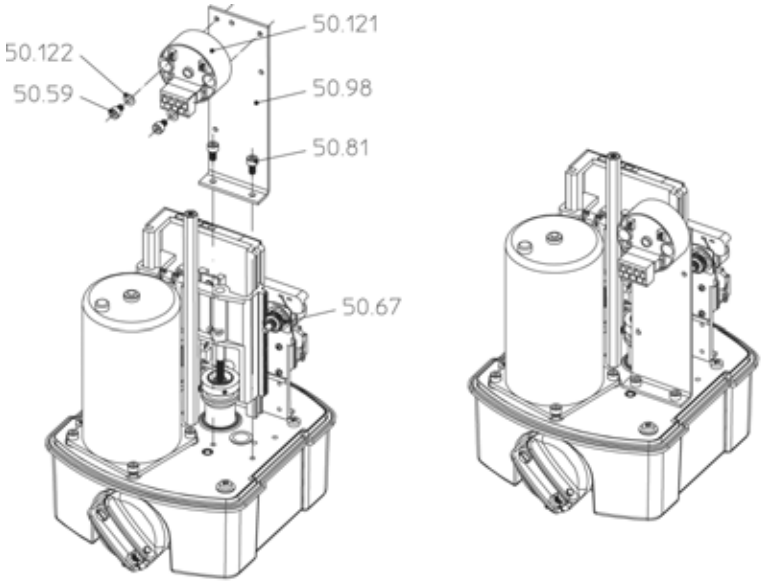


Fig. 27: Option RI32 ARI-PREMIO® 2,2 - 5 kN

Pos.	Designation
50.59	Head cap screw M4 x 6
50.67	Potentiometer
50.81	Head cap screw M4 x 8

Pos.	Designation
50.98	Fixing bracket
50.121	Position indicator RI32
50.122	Washer 4.3

5.5.13.3 Electronic position indicator (RI32) and position controller (ES11) together in the actuator

The electronic position indicator RI32 and the electronic position controller ES11 can be build-in together in the ARI-PREMIO®.

It must be used a double potentiometer with 1000/1000 Ohm.

To install the RI32 and ES11 proceed as follows:

- Switch-off mains voltage and safeguard to prevent it from being switched back on again accidentally.
- Loosen collar nut / countersunk screw on hood, carefully remove hood.
- Mount RI32 and ES11 with mounting kit according to Fig. 28.

