



INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS



***Electric linear actuators
MT 3 52 400, MT(R) 3 52 400***

TEST CERTIFICATE

ELECTRIC PART-TURN ACTUATOR MT 3 52 400, MT(R) 3 52 400	
Type number 52 400	Power supply V Hz
Serial number	Rated thrust N
Production year	Switching-off thrust N
Wiring diagram	Operating 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 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.....

Preventive and safety-measures applied on the actuator can not offer required safety level till the actuator and its safety systems are not applied by required and described way and if installation and maintenance is not applied according to applicable instructions and rules!

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The Installation, Service and Maintenance Instructions are drawn up according to requirements of EC Executive Nr. 89/392/EEC "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 **MT 3 52 400** (hereinafter **MT**) or **MT(R) 3 52 400** (hereinafter **MT(R)**) types are high-powered electric-mechanical products designed for direct installations onto controlled devices (regulating bodies -valves, etc.). EA of MT types are provided for remote control of closing bodies, and EA of MT(R) types with controller 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.

Notes:



1. Do not count with tight closing performed by control signals of EA STR 1.
2. It is forbidden to use EA as a lifting mechanism!
3. Switching of actuator by a semiconductor switches have to be consulted with producer.

1.2 Safety instructions



EA of **MT** and **MT(R)** 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 EN 61010-1+A1, 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 IEC 61000-3-2+A1 and EN 61000-3-3+A1+A2, 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 78 dB (A).

Environment hazard: the product involves a mineral oil fill harmful for water species that is capable to generate long-time lasting adverse effects in water environment. When handling and operating the product don't allow oil to escape in environment. An increased care must be given when the product is operated near to water sources.

1.3 Instructions for staff 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°C to $+60^{\circ}\text{C}$ or -50°C to $+40^{\circ}\text{C}$ or -60°C to $+60^{\circ}\text{C}$, 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 $+60^{\circ}\text{C}$, protect the actuator by additional construction in order to maintain ambient temperature max. $+60^{\circ}\text{C}$ 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°C . When choosing the connection cables for the actuator, it is therefore necessary to consider this temperature as well.

Product protection

EA 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 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 type label (type marking and serial number)
- Period of operation, ambient conditions (temperature, humidity,...), operating mode including contacting frequency, type of turn-off (position, or thrust), preset turn-off thrust
- Type of the fault – description of claimed fault
- Copy, respectively depiction of assembly and installation certificate

After performing of claim removal works will service employee prepare the service re-cord, which is sent to production company.

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

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.
- Electric actuators must be placed with access to the manual control wheel, to the cover of control box, to control box and to bushings.

- Installation and operation of actuators is possible in either position. Common position is the one with vertical position of exit part axis and control box above. Electric actuator position under the valve not recommended.



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.

1.6.2 Operation environment

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

- 1) Version „**standard**“ for type climate temperate
- 2) Version „**tropical wet**“ for type climate tropical wet
- 3) Version „**cold**“ - for type climate cold
- 4) Version „**tropical dry and dry**“ for type climate tropical dry and dry
- 5) Version „**marine**“ for type climate marine
- 6) Version „**arctic**“ for type climate arctic.

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:

- warm mild to hot dry with temperature -25°C to +60°C AA 6+AA 7*
- cold to warm mild hot dry with temperatures -50°C to +40°C AA 8*
- cold to hot dry with temperatures -60°C to +60°C AA 1*+AA 6*
- with relative humidity 10 to 100 %, including the condensation of up to 0,029 kg water content per 1 kg of dry air, at above stated temperature..... AB 6+AB 7*
- with relative humidity of 15÷100%, including the condensation of up to 0,036 kg water content per 1 kg of dry air, at above stated temperature..... AB 8*
- with relative humidity of 1÷100%, including the condensation of up to 0,035 kg water content per 1 kg of dry air, at above stated temperature..... AB 1+AB 6*
- 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 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 35 but not more than 350 mg/m² per day (products with protection enclosure of IP 5x) **AE 5***
- with shallow dive – (product in protection IP x 7)..... **AD 7***
- 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/m² 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 **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/s² 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⁻¹ **AM 2-2***

- of sun radiation with intensity $> 500 \text{ a} \leq 700 \text{ W/m}^2$ **AN 2***
- with effects of medium seismic activity with acceleration $> 300 \text{ Gal} \leq 600 \text{ Gal}$ **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 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 and duty cycle

Power supply:

electric motor Y/Δ; 400 / 230V AC resp. Y/Δ; 380 / 220V AC ±10%
 (required to be confirmed by the producer)

Power supply frequency 50 Hz or 60 Hz ± 2%

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

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

EA MT are designed for **automatic control:**

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

EA MT(R), resp. **EA MT with external controller** are designed for **automotive regulation:**

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

1.7 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.*

1.8 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. Description, function and technical parameters

2.1 Description and function

The actuators MT 52 400 resp. MT(R) (Fig.1) consist of the following modules:

Module M1 – an electric motor

Module M11 – countershaft transmission with rotary hold

Module M3 – a gearbox with a manual control mechanism

Module M4 – a control box

Module M8 – a linear mechanism

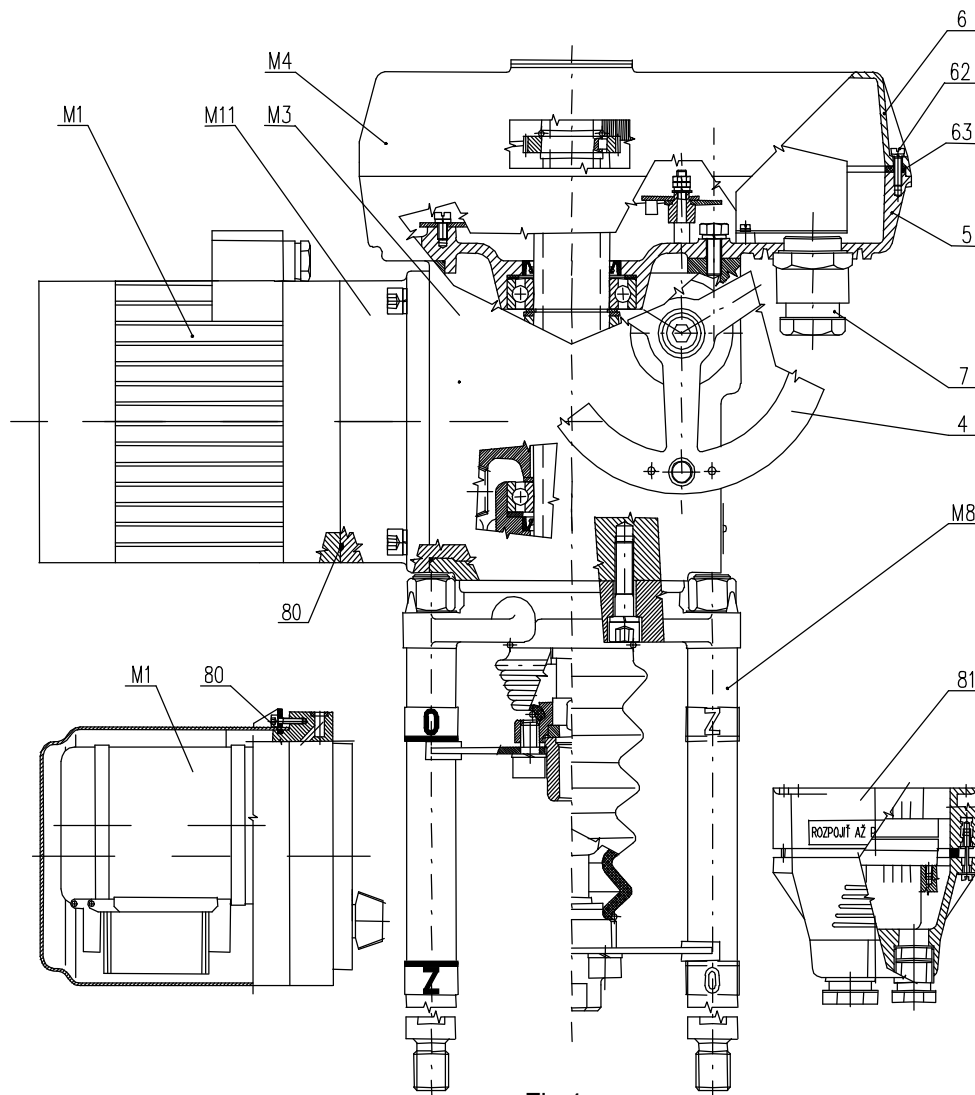


Fig.1

Module M1 – an electric motor

- 3-phase electric motor
- 1-phase electric motor with permanently connected capacitor

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.

Rotary hold substitutes motor mechanic brake and allows manual control of EA.

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

The set is stored in box (1). Gears are centrally positioned on output shaft (3) and creates independent assembly unit. Wheel rim (44) with inner gearing provides transfer between electric motor pinion and output shaft. In upper part is located the warm (2) for torque sensing and manual control, which is used for positioning of controlled equipment during electric power breakdown. Positioning is executed manually by hand wheel (4). The warm is suspended and a thrust created by output shaft torque axially shifts the warm against spring tension. The warm movement is transferred by the fork with pin through a shaft (45) joined to control box. Movement of the warm is proportional to the load torque. The fork meshes into circumferential notch, allowing rotary motion of manual wheel, therefore manual control in every operating status. On the box (1), (across to manual wheel) are three bosses with threaded openings allowing assembly of electric actuator on the wall, or supporting construction.

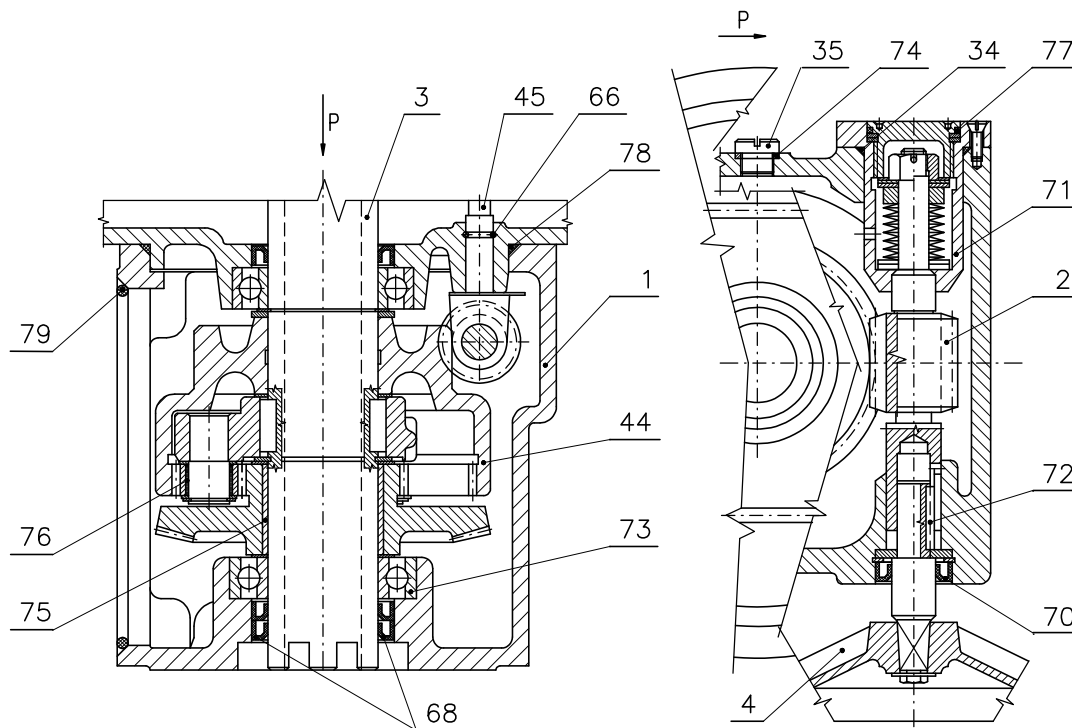


Fig.2 – Gearbox

Module M 4 – control box (Fig. 1)

Control box is in upper part of electric actuator and forms individual function unit. The top part is formed by the cover with opening and monitoring window of position indicator.

The bottom part of control box closes the box of force transmission and forms carrying part of control plate Fig.3.

On mounting base (46) of control plate are fixed these functional blocks:

- position unit (11)
- signalling unit with gear unit (12)
- torque unit (9)
- transmitter unit (33) (according to EA specification)
- heating resistor (16) with thermal switch (15)
- controller (only for EA **MOR**) (14)
- reversing contactors (13) (according to EA specification)

- electrical connections by means of terminals (58) situated within terminal box , and cable bushings (7) (Fig.1), or connector with cable bushings
- local electric control module (Fig.14) (according to EA specification) is situated in terminal box and connected with control board.

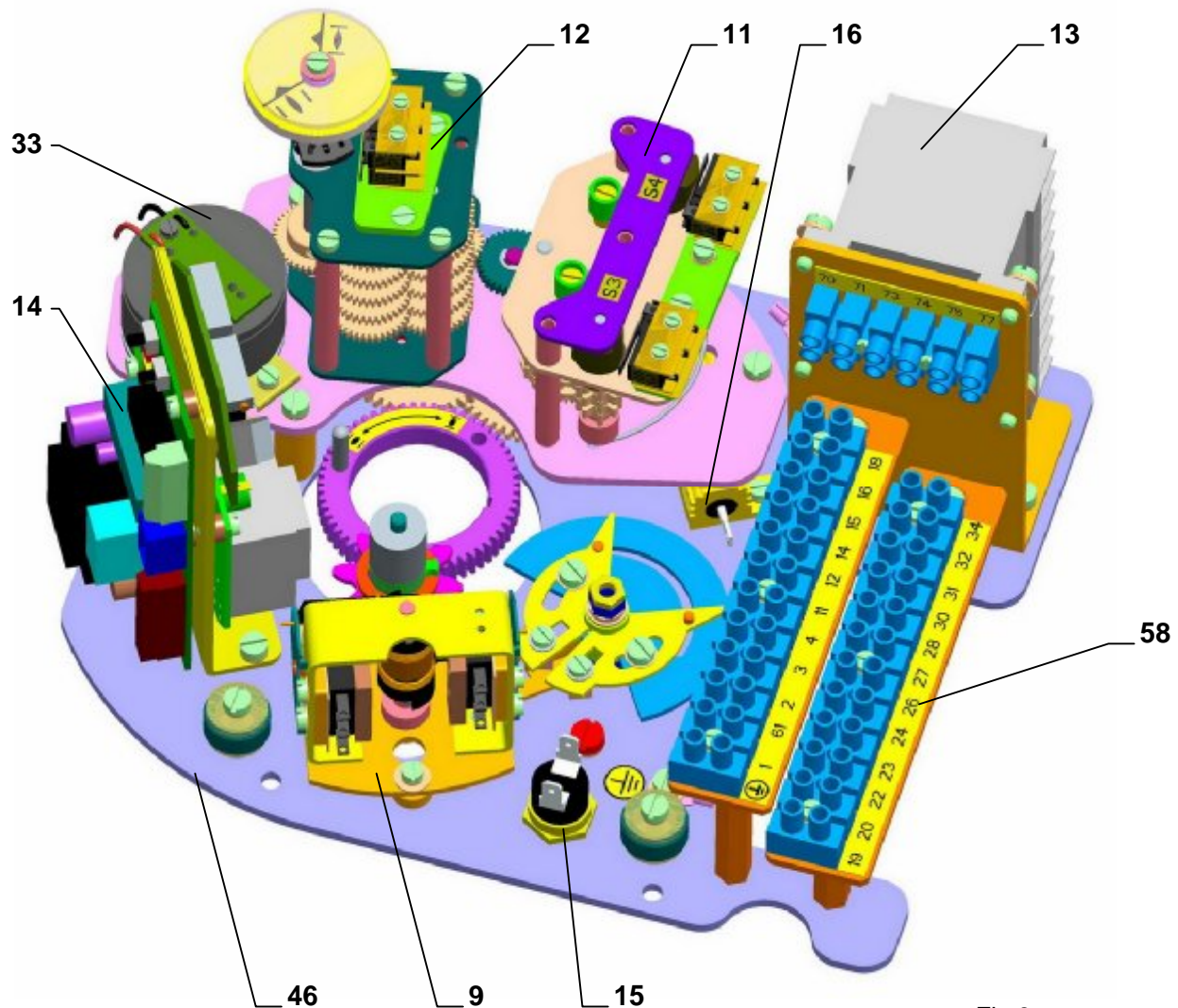


Fig.3

Position unit

EA is equipped with a position step unit that provides for limiting the EA end positions with electric control by means of S3, S4 position switches. The drive for the position unit is derived from EA output shaft by means of idle gears.

Signalling unit with gear unit

Signalling unit provides for closing S5, S6 position switches before the end positions. The drive for the signalling unit is derived from EA output shaft by means of a gear unit on which an appropriate working revolutions range is to be set by an adjustable gear wheel.

Torque unit (Fig. 4 and 5) is composed of three functional sub-units:

- torque disk (Fig. 4)
- torque unit (Fig. 5)
- locking mechanism (82) (Fig. 5)

Torque disk (Fig. 4) is assembled on torque shaft (45) discharged from power transmission (Fig.2). Steer angle of torque disk is proportional to torque moment of output shaft (3) of electric actuator. Its magnitude can be adjusted by segments (17) and by shifting of backstops (18). Achieved torque moment value is from torque disk transferred on torque unit (9) by means of torque lever (42).

