



INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS



Electric linear actuators ST 0, STR 0

TEST CERTIFICATE

ELECTRIC LINEAR THRUST ACTUATOR ST 0, STR 0	
Type number 490.	Power supply V Hz
Serial number	Max. load thrust N
Production year	Switching-off thrust N
Wiring diagram	Operation speed mm/min
.....	Operating stroke mm
.....	Input operation signal
Warranty period months	Transmitter (potentiometer)
Serial number of electric motor	
Serial number of transmitter	
Serial number of position controller	
Tests made in accordance with TP 74 0878 00	
Tests made by	Packed by
Date	Signature and stamp

COMPLETENESS CERTIFICATE

Used valve	
Assembled by: Firm	
Name.....	
Warranty period months	
Date	Signature and stamp.....

INSTALLATION CERTIFICATE

Location	
Installed by: Firm	
Name	
Warranty period..... months	
Date	Signature and stamp.....

Please read these instructions carefully before mounting and operating the actuator!

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The Installation, Service and Maintenance Instructions are drawn up according to requirements of EC Executive Nr. 2006/42/EC "Uniform requirements for machines and devices from the point of view of safety and health care", to save life and health of users and to avoid material damages and exposure environment to danger.

1. General data

1.1 Purpose and applications

Electric linear actuators (hereinafter **EA**) of **ST 0** (hereinafter **ST**) or **STR 0** (hereinafter **STR**) types are high-powered electric-mechanical products designed for direct installations onto controlled devices (regulating bodies -valves, etc.). EA of ST types are provided for remote control of closing bodies, and EA of STR types for automotive control of regulating bodies in both directions of their movement. They can be equipped with means of measuring and control of technological processes where an unified analogue direct current or voltage signal is an information bearer on their input and/or output. They can be used in heating, energy, gas, air-conditioning and other technological systems, which they are suitable for, regarding their features. They are connected with controlled devices with a flange according to DIN 3358, or using a pillar or flange.

Note:

Do not count with tight closing performed by control signals of EA STR.

Switching of actuator by a semiconductor switches have to be consulted with producer.



It is forbidden to use EA as a lifting mechanism!

1.2 Safety instructions

1.2.1 Characteristics of the Product Regarding Its Exposure Rate



EA of ST and STR types are reserved technical devices with higher rate of danger, with possibility of installation in areas specially danger regarding casualties caused by electric current.

Electric actuators are according to directive LVD 2014/35/EU and standard IEC 61010-1:2010 assigned for installation category II (overvoltage category).

1.2.2 Product influence to environment

Electromagnetic compatibility (EMC): the product complies with the requirements of the Directive 2014/30/EU of the European Parliament and of the Council on the approximation of the laws the Member States relating to the electromagnetic compatibility and with the requirements of standards as well EN 61000-6-4:2007+A1:2011, EN 61000-6-2:2005, EN 61000-3-2:2014 and EN 61000-3-3:2013.

Vibrations caused by the product: product influence is negligible

Noise produced by the product: the maximum allowable noise level (A) of the product measured in a place of operation is 78 dB (A).

1.2.3 Requirements for professional qualification of people performing installation, service and maintenance



Electric connection can be performed only by an acquainted person, i.e. an electrical engineer with professional education of electrical engineering at an apprentice school or a technical school (secondary, complete secondary or university education) and whose qualification was verified by an educational facility authorised to verify professional qualification.

Instructions for operating stuff training



Operation can be performed by skilled personel only trained by production plant, resp. by contracting service center!

Warning for safety use

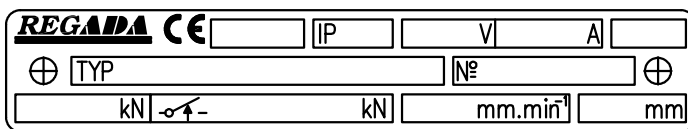
Product protection

EA **ST, STR** does not have own short-circuit protection, therefore there must be included suitable protective device into the supply power (circuit breaker, or fuse), which serves at the same time as main switch.

Type of equipment from a connection point of view: The equipment is designed for permanent connection.

1.3 Data specified on electric actuator

Nameplate:



Warning plate:



Nameplate contains the basic data concerning identification, performance and electricity: indication of producer, type, serial number, max. load thrust and switching-off thrust, protection code, operating speed, supply voltage and current.

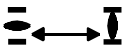
Graphic symbols on electric actuator

The graphic symbols used on electric actuator substitute the text messages. Some of them are in accordance with EN ISO 7010, ISO 7000 and IEC 60417 within valid edition.



Dangerous voltage

(EN ISO 7010-W012)



Stroke of the electric linear actuator



Switching-off thrust



Manual control

(0096 ISO 7000)



Protection terminal

(5019 IEC 60417)

1.4 Warranty conditions

The supplier is responsible for completeness of the delivery and guarantees these specifications of the product which are stated in Technical conditions (TP) or specifications agreed in the Contract.

The supplier is not responsible for any deterioration of parameters caused by the customer during storage, unauthorised installation or improper operation.

1.5 Under-guarantee and after-guarantee service

Our customers are provided with professional service of our firm in installation, operation, service, maintenance, revision and help in troubleshooting for all our products.

Trained professionals wait for you also in our contracted service centres.

Under-guarantee service is performed by the service department of the production plant, or by a contracted service centre according to a written claim.

In case of occurring of any fault please let us know it and state:

- basic data from nameplate: type code and serial number

- type of fault - description of claimed fault (actuator employment, ambient parameters (temperature, humidity...), duty cycle including frequency of switching, type of switching-off (position or thrust), set switching-off thrust)
- it is recommended to place also Installation certificate.

It is recommended to have **after-guarantee service** performed by the service department of the production plant, or by a contracted service centre.

1.5.1 Lifetime of actuators

The lifetime of an electric actuator (EA) is at least 6 years.

EA used for closing mode (closing valves) comply with the requirements for at least **15,000 working cycles** (cycle C – O – C: for linear EA).

EA used for regulating/modulating operation (control valves) comply with the below stated numbers of **operating hours** at the total number of 1 million start-ups:

Switching frequency				
max. 1,200 [h ⁻¹]	1,000 [h ⁻¹]	500 [h ⁻¹]	250 [h ⁻¹]	125 [h ⁻¹]
Minimal lifetime expectancy – number of operating hours				
850	1,000	2,000	4,000	8,000

Time of **net operation** is min. 200 hours, max. 2,000 hours.

Lifetime at operating hours depends on loading and switching frequency.

Note : High switching frequency does not ensure better regulation. Setting of regulation parameters should be therefore made with the inevitably necessary switching frequency needed for the process in question.

1.6 Operation conditions

1.6.1 Product location and operation position

Electric actuators may be installed and operated in enclosed locations of industrial facilities with no temperature and moisture regulation, protected from direct climatic effects (such as direct sunlight). Moreover, special “marine” versions may be used in waste water treatment applications, water management, selected chemical applications, tropical environments and coastal areas.

EA have to be placed with the view of access toward handle of manual operating, top cover and bushing. Installation and operation of EA is possible in **any position**.



Warning:

When the EA is installed in open air, **it must be** sheltered lightly to protect is against direct effects of atmosphere.

When installed in the areas with relative humidity more than 80%, in open air under a shelter is needed to connect the space heater directly – without a thermal switch.

1.6.2 Operation Environment

According to valid standard IEC 60 721-2-1, there are delivered these versions of electric actuators:

- 1) Version „**temperate**“ for type climate temperate
- 2) Version „**tropical**“ for type climate tropical and dry
- 3) Version „**marine**“ for type climate marine.

In accordance with IEC 60 364-1, IEC 60 364-5-51 and IEC 60 364-5-55 within valid edition the EA have to resist external effects and operate reliably:

In the conditions of the following types of environment:

- mild to hot dry with temperature in range -25°C to $+55^{\circ}\text{C}$ **AA7***
- with relative humidity 10 to 100 %, including the condensation of up to 0,029 kg water content per 1 kg of dry air at 27°C , with temperatures from -25°C up to $+55^{\circ}\text{C}$**AB7***
- with height above sea level 2 000 m, with barometric pressure range 86 to 108 kPa**AC1***
- with splash water effects from all directions (protection enclosure IP x4)**AD4***
- with shallow immersion – (product shielding IP x 7)**AD7***
- with moderate dustiness - with effects of flame-proof, non-conducting and explosion-proof dust, medium cover of dust; dust fall more than 35 but at most 350 mg/sq. m per day (protection enclosure IP 5x)**AE5***
- with effects of flame-proof, non-conducting and explosion-proof dust, medium cover of dust; dust fall more than 350 but at most 1000 mg/sq m per day (protection enclosure IP 6x).....**AE6***
- with atmospheric occurrence of corrosive and pollution media.....**AF2***
- with possibility of effects of: medium sinusoid vibrations with frequency in range from 10 up to 150 Hz, with shift amplitude of 0.075 mm for $f < f_p$ and with acceleration amplitude of $9,8 \text{ m/s}^2$ for $f > f_p$ (transition frequency f_p is from 57 up to 62 Hz) (applies to 2 pillars version)**AH2***
- with possibility of effects of: medium sinusoid vibrations with frequency in range from 10 up to 150 Hz, with shift amplitude of 0.15 mm for $f < f_p$ and with acceleration amplitude of 19.6 m/s^2 for $f > f_p$ (transition frequency f_p is from 57 up to 62 Hz) (applies to 4 pillars version)**AH2***
- medium impacts, shocks and vibrations **AG2***
- with serious danger of plants and mould growing.....**AK2***
- with serious danger of animal occurrence (insects, birds, small animals).....**AL2***
- with damaging effects of radiation:
- erratic current leakage, with intensity of magnetic field (DC and AC, line frequency) to 400 A/m**AM2-2***
- with effects of medium seismic activity with acceleration $> 300 \text{ Gal} < 600 \text{ Gal}$ **AP3***
- with indirect endanger by storm **AQ2***
- with quick air movement and strong wind.....**AR3, AS3***
- without occurrence of dangerous media in the object.....**BE1***
- with persons frequent touching earth potential (persons often touch conductive parts or they stand on the conductive basement) **BC 3***

*Marking in accordance with IEC 60364-1, IEC 60 364-5-51 and IEC 60 364-5-55 within valid edition

1.6.3 Power supply:

electric motor	230 / 220 V AC $\pm 10\%$, or 24 V AC/DC $\pm 10\%$
control	230 / 220 V AC $\pm 10\%$, or 24 V AC/DC $\pm 10\%$
potentiometer	max. $\sqrt{P \times R}$ V DC/AC
electronic positional transmitter without power supply	15 up to 30 V DC, or 24 V DC

Power supply frequency 50 Hz or 60* Hz $\pm 2\%$

* Note: At frequency of 60 Hz operating speed is increased by 1.2 times.

Duty cycle (according to EN/IEC 60034-1, 8):

EA ST are designed for **remote control**:

- short-time operation **S2-10 min**
- intermitted operation **S4-25%, 6 up to 90 cycles per hour**

EA STR are designed for **automatic regulation**:

- intermitted operation **S4-25%, 90 up to 1200 cycles per hour**

Note:

EA STR is possible connect with external controller and use it as regulated EA and for this EA stand duty cycle and power parameters like for type STR with built-in controller .

1.7 Description

The ST electric actuators are designed for automotive position control of linear valves where relatively small control thrust is required. They can be also used in air-conditioning, heating as well as in technological systems.

The actuators are driven with an electric motor (1) fed and controlled through two thrust switches (2). The thrust switches are switched with a finger (5). The position switches are switched with motion of the cams (4).

The actuators are controlled with connection of voltage to the corresponding actuator terminals. If the voltage is connected to the terminals 1 and 12 of the two-thrusts version (the thrust switches S1 and S2), or 1 and 20 ones in case of the one-thrust version (the position switch S3 and the thrust switch S2), the actuator output part performs linear motion in the direction „opening“. The motion in the direction „closing“ can be reached with connection of voltage to the terminals 1 and 16.

In accordance with the order the control part can also contain a position transmitter (6) (resistive or with the unified current or voltage output signal) functioning as a feedback or as a remote position transmitter. The remote position transmitter with the unified output signal consists of the 2000 Ω resistive transmitter and the electronics board. The transmitter rotation is derived from the output shaft through the gear wheels system (7).

In case of mains failure or switches damages the actuator can be operated manually following the instructions given in the chapter 4. Service... .

The **STR** version is equipped with an **electronic controller**.

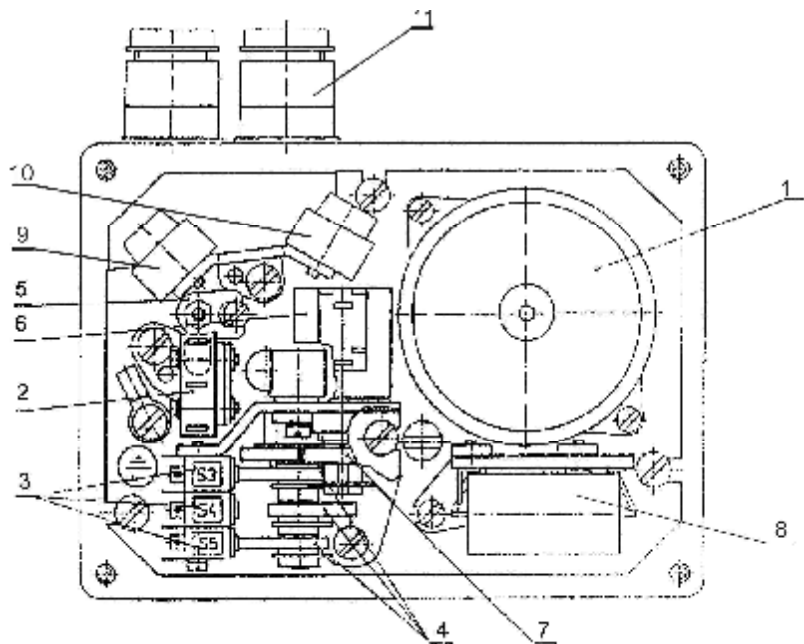


Fig.1

1.8 Basic specifications

1.8.1 Basic EA specifications

Max. load thrust [N], switch-off thrust [N], operating speed [mm/min], operating stroke [mm] and electric motor parameters are given in Table 1.