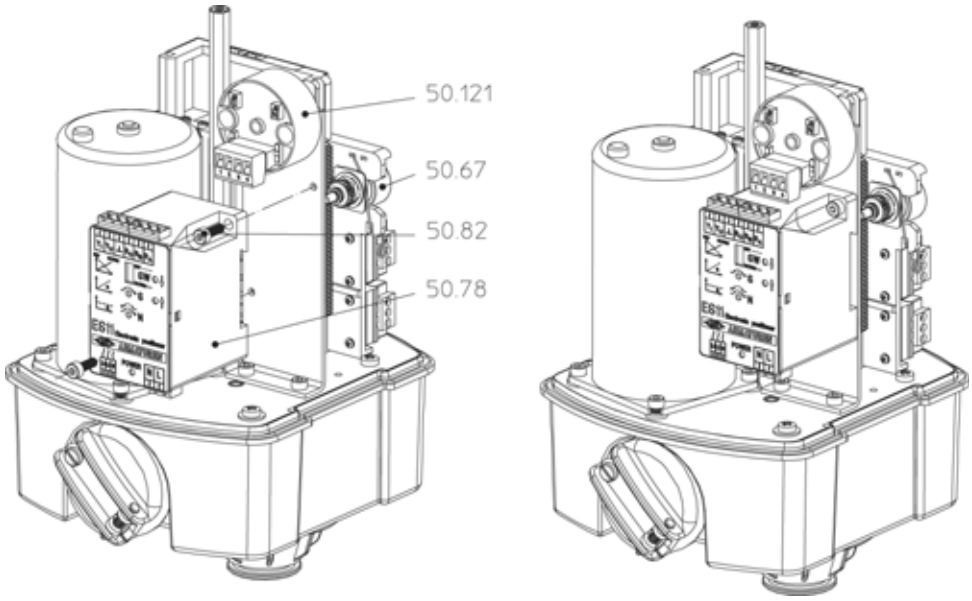


Fig. 28: Simultaneous intallation RI32 / ES11 ARI-PREMIO® 2,2 - 5 kN

Pos.	Designation
50.67	Potentiometer
50.78	Option ES11 or RI21

Pos.	Designation
50.82	Head cap screw DIN EN ISO 4762 - M4x12
50.121	Option RI32

5.5.13.4 Technical data - Position indicator RI32

Type	RI 32 Position indicator	
Supply voltage	V	24V DC / AC 50...60Hz
Potentiometer input	Ω	1 kOhm ... 10 kOhm three-conductor connection, suitable for conductive plastic potentiometer
Control signal output, voltage	V	2...10 V DC with (control signal output with supply voltage internal electrical connection)
Control signal output, current	mA	4...20 mA DC (load max. 500 W) (control output signal with supply voltage internal electrical connection)
Measuring current at potentiometer arm	μA	max. 800 μA
Linearity error	%	± 0,2 % measurement range
Temperature coefficient	%/K	0,04 %/K
Auxiliary energy inflow	%/V	0,02 %/V
Protection type EN 60529		IP40 (terminals IP20)
max. ambient temperature	°C	-40 °C...+85 °C
Humidity	%	95 % r.F., no dewing
Weight	g	aprox. 35 g
Dimensions	mm	Øxdepth: 44 x 38

Connection / installation	RI 32 Position indicator
Electrical connection	using screw terminals max 2,5 mm^2
Built into thrust actuator	in ARI-PREMIO® all versions

5.5.13.5 Potentiometer installation

ATTENTION !

When installing the potentiometer please note point „5.5.4 Potentiometers“ in these Operating Instructions.

Plug Ra, Rb, Rc connector from potentiometer cable of RI32 position indicator into pin strip 25, 26, 27 or 28, 29, 30 of the ARI-PREMIO®.