Remark:

The gauge marks on the scales do not indicate direct value switching – off torque; they are used only for more detailed orientation during adjusting its magnitude within marked MIN. and MAX. disconnecting value for given make without testing device for thrust measurement.

Torque unit (Fig.5) consists of a carrier, on which are displaced switches S1 (20) and S2 (21). On the shaft (23) are mounted disconnecting levers (24), keeping switches pressed by spring tensions until a moment when the shaft is turned out of the mesh of torque disconnection.

Locking mechanism (82) (Fig.5) provides locking of torque disconnection usually to 5-10 or 3-6 turns after reversing of electric actuator. After elapsing of adjusted revolution will torque unit acquire its original function.

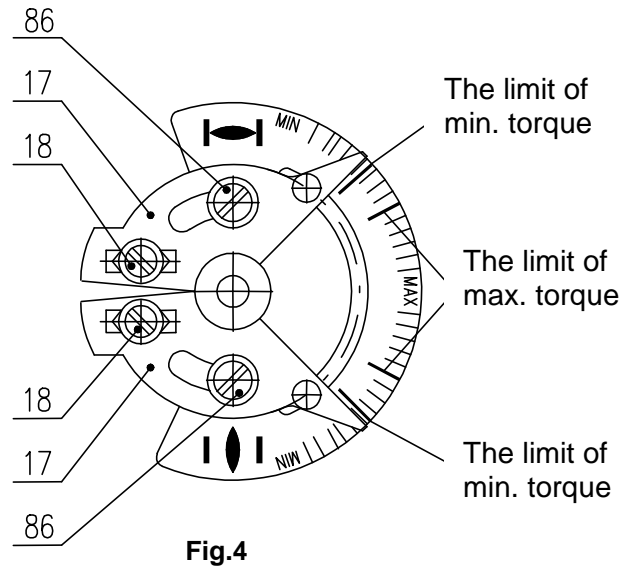


Fig.4

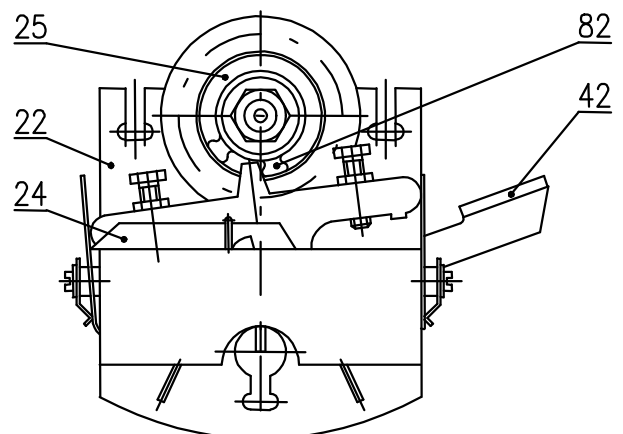
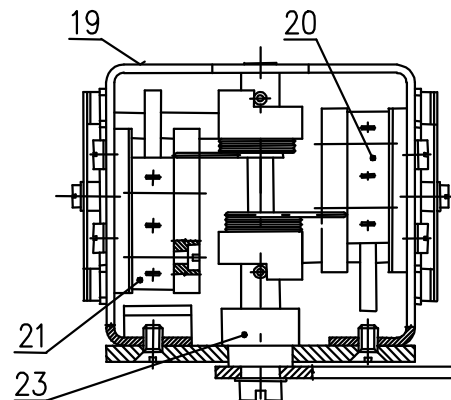


Fig.5

Transmitter unit

EA can involve also a position transmitter and output signal of which depends on the customer's specification. This transmitter provides for continuous transfer of output member position information, eventually, in the variant with regulator as a feedback for controller.

Heating resistor with thermal switch

EA is equipped with a heating resistor having a built-in thermal switch of a total power of about 35W. It is intended to prevent water vapour condensation and provide for the proper ambient for the proper function of built-in electric control parts of EA in the case of EA low temperatures.

Controller

EA of the **MT, resp MT(R)** type are equipped with an electronic controller intended for controlling EA by means of input standardized signals.

Reversing contactors

According to specification, EA can involve also reversing contactors for switching on and reversing a three-phases EA electric motor.

Electrical connections

Electrical connections is to be realised according to the specification indicated on terminal or by means of connector.

Module M8 – a linear mechanism (Fig.5a)

It changes rotary movement of the output shaft (3)(Fig.2) to linear movement of output spindle (83). The bronze joint nut (84) 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 (95) "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).

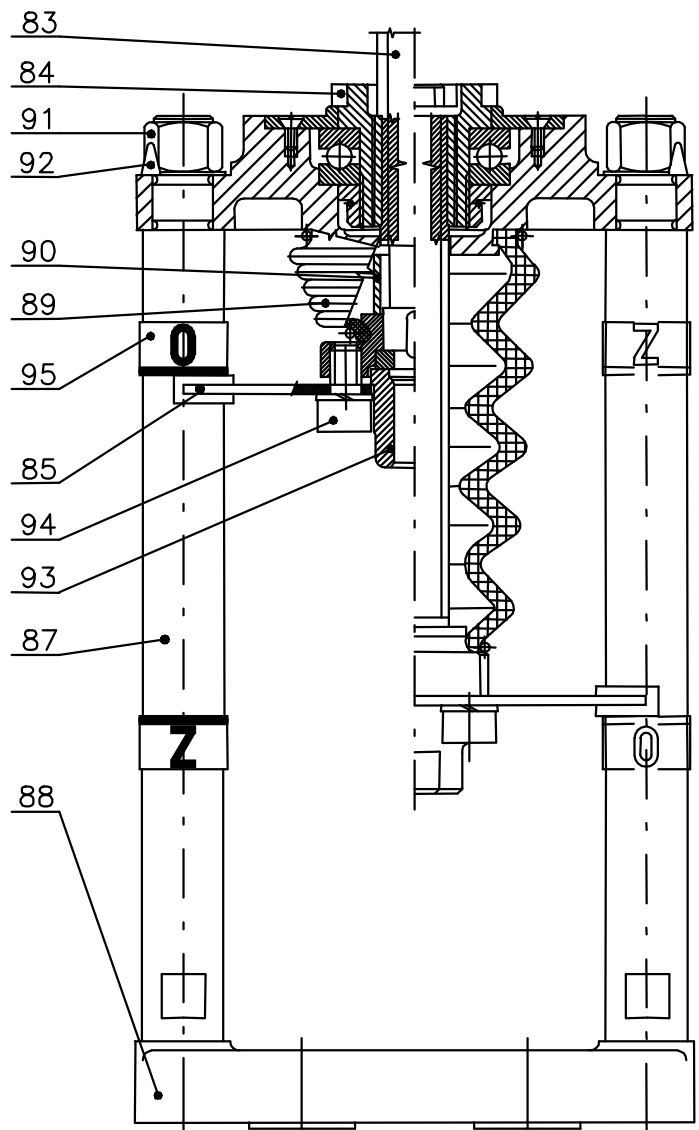


Fig.5a

2.2 Technical data of actuator

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

Table1:

Typ/ typ number	Switching-off thrust ⁵⁾⁶⁾ ±15 [%]	Operating speed ±10[%]	Stroke ⁸⁾ (screw pitch)	Weight	Electric motor ¹⁾					
					Voltage	Power output	Speed	Current ⁷⁾		
	[kN]	[mm/min]	[mm]	[kg]	[V] ±10%	[W]	[1/min]	[A]		
1	6	2	3	7	8	9	10	11	12	
MT or MT(R) Typ number 52 400	8÷12,5	32	9 ÷ 100 (s=3mm)	cca 30÷ 37	3-phase	3x400, 3x380	180	800	0,84	
		50					250	1365	080	
		80	250				1365	080		
		125	180				800	0,84		
	16÷25	32	9 ÷ 100 (s=3mm)				180	800	0,84	
		50					250	1365	080	
		80	250				1365	080		
		125	180				800	0,84		
	25÷36 ¹⁶⁾	50	15 ÷ 100 (s=5mm)				370	1360	1,08	
		80					180	875	0,85	
		125			180	800	0,84			
		180			250	1365	080			
	12÷20	32	9 ÷ 100 (s=3mm)		370	1350	1,08			
		50			1-phase	220/230	60	2770	0,7	
		9,6÷16	63							15 ÷ 100 (s=5mm)
			80							
	125									
	4,8÷8	125								

Notes:

- 1) Switching elements for different type of load (also for EA) defines standard EN/IEC 60 947-4-1.
- 5) State the switching-off thrust in your order by words. If not stated it is adjusted to the maximum rate of the corresponding range. The load torque equals minimally the maximum switching-off thrust of the choosing range multiplied by 1.3.
- 6) The maximum load thrust equals the max. switching-off thrust multiplied by:
 - 0.8 for duty cycle S2 – 10min, or S4 – 25%, 6 – 90 cycles per hour
 - 0,6 for duty cycle S4 – 25%, 90 – 1200 cycles per hour.
- 7) Valid for 3x400V AC.
- 8) Please specify a wanted stroke in your order. With variants equipped with regulator, please specify always a wanted stroke. EA is delivered from the producer plant set to a stroke corresponding to the degree 4., 5. or 6.° according to table 3, or to a stroke specified in customer's order. The stroke referred on the type label of EA corresponds to the maximum stroke of a range preset on the gear unit (degree 5. or 6.° according to table 3).
- 16) Connecting parameters by P-1313b, for version with controller and capacitive transmitter by P-1405a.

EA protection enclosure: IP 55 or IP 67 (EN/IEC 60 529)

Mechanical ruggedness:

sinusoid vibrations with frequency in range from 10 up to 150 Hz,
with shift amplitude of 0.15 mm for $f < f_p$
with acceleration amplitude of 19.6 m/s^2 for $f > f_p$
(transition frequency f_p is from 57 up to 62 Hz)

Sesistibility against drops 300 drops with acceleration 5 m.s^{-2}

Self-locking: garranged in range from 0% up to 100% of switching-off thrust

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:

- standard for **EA MT** - on the supply voltage level
- standard for **EA MT(R)** with built-in controller - by feeding of unified signal
- for the EA version **MT** with external controller – by feeding of unified signal

Output part backlash: max. 0,25mm load by 5% value switching of thrust

Space heater (E1)

Space heater - supply voltage..... max. 250 V AC
 Space heater power output..... cca 35 W/55°C

Thermal switches of the space heaters (F2)

Supply voltage:according to the supply voltage of the motor (max. 250 V AC, 5 A)
 Temperature of switching on: +20°C ± 3 K
 Temperature of switching off: +30°C ± 4 K

Set up of strokes and positioning switches

Initial position set up (i.e. bottom position according to dimensional drawing) is within tolerance ± 1 mm. Stop end switches are set up with accuracy ± 1 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 ± 30 %, unless otherwise agreed.
 Operating stroke is set up at the manufacturer, according to specified value.

Position transmitter

Resistive – potentiometer:

Resistance (single **B1**): 100 Ω, 2000 Ω
 Resistance (double **B2**): 2x100 Ω, 2x2000 Ω
 Operating life of transmitter 1.10⁶ cycles
 Load capacity:..... 0.5 W up to 40°C (max. 0 W/125°C)
 Maximum current of sliding contact max. 35 mA
 Maximum supply voltage:..... √ P_{xR} V DC/AC
 Potentiometer linearity error: ±2.5 [%]¹⁾
 Potentiometer hysteresis:..... max. 5 [%]¹⁾
 For MT: "O" (open) ≥ 93%, "Z" (closed) ≤ 5%
 For MT(R): "O" (open)..... ≥ 85% and ≤ 95%,, "Z" (closed)"..... ≥3% and ≤ 7%

Electronic positional transmitter (EPV) - converter R/I (B3)

2-wire version - without built-in power supply

Current signal 4 ÷ 20 mA (DC)
 Power supply voltage (at version without built-in power supply) 15 ÷ 30 V DC
 Load resistance max. R_L=(U_n-9V)/0,02A [Ω]
 (U_n - power supply voltage [V])
 Load resistance (at version with build-in power supply)..... max. R_L = 750 Ω
 Temperature dependency max. 0,020 mA / 10 °C

Output signal values at limit positions: "O".... 20 mA (clamps 81,82)
 "Z"..... 4 mA (clamps 81,82)
 Values tolerance of output signal of EPV "Z" +0,2 mA
 "O" ±0,1 mA

b) 3-wire version - without built-in power supply, or with built-in power supply

Current signal 0 ÷ 20 mA (DC)
 Current signal 4 ÷ 20 mA (DC)
 Current signal 0 ÷ 5 mA (DC)
 Power supply voltage (at version without built-in power supply)..... 24 V DC ±1,5%
 Load resistance..... max. 3 kΩ

Temperature dependency.....	max. 0,020 mA / 10 °C
Output signal values at limit positions:	
"O"	20 mA, or 5 mA (clamps 81; 82)
"Z"	0 mA, or 4 mA (clamps 81; 82)
Values tolerance of output signal of EPV and capacitive transmitter	
"Z"	+0,2 mA
"O"	±0,1 mA
EPV linearity error	±2,5[%] ¹⁾
EPV hysteresis	max. 5 [%] ¹⁾

¹⁾ from rated value of transmitter referred to output values

Capacitive (B3): non-contact, life 10⁸ cycles

2-wire connection with power supply or without power supply

The current signal **4 , 20 mA** (DC) is acquired from the capacitive transmitter supplied from the internal or an external voltage supply source. The electronics of the transmitter is protected against eventual wrong polarity and current overloading. The entire transmitter is galvanic insulated so several transmitters can be connected to one external voltage source.

Power supply voltage (with power supply).....	24 V DC
Power supply voltage (without power supply).....	18 to 28 V DC
Ripple voltage	max. 5%
Max power input	0,6 W
Load resistance	0 to 500 Ω
Load resistance can be single side grounded.	
Influence of resistance on output current	0,02%/100 Ω
Influence of voltage on output current	0,02%/1V
Temperature dependency	0.5% / 10 °C
Output signal values at limit positions:	
"O"	20 mA (clamps 81; 82)
"Z"	4 mA (clamps 81; 82)
Values tolerance of output signal of capacitive transmitter	
"Z"	+0,2 mA
"O"	±0,1 mA
Capacitive transmitter linearity error	±1,5[%] ¹⁾
Capacitive transmitter hysteresis	max. 5 [%] ¹⁾

¹⁾ of the transmitter nominal value related to output values with the maximum stroke for the given stroke degree of the gear unit according to table 3.

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
 (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/380V

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

Mechanical connection:

- flange (ISO 5211)
- pillars

Basic and connecting dimensions are given in dimensional drawings.

Electric connection

- a) terminal board (X)** (max. 32 terminals - connecting cable size max. 2,5 mm² - version without reverse contactor, resp. max. 24 terminals - connecting cable size max. 2,5 mm² and max. 6 terminals - connecting cable size max. 1,5 mm² - version with reverse contactor):
 2 cable bushings - M25x1,5 - cable diameter from 12,5 to 19 mm

to connector (XC) (max. 32 terminals - connecting cable size max. 0,5 mm²):

2 cable bushings - M20x1,5 and M25x1,5 - cable diameter from 8 to 14,5 and 12,5 to 19 mm

b) electric motor**to terminal board**

3~ bushings M25x1,5 on motor terminal board

to connector

3~ on joint connector

protection terminal:

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

Electric connection - according to wiring diagrams.

3. Installation and dismantling of actuator



Abide by safety measures!

Notes:

Repeatedly verify whether placing of EA corresponds to part "Operating conditions". If actual conditions differ from recommended, it is necessary to consult it with manufacturer.

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.

3.1 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 ± 1 mm.

Column version:

The columns (87) (fig.5a) of the actuators 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.

Flange version – connection with the bolts:

Actuators with the flange (88) (fig.5a) are to be connected with valves using bolts and fixing them with nuts M12.

Flange version – connection with the central nut (Fig.1):

Seat the actuator with the flange (88) (fig.5a) 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.5a) joins the actuator's spindle with the valve's one. It is free to rotate after loosening the fixing screws of the yoke (94).

3.1.1 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 bushings.

4. Before initiation EA 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.

Connecting to terminal board

- Check whether the type of current, supply voltage and frequency correspond with data on the nameplate of electric motor.

Electrical connections:

- Electrical connections are to be realized according to an electric plan attached in the EA casing.
- Electrical connections is to be done through three cable bushings to the control box and 1 cable bushing to electric motor.
- If necessary, make EA adjustment, place cover and fasten it by screws uniformly in diagonal way. Tighten cable bushings firmly; only then the protection is assured.

Electric connection to connector

- Check, whether the type of electric current, supply voltage and frequency comply with data on electric motor type label.
- Release bodies of the connectors.
- Electric connection performed through two bushings.
- Strip the ends of wires.
- Attach relevant connector tubes to the wire ends by means of pliers.
- Slide the tubes into relevant contacts of connector according to connection drawings.
- Fasten and tighten connectors.
- Firmly tighten cable bushings to secure coverage.

