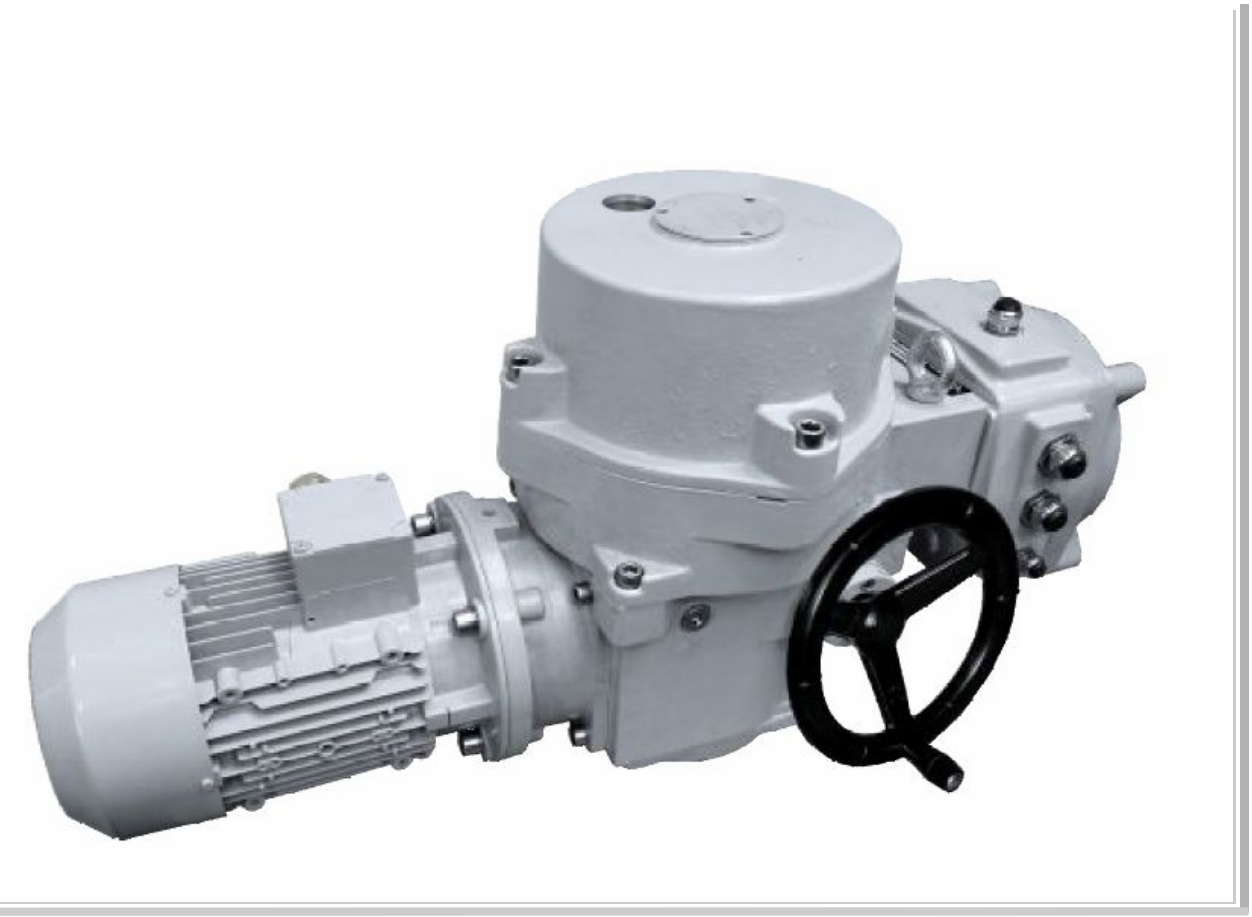
# INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS



## Electric multi-turn actuators MO 4

REGADA®

74 1207 02

**TEST CERTIFICATE**

ELECTRIC PART-TURN ACTUATOR MO 4

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

Serial number .....  Switching-off torque ..... Nm

Production year .....  Adjusted switching - off torque ..... Nm

Wiring diagram .....  Operating speed ..... $min^{-1}$

.....  Adjusted number of operating speed .....

.....  Transmitter (potentiometer) .....

Warranty period ..... months  Input operating signal .....

Serial number of electric motor .....

Serial number of transmitter .....

Serial number of position controller .....

Tests made in accordance with TP 74 1206 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!*

## *Contents*




*Edition: 11/2021* *Ev. Nr.: 74 1207 02*

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 4** only are high performance electro-mechanical products, designed for direct assembly on controlled devices (regulating bodies - valves, etc.). EA are designed for remote control of armatures by reversing rotary motion in both directions of their movement. EA **MO 4** with controller 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 and coupling shape according to ISO 5210, DIN 3338, or in accordance with GOST R 55510-2013.

1. *It is prohibited to use EA as lifting device!*
2. *The option of switching EA via semi conductive trigger switches must be consulted with the actuator manufacturer.*
3. *With EA having a built-in controller, in end position it is impossible to expect that the tight closing will be achieved by means of control signals.*

### *1.2 Safety instructions*

***EA of MO 4 types are reserved technical devices with higher rate of danger, with possibility of installation in areas specially danger regarding casualties caused by electric current.***

Electric actuators are according to directive LVD 2014/35/EU and standard EN/IEC 61010-1:2010 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 61000-6-4+A1, EN/IEC 61000-6-2, EN/IEC 61000-3-3 and EN/IEC 61000-3-2, according to valid certificates

**Vibrations caused by the product:** product influence is negligible.

**Noise produced by the product:** The maximum allowable noise level (A) of the product measured in a place of operation is 80 dB (A)

**Environment hazard:** the product involves a mineral oil fill or synthetic lubricant 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.

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

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

### Instructions for stuff training

*Service can be performed only by workers professionally qualified and trained by the producer or contracted service centre.*

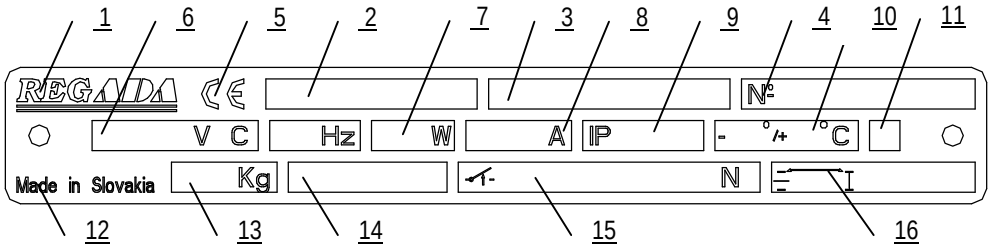
**Warning for safety use**
**Product protection**

EA MO 4 does not have own short-circuit protection, therefore there must be included suitable protective device into the supply power (circuit breaker, or fuse), which serves at the same time as main switch. For protection, we recommend to use a fuse type "T" or a contactor type "C".

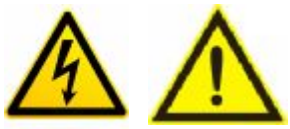
**Type of equipment from a connection point of view:** The equipment is designed for permanent connection**.**

## *1.3 Data specified on electric actuator*

**Nameplate:**



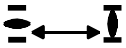

**Warning plate:**



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

**Graphic symbols on electric actuator**

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

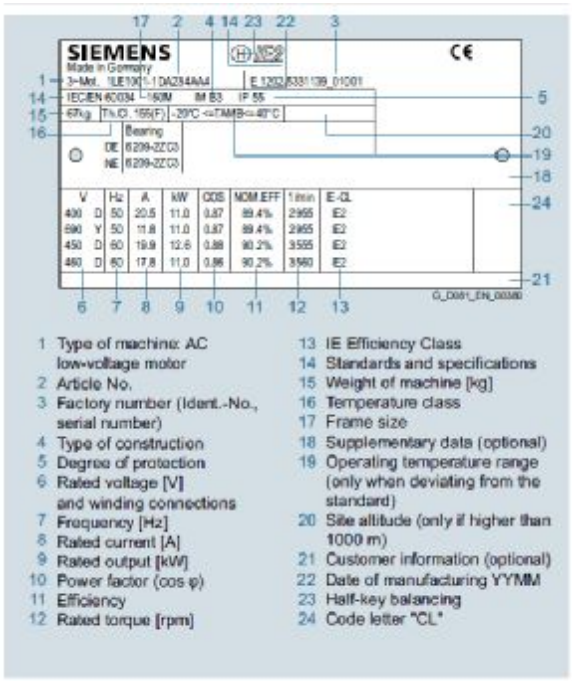
| | | |
|---|---|---|
|  | Dangerous voltage | (EN ISO 7010-W012) |
|  | CAUTION! [1)] | (EN ISO 7010-W001) |
|  | Stroke of the electric actuator | |
|  | Switching-off torque | |
|  | Manual control | (0096 ISO 7000) |
|  | Protection terminal | (5019 IEC 60417) |

[1)] See. chapter 3.1.2

| | | | EN 15714-2:2009 |
|---|---|---|---|
| 1 | Logo výrobcu; meno výrobcu/ dodávateľa a/alebo obchodná značka | | *Manufacturer/supplier's name and/or trade mark* |
| 2 | Typ, označenie výrobku; modelový typ a označenie | | *Model type and designation* |
| 3 | Objednávací kód; objednávacie číslo | | *Order code; actuator commission number* |
| 4 | Výrobné číslo servopohonu /mes./rok (...../MMYY - odkaz na rok výroby) | | *Actuator serial number and reference to year of manufacture* |
| 5 | Znak CЄ | | *CЄ marking* |
| 6 | Motor: Napájacie napätie/typ prúdu/ frekvencia; napätie, typ prúdu a frekvencia (keď je aplikované) | V/AC/Hz V/DC | *Voltage, current type and frequency (when applicable);* |
| 7 | Menovitý výkon elektromotora; nominálny výkon elektromotora (kW) | W/kW | *Nominal motor power (kW);* |
| 8 | Menovitý prúd elektromotora; nominálny prúd elektromotora (A); | A | *Nominal motor current (A);* |
| 9 | Stupeň krytia / kód IP; ochrana krytom (IP označenie) | IP66/68 | *Enclosure protection (IP designation);* |
| 10 | Pracovný rozsah teploty okolia; rozsah okolitej teploty | °C | *Ambient temperature range* |
| 11 | Trieda izolácie elektromotora | F | *Motor insulation class* |
| 12 | Vyrobené ..... | | *Made in ....* |
| 13 | Hmotnosť | Kg | *Weight* |
| 14 | Ovládacia rýchlosť/záverná doba; doba prevádzky ES alebo rýchlosť | MM/MIN 1/MIN; S/90° | *Actuator operating time or speed* |
| 15 | Rozsah vypínacích momentov / sily; menovitý moment servopoh. (Nm)/sila (kN) | Nm/kN | *Actuator rated torque (Nm) / thrust (kN);* |
| 16 | Pracovný zdvih/výstupné otáčky; pracovný uhol (len pre jednoot. ES) | mm;ot.;°<) | *Angular stroke (for part-turn actuators only)* |
| | Ovládanie: napájacie napätie/prúd | | |
| | Vysielač: napájacie napätie/prúd | | |
| | Ochrana pre prostredia s nebezpečenstvom výbuchu (ak je aplikovaná) | | *Hazardous protection (when applicable);* |
| | Bezpečnostná funkcia (ak je aplik.) | | *Fail safe action (when applicable);* |
| | Príkazové značky/symboly/znaky/ označ. | | *Mandatory marks* |
| | Zaťažovacia klasifikácia/režim a zaťažovateľ | | *Duty classification and cyclic duration factor;* |
| | Odkaz na túto európsku normu | | *Reference to this European Standard* |
| | Označenie pripojenia servopohonu (EN ISO 5210 alebo EN ISO 5211) | | *Actuator attachment designation (EN ISO 5210 or EN ISO 5211)* |
| | Korózna kategória (napr. C2) | | *Corrosion category (e.g. C2)* |
| | Typ maziva prevodovej skrine | | *Gear case lubrication type* |
| | Identifikácia výrobnej schémy zapojenia | | *Manufacturer's wiring diagram identification* |

## Electric motor nameplate:

Electric motor series: 1LE




| |
|---|
| 1 - Typ stroja: AC motor pre nízke napätie |
| 2 - Kód výrobku |
| 3 - Výrobné číslo (identifikačné č., sériové číslo) |
| 4 - Typ konštrukcie |
| 5 - Stupeň ochrany krytom - IP kód |
| 6 - Menovité napätie (V) a zapojenie vinutia |
| 7 - Frekvencia (Hz) |
| 8 - Menovitý prúd (A) |
| 9 - Menovitý výstupný výkon (kW) |
| 10 - Účinník (cos φ) |
| 11 – Účinnosť (%) |
| 12 - Menovité otáčky (otáčky za minútu) |
| 13 - IE trieda účinnosti |
| 14 - Normy a špecifikácie |
| 15 - Hmotnosť stroja (kg) |
| 16 - Teplotná trieda |
| 17 - Veľkosť kostry |
| 18 - Doplnkové údaje (voliteľné) |
| 19 - Rozsah pracovnej teploty (len keď sa líši od štandardnej) |
| 20 - Nadmorská výška inštalácie (len ak je vyššie než 1000 mn.m.) |
| 21 - Zákaznícka informácia (voliteľné) |
| 22 - Dátum výroby YYMM |
| 23 - HALF - KEY vyváženie |
| 24 - Kódové označenie "CL" |

## *1.4 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.

## *1.5 Under-guarantee and after-guarantee service*

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

**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.

### *1.5.1 Lifetime of actuators*

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

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

## *1.6 Operation conditions*

### *1.6.1 Product location and operation position*

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

**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 EA is possible in **any position.** Vertical position of output part axis and with the control part above the valve is usualWhen mounting, it is necessary to consider the space for removing cover of the control box and terminal box.

### *1.6.2 Operation environment*

**According to valid standard IEC 60 721-2-1, there are delivered these versions of electric actuators:**
1) Version **„standard“** for type climate temperate
2) Version **„tropical wet“** for type climate tropical wet
3) Version **„cold“ -** for type climate cold
4) Version **„tropical dry and dry“** for type climate tropical dry and dry
5) Version **„marine“** for type climate marine
6) Version **„arctic“** for type climate arctic.

