



CE 1026

INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS





***Explosion-proof electric multi-turn actuators
REMATIC MOR 3PA-Ex, MOR 3.4PA-Ex,
MOR 3.5PA-Ex, MOR 5PA-Ex***

TEST CERTIFICATE

EXPLOSION-PROOF ELECTRIC MULTI – TURN ACTUATOR MOR 3PA-Ex, MOR 3.4PA-Ex, MOR 3.5PA-Ex, MOR 5PA-Ex

Type number	Power supplyVHz
Serial number	Rated torque..... Nm
Production year	Switching-off torque..... Nm
Wiring diagram	Operating speed min ⁻¹
.....	Adjusted number of revolutions.....
.....	Control
.....	Input operation signal
Warranty period months	Output signal.....
Serial number of electric motor	
Serial number of control unit	

Explosion-proof version:  II 2G Ex db eb IIC T5 and T4 Gb +  II 2D Ex tb IIIC T135°C Db

Final report No.: FTZÚ 12 ATEX 0137X (valid for MOR 3PA-Ex, MOR 3.4PA-Ex, MOR 3.5PA-Ex)
 FTZÚ 14 ATEX 0058X (valid for MOR 5PA-Ex)

Design and type tests are in accordance with the following standards:

- EN/IEC 60 079-0 – Electrical apparatus for explosive gas atmospheres – Part 0: **General requirement**
- EN/IEC 60 079-1 – Electrical apparatus for explosive gas atmospheres – Part 1: **Flameproof enclosures “d”**
- EN/IEC 60 079-7 – Explosive atmospheres Part 7: **Equipment protection by increased safety “e”**
- EN/IEC 60079-31: Explosive atmospheres – Part 31: **Equipment dust ignition protection by enclosure „t“**

Tests made by	Packed by
Date	Signature and stamp

COMPLETENESS CERTIFICATE

Used valve

Assembled by: Firm

Name

Warranty period months

Date Signature and stamp

INSTALLATION CERTIFICATE

Location.....

Installed by: Firm.....

Name

Warranty period months

Date Signature and stamp.....

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

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The Installation, Service and Maintenance Instructions are drawn up according to requirements of EC Executive Nr. 89/392/EEC "Uniform requirements for machines and devices from the point of view of safety and health care", to save life and health of users and to avoid material damages and exposure environment to danger.

1. General data

1.1 Purpose and applications

Explosion - proof electric multi-turn actuators **Rematic** (hereinafter referred as EA only) with the DMS 3 electronic control of the **MOR 3PA-Ex, MOR 3.4PA-Ex, MOR 3.5PA-Ex a MOR 5PA-Ex** (hereinafter referred as **MOR X.XPA-Ex** only) are set up by the program to be controlled on the 24 V DC voltage level, or are set up by the program to be controlled by **analogue input signal**.

Electric linear actuators **MOR X.XPA-Ex** types are high-powered electric-mechanical products designed for direct installations onto controlled devices (regulating bodies - valves, etc.). EA of **MOR X.XPA-Ex** types are provided for remote control of closing bodies o **MOR X.XPA-Ex** automotive control of regulating bodies in both directions of their movement. They can be equipped with means of measuring and control of technological processes where an unified analogue direct current or voltage signal is an information bearer on their input and/or output. They can be used in heating, energy, gas, air-conditioning and other technological systems, which they are suitable for, regarding their features. They are connected with controlled devices with a flange and coupling shape according to ISO 5210, DIN 3338, or in accordance with GOST R 55510.



1. It is forbidden to use EA as a lifting mechanism!

1.2 Safety instructions

Product characteristics from risk point of view

EA of MOR X.XPA-Ex types are reserved technical devices with higher rate of danger (group A), with possibility of installation in areas specially danger regarding casualties caused by electric current. EA are according to directive LVD 2014/35/EU and standard EN 61010-1:2010/A1:2019/AC:2019-04 assigned for installation category II (overvoltage category).

In order to demonstrate the compliance with the requirements of the European Council directive on machinery 2006/42/EC, European Parliament and Council Directive 2014/34/EU on equipment and protective systems intended for use in potentially explosive environment (designated as Directive ATEX 100a), directive of the Council 2014/35/EU on LVD and Council Directive 2014/30/EU on EMC, the electric actuators are subject to certification by authorized certification facilities.

The product meets the essential safety requirements according to EN 60204-1 and is in compliance with EN 55011/A1 within valid edition.



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



1.3 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 61000-6-3:2021, EN IEC 61000-6-2:2019, EN 61000-3-3:2013/A1:2019/A2:2021 and EN IEC 61000-3-2:2019/A1:2021.

Vibrations caused by the product: product influence is negligible.

Noise produced by the product: The maximum allowable noise level (A) of the product measured in a place of operation is 78 dB (A) (valid for MOR 3PA-Ex-MOR 3.5PA-Ex) or 85 dB (A) (valid for MOR 5PA-Ex).

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.

Electric actuators MOR X.XPA-Ex are made in explosion-proof version  **II 2 G** Ex de IIC T5 and T4 Gb +  **II 2 D** Ex tb IIIC T135°C Db pursuant to:

EN/IEC 60079-0: Explosive atmospheres – Part 0 : Equipment general requirements – General requirements

EN/IEC 60079-1: Explosive atmospheres – Part 1 : Equipment protection by flameproof enclosures “d”

EN/IEC 60079-7: Explosive atmospheres - Part 7: Equipment protection by increased safety "e".

EN/IEC 60079-31: Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure „t“, within valid edition.

Electric parts EA are proposed:

- as devices of the group **II** for others threatened areas (excluding mines)
- of the category **2** with demanding requirements for safety
- for use max. in zone **1**
- for atmospheres **G** (gases, vapors or mists) or **D** (combustible conductive dusts)
- top pressure range from 0.8 to 1.1 bar.

Design version is :

- flameproof enclosures “**d**“, increased safety “**e**” or level dust ignition protection by enclosure “**tb**”
- with explosion protection group **IIC** or **IIIC**
- and temperature class **T4** (max. permissible surface temperature +135°C, valid for MOR 5PA-Ex) resp. class **T5** (max. permissible surface temperature +100°C valid for MOR 3.XPA-Ex).

