INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS

Electric multi-turn actuators
MO 5, MOR 5

REGADA

74 0993 02

TEST CERTIFICATE

ELECTRIC MULTI-TURN ACTUATOR MO 5, MOR 5

Type number 155. ..... Power supply.....V ..... Hz

Serial number ..... Rated torque ..... Nm

Production year ..... Switching-off torque ..... Nm

Wiring diagram ..... Operation speed..... min^{-1}

..... Adjusted number of revolutions .....

Warranty period ..... months Transmitter (potentiometer) .....

Serial number of electric motor .....

Serial number of transmitter .....

Serial number of position controller .....

Tests made in accordance with TP 74 0995 00

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 .....

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

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. 2006/42/EC "Uniform requirements for machines and devices from the point of view of safety and health care", to save life and health of users and to avoid material damages and exposure environment to danger.

1. Generally

1.1 Purpose and application of the product

Electric multi-turn actuators (hereafter referred to as **EA**), types **MO 5** are high performance electro-mechanical products, designed for direct assembly on controlled devices (regulating bodies -valves, etc.). EA MO 5 types are provided for remote control of closing bodies, which require more than one turn adjustable motions, like knife shifters, etc. EA MOR 5 types are provided for automotive control of regulating bodies . 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 5210 or in accordance with GOST 34287-2017.

1. It is prohibited to use EA as lifting device!
2. The option of switching EA via semiconductive trigger switches must be consulted with the actuator manufacturer.

1.2 Safety instructions

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

Characteristics of the Product Regarding Its Exposure Rate
Electric actuators are according to directive LVD 2014/35/EU and standard EN 61010-1/A1/AC, 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 noice level (A) of the product measured in a place of operation is 78dB (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 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.

1.4 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°C or –50°C to +40°C or -60°C to +60°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°C, protect the actuator by additional construction in order to maintain ambient temperature max. +60°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 MO(R) 5 does not have own short-circuit protection, therefore there must be included suitable protective device into the supply power (circuit breaker, or fuse), which serves at the same time as main switch.
Type of equipment from a connection point of view: The equipment is designed for permanent connection**.**

1.5 Warranty conditions

The supplier is responsible for completeness of the delivery and guarantees these specifications of the product which are stated in the Contract.

The supplier is not responsible for any deterioration of parameters caused by the customer during storage, unauthorized 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.

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.

1.6.1 Lifetime of actuators

The lifetime of an electric actuator (EA) is at least 6 years.
EA used for closing mode (closing valves) comply with the requirements for at least **15,000 working cycles** (cycle C – O – C at 30 revolutions per operating stroke:for multi-turn EA)
EA used for regulating/modulating operation (control valves) comply with the below stated numbers of **operating hours** at the total number of 1 million start-ups:

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

Time of **net operation** is min. 200 hours, max. 2,000 hours.
Lifetime at operating hours depends on loading and switching frequency.

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

1.7 Operation conditions

1.7.1 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.

Warning:

When the EA is installed in open air, **it must be** sheltered lightly to protect is against direct effects of atmosphere.
When installed in the areas with relative humidity more than 80%, in open air under a shelter is needed to connect the space heater directly – without a thermal switch.

Installation and operation of actuators is possible in either position, while motor axis is in horizontal position. Common position is the one with vertical position of exit part axis and control box above. During assembly must be taken care for space for disassembly of cover of control box and terminal box.

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 climate temperate

2) Version **„cold" -** for climate cold

3) Version **„tropical"** for climate tropical and dry

4) Version **„marine"** for climate marine.

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

- warm mild to hot dry with temperature -20°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 airl, 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 airl, 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/m^2 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/m^2 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<fp and acceleration amplitude 19,6 m/s^2 for f>fp; (transition frequency fp 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 a ≤ 700 W/m^2 ..... AN 2*
- with effects of medium seismic activity with acceleration > 300 Gal ≤ 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 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 operating mode

Supply voltage:

Electric motor .....Y/Δ; 400 / 230V AC respectively Y/Δ; 380 / 220V AC ±10%
Control ..... 230 V AC ±10%
Supply voltage frequency ..... 50 Hz ±2%

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

EA MO 5 are designed for ***remote control:***

- Short-time operation **S2-10 min**
- Intermitted operation **S4-25%, 6 up to 90 cycles per hour**.

EA MOR 5 are designed for ***automatic regulation:***

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

Notes: 1. The operation modes consist of the loading type, load factor and connection/switching frequency.
2. EA MO 5 can be, after connection with external regulator, used as regulating electric actuator under conditions that max. load torque is 0,4 multiple of max. switching-off torque for ES MO 5 with remote control.

1.8 Conservation, packing, transport, storing and unpacking

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

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

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

The EA MO 5 and MOR 5are delivered in solid packages guaranteeing resistance in accordance with EN 60 654 (IEC 60 654-1 and IEC 60 654-3).

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

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

The forwarder is obliged to secure packed products, loaded on transportation means, against self-motion; if open transportation means are used, to secure their protection against atmospheric precipitation's 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.
Transportation can be executed by heatless and non hermetic spaces of transportation vehicles with influences within the range:

- temperature: -25° C up to +70° C (a strange version – 45 ° C up to + 45 ° C)
- humidity : 5 up to 100 %, with max. water content 0.029 kg/kg of dry air
- barometric pressure 86 up to 108 kPa.

Upon receiving of EA examine, if during transportation, resp. storing did not come to its damage. At the same time verify, if the data on the labels corresponds to accompanying documentation and purchase-sale contract / order. Eventual discrepancies, faults and damages should be reported without any delay to supplier.

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 palettes), chemicals and foreign interventions, at ambient temperature from -10°C up to +50°C and at relative air humidity max. 80 %.

It is not acceptable to store EA outdoors, or in areas not protected against direct climate influence!

Eventual damages to surface finish remove without delay – thus preventing damage by corrosion.

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

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

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

Excessive preserving grease remove just before putting EA into operation.

1.9 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, however, contains a mineral oil fill dangerous for the environment. Please avoid oil leak into the environment at its disposal.

2. Description, function and technical parameters

2.1 Description and function

EA **MO 5 and MOR 5** are of compact construction with several connected modules. They are composed of two functionally different main parts consisting of following modules **(Fig.1)**:

Power part - Module M1 – electric motor
Module M11 – countershaft transmission with rotating bief
Module M3 – power transmission with manual control
Control part - Module M4 – control box

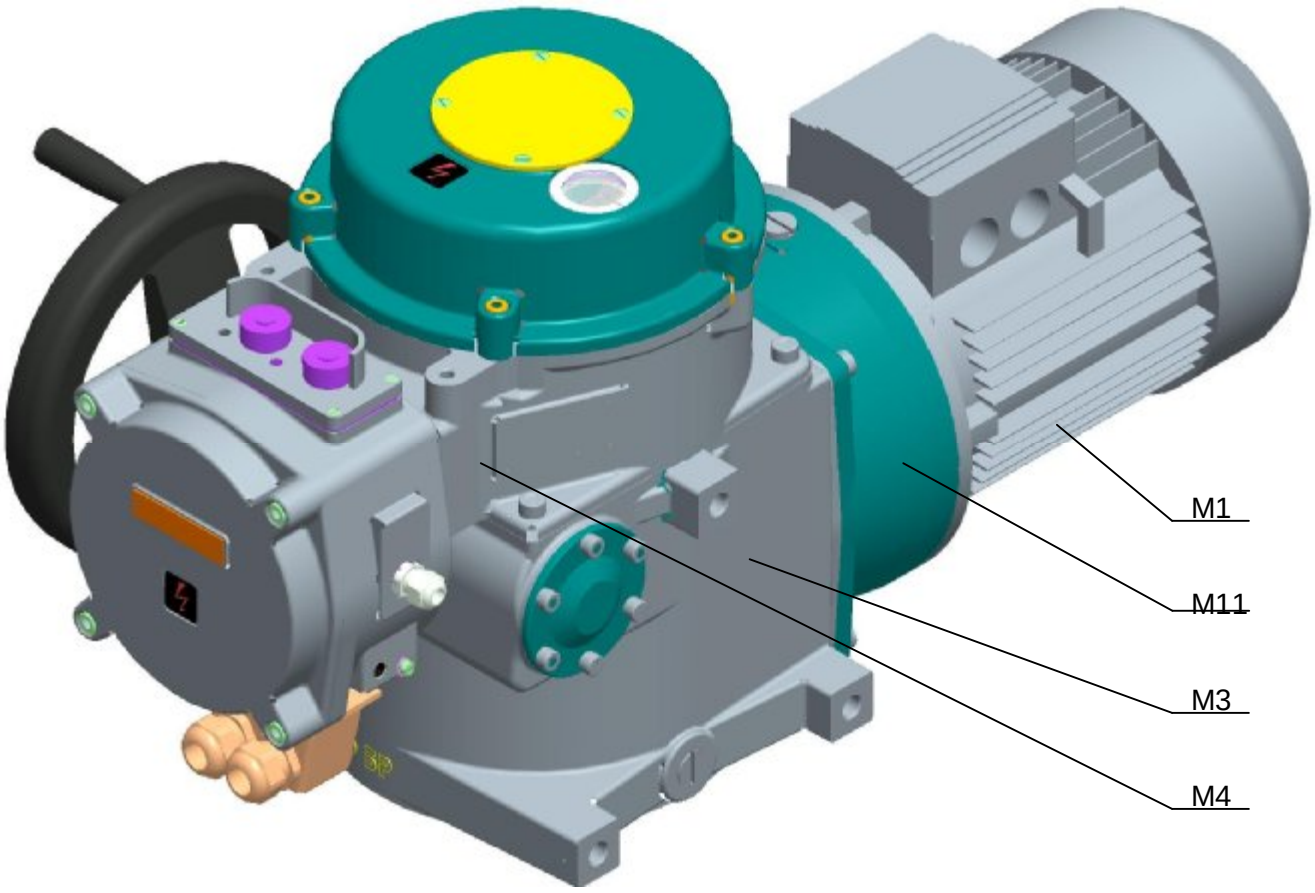


Fig.1

Power part

Module M1 – electric-motor

- **Three-phase** asynchronous electric-motor

Module M11 – countershaft transmission with rotating bief

Countershaft transmission performs reduction of electric motor revolutions to specified transmission value. Countershaft transmission consists of one up to two pairs of spur gears and is terminated by bevel pinion, which is meshed into transmission bevel wheel from module M3.

Rotating bief replaces motor mechanic brake and allows manual control of EA.

Module M3 – power transmission with manual control (Fig.2)

The set is stored in a box (22). Gears are centrally mounted on output shaft (24) and compose individual assembly unit. The pinion of electric motor transfers torque on bevel wheel (34), which together with planet gears (35) and firm crown wheel – rim (32) with inner gearing, forms planetary gearbox. The catch cam of planetary gearbox provides transfer of torque on output shaft (24). In its upper part is mounted the spiral worm (23) for torque sensing and manual control, which is used for adjustment of controlled device during electric power dropout. The adjustment is executed by hand wheel (25). The spiral worm is suspended and a force created by torque of output shaft moves the spiral worm axially against the spring tension. Movement of the spiral worm is collected by a fork with a pivot through shaft (29), joined to control box. The movement of spiral

worm is proportioned to torque load. The fork fits into perimeter slot and thus is allowed rotary motion of hand wheel, therefore manual control in every operating status. On the rear part of the box (22), (across to hand wheel) are three bosses with threaded openings, which allow fastening of electric actuator on the wall, or auxiliary construction **(Fig.1).**

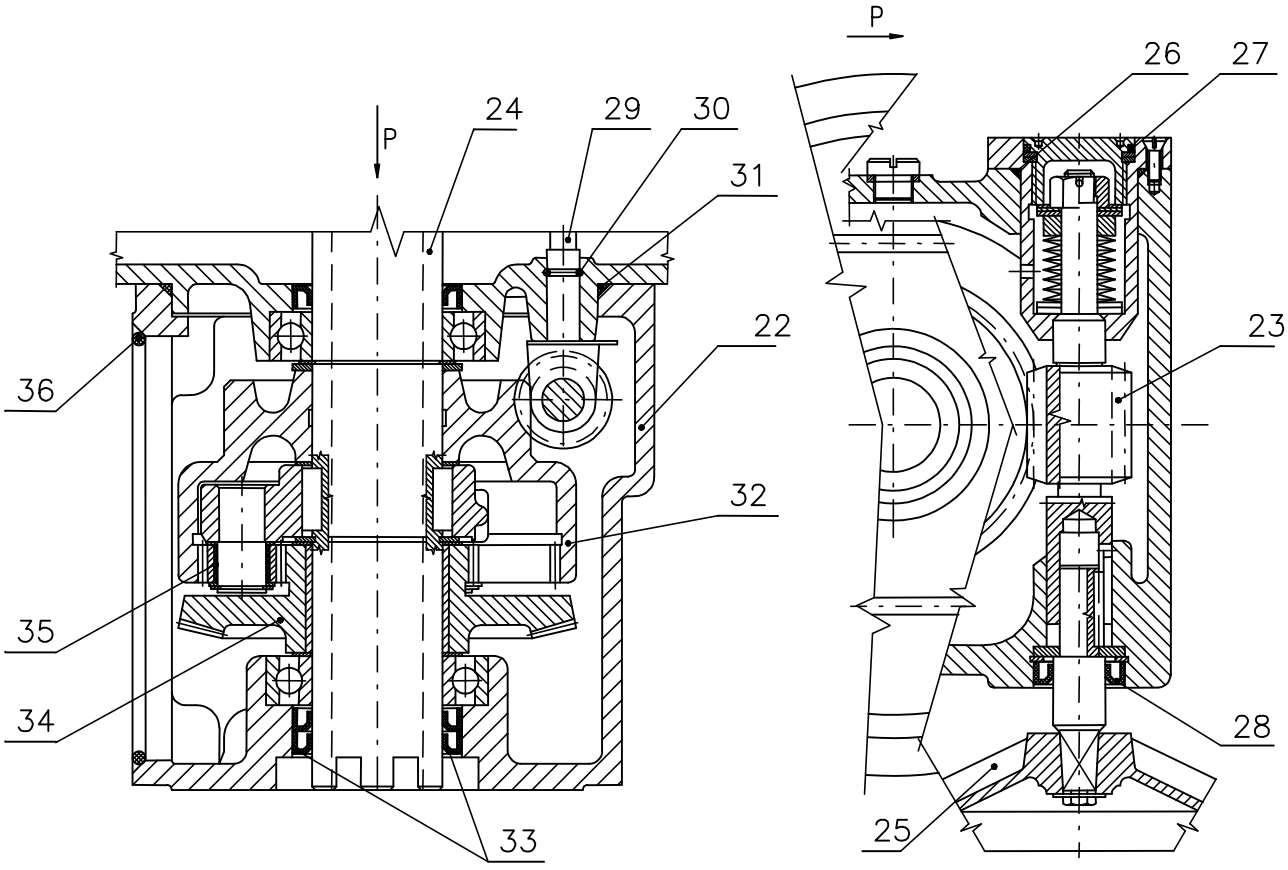


Fig. 2

Control part

Module M4 control box (fig.1) is situated on the upper part of the electric-actuator, and creates a stand-alone functional unit. On the top of the control box a cover. The bottom side of the control box closes the box of the power drive and creates at the same time a bearing construction holding the gears of a control box (46) **(fig.3)** , which contains:

position unit (11)
signaling 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 5**) (14)
reversing contactors (13) (according to EA specification) situated on terminal box (fig.3a)
electrical connections by means of terminals (58) situated within terminal box (fig.3a), and cable glands (7) (fig.3a), or connector with cable glands.
local electric control module (10) (according to EA specification) (fig.3a) is situated in terminal box and connected with control board

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.