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

- warm mild to hot dry with temperature -25°C to +60°C ..... AA 6*+AA 7*
- cold, warm mild to hot dry with temperatures -50°C to +40°C ..... AA 8*
- cold to hot dry with temperatures in range -60°C až +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 15÷100%, including condensation with maximum content 0,036kg of water in 1kg of dry air , with temperatures stated above ..... AB 8*
- with relative humidity 1 to 100 %, including the condensation of up to 0,035 kg water content per 1 kg of dry, 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 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 35 but not more than 350 mg/m$^2$ per day (products with protection enclosure of IP 5x) ..... AE 5*
- with strong dustiness – with a possibility of influences of inflammable, non-conducted and non-explosive dust; the middle layer of dust; the dust drop more than 350 but not more than 1000 mg/m$^2$ 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*

### *1.6.3 Power supply and operating mode*

**Supply voltage:**

Electric motor .....Y/Δ; 400 / 230V AC respectively Y/Δ; 380 / 220V AC ±10% (other - after agreement with manufacturer)
Control ..... 230 V AC ±10%
Supply voltage frequency ..... 50* Hz ±2%

**Duty cycle** (according to EN 60034-1 within valid edition)**:**

**EA MO 4** designed for remote control are designed for :

- short-time operation **S2-15 min**
- intermitted operation **S4-25%, 6 up to 90 cycles per hour**

**EA MO 4** designed for **automatic regulation** via analogue signals are designed for :

- intermitted operation S4-25% with min. number of starts according to the following table:

| Rated torque ranges [Nm] | Modulating with reverse contactors [starts per hour] | Continuous modulating with contactless switching [starts per hour] |
|---|---|---|
| 101-700 | 600 | 1800 |

Notes: 1. The operation modes consist of the loading type, load factor and connection/switching frequency.
*2. EA MO 4 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.*

## *1.7 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 are delivered in solid packages guaranteeing resistance in accordance with EN/IEC 60 654 -1 and EN/IEC 60 654-3.

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

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

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

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 %.

***Warning:***

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

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

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

The product, 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 4 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 |
| Electrical connection | Modul M5 | – | terminal box |
| Local control | Modul M6 | – | local control Fig. 3b) |

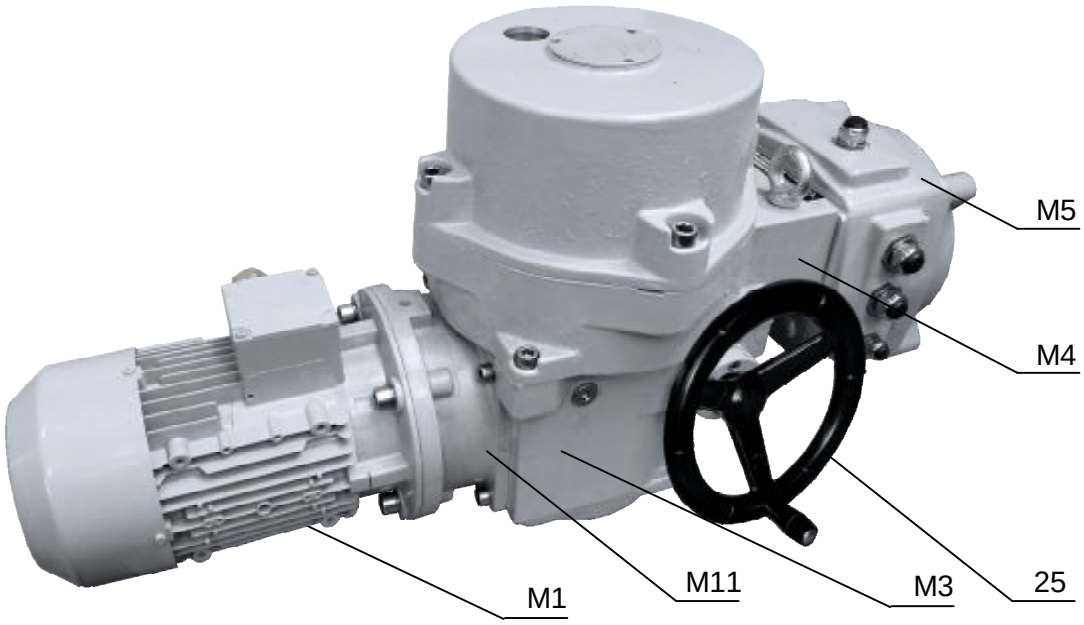



**Fig.1**

## Power part

**Module M1 – electric-motor**

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

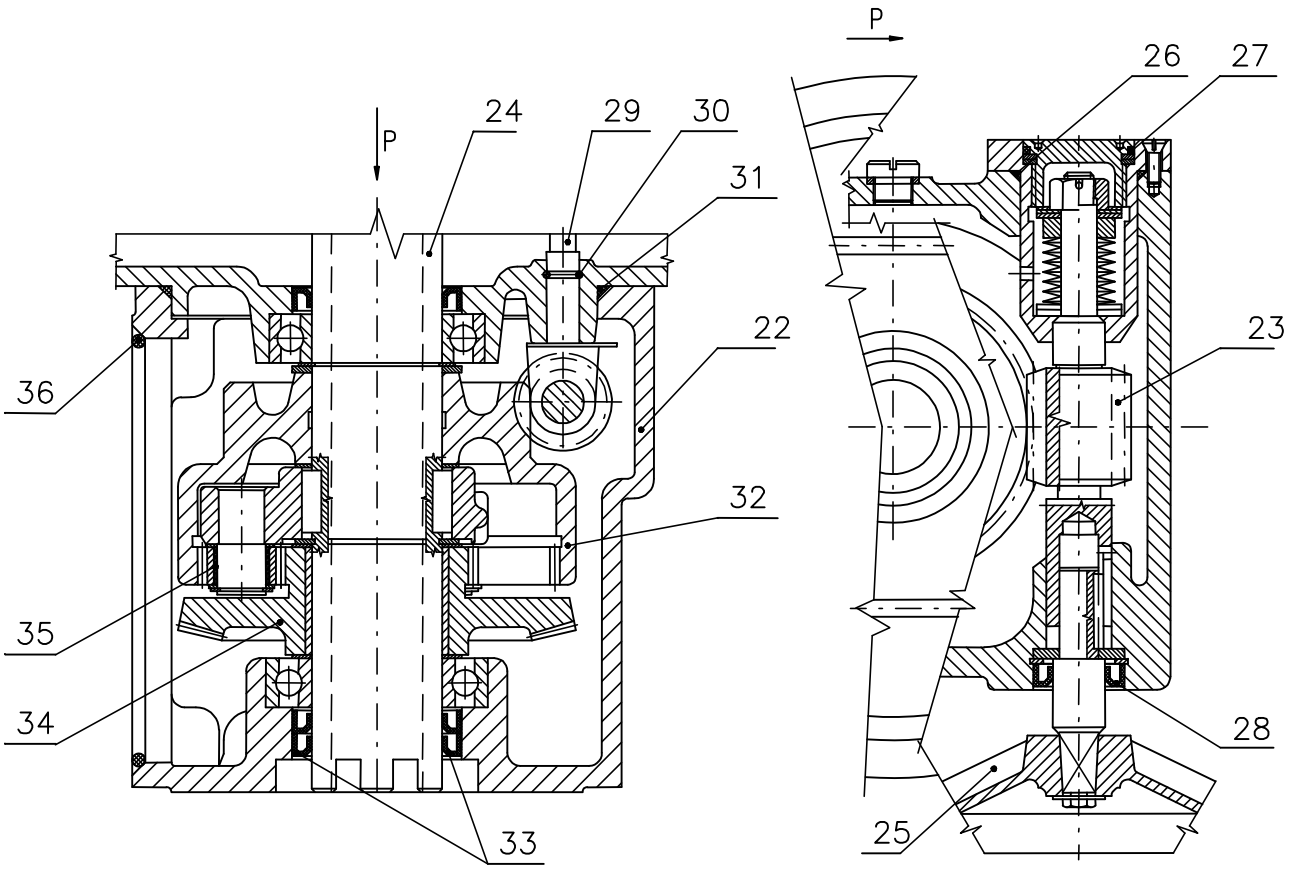
**Module M11 – countershaft transmission with rotary hold**

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

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

**Modul M 3 – force 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.




## Control part

**Module M 4 – control box (Fig. 1)**

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

The bottom part of control box closes the box of force transmission and forms carrying part of control plate (46) Fig.3a.

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

- power supply board (9)
- signalling unit with gear unit and location indicator (1)
- torque unit (7)
- transmitter unit (4) with electronic positional transmitter (3) and with power supply (5) (according to EA specification)
- heating resistor (2) with thermal switch (8)
- controller (only for EA MO 4 with controller) (14)
- reversing contactors (13) (according to EA specification)

**Module M5** - terminal case (pic. 1), enable terminal board electric connection between terminal board (58) located in terminal case (pic. 3b) and cable glands (7) (pic. 3b) or connector and cable glands.

**Module M6** - local control (pic. 3b) (according to electric actuator specification) is located in terminal case and connected with control board.

**Position unit (9, Fig. 3a)**

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

**Signalling unit with gear unit**

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

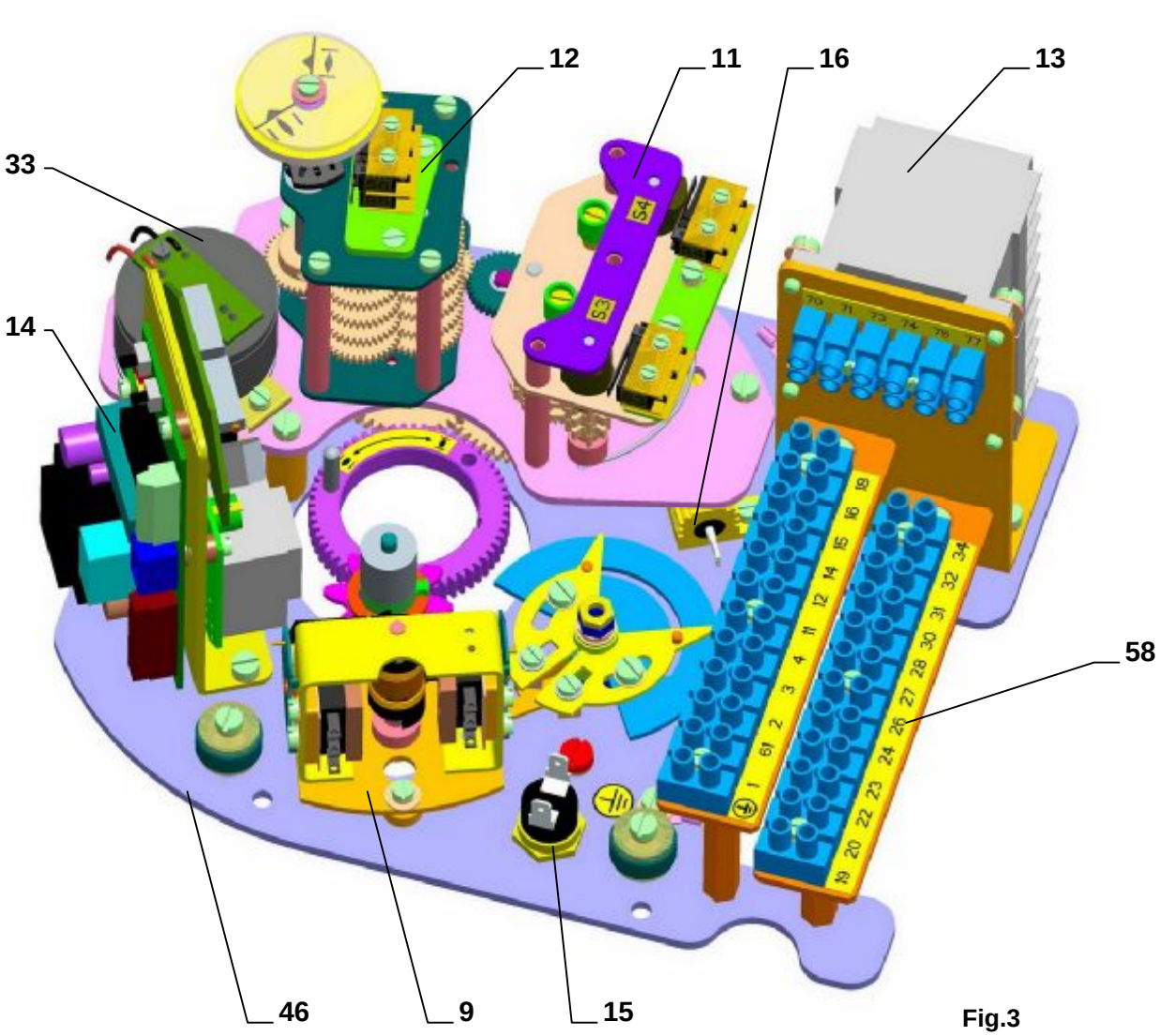



Fig.3

**Transmitter unit** (4, obr. 3a) реобразователь (3) и источник питания (5) (согласно спецификации ЕС)
s prevodníkom (3) a so zdrojom (5) (podľa špecifikácie ES)

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 (2, 8, Fig. 3a)**

EA is equipped with a heating resistor (2) having a built-in thermal switch (8, Fig. 3a) of a total power of about 25W. It is intended to prevent water vapour condensation and provide for the proper ambient for the proper function of built-in electric control parts of EA in the case of EA low temperatures.

**Controller**

EA of the **MO 4** with controller type are equipped with an electronic controller intended for controlling EA by means of input standardized signals.