Zones for installation of explosion-proof electric actuators and conditions for equipment installation are defined in the following standards:

EN/IEC 60079-10: Electrical apparatus for explosive gas atmospheres
Part 10: Classification of hazardous areas

EN/IEC 60079-14: Electrical apparatus for explosive gas atmospheres
Part 14: Electrical installations in hazardous areas

Non-electric parts of electric actuators are designed, engineered, manufactured, tested and identified in compliance with the requirements for safety of machinery according to the following standards:

EN 1127-1: Explosive atmospheres – Explosion prevention and protection
Part 1: Basic concepts and methodology

EN 13463-1: Non – electrical equipment potentially explosive atmospheres
Part 1 : Basic method and requirements

EN 13463-5: Non – electrical equipment potentially explosive atmospheres
Part 5: Protection by constructional safety “c”

Equipment identification consists of the following characters:

Ex - electric equipment complies with standard EN/IEC 60 079-0. and related standards for the corresponding types of explosion protection.

d - identification of the explosion **protection type** - "flameproof enclosure" according to EN/IEC 60 079-1.

e - identification of the explosion **protection type** – „increased safety" according to EN/IEC 60 079-7.

tb - identification of dust ignition protection by enclosure „t“ according to EN/IEC 60 079-31.

II or III - identification of the class of non-explosive electric device according to the standard EN/IEC 60 079-0.

C - identification of the **sub-class II** resp. **III** of non-explosive electric devices according to the standard EN/IEC 60 079-0.

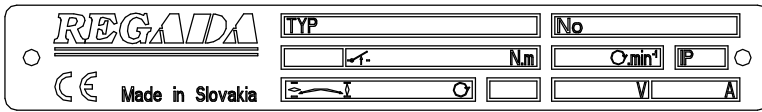
T4,T5,T100°C resp. T135°- identification of the **temperature class** of non-explosive electric device class II or III according to the EN/IEC 60 079-0.

Gb - (EPL Gb) identification of the equipment designated for explosive gaseous atmospheres, with "high" level of protection, which is not a source of initiation in standard operation or in case of expected failures.

Db - (EPL Db) - identification of the equipment designated for explosive dust atmospheres, having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.

1.4 Data specified on electric actuator

Nameplate:



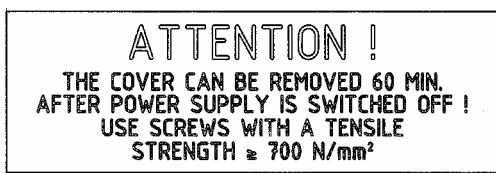
Warning plate:



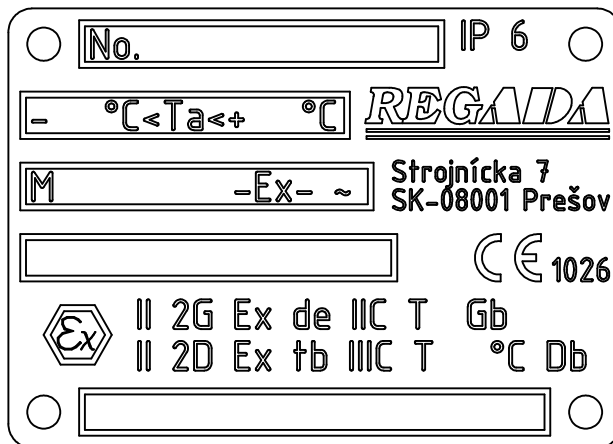
Nameplate contains the basic data concerning identification, performance and electricity: indication of producer, type, serial number, max. load torque and switching-off torque, operating speed, protection code, revolutions, supply voltage and current.

Warning label:

- with identification of the waiting time and requirements for strength of screws



Non-explosive label: identifying the manufacturer, certificate number, type identification, version identification, serial number and version for ambient temperature -20°C to +60°C or -50°C to +40°C.



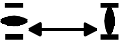





Name plate of motor:



Graphic symbols on electric actuator

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

	Dangerous voltage	(EN ISO 7010-W012)
	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

1.5 Terminology

Potentially explosive environment - an environment where explosive atmosphere can occur.

Explosive gas atmosphere - a mixture of flammable substances (in form of gases, vapors or mist) with air under atmospheric conditions, which upon initiation enables the propagation of the combustion in unconsumed mixture.

Maximum surface temperature - maximum temperature occurring during operation in most adverse conditions (but within accepted tolerance limits) at any part of the surface of the electric device, that could result in ignition of the surrounding atmosphere.

Enclosure - all walls, doors, covers, cable glands, shafts, rods, draw bars, etc., that contribute to the level of protection against explosion or to the level of protection (IP) of the electric device.

Flameproof enclosure "d" - type of protection wherein the parts capable of igniting an explosive atmosphere are located within the enclosure, in case of explosion of an explosive mixture within the enclosure, such enclosure will withstand the pressure of the explosion and prevent the propagation of explosion to the surrounding atmosphere.

Increased safety "e" - type of protection applied to electrical apparatus in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks in normal service or under specified abnormal conditions.

Dust ignition protection by enclosure "t" - type of protection for explosive dust atmospheres where electrical equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures.

Combustible dust - finely divided solid particles, 500 µm or less in nominal size, which may be suspended in air, may settle out of the atmosphere under their own weight, may burn or glow in air, and may form explosive mixtures with air at atmospheric pressure and normal temperatures⁷.

Conductive dust - combustible dust with electrical resistivity equal to or less than $10^3 \Omega \cdot m$.

Combustible flyings - solid particles, including fibres, greater than 500 µm in nominal size which may be suspended in air and could settle out of the atmosphere under their own weight.

1.6 Instructions for stuff training

Requirements for specialized skills of persons performing assembly, operation and maintenance



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



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

1.7 Warning for safety use

1. Products are assigned for operation in environment consist of gas, steam and vapours, with temperature range from -20°C up to $+60^{\circ}\text{C}$; and special version for ultra low temperatures from -50°C up to $+40^{\circ}\text{C}$, to pressure range from 0.8 to 1.1 bar. EA can be installed at areas specified max. as zone 1.



