



# ***INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS***



## ***Electric linear thrust actuators MTR VARIANT 52 420***

**TEST CERTIFICATE**

ELECTRIC LINEAR THRUST ACTUATOR MTR VARIANT 52 420	
Type number .....	Power supply ..... V ..... Hz
Serial number .....	Rated thrust ..... N
Production year .....	Switching-off thrust ..... N
Wiring diagram .....	Rated operation speed ..... mm/min
.....	Stroke ..... mm
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 18-03-171/81/2	
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.....

## **Contents**

1. Description.....	2
1.1 Purpose and Operation.....	2
1.2 Safety instructions.....	2
1.3 Instructions for staff training.....	2
1.4 Data specified on electric actuator .....	3
1.5 Warranty conditions .....	3
1.6 Under-guarantee and after-guarantee service .....	4
1.7 Operation conditions .....	4
1.7.1 Product location and operation position .....	4
1.7.2 Operation environment .....	4
1.7.3 Power supply and duty cycle .....	5
1.8 Description of the actuator .....	5
1.9 Technical data of actuator.....	11
1.9.1 Mechanical connection: .....	12
1.9.2 Electric connection .....	12
1.10 Packing, transport, storing and unpacking .....	12
1.11 Assessment of the product and packaging and removal of contamination .....	13
2. Installation and dismantling of actuator .....	14
2.1 Installation.....	14
2.2 Mechanical connection EA on the valve .....	14
2.3 Electric connection and checking of function.....	14
2.4 Dismantling .....	16
3. Adjusting of actuator .....	16
3.1 Adjustment of stroke .....	16
3.2 Adjustment of position unit (Fig.4).....	16
3.3 Transmitter unit adjustment .....	17
3.3.1 Adjustment of resistive transmitter unit .....	17
3.3.2 Adjustment of capacitive transmitter unit .....	17
3.3.3 Torque unit adjustment (Fig.7).....	17
4. Service, maintenance and troubleshooting .....	17
4.1 Service.....	17
4.2 Maintenance - extent and periodicity.....	18
4.3 Troubleshooting .....	18
5. Enclosures .....	19
5.1 Wiring Diagrams .....	19
5.2 Dimensional Drawings .....	23
5.3 Guarantee service check report .....	25
5.4 Post guarantee service check report.....	26
5.5 Commercial representation .....	27

## 1. Description

### 1.1 Purpose and Operation

Electric linear actuators (hereinafter **EA**) of **MTR 52 420** (hereinafter **MTR**) types are high-powered electric-mechanical products designed for direct installations onto controlled devices (regulating bodies - valves, etc.). EA of MTR types are provided for remote control of closing bodies, and EA of MTR 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 ISO 5211 and a coupling or using a stand and a coupling/a lever.



***It is forbidden to use EA as a lifting mechanism!  
Switching of actuator by a semiconductor switches have to be consulted with producer.***

### 1.2 Safety instructions



***EA of MTR 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 EN 61010-1, in the edition in terms of valid certificate, assigned for installation category II (overvoltage category, pollution degree 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 IEC 61000-6-3, EN IEC 61000-6-2, EN 61000-3-3/A1/A2 and EN IEC 61000-3-2/A1 in the edition in terms of valid certificate.

**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 80 dB (A).

Electric actuators are according to EN 61010-1:2010.assigned for installation category II (over voltage category).

### 1.3 Instructions for stuff training

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



The electrical connection of the actuator can only be carried out by a person in accordance with legislative requirements of the given country, depending on the required areas of location/use. Service can be performed only by workers professionally qualified and trained by the producer or contracted service centre

**Warning for safety use**



1. Products are assigned for operation in environment consist of gas, steam and vapours, with temperature range:  $-25^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ , with pressure range from 0.8 to 1.1 bar.
2. If the actuator is placed on device which regulate medium with higher temperature than  $+55^{\circ}\text{C}$ , protect the actuator by additional construction in order to maintain ambient temperature max.  $+55^{\circ}\text{C}$  and also to stop temperature transmitting through junction component!
3. Cable glands blinds are assigned only for transport and storage period, i.e. for period till the actuator is builded into operation, than blinds must be replace by connecting cable.
4. In case of not using one of the cable gland, it has to be replaced with a suitable blinding plug.
5. Temperature at the point where the cables enter the actuator can reach max.  $90^{\circ}\text{C}$ . When choosing the connection cables for the actuator, it is therefore necessary to consider this temperature as well.

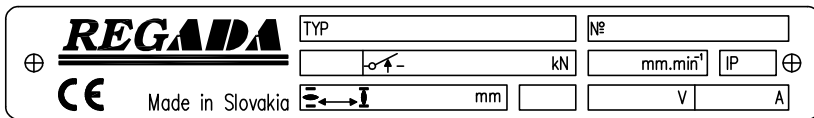
**Product protection**

EA MTR 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. For protection, we recommend to use a fuse type "T" or a contactor type "C".

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

**1.4 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)

**1.5 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.

## 1.6 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:

- type code
- serial number
- ambient parameters (temperature, humidity...)
- duty cycle including frequency of switching
- type of switching-off (position or torque)
- set switching-off torque
- type of fault - description of claimed fault
- 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.

## 1.7 Operation conditions

### 1.7.1 Product location and operation position

- EA can be installed and operated at sheltered areas of industrial plants without temperature and humidity regulation, protected against climate effects (e.g. direct sunshine).
- EA have to be placed with the view of access toward handle of manual operating (4) (obr.2, top cover (6), to control box (M4), to bushings (7).
- Installation and operation of actuators is possible in either position, while motor axis is in horizontal position; variance of motor axis from horizontal plane can be  $\pm 15^\circ$ . Common position is the one with vertical position of exit part axis and control box above.

#### Warning:



Actuator installed on the open place **must be protected** against a direct climate effects by shelter. Actuator installed in the place with relative humidity over 80% and on the open place under shelter have to have permanently connected space heater without thermal switch.

### 1.7.2 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  $-25^\circ\text{C}$  to  $+55^\circ\text{C}$  ..... AA 7\*
- with relative humidity 10 to 100 %, including the condensation of up to 0,028 kg water content per 1 kg of dry air at  $27^\circ\text{C}$ , with temperatures from  $-25^\circ\text{C}$  up to  $+55^\circ\text{C}$ ..... AB 7\*
- with height above sea level 2 000 m, with barometric pressure range 86 to 108 kPa ..... AC 1\*
- with spraying or jet water from all directions–(protection enclosure IP x5) ..... AD 5\*
- with shallow dive – (product in protection IP x 7)..... AD 7\*

- with mild dustiness – with potential influence of fireproof, non-conducting and explosion-proof dust; mean dust layer; dust fall above 35, but not more than 350 mg/m<sup>2</sup> per day (IP 5x) ..... AE 5\*
  - with strong dustiness – with a possibility of influences of inflammable, non-conducted and non-explosive dust; the middle layer of dust; the dust drop more than 350 but not more than 1000 mg/m<sup>2</sup> per day (products with protection enclosure of IP 6x) ..... AE 6\*
  - with atmospheric occurrence of corrosive and pollution media (with high degree of atmosphere corrosive aggressiveness); important presence of corrosive pollution..... AF 2\*
  - with permanent exposure of big amount of corroding or contaminated chemicals and salt fog in execution for sea environment , for sewage water disposal plant and some chemical plant. .... AF 4\*
  - with a possibility of influences of mechanical stress:
    - medium sinusoid vibrations with frequency in range 10 up to 150 Hz, with shift amplitude of 0,15 mm for  $f < f_p$  and acceleration amplitude 19,6 m/s<sup>2</sup> for  $f > f_p$ ; (transition frequency  $f_p$  is from 57 up to 62 Hz) ..... AH 2\*
    - medium impacts, shocks and vibrations ..... AG 2\*
  - with serious danger of plants and moulds growing..... AK 2\*
  - with serious danger of animals occurrence (insects, birds, small animals) ..... AL 2\*
  - with detrimental influence of radiation:
    - of stray current with intensity of magnetic field (direct and alternating of power supply frequency) to 400 A.m<sup>-1</sup> ..... AM 2-2\*
    - of sun radiation with intensity  $> 500$  a  $\leq 700$  W/m<sup>2</sup> ..... AN 2\*
  - with effects of medium seismic activity with acceleration  $> 300$  Gal  $\leq 600$  Gal ..... AP 3\*
  - with indirect danger of storm activity ..... AQ 2\*
  - with fast moving of air and strong winds ..... AR 3 , AS 3\*
  - with persons frequent touching earth potential (persons often touch conductive parts or they stand on the conductive basement) ..... BC 3\*
  - without any danger media with object ..... BE 1\*
- \* marking according to IEC 60 364-3:1993

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

### 1.7.3 Power supply and duty cycle

#### Power supply:

electric motor ..... 230 V AC  $\pm 10\%$   
**Power supply frequency** ..... 50 Hz or 60\*\* Hz  $\pm 2\%$

\*\* At frequency of 60 Hz operating speed is reduced by 1.2 times.