Table 1: Basic Specifications

Type/type number	Operating speed ±10[%]	Operating stroke		Max. load thrust for STR.	Max. load thrust for ST	Switch-off Thrust ±10 [%]	Weight	Electric motor ¹⁾					
		without transmitter	with transmitter					Power supply nominal voltage	Nom. power	Nom. speed	Men. current	Capacitor capacity.	
	[mm/min]	[mm]	[mm]	[N]	[N]	[N]	[kg]	[V] ±10%	[W]	[1/min]	[A]	[µF/V]	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	5	16; 25; 28; 40*	8; 10; 12,5; 16; 20; 25; 28	3 200	4 000	4 500		direct current	24 V DC	6	3100	0,6	-
				2 560	3 200	3 800							
				1 280	1 600	1 900							
				640	800	950							
	10			3 200*	4 000*	4 500*							
				2 560	3 200	3 800							
				1 280	1 600	1 900							
	16			640	800	950							
				2 000*	2 500*	2 900*							
				1 280	1 600	1 900							
	20			640	800	950							
				1 280	1 600	1 900							
	40			640	800	950							
				504	630	725							
				256	320	360							
16				504	630	725							

* For $U_N - 10\%$ stands: $F_{(U_N-10\%)} = F.0.9$
 For -25°C stands: $F_{(-25^\circ\text{C})} = F.0.9$

1) Switching elements for different type of load (also for EA) defines standard EN/IEC 60 947-4-1

Electronic position controller (N)**Controller software equipment:****A) Function and parameters**programmable **functions:**

- ..with functional buttons SW1, SW2 and LED diodes D1, D4 directly placed on controller
- ..with computer or terminal equipped with corresponding programme, using RS 232 interface.

programmable **parameters:**

- ..control signal
- ..response to SYS-TEST signal
- ..mirroring (ascending/descending characteristics)
- ..insensitiveness
- ..EA limit positions (only with computer and ZP2 programme)
- ..way of regulation

B) Operation states of controller**Error message** from error memory: (using LED diodes and RS 232 and personal computer)

- ..control signal missing or faulty
- .. input value of current control signal under 3.5 mA
- ..existence of SYS-TEST signal
- ..activity of switches
- ..failure of feedback position transmitter

Statistic data: (using RS 232 and personal computer)

- ..number of controller operation hours
- ..frequency of relay switching in direction "opening"
- ..frequency of relay switching in direction "closing"

Supply voltage:	terminal 61 (L1) -1(N) - 230 V AC, $\pm 10\%$
Frequency:	50/60 Hz $\pm 2\%$
Input control signals - analogue:	0 - 20 mA
.....	4 - 20 mA
.....	0 - 10 V
Input resistance for signal 0/4 - 20 mA	250 Ω
Input resistance for signal 0/2 - 10 V	50k Ω
	(Actuator opens at rising of control signal.)
Controller linearity:	0.5 %
Controller insensitiveness:	1 - 10% (adjustable)
Feedback (position transmitter):	resistive 100 up to 10,000 Ω
.....	current 4 up to 20 mA
Power outputs:	2x relay 5A/250 V AC
Digital outputs:	4x LED (supply, error, adjustment, "opening", "closing" - with two-colour LED)
Error status:	control switch 24 V, 2W - POR
Reaction at error situation:	transmitter error - error message LED
Control signal missing:	error message LED
SYS mode:	error message LED
Adjusters:	communication connector
.....	2x calibrating and adjusting button

Switching-off:

Switching-off voltage: 250 V(AC); 50/60 Hz; 2 A; $\cos \varphi=0.8$; or 250V(DC); 0,1 A,
 or 24 V (DC); 2 A; T=L/R=3ms

Manual control: with handle;
 rotating clockwise (counter-clockwisely) EA output part is moving in direction "Z" ("O")

Output part backlash: max. 0,25 mm (at 5% of max. load thrust)

Adjustment of limit positions:

Position switch S3 is adjusted to specified stroke.

Limit position switches are adjusted with accuracy $\pm 0,5$ mm referring to lower position and stroke.

Additional position switches are adjusted 1mm before end positions.

Setting of thrust switches

Switching thrust is set to the rated thrust with tolerance of ± 10 %.

Switching thrust is not adjustable.**1.8.2 Mechanical connection:**

- flange (DIN 3358)
- pillars

Basic and connecting dimensions are given in dimensional drawings.

1.8.3 Electric connection**with terminal board (X):**

- max. 12 terminals, nominal connecting cable size 1,5 mm², max. 2,5 mm² (for **ST**)
- 12 terminals, nominal connecting cable size 1.5 mm², max. 2,5 mm² + 5 terminals, connection size max. 0.5 mm² (for **STR**)
- 3 cable glands - cable diameter from 6 up to 10,5 mm

When using two types of extended cable glands - cable diameter from 9 up to 13 mm (max for 2 positions, without combination with cable glands from 14 to 18 mm) resp. from 14 to 18 mm (just for one position).

with protection terminal:

external and internal, mutually connected and marked with protection earthing mark

Electric connection - according to wiring diagrams.

1.9 Conservation, packing, transport, storing and unpacking

Surfaces without surface treatment are treated by conservation preparation MOGUL LV 2-3 before packaging .

Conservation is not necessary if the following storage conditions are complied with:

- Storage temperature: -10 to +50 °C
- Relative air humidity max.80 %
- Electric actuators and their accessories must be stored in dry, well ventilated covered spaces, protected against impurities, dust, soil humidity (by placement to racks, or on pallets), chemicals and foreign interventions
- There shall be no corrosive gases present in the storage areas.

The EA are delivered in solid packages guaranteeing resistance in accordance with EN 60 654 (IEC 60 654-1 and IEC 60 654-3).

Package is a box. Products in boxes is possible to load on the pallets (pallet is returnable). On the outer side of the package is stated:

- manufacturer label,
- name and type of product,
- number of pieces,
- other data – notices and stickers.

The forwarder is obliged to secure packed products, loaded on transportation means, against self-motion; if open transportation means are used, to secure their protection against atmospheric precipitations and splashing water. Displacement and securing of products in transportation means must provide their stable position, exclude the possibility of their inter-collision and their collision with the vehicle walls.

They can be transported in unheated and not airtight areas of transport means with effects in range:

temperature: -25°C up to +70°C

humidity: 5 up to 100%, with maximal content of water 0.029 kg/kg per kg of dry air

barometric pressure: 86kPa up to 108kPa

After receiving EA check whether during transport or storage the actuator was not damaged. Compare also whether the parameters on their nameplates are in accordance with accompanying documentation or the Contract. If any discrepancy or fault occur inform immediately your supplier.



If the actuators and accessories are not immediately installed, they have to be stored in dry, well-ventilated sheltered roos, protected against dirt, dust, soil humidity (with placing onto shelves or onto pallets), chemical impacts and encroachment, at ambient temperature from -10°C up to +50 °C and relative humidity max. 80 %.

It is not allowed to store EA in the open air or in areas not protected against direct impact of climate!

If any scratch on the surface finishing occurs remove it immediately - you protect this way actuators against damaging with corrosion.

If storing takes longer than 1 year, it is necessary to inspect lubrication fillings before putting EA into operation.

Assembled EA, but not put into operation is necessary to protect by the equivalent method as during storage (for example suitable protective cover).

After assembly to the armature in free and wet areas, or in areas with temperature changes, connect without delay heating resistor – thus preventing damages caused by corrosion from liquefied water in the control area.

Excessive preserving grease remove just before putting EA into operation.

1.10 Appreciation of the product and packing

The product and its package are made of recycling materials. Do not throw the single parts of the package and of the product after their life but sort them according to instructions in corresponding executives or regulations of environment protection, and allow their recycling.

The product and its packing are not a source of any environment pollution or contamination and do not contain any dangerous waste.

2. Installation and dismantling of actuator



Abide by safety measures!

Before starting of mounting the EA onto the valve:

- Check again whether the EA was not damaged during storing.
- Check whether the adjusted operating stroke and connecting dimensions of the actuator (see the nameplate) are in compliance with the valve parameters.
- In case of inconsonance, perform adjusting according to the part Adjustment.

2.1 Installation

EA is by the producer adjusted to parameters according to the nameplate, with connecting dimensions according to the corresponding dimensional drawing and put it to a mid-position.

Before installation put the handle on.

2.1.1 Mechanical connection

The actuators can be installed and operated in any position. While installing leave enough space for dismantling of the upper cover to allow adjusting of the control parts.

Mechanical connection with connection dimensions according to DIN Standards (Fig. 2)

Connection procedure:

- Set the actuator (A) and the valve (B) to the position „closed“.
- Put the actuator (A) onto the valve (B).
- Screw the actuator shaft (8) into the valve coupling (15) until the actuator flange seats on the valve body (13).
- Tighten the screws (9) to connect the actuator flange (5) with the valve body (13).
- Check connection dimensions in accordance with Fig. 1.
- Turn the valve output shaft by one revolution and lock it with the nut (12).

- A electric actuator
 1 disengagement button
 2 hand wheel
 5 actuator flange
 6 pillar
 8 actuator output shaft
 9 screw
- B valve
 10 valve output shaft
 12 locking nut
 13 valve body
 15 valve coupling

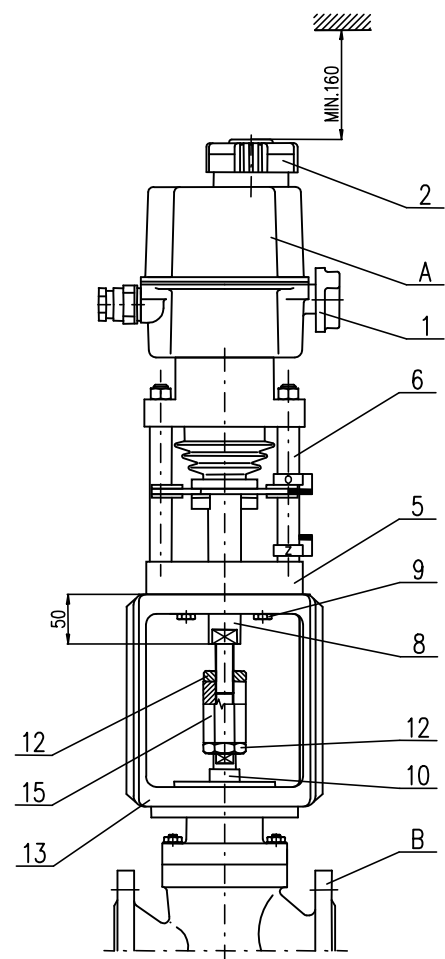


Fig.2

Mechanical connection for pillar version - Fig. 3

Connection procedure:

- The valve (B) is put to the position „closed“ and the actuator (A) to a mid-position.
- Loosen the nuts (4) on the pillars (6).
- Screw the pillars (6) with the cross system into the valve flange (13).
- Tighten the pillars (6) nuts.
- Unscrew the coupling (3) screws (7) to dismantle the coupling into parts.
- Screw the coupling (3) nut onto the valve shaft (10) to reach the connecting size H in accordance with the table and the actuator nameplate.
- Unscrew the coupling (3) nut by one revolution and lock it by a nut (12).
- Use the hand wheel (2) to put the actuator output shaft next to the valve (10), and screw the coupling parts together.

- A electric actuator
 1 disengagement button
 2 hand wheel
 3 coupling nut
 4 pillar nut
 6 pillar
 7 coupling screw
- B valve
 10 valve shaft
 12 locking nut
 13 valve flange

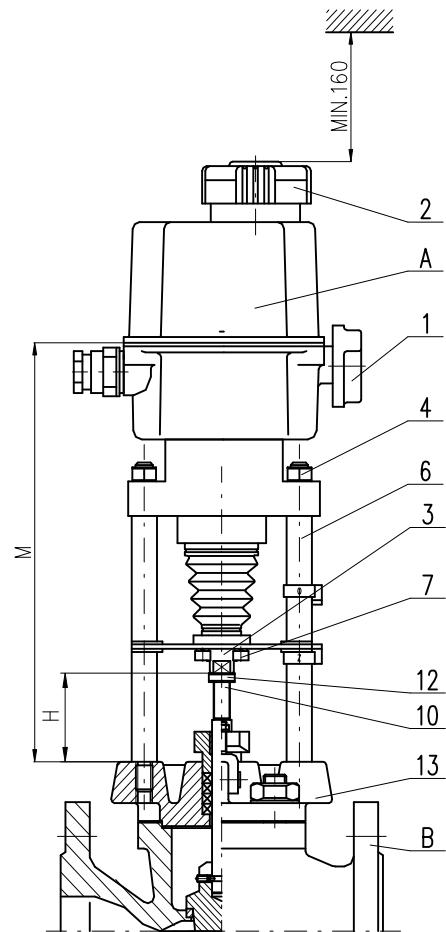


Fig. 3

Mechanical connection for versions with flange (Fig. 4)

Connection procedure:

- Set the actuator (A) and the valve (B) to the position „closed“.
- Place the actuator (A) onto the valve (B).
- Tighten the central nut (11) to connect flanges (13) and (5).
- Unscrew the coupling (3) screws to dismantle the coupling into parts.
- Screw the coupling (3) nut onto the valve shaft (10) to reach the connecting size H in accordance with the table and the actuator nameplate.
- Unscrew the coupling (3) nut by one revolution and lock it by a nut (12) to create the prestress onto the valve seat.
- Use the hand wheel (2) to put the actuator output shaft near the valve (10), and screw the coupling parts together.

- A electric actuator
 1 disengagement button
 2 hand wheel
 3 coupling nut
 4 pillar nut
 5 actuator flange
 6 pillar
 B valve
 10 valve shaft
 11 central nut
 12 locking nut
 13 valve flange

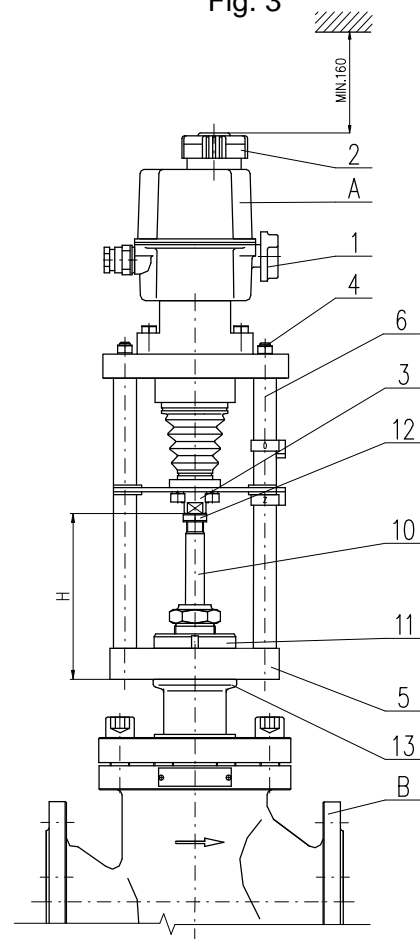


Fig.4

Mechanical connection for versions with flange TGL (Fig. 5)

Connection procedure:

- Set the actuator (A) and the valve (B) to the position „closed“.
- Place the actuator (A) onto the valve (B).
- Tighten the clamp nuts (11) to connect flanges (13) and (5).
- Unscrew the coupling (3) screws to dismantle the coupling into parts.
- Screw the coupling (3) nut onto the valve shaft (10) to reach the connecting size H in accordance with the table and the actuator nameplate.
- Unscrew the coupling (3) nut by one revolution and lock it by a nut (12) to create the prestress onto the valve seat.
- Use the hand wheel (2) to put the actuator output shaft next to the valve (10), and screw the coupling parts together.