It matters about following products:

It matters about following products are designated for enviroment:

- group **II**
 - the category **2**
 - for type of the atmospheres **G** or **D**
 - subgroup **C**
 - temperature class **T4** resp.**T5**.
2. Products are designed according to standards for electrical and non-electrical devices assigned for areas with danger of explosion:
- for electric parts: EN/IEC 60079-0, EN/IEC 60079-1 and EN/IEC 60079-7 and EN/IEC 60079-31
 - for non-electric parts: EN 1127-1, EN 13463-1 and EN 13463-5.
3. The maximum surface temperature of the actuator for given group **T4** is not allowed to exceed $+135^{\circ}\text{C}$ and for given group **T5** is not allowed to exceed $+100^{\circ}\text{C}$.
4. If the actuator is placed on device which regulate medium with higher temperature than $+55^{\circ}\text{C}$, protect the actuator by additional construction in order to maintain ambient temperature max. $+55^{\circ}\text{C}$ and also to stop temperature transmitting through junction component!
5. Cable glands blinds are assigned only for transport and storage period, i.e. for period till the actuator is builded into operation with danger of explosion, than blinds must be replace by connecting cable.
6. If any of the cable glands are not used to install a cable, it must be replaced with certified Ex plug of the approved type, secured with Loctite 243 adhesive.
7. Temperature on entry cables is max. 90°C .
8. **ATTENTION: THE COVER CAN BE REMOVED 60 MIN. AFTER POWER SUPPLY IS SWITCHED OFF! USE SCREWS WITH A TENSILE STRENGTH $\geq 700 \text{ N/mm}^2$.**
9. Affter reassembling the cover of control box and the cover of terminal box please proceed according to warning in section 5.3 Maintenance to assure inexplosiveness.
10. **WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD.**
During operation of EA it must be prevented any process with intensive formation of electrostatic charge stronger than manual friction of his surface.

Product protection

EA MOR X.XPA-Ex 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.

1.8 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, unauthorised installation or improper operation.

1.9 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 thrust)
- set switching-off thrust
- 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, with national laws.

1.9.1 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

1.10 Operation conditions

1.10.1 Product location and operation position

- Electric actuators may be installed and operated in enclosed locations of industrial facilities with no temperature and moisture regulation, protected from direct climatic effects (such as direct sunlight). Moreover, special "marine" versions may be used in waste water treatment applications, water management, selected chemical applications, tropical environments and coastal areas.
- Electric actuators must be placed with access to the manual control wheel, to the cover of control box, to control box, to bushings.
- Installation and operation of actuators is possible in either position, while motor axis is in horizontal position; variance of motor axis from horizontal plane can be $\pm 15^\circ$. Common position is the one with vertical position of exit part axis and control box above.

Warning:



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

In applications placed in an ambient of a relative moisture above 80%, in external ambient under shed, it is necessary to change the preset thermostat temperature $+25^\circ\text{C}$ to $+70^\circ\text{C}$ by a PC and program to prevent switching off the heating resistor.

1.10.2 Working environment

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

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

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

In conditions of external environment marked as:

- warm mild to very hot dry with temperature in range -20°C to $+60^\circ\text{C}$ AA 6+AA 7*
- cold, warm mild to hot dry with temperatures -50°C to 40°C AA 8*
- with relative humidity 10 to 100 %, including the condensation of up to 0,029 kg water content per 1 kg of dry air at 27°C , at above stated temperature AB 6+AB 7*
- with relative humidity 15 to 100 %, including the condensation of up to 0,036 kg water content per 1 kg of dry air, at above stated temperature AB 8*
- with elevation up to 2000 m, with barometric pressure range from 86 kPa up to 108 kPa AC 1*
- with exposure to intensive water jets (IPx6) AD 6*
- 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*
- expose to corroding or pollute chemical substances during producing or using of these substances); at places where is handled with small quantity of chemical products and these can accidentally get in contact with an electric device AF 3*
- with permanent exposure of big amount of corroding or contaminated chemical and salt fog in execution for sea environment, fog sewage water disposal plant and some chemical plant AF 4*
- with a possibility of influences of mechanical stress:
 - medium sinusoid vibrations with frequency in range from 10 up to 150 Hz, with shift amplitude of 0,15 mm for $f < f_p$ and acceleration amplitude $19,6 \text{ m}/\text{s}^2$ for $f > f_p$ (transition frequency f_p is from 57 up to 62Hz) AH 2*
 - medium impacts, shocks and vibrations AG 2*
- with serious danger of plants and mould growing AK 2*
- with serious danger of animal occurrence (insects, birds, small animals) AL 2*
- with detrimental influence of radiation:
 - of stray current with intensity of magnetic field (direct or alternate, of mains frequency) up to $400 \text{ A} \cdot \text{m}^{-1}$ AM2-2*
 - of sun radiation with intensity > 500 and $\leq 700 \text{ W}/\text{m}^2$ AN 2*
- with effects of medium seismic activity with acceleration $> 300 \text{ Gal}$ $\leq 600 \text{ Gal}$ AP 3*

- with direct endanger by stormAQ 3*
- with quick air movement and strong wind AR 3 , AS 3*
- stand on a conductive bottom)BC 3*
- with a danger of inflammable gases and vapours explosion - for Ex of version..... BE 3N2*
- fire risks BE 2*

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

1.10.3 Power supply and duty cycle

Power supply:

Electric motor..... Y/Δ; 400 / 230V AC resp. Y/Δ; 380 / 220V AC ±10%
Controlbinary inputs 24 V DC ±10%
input control signal 0/4/12 up to 20mA, 4 up to 12mA resp. 20 up to 0/4/12 mA, 12 up to 4mA or 0/2 up to 10V resp. 10 up to 0/2 V

Electronic positional transmitter (EPV) without power supply (passive)..... 18 up to 30 V DC ±10%
Frequency of power supply 50/60* Hz Hz (MOR 3PA-Ex-MOR 3.5PA-Ex), 50Hz (MOR 5PA-Ex) ±2%

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

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

EA MOR X.XPA-Ex 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 MOR X.XPA-Ex 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]
do 100	1200	3600
101-700	600	1800

1.11 Packing, transport, storing and unpacking

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

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

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

The of EA are delivered in solid packages guaranteeing resistance in accordance with EN/IEC 60 654.

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 –50 ° 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

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

If the actuators and accessories are not immediately installed, they have to be stored in dry, well-ventilated sheltered rooms, protected against dirt, dust, soil humidity (with placing onto shelves or onto pallets), chemical impacts and encroachment, at ambient temperature from -10°C up to +50 °C and relative humidity max. 80 %, in special version at temperature –50°C do +40°C.

- It is forbidden to store EA outside or in areas not prevented against direct impact of climate.
- Strains of the surface finishing should be promptly removed if any – it can prevent the product against corrosion damages.
- While storing more than one year it is necessary to check lubrication filling before the actuator is put into operation.
- The EA installed but not operated are to be protected the same way as when storing (e.g. with a wrapping).
- After it is mounted onto a valve in free and wet areas or in areas where temperature is changing it is necessary to connect the space heater – to prevent the actuator against corrosion resulted from water condensed in the control part.
- Remove odd conservation grease as late as before putting into operation.