**Reversing contactors**

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

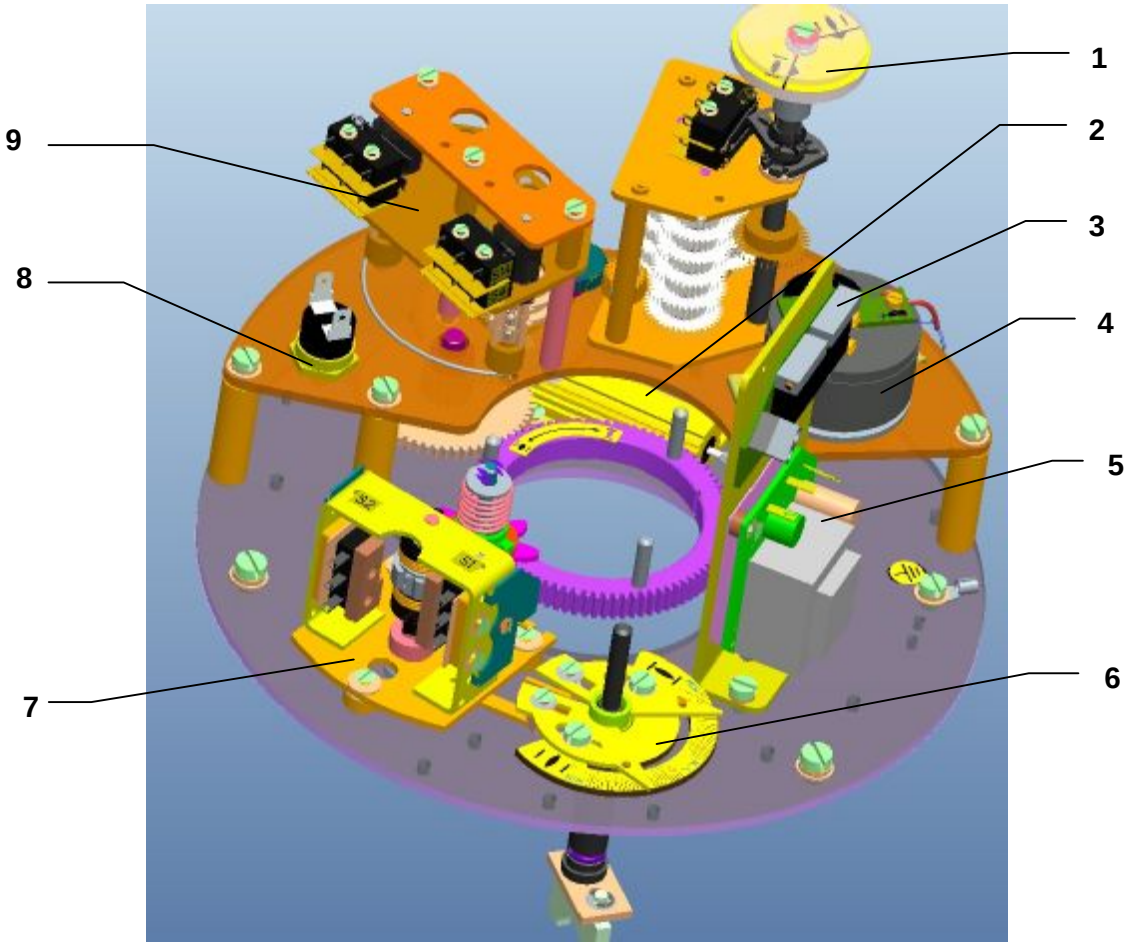



Fig.3a

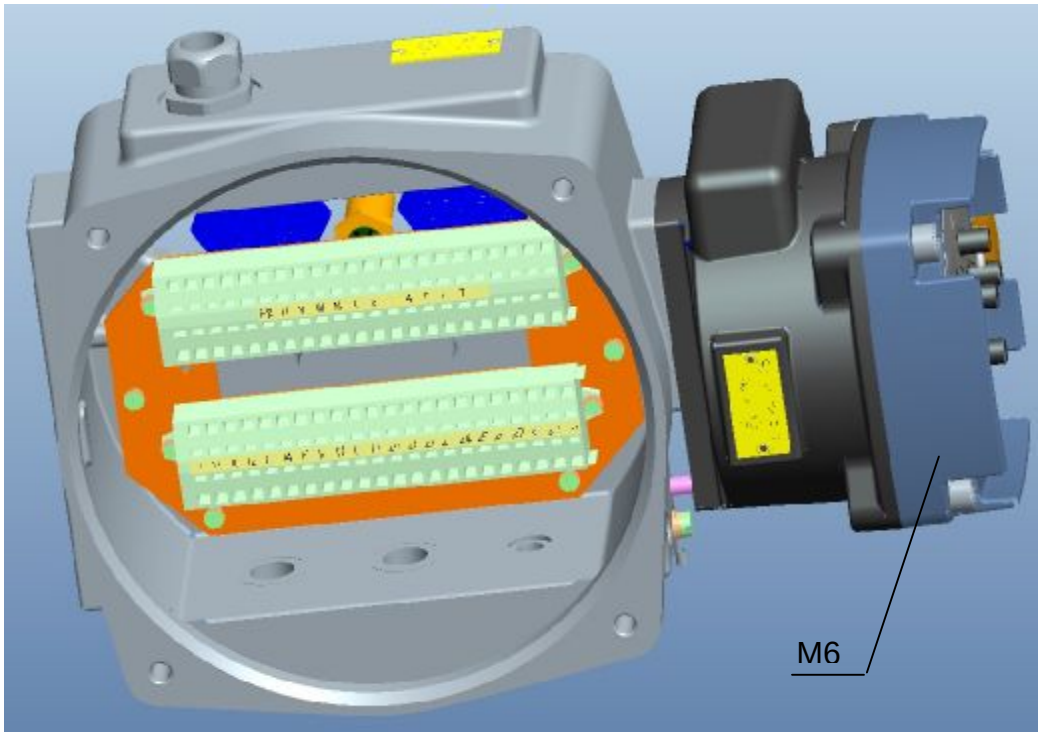



Fig.3b

## *2.2 Technical data*

Basic technical data of EA are presented in table Nr.1

Table Nr.1

| Type/ type number | Control speed ±10[%] | Switching - off torque ±10 [%] | Max. load torque | | Operating stroke | | | | Weight | Electric motor [1] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Supply voltage | | Nominal | | |
| | | | S2 | S4-25% | | | | | | | | power | speed | current |
| | [min$^{-1}$] | [Nm] | [Nm] | | [rev.] | | | | [kg] | | [V] ±10 [%] | [kW] | [1/min] | [A] |
| **MO 4** type number **160** | 16 | 150–250 | 150 | 100 | Without transmitter | 1,0 - 3,0 resp. 2,5 – 685,0 | With potentiometer | 1,75; 3 resp. 5,7;10,5;19;**34**;63;113;206;375;685 | 70 - 85 | Three - phase | Y / Δ; 380 / 220; 50 Hz<br>Y / Δ; 400 / 230; 50 Hz | 0,75 | 940 | 2,3 |
| | 25 | | | | | | | | | | | 1,10 | 1405 | 2,50 |
| | 32 | | | | | | | | | | | 1,10 | 1405 | 2,50 |
| | 40 | | | | | | | | | | | 1,50 | 1410 | 3,35 |
| | 50 | | | | | | | | | | | 1,5 | 2835 | 3,30 |
| | 63 [2] | | | | | | | | | | | 1,50 | 1410 | 3,35 |
| | 80 [2] | | | | | | | | | | | 2,20 | 2855 | 4,70 |
| | 125 [2] | | | | | | | | | | | 3,00 | 2895 | 6,00 |
| | 180 [2] | 120-200 | 120 | 80 | | | | | | | | | | |
| | 16 | 300–500 | 300 | 200 | | | | | | | | 1,10 | 925 | 3,15 |
| | 25 | | | | | | | | | | | 1,50 | 1410 | 3,35 |
| | 32 | | | | | | | | | | | 2,20 | 1425 | 4,65 |
| | 40 | | | | | | | | | | | 2,20 | 1425 | 4,65 |
| | 50 | | | | | | | | | | | 2,20 | 2845 | 4,70 |
| | 63 [2] | | | | | | | | | | | 2,20 | 1425 | 4,65 |
| | 80 [2] | 250–400 | 240 | 160 | | | | | | | | 3,00 | 2895 | 6,00 |
| | 125 [2] | 180–300 | 180 | 120 | | | | | | | | | | |
| | | | | | | | | | | | | | | |

**Remarks:**

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

[2] Valid for the version without any controller.

**Other technical data:**

The cover of electric actuator.....**IP 55; IP 67** 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. 1.6.2

**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 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 **EA MO 4**- on the supply voltage level
- standard for **EA MO 4** with built-in controller - by feeding of unified signal

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

**Heating element (E1)**

Heating resistor – supply voltage: ..... max. 250 V AC;

Heating output: ..... about 30 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 set up 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 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 4: "O" (open)..... ≥ 93%, "Z" (closed) ..... ≤ 5%
For MO 4 with controller: "O" (open)..... ≥ 85 % and ≤ 95%, "Z" (closed) ≥ 3 % and ≤ 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])
Load resistance (at version with build-in power supply) ..... max. $R_L$ = 750 Ω
Output signal values at limit positions: ..... "O“ ..... 20 mA (clamps 81,82)
..... "Z“ ..... 4 mA (clamps 81,82)
Values tolerance of output signal of EPV ..... "Z“ ..... +0,2 mA
..... "O“ ..... ±0,1 mA

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

Current signal ..... 0 ÷ 20 mA (DC)
Current signal ..... 4 ÷ 20 mA (DC)
Current signal ..... 0 ÷ 5 mA (DC)
Power supply voltage (at version without built-in power supply) ..... 24 V DC ±1,5%
Load resistance ..... max. 3 kΩ
Temperature dependency..... max. 0,020 mA / 10 K
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**

**2-wire connection** with power supply or without power supply

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

Power supply voltage (with power supply) ..... 24 V DC
Power supply voltage (without power supply) ..... 18 to 28 V DC
Ripple voltage ..... max. 5%
Max power input ..... 0,6 W
Load resistance ..... 0 to 500 Ω
Load resistance can be single side grounded.
Influence of resistance on output current ..... 0,02%/100 Ω
Influence of voltage on output current ..... 0,02%/1V
Temperature dependency ..... 0.5% / 10 °C
Output signal values at limit positions:

"O".... 20 mA (clamps 81; 82)
"Z"..... 4 mA (clamps 81; 82)

Values tolerance of output signal of capacitive transmitter
"Z" ..... +0,2 mA
"O"..... ±0,1 mA

Capacitive transmitter linearity error ..... ±1,5[%][1)]
Capacitive transmitter hysteresis ..... max. 5 [%][1)]

*1) of the transmitter's nominal value related to output values with max. revolutions setting for the given stroke degree according to table 3.*

### *2.2.1 Mechanical connection*

- By flange F14 (ISO 5210, DIN 3338)
- By flange ϕ135 (GOST R 55510-2013)

Main and connecting dimensions are presented in **dimensional drawings**.

### *2.2.2 Electric connection*

**a) Electric actuator**

**to terminal box type (X) ):** - max. 32 terminal connectors , crosscut of connecting wire max. 2,5 $mm^2$
- 2 cable bushings from control box – M25x1,5 cable diameter 12,5 to 19 mm
- 1 cable bushing from control box – M16x1,5 cable diameter 6 to 10,5 mm
- 1 cable bushing from control box – M32x1,5 cable diameter 15 to 21 mm

**to connector (XC):** - max. 32 poles - the crosscut of connecting wire 0, 5 $mm^2$:
- 1x cable bushings-M20x1,5 cable diameter from 8 -14,5 mm
- 1x cable bushings-M25x1,5 cable diameter from 12,5 - 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 operating speed 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*

The actuator is set up by the manufacturer to the parameters according to label tag, with connecting dimensions according to relevant dimensional drawing and is set to mid - position.

Put on the hand wheel before assembly.

### *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, F14 or F10), resp. C-shape adapter (with flange F14) 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 in the „open" direction.

**Mechanical connection – rising spindle (for shape A resp. C):**

- If the rising spindle of armature is in terminal position „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 wheel in the „open" direction.

Note:
It is also possible to fix the EA on the wall construction using the three feeders located at the box external wall, opposite to the hand 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 1.2 Safety instructions*
2. *While laying electrical line abide by the instructions for heavy current installations. Power supply cables must be of the type approved. Minimum thermal resistance of power supply cables and wires must be +90°C.*
3. *Line wires to terminal boards, respectively to connector lead by screw cable bushings.*
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 bushings!*
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**

Before electric connection remove the cover of electric actuator control box and check whether the type of electric current, supply voltage and frequency comply with data on electric motor type label.

**Electrical connections:**

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

**Electric connection to connector**

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

*Remarks:*

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

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

**The check of el. motor connection and control drawing.** Set up 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.4,5).** 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.

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

# 4. Adjusting

***Attention!*** *See chapter 1.2*
If it is necessary to connect the supply voltage to Electric actuator, make sure by following the mentioned procedure that there is no injury caused by the electric current. Otherwise, disconnect the Electric actuator from the electricity network.
***Observe safety regulations!***

The EA has been factory set to the fixed operation speed (entered into the order by the customer). If you wish to have the EA readjusted to other parameters, please follow the following instructions. Make the readjustment with the EA connected both mechanically and electrically. This chapter includes the electric actuator adjustment to the parameters specified in the specification table in case that you need to change the set EA parameters. See Fig. 3 for arrangement of the operating elements on the control board.

## 4.1 The torque unit adjustment

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 **(Fig. 5)** 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 moment of output shaft of electric actuator. Its magnitude can be adjusted by segments (17) and by shifting of backstops (18) **(Fig. 4)**. Achieved torque moment value is from torque disk transferred on torque unit by means of torque lever (42) **(Fig. 5)**.

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

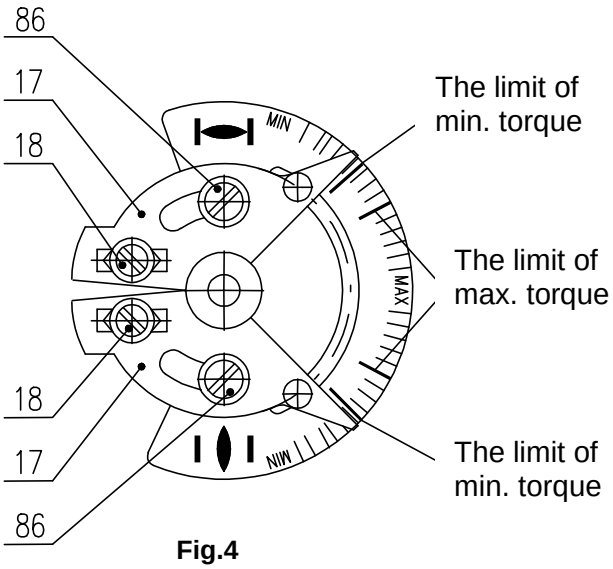



**Fig.4**

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

*Locking mechanism (82)* **(Fig.5)** provides locking of torque disconnection usually to 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.

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.