- A electric actuator
 1 disengagement button
 2 hand wheel
 3 coupling nut
 5 actuator flange
 6 pillar
- B valve
 10 valve shaft
 11 connecting nut
 12 locking nut
 13 valve flange

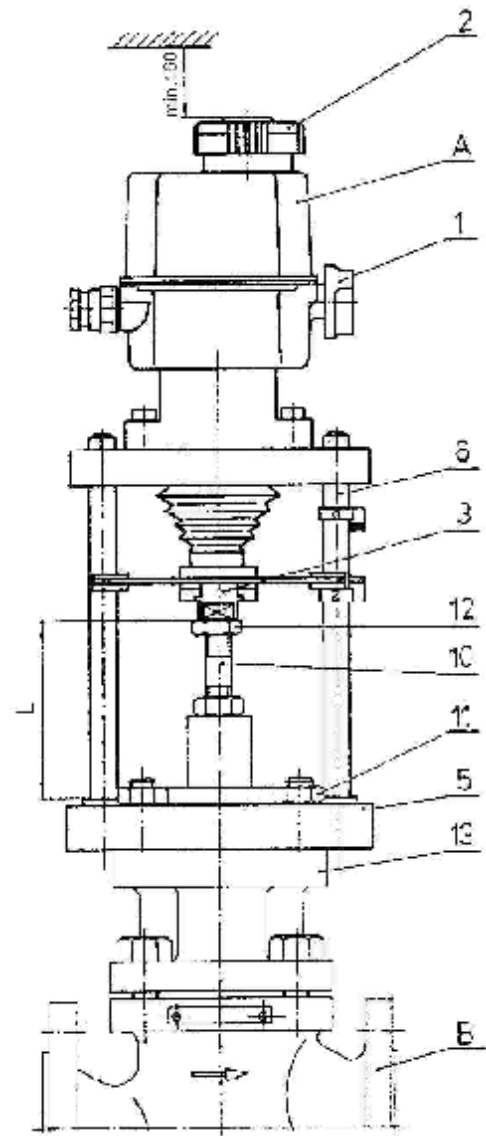


Fig. 5

2.1.2 Electric connection and checking of function

1. Follow instructions in the part "Requirements for professional qualification"!
2. While laying electrical line abide by the instructions for heavy current installations.
3. Cables to terminal boards or connectors lead through cable glands. The cable jacket diameters must conform to the extent specified in Chapter 1.8.3!
4. Before initiation ES into operation internal and external protection terminals are needed to be connected.
5. Feeding cables are to be fixed to the solid construction at most 150 mm from the cable glands.
6. It is recommended to use screened cables to connect remote transmitters.
7. To prevent moisture from entering the actuator around the connecting cables, the cables must be sealed with silicone material at the point of penetration through device shell.



Connecting with the master system:

The EA can be controlled with:

- a built-in position controller
- an external position controller

The actuator is connected in accordance with the wiring diagrams put into the actuator upper cover. Electric connection is made through cable glands to the terminal boards. The terminal board with six terminals (9) (Fig. 1) is designed for connection and control of the actuator and the terminal board with three terminals (10) for connection of the transmitter. The installed set of capacitors (8) allows starting of the actuator.

After electric connection it is recommended:

Check of wiring of the electric motor and the control part: Set the actuator into a mid-position. Check the right direction of output shaft movement with pressing of the button „closing“ (on the manual control box or on the test press-button box), and follow the output stem which should shift out from the actuator. If not you check proper connection.

Check of the position switch: When the actuator is moving in the direction „opening“ switch the contact of the switch with pressing of its switching spring. In case of proper connection the actuator should stop. If any of the functions is not proper, check wiring of the switches in accordance with the wiring diagram.



In the **STR version** with the built-in electronic controller it is needed to perform **autocalibration** for assuring optimal functioning.

The procedure is as follows

Press the button **SW1** for about 2 sec (i.e. till the **D3** diode is got on) to set the controller to the **autocalibration** mode. During this process the controller checks the feedback transmitter and the sense of turning, puts the EA to the positions open and closed, measures inertia mass in the directions "opening" and "closing", and loads the adjusted parameters into the EEPROM memory. In case that during the initialisation process an error occurs (e.g. in connection or adjustment) the initialisation process will be interrupted and the controller with the **D4** diode reports about the type of the error. Else after finishing the initialisation process the controller is put into the **regulation mode**. If needed to change adjusted parameters of the controller follow instructions given in the part Adjusting of actuator.

2.2 Dismantling



**Before dismantling it is required to disconnect the EA from mains!
Do not connect and disconnect live connectors!**

- Disconnect the EA from mains phases.
- Disconnect the leads from the EA terminal boards and loosen the cables from cable glands.
- Loosen the fixing screws of the EA flange and of the coupling and disconnect the EA from the valve.
- While sending the EA to be repaired put it into a package solid enough to avoid damages of the EA during transportation.

3. Adjusting of actuator



Abide by safety measures!

The adjustment can be performed at a mechanically and electrically connected EA. This part describes adjustment of EA to specified parameters in case that any unit of EA is reset.

Laying of adjusters of the control board is shown on Fig.1.

3.1 Gear unit adjustment

The switching thrust values both for the direction „opening“ (the thrust switch S1) and for the direction „closing“ (the thrust switch S2) are in the production plant adjusted to the rated thrust with tolerance $\pm 10\%$. The numeric values are given in the corresponding specification table. Adjustment and resetting of the gear unit to other thrust values are not possible without having a special test device to measure thrust values.

3.2 Position unit adjustment (Fig. 6)

The position switches are to be adjusted with setting the cams switching them. Turning the cam is performed with a screwdriver put into the cam groove.

Adjustment of the S3 limit switch

In case of the one-thrust wiring of the actuator the electric motor is during the actuator motion in the direction „opening“ fed through the S3 position switch. If it is out of tune follow these steps:

- Put the actuator and the controlled device to the required position „open“.
- Turn the cam switching the switch S3 clockwise until the switch S3 switches.

Adjustment of the additional position switches

The switches are in the plant adjusted to switching ca. 1mm before the correspondent limit position of the actuator.

While adjusting of the switches S5 and S6 follow these steps:

- Put the actuator to the position where the switch S5 should indicate the position „open“.
- Turn the cam switching the switch S5 clockwise until the switch S3 (14) switches.
- Put the actuator to the position where the switch S6 should indicate the position „closed“.
- Turn the cam switching the switch S6 counter clockwise until the switch S6 switches.

S3 – position switch "open"

S5 – additional position switch "open"

S6 – additional position switch "closed"

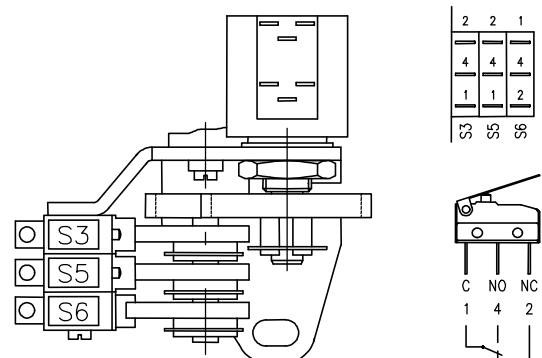


Fig.6

3.3 Adjustment of resistant transmitter

The **resistant transmitter** is in the EA **ST** used to function as a remote position indicator; in the EA **STR** to function as a feedback in the position controller and if needed also in the position of a remote resistant position indicator.

The potentiometer is not needed to be adjusted, it is able to adjust itself with putting the actuator to the both limit positions in accordance with the stroke specified on the nameplate.

Notes:

1. If the actuator was adjusted to another stroke the transmitter resistance in the limit positions should not correspond with the technical parameters given in the chapter 1.7.
2. In case that the EA is not used in the whole stroke range given on the nameplate, the resistance in the limit position "open" is proportionally reduced.
3. In the EA **STR** 2000W resistant transmitters are used. In the other cases if the resistant branch is lead to the terminal board the resistance of the transmitters is according to the customer's specification.

3.4 Adjustment of the Electronic Position Transmitter (EPV) - the Resistive Transmitter (Potentiometer) with the Converter PTK 1

The position transmitter with the converter is in the plant adjusted to have the output current signal on the terminals 81-82 as follows:

- in the position "open" 20 mA
- in the position "closed" 4 mA

If the transmitter requires a new adjustment follow these steps:

Adjustment of the **EPV – the 2-wire version:**

- Put the actuator to the position "closed" and switch the power supply off.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (Fig. 7, 7a). The used transmitter resistance is 100 W.
- Switch the converter's power supply on.
- Turn the adjusting trimmer ZERO resp. A to adjust the output current signal rate measured on the terminals 81-82 to 4mA.
- Set the actuator to the position "open".
- Turn the adjusting trimmer GAIN resp. B to adjust the output current signal rate measured on the terminals 81-82 to 20mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

Note:

The output signal of 4-20mA can be adjusted at the range from 75 up to 100% of the rated stroke stated on the actuators nameplate. At values less than 75% the value 20mA is reduced proportionally.

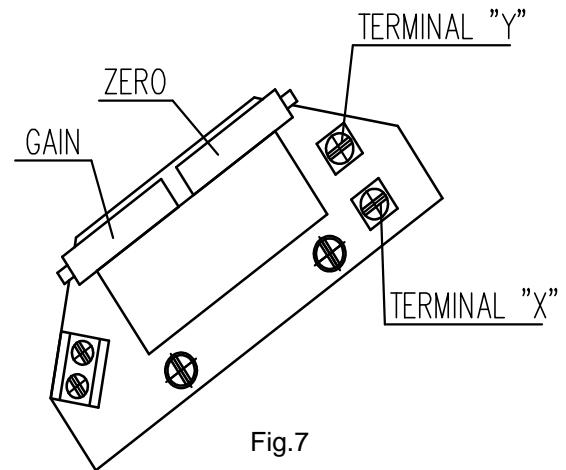


Fig.7

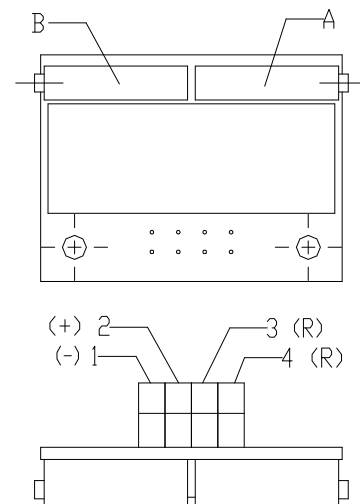


Fig. 7a

Adjustment of the EPV in Electric Actuators STR with controllers

- Disconnect the circuit with removing a jumper on the terminals 81 and 82.
- Disconnect the control signal from the terminals 86/87 and 88.
- Set the actuator to the direction "OPENING" or "CLOSING" with the handwheel, or with connecting power to the terminals 1 and 20 for the direction "OPENING" or 1 and 24 for the direction "CLOSING".
- Set the actuator to the position "CLOSING" and switch the converter off on the terminals 1 a 61.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (Fig. 7).
- Connect power supply to the terminals 1 and 61.
- Turn the adjusting trimmer ZERO (Fig. 7) to adjust the output current signal rate measured on the terminals 81-82 to 4mA.
- Set the actuator to the position "open".
- Turn the adjusting trimmer GAIN (Fig. 7) to adjust the output current signal rate measured on the terminals 81-82 to 20mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

- Having the transmitter adjusted put the jumper again on the terminals 81 and 82 in case that the output signal wont be used (the circuit through the terminals 81 and 82 should be closed).
- Connect the control signal to the terminals 86/87 and 88.

3.4.1 EPV – 3-wire version (Fig. 8, 8a)

The resistive transmitter with the converter is in the plant adjusted to have the output current signal metered on the terminals 81-82 as follows:

- in the position "open" 20 mA, resp. 5 mA, resp. 10V
- in the position "closed" 0 mA, resp. 4mA, resp.0 mA

according to the specified version of the converter.

If the transmitter requires a new adjustment follow these steps:

- Put the actuator to the position „closed“ and switch the power supply off.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y, resp. 0%-100% (Fig. 8, 8a). The used transmitter resistance is 2000 W resp. 100 W.
- Switch the converter’s power supply on.
- Turn the adjusting trimmer ZERO resp A to adjust the output current signal rate measured on the terminals 81-82 to 0 mA, resp. 4mA, resp. 0V.
- Set the actuator to the position "open".
- Turn the adjusting trimmer GAIN resp. B to adjust the output current signal rate measured on the terminals 81-82 to 20mA, resp. 5 mA, resp. 10V.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

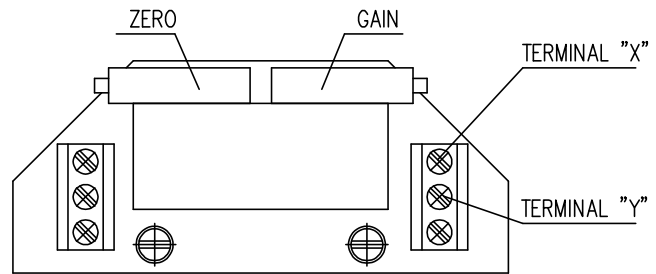


Fig.8

Note:

The output signal of (0-20mA, 4-20mA, 0-5mA, resp. 0-10V according to the specification) can be adjusted at the range from 85 up to 100% of the rated stroke stated on the actuators nameplate. At values less than 85% the value of the output signal is reduced proportionally.

3.5 Adjustment of position controller (Fig. 9)

The built-in position controller REGADA of new generation is a user-friendly control system to control actuators with an analogue signal. The controller takes advantages of high-power RISC processor MICROCHIP to perform all functions. It provides also continuous automotive diagnostics of the system, error messages as well as number of relay switching and number of controller's operation hours. Placing an analogue signal onto the input terminals of the terminal board 86/87 (GND, -) and 88 (+) causes that the EA output is reset.

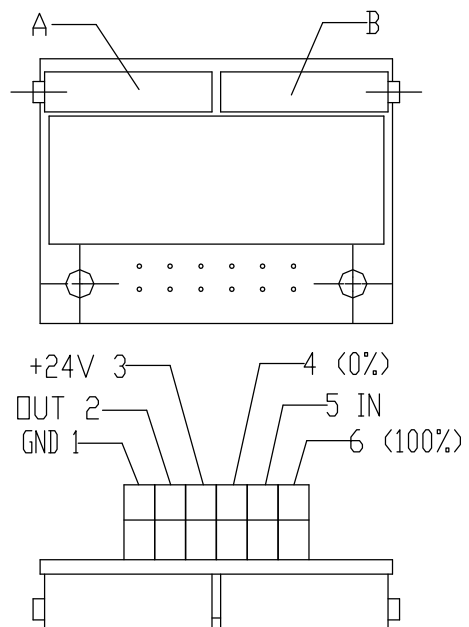


Fig. 8a

Required parameters and functions can be programmed using function buttons SW1 - SW2 and LED diodes D3 - D4 placed directly on the controller, see Table 2.

3.5.1 Setting of controller

The controller's microprocessor unit is in the production plant programmed to parameters given in **Table 2** (Note 2).