**Duty cycle** (according to EN/IEC 60034-1.8):

**EA MTR 52 420** are designed for **remote control**:

- short-time operation S2-10 min

intermitted operation S4-25%, 6 up to 90 cycles per hour

resp. for: **automatic regulation**:

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

### 1.8 Description of the actuator

The actuators MTR 52 420 (Fig.1, 9) consist of the following modules:

Module M1 – an electric motor

Module M3 – a gearbox with a manual control mechanism

Module M4 – a control box

Module M8 – a linear mechanism

Module M11 – a countershaft box

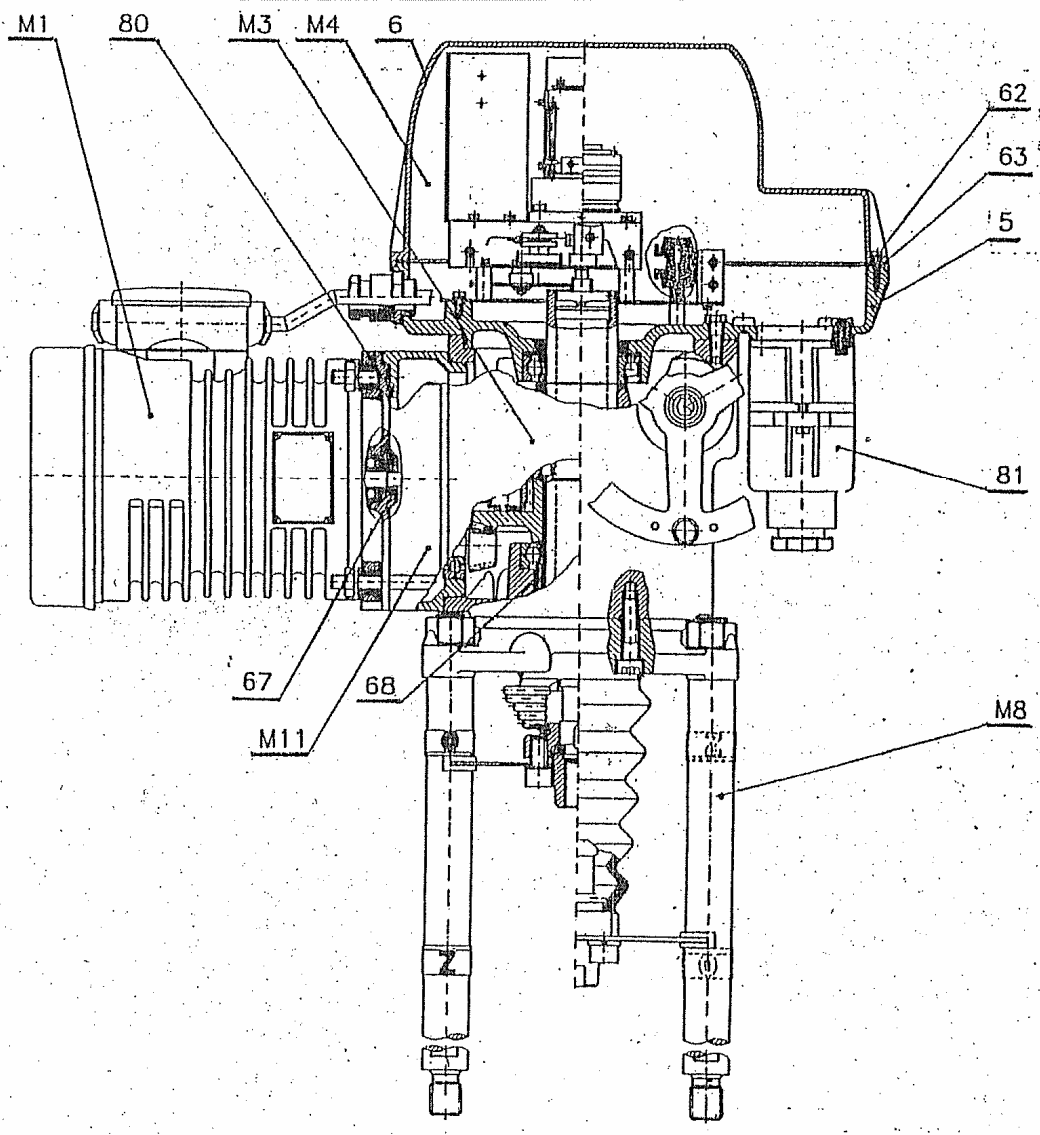


Fig.1



**Module M1 – an electric motor**

Special capacitor asynchronous electric motor with a electrically controlled friction brake. It is suitable for continuous control with possible operation as a permanent squirrel-cage motor.

**Module M11 – countershaft transmission with rotary hold**

Countershaft transmission performs reduction of revolutions of electric - motor to specified transmission value. Countershaft transmission consists of two or three pairs of spur meshing toothed wheels and is terminated by bevel pinion, which meshes into bevel gear of transmission from module M3.

**Module M3 – a gearbox with a manual control mechanism (Fig.2)**

The gear train is located in the case (1). The gear are placed on the output shaft (3) and they make up an independent assembly set. The rim (44) with internal teeth provides gearing between the pinion of the electrical motor and the output shaft. The worm (2) designed for torque taking down and manual control is seated in the upper part. The resetting is made with the handwheel (4). The worm is then sprung and the power caused by torque of the output moves the worm shaft axially against spring power. The movement of the worm is taking off by a fork and a pin through shaft (45) leading to the control box. The movement of the worm is a measured off torque. The fork meshes with the groove circumference to allow rotary movement of handwheel it means its rotary movement in every position.

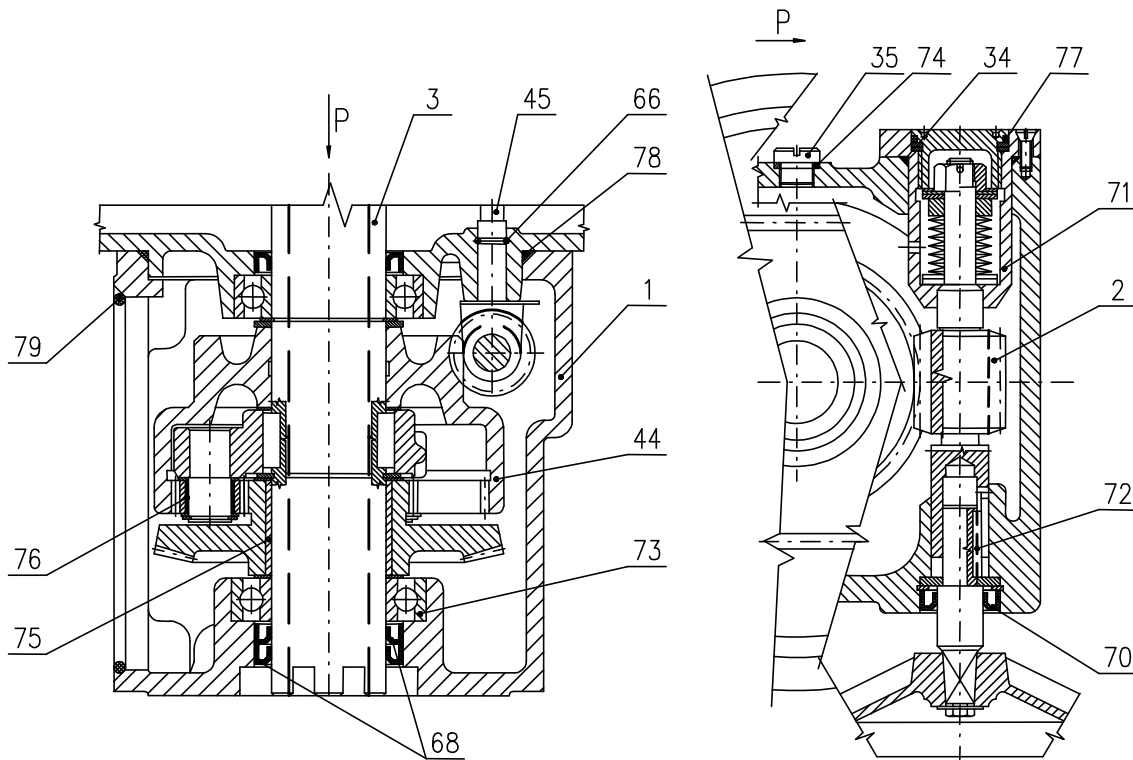


Fig.2

### Module M4 – a control box

It is located in the upper of actuator. On the base plate (46) the following functional block are mounted:

- a torque switch unit (20)
- a transmission unit (10)
- space heater (16)
- a position unit

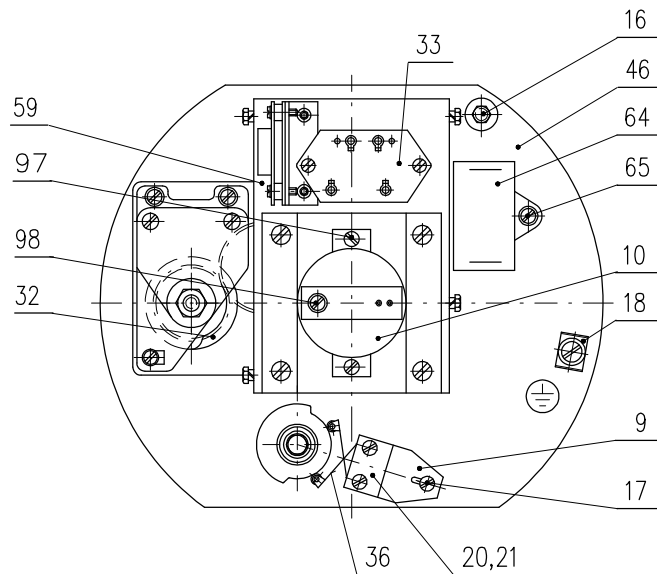


Fig.3

### Position unit (Fig.4)

After loosening a nut of the position unit (51) cams (53), (54), (56) and (57) can be set. The design is solved the way that setting one cam the other are kept in their set position. After setting tighten the nut (51).

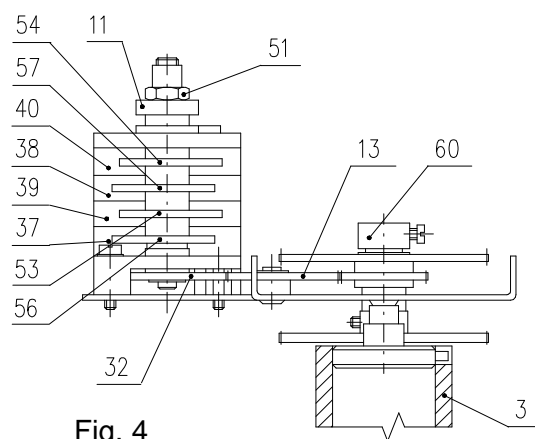


Fig. 4

### Transmitter unit (Fig. 6)

The unit is derived from the gear unit. Gear wheels (43a), (43b), (43c) and (43d) and the transmitter joint (60) make up a module. Rotary movement from the gears to the transmitter is transferred via the clutch after tightening of the screw (50).

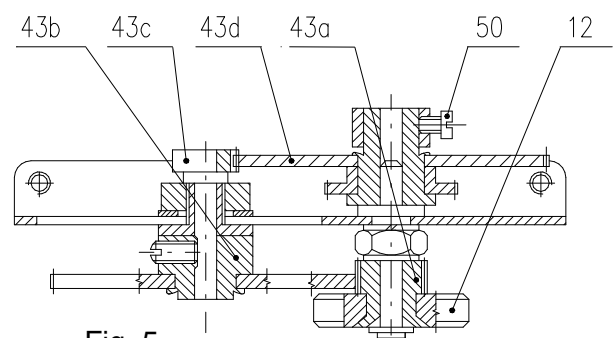


Fig. 5

**Torque switch unit (Fig. 7)** consists of the following parts:

Switch element (9) (Fig.3) is formed by two micro-switches S1 and S2. It is put into operation after loosening of the nut (17).

Cam unit is formed by two adjustable cams (19) and (20) (Fig.6) placed on the shaft of the torque control element (45) (Fig.2). The cams turned according to set switch-off force.

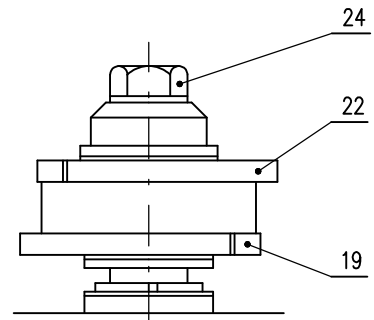


Fig. 6

**Space heater**

The actuator is equipped with two parallel space heaters (16) (Fig. 3) with total power output 20W. Connection of the space heaters is conditional by operation environment.

**Electric connection**

Can be made through the terminal board (58) (Fig.7).

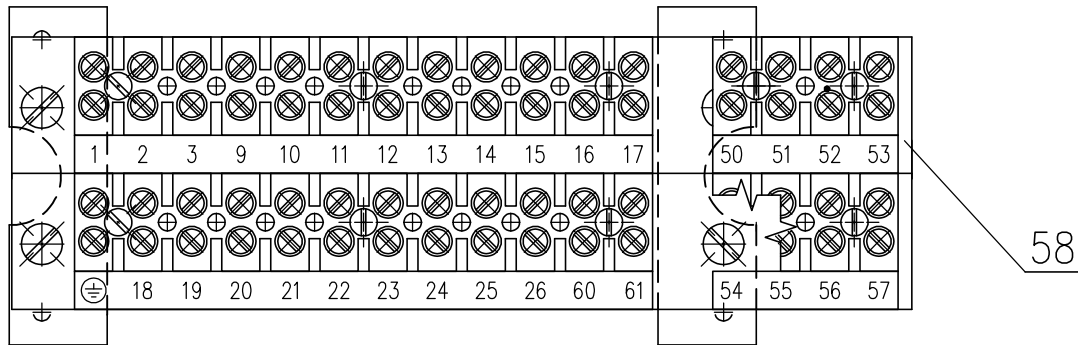


Fig.7

### Module M8 – a linear mechanism (Fig.8)

It changes rotary movement of the output shaft (3)(Fig.2) to linear movement of output spindle (83). The bronze joint nut with a trapezoidal thread is put into teeth of the output shaft (3). The frame (85) limits rotation of the output shaft (83) and function to indicate position. Pointers (86) "O" (open) or "Z" (closed) indicate position and they are fixed on actuators supporting columns (87).

Spindle's thread is protected against impurities with a collar (89). The upper position of the spindle "O" is limited by the stop tube (90).