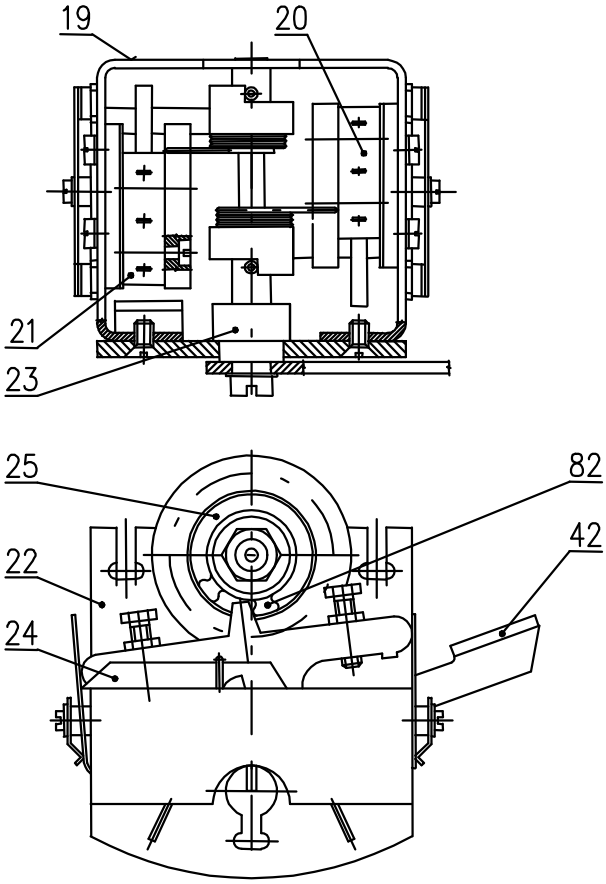



**Fig.5**

**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) | |
| **MO 4, MO 4 with controller** | **Cams on pinion (25) are revolved by** |
| **1,0 – 2,0** | 90° |
| 3,0 – 4,0 | 80° |
| 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 ES (3 pins in driving wheel) | | |
| **MO 4 MO 4 with controller** | | **Cams on pinion (25) are revolved by** |
| **0,33 – 0,66** | | 90° |
| 1 – 1,33 | | 180° |
| 1,66 – 2 | | 270° |
| 2,33 – 2,66 | | 360° |

The torque unit blocking is set by the producer withing the range marked in bold in the following table. In case the revolutions modification is needed please contact the authorized service center.

## *4.2 Position switches adjustment (S3,S4(S14) (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.*

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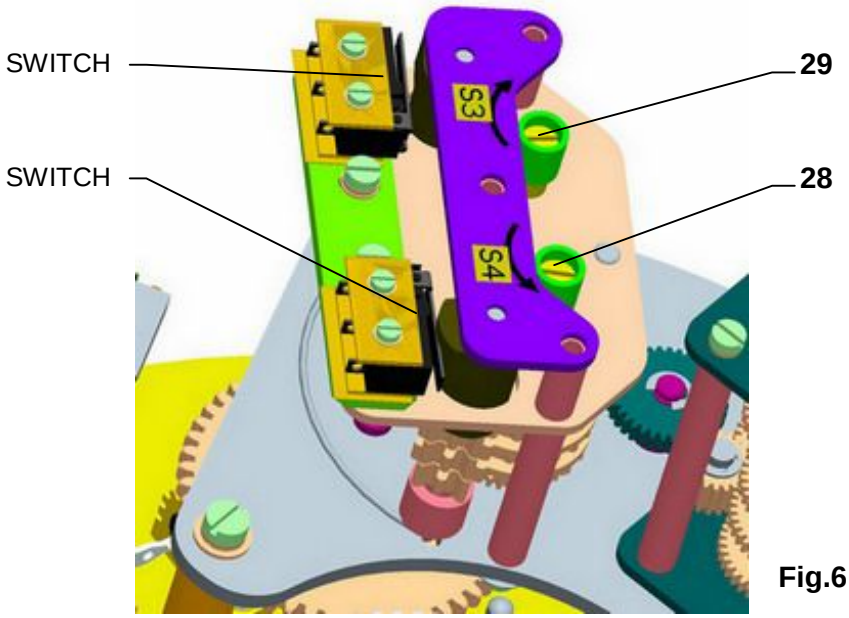



**Fig.6**

| TABLE 3 | |
|---|---|
| **STROKE DEGREE** | **MAX. EA WORKING REVOLUTIONS** (provided customer doesn´t specify otherwise, EA will be set to 6° by producer) |
| | **MO 4** |
| 1.° | 1,25 |
| 2.° | 2,3 |
| 3.° | 4 |
| 4.° | 7,5 |
| 5.° | 14 |
| **6.°** | **25** |
| 7.° | 45 |
| 8.° | 80 |
| 9.° | 150 |
| 0.° | 270 |
| 11.° | 500 |

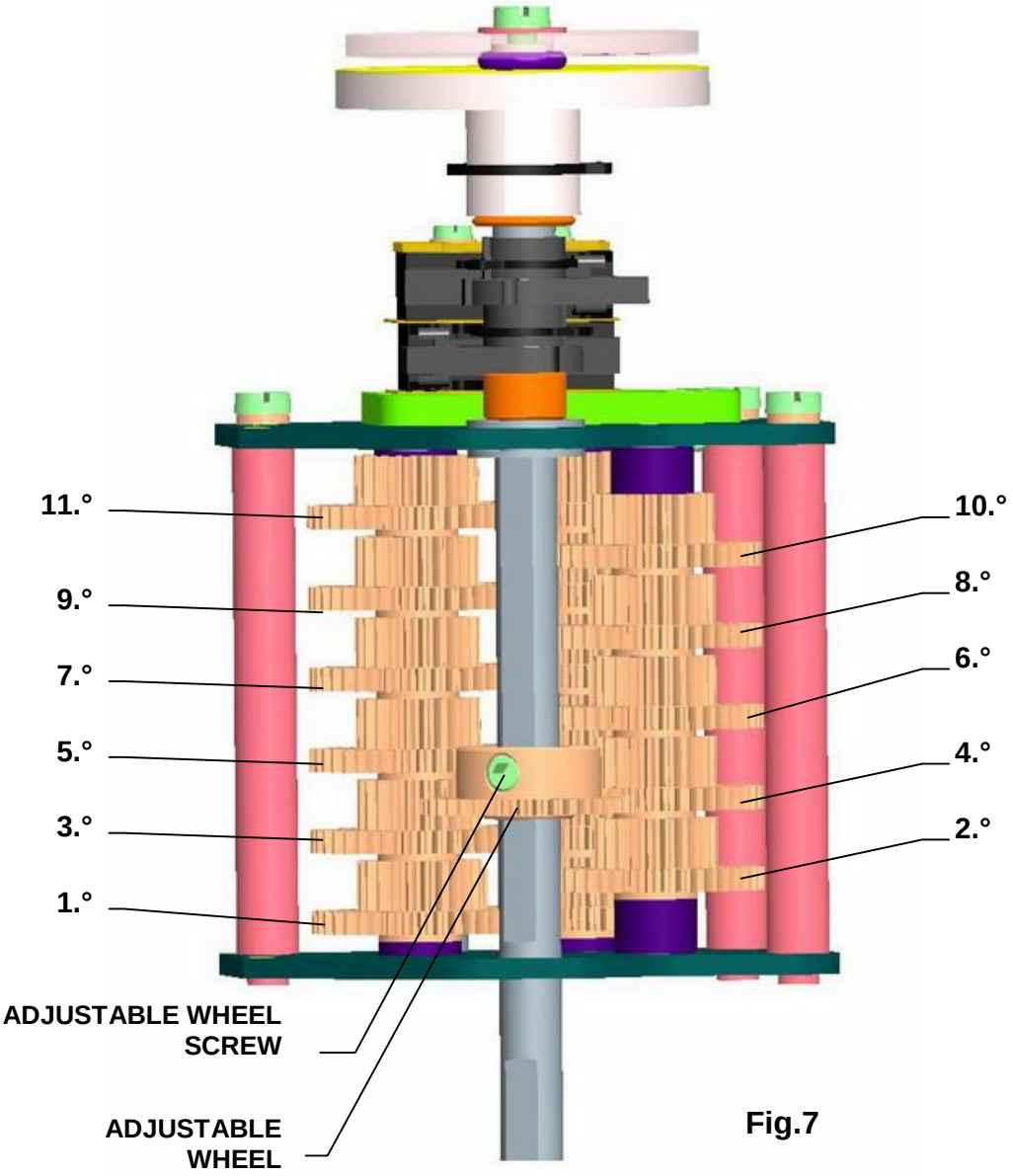



Fig.7

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

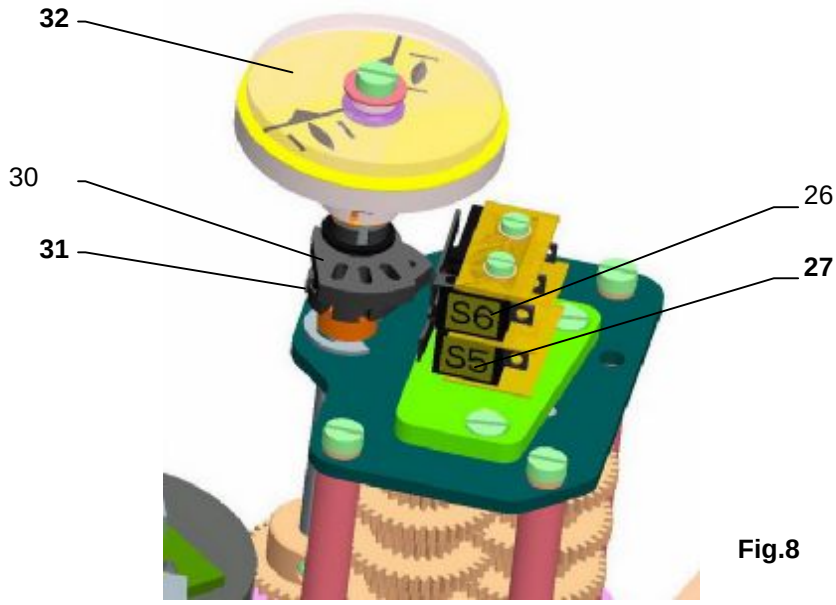



**Fig.8**

## *4.4 Position indicator adjustment (Fig.8)*

The position of the output member relative to the end positions of EA stroke is indicated by a mechanical position indicator.
Before starting to adjust the position indicator, S3 and S4 position switches must be adjusted if required.
The procedure of position indicator adjustment is as follows :

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

## *4.5 Adjustment of resistant transmitter (Fig.9)*

The **resistant transmitter (92)** is in the EA **MO 4** used to function as a remote position indicator; in the EA **MO 4** with controller to function as a feedback in the controller.

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

*Notes:*

1. *In case that the EA is not used in the working 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 4* with controller *2000 W resistant transmitters are used. In the other cases if the resistant branch is lead to the terminal board the resistance of the transmitters is according to the customer's specification. With EA of 2- wire converter a transmitter of 100 W resistance is used .*

To adjust the transmitter follow these steps:

- Loosen the fixing screws (90) of the transmitter holder and push the transmitter out of mesh.
- Connect a meter for resistance measuring to the terminals 71 and 73 of the EA terminal board, or to the terminals 7 and 10 of the EA **MO 4** with controller 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 4**, and 3 up to 7% of the nominal transmitter resistance in case of EA **MO 4** with controller**,** i.e. with the resistant transmitter with the converter PTK1.
- In the position put the transmitter to mesh with the drive wheel and fix the fixing screws on the transmitter holder.

Disconnect the meter from the terminal board.


**Fig.9**

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

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

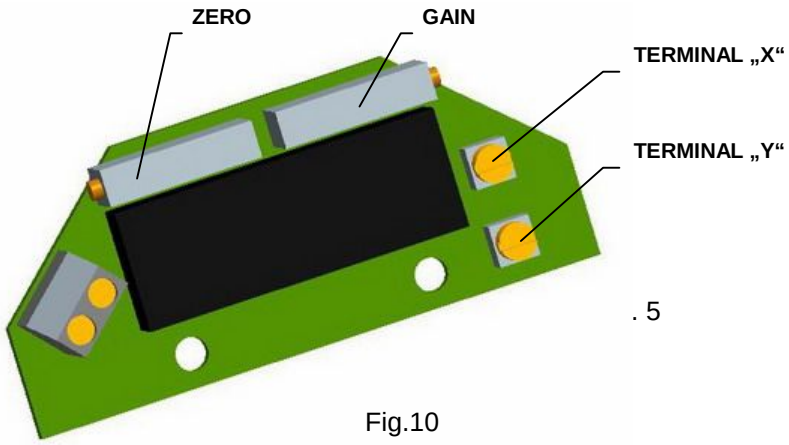
The position transmitter with the converter PTK1 is in the plant adjusted to have the output current signal on the terminals 81-82 as follows:

- in the position ”open“ ..... 20 mA
- in the position ”closed“ ..... 4 mA

**Adjustment of the EPV in electric actuators MO 4**

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.




. 5

Fig.10

*Note:*

*The output signal of 4-20mA can be adjusted at the range from 75 up to 100% of the rated stroke according to table Nr.3 . At values less than 75% the value 20mA is reduced proportionally.*

### 4.6.2 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“.
- 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.

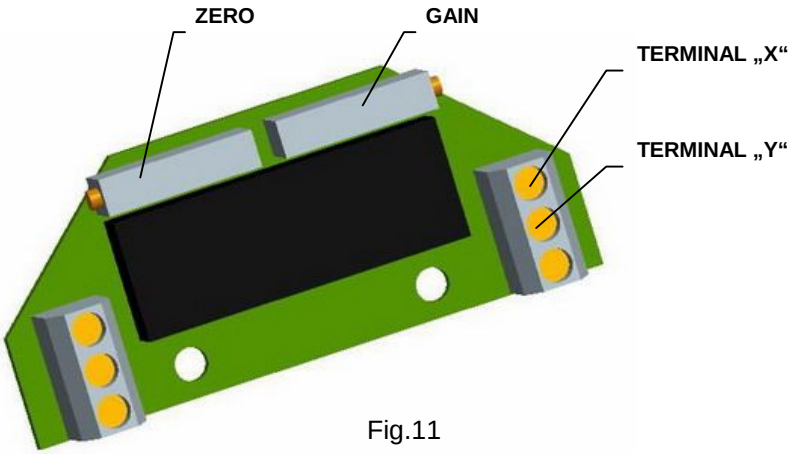



Fig.11

- 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 according to table Nr.3. At values less than 85% the value of the output signal is reduced proportionally.*

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

The chapter describes adjustment of the capacitive transmitter to the specified parameters (standard values of output signals) in case they are reset. The capacitive transmitter (95) serves as a position transmitter of electric actuators with unified output signal of 4÷20 mA.