Remarks:

1. *Stuffing bushings are delivered with EA, which in case of tight mounting on supply line secure coverage up to IP 68. For required coverage is necessary to use ringlets according to actual cable diameter and required thermal resistibility.*
2. *During attachment of a cable is necessary to watch acceptable bending radius to prevent damage, respectively not acceptable deformation of sealing element of cable bushing. Supply cables must be attached to firm construction maximum 150 mm from bushings.*
3. *For connection of remote transmitters is recommended to use shielded wires.*
4. *Sealing surfaces of control part cover must be cleaned before repeated fastening.*
5. *EA reversal is secured, if time interval between switching OFF and ON of supply voltage for reverse direction of output part motion is minimum 50 ms.*
6. *Delay after turn-off, i.e. time from reaction of the switches until the motor is without voltage, can be max. 20 ms.*



Adhere to instructions of armature manufacturers, whether turn-off in terminal positions must be executed via position, or force switches!

After the EA is electrically connected it is advised to check functions:

The check of el. motor connection and control drawing. Adjusting the electric actuator by hand wheel to mid position. For making sure that the wiring is OK press the "close" pushbutton (situated on the manual control box or on the panel of the test pushbutton box) and watch the pull rod that must move out of the servo drive. If it is not so, change the sequence of electric power network phases.

Check of torque switches (Fig.5). When the actuator moves towards "close" and at torque switches connection to "torque switching-off" should be contacts of switch S2 switched over by pressing of disconnecting bell (24 Fig.5) of relevant switch. If the connection is properly performed, the actuator must stop. When the torque switches are connected for "signalization" only, signalization on control box panel will be activated.

Analogous repeat test towards "open" by switching over of switch S1 contacts. If any of function is not correct, check the connection of switches according to wiring diagram.

Check of position switches (Fig.6,8). When the actuator moves towards "close" switch over contacts of switches S4 resp. S6 by pressing of disconnecting bell of relevant switch. If the connection is properly performed, the actuator must stop when contacts of switch S4 are switched over and light up when contacts of switch S6 are switched over. Analogous repeat test towards "open". By pressing disconnecting bell of switches S3 resp. S5, the actuator must stop resp. signalize. Again, if any of the function is not correct, connection of switches should be checked according to wiring diagram.

Electric connection of the controller



In the **MT(R) 52 400 version** with the built-in electronic controller (Fig. 13) 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.

3.2 Dismantling



Attention!

Before disassembly is necessary to disconnect electric supply of electric actuator!

Connection and disconnection of connectors must not be performed under the voltage!

Secure by prescribed way protection against connection of EA to the network and thus potential electrical accident!

- Disconnect the EA from mains.
- Disconnect the leads from the EA terminal boards and loosen the cables from bushings. Pull out the connectors in case of the connector version.
- Loosen the fixing screws of the EA flange and disconnect the EA from the valve/gearing.
- While sending the EA to be repaired put it into a package solid enough to avoid damages of the EA during transportation.

4. Adjusting of actuator



Attention! See chapter 1.2

Disconnect the electrical electric actuator from electrical power network!

Observe safety regulations!

The EA has been factory set to the fixed operation speed (entered into the order by the customer). If you wish to have the EA readjusted to other parameters, please follow the following instructions. Make the readjustment 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.

4.1 The torque unit adjustment (Fig. 4 and 5)

It is only possible to set up the switching – off torque using the torque measuring equipment and only within the particular range with application of rough adjustment (17) and soft adjustment (18), Figure 4, according to the Version Table.

It is only possible to readjust the electric actuator using the segments (17), Fig. 4, within the marked MIN - MAX limit on the torque wrench and within the particular electric actuator torque range.

To change the torque range, the springs need to be replaced in the torque drive, executable in the manufacturing concern or service station from the point of view of mounting seriousness.

Blocking adjustment:

EA operates within a operating stroke range according to Variant table.

Blocking can be set to a number of revolutions given in tables 2a, 2b.

TABLE Nr. 2a		
Torque blocking stroke EA after reversal (1 pin in driving wheel)		
MT screw pitch 5 mm Stroke up 25 mm	MT screw pitch 3 mm Stroke up 15 mm	Cams on pinion (25) are revolved by
5,0 – 10,0	3 - 6	90°
15 - 20	9 - 12	180°
25 - 30	15 - 18	270°
35 - 40	21 - 24	360°

TABLE Nr. 2b		
Torque blocking stroke EA after reversal (3 pin in driving wheel)		
MT screw pitch 5 mm Stroke till 25 mm	MT screw pitch 3 mm Stroke till 15 mm	Cams on pinion (25) are revolved by
1,65 – 3,3	0,99 – 1,98	90°
5 – 6,65	3 – 3,99	180°
8,3 – 10	4,98 – 6	270°
11,65 – 13,3	6,99 – 7,98	360°

The blocking is preset at producer to a range identified in the table with the bold type. In the case of need to change stroke with regard to blocking, please contact an appropriate service centre.

4.2 Position switches adjustment (S3,S4) (Fig. 6)

EA is delivered set to a stroke corresponding to 4.,5. resp. 6.° according to table 3 or to a stroke required by customer. The stroke referred on the type label of EA corresponds to the maximum stroke with the gear unit set to 5.° resp. 6.° according to table 3. If it would be necessary to change the stroke range (see table 3) contact Your appropriate service centre. The procedure for position switches setting, adjustment a new setting is as follows (Fig. 6, 7):

- With variant having resistance transmitter, disengage the transmitter, (Fig.9)
- Having the set screw of the gear unit wheel released, move the adjustable wheel to a required stage of the range (to the next higher one or a one corresponding to the particular stroke in the given range) according to table 3 and Fig.7. When moving the adjustable wheel, take care to achieve the proper meshing with the gear wheel of the subjected stage, and then tighten the set screw back.
- Move EA to the "open" position electrically or manually. If, with electric move, EA has been switched off by S3 switch (Fig. 6), insert a screwdriver into set screw (29), press it and rotate in the arrow direction until an appropriate cam opens S3 switch. Pull the screwdriver out (see notice 1) and continue in moving EA in the „open“ position.
- In the „open“ position, insert a screwdriver into set screw (29), press it and rotate in the arrow direction until an appropriate cam closes S3 switch. Pull the screwdriver out (see notice 1).
- Move EA to the "close" position electrically or manually. If, with electric move, EA has been switched off by S4 switch (Fig. 6), insert a screwdriver into set screw (28), press it and rotate in the arrow direction until an appropriate cam opens S4 switch. Pull the screwdriver out (see notice 1) and continue in moving EA in the „close“ position.
- In the „close“ position, insert a screwdriver into set screw (28), press it and rotate in the arrow direction until an appropriate cam closes S4 switch. Pull the screwdriver out (see notice 1).
- Having position switches adjusted, You may need (depends on EA accessories) to adjust signaling switches, position transmitter, converter, position indicator and controller.

Notice 1: in the case that the set screw remains pressed notwithstanding the screwdriver is out (it means that disengaged gear wheels don't mesh each other), turn gently the set screw against the arrow direction without pressing it until the set screw releases back to its initial position.

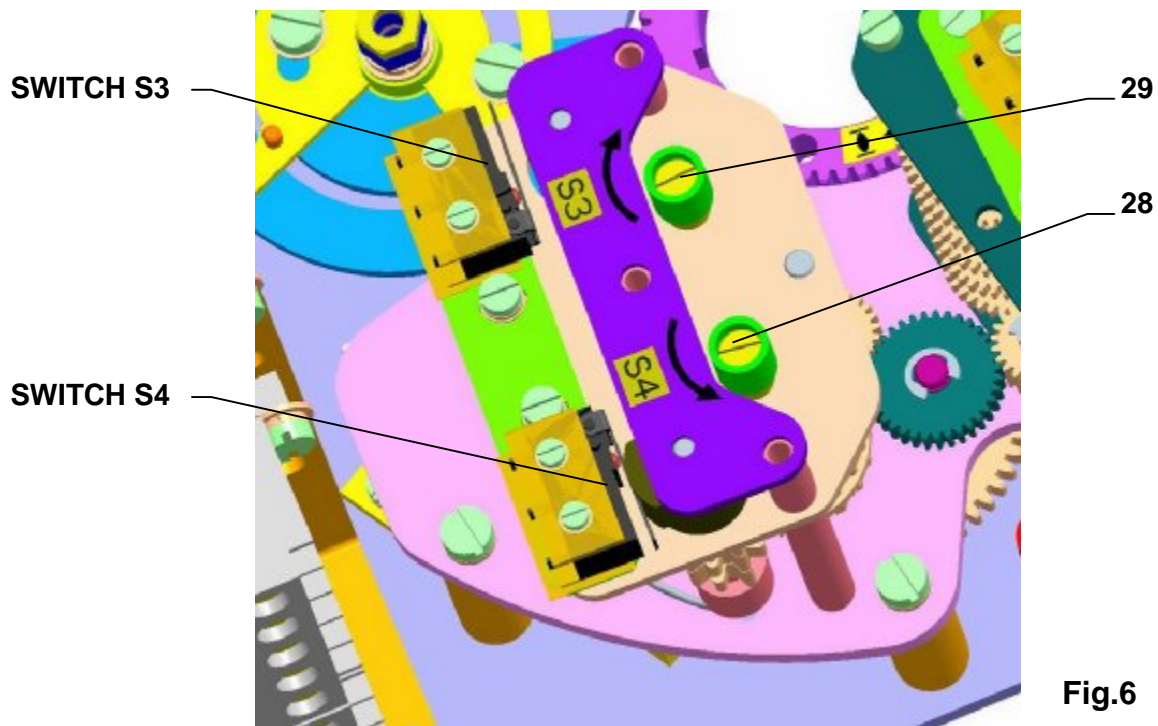
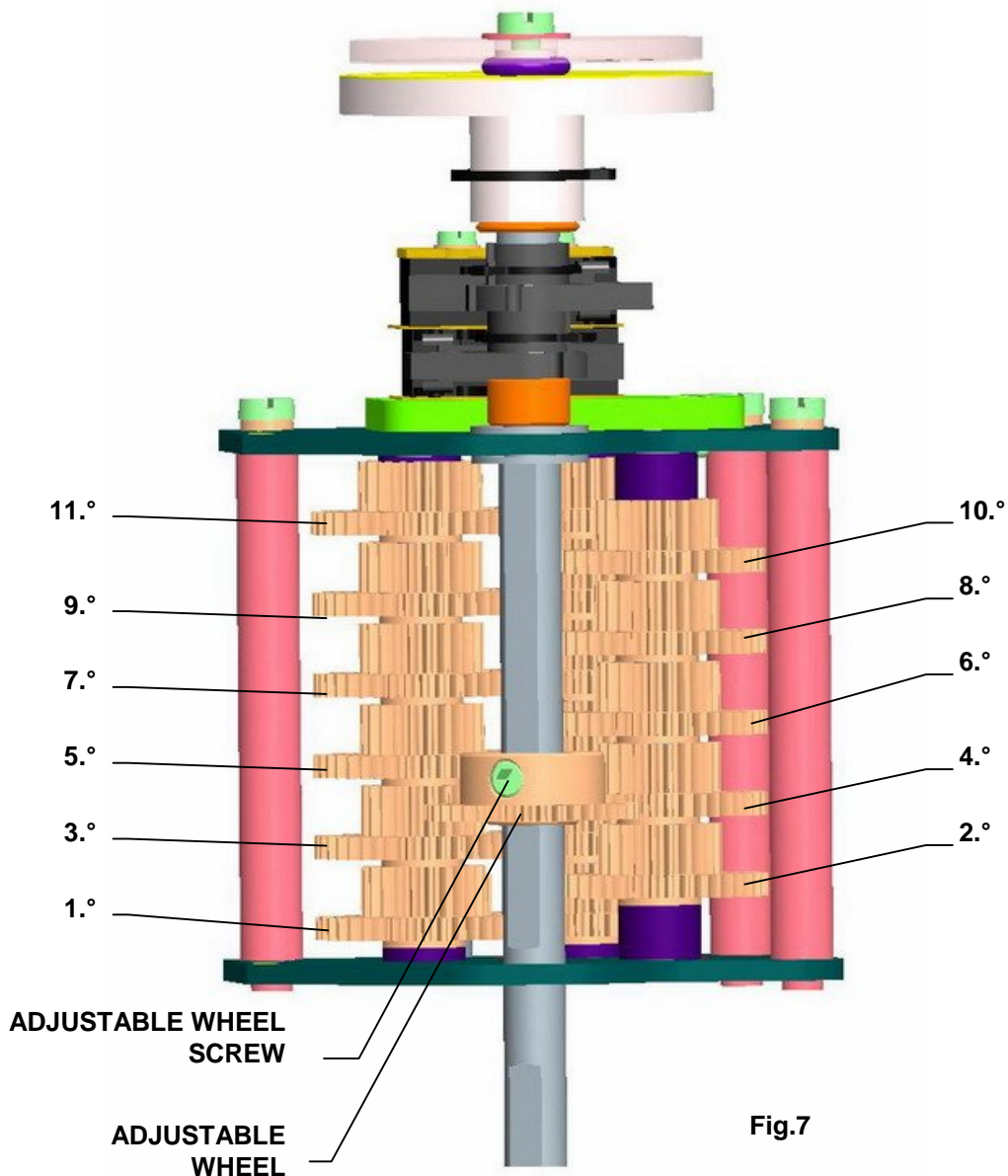


Fig.6

TABLE Nr.3								
STROKE DEGREE	MAX. EA OPERATING STROKE [mm] (provided customer doesn't specify otherwise, EA will be set to 5. resp.6.° stroke by producer)							
	* - without transmitter, resp. with capacite transmitter							
	MT – screw pitch 5mm				MT – screw pitch 3mm			
	RAD ZDVIHU				RAD ZDVIHU			
	I.	II.	III.	IV.	I.	II.	III.	IV.
1.°		-				-		
2.°		15				9		
3.°		28				17		
4.°		50				30		
5.°		90				55		
6.°		100*				100		
7.°		-				-		
8.°		-				-		
9.°		-				-		
10.°		-				-		
11.°		-				-		

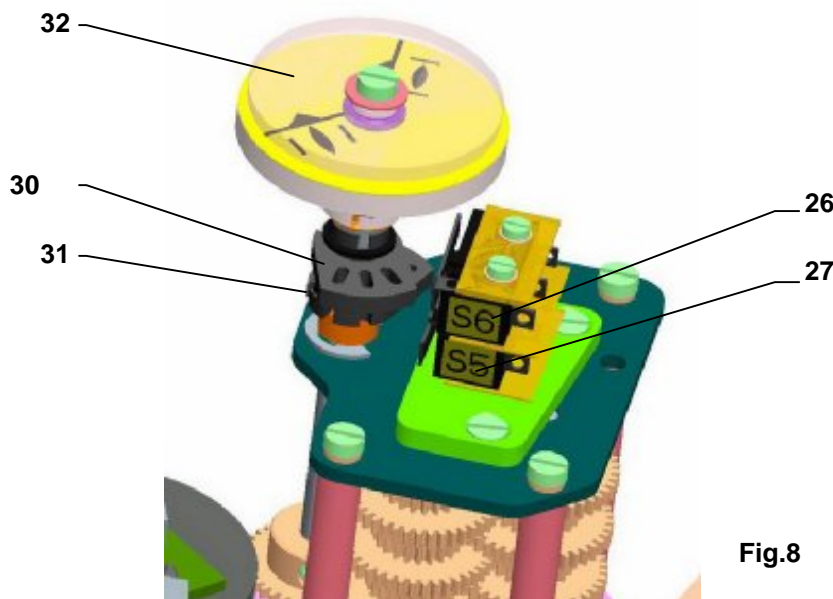


4.3 Signaling switches adjustment (S5,S6) (Fig. 8)

The signaling switches of EA are at producer preset to switch on about 10% before end positions provided the customer not specified otherwise. Before proceeding with signaling switches adjustment, S3, S4 end position switches must be adjusted according to the previous chapter if necessary. The procedure of signaling switches adjustment is as follows:

- Bring EA to a position in which You want S5 switch to close when EA is running in the „open" direction.
- Turn cam (31) of S5 switch (27) clockwise until S5 switch closes.
- Bring EA to a position in which You want S6 switch to close when EA is running in the "close" direction.
- Turn cam (30) of S6 switch (26) counterclockwise until S6 switch closes.

Notice: This signaling is capable to signalise from 50 up to 100 %..of the working stroke in both movement directions. With switch reversing function, a signaling capability from 0 up to 100 % is available.



4.4 Position indicator adjustment (Fig.8)

The position of the output member relative to the end positions of EA stroke is indicated by a mechanical position indicator.

Before starting to adjust the position indicator, S3 and S4 position switches must be adjusted if required.

The procedure of position indicator adjustment is as follows :

- Bring EA to the „closed“ position;
- Turn the position indicator disc (32) to bring a mark identified with a symbol for the „close“ direction in coincidence with a mark on the upper cover aperture.
- Bring EA to the „opened“ position.
- Turn the upper part of the position indicator disc (32) to bring a mark identified with a symbol for the „open“ direction in coincidence with the mark on the upper cover aperture.

4.5 Adjustment of resistant transmitter (Fig.9)

The **resistant transmitter (92)** is in the EA **MT** used to function as a remote position indicator; in the EA **MT(R)** to function as a feedback in the controller.

Before the resistant transmitter adjustment the position switches have to be adjusted. Adjustment consists in setting of the resistance in the defined limit position of the EA.

Notes:

1. In case that the EA is not used in the working stroke range according to chosen degree on the competent stroke according to table 3, the resistance in the limit position "open" is proportionally reduced.
2. In the EA MT(R) 2000 W 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. With EA of 2- wire converter a transmitter of 100 W resistance is used .