1.12 Assessment of the product and packaging and removal of contamination

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

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

2. Description, function and specifications

2.1 Description and function

EA MOR X.XPA-Ex 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 (MOR 3PA-Ex-MOR 5PA-Ex) and power transmission with manual control and with additional gear box (MOR 3.4PA-Ex and MOR 3.5PA-Ex)
Control part -	Module M4	- control box

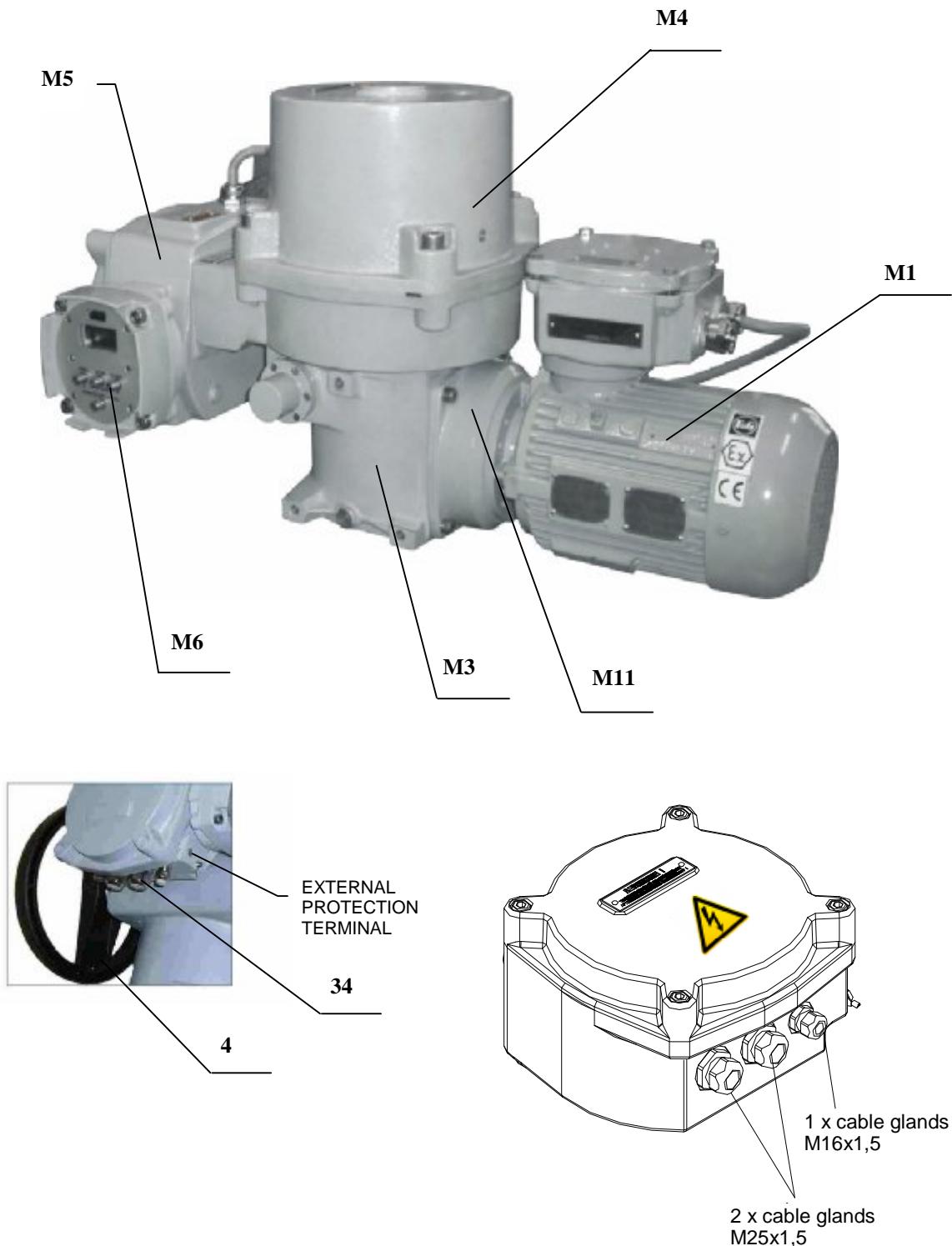


Fig. 1 – MOR 3-PA-Ex, MOR 4PA-Ex

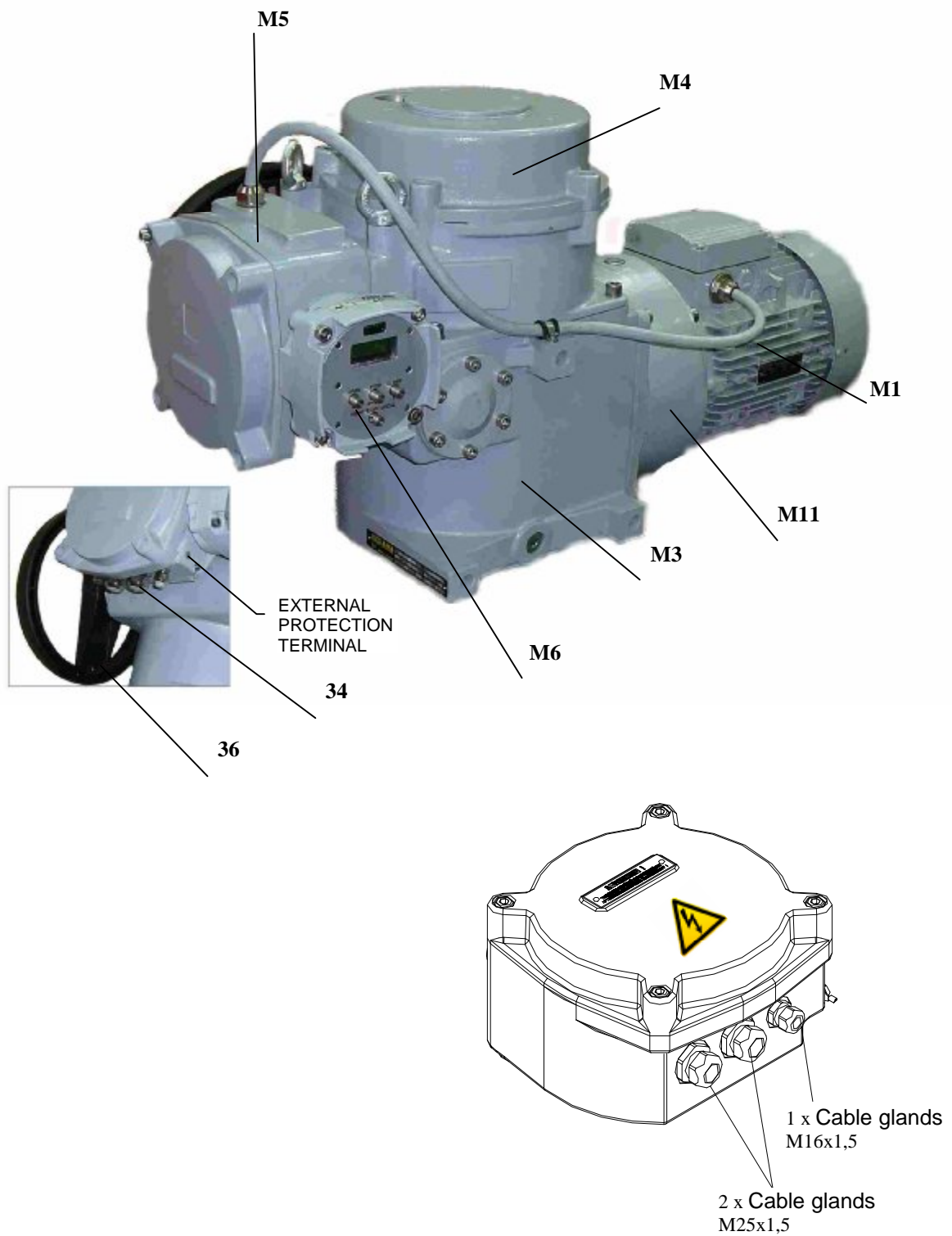


Fig. 1a – MOR 5PA-Ex

Modul M 1 – electric motor

3-phase explosion-proof electric motor (M1) is in make **Ex de IIC T4 and T5 Gb** - what is flameproof enclosures "d", increased safety "e".