Setting of the controller is performed using buttons and LED diodes.

Adjust the position and thrust switches and the position transmitter before adjustment of the controller.

Laying of adjusters and signalling elements on the board of the REGADA controller is shown on Fig. 9:

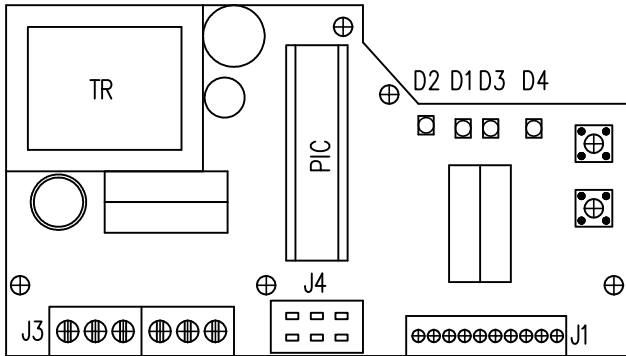


Fig. 9

SW1 button	starts an initialisation routine and allows listing in the adjust menus
SW2 button	setting of parameters in the chosen menu
D1 diode	power on indication
D2 diode	motion to the direction "opening" indication (green) - "closing" (red) indication
D3 diode	(yellow light) number of blinking codes indicates chosen adjust menu
D4 diode	(red light) number of blinking codes indicates adjusted parameter of the controller from the chosen menu

Table 2:

D3 (yellow) diode number of blinking	Adjust menu	D4 (red) diode number of blinking	Adjusted parameter
1 blink	control signal	1 blink	0-20mA
		2 blinks	4-20 mA (*) (**)
		3 blinks	0-10V DC
2 blinks	response for signal SYS-TEST	1 blink	EA opens receiving signal SYS
		2 blinks	EA closes receiving signal SYS
		3 blinks	EA stops receiving signal SYS (*)
3 blinks	mirroring (ascending/descending characteristics)	1 blink	EA CLOSING at increasing of control signal
		2 blinks	EA OPENING at increasing of control signal (*)
4 blinks	insensitiveness of controller	1 to 10 blinks	insensitiveness of controller of 1-10% (3% set by the producer) (*)
CONTINUE >>>			

D3 (yellow) diode number of blinking	Adjust menu	D4 (red) diode number of blinking	Adjusted parameter
5 blinks	way of regulation	1 blink	narrow thrust
		2 blinks	narrow position (*)
		3 blinks	wide thrust
		4 blinks	wide position

Notes:

1. The controller at autocalibration automatically sets the feedback type - resistant/current
2. (*) Parameters set in the production plant, if customer has not stated else.
3. (**) Input signal
4 mA - position "closed"
20 mA - position "open"

Standard setting of controller (programmed RESET of controller) - in case of any problems with setting of the parameters it is possible with pressing both **SW1** and **SW2** at the same time and then switching power on to set the standard parameters.

Controller setting procedure:

The initialisation routine starts at the switched-on controller, zero system deviation and short pressing of the SW1 button for ca 2 sec (i.e. until the diode D3 got on). Loosing the button some of the default menus starts (usually control signal) what is shown with 1 blink on the D3 diode as well as one of the default parameters (usually control signal of 4-20mA) what is shown with 1 blink on the D4 diode. Then the required parameters of the controller can be changed according to Table 2:

- press shortly the SW1 button to list the menu shown with the blinking number on the D4 diode.
- press shortly the SW2 button to set parameters shown with the blinking number on the D4 diode.

After changing of the parameters according to user's wishes, put the controller to autocalibration with pressing the SW1 button for ca 2 sec (i.e. until the diode D3 got on). During this process the controller performs the feedback transmitter and turning sense checking, sets actuator to the positions "open" and "closed", measures inertia mass in the directions "opening" and "closing", and loads the adjusted parameters into the EEPROM memory. In case that during the initialisation process an error occurs (e.g. in connection or adjustment) the initialisation process will be interrupted and the controller with the D4 diode reports about the type of the error. Else after finishing the initialisation process the controller is put into the regulation mode.

Error messages of the controller with D4 diode at initialisation

4 blinks improper connection of the thrust switches

5 blinks improper connection of the feedback transmitter

8 blinks bad sense of actuator's turning direction or adverse connection of the feedback transmitter

3.5.2 Watching operation and error states

Watching operation and error states is possible with the EA open.

a) Operation status with the D3 LED diode indicating:

- it is continuously lighting - the controller regulates
- it is continuously not lighting - system deviation in the insensitiveness range - the EA has stopped

b) Error state with the D4 and D3 LED diodes indicating - D4 continuously lighting, D3 indicates error state with blinking

1 blink (repeated)	indication of the "TEST" mode - the EA is put to the position according to the signal in the "TEST" menu (at connecting the 66 and 86/87 terminals)
2 blinks (repeating after short pause)	missing of control signal - the EA is put to the position according to the signal in the "TEST" menu
4 blinks (repeating after short pause)	thrust switches activity indication (the EA switched-off with the thrust switches in a mid-position)
5 blinks (repeating after short pause)	failure of the feedback transmitter - the EA is put to the position according to the signal in the "TEST" menu
7 blinks (repeating after short pause)	control signal (current at range 4-20mA less than 4mA (3.5mA)).

3.6 Positions of jumpers of bidirectional (reversing) board for supply voltage 24V DC (wiring diagram Z216d).

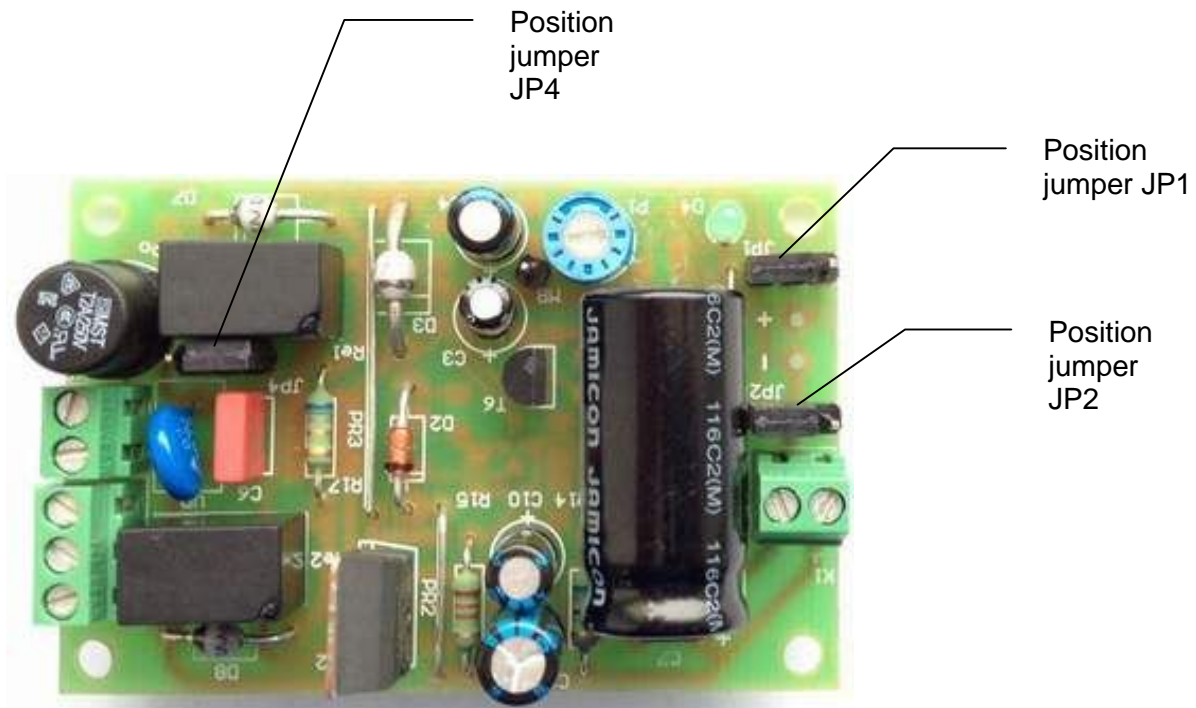


Fig. 10 Positions of jumpers of bidirectional (reversing) board

4. Service, maintenance and troubleshooting

4.1 Service



1. In general it is provided that service of the EA is performed by a qualified worker in accordance with requirement given in Chapter 1!
2. After putting the EA into operation it is needed to verify whether during manipulation any scratch on surface occurred, it is to be removed to prevent actuator against corrosion!

The EA ST/STR requires just negligible service. Proper putting into operation is a recondition of reliable operation.

The service of the EA leads from the operation conditions and usually resides in information processing for further arranging of required functions.

The stuff has to perform prescribed maintenance to prevent the EA during operation against impacts of environment, which exceed the frame of allowed influences.

Manual control:

If needed (during adjusting, function checking, failure etc.) the stuff can change setting of the controlled body using the handle.

Instructions for manual control:

- Switch the power supply off.
- Turn the button for gear disengagement to the right by 90° (Fig. 10, the button arrow shows the symbol of hand) what disengages the gear in the actuator.
- Set the actuator to the chosen position:
- Push and turn the hand wheel located on the actuator upper cover. While turning counter-clockwisely the valve is turning in the direction "open". Having the valve in the required position turn the button for gear disengagement to the position "motored operation" what engages the gears. Put the hand wheel back to its original position.

Note:

After putting the button for disengaging of gearing again to the position of motor operation if the gearing is not connected it is needed to turn the hand wheel to put the gears into mesh.

In case of manual control the set of end positions are not detuned.

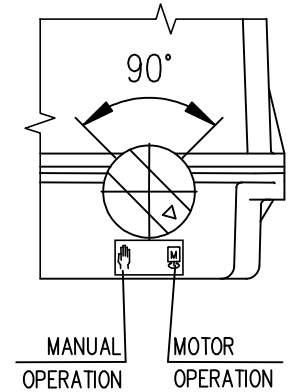


Fig. 10

4.2 Maintenance - extent and periodicity

All screws and nuts affecting tightness and protection (IP) must be tighten during the inspection and maintenance. Similarly, once a year should be checked and if necessary tighten mounting screws of the terminal wires and assuring of the slip-on joints with wires.

The internal between two preventive inspections is four years.

In case of damage or after 6 years of the actuator's operation the replacement of cover seals and oil filling seals must be done.

The grease in the supplied actuators is designed for the lifetime of the product. It is not necessary to change the grease during the operation of the actuator.

Lubrication:

- - gear part – grease HF 401/0 (GLEIT-μ) resp. GLEITMO 585 K
- - linear adapter – grease GLEIT- μ - HP 520M.



Lubrication of the valve stem is independent on maintenance of the EA!

After every potential flooding of the product check, whether there is no water inside. After eventual water penetration, dry the product before repeated putting into operation and replace damaged sealings, resp. other parts of EA. identically check also tightness of cable bushings and replace them, if they are damaged.

- Every six months it is recommended to perform one check move in frame of adjusted operation stroke to verify reliability of functioning with setting back to the original position.
- If the audit rules do not determine else the inspection of EA is performed ones a year and tightening of all connecting and grounded screws have to be checked to avoid overheating.
- After 6 months from putting of EA into operation and once a year it is recommended to check tightening of fixing screws between the EA and the valve. (Tighten the screws with the cross system.)



- While connecting and disconnecting of the EA check the tightness of cable glands – those with damaged sealings should be replaced by new ones of the approved type!
- Keep the EA clean and take care about removing impurities and dust. The cleaning has to be performed regularly according to the operation possibilities and requirements.

4.3 Troubleshooting

At failure of power supply the EA stops in the position where it was before the failure. If needed the EA can be set only with the manual control (the handle). After restoration of power the EA is prepared for operation.

In case of failure of any element of the EA it can be changed by a new one. Entrust the change to a service centre.

In case of an EA failure, which cannot be eliminated directly in operation, follow instructions for under-guaranty and after-guaranty service.

For controller repair a F1,6 A subminiature fuse for PCB should be used, alternatively also F 2A, 250 V e.g. Siba type 164 050.1,6 or MSF 250, and for DB voltage source repair a M160 mA, 250V fuse, e.g. Siba, or MSF 250.

Note:

If the EA requires dismantling follow the chapter "Dismantling".



Taking the EA to pieces for repair purposes is allowed only by professionally qualified persons trained in the production plant or by a contracted service centre!

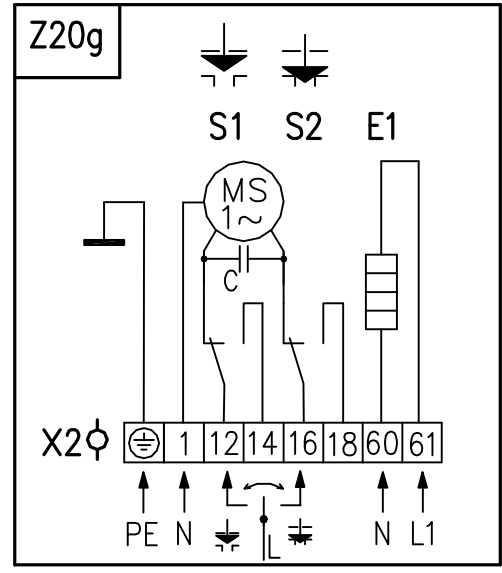
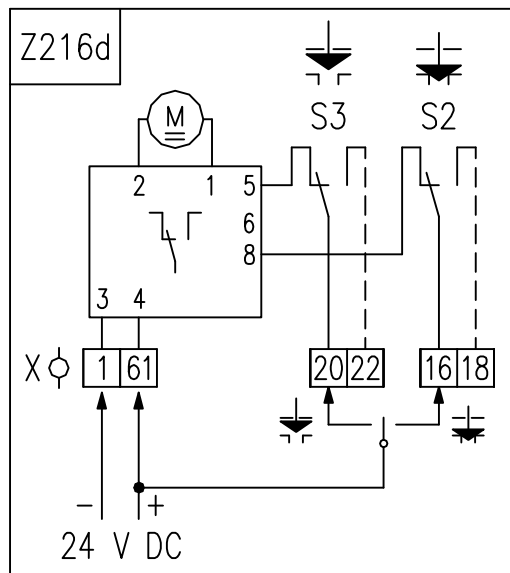
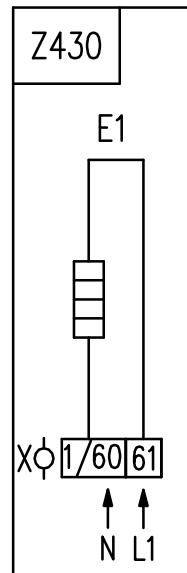
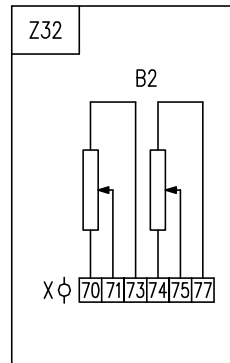
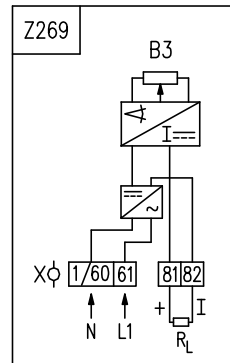
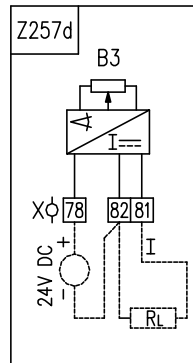
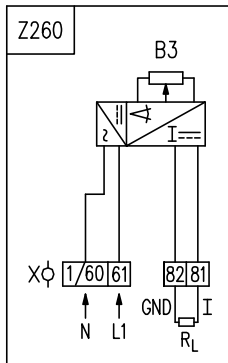
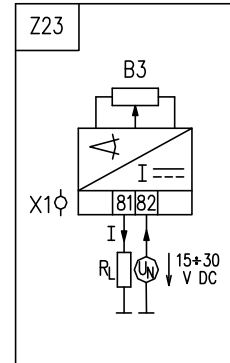
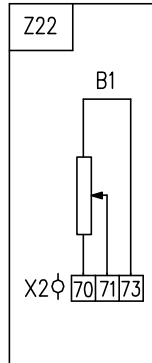
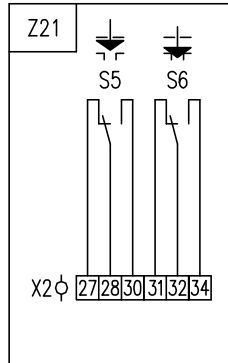
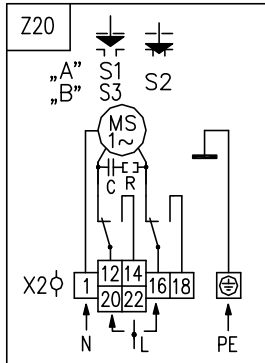
5. Spare parts