To adjust the transmitter follow these steps:

- Loosen the fixing screws (90) of the transmitter holder and push the transmitter out of mesh.
- Connect a meter for resistance measuring to the terminals 71 and 73 of the EA **MT** terminal board, or to the terminals 7 and 10 of the EA **MT(R)** terminal board.
- Put the actuator to the position "closed" (with the hand wheel, or with the local electric position control until the corresponding position switch S2 or S4 switches).
- Rotate the transmitter (91) shaft until resistance of $\leq 5\%$ of the nominal transmitter resistance can be read on the meter in case of EA **MT** , and 3 up to 5% of the nominal transmitter resistance in case of EA **MT(R)**, i.e. with the resistant transmitter with the converter PTK1.
- In the position put the transmitter to mesh with the drive wheel and fix the fixing screws on the transmitter holder.
- Disconnect the meter from the terminal board.



Fig.9

4.6 Adjustment of the Electronic Position Transmitter (EPV) - the Resistive

Transmitter (Potentiometer) with the Converter PTK 1

4.6.1 EPV – the 2-wire version (Fig. 10,10a)

The position transmitter with the converter PTK1 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

Adjustment of the EPV in electric actuators MT

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 (Fig. 10,10a). The used transmitter resistance is 100 Ω.
- Switch the converter's power supply on.
- Turn the adjusting trimmer ZERO 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 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 according to table Nr.3 . At values less than 75% the value 20mA is reduced proportionally.

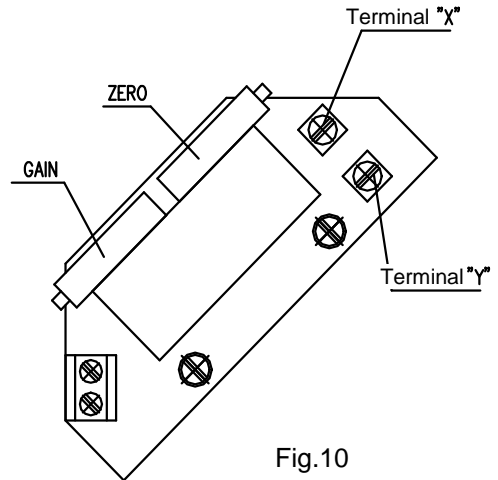


Fig.10

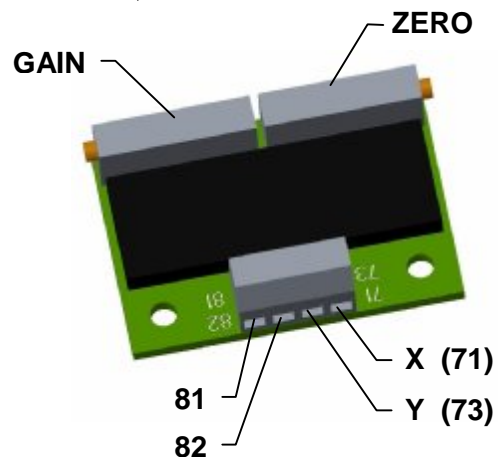


Fig.10a

4.6.2 EPV – 3-wire version (Fig. 11,11a)

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

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 (Fig. 11). The used transmitter resistance is 2000 W or 100 Ω.
- Switch the converter's power supply on.
- Turn the adjusting trimmer ZERO (Fig. 11) to adjust the output current signal rate measured on the terminals 81-82 to 0 mA or 4mA.
- Set the actuator to the position "open".
- Turn the adjusting trimmer GAIN (Fig. 11) to adjust the output current signal rate measured on the terminals 81-82 to 20mA or 5 mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

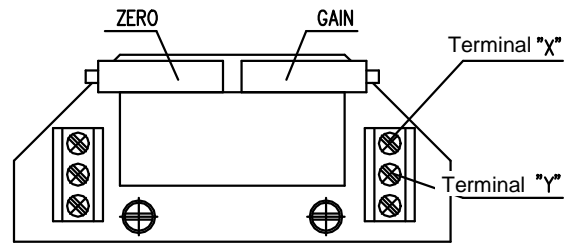


Fig. 7

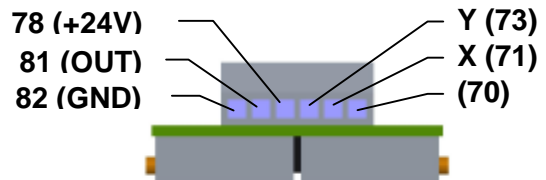
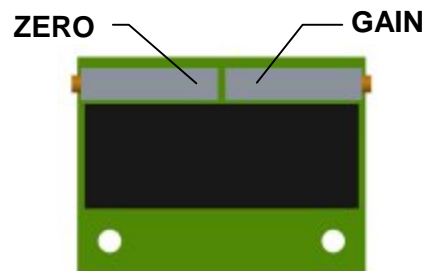


Fig.7a

Note:

The output signal of (0-20mA, 4-20mA or 0-5mA - according to the specification) can be adjusted at the range from 85 up to 100% of the rated stroke according to table Nr.3. At values less than 85% the value of the output signal is reduced proportionally.

4.7 Adjustment of Capacitive Transmitter CPT1/A (Fig.12)

The chapter describes adjustment of the capacitive transmitter to the specified parameters (standard values of output signals) in case they are reset. The capacitive transmitter (95) serves as a position transmitter of electric actuators with unified output signal of 4÷20 mA in electric actuators **MT**, or as a feedback of a position controller, or if required it functions also as a remote position transmitter of electric actuators with unified output signal of 4÷20 mA in electric actuators **MT with controller**.

Note1: With the version with controller ; at using the output signal, this signal isn't galvanic insulated from the input signal !

Note2: In case that reversed output signals are needed (in the position "OPEN" minimum output signal) contact personnel of service centres.

The capacitive transmitter CPT1/A is adjusted by the producer to the fixed Operating angle according to the order and wired according to the wiring diagrams placed into the cover. Check the power supply of the user after connecting to terminal of the terminal board before the transmitter is electrically checked. Adjustment of the capacitive transmitter can be performed when the position switches are adjusted.

The following versions of electric actuators with built capacitive transmitters can be specified:

- A) The version without any power supply** (2-wire version) for EA **MT**
- B) The version with a power supply** (2-wire version) for EA **MT**
- C) The version CPT as a feedback to the position controller** for EA **MT(R) with controllers**

A.) Adjustment of the Capacitive Transmitter without any Power Supply

Before connecting check the power supply. The measured voltage should be in range from 18 up to 28 V DC.



The voltage of the power supply **must not be in any case higher than 30 V DC**. The transmitter can be irreversibly damaged!

While checking or adjusting the output signal of 4÷20 mA follow these steps:

- Connect a mA meter of precision class 0,5 and loading resistance lower than 500 Ω serially with the transmitter (pole "-"; terminal 82)
- Put the actuator to the position "CLOSED", the signal value should decrease.
- Check the signal value for the position "CLOSED" (4 mA).
- Tune the signal with loosening the fixing screws (96) and turning the trimmer (95) until the required value of 4 mA is reached. Tighten the fixing screws.
- Put the actuator to the position "OPEN", the signal value should raise.
- Check the signal value for the position "OPEN" (20 mA).
- Tune the signal with turning the trimmer (97) until the required value of 20 mA is reached.
- Check the signal value for the position "CLOSED" and then for the position "OPEN".
- Repeat the procedure until the change from 4 to 20 mA is reached with deviation less then 0,5 %.
- Disconnect the meter and lock the screws with a varnish.

B.) Adjustment of the Capacitive Transmitter with the Power Supply

While checking or adjusting the output signal of 4÷20 mA follow these steps:

- Check the power supply: 230 V AC ±10% on the terminals 1,61.
- Connect a mA meter of precision class 0,5 and loading resistance lower than 500 Ω on the terminals 81, 82.
- Follow the procedure described in the previous chapter A.

C.) Adjustment of the Capacitive Transmitter Served as a Feedback of the Position Controller (EA MOR)

While checking or adjusting the output signal of 4-20 mA follow these steps:

- Disconnect the circuit on the terminals 81 and 82 removing the jumper.
- Connect power supply to the terminals 1 and 61.
- Disconnect the control signal from the terminals 86/87 and 88.
- Put the actuator to the direction "OPENING" or "CLOSING" with the hand wheel or connecting power supply to the terminals 1 and 20 for the direction "OPENING", or 1 and 24 for the direction "CLOSING".
- Connect a mA meter of precision class 0,5 (e.g. digital) and loading resistance lower than $500\ \Omega$ on the terminals 81,82.
- Follow the procedure for the version without any power supply described in the previous chapter A.
- 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.



The user has to arrange grounding of the 2-wire circuit of the capacitive transmitter to the electrical ground of a joined controller, computer, etc. The grounding should be performed only in one place in any part of the circuit outside the electric actuator!

With the version with regulator when the feedback from the CPT transmitter is used; at using the input signal, this signal isn't galvanic insulated from the output signal !

Note:

The trimmer (97)(Fig.12)) can be used to adjust the output signal of the capacitive transmitter to any value of operating stroke in range from ca 50% up to 100% of the max. value of the operating stroke on the competent degree according to table 3.

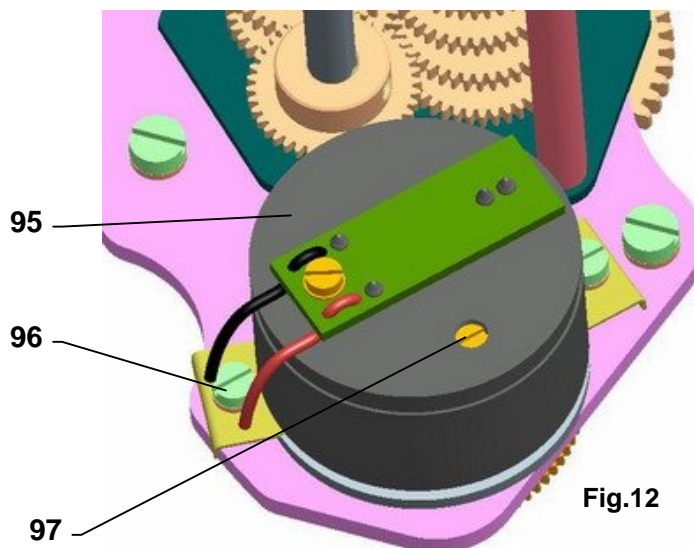


Fig.12

4.8 Adjustment of position controller (Fig. 13)

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 (GND, -) and 88 (+) causes that the EA output is reset.

Required parameters and functions can be programmed using function buttons SW1 - SW2 and LED diodes D3 - D4 placed directly on the controller, see Table 4.

4.8.1 Setting of controller

The controller's microprocessor unit is in the production plant programmed to parameters given in **Table 4** (Note 2).

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

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

Laying of adjusters and signaling elements on the board of the REGADA controller is shown on **Fig. 13**:

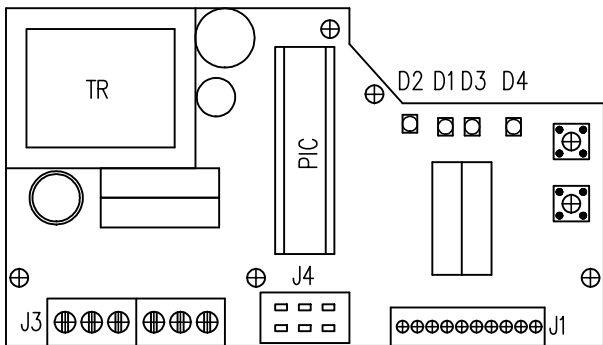


Fig.13

SW1 button	starts an initialization 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 4:

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) (*)
5 blinks	way of regulation	1 blink	narrow torque
		2 blinks	narrow position (*)
		3 blinks	wide torque
		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 initialization 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 4:

- press shortly the **SW1** button to list the menu shown with the blinking number on the **D3** 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 initialization process an error occurs (e.g. in connection or adjustment) the initialization process will be interrupted and the controller with the **D4** diode reports about the type of the error. Else after finishing the initialization process the controller is put into the regulation mode.

Error messages of the controller with D4 diode at initialization

- 4 blinks.....improper connection of the torque 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

4.8.2 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)	torque switches activity indication (the EA switched-off with the torque 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).

4.9 Local electric control (Fig.14)

In case of need (during adjusting, function checking etc.), but power supply must be provided, is possible to readjust actuator by electric local control. After switching the mode switch to the mode "LOCAL" it is possible by the direction switch to control motion of the output part to setting direction. Signal lights indicate achievement of limit position at relevant direction

The control is possible after removing the padlock (1). Control mode selection is changed by sequential pressing of the button (2) **REMOTE-OFF-LOCAL** to "Remote" "Shut off", "Local", "Shut off". Individual modes are cycled by sequential pressing. The selection is indicated by LEDs visible on the front panel of the local control.

The presence of the supply voltage for the control of the local control is signalled by the lighting of one of the three LEDs REMOTE (6), OFF (7), or LOCAL (8).

Individual local control modes:

"OFF" mode - in this mode, the EA cannot be controlled remotely or locally. The mode is signalled by the lighting of the OFF LED (7).

The „LOCAL“ mode - this mode enables EA control in the open and close direction and to stop using buttons **OPEN** (3) (open), **CLOSE** (4) (close) and **STOP** (5). The „LOCAL“ mode is indicated by **LOCAL** (8) LED being lit. When **OPEN** button is pressed in this mode, it is indicated by **OPEN** LED being lit (9). When **CLOSE** button is pressed in this mode, it is indicated by **CLOSE** LED being lit (10). When **STOP** button is pushed, the signal LEDs **OPEN** (9) and **CLOSE** (10) are switched off.

The „REMOTE“ mode - in this mode the EA can be remotely controlled by commands from master system. The „REMOTE“ mode is indicated by **REMOTE** (7) LED being lit. In this mode the OPEN, STOP and CLOSE buttons are not functional.

After finishing the work with electrical local control, we recommend to return the padlock to button (2) in mode „REMOTE“ and lock out the device to avoid unwanted tampering by unauthorized person. Padlock can be fitted and locked to button (2) in any local control mode

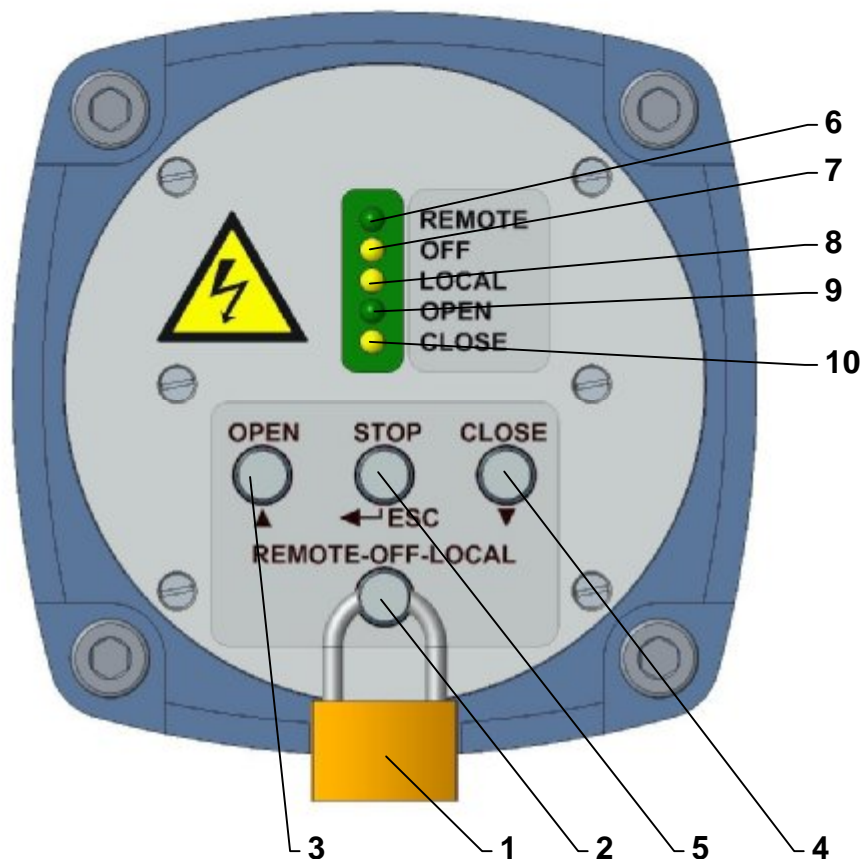


FIG.. 14

5. Service, maintenance and troubleshooting

5.1 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!

3. 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!

- Electric actuator requires only inconsiderable operation. The assumption for reliable operation is proper putting into operation.
- The operation of these EA comes out of operating conditions and usually consists of information processing for consequential securing of required function.
- EA can be controlled either remotely by electricians, or manually on their assembly position. Manual control is executed via hand wheel.
- The operators must take care for performing of prescribed maintenance and for protection of EA during operation against harmful ambient effects and atmospheric exposure, which exceeds the scope of acceptable effects described in part „Working conditions“.
- Operation beyond the switching – off torque limits is not allowed.
- It is necessary to prevent excessive heating of the surface of EA, exceeding of type label values and excessive vibration of EA.

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.

5.2 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.