Signaling unit with gear unit

Signaling unit provides for closing S5, S6 position switches before the end positions. The drive for the Signaling 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.

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 (16) having a built-in thermal switch (15) (fig. 3) of a total power of about 2x25 W. It is intended to prevent water vapor 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 **MOR 5** type are equipped with a 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 realized according to the specification indicated on terminal (58) (fig.3a) or by means of connector.

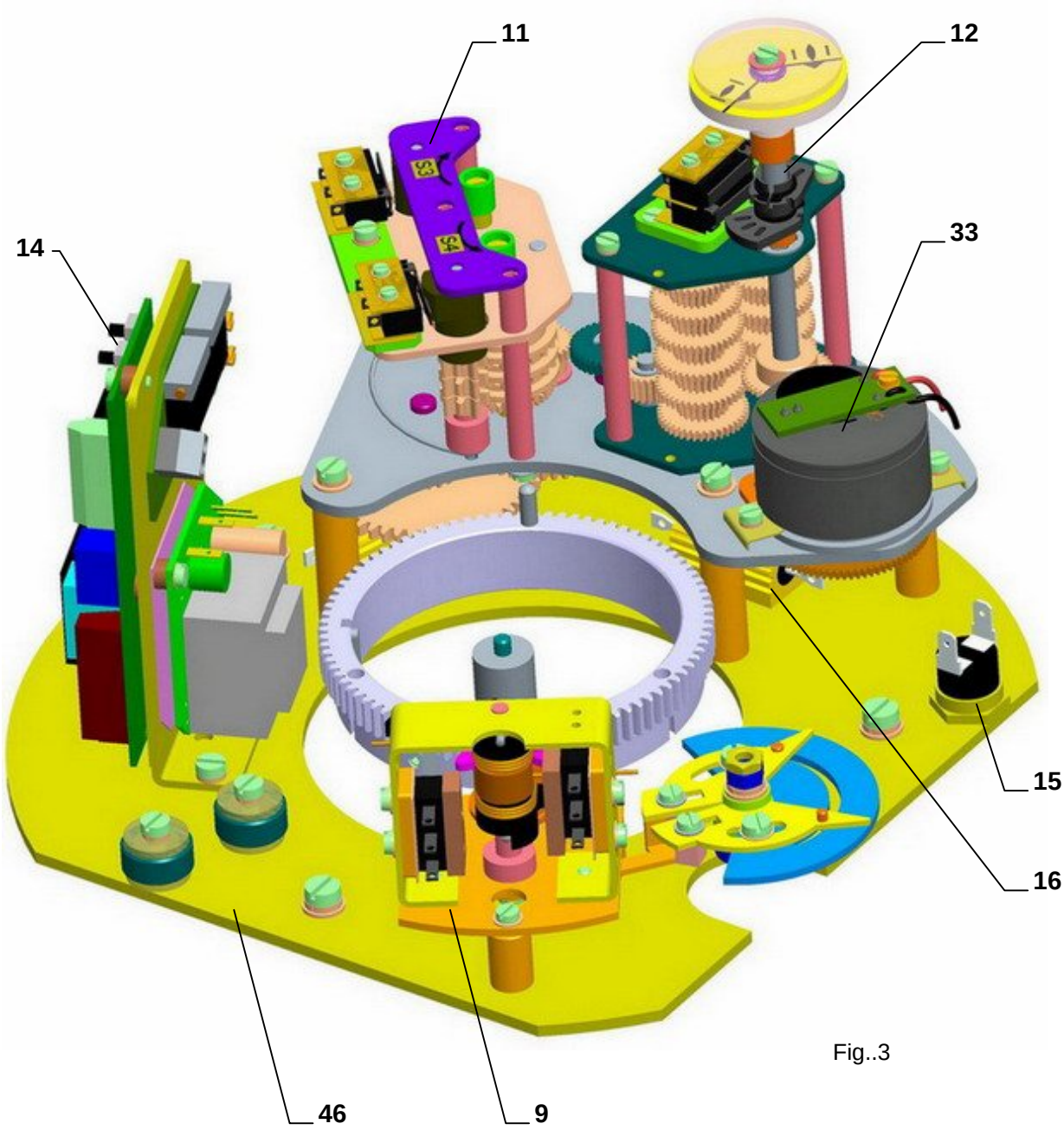


Fig..3

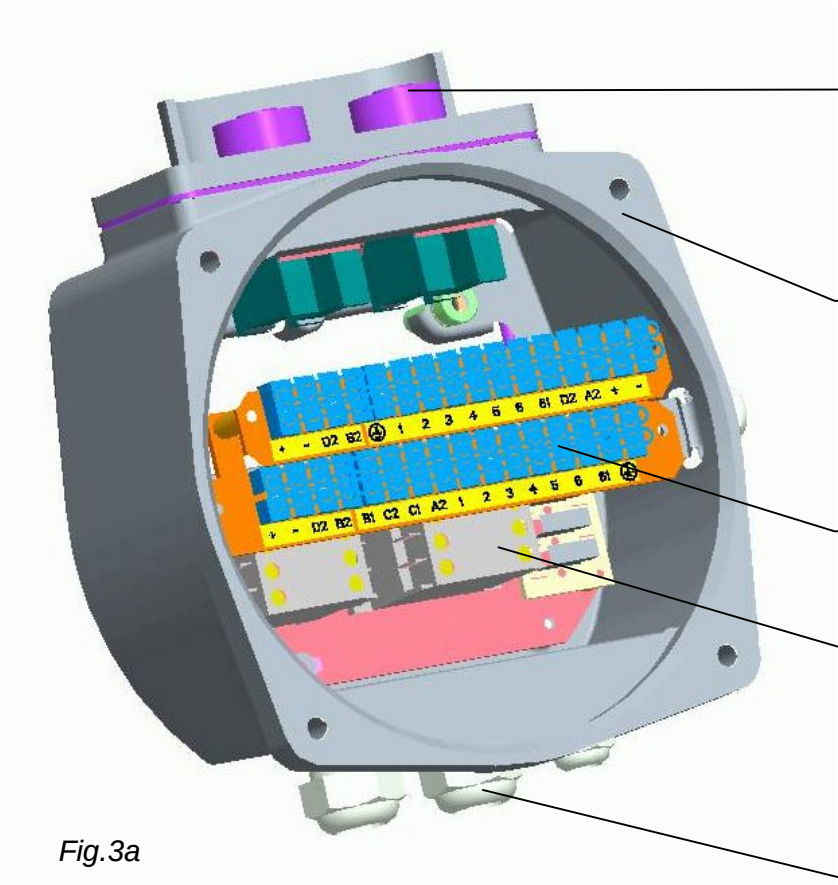


Fig.3a

2.2 Technical data

Basic technical data of EA are presented in table no.1.

Table no. 1: Basic technical data

Type Number	Operating speed ±10[%]	Number of revolutions	Maximum load torque		Switching - off torque ±10 [%]	Weight	Electric motor[1)]				
							Supply voltage		Nominal		
			S2	S4-25%					power	revolutions	current
	[min^{-1}]	[revolutions]	[Nm]		[Nm]	[kg]		[V]	[kW]	[1/min]	[A]
1	2	3	5		6	7	8	9	10	11	12
MO(R) 5 /Type number **155**	15	1,25 - 500	600	400	630 - 1000	93,5 - 103	Three-phase	Y / Δ; 380 / 220; 50 Hz Y / Δ; 400 / 230; 50 Hz	1,5	705	3,9
			375	250	500 - 630				1,1	680	2,9
			300	200	300 - 500						
	20		600	400	630 - 1000				2,2	940	5,2
			375	250	500 - 630				1,5	925	3,9
			300	200	300 - 500						
	40		600	400	630 - 1000				3	1420	6,4
			375	250	500 - 630				2,2	1420	4,7
			300	200	300 - 500						
	60[9)]		600	400	630 - 1000				4	1440	8,2
			375	250	500 - 630				3	1420	6,4
			300	200	300 - 500				2,2	1420	4,7
	100[9)]		375	250	500 - 630				4	1440	8,2
			300	200	300 - 500				3	1420	6,4

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

9) Valid for the EA version without any controller only.

Other technical data:

The cover of electric actuator.....**IP 55** (IP67 - after agreement with manufacturer)(EN/IEC 60 529)

Mechanical ruggedness:

sinusoidal vibrations with frequency with in 10 up to 150 Hz ……. with shift amplitude 0, 15 mm for $f < f_p$
…….……with acceleration amplitude 19, 6 m/s^2 for $f > f_p$
……. ..... (transient frequency f_p must be within range 57 up to 62 Hz))
sesistibility against drops .....300 drops with acceleration 5 $m.s^{-2}$
seismic resistibility .....according to art. 1.5.2

Self-buckling: .....guaranteed within range from 0 % up to 100 % of switching-off torque

Braking of EA: .....by roller bief

Output part backlash: .....< 5 °at the load by 5% value of switching of torgue

Switches: .....DB 6 (Cherry) switches

Supply voltage ……..... 250 V (AC), 50/60 Hz, 2 A; resp.: 250 V (DC), 0, 1 A

Manual control:

By hand wheel; after releasing of locking screw even during operation of the electric motor. By rotation of hand wheel clockwise is electric actuator output shaft shifted towards „close“.

Electric control:

standard for **MO 5** - on the supply voltage level
standard for **MOR 5** with built-in controller - by feeding of unified signal
for the EA version **MO 5** with external controller – by feeding of unified signal.

Heating element (E1)

Heating resistor – supply voltage: ..... max. 250 V AC;
Heating output: ..... about 2x25 W/55°C

Thermo-switch of heating element (F2)

Supply voltage: .....230 V AC, 5 A
Temperature of conduction: +20°C ± 3 °C
Temperature of disconnection: +30°C ± 4 °C

Position switch adjustment

End position switches are preset to a specified revolutions number with an accuracy of ± 90° .
Additional position switches are preset to close immediately before appropriate end position switches.

Adjustment of torque switches

Switching of torgue, unless other adjustment is specified, is adjusting to maximum switching of torgue of selected range with tolerance ±10 %, for repeated torque switching-off.

Position transmitter

Resistive – potentiometer:

Resistance (single **B1**): ..... 100 Ω, 2000 Ω
Resistance (double **B2**): ..... 2x100 Ω, 2x2000 Ω
Operating life of transmitter .... 1.10^6 cycles
Load capacity:…… ..... 0.5 W up to 40°C (max. 0 W/125°C)
Maximum current load: ..... 100 mA
Nominal current of sliding contact ..... max. 35 mA
Maximum supply voltage:..... $\sqrt{PxR}$ V DC/AC
Potentiometer linearity error: ..... ±1.5 [%][1)]
Potentiometer hysteresis: .....max. 5 [%][1)]
Potentiometer values at limit positions:
For MO 5: "O" (open) $\geq$ 93%, "Z" (closed) ..... $\leq$ 5%
For MOR 5 with controller: "O" (open) $\geq$ 85 % and $\leq$ 95%, "Z" (closed) $\geq$ 3 % and $\leq$ 7%

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

a) 2-wire version - without built-in power supply, or with built-in power supply

Current signal ..... 4 ÷ 20 mA (DC)
Power supply voltage (at version without built-in power supply)..... 15 ÷ 30 V DC
Power supply voltage (at version with build-in power supply)..... 24 V DC ±1,5%
Load resistance .....max. $R_L=(U_n-9V)/0,02A$ [Ω]
(U_n - power supply voltage [V])
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
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

Capacitive (B3): non-contact, life 10^8 cycles

a) 2-wire version - with built-in power supply

Current signal **4 ÷ 20 mA** (DC) is obtaining from capacitive transmitter, which is fed from internal supply.
Transmitter is equipped with diode against reversing of polarity.
Load resistance ..... 400 till 500 Ω
Load resistance can be single side grounded.
Influence load resistance on output current ..... 0,1%/100 Ω
Temperature dependency ..... ± 0.5 % / 10 °C
Current limit ..... 25 ÷ 30 mA
Output signal values at limit positions: ....."O“.... 20 mA (clamps 81,82)
....."Z“..... 4 mA (clamps 81,82)

b) 2-wire version - without built-in power supply

Current signal **4 ÷ 20 mA** (DC). Whole transmitter is galvanically insulated, so is possible to connect more transmitters to one power supply.
Power supply voltage ..... 18 till 28 V DC
Ripple voltage ..... max. 5%
Load resistance ..... 400 till 500 Ω
Load resistance can be single side grounded.
Influence load resistance on output current ..... 0,05%/1 V
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's nominal value related to output values with max. revolutions setting for the given stroke degree according to table 3.

Electronic position controller (N) „REGADA" (Valid for the EA MOR 5 version with controller only)

Controller software equipment:

A) Function and parameters

programmable **functions:**

- with functional buttons SW1, SW2 and LED diodes D3, 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 ±10%
Frequency: ..... 50/60 Hz ±2%
Input control signals - analogue: ..... 0 - 20 mA
..... 4 - 20 mA
..... 0 - 10 V
Input resistive for signal 0/4 - 20 mA.....250Ω
Input resistive for signal 0/2 - 10 V 50kΩ
(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-color 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
By flange F16 (ISO 5210)
By flange ϕ220 (GOST 34287-2017)
Main and connecting dimensions are presented in **dimensional drawings**.

Electric connection
to terminal box type (X)):
- max. 32 terminal connectors
- crosscut of connecting wire max. 2,5 mm^2
- 2 cable glands from control box – cable diameter 12,5 to 19 mm
- 1 cable gland from control box – cable diameter 6 to 10,5 mm
- 1 cable gland from electric motor – cable diameter 12,5 to 19 mm

to connector (XC):
- (max. 32 poles - the crosscut of connecting wire 0, 5 mm^2):
- 2x cable glands - cable diameter from 12,5 to 19 mm

- **with protection terminal:**
  external and internal, mutually connected and marked with protection earthling mark.

Electric connection: according to wiring diagrams.

3. Installation and dismantling of actuator

Abide by safety measures!

Notes:

Repeatedly verify whether placing of EA correspondents 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 Installation

EA is by the producer adjusted to parameters according to the nameplate.

3.1.1 Mechanical connection to the armature

In case that required shape of mechanical connection is designed by A-shape adapter (with flange F16), at first is necessary to fix this adapter to connecting flange of EA by the screws.

Mechanical connection – shape of connecting element B, C, D and gear clutch :

Bearing surfaces of EA connecting flange must be carefully de-greased.
Slightly grease the shaft of armature/gearbox by acid-free grease;
Shift EA to its terminal position „CLOSED“; shift armature into identical terminal position.
Put EA on armature, so as output shaft reliably fits into clutch of armature.

Warning!

Do not use force when you put EA on armature, otherwise the gear can be damaged!
Should there is the necessity to synchronize the openings in the EA flange and armature, turn the EA by hand wheel;
Verify, whether connecting flange fits tightly to the armature / gearbox.
Attach the flange by four bolts (with mechanical hardness min. 8G), which steadily tighten crosswise.

- At the end of mechanical connection perform **the check of proper connection with the armature,** by turning hand wheel.