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)

**B) The version with a power supply** (2-wire version)

**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.

*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.*

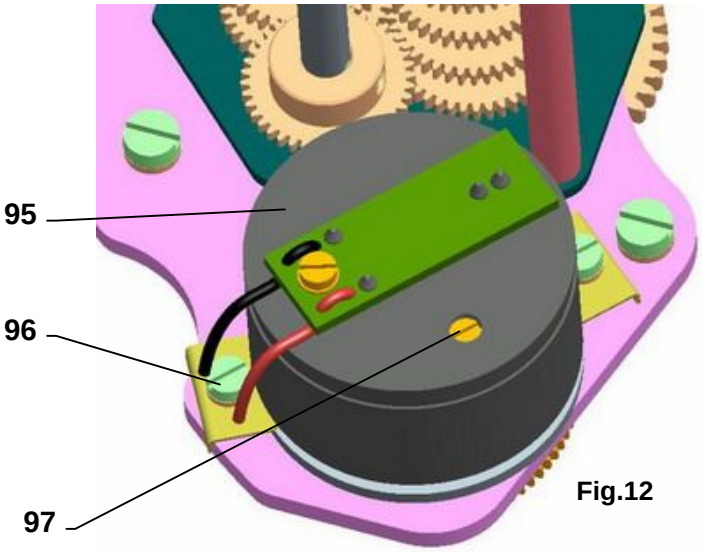



**Fig.12**

## *4.8 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.

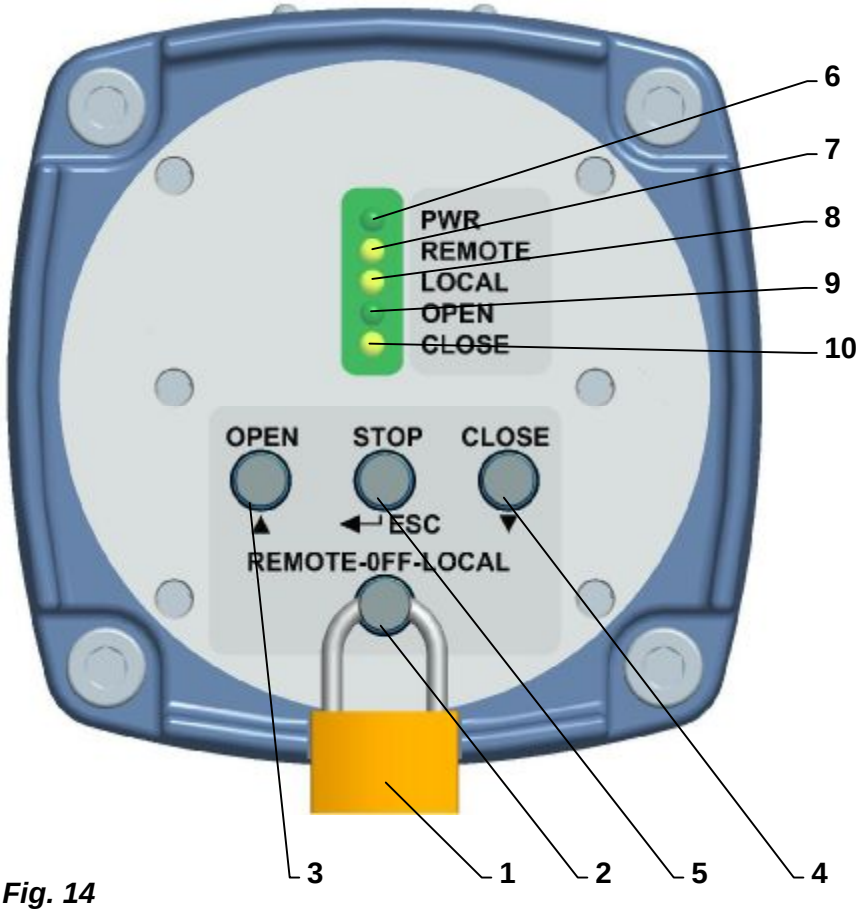



*Fig. 14*

# 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 electrics, or manually on their assembly position. Manual control is executed via hand wheel.
- The operators must take care for performing of prescribed maintenance and for protection of EA during operation against harmful ambient effects and atmospheric exposure, which exceeds the scope of acceptable effects described in part „Working conditions“.
- Operation beyond the switching – off torque limits is not allowed.
- It is necessary to prevent excessive heating of the surface of EA, exceeding of type label values and excessive vibration of EA.

## 5.2 Maintenance – scope and regularity

All screws and nuts affecting tightness and protection (IP) must be tighten during the inspection and maintenance. Similarly, once a year should be checked and if necessary tighten mounting screws of the terminal wires and assuring of the slip-on joints with wires.
The internal between two preventive inspections is four years.
In case of damage or after 6 years of the actuator´s operation the replacement of cover seals and oil filling seals must be done.
The grease in the supplied actuators is designed for the lifetime of the product.

It is not necessary to change the grease during the operation of the actuator.

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 +60°C - Madit PP-80 (Slovnaft)
  in versions with temperatures –60°C till +60°C - Avia SYNTOGEAR PE 68
- gears of transmission unit and drive mechanism on the control board:
  - in versions with temperatures -25°C till +60°C - grease μ HF 401/0, resp. GLEITMO 585 K
  - in versions with temperatures -50°C till +40°C - ISOFLEX TOPAS AK 50
  - in versions for climate with temperatures -60°C till +60°C grease DISCOR R-EP 000.

.
*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 centre.

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

For controller repair a F1,6 A subminiature fuse for DPS should be used, 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 4 have neither accessory packed with.

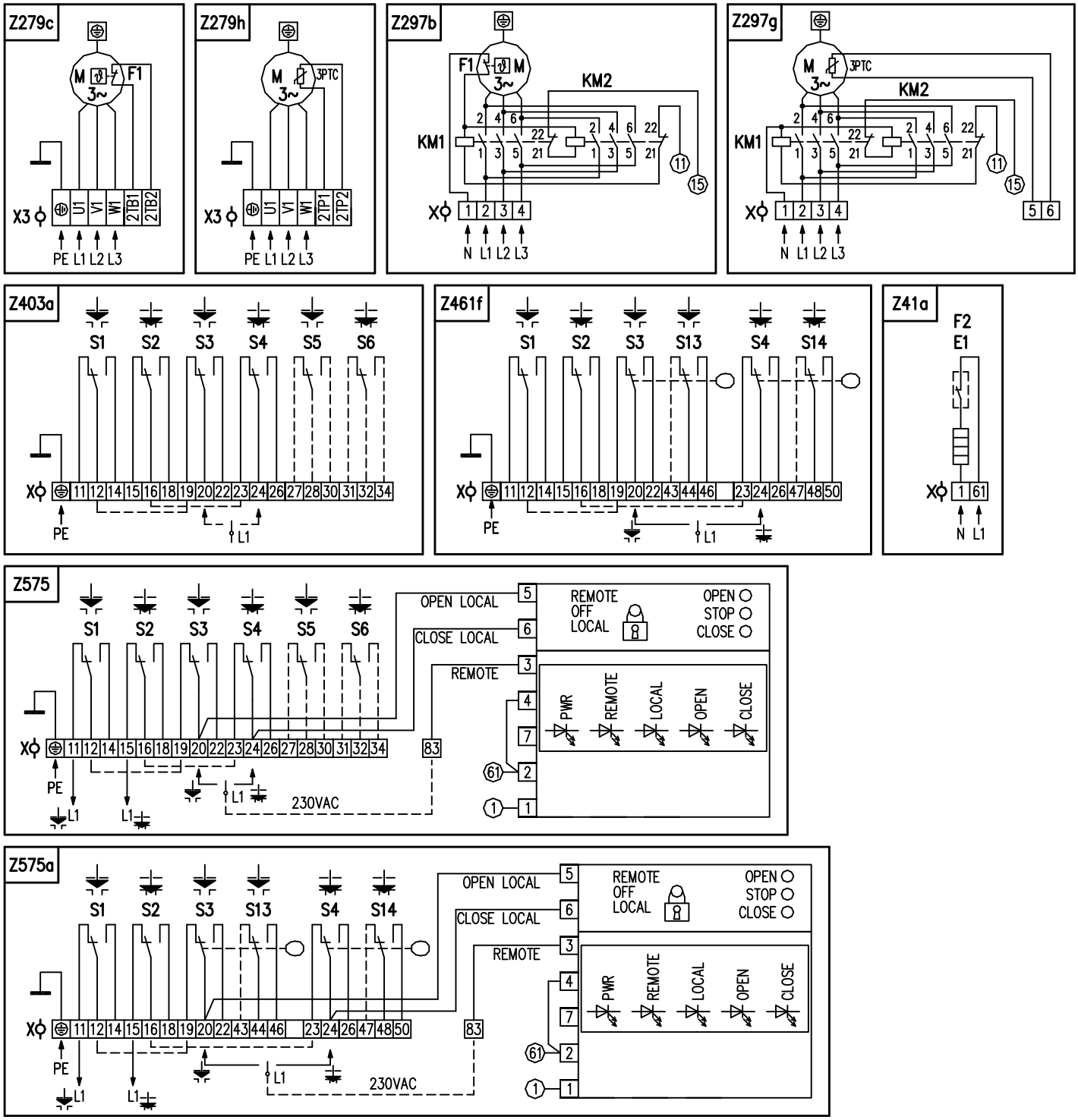
## 6.2 The list of spare parts

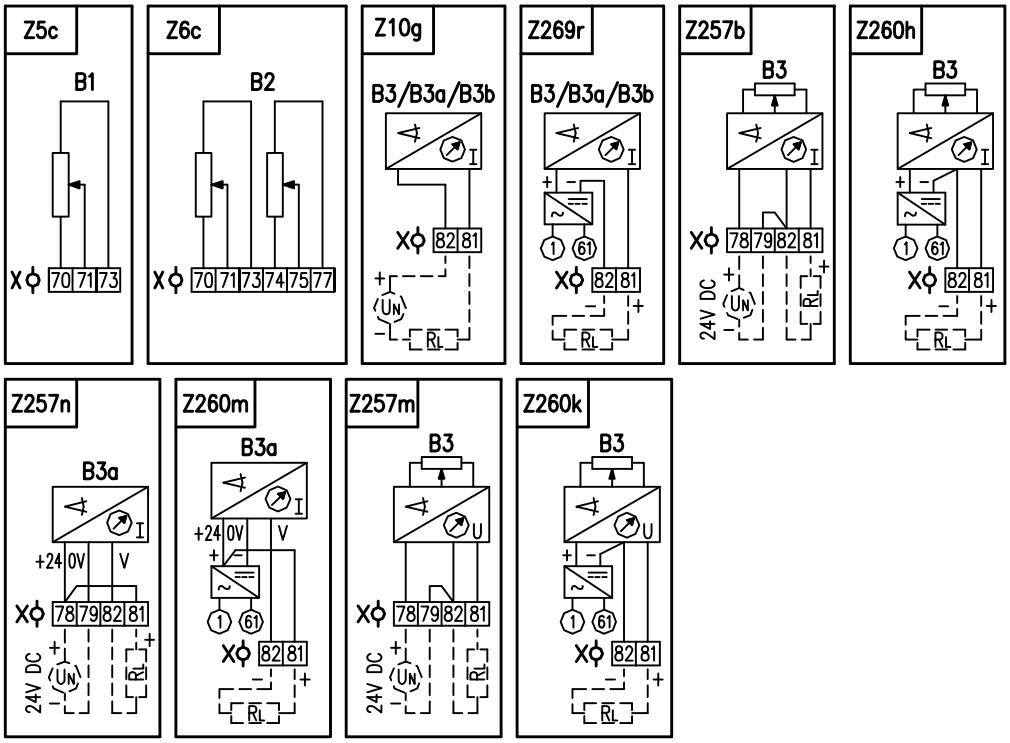
**Table 5: spare parts**

| Name of part – Type | | | | | Order number PNm | Pos. | Fig. |
|---|---|---|---|---|---|---|---|
| | **0,75 kW;** | | 1LE1001-**0EC0** | 1LE1501-**0EC0** | | M1 | 1 |
| | **1,10 kW;** | | 1LE1002-**0EC4** | 1LE1501-**0EC4** | | M1 | 1 |
| | **0,75 kW;** | | 1LE1002-**0DB3** | 1LE1501-**0DB3** | | M1 | 1 |
| | **1,10 kW;** | | 1LE1002-**0EB0** | 1LE1501-**0EB0** | | M1 | 1 |
| | **1,50 kW;** | | 1LE1002-**0EB4** | 1LE1501-**0EB4** | | | |
| | **2,20 kW;** | | 1LE1001-**0EB6** | | | | |
| | **2,20 kW;** | | | | | | |
| | **1,50 kW;** | | 1LE1001-**0EA0** | 1LE1501-**0EA0** | | | |
| | **2,20 kW;** | | 1LE1002-**0EA4** | 1LE1501-**0EA4** | | | |
| | **3,00 kW;** | | 1LE1001-**0EA6** | | | | |
| Micro-switch CHERRY DB6G-B1BA +lever | | | | | 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 |