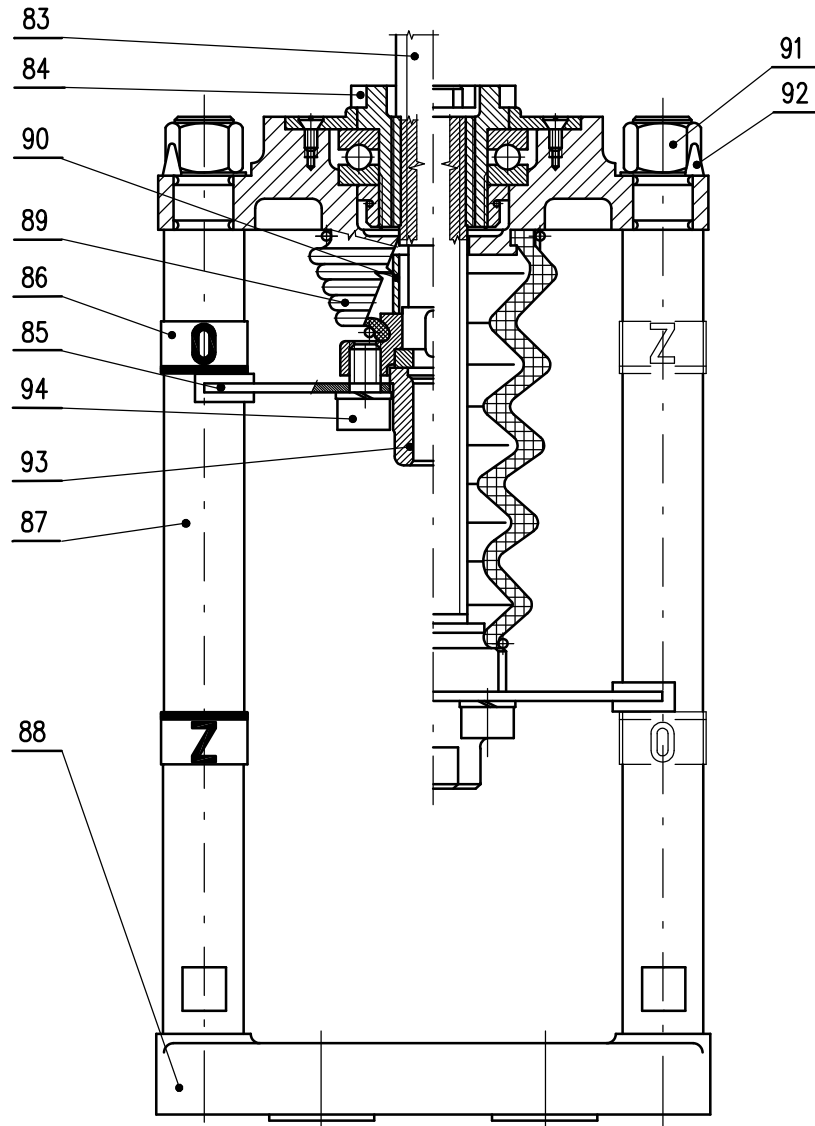


Fig. 8

#### Note:

While adjusting the actuator of the version with the ball screw do not exceed the lower position of the stem stated in the dimensional drawings P-1045b and P-1046b. In case of exceeding of the lower position the ball could fall out and the ball screw could be damaged. The ball screw is filled with the grease GLEIT- $\mu$  HP 520M.

## 1.9 Technical data of actuator

The basic technical data of actuator are given in the Table 1.

**Table No. 1**

Type/ type number	Screw version	Rated operating speed $\pm 10\%$		Operat. stroke	Switching-off thrust <sup>5)6)</sup> $\pm 15\%$	Weight	Electric motor <sup>1)</sup>				
		[mm/min]	[mm]				[kN]	[kg]	Voltage.	Power output	Speed
1	2	3		4	5	7	8	9	10	11	12
		50Hz	60Hz								
<b>MTR</b> Typ number <b>52 420</b>	trapezoidal	32	38	12,5 - 100	4,0 – 6,3	cca 25 - 46	1-phase	230/50 230/60 <sup>7)</sup>	16	1 150	0,31
		50	50		2,5 – 4,0				25	1 250	0,41
		32	38		6,3 – 10,0				16	1 150	0,31
		50	50		4,0 – 6,3				25	1 250	0,41
	Ball screw	32	38		10,0 – 16,0				16	1 150	0,31
		50	50		6,3 – 10,0				25	1 250	0,41
		32	38		10,0 – 25,0						
		50	50		10,0 – 16,0						
		63	75		6,3 – 10,0						
		100	120		4,0 – 6,3						

### Notes:

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

<sup>5)</sup> State the switching-off thrust in your order by words. If not stated it is adjusted to the maximum rate of the corresponding range.

<sup>6)</sup> The maximum load thrust equals the max. switching-off thrust multiplied by:

- 0,8 for duty cycle S2-10 min, or S4-25%, 6-90 cycles per hour
- 0,6 for duty cycle S4-25%, 90-1200 cycles per hour

<sup>7)</sup> At frequency of 60 Hz operating speed is reduced by 1.2 times.

**EA protection enclosure:** ..... IP 55, IP 67 (EN 60 529)

### Mechanical ruggedness:

sinusoidal vibrations: with frequency in range 10 to 150 Hz,  
with shift amplitude of 0,15 mm for  $f < f_p$ ,  
with acceleration amplitude of  $19,6 \text{ m/s}^2$  for  $f > f_p$ ,  
(transition frequency  $f_p = 57$  to  $62 \text{ Hz}$ )

drop resistance:..... 300 drops with acceleration  $2 \text{ m.s}^{-2}$

seismic resistance:..... amplitude of the shock off 6 on Richter scale

**Self-locking:** ..... garranged in range from 0% up to 100% of max. rated thrust

..... Switch-off thrust in linear mechanism with trapeze thread

..... Unguaranteed in linear mechanism with ball screw

### Switching-off:

Switching-off voltage ..... max. 250V, 50/60 Hz, 2A or 250V DC; 0.1A

**Manual control:** ..... with handwheel;

rotating clockwise (counter-clockwise ) EA output part is moving in direction "Z" ("O")

### Electric control:

remote control (output motion of actuator is operated by power supply voltage)

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

### Space heater (E1)

Space heater power output: ..... cca 20 W

**Adjustment of limit positions:**

Position switch S3 or S4 is adjusted to specified stroke.

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

**Set up of strokes and positioning switches**

Initial position set up (i.e. bottom position according to dimensional drawing) is within tolerance  $\pm 1$  mm. Stop end switches are set up with accuracy  $\pm 0,5$  mm in relation to bottom stroke position.

Additional positioning switches are set up to 1mm before end positions.

**Set up of thrust switches**

Switching thrust is set up to maximum value with tolerance  $\pm 15$  %, unless otherwise agreed.

Operating stroke is set up at the manufacturer, according to specified value.

**Weight:** 27-31kg

**Grease:**

- grease oil PP 80
- gear part - grease GLEIT -  $\mu$  HF 401/0 or GLEITMO 585 K
- linear adapter – grease GLEIT- $\mu$  HP 520M.

**1.9.1 Mechanical connection:**

- flange (ISO 5211)
- pillars

Basic and connecting dimensions are given in dimensional drawings.

**1.9.2 Electric connection****a) terminal board**

**to terminal board (X):** .....max. 2 cable glands M25x1,5 mm

**to connector (XC):** .....cable glands M20x1,5 a M25x1,5

**b) electric motor**

**terminal board execute** .....2 cable glands M25x1,5

**protection terminal:**

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

Electric connection - according to wiring diagrams

**1.10 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 palletes), 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 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 (a strange version – 45 ° C up to + 45 ° 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 %.*

### **Warning:**

1. *It is not acceptable to store EA outdoors, or in areas not protected against direct climate influence!*
2. *It is not recommended to set up the electric actuator manually without mechanic connection with armature. The electric actuator does not have mechanic restriction of working stroke in terminal positions and therefore can after exceeding of the stroke come to mistuning of parameters set up by production plant.*
3. *Eventual damages to surface finish remove without delay – thus preventing damage by corrosion.*
4. *If storing takes longer than 1 year, it is necessary to inspect lubrication fillings before putting EA into operation.*
5. *Assembled EA, but not put into operation is necessary to protect by the equivalent method as during storage (for example suitable protective cover).*
6. *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.*
7. *Excessive preserving grease remove just before putting EA into operation.*

### **1.11 Assessment of the product and packaging and removal of contamination**

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

### 2.1 Installation



**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 operation angle 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.

### 2.2 Mechanical connection EA on the valve

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 handwheel on.

The EA have to be set on the valve in the height enough to have the spindle in the position "closed" (the spindle pulled out of the actuator) with an accuracy  $\pm 1$ mm.

#### **Column version:**

The columns of the actuators (87) are in the upper part locked with a nut (91) and with a locking O-ring (92). After unlocking the columns (87) can be screwed into a valve yoke with a wrench OK 22 sat on the column surface (Fig. 8).

#### **Flange version – connection with the bolts:**

Actuators with the flange (88) are to be connected with valves using bolts and fixing them with nuts M12.

#### **Flange version – connection with the central nut (Fig.9):**

Seat the actuator with the flange (88) onto the guarding cylinder part of the valve and fix it by the central nut. The central nut is not an object of standard delivery.

The coupling (93) (Fig..8 and 9), joins the actuator's spindle with the valve's one. It is free to rotate after loosening the fixing screws of the yoke (94).