Mechanical connection – rising spindle (for shape A , eventually C):

- If the rising spindle of armature is in terminal positions „open“ longer than dimension of mounting flange up to the control box cover, disassembly cover of output shaft (Fig.1) on control box and replace it by covering pipe (not part of delivery) after assembly of electric actuator on armature.
- Seating surfaces of EA connecting flange and armature carefully de-grease.
- Slightly grease the output shaft of armature.
- Shift EA to terminal position „CLOSED“; shift armature into identical terminal position.
- Slide electric actuator by output shaft / nut on the spindle / nut of armature and turn by hand wheel counterclockwise until connecting flange of electric actuator fits to connecting flange of armature. Further procedure is identical to previous part of mechanical connection for shapes B, C, D.
- At the end of mechanical connection perform the check of proper connection of EA with the armature by turning the hand control wheel.

3.1.2 Electric connection to the network, respectively control system

Consequently perform electric connection to the network, respectively to joining system.

1. *Adhere to instructions stated in chapter Safety instructions – Requirements for professional .....*
2. *During deposition of electric line is necessary to adhere to regulations for installations of heavy-current equipment.*
3. *Line wires to terminal boards, respectively to connector lead by screw cable glands.*
4. *Before putting the electric actuator into operation is necessary to connect inner and outer grounding terminal.*
5. *Leading-in cables must be attached to firm construction maximum 150 mm from cable glands!*
6. *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 glands to the control box and 1 cable gland to electric motor.
- If necessary, make EA adjustment, place cover and fasten it by screws uniformly in diagonal way. Tighten cable glands 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.
- Electric connection performed through two glands.
- Release bodies of the connectors.
- 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 glands to secure coverage.

Remarks:

1. *Stuffing glands 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 gland. Supply cables must be attached to firm construction maximum 150 mm from glands.*
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. Check proper connection by pressing the pushbutton "close" (on the box of manual control, respectively on the panel of testing pushbutton box) and output shaft must turn clockwise from the view from the top view (into control box) on output shaft. 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.

In the **MOR 5 version** (Fig.13) with the built-in electronic controller it is needed to perform **autocalibration** for assuring optimal functioning.

The procedure is as follows

Press the button **SW1** for about 2 sec (i.e. till the **D3** diode is got on) to set the controller to the **autocalibration** mode. During this process the controller checks the feedback transmitter and the sense of turning, puts the EA to the positions open and closed, measures inertia mass in the directions "opening" and "closing", and loads the adjusted parameters into the EEPROM memory. In case that during the 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**. If needed to change adjusted parameters of the controller follow instructions given in the part Adjusting of actuator.

3.2 Disassembly

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 glands. 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

Attention! *See chapter 1.2-1.4!*
Disconnect the electrical electric actuator from electrical power network!
Observe safety regulations!

After mechanical connection, electric connection and verification of connection and functionality start adjusting and adjusting of the equipment adjusting perform on mechanically and electrically connected electric actuator. This chapter describes adjusting of electric actuator to parameters specified in specification table for a case, if some of electric actuator elements are mistuned. Displacement of adjusting elements of control box is in the Fig. 3. After finishing of manual control fasten locking screw back.

4.1 Adjusting of torque unit

Switching – off torques are in production plant adjusted to required values for direction „open" (torque switch S1), as well as for direction "close" (torque switch S2), with the accuracy ±10 %. Unless agreed otherwise, they are adjusting to maximum value.

Torque unit is composed of three functional sub-units:

- Torque disk **(Fig. 4)**
- Torque unit with locking mechanism (82) **(Fig. 5)**

Torque disk **(Fig. 4)** is assembled on torque shaft discharged from power transmission **(Fig.2).** Steer angle of torque disk is proportional to torque of output shaft of electric actuator. Its magnitude can be adjusted by segments (17) and by shifting of backstops (18) **(Fig. 4)**. Achieved torque value is from torque disk transferred on torque unit by means of torque lever (42) **(Fig. 5)**.

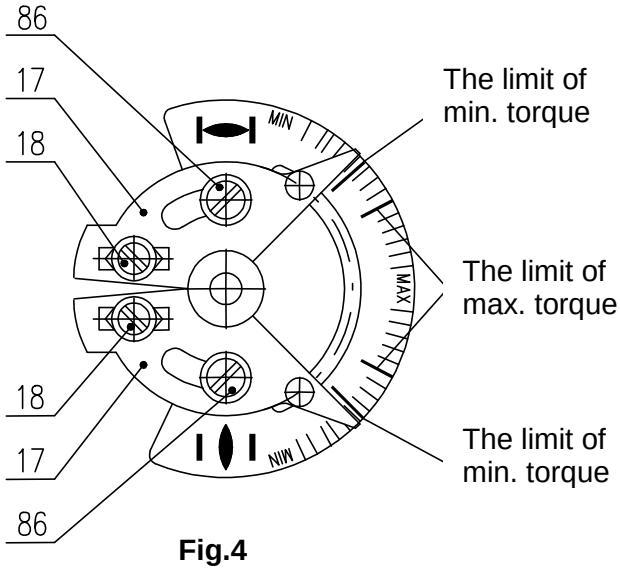


Fig.4

Remark:

The gauge marks on the scales do not indicate direct value of 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 torque measurement.

Torque unit **(obr.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 torque when the shaft is turned out of the mesh of torque disconnection.

Locking mechanism (82) **(Fig.5)** provides locking of torque disconnection usually to 1 or 2 turns after reversing of electric actuator. After elapsing of adjusted revolution will torque unit acquire its original function.

Disconnecting torque can be adjusted only in connection with a device for torque measurement and only within relevant range, according to specification table, by rough regulation (17) and soft regulation (18), **(Fig.4)**.

Adjustment of disconnecting torque by means of segments (17), **(Fig.4)**, can be performed only within highlighted interval MIN – MAX on torque disk within relevant power range of electric actuator.

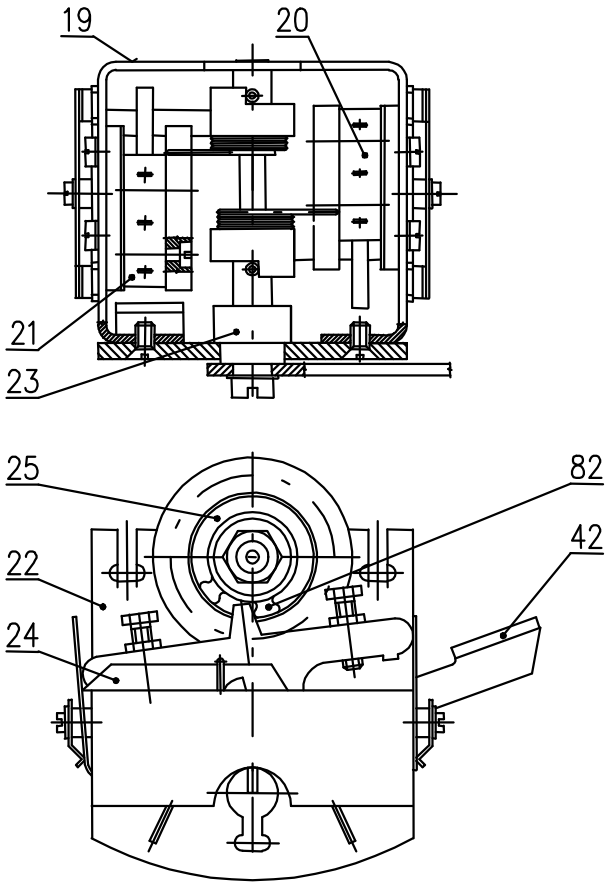


Fig.5

To change torque range, springs in torque drive must be replaced, what can be executed only in production plant, respectively service center due to its assembly requirements.

Blocking adjustment:

EA operates within a working revolutions range according to Variant table.
Blocking can be set to a number of revolutions given in tables 2a, 2b.

TABLE Nr. 2a	
Torque blocking speed for the version with **more than 5 working revolutions** for EA (1 pin in driving wheel)	**Cams on pinion (25) are revolved by**
MO 5, MOR 5	
1,0 – 2,0	90°
3,0 – 4,0	180°
5,0 – 6,0	270°
7,0 – 8,0	360°

TABLE Nr. 2b	
Torque blocking speed for the version with **less than 5 working revolutions** for EA (3 pins in driving wheel)	**Cams on pinion (25) are revolved by**
MO 5, MOR 5	
0,33 – 0,66	90°
1 – 1,33	180°
1,66 – 2	270°
2,33 – 2,66	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 revolutions with regard to blocking, please contact an appropriate service center.

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

EA is delivered set to a stroke corresponding to 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 11.° according to table 3. 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 (it means to a one corresponding accurately to the particular revolutions, or to the next higher one) 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 „open“ 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.

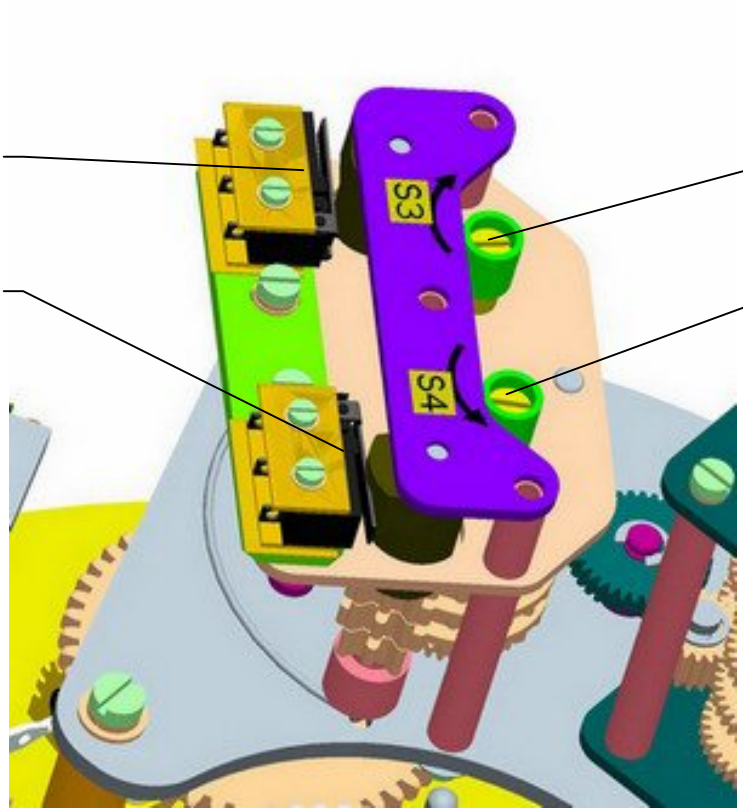


Fig.6

TABLE 3	
STROKE DEGREE	**MAX. EA WORKING REVOLUTIONS** (provided customer doesn't specify otherwise, EA will be set to 6° by producer)
	MO 5, MOR 5
1.°	1,25
2.°	2,3
3.°	4
4.°	7,5
5.°	14
6.°	**25**
7.°	45
8.°	80
9.°	150
10.°	270
11.°	500

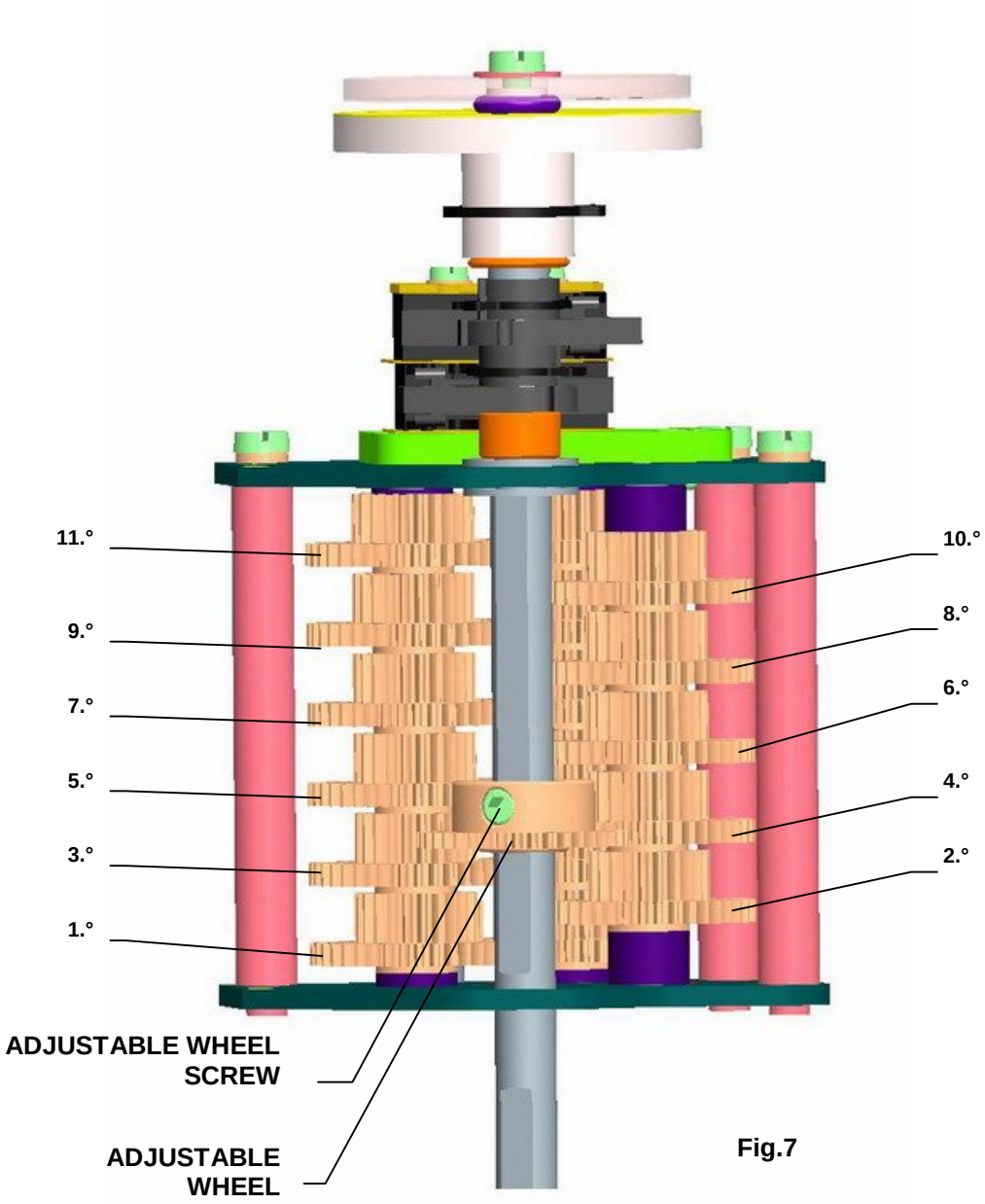


Fig.7

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 signalize 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.

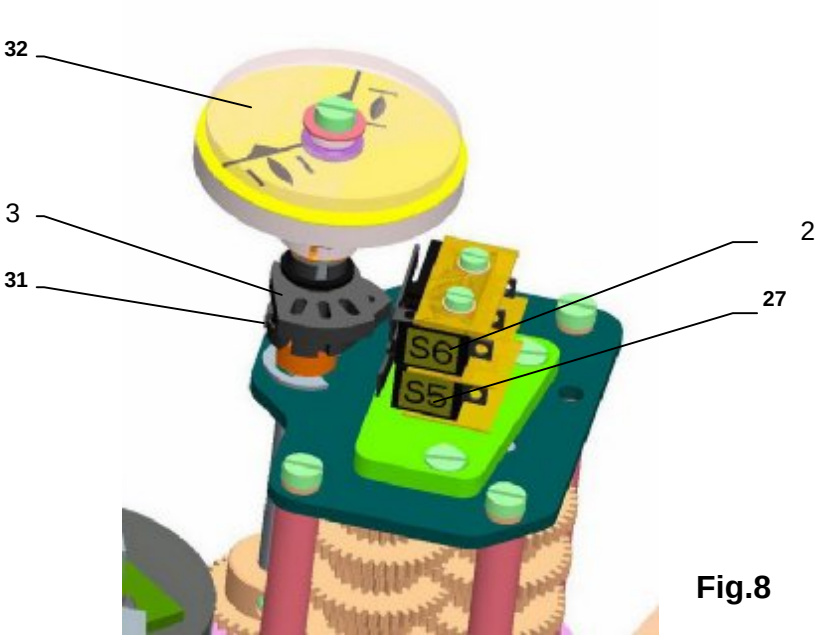


Fig.8

4.4 Position indicator adjustment (Fig.8)

The position of the output member relative to the end positions of ES 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 **MO 5** used to function as a remote position indicator; in the EA **MOR 5** to function as a feedback in the position 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 revolutions 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 MOR 5 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 Ω 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 **MO 5** terminal board, or to the terminals 7 and 10 of the EA **MOR 5** 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 ≤5% of the nominal transmitter resistance can be read on the meter in case of EA **MO 5**, and 3 up to 5% of the nominal transmitter resistance in case of EA **MOR 5,** 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.