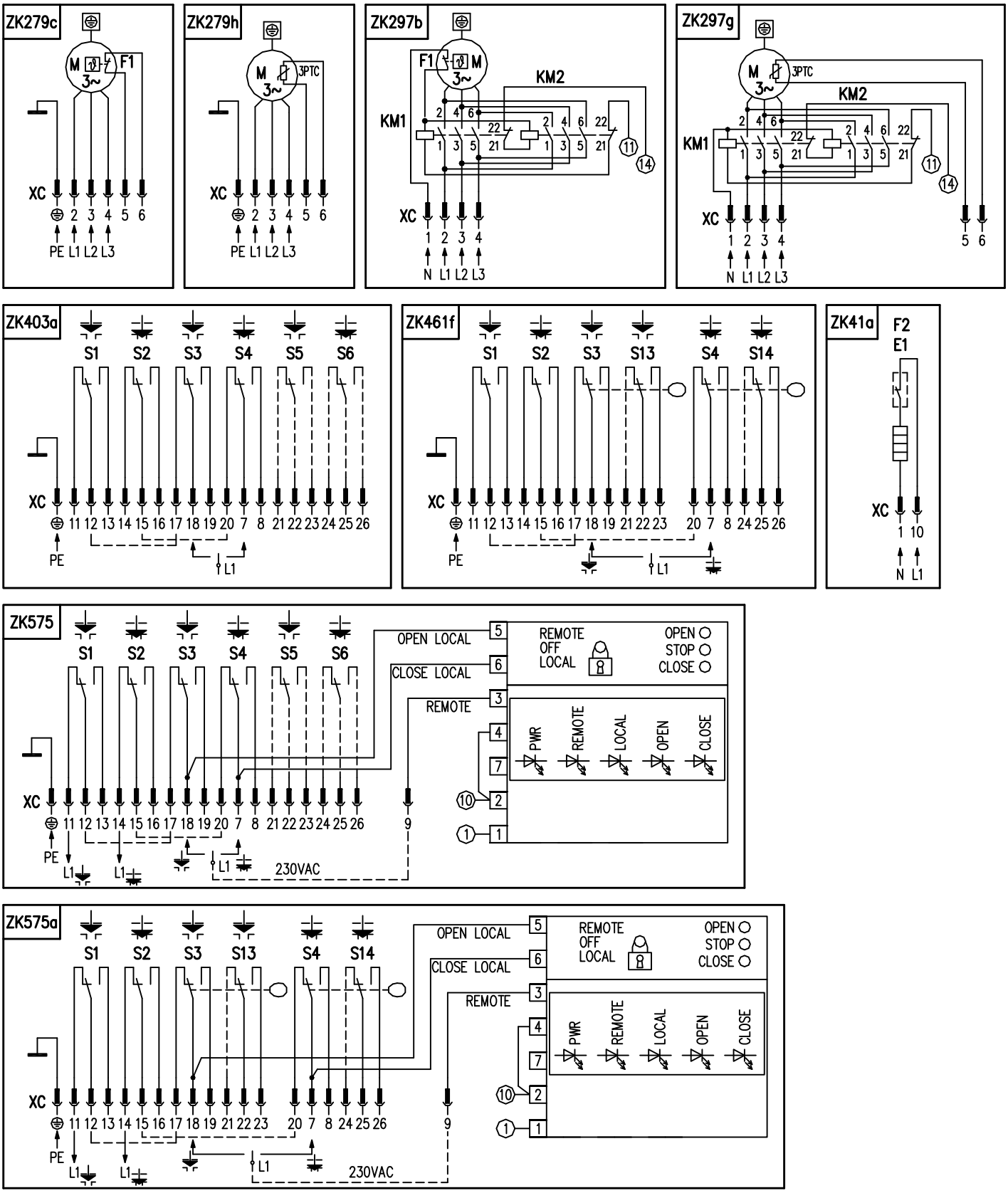
# 7. Enclosures

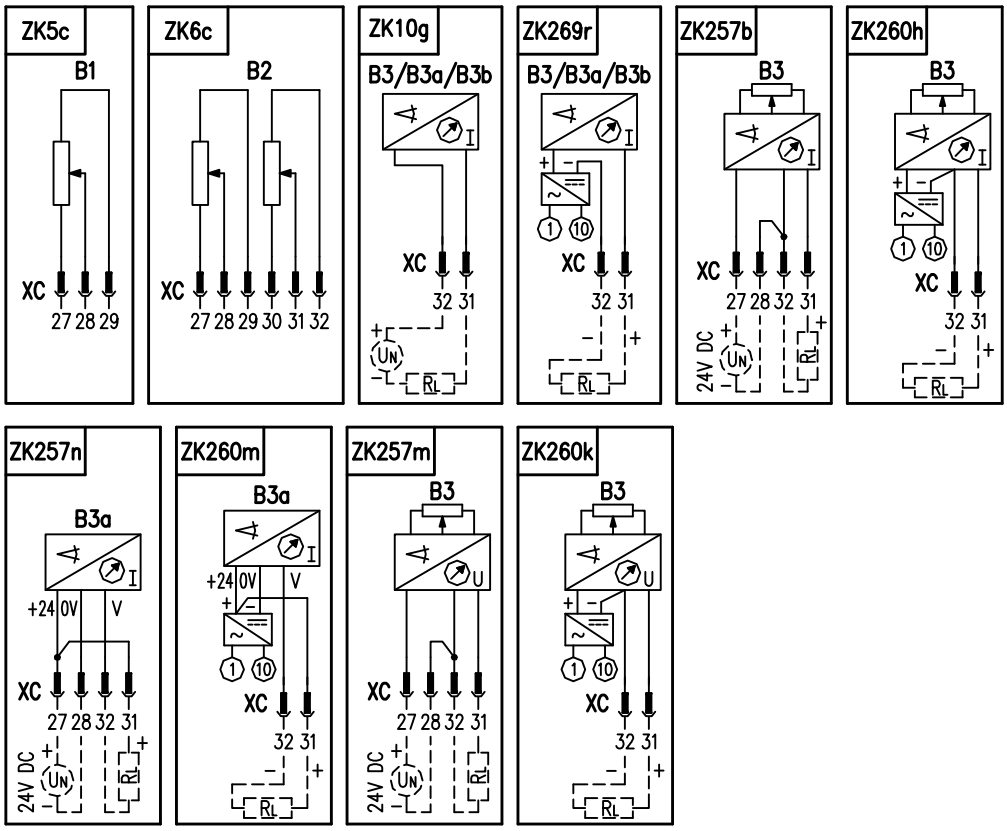
## 7.1 Wiring diagrams EA MO 4 - electrical connection to terminal board




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

## *7.2 Wiring diagrams EA MO 4 - electrical connection to the connector*




ZK5c
B1
XC
27 28 29
ZK6c
B2
XC
27 28 29 30 31 32
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
ZK257n
B3a
I
+24 0V V
XC
27 28 32 31
24V DC
UN
RL
ZK260m
B3a
I
+24 0V V
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

## Legend:

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

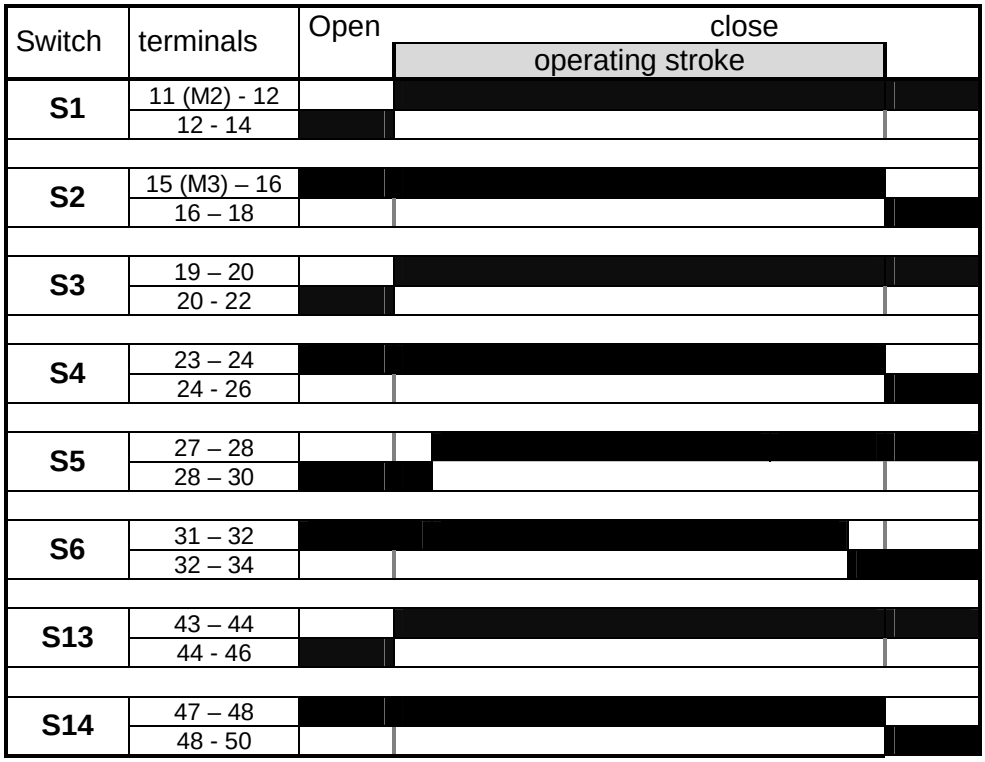
Z5c ..... connection of single resistive transmitter
Z6c ..... connection of double resistive transmitter
Z10g ..... connection of resistive with current converter or resp. capacitive transmitter or DCPT transmitter – 2-wire without supply
Z21a ..... connection of additional position switches connection for EA MO with controller
Z41a ..... connection of space heater and space heater's thermal switch
Z257b .... connection of resistive transmitter with current converter – 3-wire without power supply
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 MO 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

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/PTO..thermal protection of electric motor
$R_L$ ..... 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. The torque tripping is equipped with a mechanical interlocking mechanism.

**Switch operation chart**



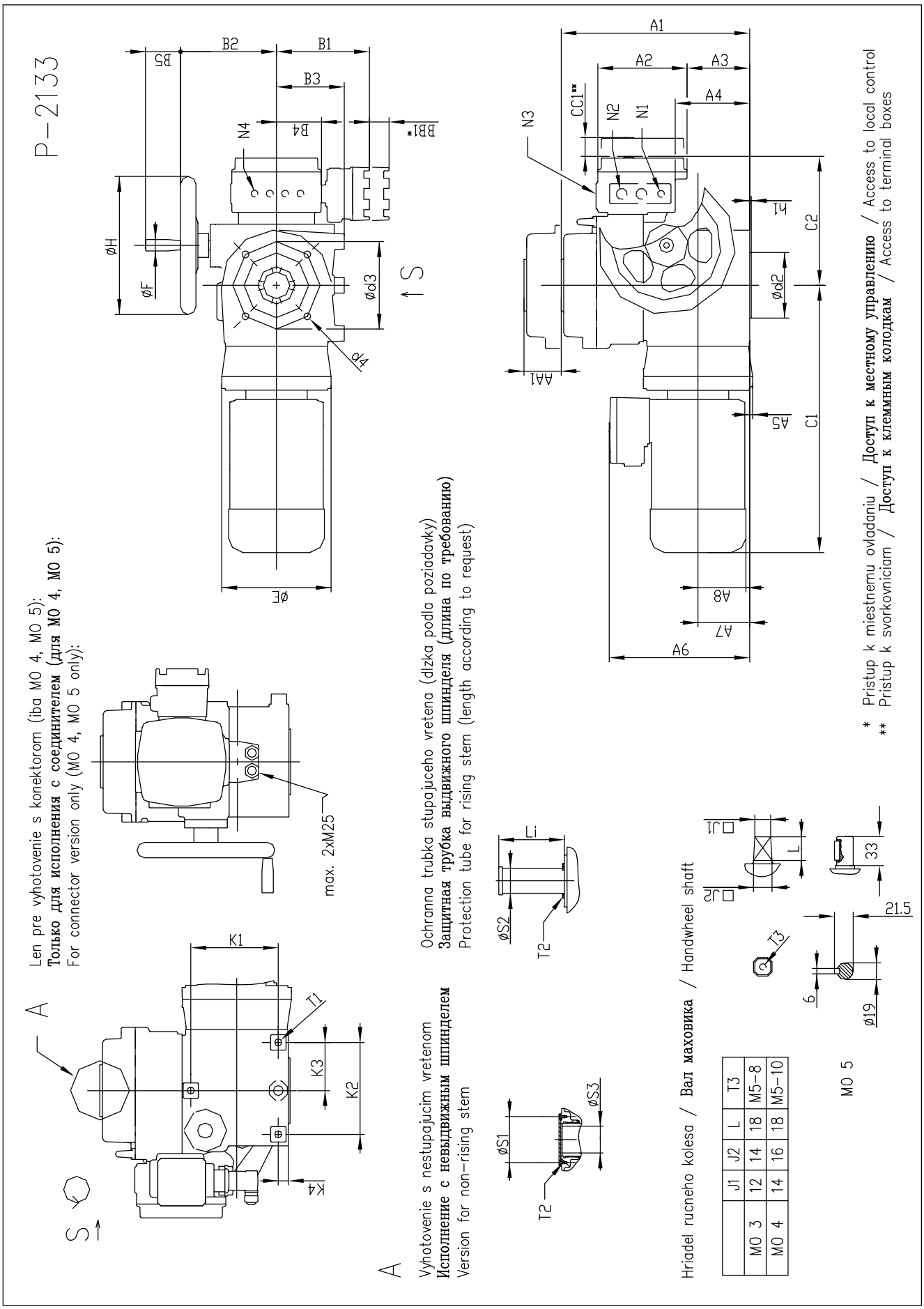

*Remark 1: The S1, S2 torque switches trip when the set up tripping torque is achieved doesn't matter in which point of the working stroke, it doesn't apply for the set up range of interlocking during EA reversal from any position*

*Remark 2: 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.*

*Remark 3: Tandem position switches S13, S14 are switched by one cam together with position switches S3, S4. At slow adjustment speeds,for the correct function while switching from position, it is necessary to select from the pair of switches (S3 / S13 or S4 / S14) the one that switches second when moving in the given direction to ensure that in the end position both of the pair of switches will be switched.*

*Remark 4: The terminal numbers correspond to the numbering when electrically connected to the terminal block.*

## 7.3 Dimension drawings and mechanic connections



| | MO 3 [1] | MO 4 | MO 5 |
|---|---|---|---|
| A1 | 371 | 407 | 431 |
| AA1 min. | 600 | 600 | 600 |
| A2 | 204 | 204 | 204 |
| A3 | 43 | 98 | 143 |
| A4 | 70 | 125 | 170 |
| A5 max. | 7 | – | 7 |
| A6 max. | 196 | 281 | 314 |
| A7 | 75 | 117 | 118 |
| A8 max. | 81 | 90 | 111 |
| B1 | 214 | 213 | 213 |
| BB1 min. | 600 | 600 | 600 |
| B2 | 135 | 173 | 219 |
| B3 max. | 122 | 147 | 155 |
| B4 | 104 | 103 | 103 |
| B5 | 57 | 79 | 90 |
| C1 max. | 411 | 511 | 583 |
| CC1 min. | 600 | 600 | 600 |
| C2 | 290 | 306 | 295 |
| øE max. | 146 | 200 | 250 |
| øF | 18 | 26 | 22 |
| øH | 160 | 200 | 315 |
| K1 | 120 | 140 | 200 |
| K2 | 110 | 160 | 210 |
| K3 | 61 | 75 | 110 |
| K4 | 16 | 47 | 23 |
| N1 | M16x1.5 | M16x1.5 | M16x1.5 |
| N2 | 2x M25x1.5 | 2x M25x1.5 | 2x M25x1.5 |
| N3 max. | 1x M20x1.5 | 1x M20x1.5 | 1x M20x1.5 |
| N4 max. [1] | 4x M16x1.5 | 4x M16x1.5 | 4x M16x1.5 |
| øS1 | 50 | 71 | 105 |
| øS2 | 35x3 | 57x5 | 88.9x6.3 |
| øS3 max. | 28 | 45 | 70 |
| T1 | 3x M10–14 | 3x M12–24 | 3x M16–34 |
| T2 | 3x M4–8 | 3x M4–8 | 4x M5–10 |
| ød2 max. | 70 | 100 | 130/– [2]/150/– |
| ød3 | 102 (80) | 140 | 165/220 [2]/200/200 |
| d4 | 4x M10 | 8x M16 | 4x M20/M20 [2]/M16/M20 |
| h1 max. | 3,5 | 4 | 4/– [2]/4/– |