Module M11 – countershaft transmission with rotary hold **Ex c IIC T4 and T5 Gb**

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

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

Modul M 3 – force transmission with manual control (Fig. 2) **Ex c IIC T4 and T5 Gb**

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

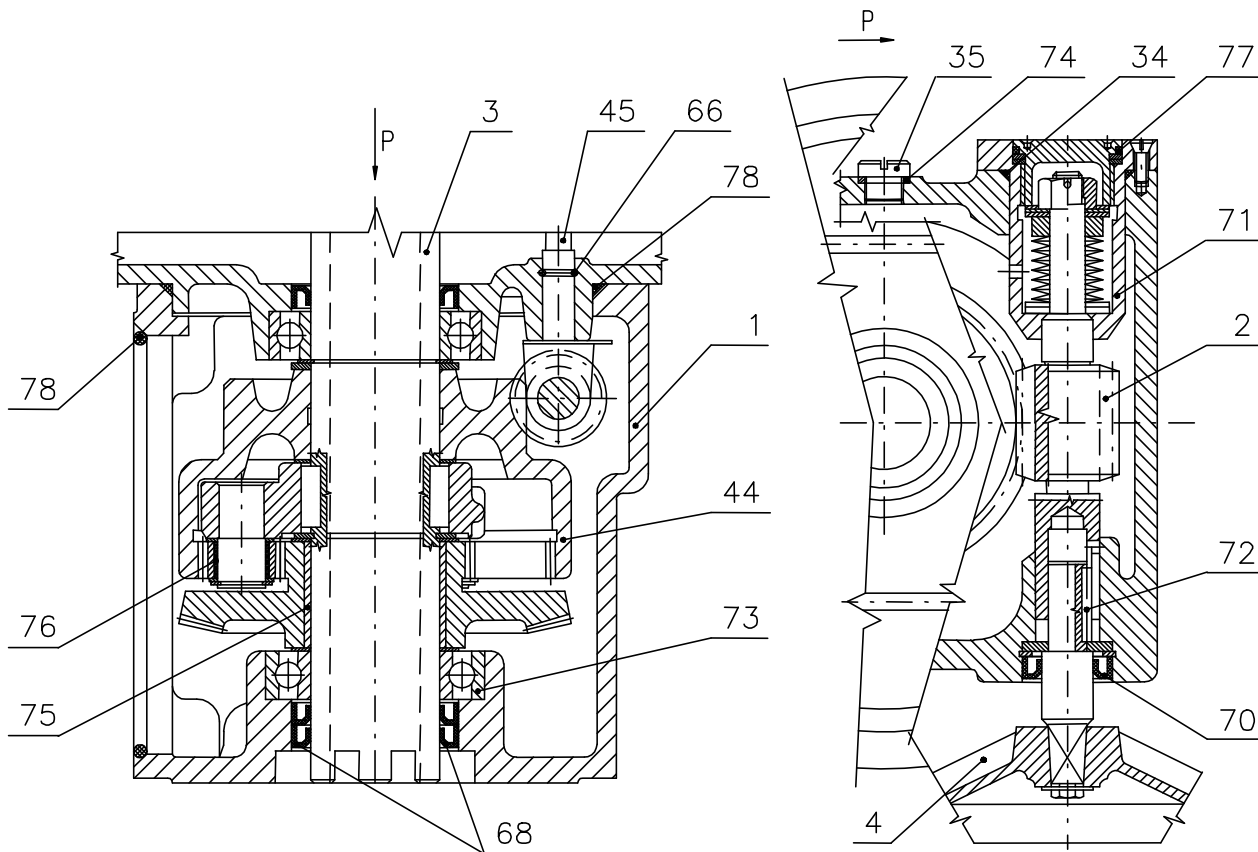


Fig. 2

Module M 4 – control box (Fig. 1)

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

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

On mounting base (8) of control plate are fixed these functional blocks:

- power supply board (9)
- control unit of the electronics DMS3 (10)
- position sensing unit (11)
- torque sensing unit (12)
- thyristor unit or reversing contactors (13)
- space heater (14)
- transformer (15)
- LED display (16) (in version without manual control)