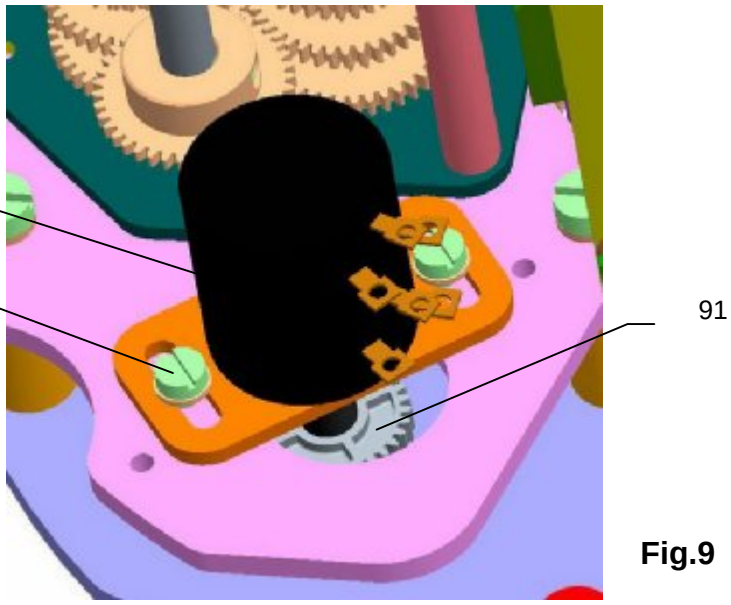


Fig.9

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

EPV – the 2-wire version (Fig. 10)

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

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). The used transmitter resistance is *100* Ω.
- Switch the converter′s power supply on.
- Turn the adjusting trimmer ZERO (Fig. 10) to adjust the output current signal rate measured on the terminals 81-82 to 4mA.
- Set the actuator to the position ”open“.
- Turn the adjusting trimmer GAIN (Fig. 10) 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.

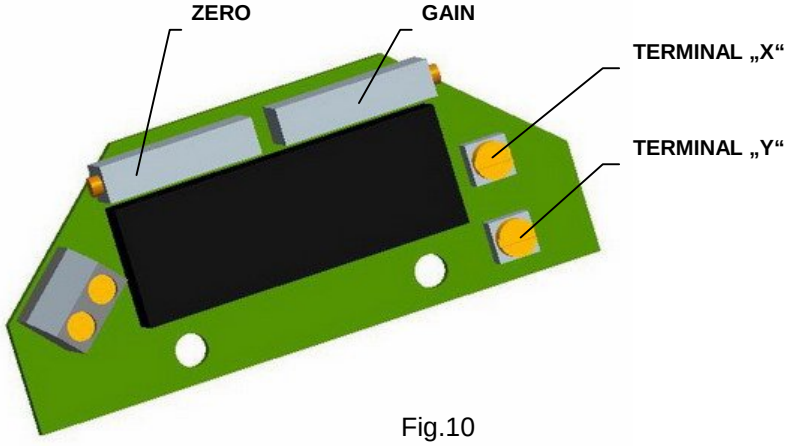


Fig.10

<u>Note:</u>

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

EPV – 3-wire version (Fig. 11)

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 or 5 mA
- in the position ”closed”.....0 mA or 4 mA

according to the specified version of the converter.

If the transmitter requires a new adjustment follow these steps:

- Put the actuator to the position ”closed” and switch the power supply off.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (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“.

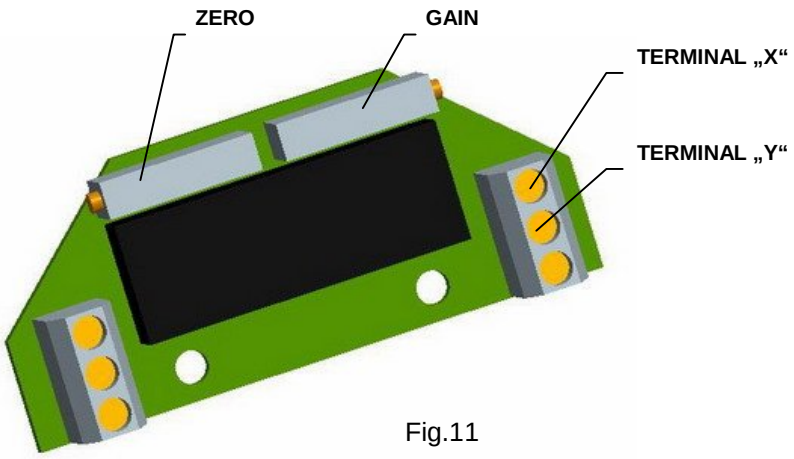


Fig.11

- 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.

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 (see table 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 **MO 5**, 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 **MOR 5 with controllers.**

Note1: With the version with controller when the feedback from the CPT transmitter is used; 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 centers.

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 **MO 5**

B) The version with a power supply (2-wire version) for EA **MO 5**

C) The version CPT as a feedback to the position controller for EA **MOR 5 with controller**

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 controller (EA MOR 5)

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 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 Ω 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 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 revolutions in range from ca 50% up to 100% of the max. value of the operating revolutions on the competent degree according to table 3.

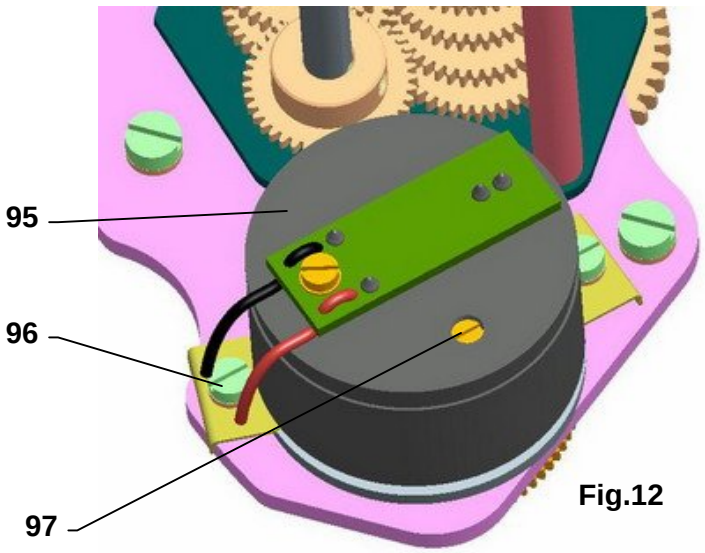


Fig.12

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 86/87 (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:

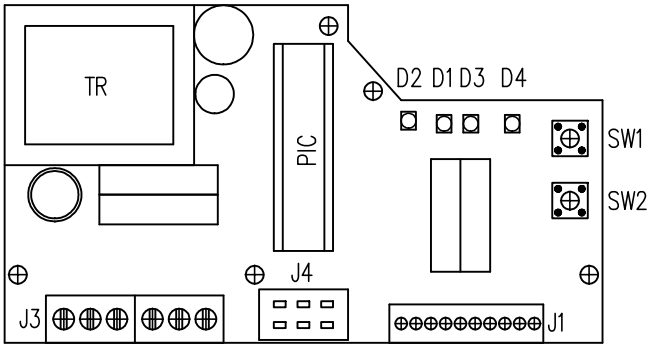


Fig.13

SW1 button	starts an initialization routine an 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)

- additional equipment

If necessary (accession, function check and so on), it is possible to preset EA by local electric control with secured power feeding. Upon switching the local control to "LOCAL" mode, it is possible to use OPEN and CLOSE buttons to control the movement of the output element in the entered direction. LEDs indicate individual modes of the local control.

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. LED**PWR** (6) indicates the presence of supply voltage to control the local control.

Individual local control modes:

The„**OFF**" mode - this mode does not enable remote or local control of EA. The mode is indicated by LEDs **REMOTE** (7) and **LOCAL** (8) being off

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 ode 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.

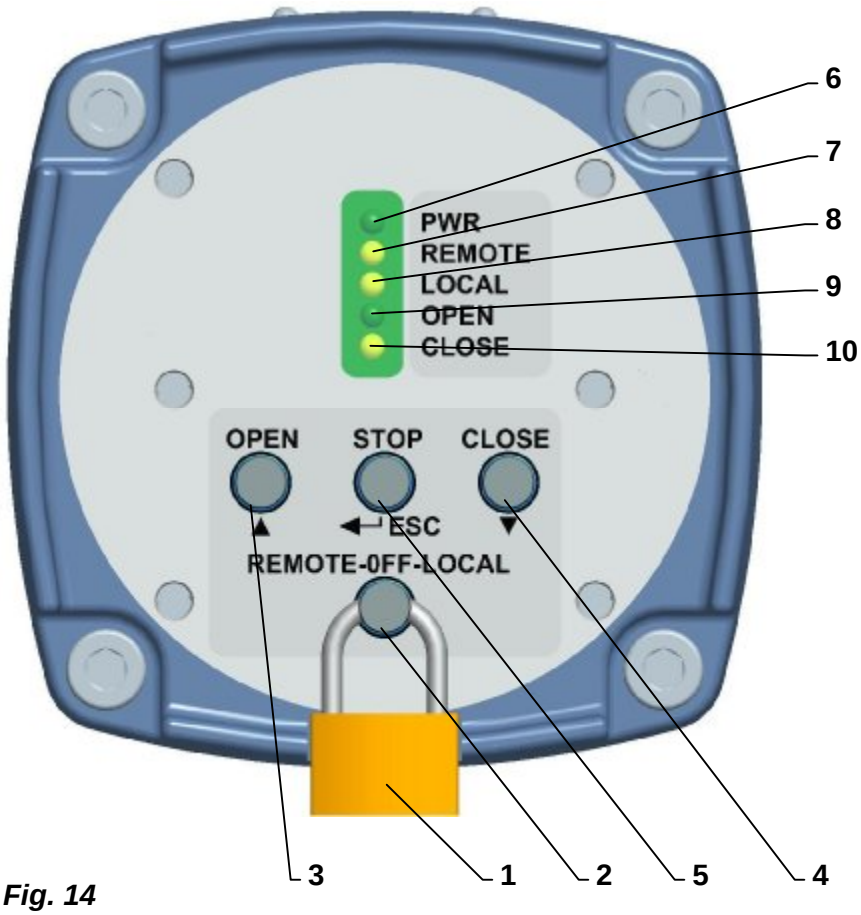


Fig. 14

5. Service, maintenance and troubleshooting

5.1 Operation

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!

- 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 electric, 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".
- It is necessary to prevent excessive heating of the surface of EA, exceeding of type label values and excessive vibration of EA.

Manual control:

- In case of necessity (set up, functional check, dropout, etc.) can the operator perform adjustment of controlled body by means of hand wheel. When the hand wheel is turned clockwise, the output member turns towards "CLOSE".
- Before manual control must be realized locking screw **(Fig.15)**. Fasten locking screw after finishing of manual control.

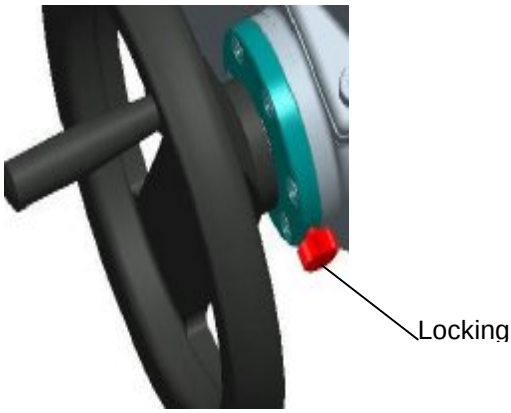


Fig.15

5.2 Maintenance – scope and regularity

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 is1,6 l (1,5 kg).

Lubrication:

- the gearbox: - in versions with temperatures –25°C till +55°C - Madit PP-80 (Slovnaft)
  - in versions with temperatures –40°C till +40°C - Avia SYNTOGEAR PE 68
- gears of transmission unit and drive mechanism on the control board:
  - in versions with temperatures -25°C till +55°C - grease µ HF 401/0, resp. GLEITMO585
  - in versions with temperatures -40°C till +40°C - grease Gleit-µHF 401/0, resp. GLEITMO585 K

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

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

- Every six months it is recommended to perform one check move in frame of adjusted operation stroke to verify reliability of functioning with setting back to the original position.

- If the audit rules do not determine else the inspection of EA is performed ones a year and tightening of all connecting and grounded screws have to be checked to avoid overheating.
- After 6 months from putting of EA into operation and once a year it is recommended to check tightening of fixing screws between the EA and the valve. (Tighten the screws with the cross system.)

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

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 hand wheel). 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 center.
- 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, alternativelly 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

6.1 Accessories

EA **MO 5**, or **MOR 5** have neither accessory packed with .