[1] Pre / Для / For Modbus (Profibus)
[2] Pripojenie podla / Присоединение согласно / Connection according to ОСТ 26-07-763

| | MO 4 |
|---|---|
| A1 | 407 |
| AA1 min. | 600 |
| A2 | 204 |
| A3 | 98 |
| A4 | 125 |
| A5 max. | – |
| A6 max. | 281 |
| A7 | 117 |
| A8 max. | 90 |
| B1 | 213 |
| BB1 min. | 600 |
| B2 | 173 |
| B3 max. | 147 |
| B4 | 103 |
| B5 | 79 |
| C1 max. | 511 |
| CC1 min. | 600 |
| C2 | 306 |
| øE max. | 200 |
| øF | 26 |
| øH | 200 |
| K1 | 140 |
| K2 | 160 |
| K3 | 75 |
| K4 | 47 |
| N1 | M16x1.5 |
| N2 | 2x M25x1.5 |
| N3 max. | 1x M20x1.5 |
| N4 max. [1] | 4x M16x1.5 |
| øS1 | 71 |
| øS2 | 57x5 |
| øS3 max. | 45 |
| T1 | 3x M12–24 |
| T2 | 3x M4–8 |
| ød2 max. | 100 |
| ød3 | 140 |
| d4 | 8x M16 |
| h1 max. | 4 |

[1] Pre / Для / For Modbus (Profibus)

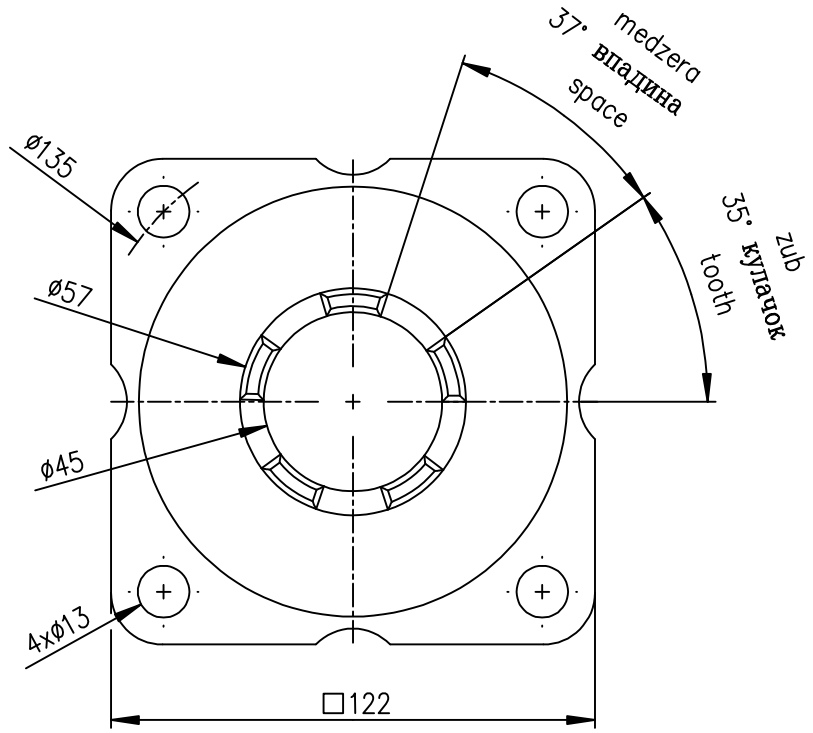
| | MO 5 |
|---|---|
| A1 | 431 |
| AA1 min. | 600 |
| A2 | 204 |
| A3 | 143 |
| A4 | 170 |
| A5 max. | 7 |
| A6 max. | 314 |
| A7 | 118 |
| A8 max. | 111 |
| B1 | 213 |
| BB1 min. | 600 |
| B2 | 219 |
| B3 max. | 155 |
| B4 | 103 |
| B5 | 90 |
| C1 max. | 583 |
| CC1 min. | 600 |
| C2 | 295 |
| øE max. | 250 |
| øF | 22 |
| øH | 315 |
| K1 | 200 |
| K2 | 210 |
| K3 | 110 |
| K4 | 23 |
| N1 | M16x1.5 |
| N2 | 2x M25x1.5 |
| N3 max. | 1x M20x1.5 |
| N4 max. [1] | 4x M16x1.5 |
| øS1 | 105 |
| øS2 | 88.9x6.3 |
| øS3 max. | 70 |
| T1 | 3x M16–34 |
| T2 | 4x M5–10 |
| ød2 max. | 130/– [2]/150/– |
| ød3 | 165/220 [2]/200/200 |
| d4 | 4x M20/M20 [2]/M16/M20 |
| h1 max. | 4/– [2]/4/– |

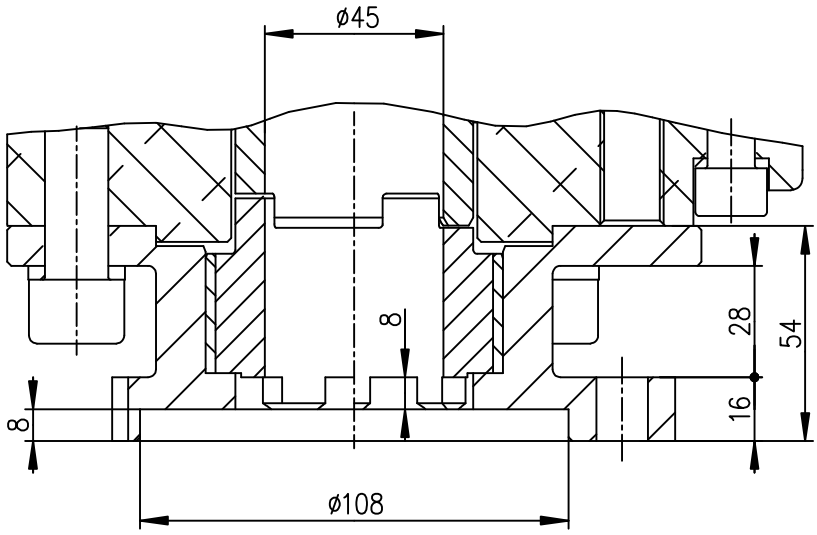
[1] Pre / Для / For Modbus (Profibus)
[2] Pripojenie podla / Присоединение согласно / Connection according to ОСТ 26-07-763

Connection dimensions MO 4 with flange according to GOST R 55510-2013

Coupling shape «**Б**».

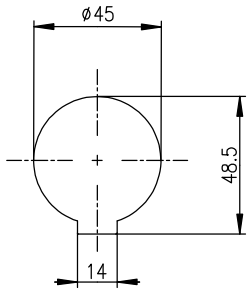
P–2125

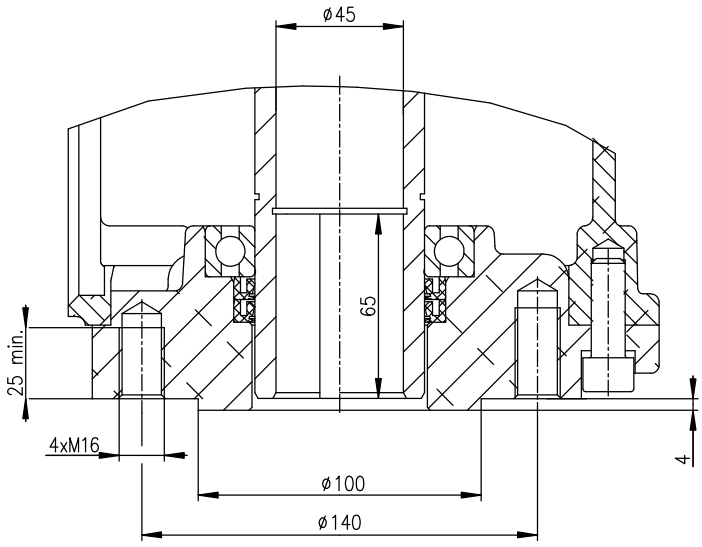


Connection dimensions **MO 4** with flange «**F14**» according to ISO 5210.
Coupling shape «**B2 / B4**» ISO 5210.

P–2123

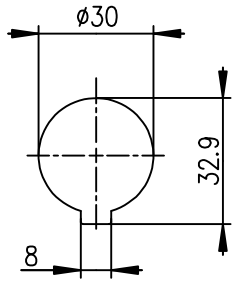


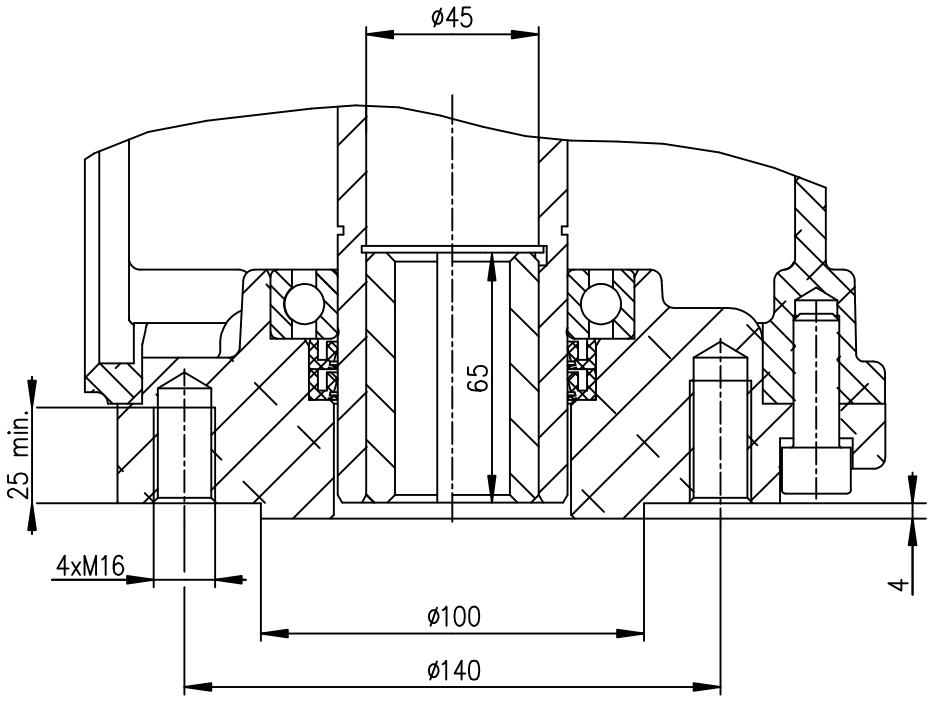



Connection dimensions MO 4 with flange «F14» according to ISO 5210.

Coupling shape « **B3**» DIN 3338.