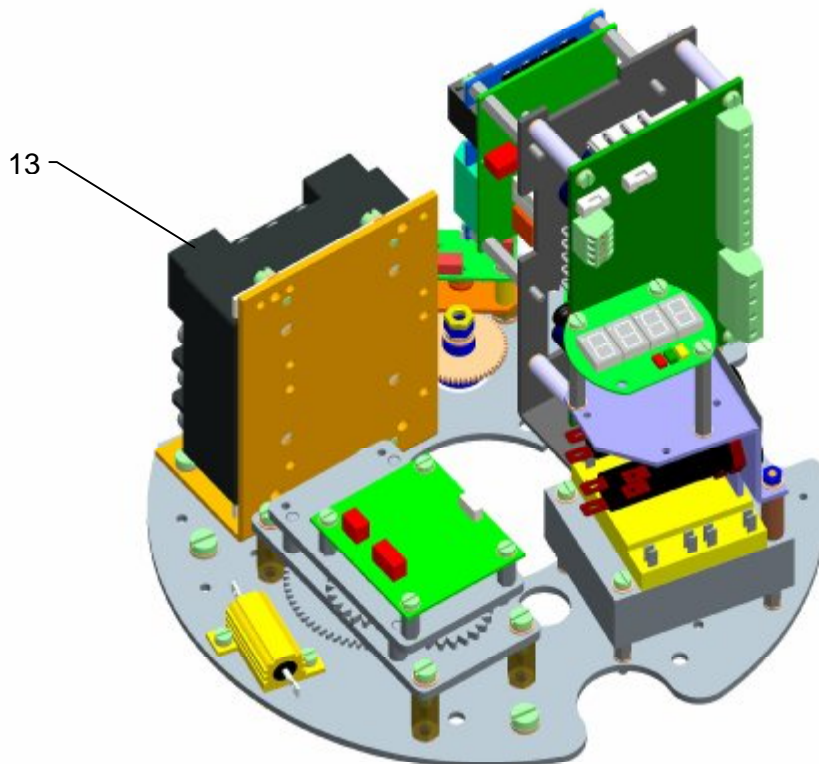
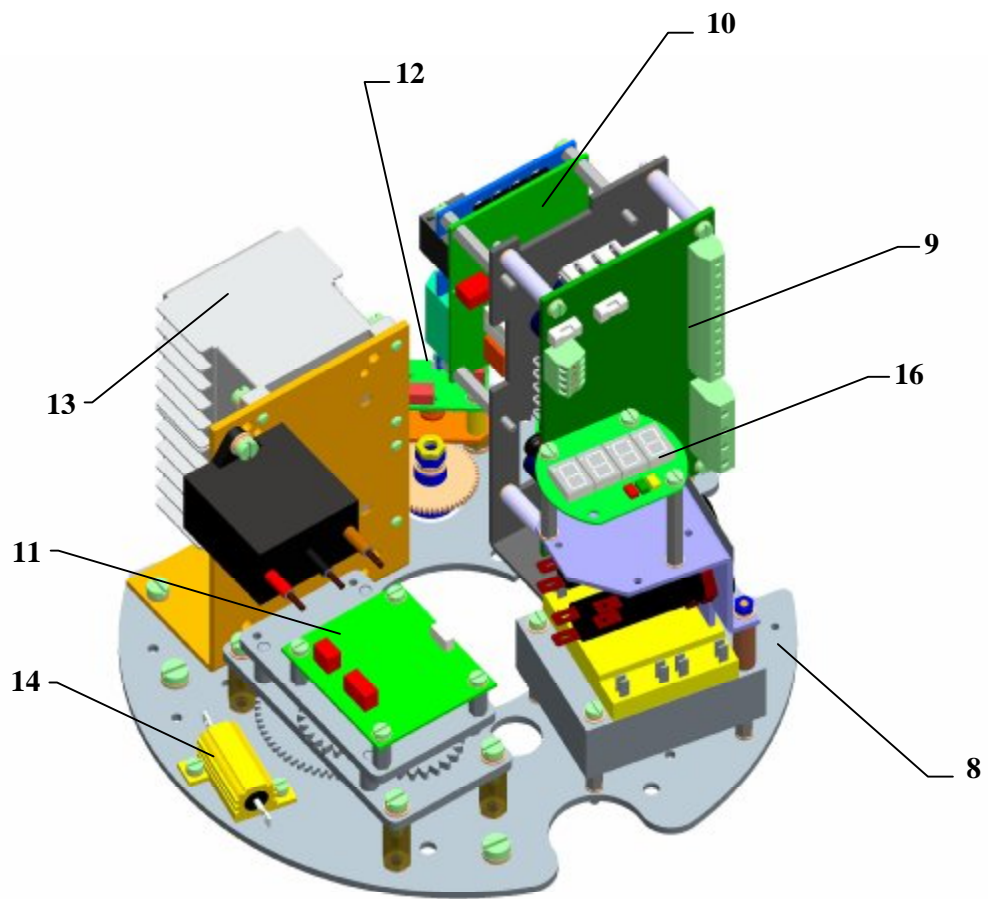