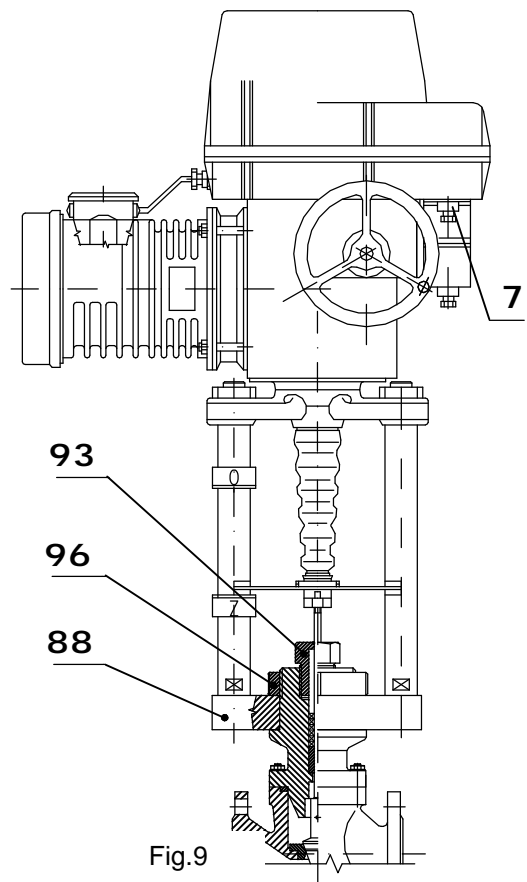


Fig.9

### 2.3 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 screw cable glands.
4. Before initiation ES into operation internal and external protection terminals are needed to be connected.
5. 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.

Put the actuator control box cover off and proceed with connection according to wiring diagram (it is fastened inside control box).



### a) Terminal board connection

**Connecting of the motor.** Electric connection should be made through 2 cable glands M25 x 1,5. The recommended diameter of the connecting cable is 12,5 up to 19mm. Excitation winding, control winding and capacitor have to be connected in accordance with the recommended motor wiring diagram Z-296a.

**Control device connection.** The control device connection has to be done through 2 cable glands M25x1,5 onto the terminal board with terminal size 2,5mm<sup>2</sup>. The total number of terminals is max. 32. They are marked with numbers corresponding with the wiring diagram placed in the cover. Diameter of the connecting cable is 12,5 up to 19 mm.

#### Notes 1:

1. For the EA version with connection to the terminal board, the terminal 1/60 (the wiring diagrams Z269a and Z260a) is led out to the terminal No. 1.
2. For the version with connection to the terminal board, the EA is not equipped with the jumper X3:6-X:7 and X3:2-X:8 (wiring Z296) in manufacturing plant (it is necessary to connect it by customer).  
By connectors version, jumpers are made in production plant.
2. By engine control, it is necessary to unbreak the engine by bringing 230 V AC voltage on X3:7 and X3:8 jacks.
3. Actuator is basically delivered with terminal board connection (engine terminal board X3 and terminal board in control box X). Connector XC is valid only for electrical connection on connector.

#### Notes 2:

1. The EA are delivered with cable glands, which in case of tight putting on the leads assure protection enclosure up to IP 68. For required protection enclosure it is needed to use rings according to the actual cable diameter.
2. While fixing the cable it is needed to count with allowed bend radius to avoid damaging or deformation of the sealing element of the bushing. The leads are to be fixed with the solid construction at most 150 mm from the cable glands.
3. It is recommended to use screened cables to connect remote transmitters.
4. The face areas of the control part cover have to be before re-mounting clean, coated with a grease without any acid (e.g. vaseline) and sealing not damaged to avoid joint corrosion.
5. Reversation of the EA is sure, if the period between switching-off and switching-on of power supply for the reversed movement of the output part is minimally 50 ms.
6. Delay after switching-off, i.e. time since a reaction of switches till the motor is dead can be maximally 20 ms.

After electric connection it is recommended:

**Check movement direction.** Set actuator with the handwheel to a midposition . Check the wiring pressing the button "closing" (on the manual control box as well as on the board, the test button box). The output spindle is to be moving down. If not check wiring of the el. motor and the control part.

**Check to torque switches.** Set actuator to have it moving in the direction "closing" and switch the switches for "torque switching-off". The n switch contacts of the S2 (S1) from the position 1-3 to the position 1-2 by pressing the switch button. In case of the correct wiring the actuator will stop. If the torque switch are switched for "indication" just indication on the control box of the board will occur. Repeat the check analogically also the direction "opening" by switching the contacts of the S1 (20) switch from the position 1-3 to the position 1-2. If any of the functions is not correct, check wiring of the switches in accordance with the wiring diagram.

**Check of positional switches.** Set the actuator to have it moving in the direction "closing" and switch contacts of the S4 (39) or S6 (40) switches from the position 1-3 to the position 1-2 by pressing the corresponding switching-off pin (36). In case of correct wiring the actuator will stop after switching the contacts of the S4 switch and indication will turn-on after switching the S6 switches. Repeat the check also for the direction "opening". Press the switching-off pin of the S3 (37) or S5 (38) from the position 1-3 to the position 1-2, The actuator will stop or indicate. If any of the functions is not correct check wiring of the switches in the actuator in accordance with the wiring diagram.

## 2.4 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. In connector version disconnect the connector.
- Loosen the fixing screws of the EA flange and of the coupling and disconnect the EA from the valve.

## 3. Adjusting of actuator



**Attention! See chapter 1.2  
Disconnect the electrical electric actuator from electrical power network!  
Observe safety regulations!**

Make the adjustment with the EA connected both mechanically and electrically. This chapter includes the electric actuator adjustment to the parameters specified in the specification table in case that you need to change the set EA parameters. See Fig. 3 for arrangement of the operating elements on the control board.

Adjustment can be made only with special service box with dividing transformer. The service box is to be connected with the terminal board of the actuator with lead cables disconnected from the control system.

If it is needed to set the actuator to other parameters than it is set in the plant, follow these steps:

### 3.1 Adjustment of stroke

In the plant the actuator are set only on fixed stroke in accordance with the specification table. The set operation stroke is given on the type label. Resetting is allowed only in the plant or in any of contracted service firms.

### 3.2 Adjustment of position unit (Fig.4)

The position unit is in the plant set with limiting of the operation stroke in accordance with the dimensional drawing. The starting position is defined as the lower position, it means "closed". Up of this position the set stroke of the actuator can be measured. The lower position of the stroke is in accordance with the dimensional drawing as well as whole stroke set with a tolerance of  $\pm 1\text{mm}$ . The indication switches are set next to the position switches. Fine adjustment of the position and indication switches in the end positions can be made as follows:

Set the actuator to the position "closed". Loosed the switching-off cam(53) from the nut(51) and turn it clockwise until it meets the switching-off pin (36). The pin then will switch the S4 switch (39). The S6 signalling switch (40) is also adjusted by turning the switching-off cam (54) clockwise. Fix the switching-off cams by tightening the nut (51). Then reset the actuator to the position "open" Adjust S3(37) and S5(38) switches the same way as the S4 and S6 are adjusted but in the position "open" the switching-off cams (56) and (57) are to be turned counterclockwise. The S5 and S6 signalling switches are recommended to be adjusted to indicate next to the end positions.

#### Note:

*While adjusting the actuator with the valve do not exceed the lower position of the stem stated in the dimensional drawings P-1045b and P-1046b. In case of exceeding of the lower position the ball could fall out and the ball screw could be damaged.*

### 3.3 Transmitter unit adjustment

#### 3.3.1 Adjustment of resistive transmitter unit

Driving force is transferred to the transmitter through a friction clutch after tightening of the nut (50) and that is why no special gear unit adjustment is necessary. Having the nut (50) loosened the drive of the transmitter is disconnected and on the other hand after tightening it is connected. The transmitter itself is equipped with fixed stop ends preventing it against a damage. After an impact to the stop end transmitter shaft it will slip in the friction clutch.

#### 3.3.2 Adjustment of capacitive transmitter unit

The force from the gears is led through the friction brake after tightening of the screw (50), and that is why no special adjustment of the transmitter unit is necessary. Loosen the screw (50) to disconnect the transmitter drive, and tighten it to connect the drive.

The output signals from the capacitive transmitter 4-20mA or 20-4 mA is set in relation with the stroke the end position switches with tolerance of  $\pm 1\%$  of max. value.

Fine adjustment of the output signals (4mA – position “closed” , 20mA position “open” can be made following these steps (Fig.4)):

1. Connect a digital amperemeter into the capacitive transmitter circuit.
2. Set the actuator to the position “closed”
3. Loosen the fixing screws (97) on the transmitter holder.
4. Rotate the transmitter in both directions to adjust the signal 4mA finely.
5. Tighten the screws (97)
6. Set the actuator to the position “open”.
7. Adjust the signal 20mA finely with the potentiometer (98).
8. Check set of signals 4 – 20 mA.

#### 3.3.3 Torque unit adjustment (Fig.7)

Setting of switching-off force can be done only in connection with a device for thrust measurement in the range 4-25kN by turning the cams (19) and (22).