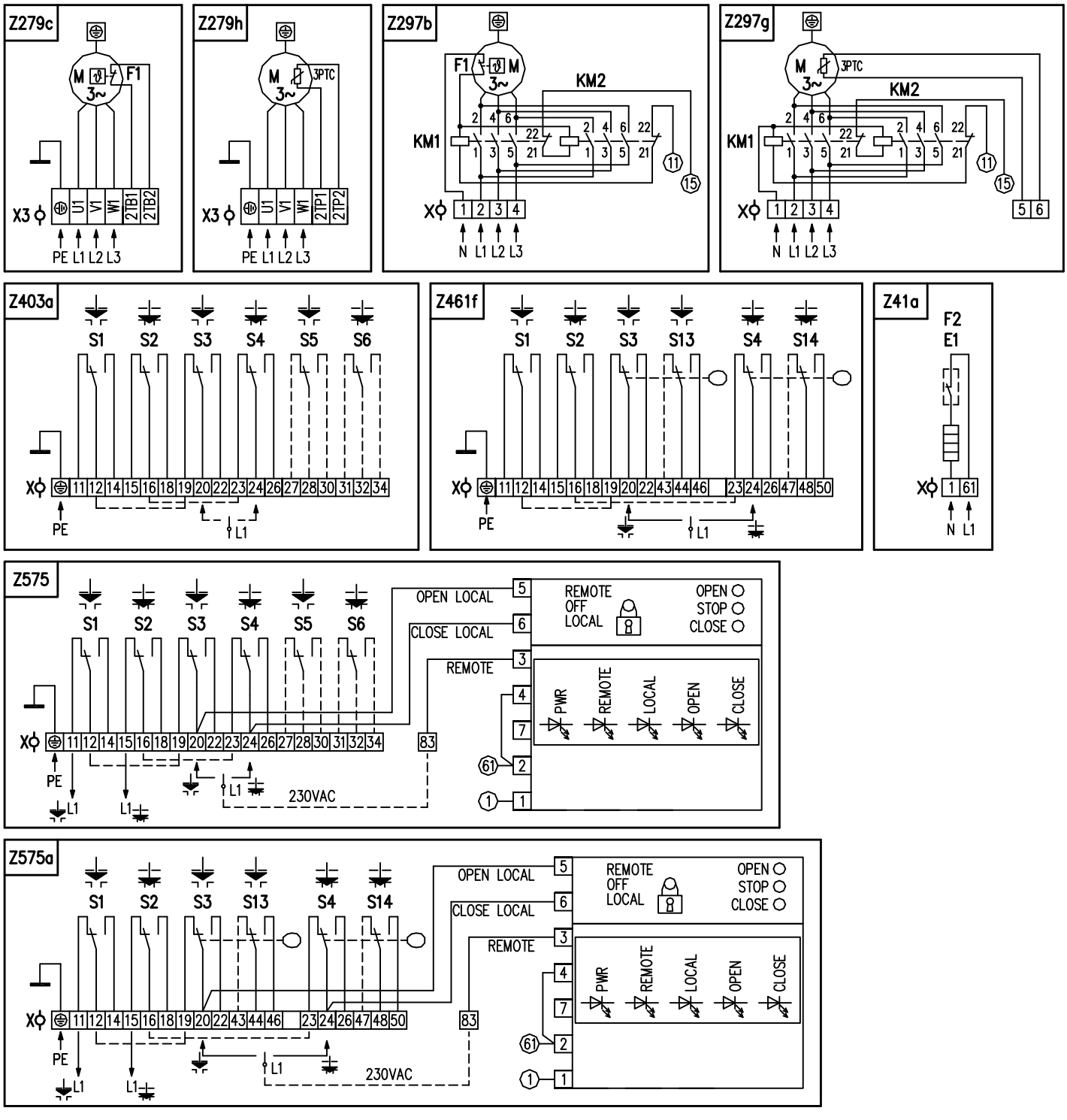
6.2 The list of spare parts

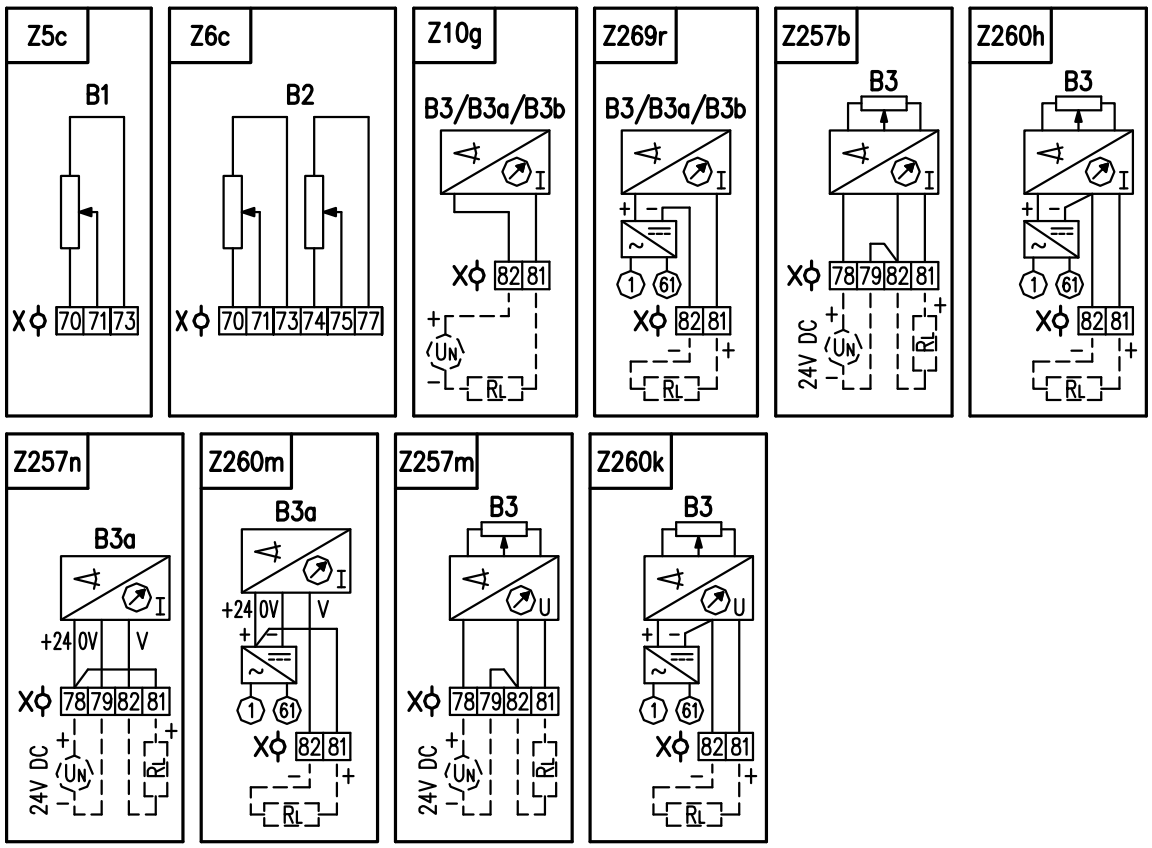
Table 5: spare parts

Name of part - Type	Order number PNm	Pos.	Fig.
Electric motor 1LA7113-4AA11-ZK17;4 kW; Y/Δ 400/230V AC;	63 592 222	M1	1
Electric motor 1LA7107-4AA11-ZK17;3 kW; Y/Δ 400/230V AC;	63 592 223	M1	1
Electric motor 1LA7113-6AA11-ZK17;2.2 kW; Y/Δ 400/230V AC;	63 592 224	M1	1
Electric motor 1LA7106-6AA11-ZK17;1.5 kW; Y/Δ 400/230V AC;	63 592 225	M1	1
Electric motor 1LA7107-8AB11-ZK17;1.1 kW; Y/Δ 400/230V AC;	63 592 226	M1	1
Electric motor 1PP7113-8AB11/K17/IP67;1.5 kW; Y/Δ 400/230V AC;	63 592 258	M1	1
Micro-switch CHERRY DB6G-B1BA	64 051 219 + 64 051 415	20,21	5
Micro-switch CHERRY DB 6G-A1LB	64 051 466	26,27	6, 8
Resistive transmitter RP19; 1x100	64 051 812	92	9
Resistive transmitter RP19; 1x2000	64 051 827	92	9
Resistive transmitter RP19; 2x100	64 051 814	92	9
Resistive transmitter RP19; 2x2000	64 051 825	92	9
CPT transmitter	64 051 781	95	12
Converter	According to version	-	10, 11

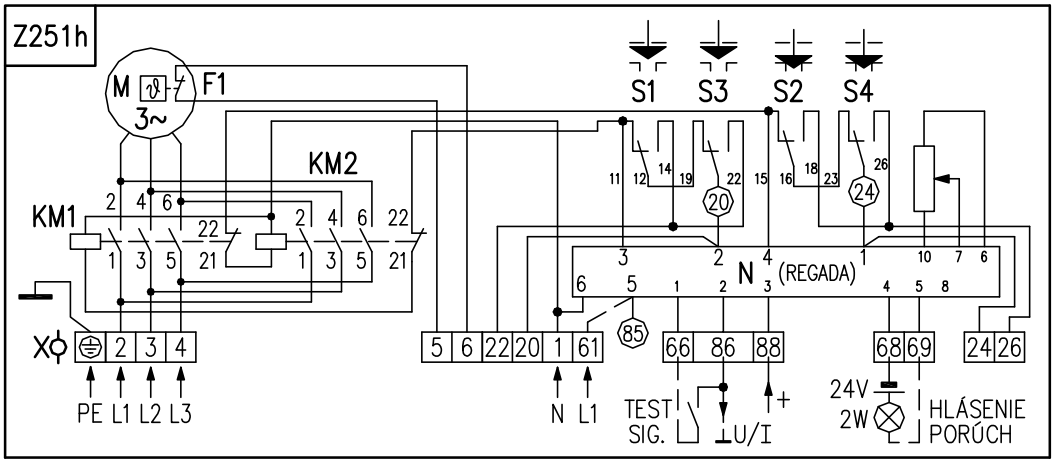
7. Enclosures

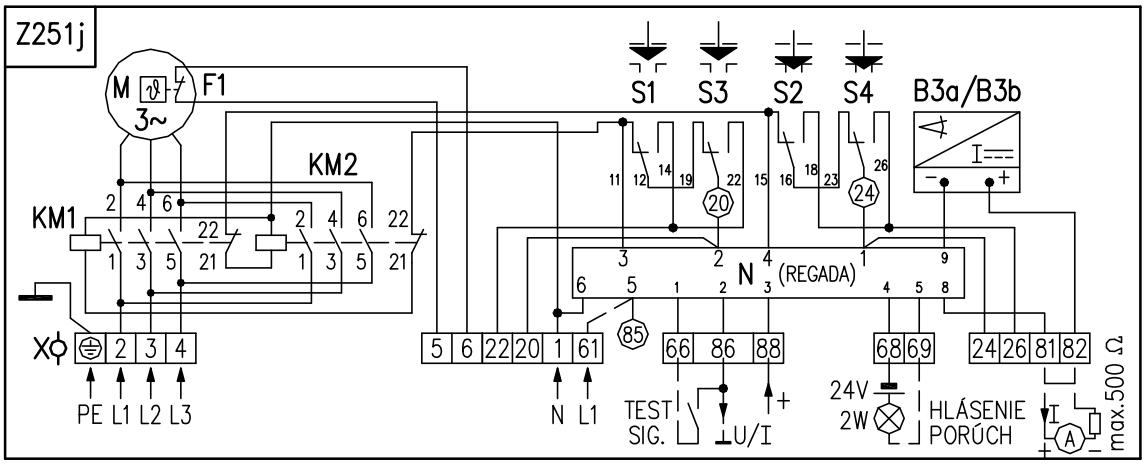
7.1 Wiring diagrams MO 5 – electric connection to terminal box

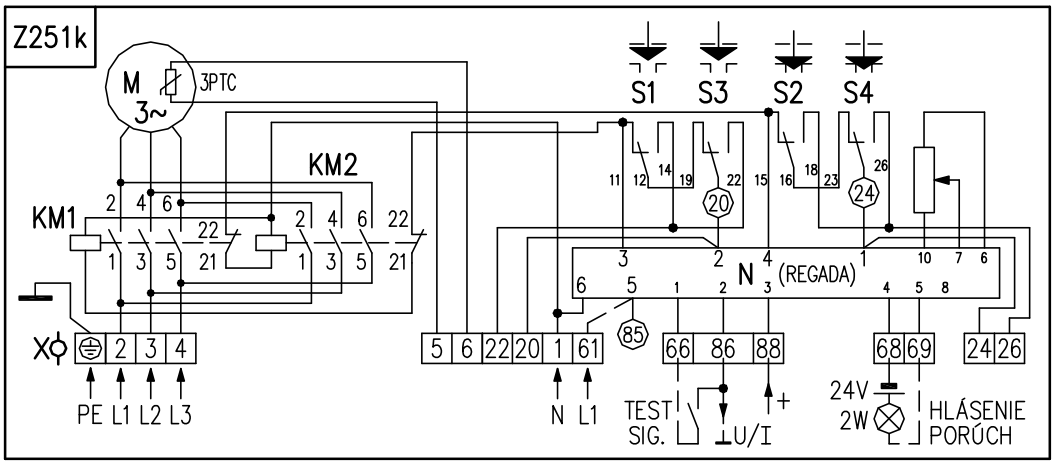


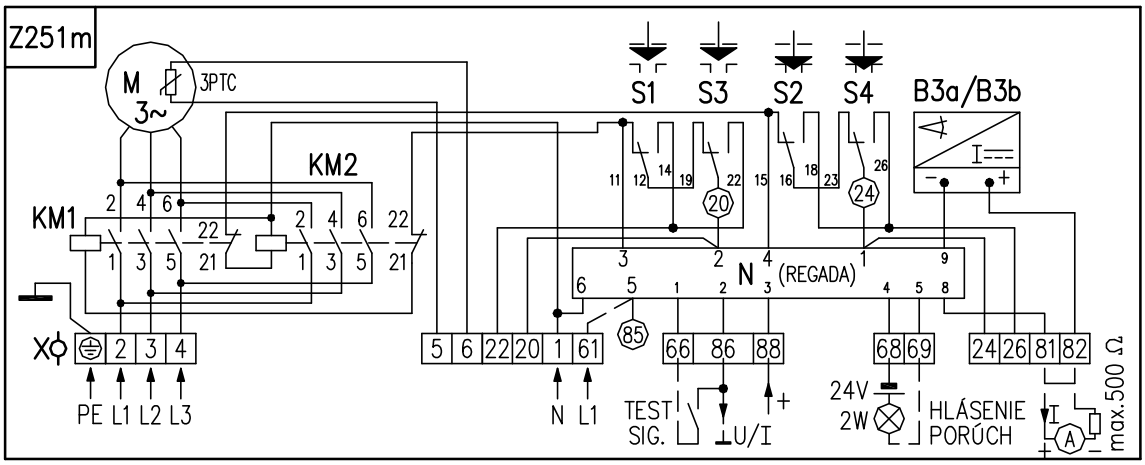

Z5c
B1
70 71 73
Z6c
B2
70 71 73 74 75 77
Z10g
B3/B3a/B3b
82 81
Z269r
B3/B3a/B3b
1 61
82 81
Z257b
B3
78 79 82 81
24V DC
Z260h
B3
1 61
82 81
Z257n
B3a
+24 0V V
78 79 82 81
24V DC
Z260m
B3a
+24 0V V
1 61
82 81
Z257m
B3
U
78 79 82 81
24V DC
Z260k
B3
U
1 61
82 81

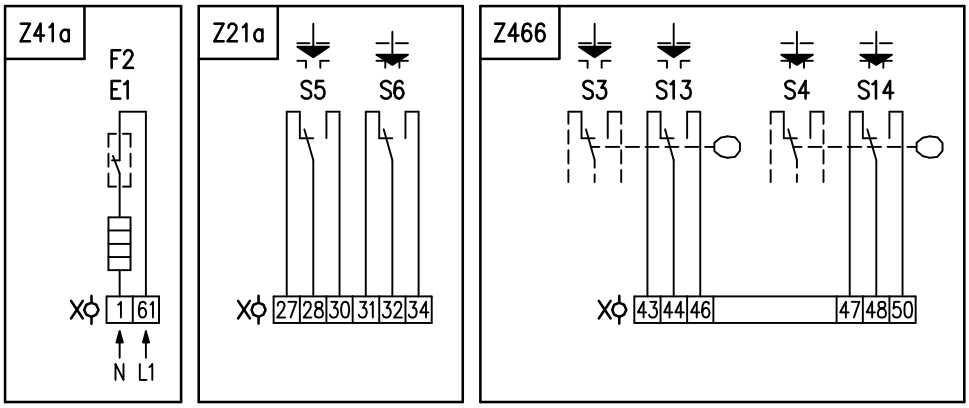
7.2 Wiring diagrams MOR 5 – electric connection to terminal box