Spare part	Order Nr.	Position	Figure
Electric motor; 1 W; 230/220 V AC	63 592 346	1	1
Electric motor; 2.75 W; 230/220 V AC	63 592 382	1	1
Electric motor; 1 W; 24 V AC	63 592 301	1	1
Electric motor; 2,75 W; 24 V AC	63 592 437	1	1
Electric motor; 6 W, 24 V DC	63 592 377	1	1
Resistant wire transmitter (potentiometer) RP19; 1x100	64 051 812	6	1
Resistant wire transmitter (potentiometer) RP19; 1x2000	64 051 827	6	1
Micro switch CHERRY DB 6G A1BA	64 051 447	2	1
Micro switch CHERRY DB 6G A1LB	64 051 466	3	1
Cable gland M16	63 456 595	11	1
Terminal board EKL	63 456 710	9,10	1
Sealing – IP 65	04 790 800	-	-
Sealing – IP 67	62 732 128		

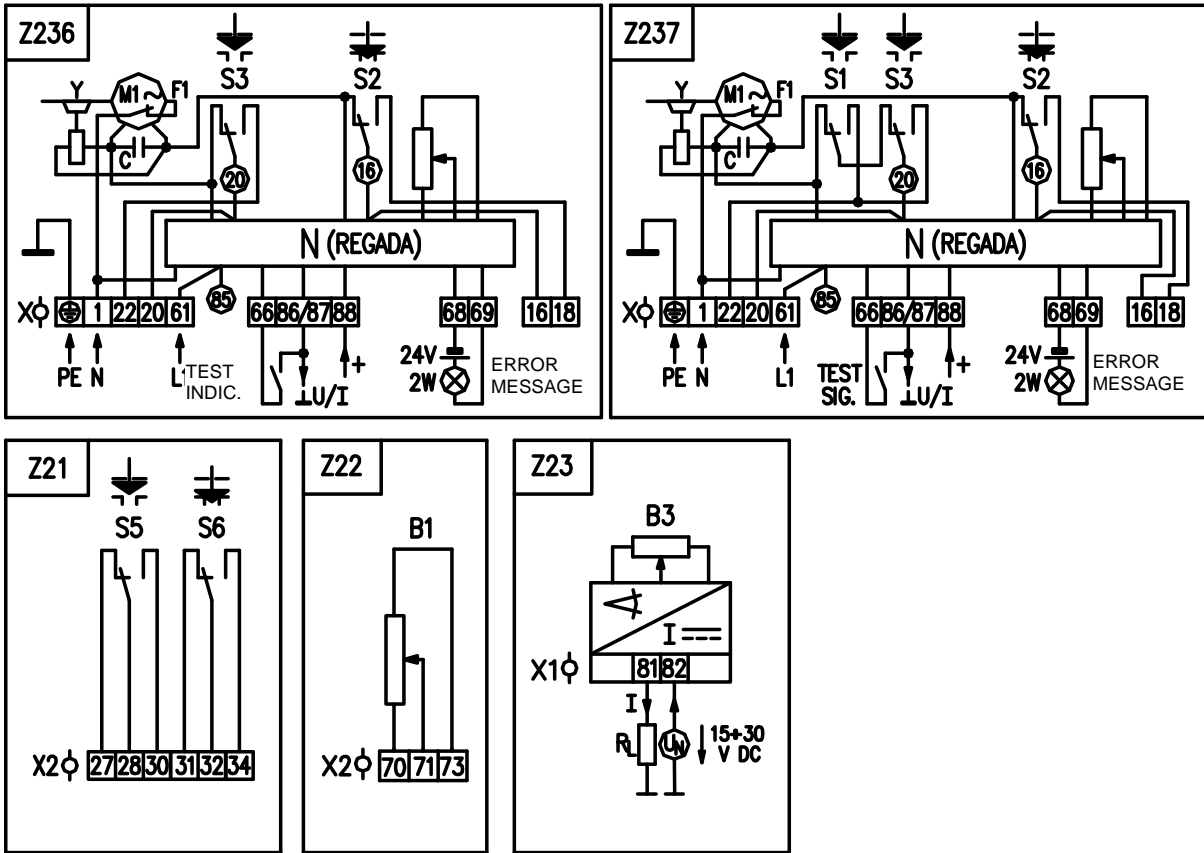
6. Enclosures

6.1 Wiring diagrams

Wiring diagrams for EA ST



Wiring diagrams foe EA STR with controller



Legend:

- Z20 electric motor with thrust and positional switches connection
- Z20g..... electric motor with thrust switches connection and space heater connection
- Z21 additional position switches connection
- Z22 single resistant transmitter connection
- Z23 2-wire version of EPV – without power supply connection
- Z32 wiring diagram of double resistant transmitter
- Z216d.... wiring diagram of electric motor 24 V DC - single-thrust version
- Z236 position controller with resistant feedback connection – single-thrust version
- Z237 position controller with resistant feedback connection - double-thrust version
- Z257d ... 3-wire version of EPV - without power supply connection
- Z260 wiring diagram of resistive transmitter with current converter -3-wire version with power supply
- Z269 wiring diagram of resistive transmitter with current converter or capacitive transmitter -2-wire version with power supply

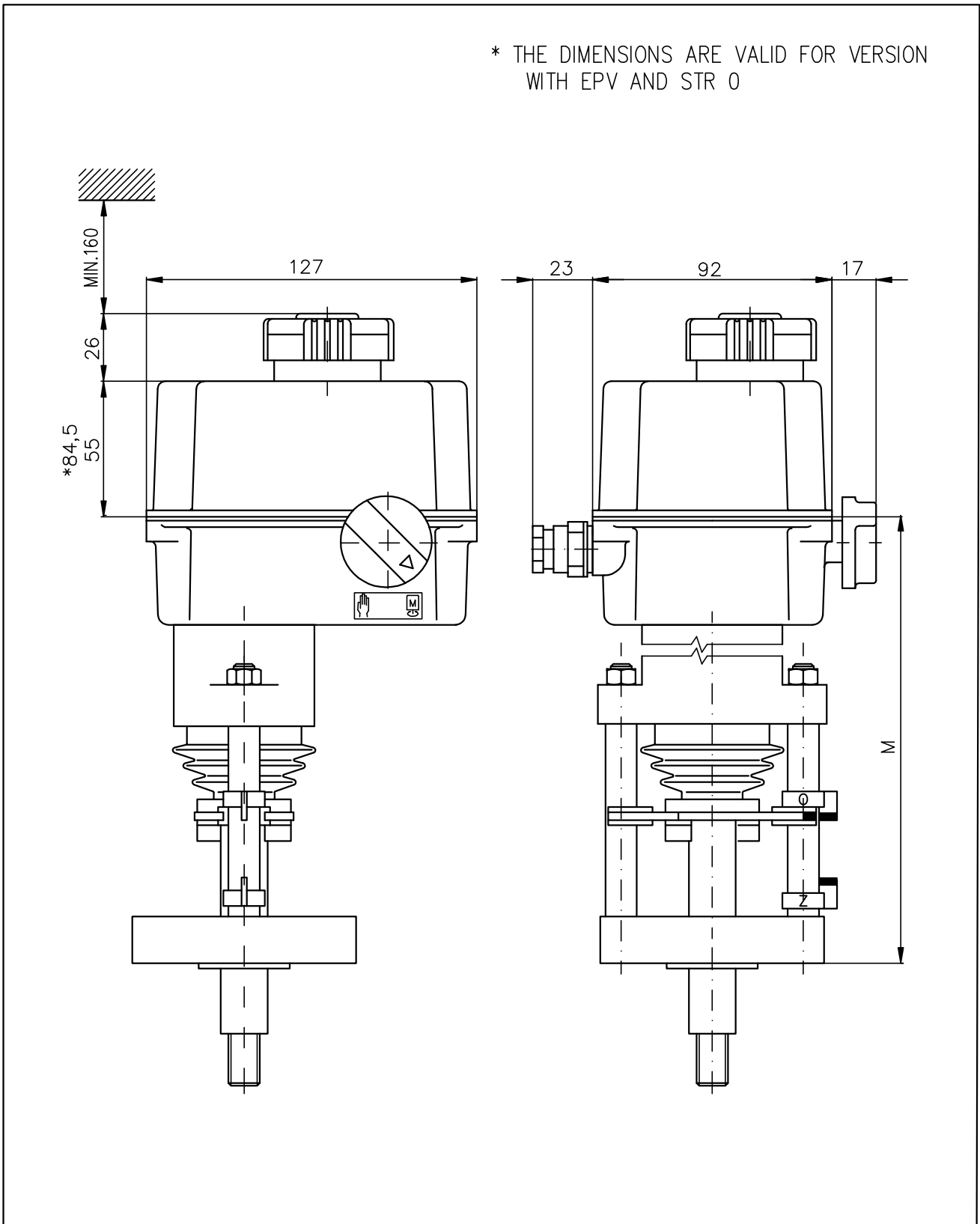
- | | |
|---|--|
| B1..... remote transmitter-resistive, single | R _L load resistance |
| B3 electronic position transmitter (EPV) | S1 thrust switch "open" |
| C..... capacitor | S2 thrust switch "closed" |
| I(U) input (output) current (voltage) signals | S3 positional switch "open" |
| MS, M1 electric motor | S5..... additional positional switch "open" |
| N..... controller | S6 additional positional switch "closed" |
| R resistor | X, X1, X2.... terminal board |
| E1..... space heater | |
| F1..... electric motor thermal protection | |

Notes:

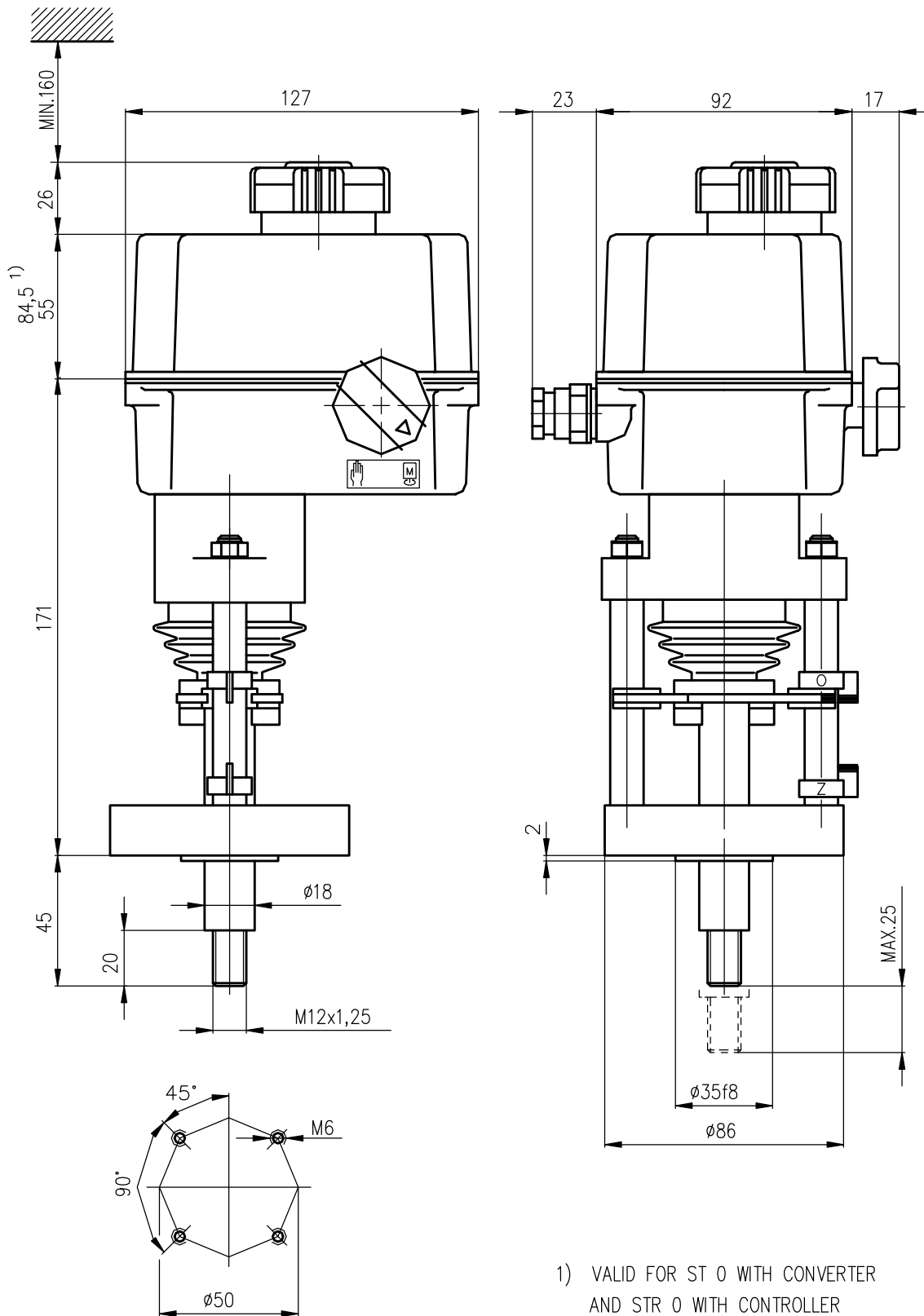
1. In the version of EA with additional positional switches (S5, S6) and together with terminate resistive transmitter (B1) the switching contacts leaded to terminals 14 and 18, or 22 and 18 are not drawn dotted line in wiring scheme Z20.
2. At version ES with feeding voltage 24 V AC is not needed to connect ground wire PE.