## 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!

Service of the linear actuators is consequent to operation conditions and it is normally reduced to giving impulses to the functional tasks. In case of mains failures reset a controlled body with the handwheel. If the actuator is a part of an automotive loop it is recommended to locate members for manual remote control in the loop to allow control of the actuator also in case of an automotive system failure. Operators take care to provide enough maintenance to prevent the actuator against damaging ambient and weather influences not stated in the part “Operation conditions and regulations”.

Operation with crossing the operation axial force is not allowed. The torque switches set to the maximal values of switch-off forces check the critical load of the actuator and that is why they should be connected with the automotive control circuits.

The maximal axial force is measured on the position controller, at the motor run to the short-circuit status, at power supply of 230V AC. This operation status can occur in case that the torque switches are not connected with the automotive control circuits. Normal operation to the short-circuit status is not allowed, because the actuator can cope only with limited number of the short-circuit load situations.

## 4.2 Maintenance - extent and periodicity

All During inspections and maintenance it is needed to tighten all screws and nuts which maintenance. The interval between two preventive inspections is four years. 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.

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.

In case there is no leakage in the transmission box caused by damaged seal the oil filling is permanent. The change of oil filling shall be done after 6 years of the actuator's operation.

The oil level check must be carried out once in a 3 months interval. The oil level must reach the filling hole. Oil capacity is 1,6 l (1,5 kg).

### Lubrication:

- the gearbox – oil for temperatures:  $-25^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  Madit PP-80 (Slovnaft) SAE 80W
- gears of transmission unit and drive mechanism on the control board:  
 $-25^{\circ}\text{C}$  až  $+55^{\circ}\text{C}$  GLEIT-  $\mu$  HF 401/0, resp. GLEITMO 585 K
- grease recommended for linear mechanism lubrication - HP 520M (GLEIT- $\mu$ ).

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.



### **Lubrication of armature spindle is performed regardless on EA service!**

- It is recommended to perform inspection run every 6 months within adjusting working stroke to verify proper function, with reverse adjusting of original position.
- Unless otherwise stated in revision rules, perform inspection of EA once a four years, whereby check tightening of all connecting and grounding bolts, to prevent heat-up.
- 6 months after putting EA into operation and then once a year is recommended to check tightness of fastening bolts between EA and armature (bolts should be tightened by cross method).
  - During electric connection and disconnection of EA check sealing rings of bushings – damaged and obsolete sealings replace by original ones!
- Maintain EA clean and take care for removal of impurities and dust. Cleaning should be performed regularly, according to operating options 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 handwheel). 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.

### Note:

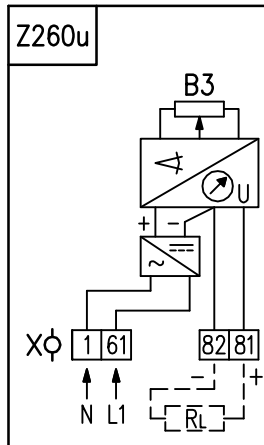
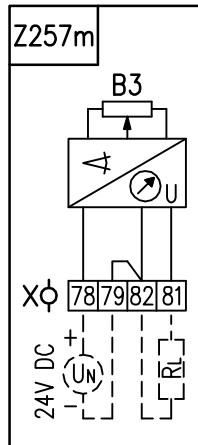
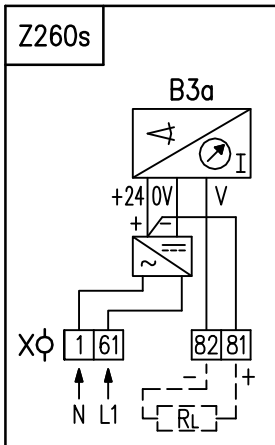
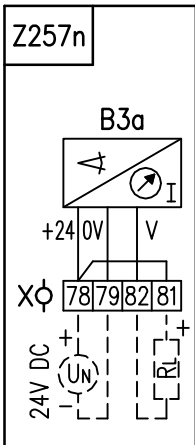
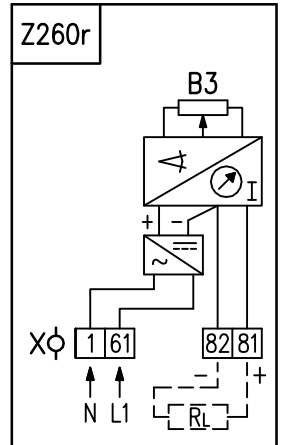
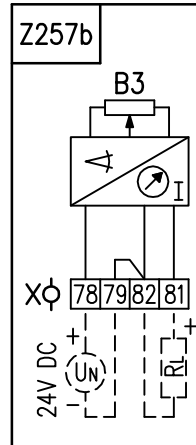
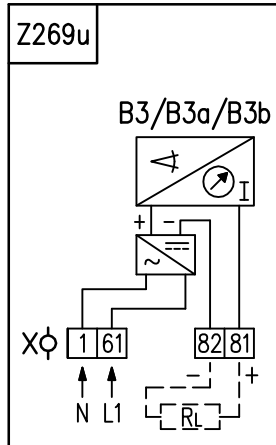
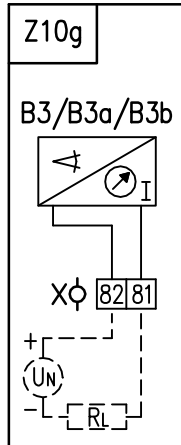
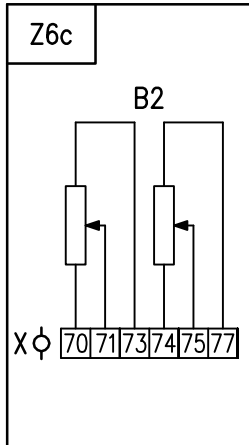
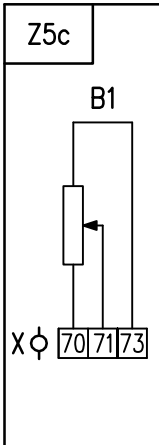
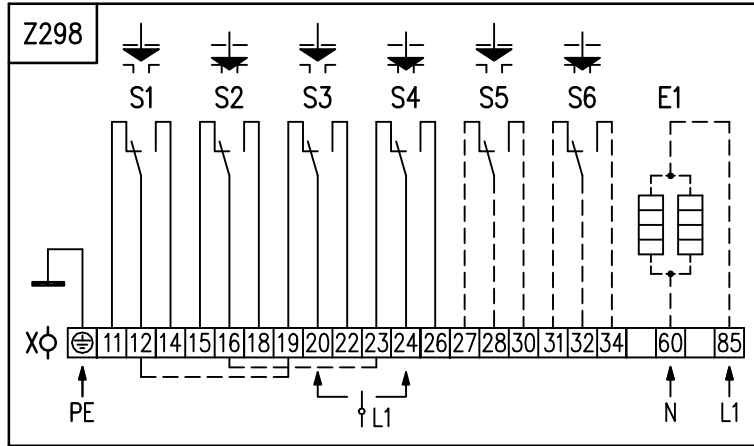
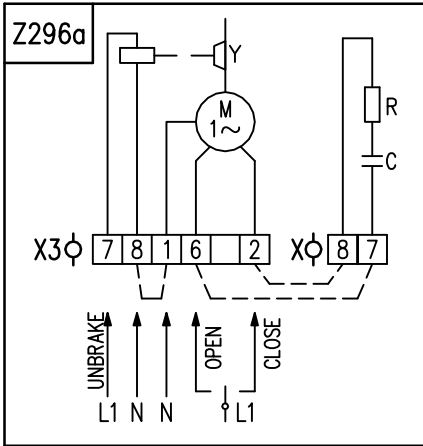
If the EA requires dismantling follow the chapter "Dismantling".