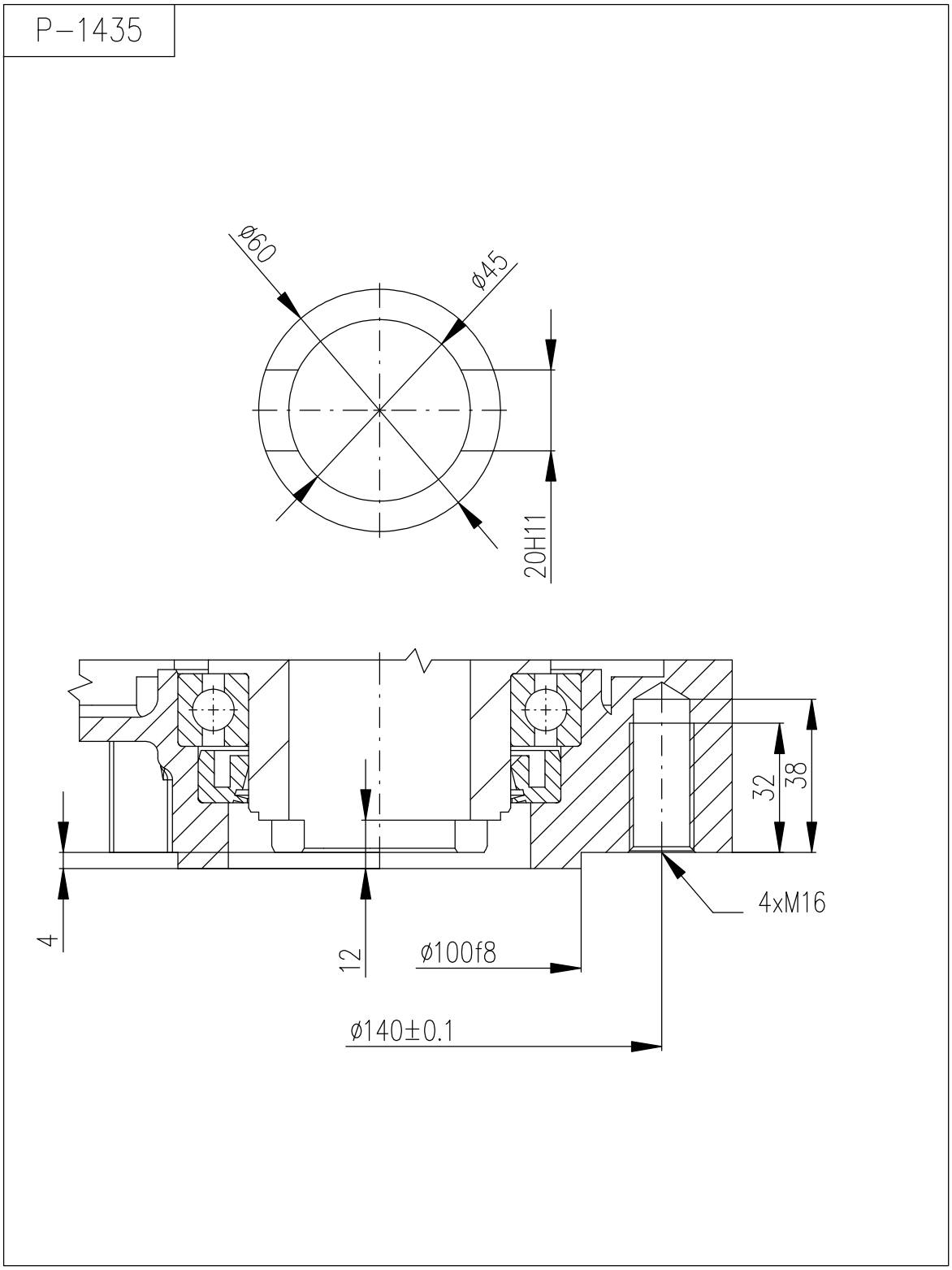
P–2124



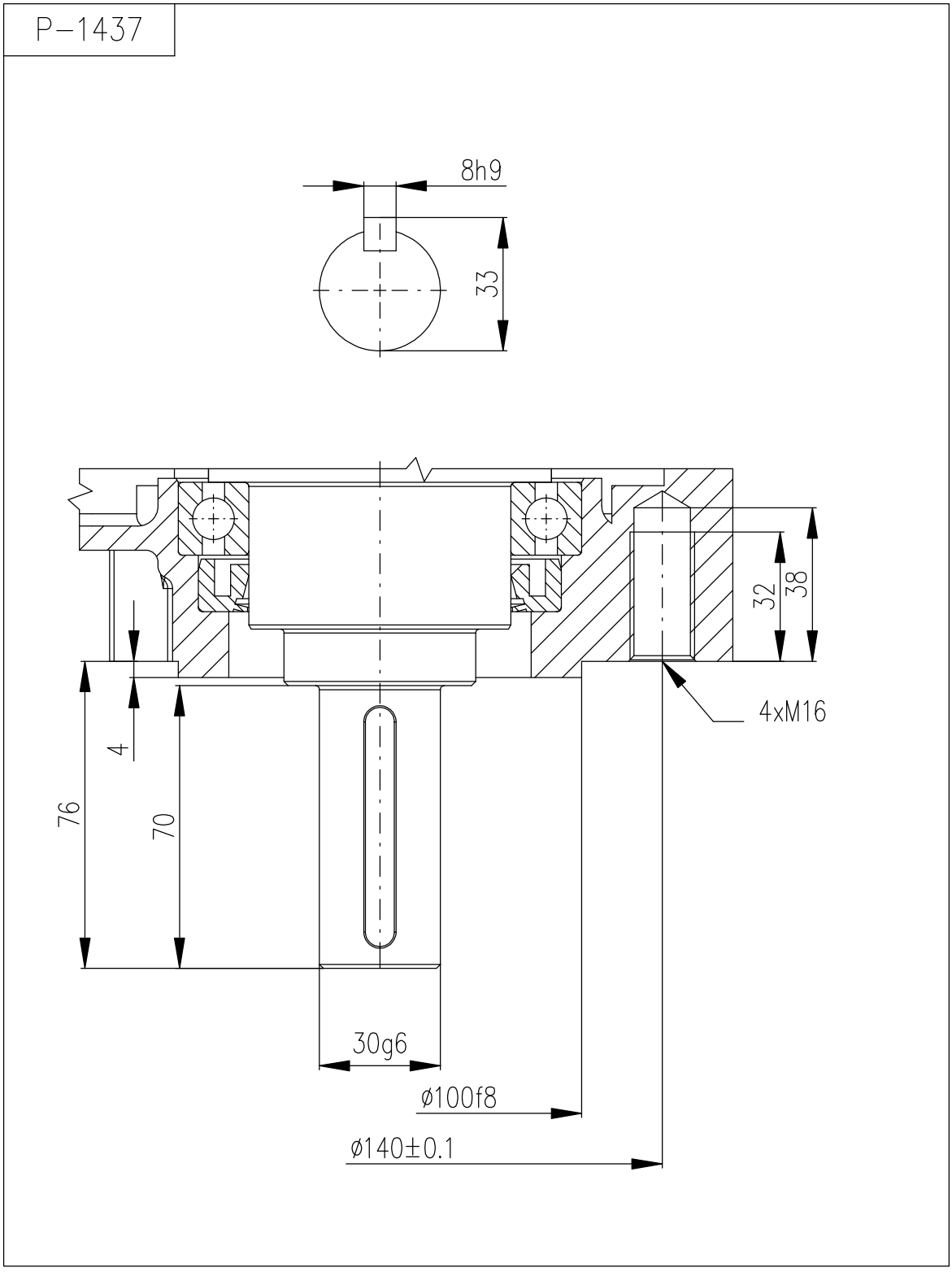
Connection dimensions **MO 4** with flange «**F14**» according to ISO 5210.

Coupling shape «**C**» ISO 5210.



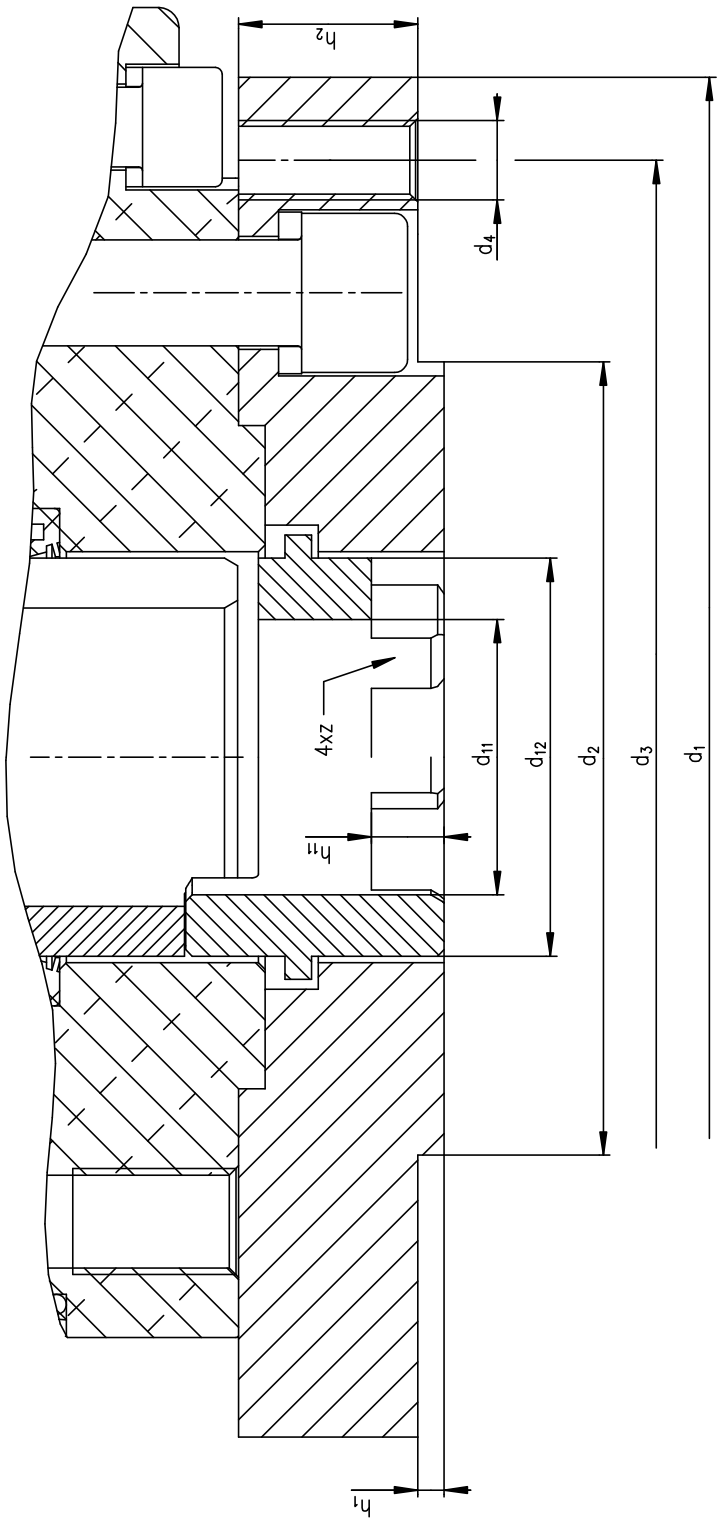
Connection dimensions **MO 4** with flange «**F14**» according to ISO 5210.

Coupling shape «**D**» Non-standard



Connection dimensions **MO 4** with flange «**F14**» according to ISO 5210.

Coupling shape «ZPA» Non-standard



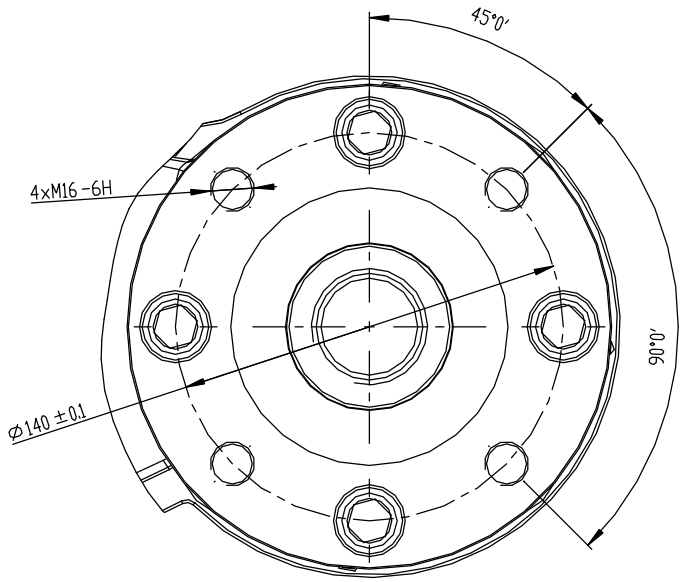

| | d1 | d2 | d3 | d4 | d11 | d12 | h1 | h2 | h11 | 4xz |
|---|---|---|---|---|---|---|---|---|---|---|
| P-2121/A | ø205 | ø120 h8 | ø180 | M12 | ø41.5 | ø60 | 4 | 27 | 11 | 4x30° |

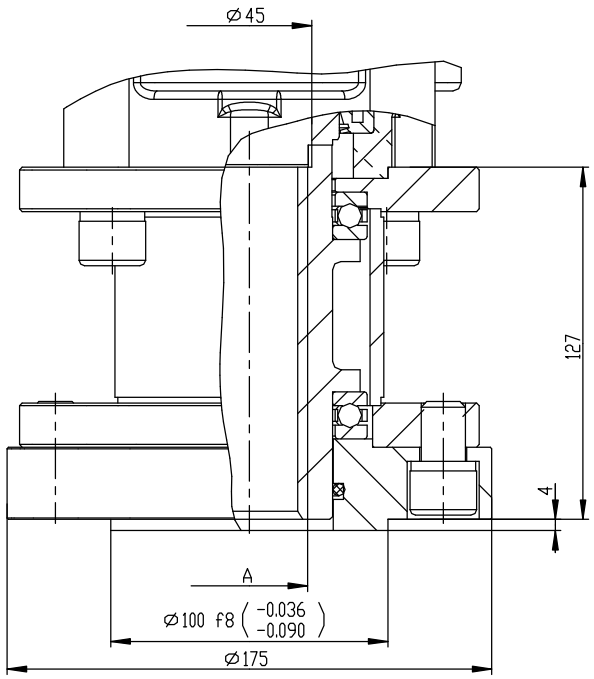
P-2121

Connection dimensions **MO 4** with flange «**F14**» according to ISO 5210.

Coupling shape «**A**» ISO 5210.

P-1471



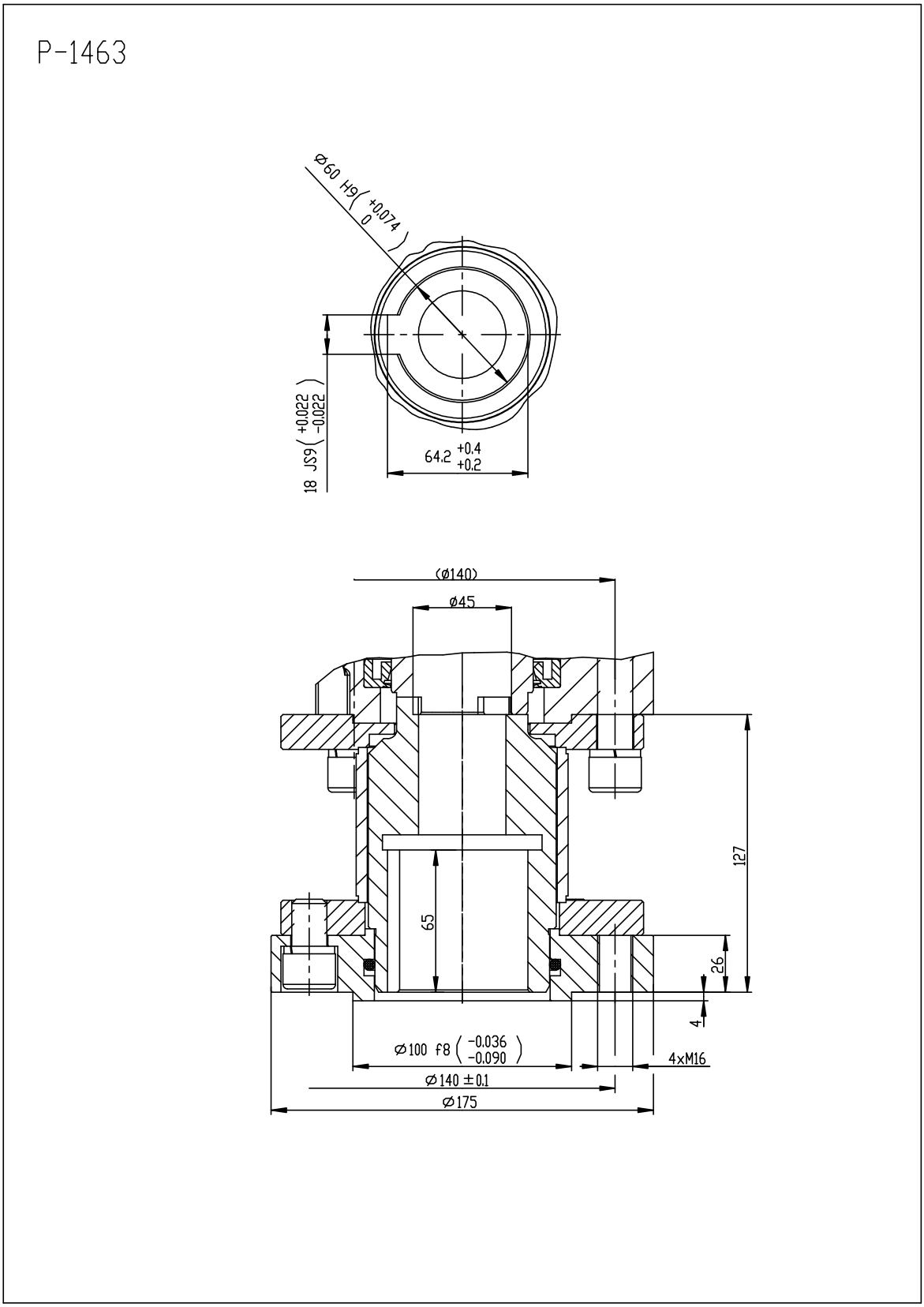




| | |
|---|---|
| P-1471/V | Ø10 |
| Vyhotovenie | A |

Connection dimensions MO 4 with flange «**F14**» according to ISO 5210.

Shape of connecting detail «**B1**» ISO 5210.

P-1463



## *7.4 Commercial representation*

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