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°C to +55°C Madit PP-80 (Slovnaft) SAE 80W
- gears of transmission unit and drive mechanism on the control board:
–25°C až + 55°C GLEIT- μ HF 401/0, resp. GLEITMO 585 K

- grease recommended for linear mechanism lubrication - HP 520M (GLEIT-μ).

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.

5.3 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.

For controller repair a F1,6 A subminiature fuse for DPS 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!

6. Accessories and Spare Parts

As accessories the **handwheel** is packed with the product.

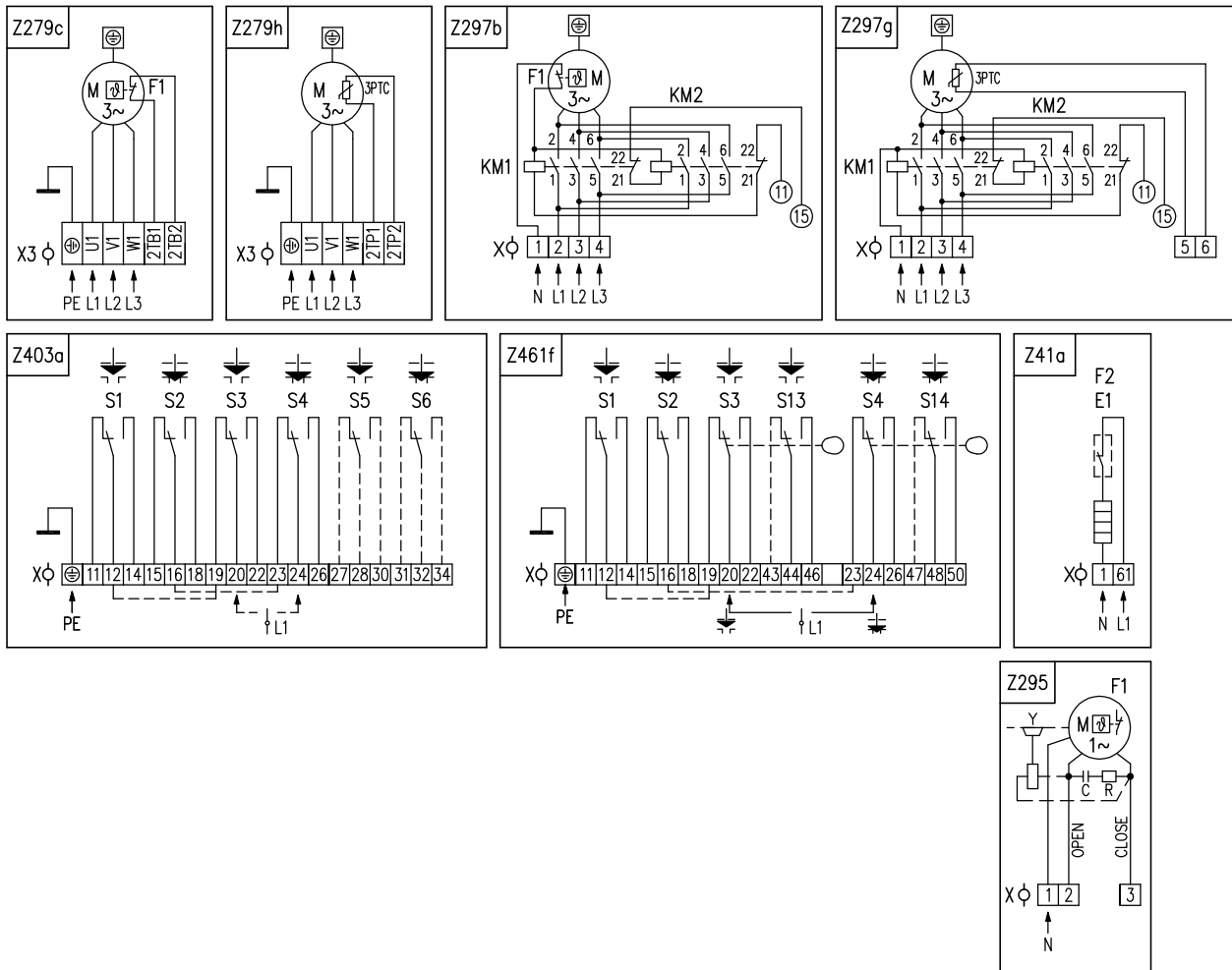
6.1 Spare parts

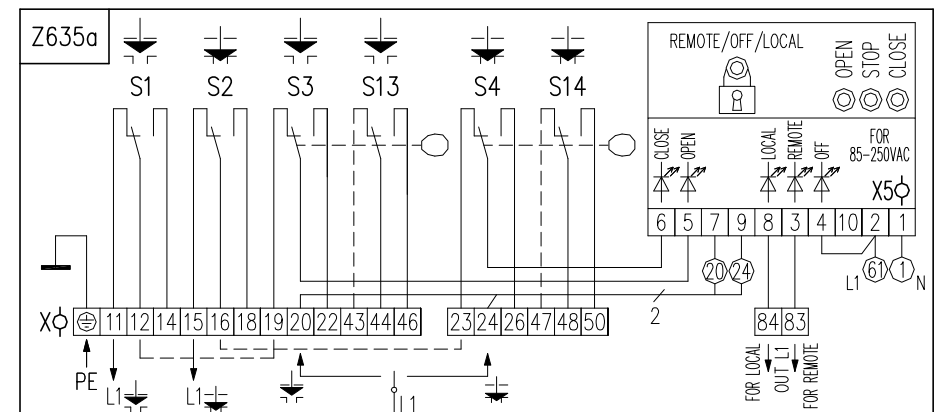
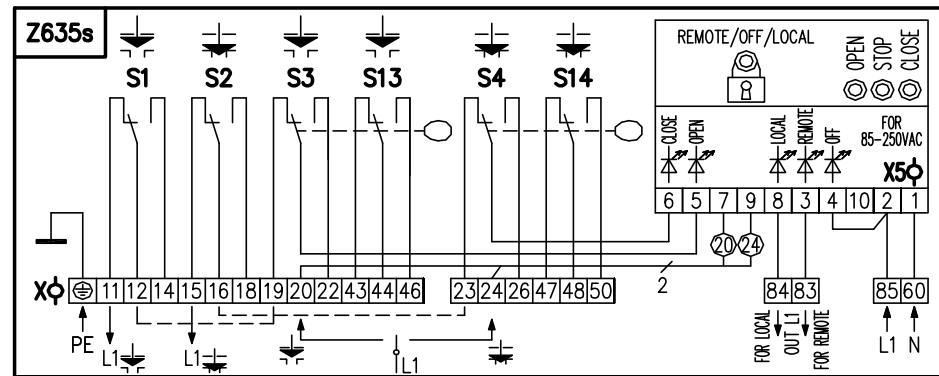
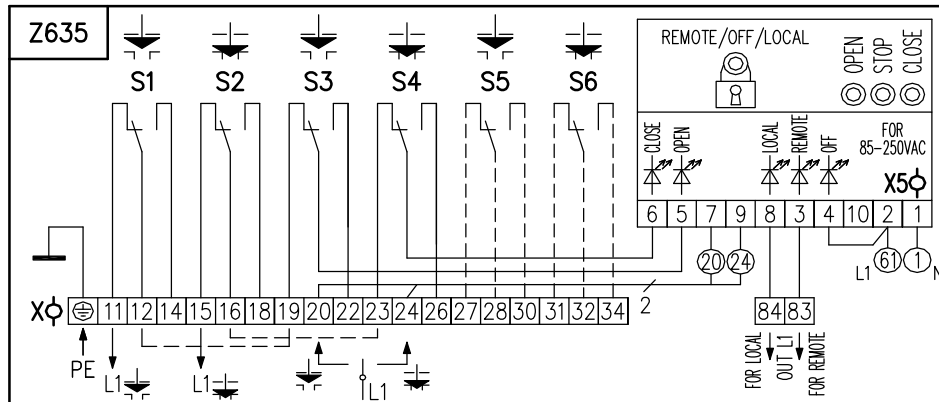
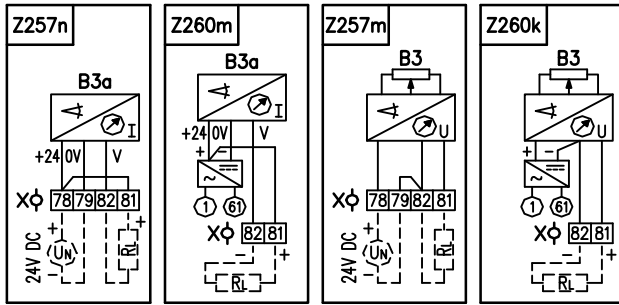
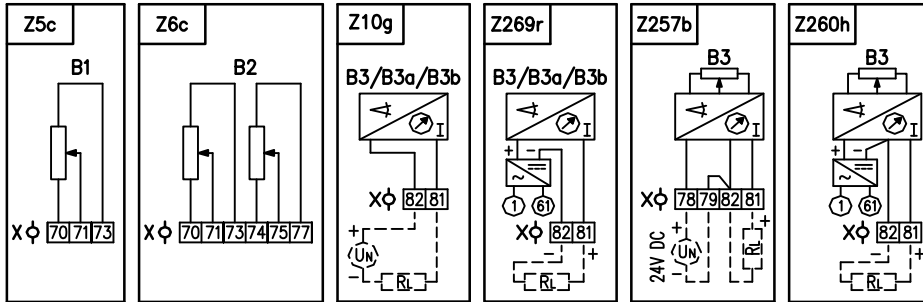
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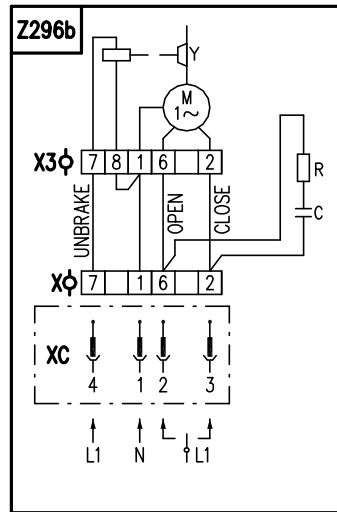
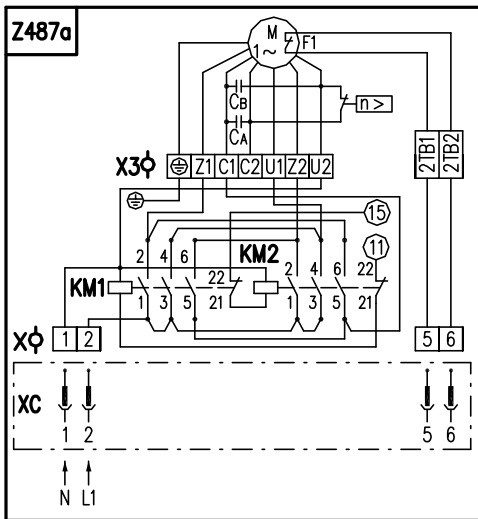
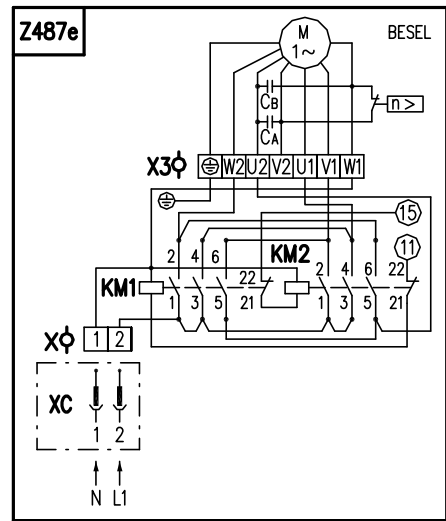
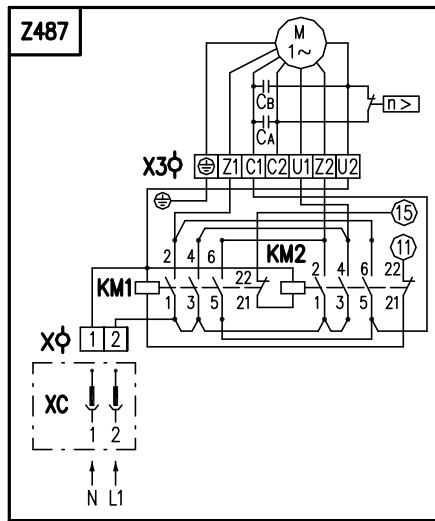
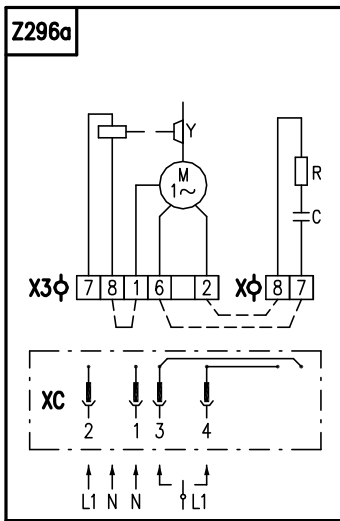
Name of part - Type	Order number PNm	Position	Picture
Electric motor; 0,18kW, Δ/Y 230V/400V	63 592 XXX	M1	1
Electric motor; 0,25kW, Δ/Y 230V/400V	63 592 XXX	M1	1
Electric motor; 0,37kW, Δ/Y 230V/400V	63 592 XXX	M1	1
Electric motor; 60 W 230/220 V AC	63 592 XXX	M1	1
Micro-switch CHERRY DB6G-B1BA	64 051 219	20,21	5
Micro-switch CHERRY DB6G-B1BA	64 051 466	26,27	6, 8
Resistive transmitter RP19; 1x100 Ω	64 051 812	92	9
Resistive transmitter RP19; 2x100 Ω	64 051 814	92	9
Resistive transmitter RP19; 1x1000 Ω	64 051 827	92	9
Resistive transmitter RP19; 2x2000 Ω	64 051 825	92	9
CPT transmitter	64 051 499	95	12
Converter	According to make	-	10, 11
Casing KU 40x30	63249037	75	2
Casing KU 14x12	63243150	76	2
Ringlet 10 x 6	62732017	66	2
Sealing ring 16 x 28 x 7	62735044	70	2
Sealing ring 40 x 52 x 7	62735043	68	2
Ringlet 32 x 2	62731015	77, 34	2
Ringlet 110 x 3	62732116	-	1
Ringlet 125 x 3	62732114	-	1
Ringlet 130 x 3	62732020	78	2
Sealing	44 5324 00-3	-	1

7. Enclosures

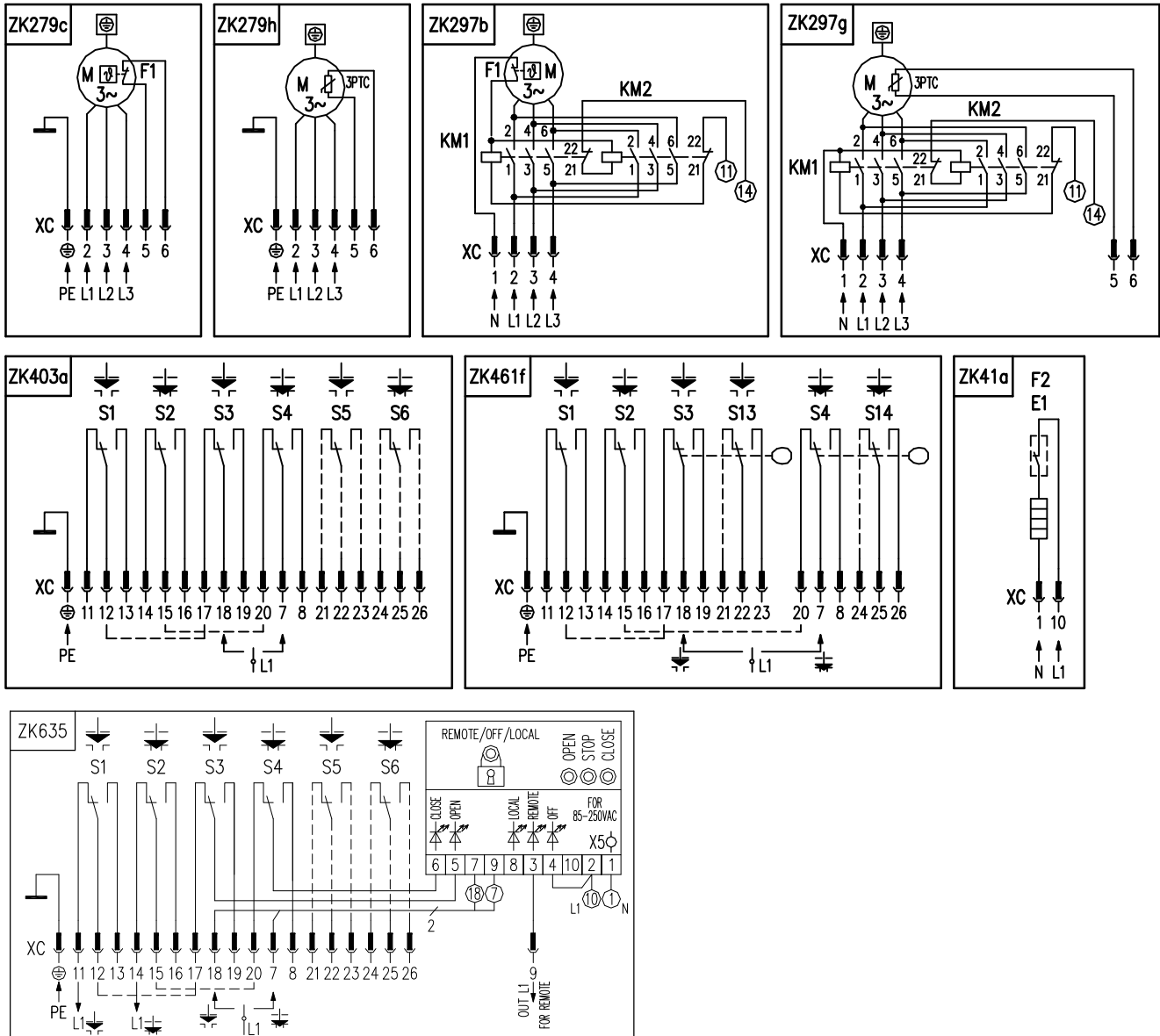
7.1 Wiring Diagrams EA MT - electric connection to terminal board