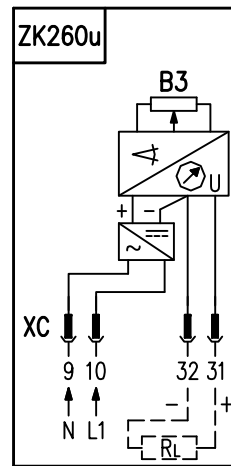
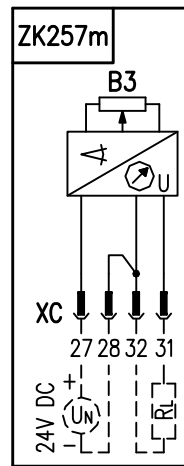
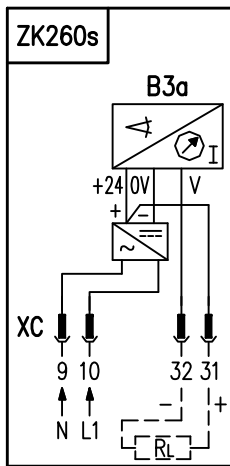
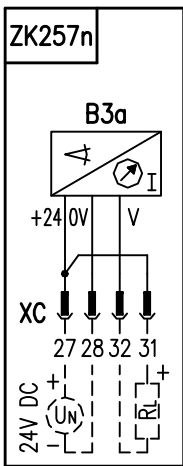
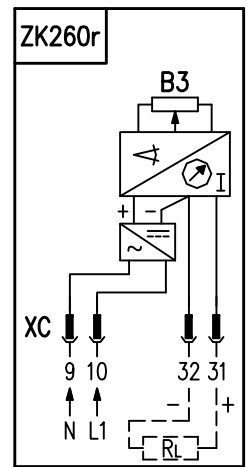
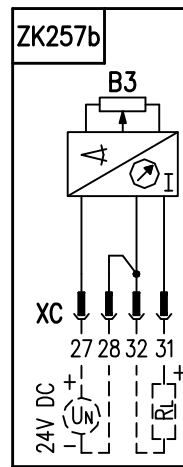
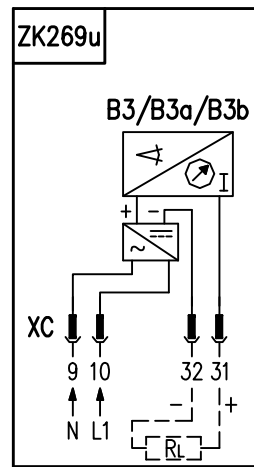
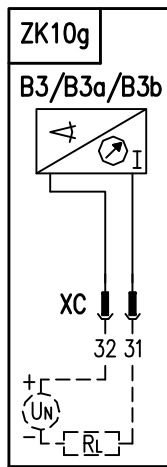
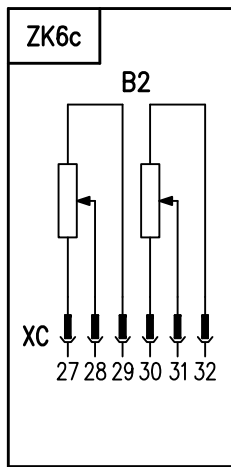
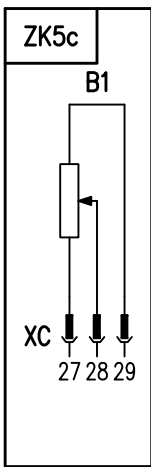
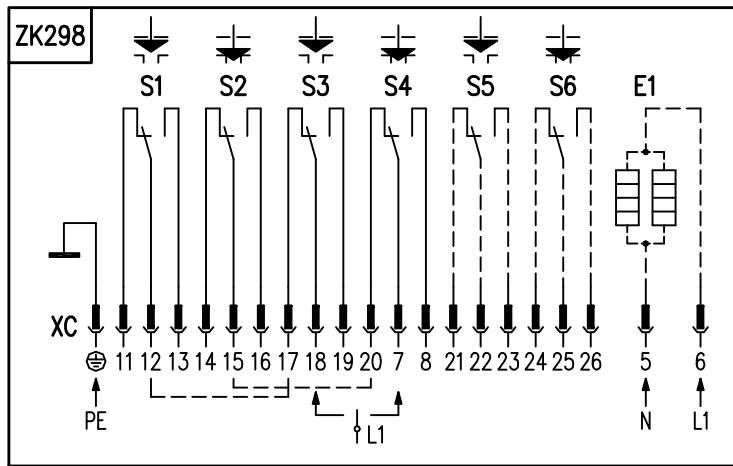
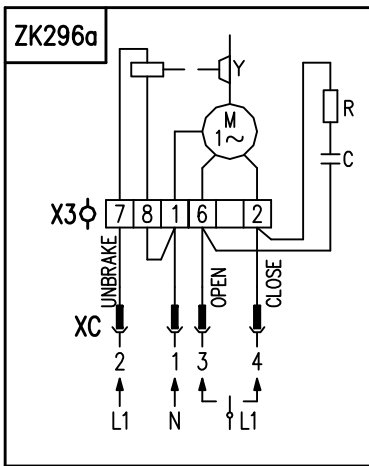


**Taking the EA to pieces for repair purposes is allowed only by professionally qualified persons trained in the production plant or by a contracted service centre!**

### 5. Enclosures

#### 5.1 Wiring Diagrams





Notes:

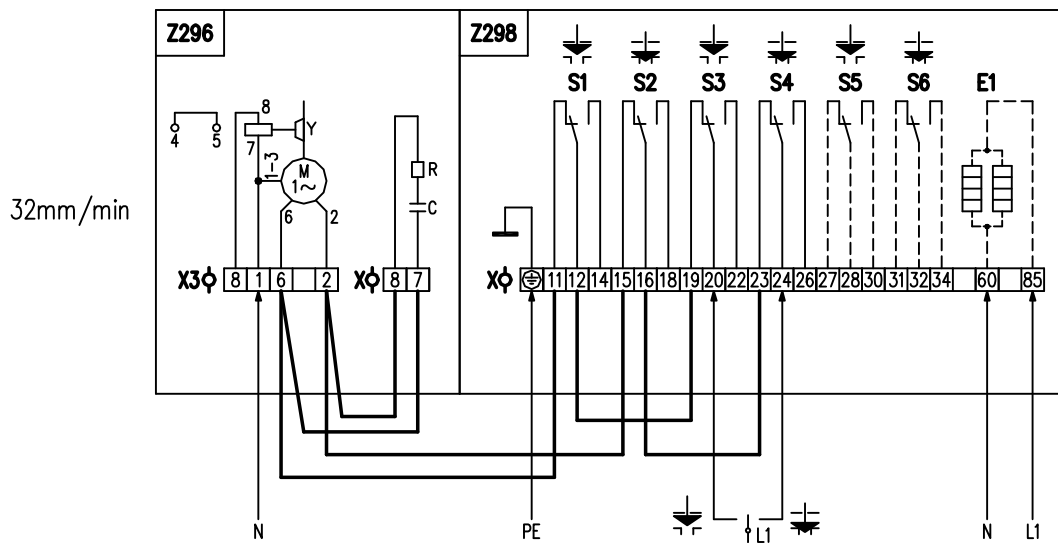
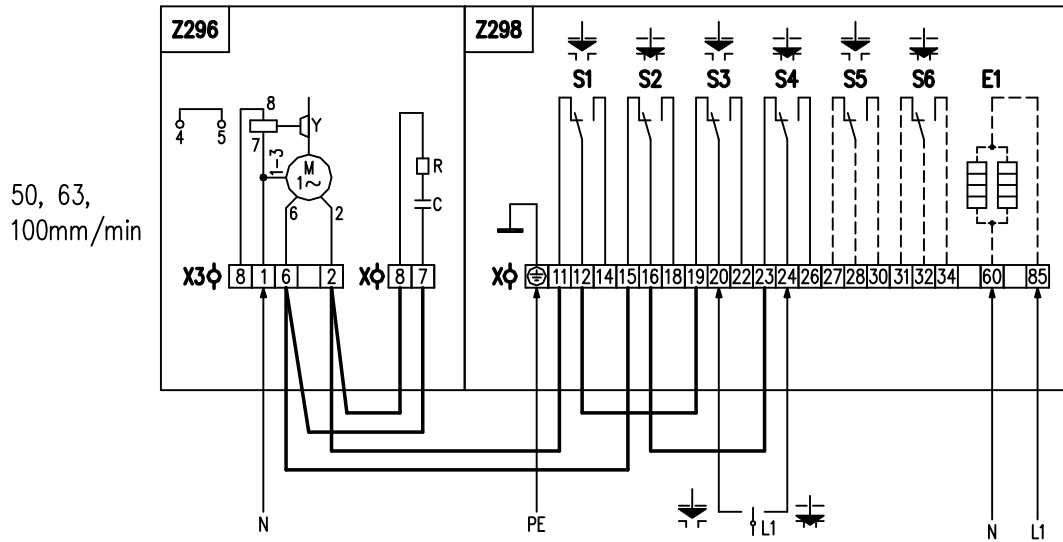
1. By engine control, it is necessary to unbreak the engine by bringing 230 V AC voltage on X3:7 and X3:8 jacks.
2. Actuator is basically delivered with terminal board connection (engine terminal board X3 and terminal board in control box X). Connector XC is valid only for electrical connection on connector.

**Legend:**

The legend to the wiring diagrams Zxxx (eg Z5c) with terminal board connection is identical with wiring diagrams with connection to connector ZKxxx (eg ZK5c).