5.5.13.6 Wiring diagram

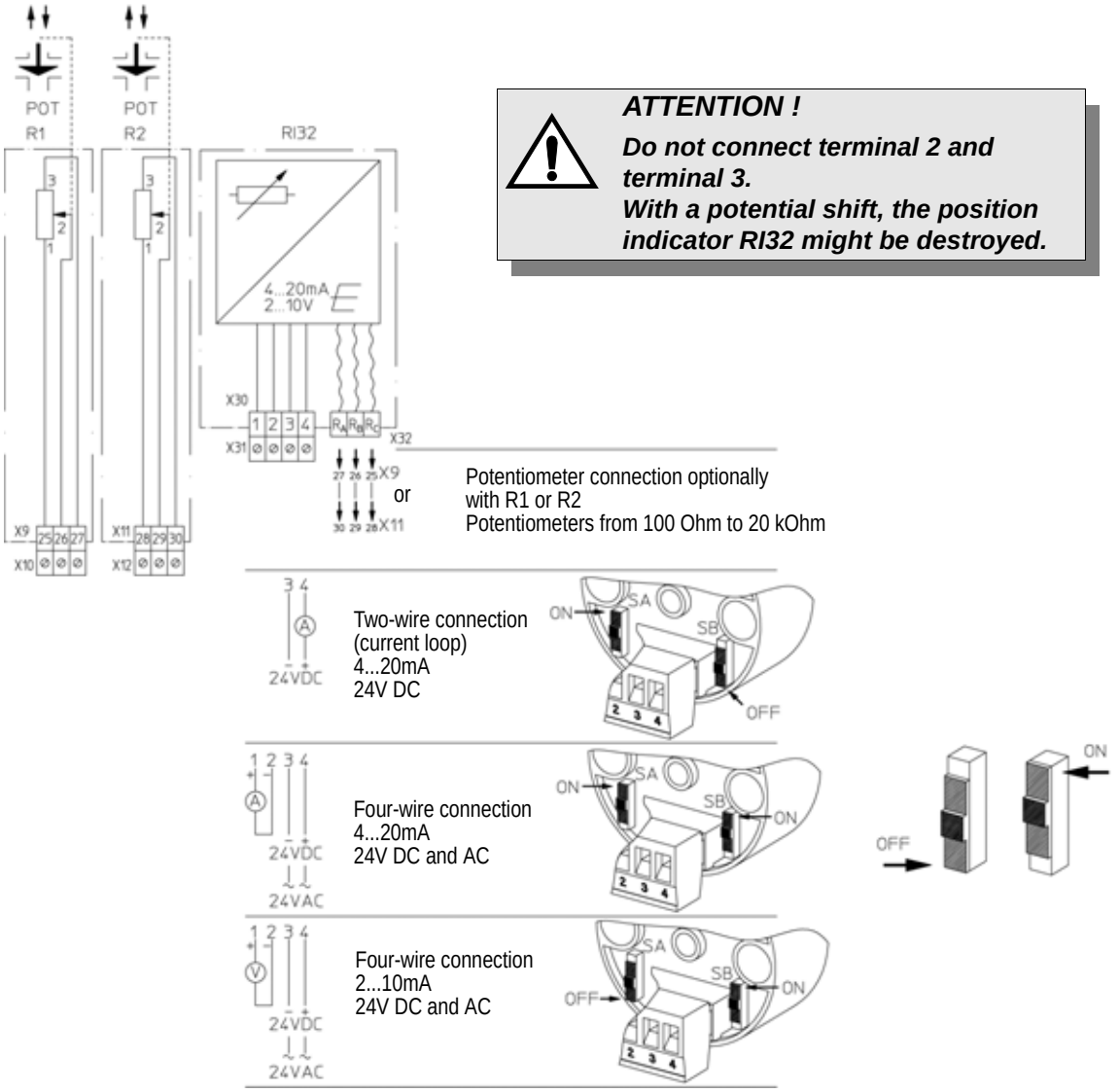


Fig. 29

5.5.13.7 Connection conditions

The electrical connections are joined to position indicator RI32 by series disconnect terminals. The connection to the potentiometer is made by a cable.
Position indicator RI32 is connected by a potentiometer (R1 or R2) built into the ARI-PREMIO®.

When the valve is shut approx. 0 ohm are applied between **Rb** and **Rc**.
Appropriate conductor cross-sections for terminal connections are 0.2 to 2.5 mm^2.
To achieve electromagnetic compatibility is recommended that shielded conductors be used for longer routings.

Please request technical information direct from ARI-Armaturen.

5.5.13.8 Setting zero point and slope span

The 4...20mA or 2...10V output control signal is adjusted to the potentiometer stroke by miniature potentiometers S (slope) and N (zero).

Zero point setting

- The zero point setting is always made before the slope span setting.
- Potentiometer must be at approximately **0** Ω.
- Before measuring resistance, isolate the potentiometer from the RI32 position indicator and reconnect after measuring.
- Resistance measurement at the potentiometer cable between **Rb** and **Rc**.
- Make the connection in accordance with the wiring diagram.
- Zero point setting is made at the zero point setscrew marked **N**.
- Adjust zero point setscrew **N** so that the desired minimum control signal value is applied to the meter.
- Rotate zero point setscrew **N to the right** to **increase** the output signal, rotate to the **left** to reduce it (a slip clutch engages after 12 rotations)

For example:

- Current output..... minimum value ..... = **4 mA**
- Voltage output..... minimum value ..... = **2 V**

Slope span setting

The slope span setting is made after the zero point setting.

- Before measuring resistance, isolate the potentiometer from the RI32 position indicator and reconnect after measuring.
- Resistance measurement at potentiometer cable between **Rb a**nd **Rc**.
- Adjustment of resistance range to control signal output range is set at the slope span setscrew marked **S**.
- The meter from the zero point setting stays in the same measurement range for the slope span setting.
- Adjust the slope span setscrew **S** so that the desired maximum control signal value is applied to the meter.
- Rotate slope span setscrew **S to the right** to **increase** the output signal, rotate to the **left** to **reduce** it (a slip clutch engages after 12 rotations).

For example:

- Current output..... minimum value .....= **20 mA**
- Voltage output..... minimum value .....= **10 V**

6.0 Putting the actuator into operation

ATTENTION !

- Actuator components which rotate or move during operation are coloured red. Crushing or injury hazard!

Before putting a new plant into operation or restarting a plant after repairs or modification, always make sure that:

- all works has been completed!

- Regional safety instructions must be observed as a matter of policy.

- hood of thrust actuator assembled.

When placing into service proceed as follows:

- Using the handwheel, run the thrust actuator to approximately mid lift position.
- Apply brief pulses to the thrust actuator for each direction of movement and check whether the directions of movement correspond to those desired. If this is not the case, the pulse lines governing the retracting and extending action must be exchanged on the thrust actuator.
- Run thrust actuator to the final position in each direction of movement and check whether it switches off automatically and whether all externally moving parts are able to move freely.
- If failing to function properly, check all installation and setting work previously carried out, correcting if necessary, and afterwards place into service once again.