6.2 Dimensional drawings

EA ST, STR (The dimensions are valid also for the following dimensional drawings where only mechanical connection types are shown.)

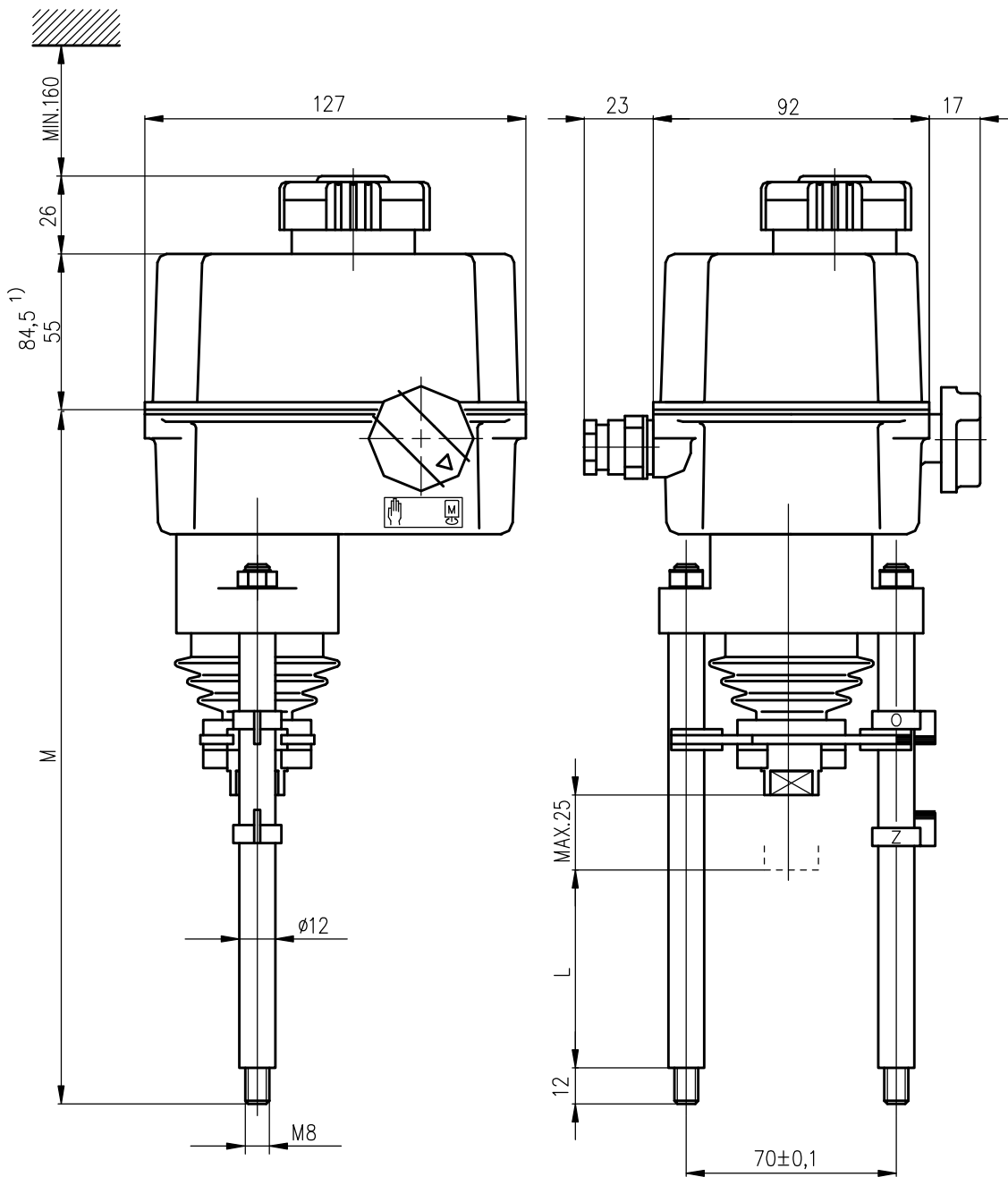


Flange DIN 3358



1) VALID FOR ST 0 WITH CONVERTER AND STR 0 WITH CONTROLLER

Pillars

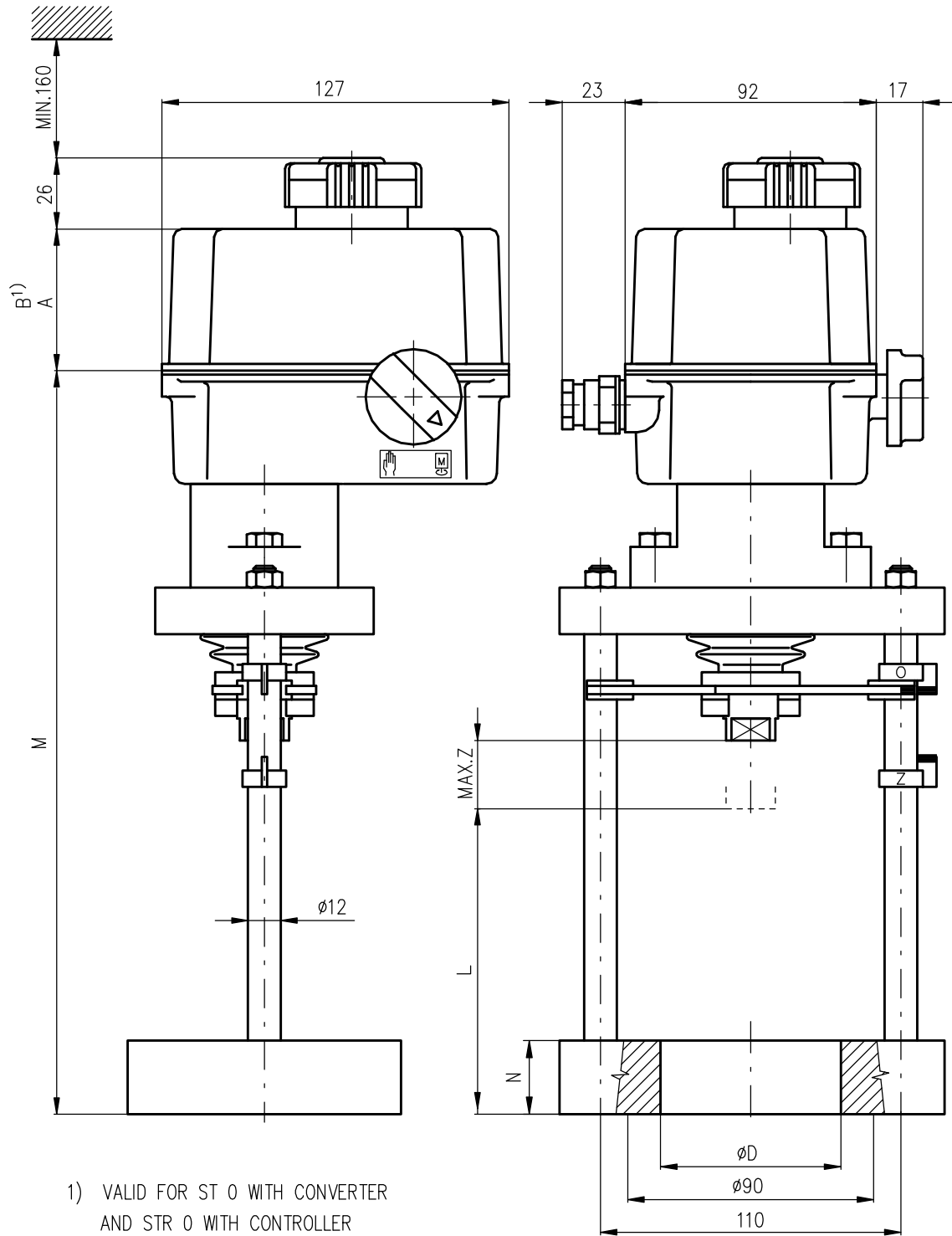


P-1181/B	92,5	264
P-1181/A	66	237,5
VERSION	L	M

1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER

P-1181

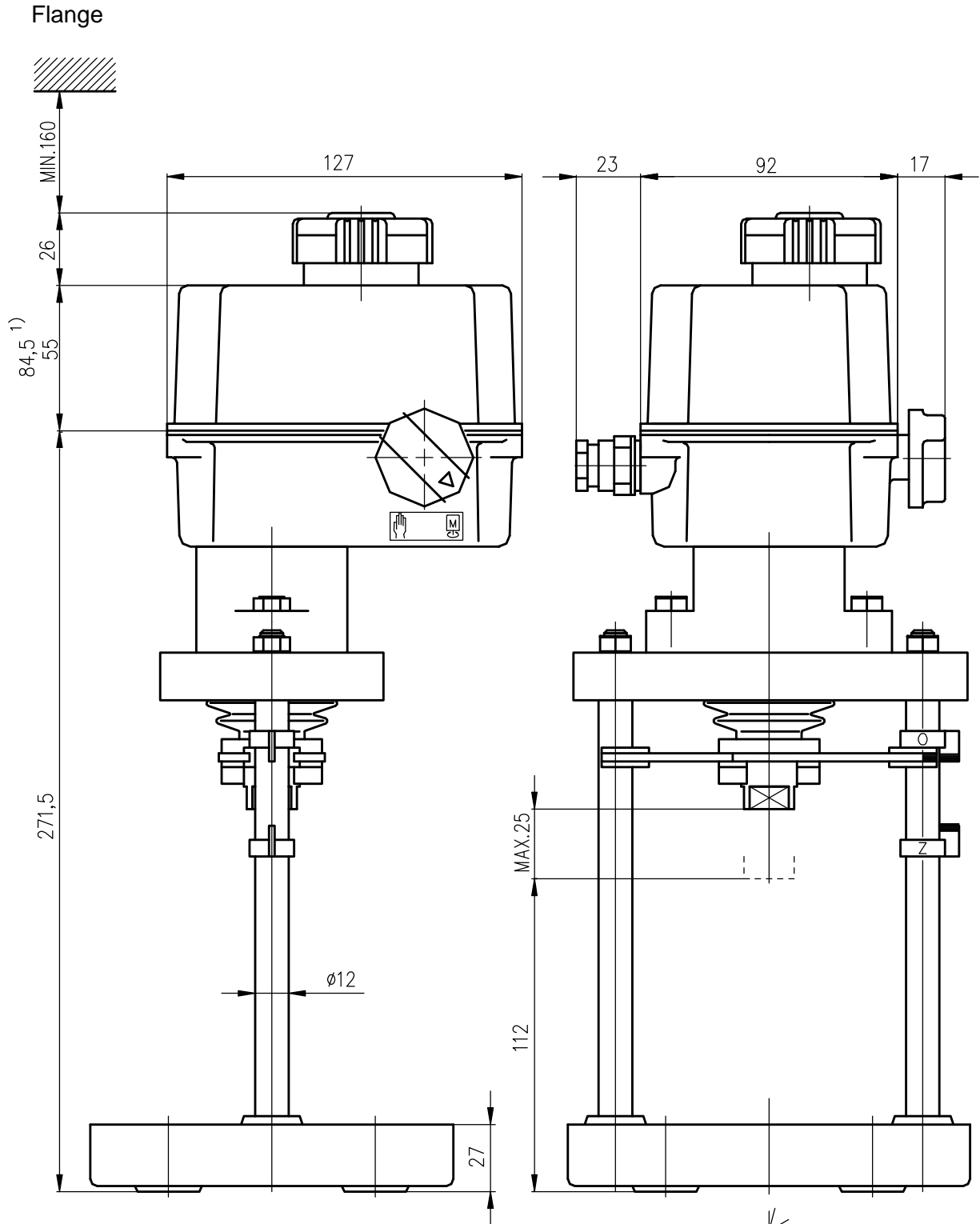
Flange



1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER

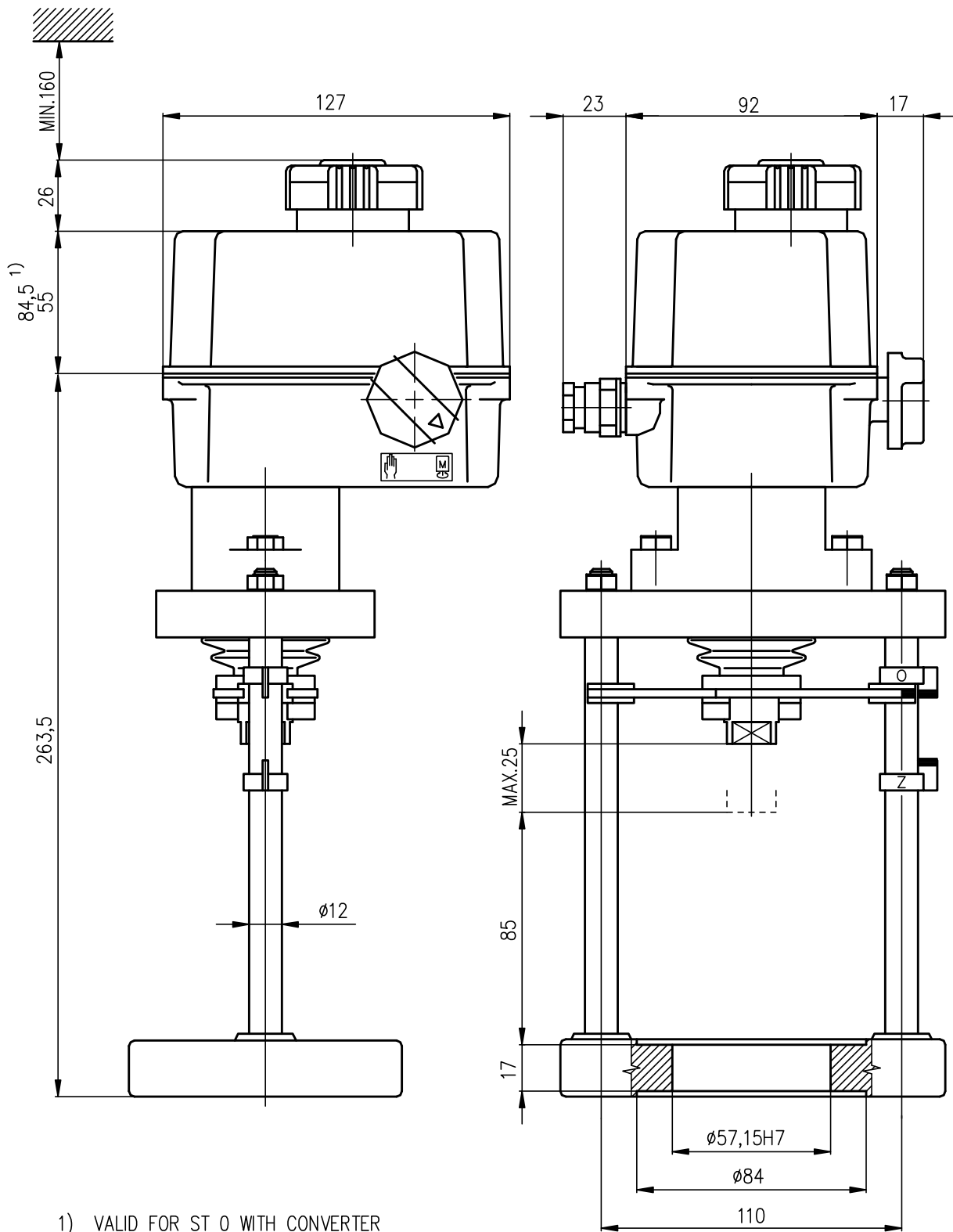
P-1182/F	124	28	288,5	84,5	84,5	25	58
P-1182/E	94	28	258,5	84,5	84,5	18	58
P-1182/D	110	40	301,5	84,5	84,5	25	65,15H7
P-1182/B	103	25	264,5	55	84,5		
P-1182/A	110	25	271,5	55	84,5		
VERSION	L	Z	M	A	B	N	ø D