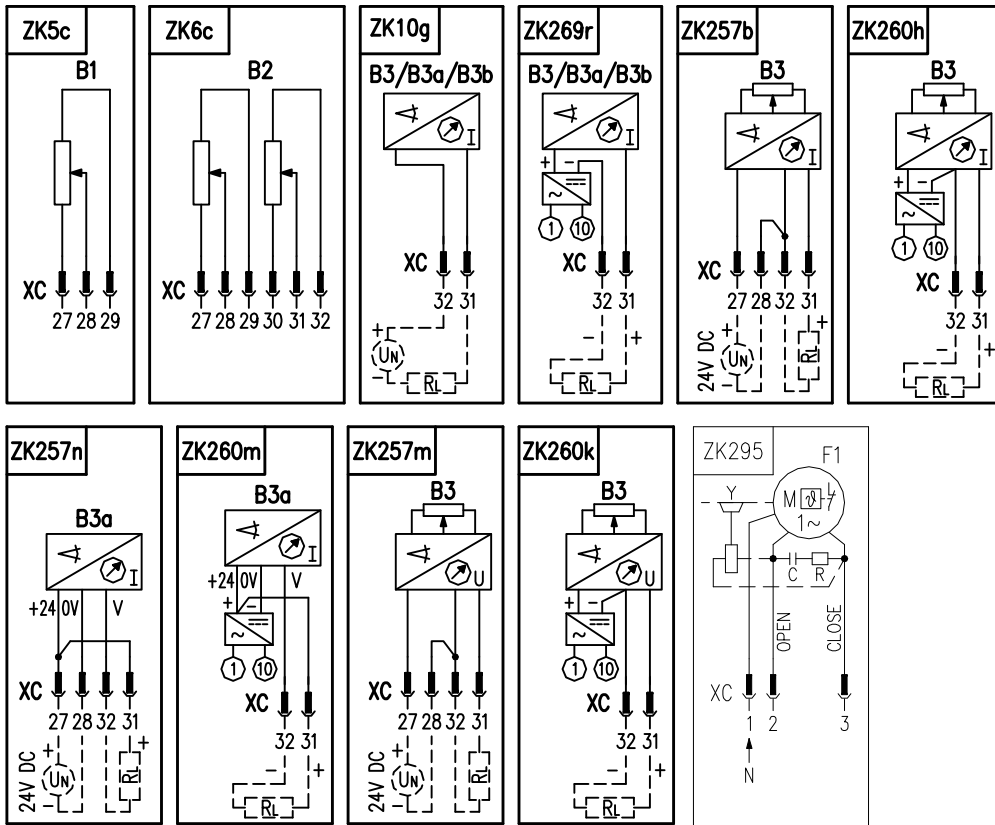




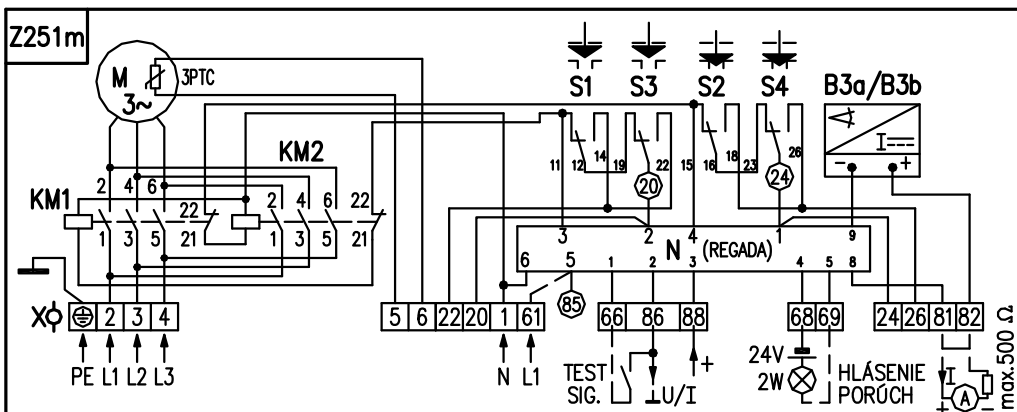
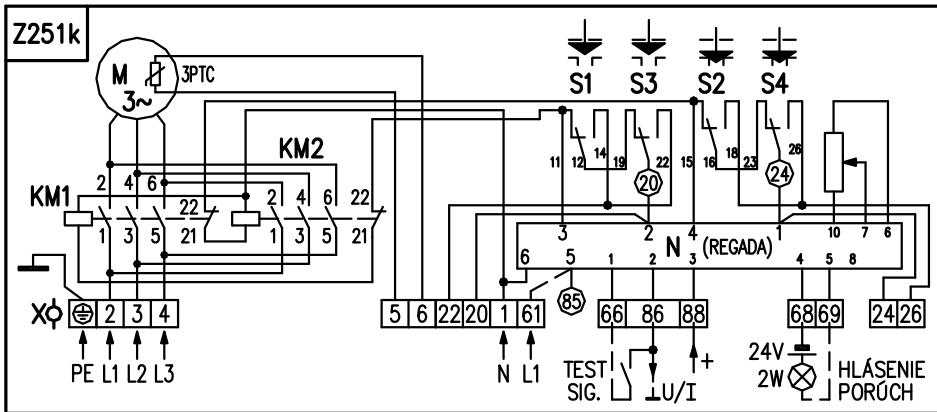
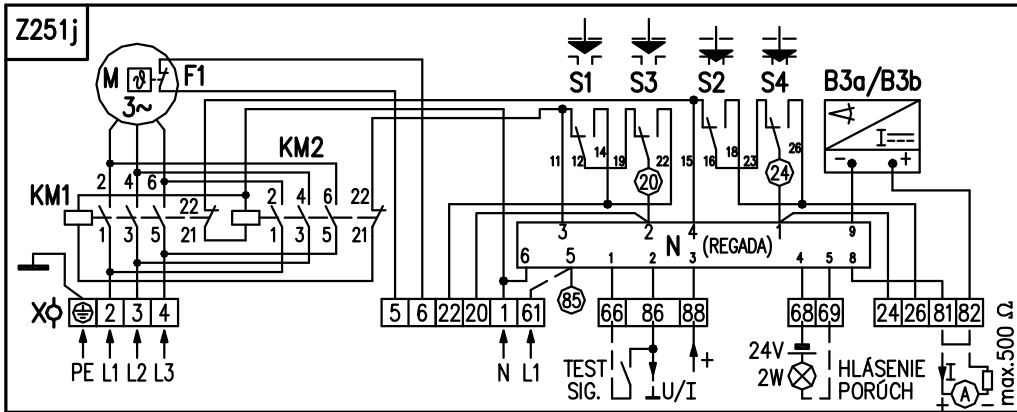
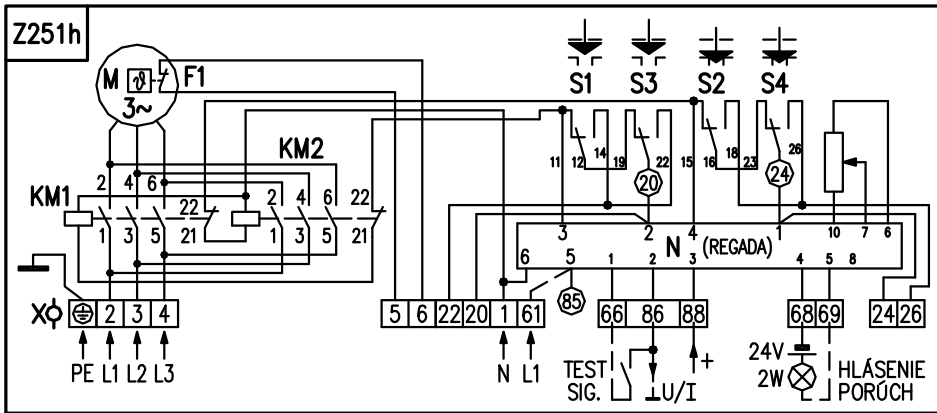


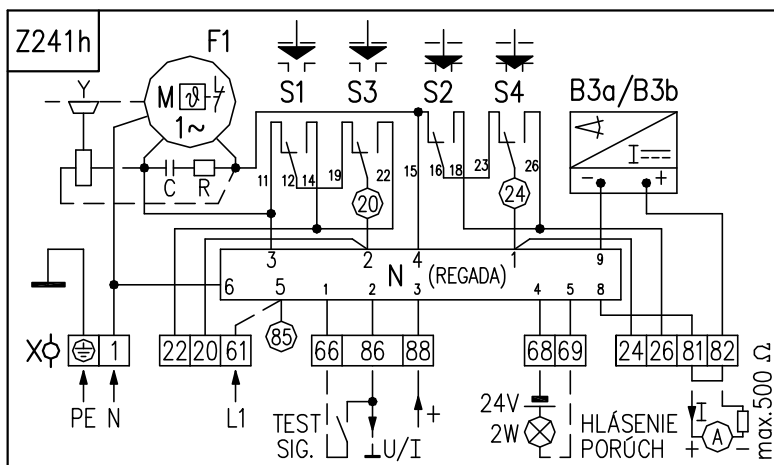
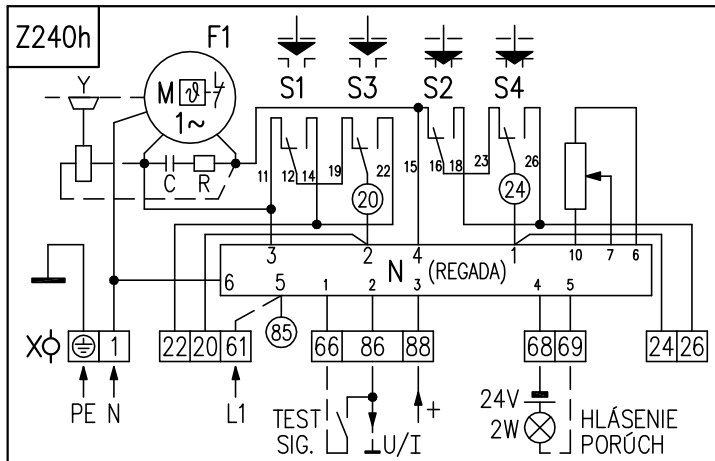
7.2 Wiring Diagrams without controller (EA MT) - electric connection to connector

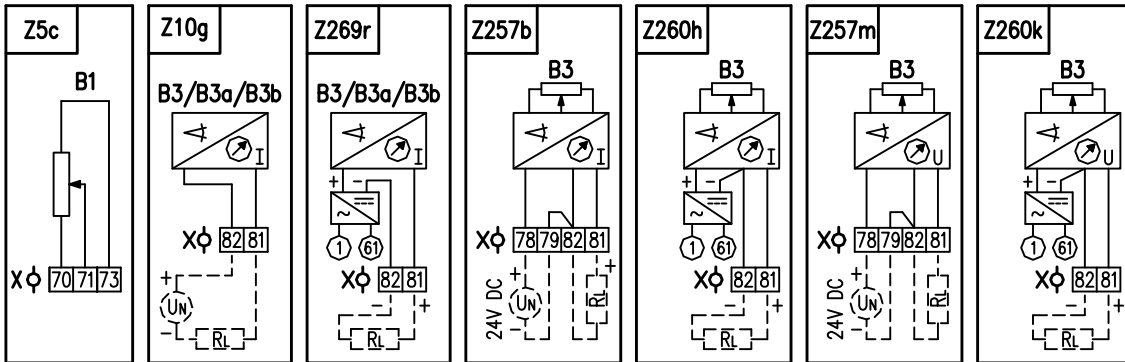
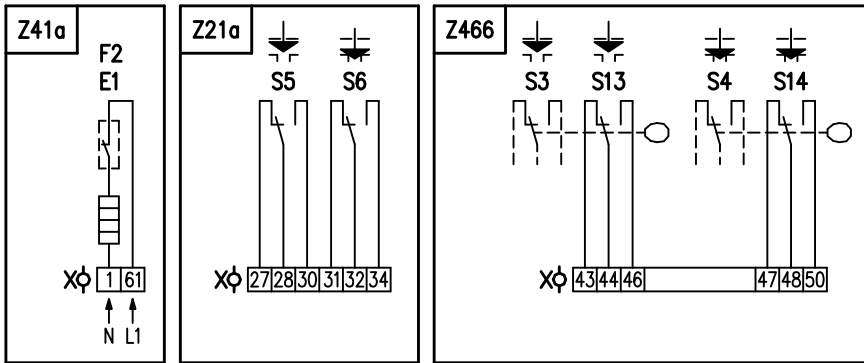




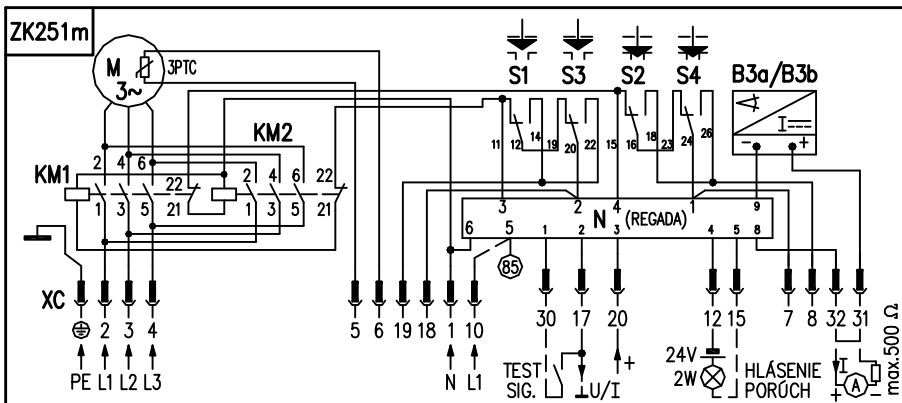
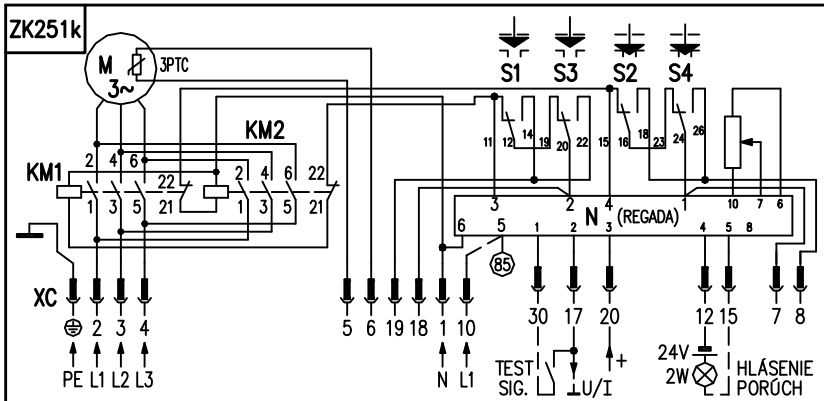
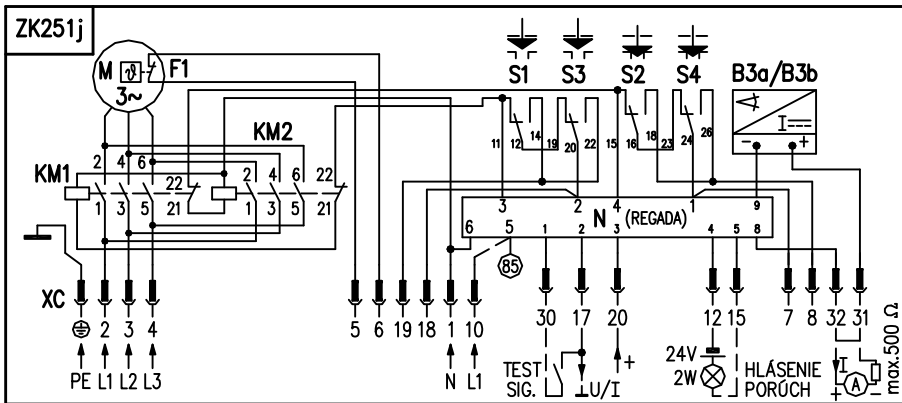
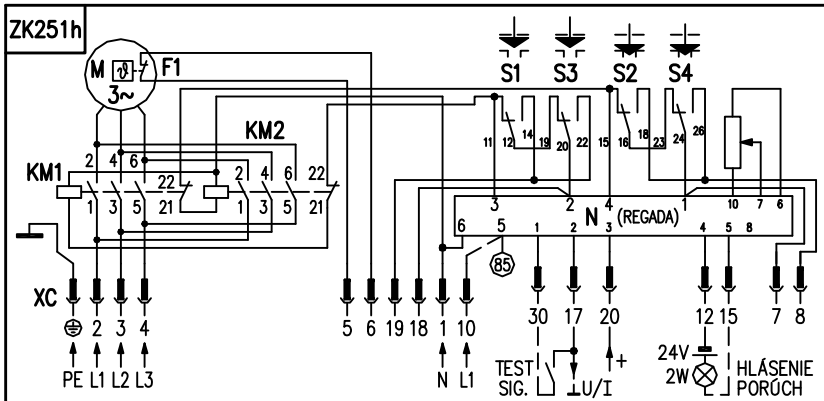
7.3 Wiring Diagrams with controller (EA MT(R)) – electric connection to terminal board