7.0 Care and maintenance

The thrust actuator requires very little maintenance. Accordingly maintenance in specified intervals is not necessary.

Depending on the conditions governing use, the maintenance and maintenance-intervals have to be defined by the operator.

The thrust actuator must not be cleaned with high-pressure equipment or aggressive solvents or detergents injurious to health or highly inflammable.
During and after cleaning, an inspection should be carried out of the sealing points on the thrust actuator.
If there is any sign of lubricant escaping or dirt having accumulated, the sealing elements must be repaired.

8.0 Troubleshooting

In the event of malfunction or faulty operating performance check that the installation and adjustment work has been carried out and completed in accordance with these Operating Instructions.

ATTENTION !

It is essential that the safety regulations are observed when identifying faults.

If malfunctions cannot be eliminate with the help of the following table
“**9.0 Troubleshooting table**”, the supplier or manufacturer should be consulted.

9.0 Troubleshooting table

ATTENTION !

- read point 10.0 and 11.0 prior to dismantling and repair work !

- read point 6.0 before restarting the plant !

Fault	Possible Causes	Remedy
Thrust actuator fails to move	Power failure	Ascertain and eliminate cause
	Fuse has blown	Replace fuse
	Thrust actuator not properly connected	Rectify connection on thrust actuator in accordance with wiring diagram
	Short circuit due to: - moisture - wrong connection - motor has burned out	Ascertain exact cause, - Dry the thrust actuator and eliminate leakage - Rectify connection on thrust actuator in accordance with wiring diagram - Check whether the mains voltage agrees with the voltage specified on the rating plate. Have motor changed.
	Connector contacts not plugged in/ not properly plugged into jack strip	Insert connector firmly in jack strip thus affected
	(Only for 12 - 15 kN) Handwheel is still engaged and does not disengage when the motor starts up	Unscrew the motor mounting screw closest to the cable feed-through. (Manual release of the handwheel disengagement mechanism.)
Thrust actuator alternates between clockwise and counter-clockwise rotation	Motor operating capacitor defective	Have motor operating capacitor replaced.
	Several 3-point actuators with a single-phase capacitor motor are operated via a control contact. If one actuator is moved into the end position, it receives a control signal in the opposite direction via the second actuator's auxiliary capacitor and is moved out of the end position again.	Isolate actuators electrically, e.g. with cut-off relay
	Controller outputs defective, e.g. relays stick or semiconductor outputs are defective. The actuator is moved into an end position without a control signal from the controller. If it is operated in the opposite direction, the motor receives a signal to move in both directions (undefined direction of rotation).	Replace controller outputs / electronics

Thrust actuator fails to run to final positions and also produces chatter	Load-dependent travel switches out of / defective	Remove thrust actuator and send to factory for repair
	Voltage drop due to excessively long connecting cables or inadequate conductor cross-section	Lay connecting cables in accordance with requisite output
	Mains fluctuations beyond permissible tolerance travels	Arrange for "clean" mains system within requisite tolerances
	System pressure too high	Reduce system pressure
Periodic failure on thrust actuator	Loose connection on feedline	Tighten connections on terminal strips
Thrust actuator is switched off in retracting direction prior to load-dependent switch (three-way valve)	Travel switch S3 not set corresponding to use	Set travel switch S3 in accordance with operating instructions

10.0 Dismantlement of thrust actuator

ATTENTION !

- The supply line for connecting up the thrust actuator must be in the dead state i.e. disconnected while dismantlement work is being carried out. After being disconnected, the mains power must be prevented from being switched back on again accidentally.

- The system must be run down (depressurised state) as the valve cone is not held without the thrust actuator and would thus be conducted by the system pressure.

- Valve plug approximately in mid lift position - on no account supported inside a seat!

To dismantle the thrust actuator proceed as follows:

- Loosen collar nut / countersunk screw on hood, carefully remove hood.
- Disconnect all cables led into thrust actuator from outside and remove from thrust actuator.
- Place hood on carefully from above and fix in place with collar nut / countersunk screw and rubber gasket.
- Loosen grub screw inside torsion safety feature; screw coupling out of torsion safety feature.
- Loosen clamping bolts connecting the thrust actuator to the fitting.
- Remove thrust actuator from valve.