P-1182



1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER

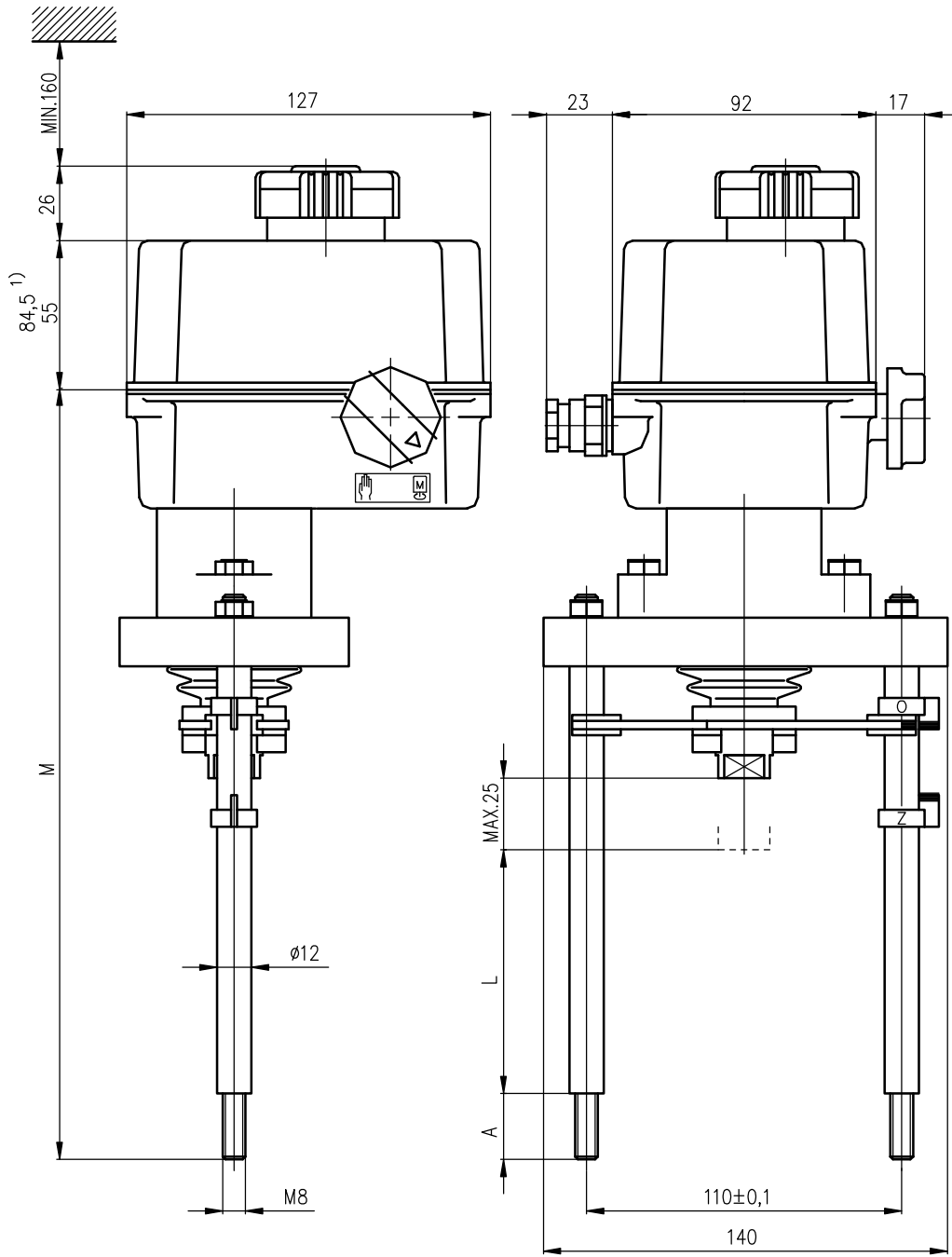
P-1183



1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER

P-1184

Pillars

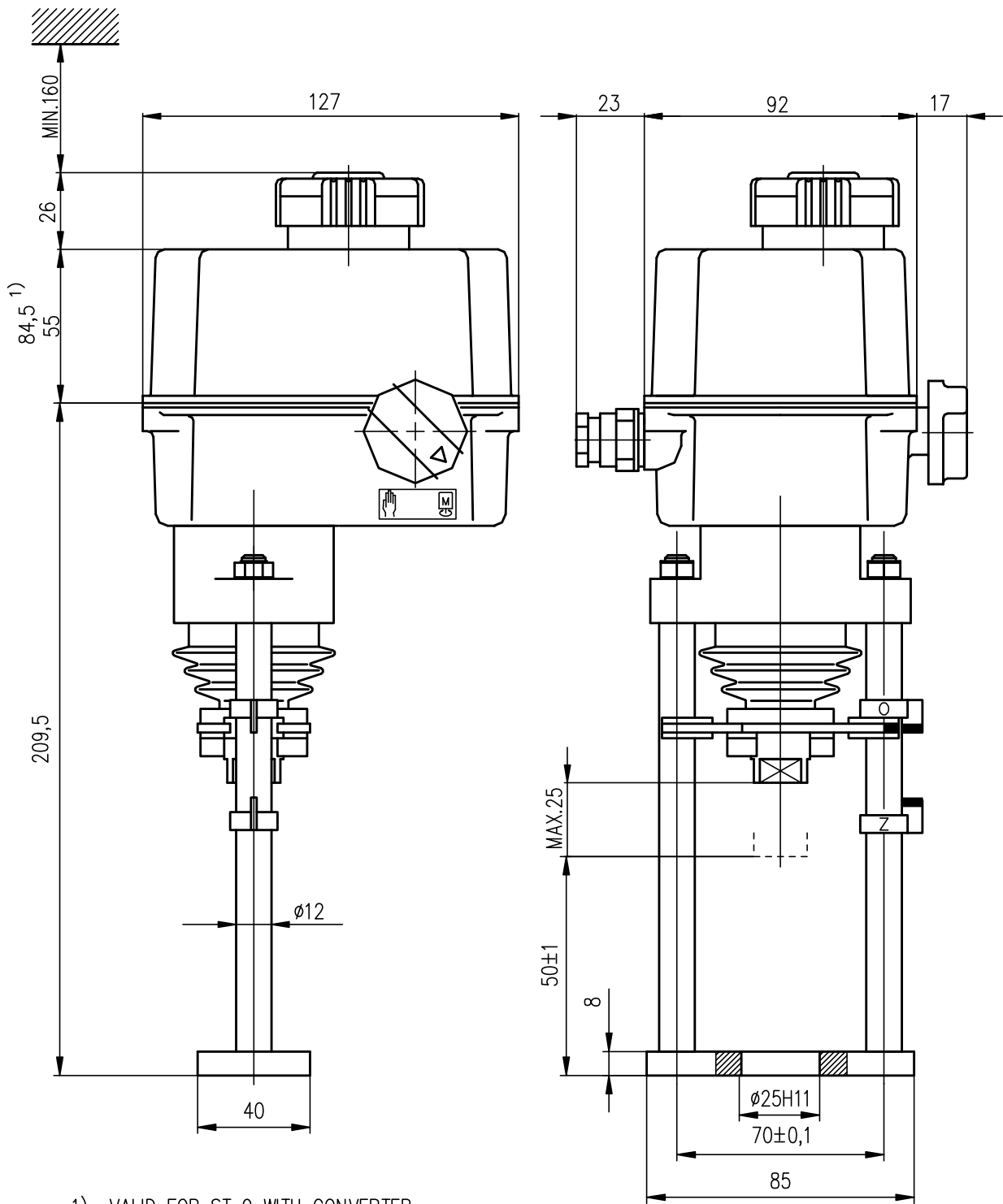


1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER

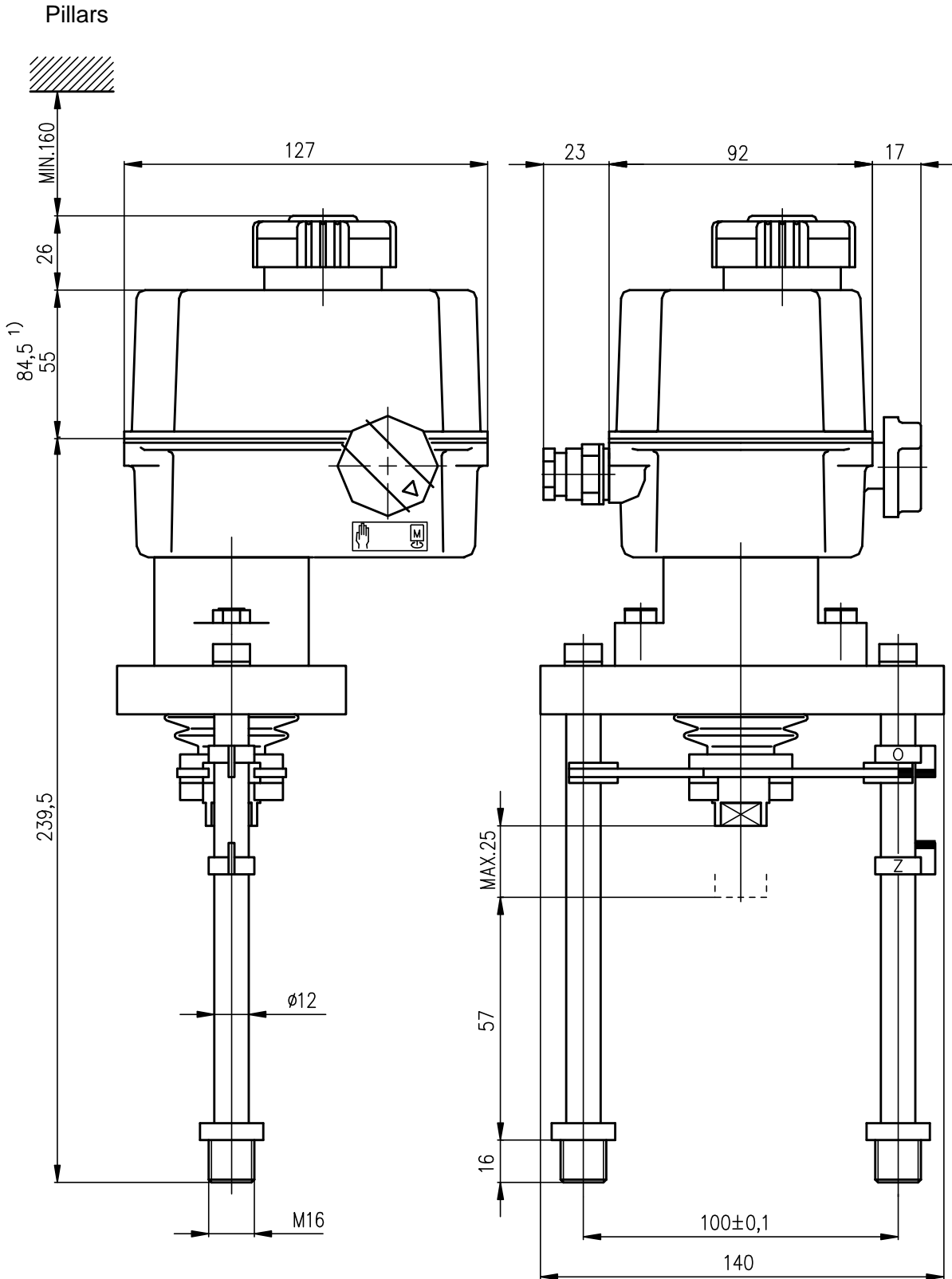
P-1185/B	110	18	287,5
P-1185/A	85	23	267,5
VERSION	L	A	M

P-1185

Flange



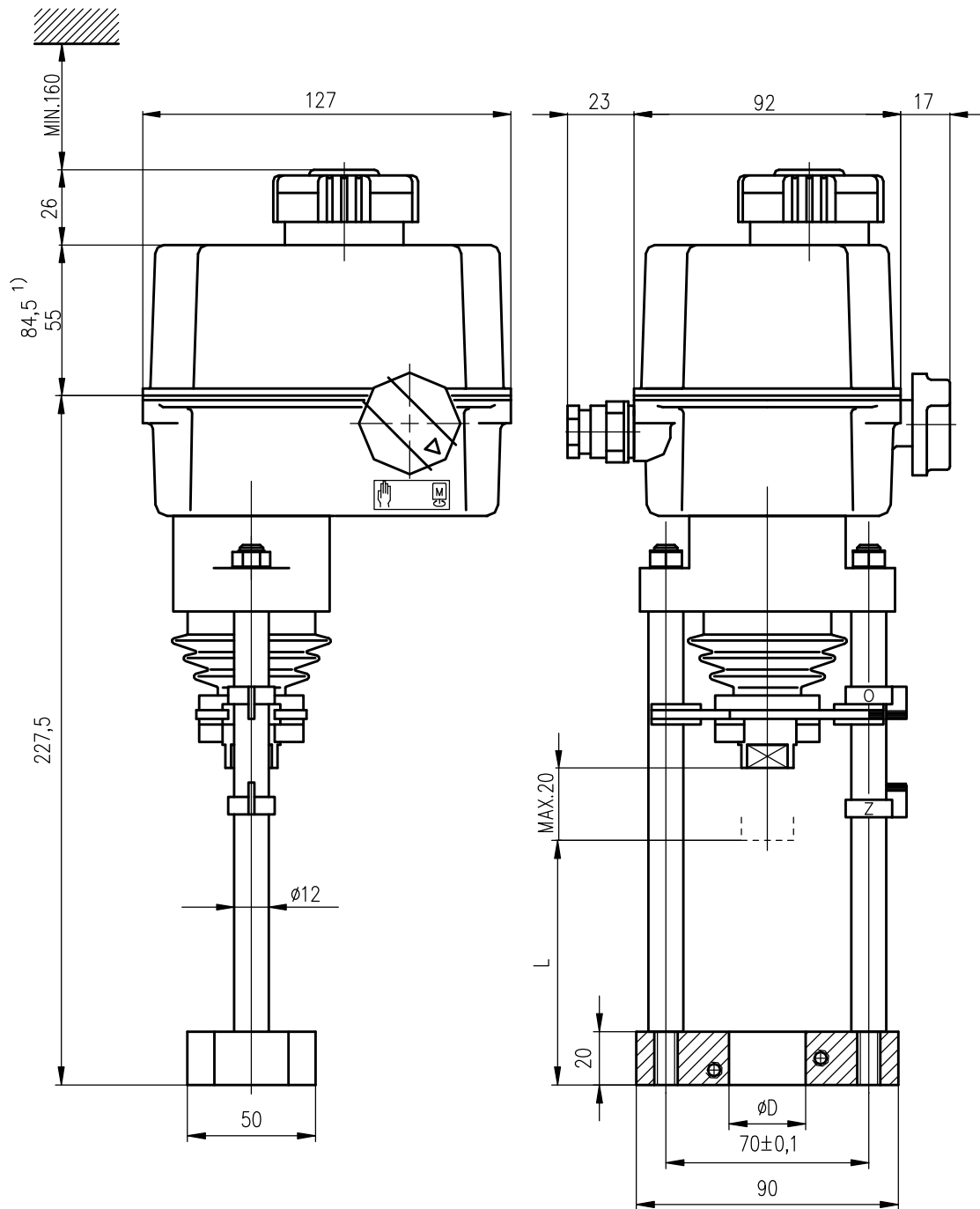
1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER