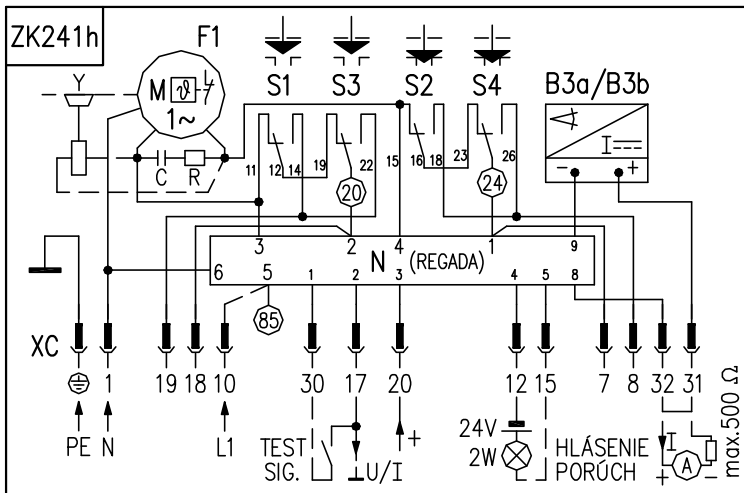
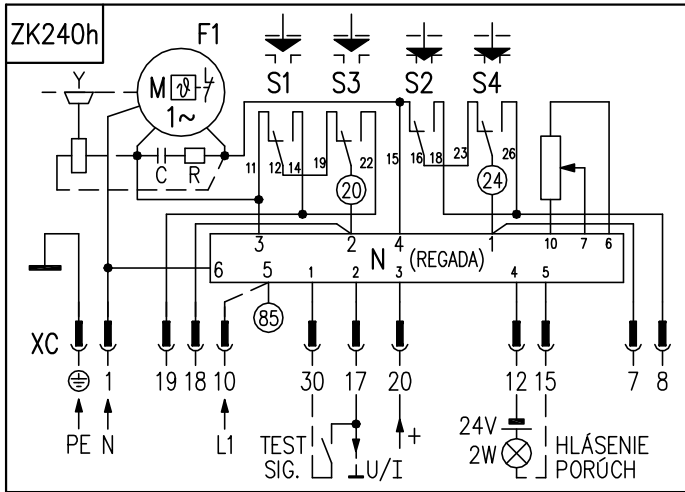


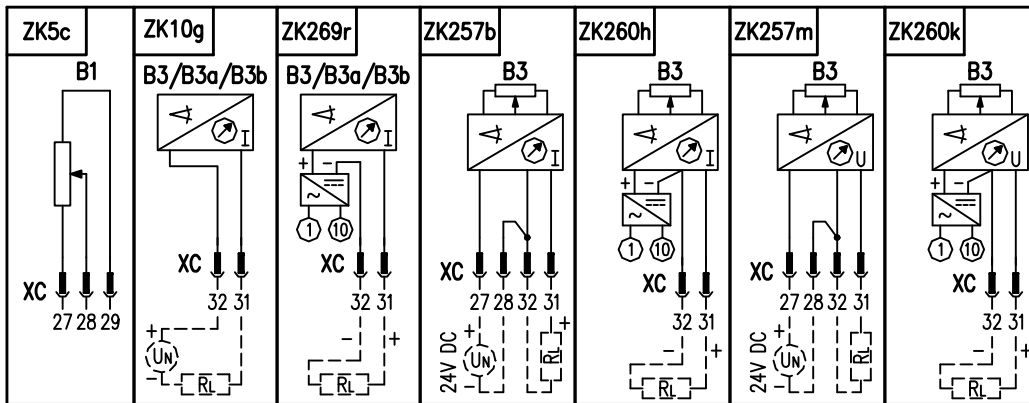
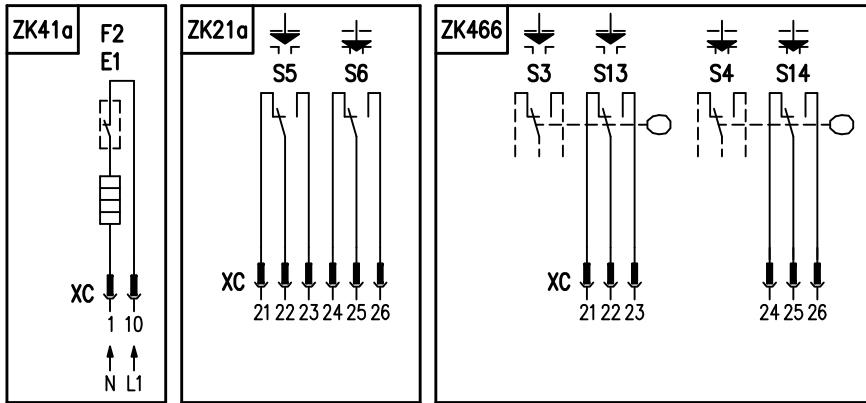




7.4 Wiring Diagrams with controller (EA MT(R)) – electric connection to connector







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).

Z5c	connection of single resistive transmitter	
Z6c	connection of double resistive transmitter	
Z10g	connection of resistive with current converter or resp. capacitive transmitter or DCPT transmitter - 2-wire without supply	
Z21a	connection of additional position switches connection for EA MO with controller	
Z41a	connection of space heater and space heater's thermal switch	
Z257b	connection of resistive transmitter with current converter – 3-wire without power supply	
Z260m	connection of current capacitive transmitter – 3-wire with supply	
Z260h	connection of resistive transmitter with current converter – 3-wire with power supply	
Z260k	connection of resistive transmitter with voltage converter – 3-wire with power supply with voltage output signal	
Z269r	connection of resistive with current converter resp. capacitive transmitter or DCPT transmitter – 2-wire with supply	
Z279c	connection of 3-phase electric motor without contactors with led out thermal protection – thermo- switches	
Z279h	connection of 3-phase electric motor without contactors with led out thermal protection – PTC	
Z297b	connection of 3-phase electric motor with contactors with not led out thermal protection – thermo- switches	
Z297g	connection of 3-phase electric motor with contactors with led out thermal protection – PTC	
Z403a	connection of torque and position switches	
Z461f	connection of torque and position switches with tandem position switches	
Z635	connection of torque and position switches with electric local control	
Z635a,Z635s	connection of torque and position switches with tandem position switches and with electric local control	
Z295, Z487, Z487e, Z487a,Z296a, Z296b	connection of EA with 1--phase electric motor	
Z240h	connection of EA MT(R) for 1-phase electric motor and with controller with resistant feedback	
Z241h	connection of EA MT(R) for 1-phase electric motor and with controller with current feedback	
Z251h	connection of EA MT(R) for 3-phase electric motor, with contactors, with led out thermal protection – thermo-switches and with controller with resistant feedback	
Z251j	connection of EA MT(R) for 3-phase electric motor with contactors, with led out thermal protection – thermo-switches and with controller with current feedback	
Z251k	connection of EA MT (R) for 3-phase electric motor with contactors, with contactors, with led out thermal protection – PTC and with controller with resistant feedback	
Z251m	connection of EA MT(R) for 3-phase electric motor with contactors, with led out thermal protection – PTC and with controller with current feedback	
Z257m	connection of resistive transmitter with voltage converter – 3-wire without power supply with voltage output signal	
Z257n	connection of current capacitive transmitter – 3-wire without supply	
Z466	connection of tandem position switches for EA MT with controller	
B1	resistive transmitter (potentiometer) single	R _L voltage-dropping resistor
B2	resistive transmitter (potentiometer) double	REMOTE-OFF-LOCAL... mode selection button on local control
B3	electronic position transmitter (EPV)	OPEN, STOP, CLOSE... local control buttons
B3a	capacitive transmitter	S1
B3b	DCPT transmitter	S2
E1	space heater	S3
F1	motor's thermal protection (not valid for this type of the EA)	S4
F2	space heater's thermal switch	S5
I/U	input / output current (voltage) signals	S6
KM1, KM2	reverse contactor	S13
M	electric motor	S14
N	controller	X
PTC	thermal protection of electric motor - PTC	X3
		XC..

Notes:

Notes:

1. In case, that output signal from the capacitive transmitter DCPT3 (wiring diagram Z251j/ZK251j, Z251m/ZK251m) is not used (incomplete circuit between terminal 81 and 82 resp. between pins 31 and 32 of connector), it is required to connect clamps 81 and 82 (resp. pins 31 and 32 of connector) by jumper (jumper is connected at manufacturing plant for connecting to terminal board only). By using output current signal from capacitive transmitter it is needed to remove jumper.
2. With the version with controller when the feedback from the CPT transmitter is used; at using the output t signal, this signal isn't galvanic insulated from the input signal !
3. The torque tripping is equipped with a mechanical interlocking mechanism.

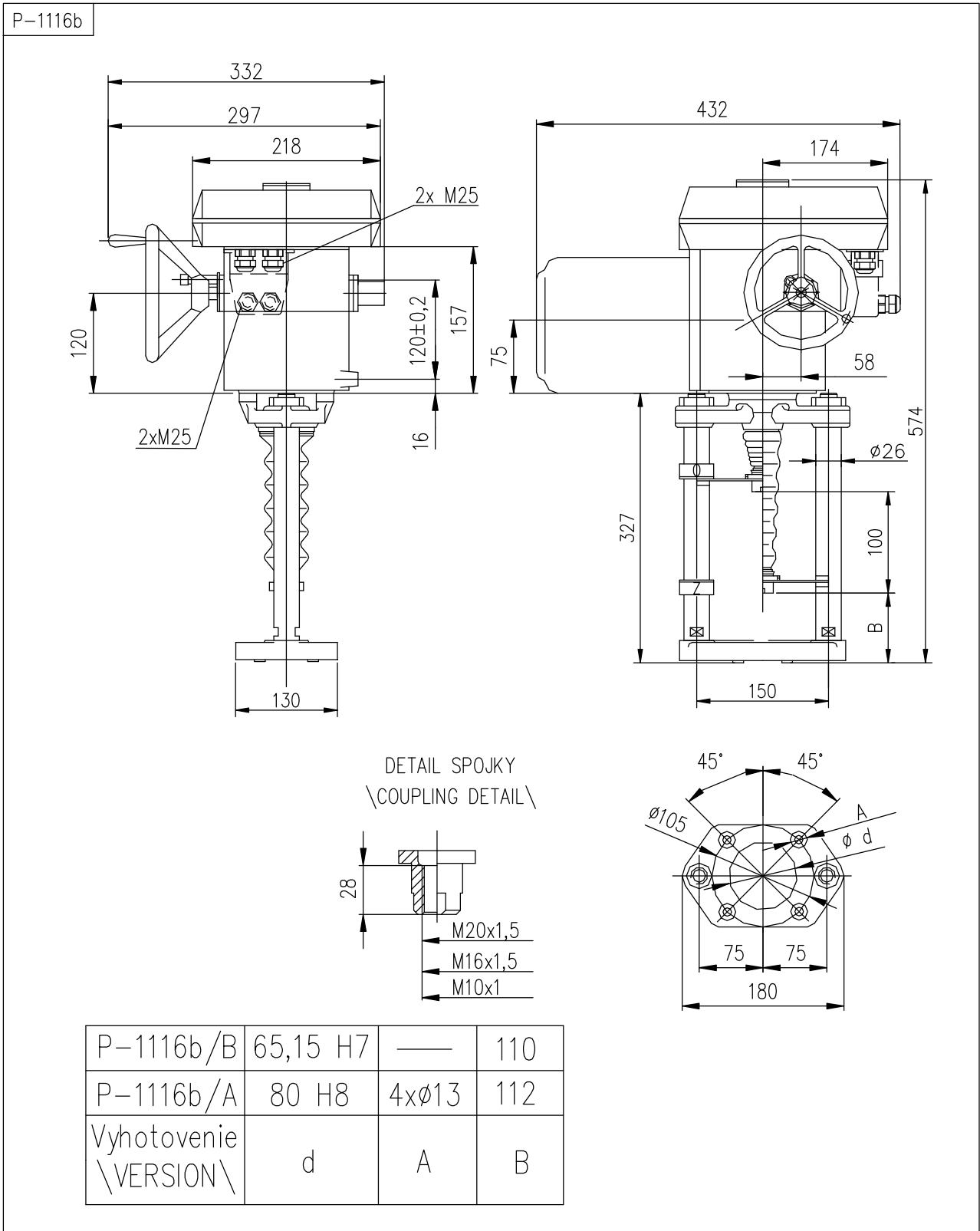
7.5 Switch operation chart

Switch	terminals	Open		close	
				operating stroke	
S1	11 (M2) - 12				
	12 - 14				
S2	15 (M3) - 16				
	16 - 18				
S3	19 - 20				
	20 - 22				
S4	23 - 24				
	24 - 26				
S5	27 - 28				
	28 - 30				
S6	31 - 32				
	32 - 34				
S13	43 - 44				
	44 - 46				
S14	47 - 48				
	48 - 50				

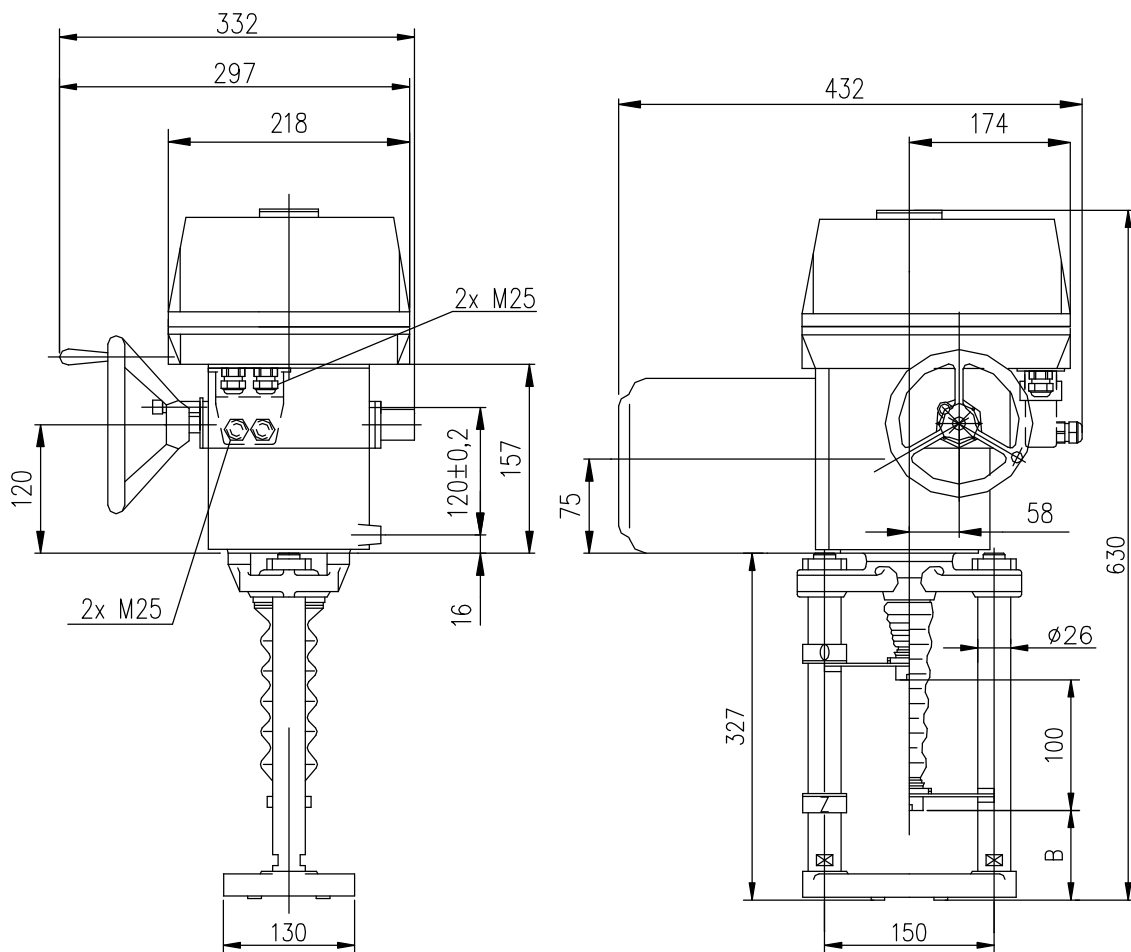
 Closed contact

 Opened contact

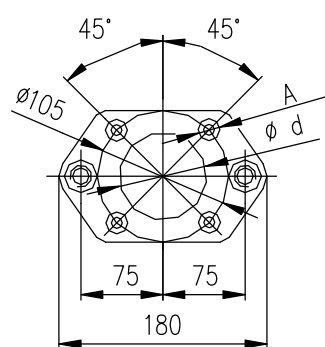
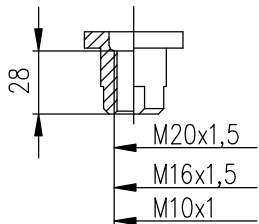
7.6 Dimensional Drawings