11.0 Warranty / Guarantee

The extent and period of warranty cover are specified in the "Standard Terms and Conditions of Albert Richter GmbH & Co. KG“ valid at the time of delivery or, by way of departure, in the contract of sale itself.

We guarantee freedom of faults in compliance with state-of-the-art technology and the confirmed application.

No warranty claims can be made for any damage caused as the result of incorrect handling or disregard of operating and installation instructions, datasheets and relavant regulations.

This warranty also does not cover any damage which occurs during operation under conditions deviating from those laid down by specifications or other agreements.

Justified complaints will be eliminated by repair carried out by us or by a specialist appointed by us.

No claims will be accepted beyond the scope of this warranty. The right to replacement delivery is excluded.

The warranty shall not cover maintenance work, installation of external parts, design modifications or natural wear.

Any damage incurred during transport should not be reported to us but *rather* to the competent cargo-handling depot, the railway company or carrier company immediately or else claims for replacements from these companies will be invalidated.

Technik mit Zukunft.

DEUTSCHE QUALITÄTSARMATUREN

ARI-Armaturen Albert Richter GmbH & Co. KG, D-33750 Schloß Holte-Stukenbrock
Telefon +49 (0)5207 / 994-0 Telefax +49 (0)5207 / 994-297 oder 298
Internet: http://www.ari-armaturen.de E-mail: info.vertrieb@ari-armaturen.de

12.0 Translated Declaration of Incorporation and Conformity

ARI-Armaturen
Albert Richter GmbH & Co. KG
Mergelheide 56-60, D-33758 Schloß Holte-Stukenbrock, www.ari-armaturen.com

Translated Declaration of Incorporation of Partly Completed Machinery
EC-directive 2006/42/EC and EC-/EU declaration of conformity
as defined by the EC-directive about electromagnetic compatibility 2004/108/EC,
the EU-directive about electromagnetic compatibility 2014/30/EU,
the EC-Low voltage directive 2006/95/EC,
the EU-Low voltage directive 2014/35/EU
and the EU-directive 2011/65/EU (RoHS II)

for the supplied model of ARI electric thrust actuators:

- **ARI-PACO 2G**
- **ARI-PREMIO**
- **ARI-PREMIO-Plus 2G inclusive accessories**

ARI-Armaturen GmbH & Co. KG as facturer herewith declares, that the products mentioned above meet the following basic requirements of the Machinery Directive (2006/42/EC):

Annex I, articles 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1,2,2, 1.2.6, 1.3.2, 1.3.4, 1.3.7, 1.3.8, 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.5, 1.5.6, 1.7.1, 1.7.3, 1.7.4

The following harmonised standards have been applied:

- DIN EN ISO 12100: 2011-03 + Berichtigung 1: 2013-08
- EN 60204-1: 2006

ARI-thrust actuators are designed for assembling with valves.
ARI-thrust actuators must not be put into service until the final machinery, into which they are to be incorporated has been declared in conformity with the provisions of the EC Directive 2006/42/EC.
The relevant technical documentation pertaining to the machinery described in Annex VII, part B has been prepared. With regard to the partly completed machinery, the manufacturer commits to submitting the documents to the competent national authority via electronic transmission upon request.

Authorised person for documentation: Dieter Richter

The thrust actuators further meet the requirements of the following european directives and the respective approximation of national laws:

1. **EC-directive about electromagnetic compatibility 2004/108/EC** (valid until 19. April 2016)
   EU-directive about electromagnetic compatibility 2014/30/EU (valid from 20. April 2016)
   The following harmonised standards have been applied:
   EN 61000-6-3: 2007 + A1: 2011; EN 61000-6-2: 2005
2. **EC-Low voltage directive 2006/95/EC** (valid until 19. April 2016)
   EU-Low voltage directive 2014/35/EU (valid from 20. April 2016)
   The following harmonised standards have been applied:
   EN 60204-1, EN 60335-1, EN 60730-1, EN 60730-2-14
3. **EU-directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2011/65/EU (RoHS II)**

Schloß Holte-Stukenbrock, 15.07.2016

(Brechmann, Managing director)

The declaration certifies the conformity with the mentioned directives, it does not contain any warranty of properties in the sense of the product liability lay, however. The safety hints of the product information supplied with the product must be observed. In case of a modification of the applieance not agreed with the manufacturer and of non-observance of the safety hints this declaration loses its validity.