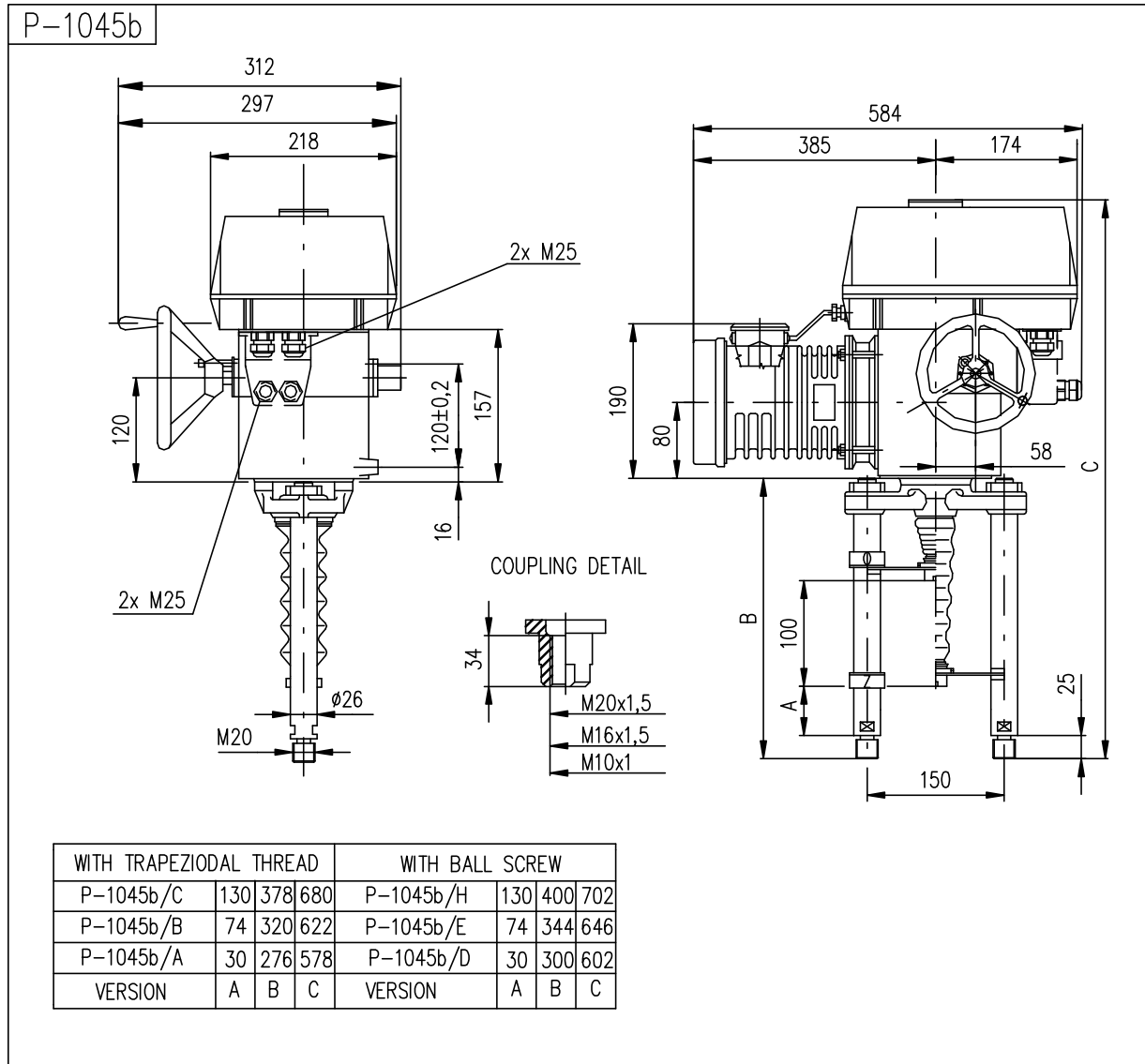
Z296a.....	connection of 1-phase electric motor
Z298.....	connection of thrust and position switches and space heater
Z5c.....	connection of single resistive transmitter
Z6c.....	connection of double resistive transmitter
Z10g.....	CPT, DCPT 3M or electronic transmitter, 2-wire, passive
Z269u.....	CPT, DCPT 3M or electronic transmitter, 2-wire, active
Z257b.....	current electronic position transmitter, 3-wire, passive
Z260r.....	current electronic position transmitter, 3-wire, active
Z257n.....	position transmitter CPT, 3-wire, passive
Z260s.....	position transmitter CPT, 3-wire, active
Z257m.....	electronic position transmitter 0 - 10 V, 3-wire, passive
Z260u.....	electronic position transmitter 0 - 10 V, 3-wire, active
B1 .....	resistive transmitter (potentiometer)single
B2 .....	resistive transmitter (potentiometer)double
B3 .....	capacitive transmitter
B3a .....	CPT - current position transmitter (capacitive)
B3b .....	DCPT - current position transmitter (magnetic)
S1 .....	torque switch "open"
S2 .....	torque switch "closed"
S3 .....	position switch "open"
S4 .....	position switch "closed"
S5 .....	additional position switch "open"
S6 .....	additional position switch "closed"
M .....	electric motor
C.....	capacitor
Y .....	motor's brake
E1 .....	space heater
X .....	terminal board
X3.....	electric motor's terminal board
XC.....	connector
I/U.....	input (output) current (voltage) signals
R.....	reducing resistor
RL.....	loading resistor

Example of single phase engine connection with switches for existing operating speed

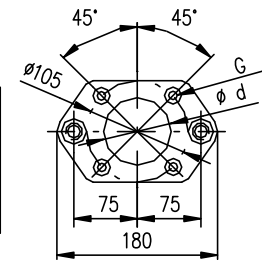
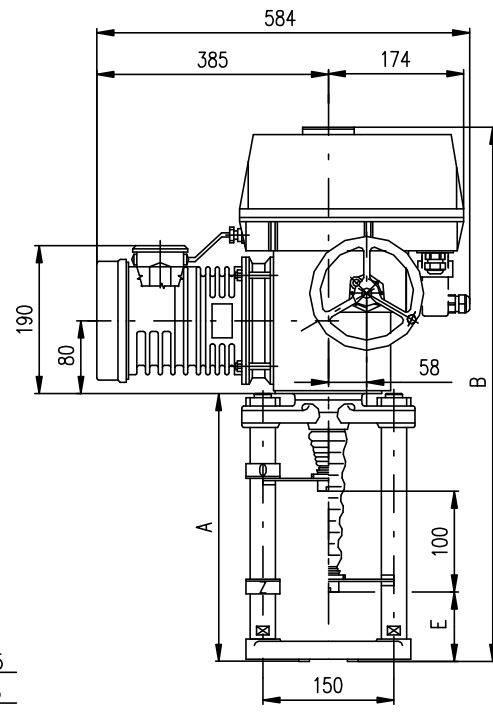
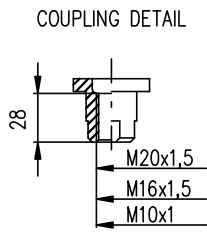
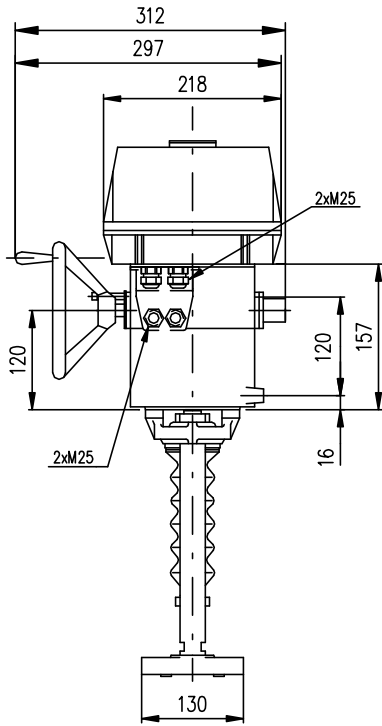




5.2 Dimensional Drawings



P-1046b



WITH TRAPEZIODAL THREAD						WITH BALL SCREW					
P-1046b/B	327	656	65,15 H7	110	-	P-1046b/D	349	678	65,15 H7	110	-
P-1046b/A			80 H8	112	4xØ13	P-1046b/C			80 H8	112	4xØ13
VERSION	A	B	d	E	G	VERSION	A	B	d	E	G

**5.3 Guarantee service check report**

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

**5.4 Post guarantee service check report**

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

## **5.5 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](mailto: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