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E1
X
1
61
N
L1
Z21a
S5
S6
X
27
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30
31
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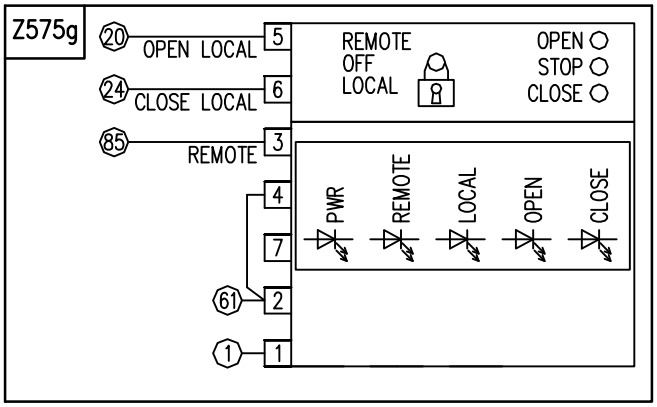
S13
S4
S14
X
43
44
46
47
48
50


Z575g
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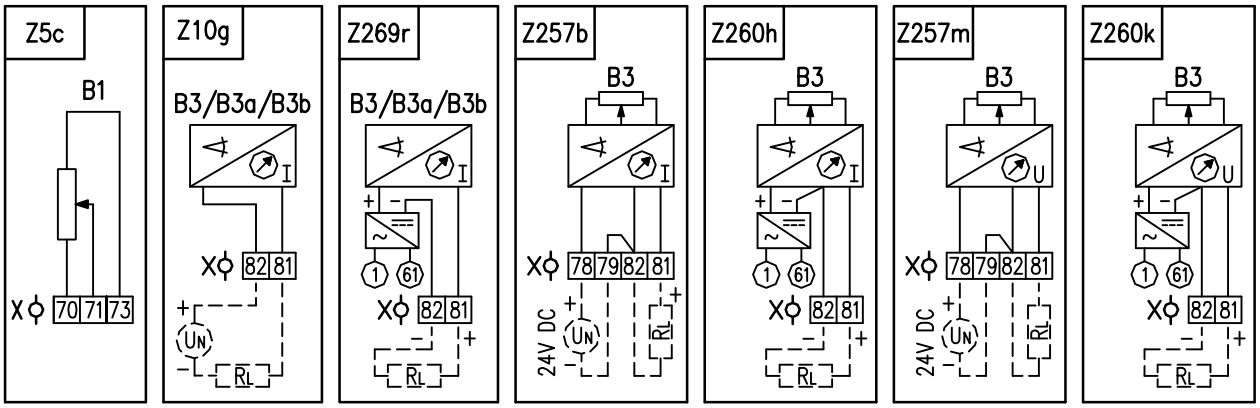
OPEN LOCAL
5
24
CLOSE LOCAL
6
85
REMOTE
3
4
7
61
2
1
1
REMOTE
OFF
LOCAL
OPEN
STOP
CLOSE
PWR
REMOTE
LOCAL
OPEN
CLOSE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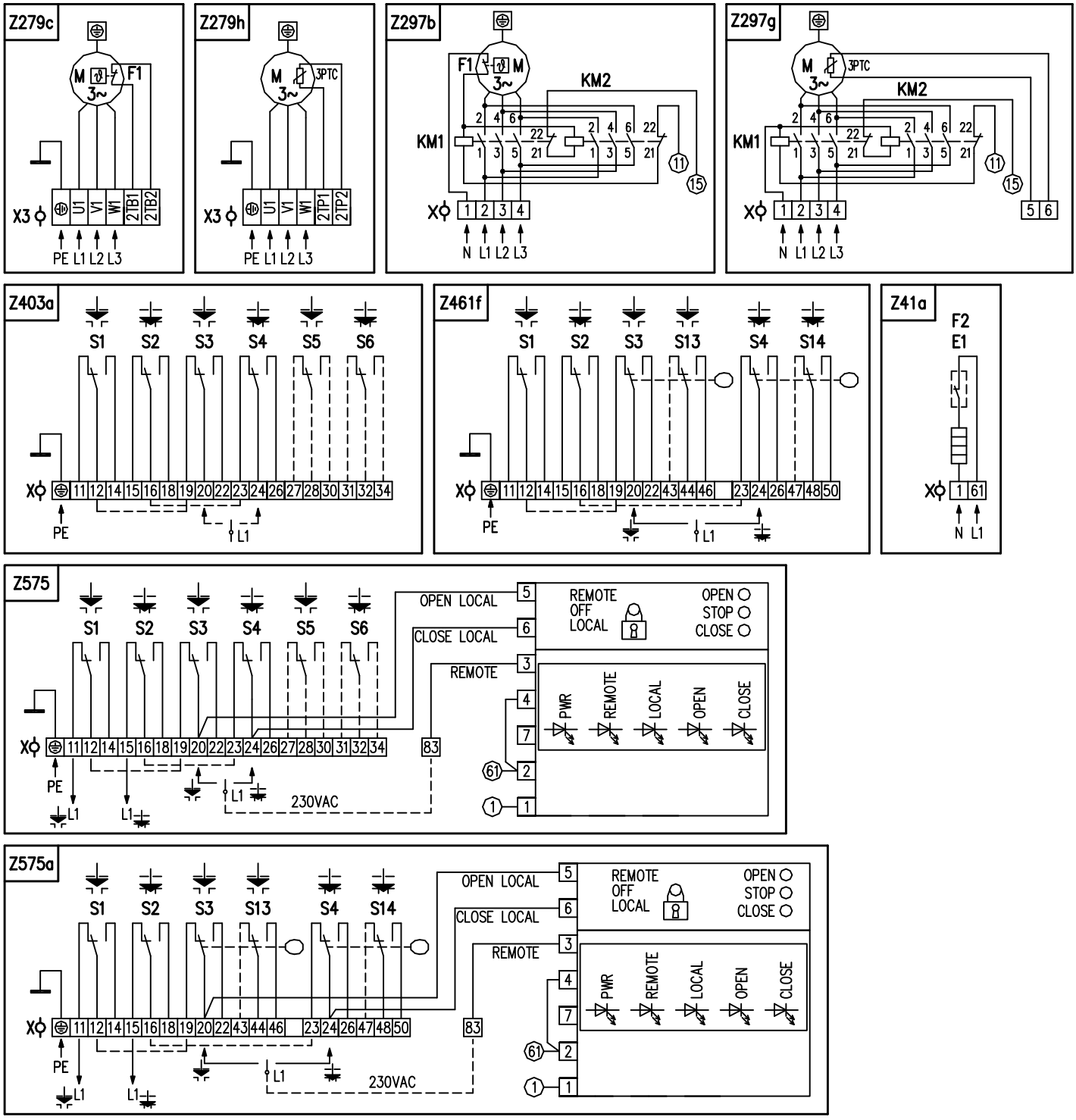
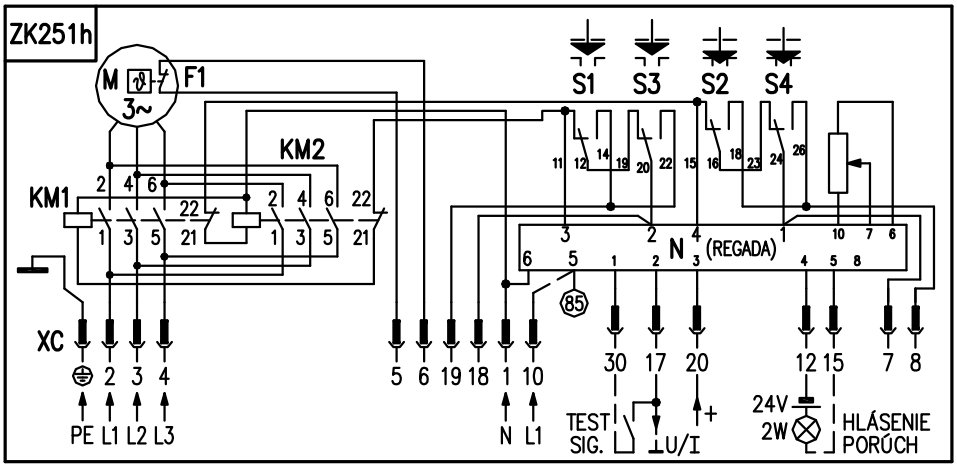
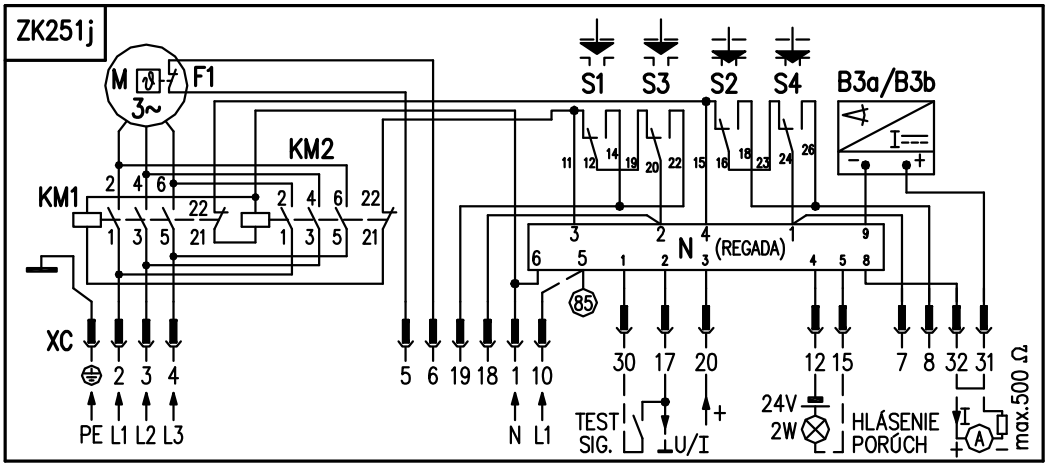
B1
X
70
71
73
Z10g
B3/B3a/B3b
I
X
82
81
UN
RL
Z269r
B3/B3a/B3b
I
1
61
X
82
81
RL
Z257b
B3
I
X
78
79
82
81
24V DC
UN
RL
Z260h
B3
I
1
61
X
82
81
RL
Z257m
B3
U
X
78
79
82
81
24V DC
UN
RL
Z260k
B3
U
1
61
X
82
81
RL

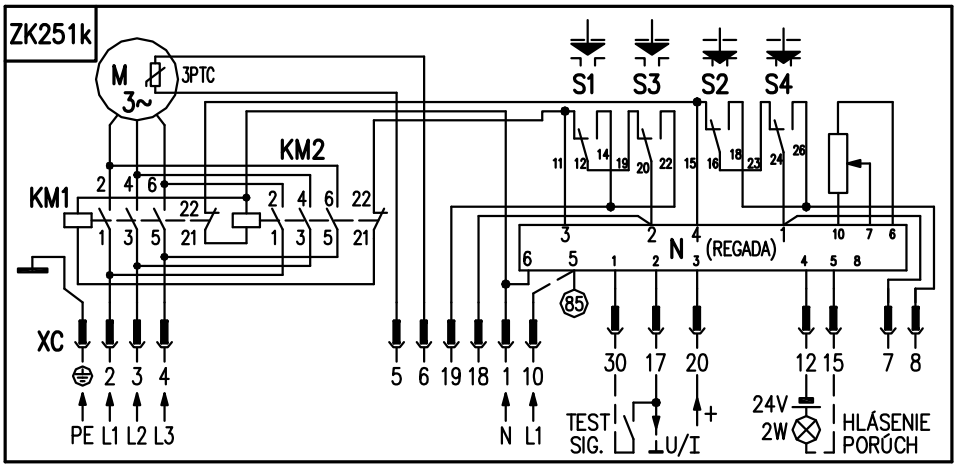
7.3 Wiring diagrams MO 5 – electric connection to connector

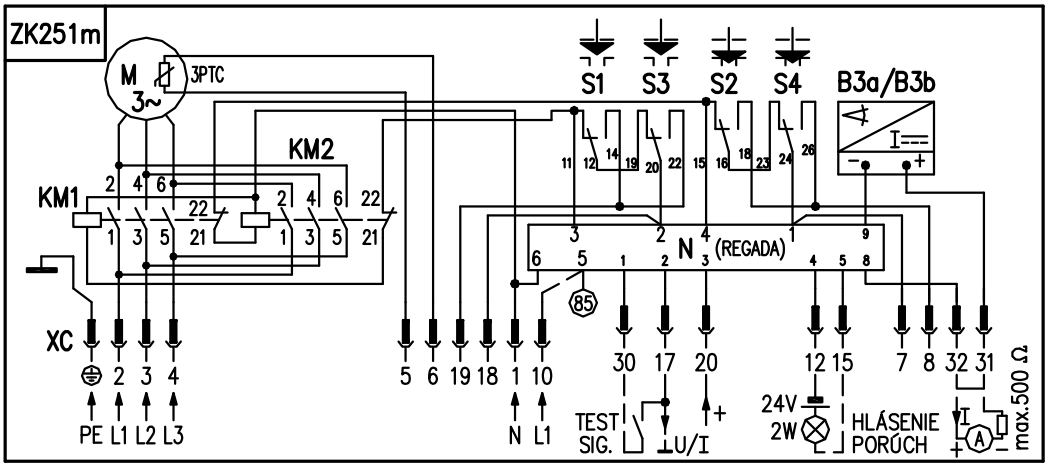


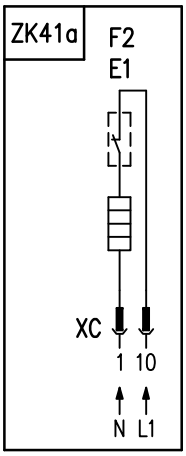
7.4 *Wiring diagrams MOR 5 – electric connection to connector*







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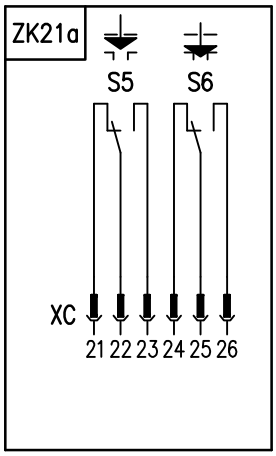
F2
E1
XC
1 10
N L1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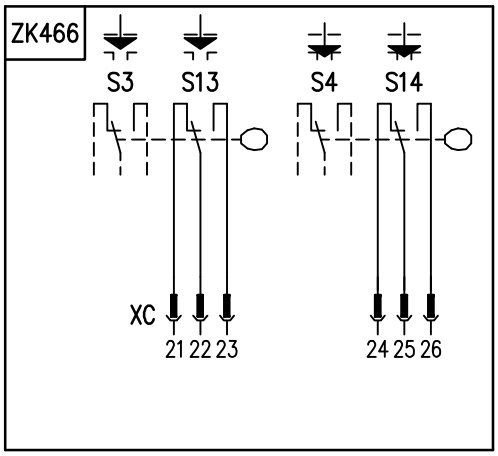
S5
S6
XC
21 22 23 24 25 26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S3
S13
S4
S14
XC
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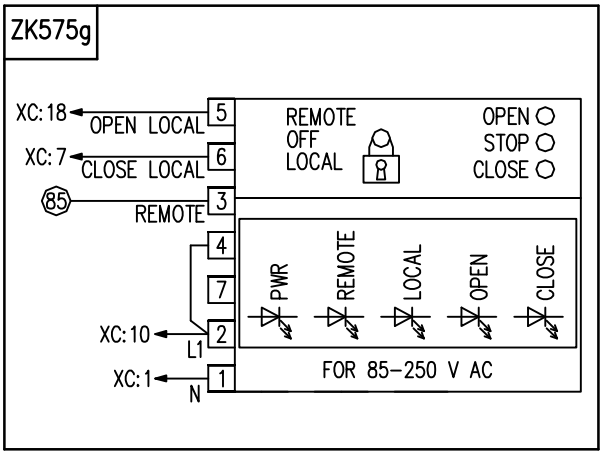
24 25 26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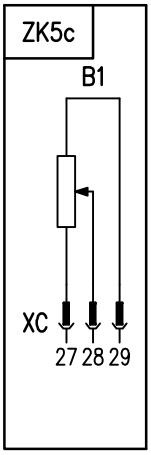
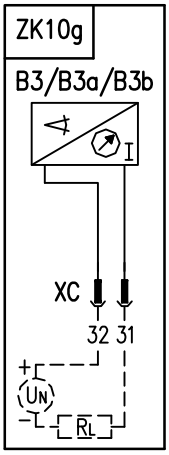
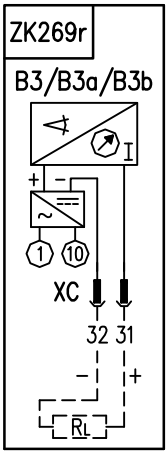
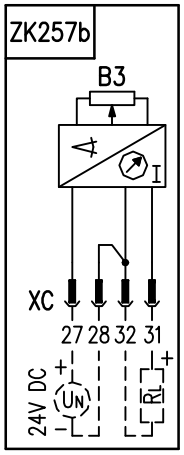
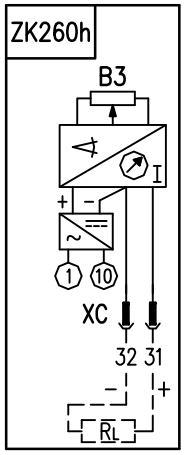
XC:18
OPEN LOCAL
5
XC:7
CLOSE LOCAL
6
85
REMOTE
3
4
7
XC:10
L1
2
XC:1
N
1
REMOTE
OFF
LOCAL
OPEN
STOP
CLOSE
PWR
REMOTE
LOCAL
OPEN
CLOSE
FOR 85–250 V AC