Fig.3 – MOR 3.XPA-Ex – three – phase version

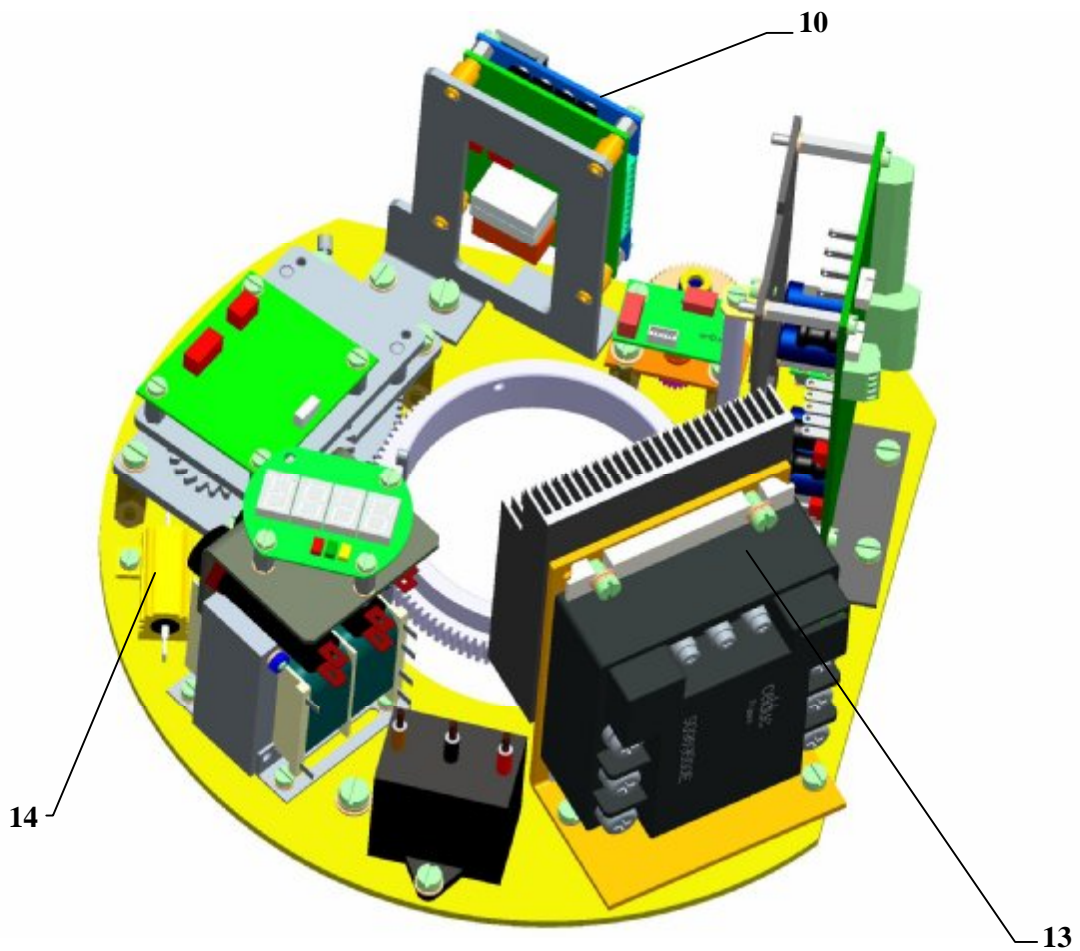
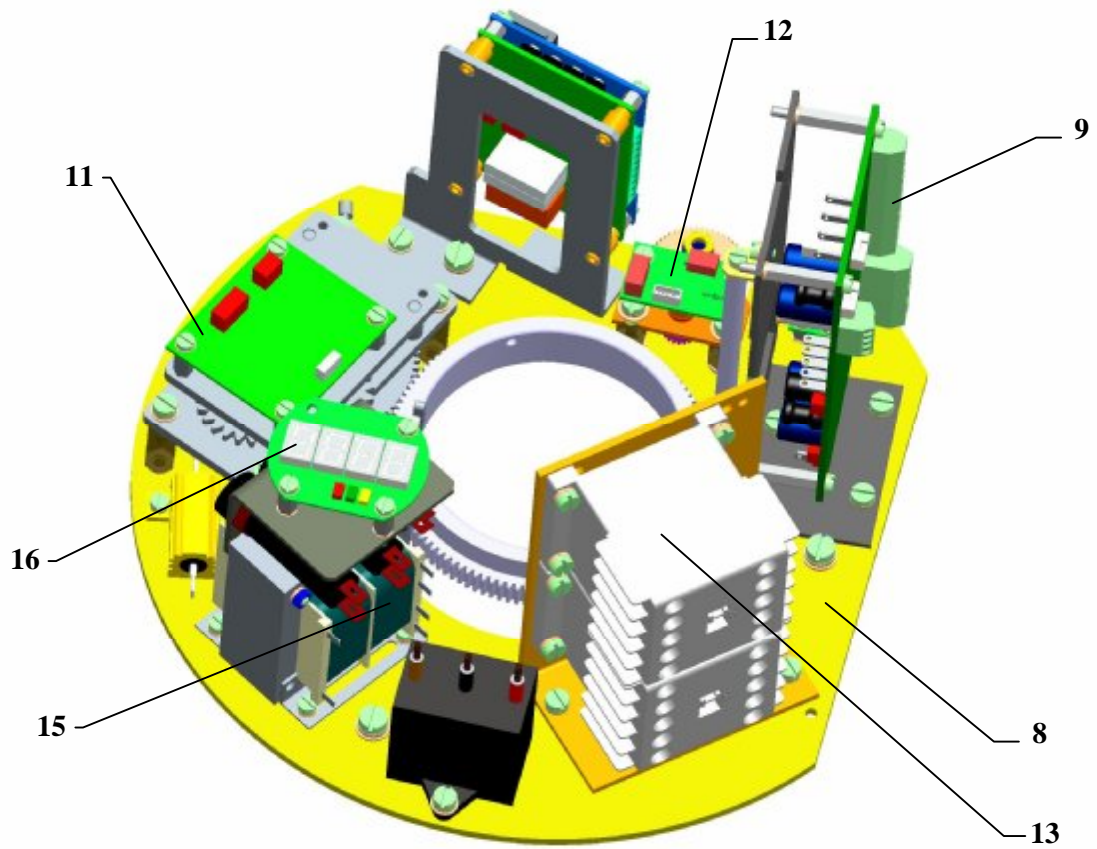


Fig.3a - MOR 5PA-Ex

The MOR X.XPA-Ex electric actuator is controlled by 24 V DC voltage fed to the electric actuator's terminals according to the wiring diagram or by 0/4/12 to 20 mA, 4 to 12 mA resp. 20 to 0/4/12 mA, 12 to 4 mA, (0/2 to 10 V resp. 10 to 0/2 V) input control signal and provides for moving the output part of the EA automatically to a position corresponding to the value of the input signal, and other functions as well.

The electric actuator consists of these main parts (**1,2,3,3a**):

The electric actuator is driven by an **electric motor (M1) (fig.1)** supplied and controlled from the **power supply board (9)** (fig.3, 3a) and **control unit (10)** (fig.3,3a) of the DMS3 electronics.

Position of output element of EA and torque are scanned by contactless absolute sensor.

Depending on the version, the DMS3 electronic circuit board may include **an electronic position transmitter (EPV)** without power supply (passive) with output signal 4 - 20 mA.

Space heater (14) (fig.3,3a) is placed at the mounting base (8) (fig.3,3a).

In case of power cut or damage of switches the actuator can be controlled manually according to instructions stated in chapter 1.9 Basic specifications and in chapter 4.1 Service.

Basic modules of DMS3 electronic control system for MOR X.XPA-Ex:

Control unit (10) (fig.3,3a) – main part of system DMS3 – it contains microprocessor, 6 signal LED and 4 buttons for simple adjustment and control of EA, connectors for connection of torque scanner and sourcing board and communication connector (connection to PC for adjustment and diagnostic), 2 free programmable relays R1 and R2, 1 relay READY and terminals for electric connection.

Supply board for 3-phases version (9) (pic. 3,3a) – is powered from the transformer (15) (pic. 3, 3a) and offers to the user output voltage 24 V DC, max. 100mA. The user relays READY, RE1 to RE5 are part of the supply board. The supply board gives the output to the space heater and also to control of reverse contactors coils eventually to the contactless motor switch. The supply board contains user terminal board and connector for wiring with control box.

Position sensing unit (11) (fig.3, 3a) – secures contactless magnetic position sensing of output element.

Torque sensing unit (12) (fig.3, 3a) – provides contactless magnetic torque reading.

LED display (16) (fig.3, 3a) – shows instant position of EA output member and reports and displays potential errors, which would occur when EA is operated. Signalling motion and failure of the EA is also indicated by LEDs diode. LED display is used only pro type of construction EA without local control.