P-1401a

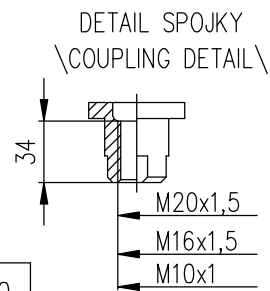
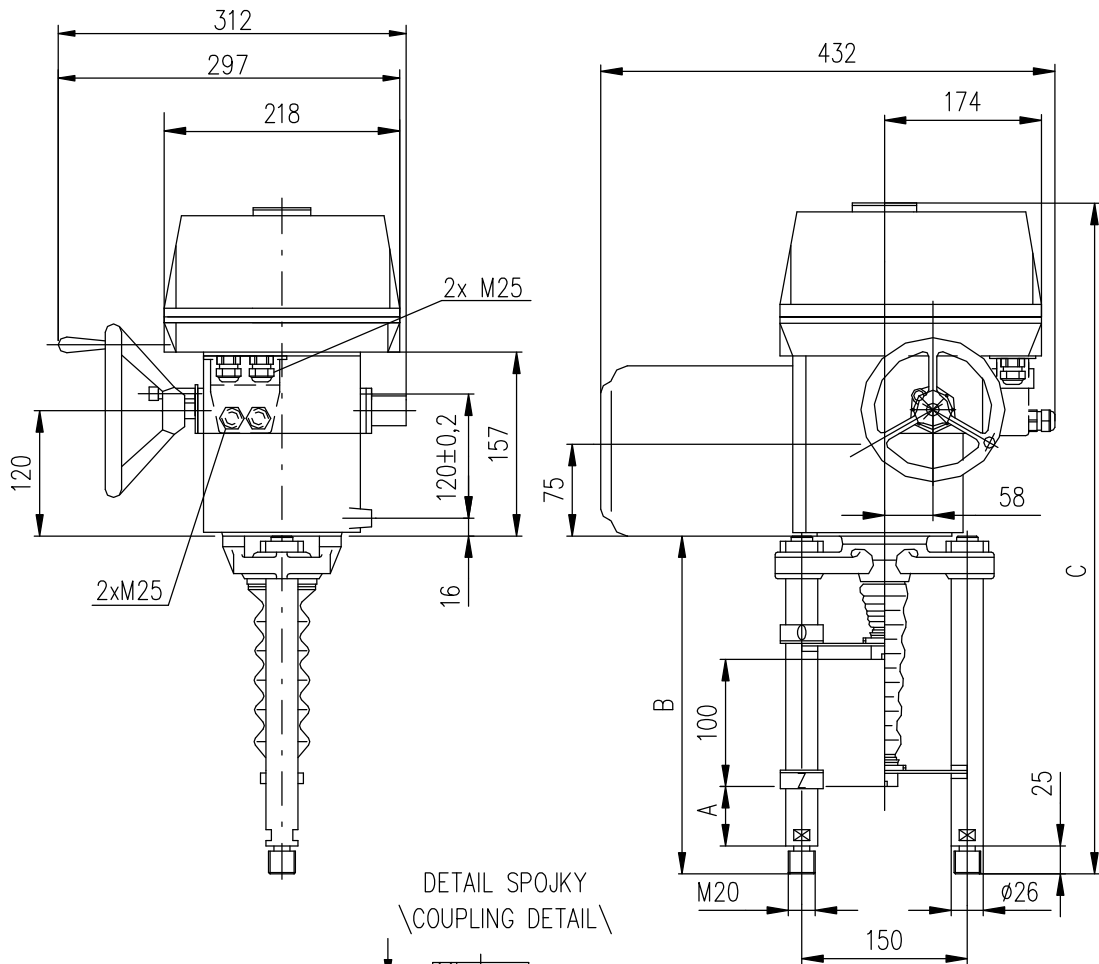


DETAIL SPOJKY
 \COUPLING DETAIL\



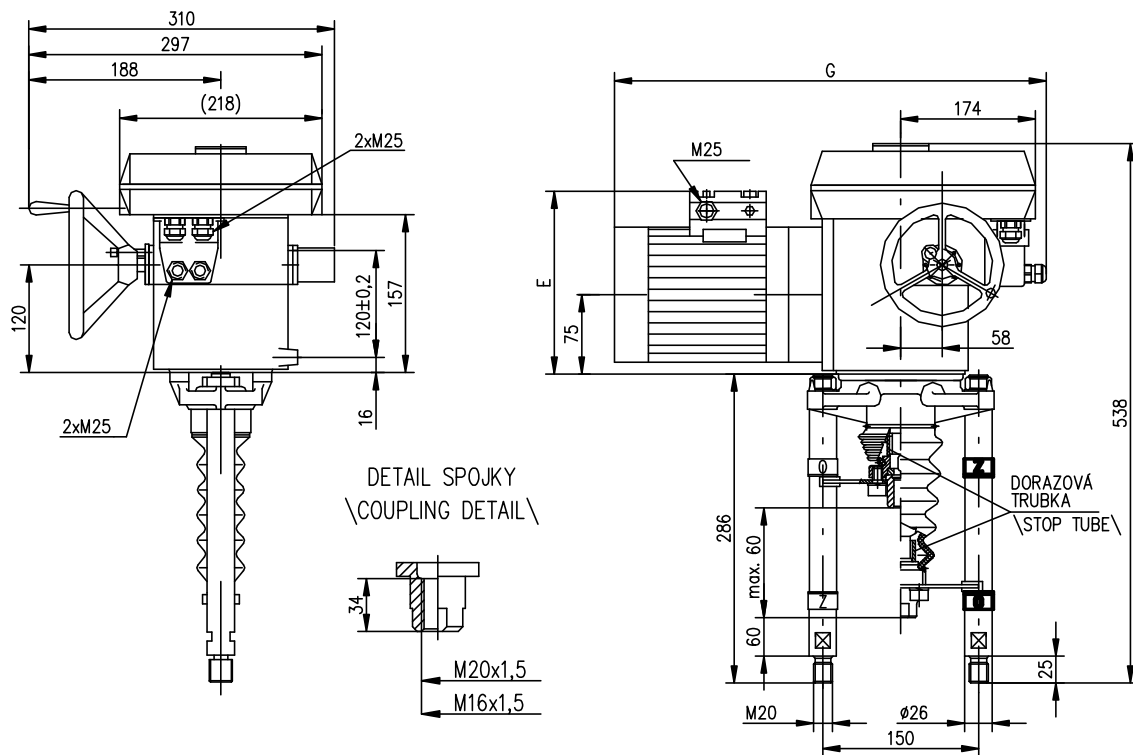
P-1401a/B	65,15 H7	—	110
P-1401a/A	80 H8	4xø13	112
Vyhotovenie \VERSION\	d	A	B

P-1403a



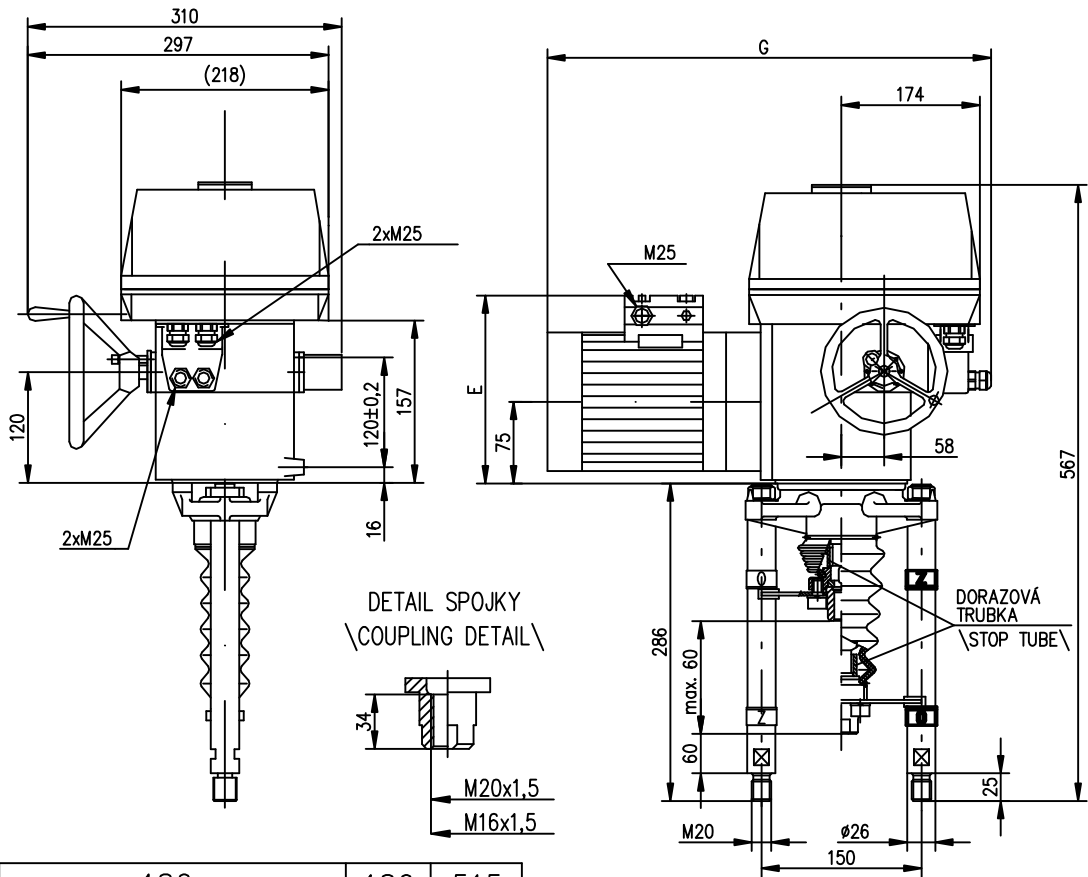
P-1403a/C	130	400	710
P-1403a/B	74	320	630
P-1403a/A	30	276	586
Vyhotovenie \VERSION\ A	B	C	

P-1313b

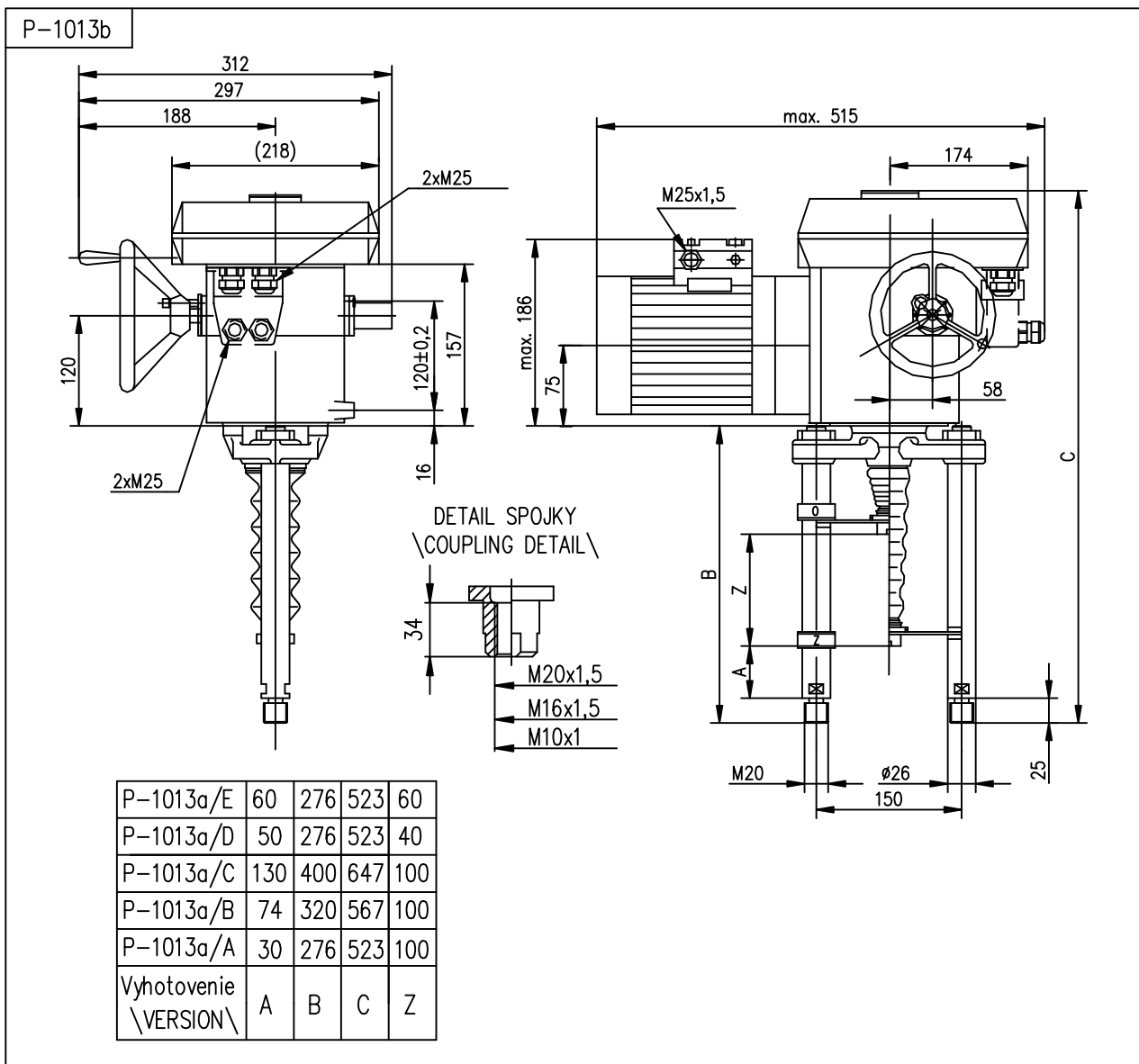


180	186	515
125	186	515
80	176	484
Rýchlosť prestavenia Operating speed	E	G

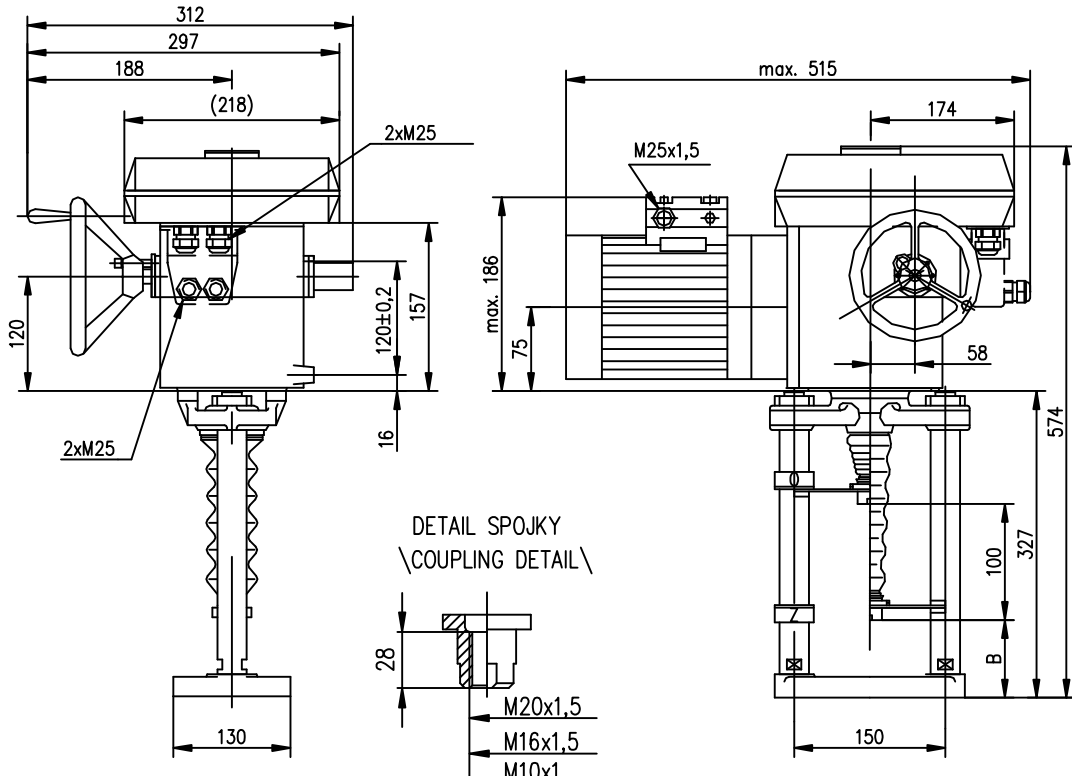
P-1405a



180	186	515
125	186	515
80	176	504
Rýchlosť prestavenia \Operating speed\	E	G



P-1014b



P-1014a/D	85 H12	—	110
P-1014a/C	70 H12	—	110
P-1014a/B	65,15 H7	—	110
P-1014a/A	80 H8	4xØ13	112
Vyhotovenie \VERSION\	d	A	B