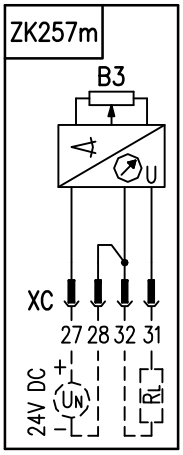

ZK5c
B1
XC
27 28 29

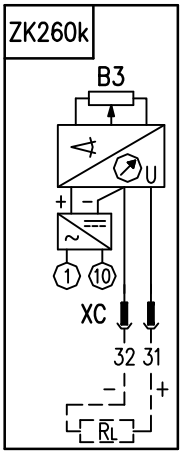

ZK10g
B3/B3a/B3b
I
XC
32 31
UN
RL


ZK269r
B3/B3a/B3b
I
1
10
XC
32 31
RL


ZK257b
B3
I
XC
27 28 32 31
24V DC
UN
RL


ZK260h
B3
I
1
10
XC
32 31
RL


ZK257m
B3
U
XC
27 28 32 31
24V DC
UN
RL


ZK260k
B3
U
1
10
XC
32 31
RL

Legenda:

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 MOR 5
Z41a ….. connection of space heater and space heater's thermal switch for MOR 5
Z251h.... connection of EA MOR 5 with controller for 3-phase electric motor, with contactors, with led out thermal protection – thermo-switches and with controller with resistant feedback
Z251j..... connection of EA MOR 5 with controller with resistant feedback for 3-phase electric motor with contactors, with led out thermal protection – thermo-switches and with controller with current feedback
Z251k.... connection of EA MOR 5 with controller with resistant feedback for 3-phase electric motor with contactors, with led out thermal protection – PTC and with controller with resistant feedback
Z251m... connection of EA MO 5 with controller with resistant feedback for 3-phase electric motor with contactors, with led out thermal protection – PTC and with controller with current feedback
Z257b.... connection of resistive transmitter with current converter – 3-wire without power supply
Z257m... connection of resistive transmitter with voltage converter – 3-wire without power supply with voltage output signal
Z257n.... connection of current capacitive transmitter – 2-wire without 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
Z260m .. connection of current capacitive transmitter – 3-wire with supply
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
Z466..... connection of tandem position switches for EA MOR 5 with controller
Z575..... connection of torque and position switches with electric local control
Z575a.... connection of torque and position switches with tandem position switches and with electric local control
Z575g.... connection of electric local for EA MOR 5 with controller

B1..... resistive transmitter (potentiometer) single
B2..... resistive transmitter (potentiometer) double
B3..... electronic position transmiter (EPV)
B3a..... capacitive transmitter
B3b..... DCPT transmitter
E1..... space heater
F1 ..... motor's thermal protection (not valid for this type of the EA)
F2..... space heater's thermal switch
I/U..... input / output current (voltage) signals
KM1, KM2 ...reverse contactor
M ..... electric motor
N..... controller
PTC..... thermal protection of electric motor - PTC
R_L voltage-dropping resistor
REMOTE-OFF-LOCAL... mode selection button on local control
OPEN, STOP, CLOSE... local control buttons
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"
S13..... tandem position switch "open"
S14..... tandem position switch "closed "
X..... terminal board
X3..... electric motor's terminal board
XC.. ..... connector

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	closed
	12 - 14	open
S2	15 (M3) – 16	closed
	16 – 18	open
S3	19 – 20	closed
	20 - 22	open
S4	23 – 24	closed
	24 - 26	open
S5	27 – 28	closed
	28 – 30	open
S6	31 – 32	closed
	32 – 34	open
S13	43 – 44	closed
	44 - 46	open
S14	47 – 48	closed
	48 - 50	open

Closed contact

Opened contact

<u>Remark 1:</u> The S1, S2 torque switches trip when the set up tripping torque is achieved doesn't matter in which point of the working stroke, it doesn't apply for the set up range of interlocking during EA reversal from any position

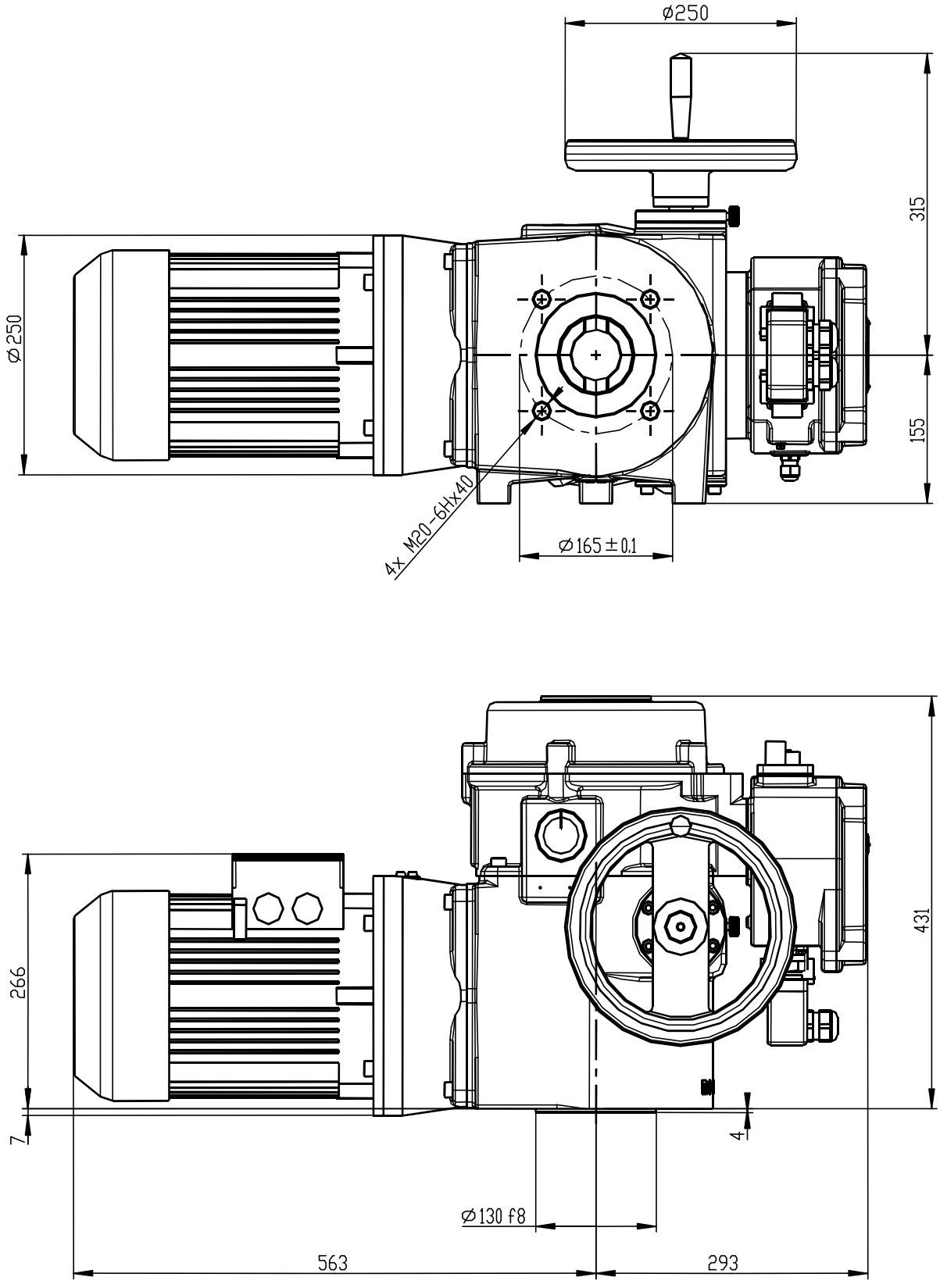
<u>Remark 2:</u> The S5, S6 signaling switches are settable within the range from the end position up to a position corresponding to the 50% of the working stroke. If a larger range for signaling purposes is necessary, the reversal function of the switches is available.

<u>Remark 3:</u> Tandem position switches S13, S14 are switched by one cam together with position switches S3, S4.

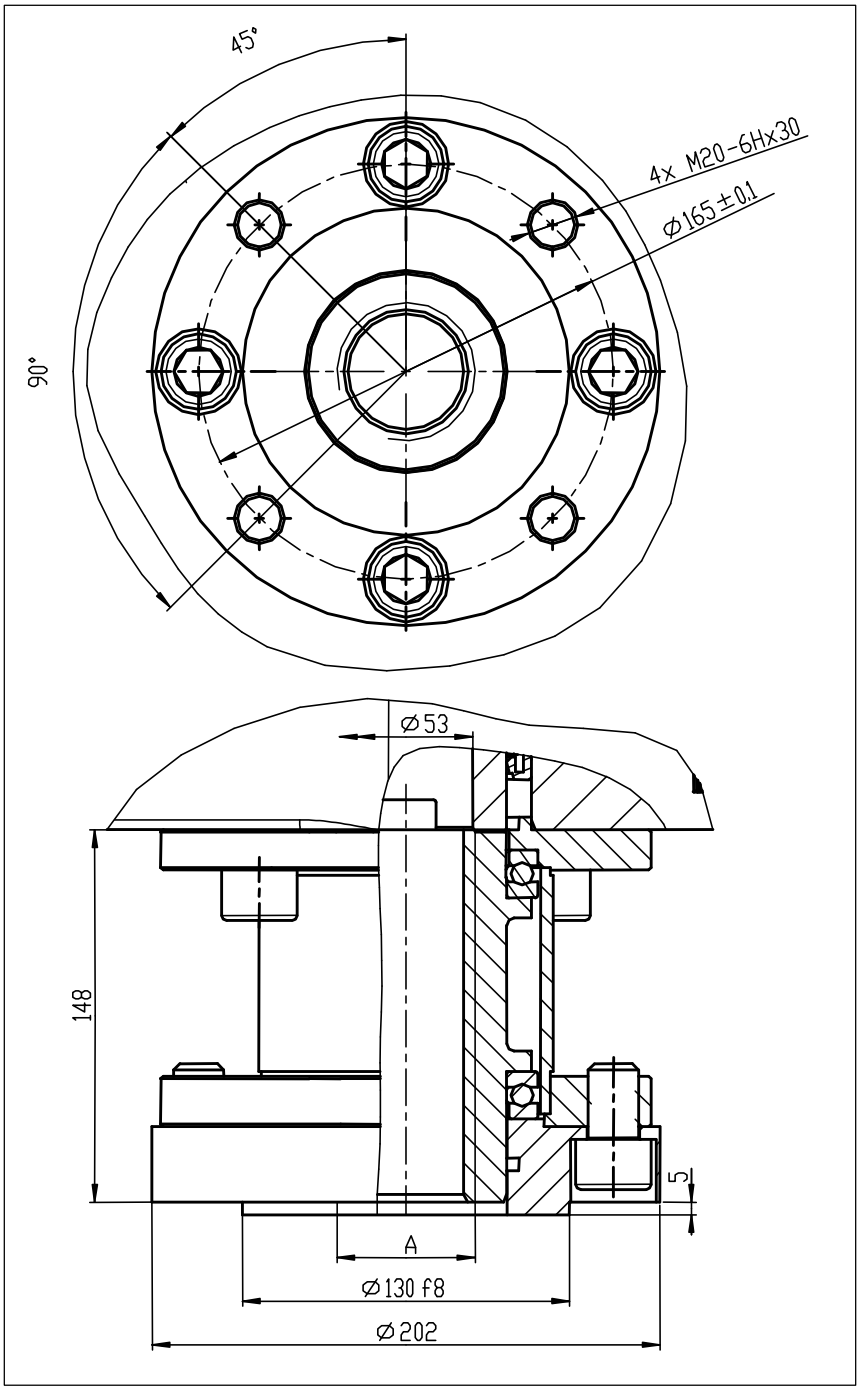
7.6 Dimension drawings

P-1424	EA	MO 5	ISO 5210 F16
P-1424/A	EA	MO 5	ISO 5210, shape A
P-1424/B	EA	MO 5	ISO 5210, shape B3
P-1424/C	EA	MO 5	ISO 5210, shape C
P-1424/D	EA	MO 5	ISO 5210, shape D
P-1425	EA	MO 5	GOST 34287-2017, ϕ220/4xM20
P-1425	EA	MO 5	shape five toot 35°/37°

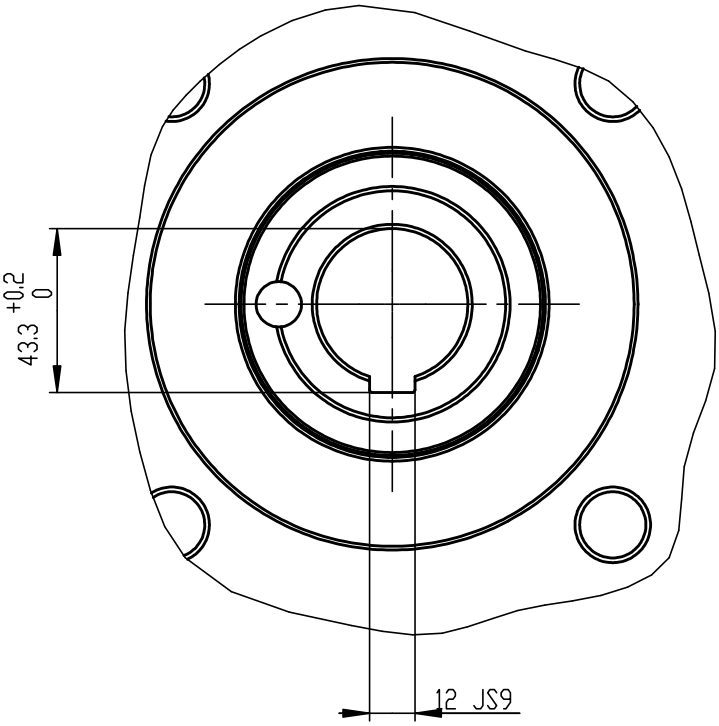
Dimensional connection drawings according to GOST 34287-2017