1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER

P-1309

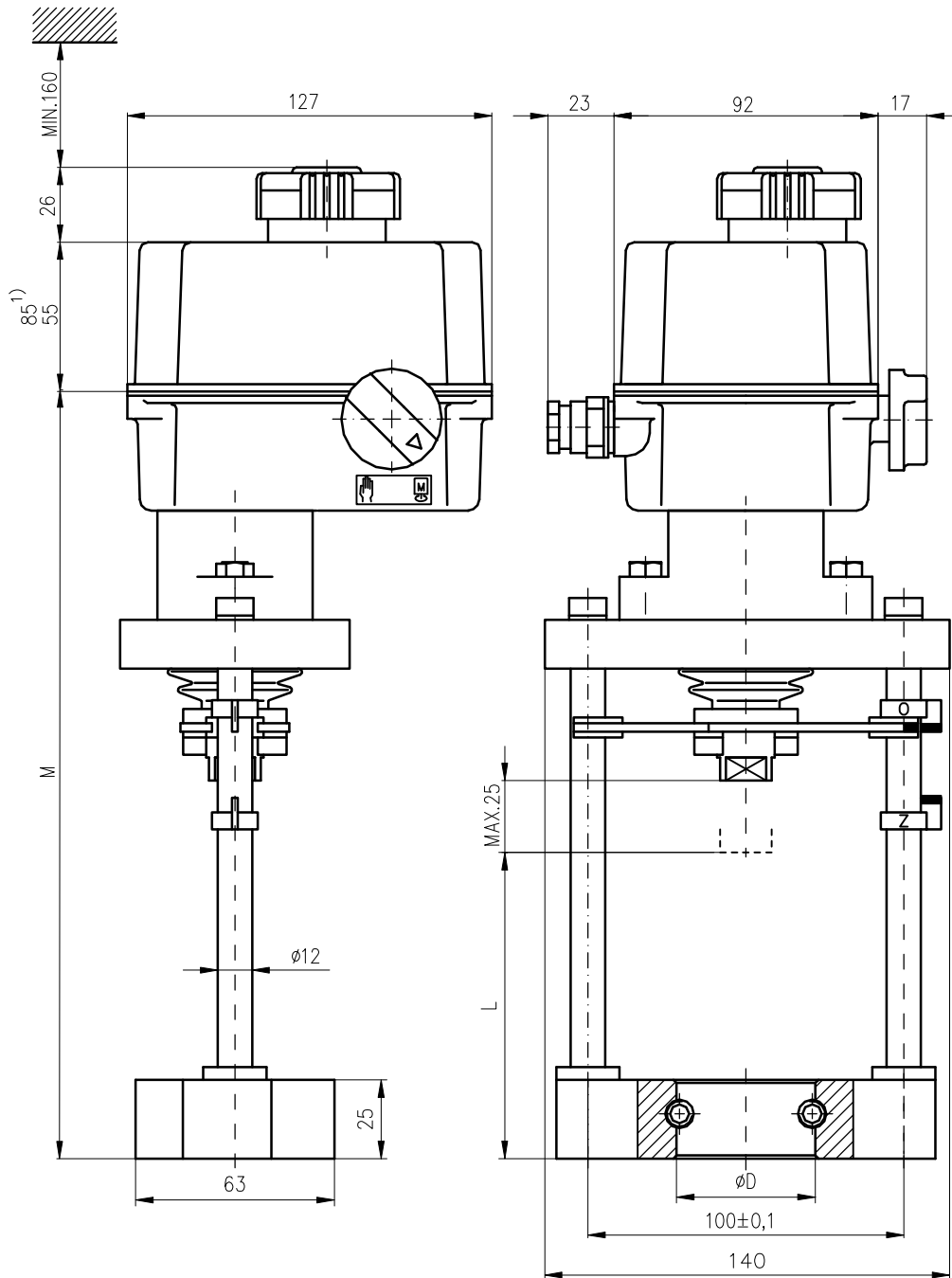
Flange



1) VALID FOR ST 0 WITH CONVERTER
AND STR 0 WITH CONTROLLER

P-1375/B	66	$\phi 40H9$
P-1375/A	62	$\phi 32H9$
VERSION	L	ϕD

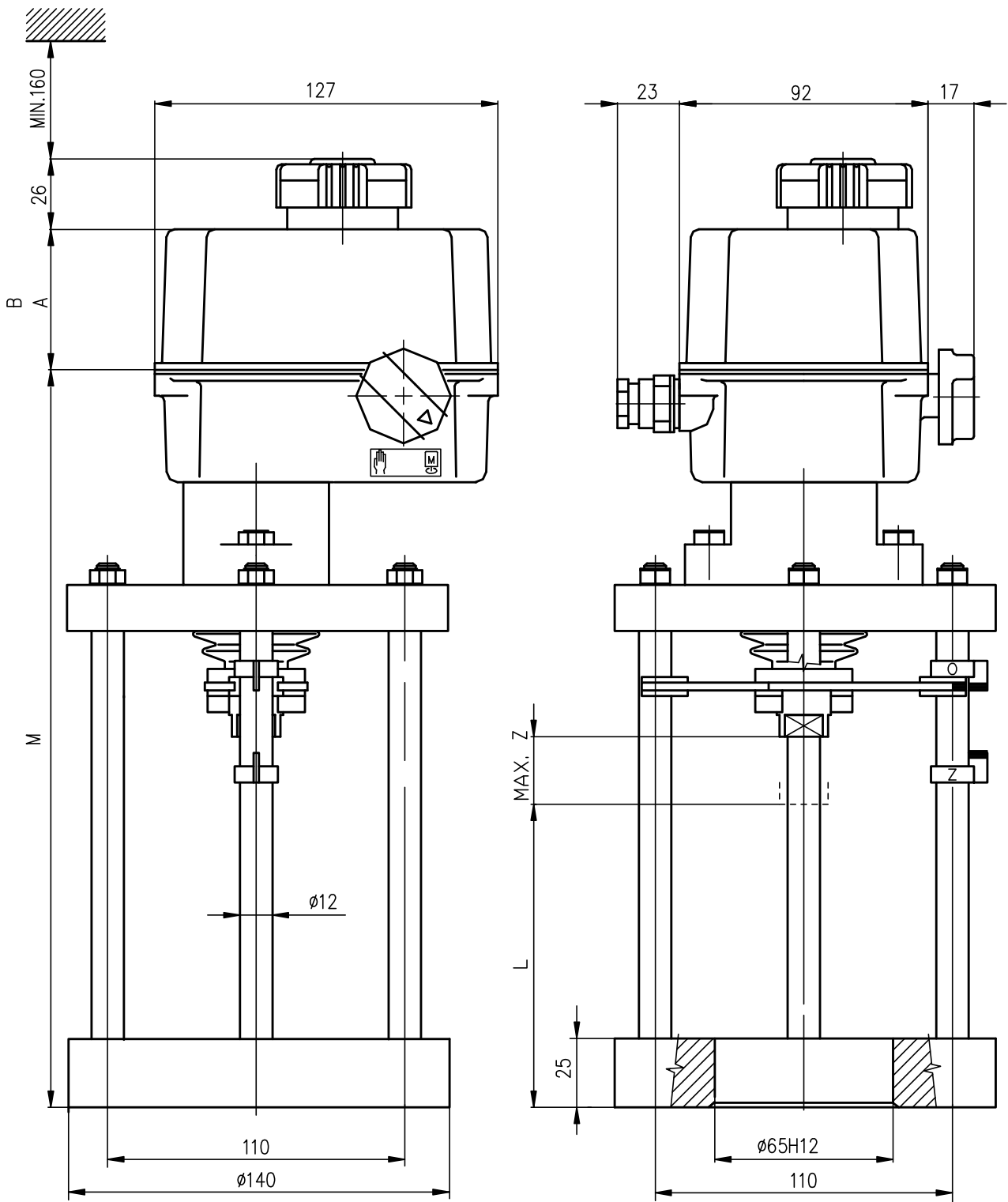
Flange



- 1) VALID FOR ST 0 with converter
and STR 0 with controller

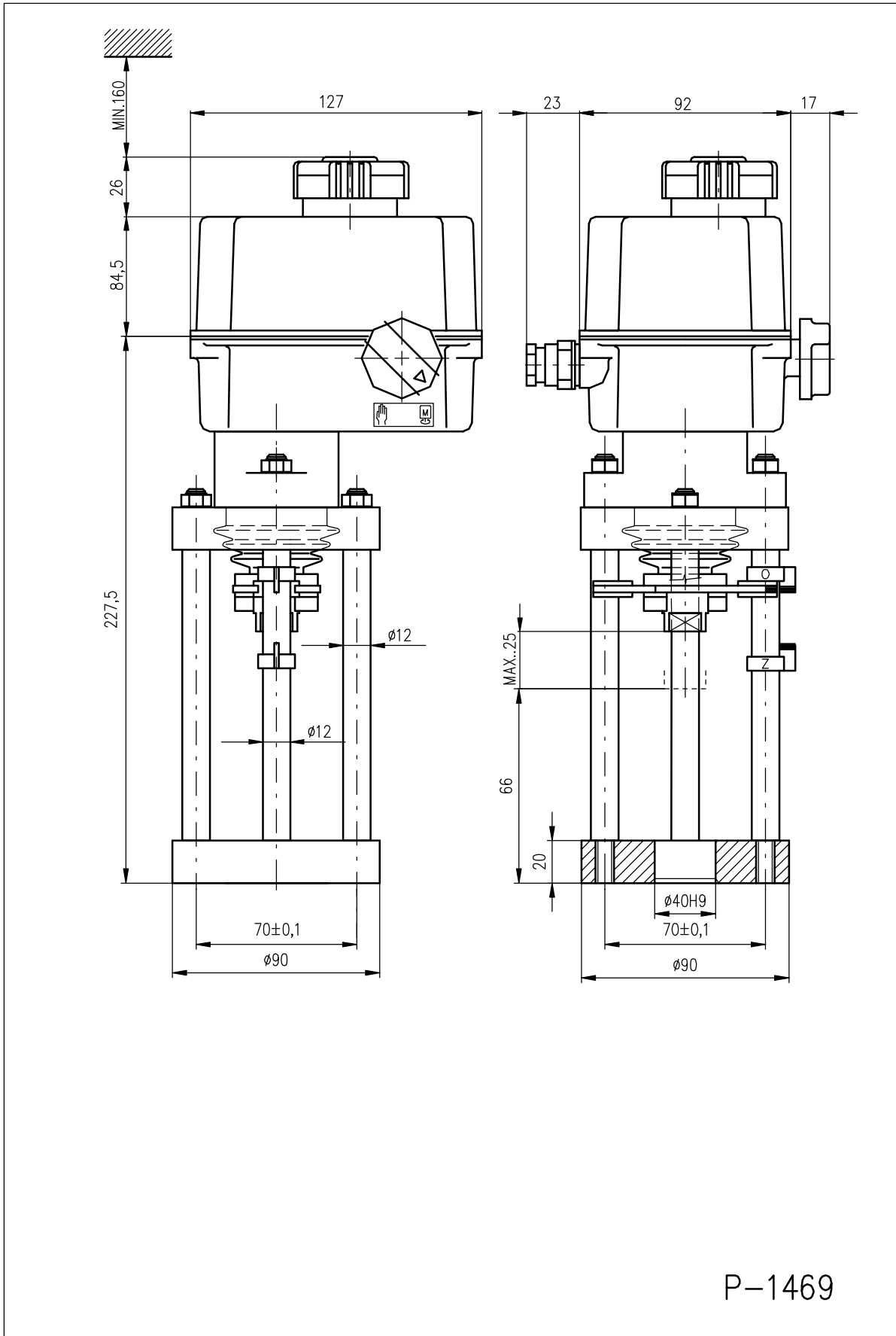
P-1385

P-1385/C	86	60	249,5
P-1385/B	59	38	228,5
P-1385/A	53	44	216,5
VERSION	L	ϕD	M



P-1467/B	110	25	271,5	55	84,5
P-1467/A	103	25	264,5	55	84,5
VERSION	L	Z	M	A	B

P-1467



P-1469

6.3 Guarantee service check report

Service center:	
Date of repair:	Guarantee repair no.:
User of actuator:	Claim applied by:
Actuator type number:	Actuator production number:
Product claim fault:	Detected product fault:
Used spare parts:	
Remarks:	
Issued on a day:	Signature:

6.4 Post guarantee service check report

Service center:	
Date of repair:	
User of actuator:	Actuator operating place :
Actuator type number:	Actuator production number:
Detected product fault:	
Used spare parts:	
Remarks:	
Issued on a day:	Signature:

6.5 Commercial representation

Slovak Republic:

Regada, s.r.o.,
Strojnícka 7,
080 01 Prešov
Tel.: +421 (0)51 7480 460,
Fax: +421 (0)51 7732 096,
E-mail: regada@regada.sk

Czech Republic:

Exclusive representation Regada, s.r.o. (Ltd.) for sale of electric actuators

Regada Česká, s.r.o.
Nám. 5. května 17,
252 25 Jinočany,
PRAHA – západ,
Tel.: +420 257 961 302
Fax: +420 257 961 301