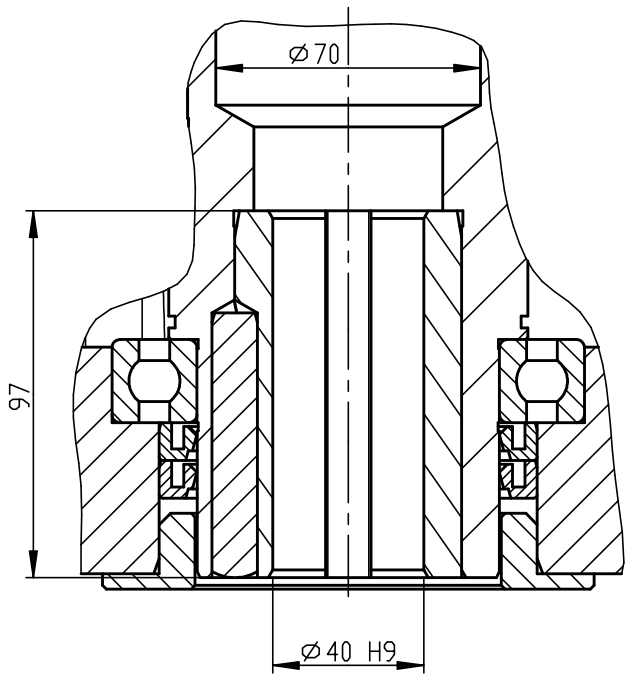


P-1424

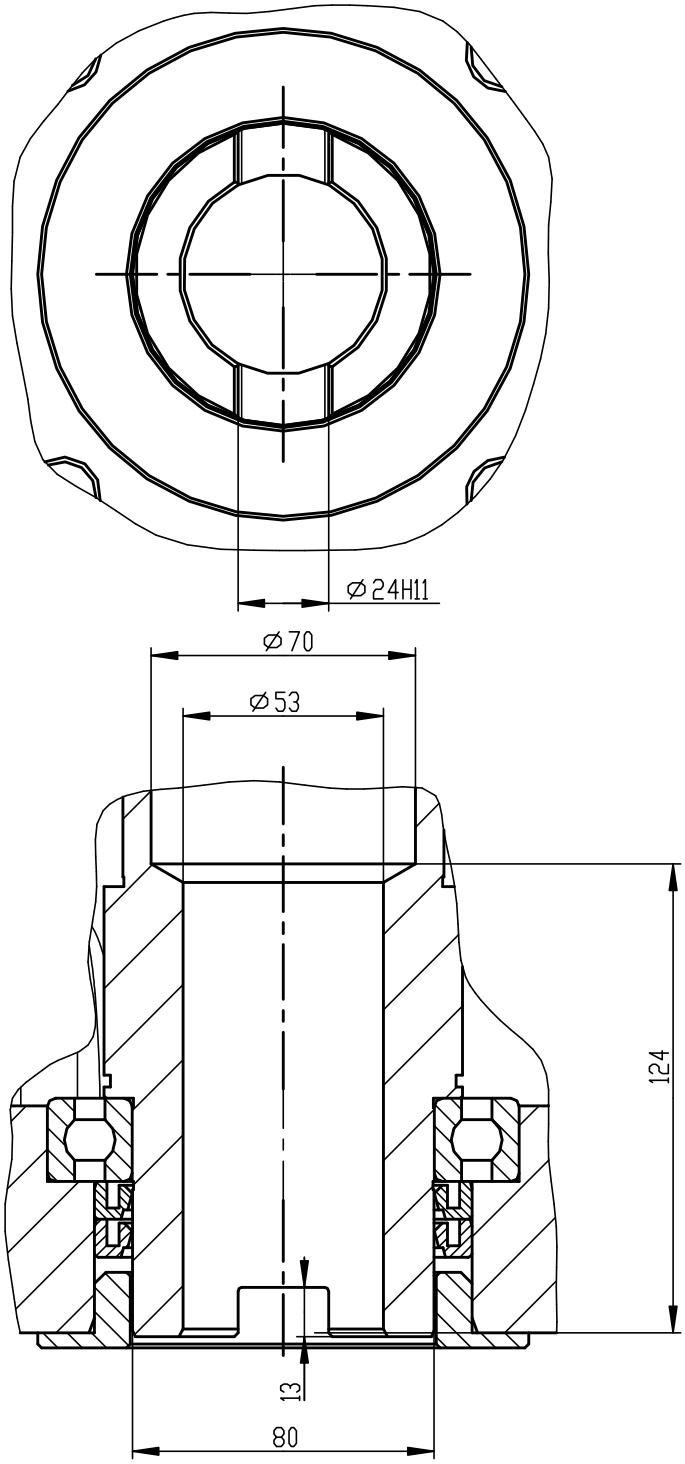


Dimension A is in table of version

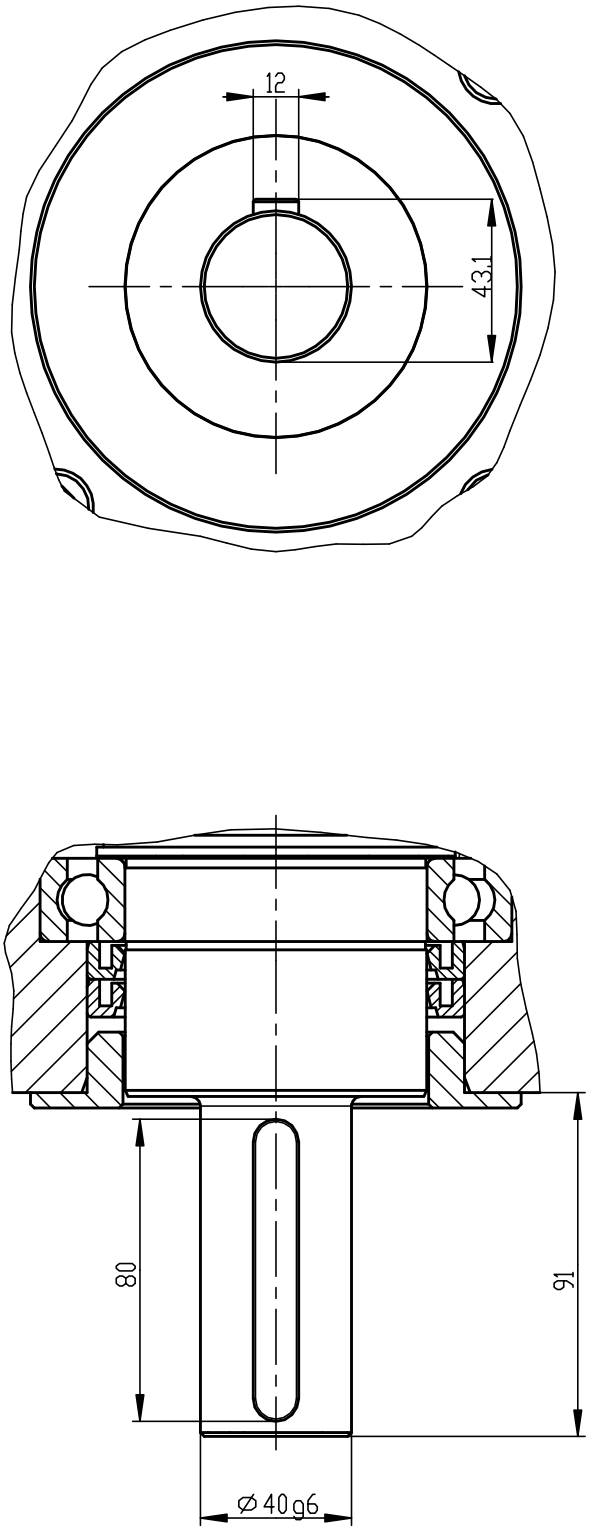




P-1424/B

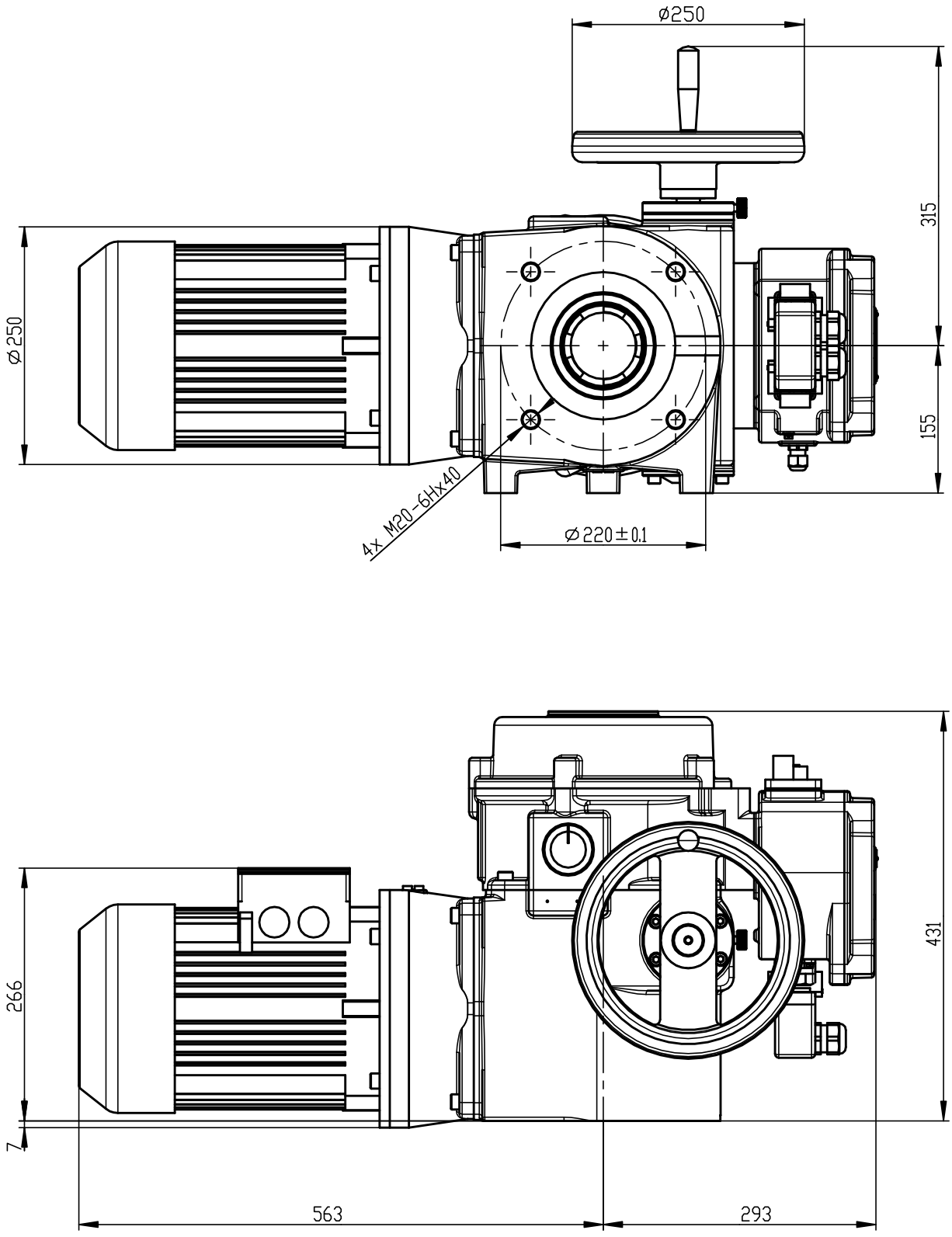


P-1424/C

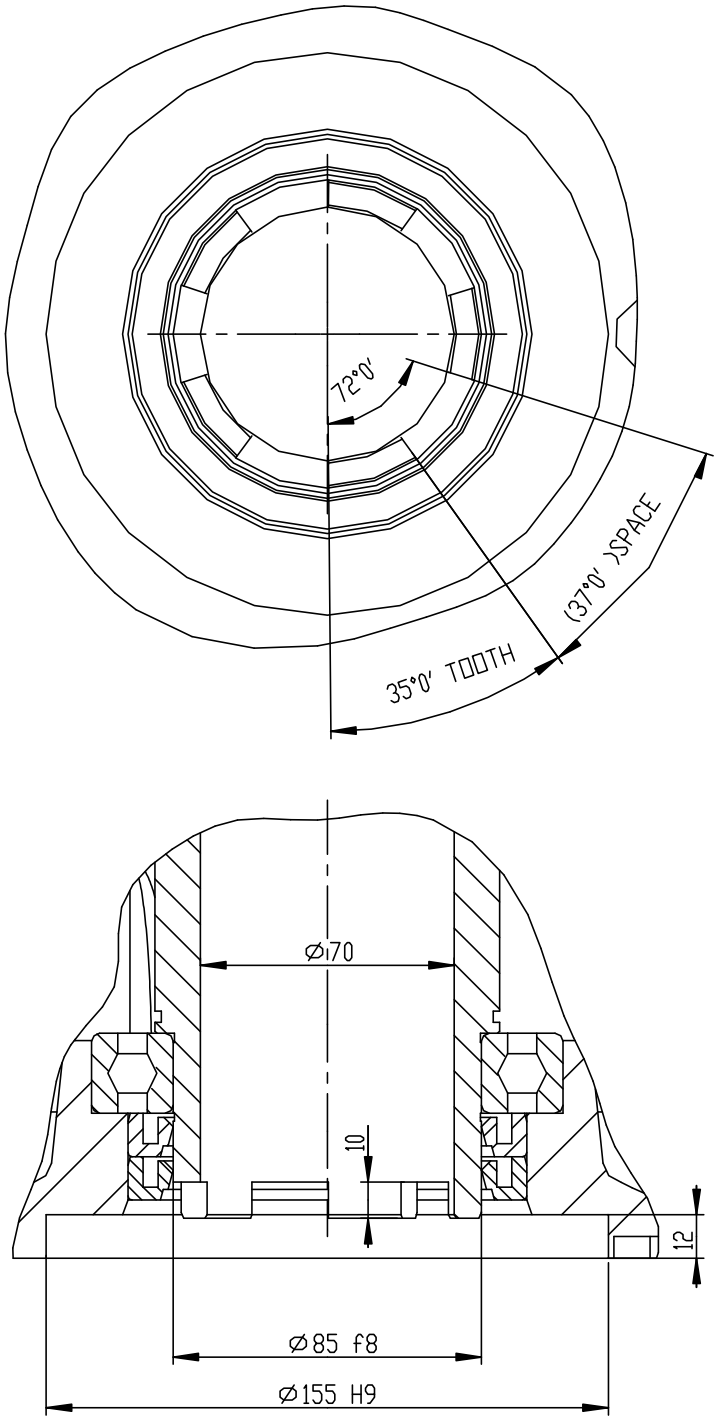


P-1424/D

Dimensional connection drawings according to GOST 34287-2017.



P-1425



P-1425

7.7 Guarantee service check report

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

7.8 *Post guarantee service check report*

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

7.9 Commercial representations

Slovak Republic:

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

Czech Republic:

Exclusive representation Regada, s.r.o. (Ltd.) for sale of electric actuators
Regada Česká, s.r.o.
Nám. 5. května 17,
252 25 Jinočany,
PRAHA – západ,
Tel.: +420 257 961 302
Fax: +420 257 961 301