Manual control: made up by a handwheel with a worm gearing (4) (fig.1).

Other accessories – as optional accessories:

- Local electric control module equipped with a 2-line LCD display (33) (fig.1) resp. (fig. 7).

2.2 Basic specifications

Basic EA specifications:

Operating speed [min^{-1}], operating stroke [rev.], switching-off torque [Nm], and electric motor parameters are given in Table 1 and 1a.

Table 1: Basic EA Specifications MOR 3.4PA-Ex. MOR 3.5PA-Ex																
Type/ type number	Operating speed $\pm 10\%$	Operating stroke ³⁾	Max. load torque		Switching-off torque ¹⁾ $\pm 10\%$	Weight	Electric motor									
			(ON – OFF duty) S2-15 min.	(Modulating duty) S4-25%			Supply voltage nominal voltage	Nominal								
								Power	Revolutions	Current ²⁾						
	[min^{-1}]	[rev]	[Nm]	[Nm]	[Nm]	[kg]	[V] $\pm 10\%$	[W]	[1/min]	[A]						
1	2	3	4	5	6	7	8	9	10	11	12					
MOR 3PA -Ex type number 109	16		34	20	26 - 40	cca 26,5 - 34,5	Three-phase	Y / Δ ; 380 / 220; 50 Hz Y / Δ ; 400 / 230; 50 Hz	250	1355/400V	0,66					
			76	45	60 – 90					1335/380V	(0,69)					
			110	65	80 – 130					370	1350/400V	0,94				
			127	75	100 – 150						1325/380V	(0,95)				
	25			34	20				26 - 40					250	1355/400V	0,66
				76	45				60 – 90					1335/380V	(0,69)	
				110	65				80 – 130					370	1350/400V	0,94
				127	75				100 - 150					1325/380V	(0,95)	
	40			34	20				26 - 40					250	1355/400V	0,66
				76	45				60 – 90					1335/380V	(0,69)	
				110	65				80 – 130					370	1350/400V	0,94
				127	75				100 - 150					1325/380V	(0,95)	
	60 ⁴⁾		68	-	50 - 80					550	915/400V	1,6				
			76	-	60 – 90					905/380V	(1,5)					
			127	-	100 - 150					750	1400	1,81				
										750	1400	(1,7)				
	63 ⁴⁾		34	-	26 - 40					370	1350/400V	0,94(0,95)				
			54	-	40 - 63					1325/380V						
	90 ⁴⁾		34	-	26 - 40					1100	2790	2,5(2,29)				
			68	-	50 - 80					750	1400	1,81(1,7)				
	95 ⁴⁾		68	-	50 - 80					1500	2830/400V	3,0(3,07)				
			127	-	100 - 150					2815/380V						

continue >>>>>>

Table 1: Basic EA Specifications MOR 3.4PA-Ex. MOR 3.5PA-Ex - continue

Type/type number	Operating speed $\pm 10\%$	Operating stroke ³⁾	Max. load torque		Switching-off torque ¹⁾ $\pm 10\%$	Weight	Electric motor					
			(ON – OFF duty) S2-15 min.	(Modulating duty) S4-25%			Supply voltage nominal voltage	Nominal				
								Power	Revolutions	Current ²⁾		
	[min ⁻¹]	[rev.]	[Nm]	[Nm]	[Nm]	[kg]	[V] $\pm 10\%$	[W]	[1/min]	[A]		
1	2	3	4	5	6	7	8	9	10	11	12	
MOR 3.4PA-Ex type number 108	10	1-500	240	180	200 – 300	cca 42 $\pm 5\%$	Three-phase	Y / Δ ; 380 / 220; 50 Hz Y / Δ ; 400 / 230; 50 Hz	370	1350/400V	0,94	
			280	210	250 – 350					1325/380V	(0,95)	
	16		144	108	100 – 180				550	915/400V	1,6	
			160	120	150 – 200					905/380V	(1,5)	
			200	150	200 – 250					280	1350/400V	0,94
	25		160	120	150 – 200				370	1325/380V	(0,95)	
			200	150	200 – 250					550	915/400V	1,6
			280	210	250 – 350						905/380V	(1,5)
			750	1400	1,81							
	40		136	102	100 – 170				550	915/400V	1,6	
			160	120	150 – 200					905/380V	(1,5)	
			240	180	200 – 300					750	1400	1,81
	63 ⁴⁾		120	90	100 – 150				750	1400	1,81	
			240	180	200 – 300					1500	2830/400V	3,0
			160	120	100 – 200						2815/380V	(3,07)
			200	150	200 – 250					1100	2790	2,5(2,29)
80 ⁴⁾	112	84	80 – 140	cca 49 $\pm 5\%$	Three-phase	Y / Δ ; 380 / 220; 50 Hz Y / Δ ; 400 / 230; 50 Hz	1100	2790	2,5(2,29)			
	256	192	140 – 320					1500	2830/400V	3,0(3,07)		
	360	270	300 – 450						2815/380V	3,0(3,07)		
	440	330	400 – 550					1100	2790	2,5(2,29)		
	112	84	80 – 140					1500	2830/400V	3,0(3,07)		
	256	192	140 – 320						2815/380V	3,0(3,07)		
	360	270	300 – 450						1100	2790	2,5(2,29)	
	424	318	400 – 530						1500	2830/400V	3,0(3,07)	
40	112	84	80 – 140	cca 49 $\pm 5\%$	Three-phase	Y / Δ ; 380 / 220; 50 Hz Y / Δ ; 400 / 230; 50 Hz	1100	2790	2,5(2,29)			
	208	156	140 – 260					1500	2830/400V	3,0(3,07)		
	256	192	260 – 320						2815/380V	3,0(3,07)		
	304	228	300 – 380					1100	2790	2,5(2,29)		

Table 1a: Basic EA Specifications MOR 5PA-Ex														
Type/type number	Operating speed ±10[%]	Operating stroke ³⁾	Max. load torque		Switching-off torque ¹⁾ ±10 [%]	Weight	Electric motor							
			(ON – OFF duty) S2-15 min.	(Modulating duty) S4-25%			Supply voltage nominal voltage	Nominal						
								Power	Revolutions	Current ²⁾				
	[min ⁻¹]	[rev.]	[Nm]	[Nm]	[Nm]	[kg]		[V] ±10 [%]	[kW]	[1/min]	[A]			
1	2	3	4	5	6	7	8	9	10	11	12			
MOR 5PA-Ex/ type number 168	15	1 - 800	300	200	300 - 500	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			
			600	400	630 - 1000				2,2	940	5,2			
	20		300	200	300 - 500				1,5	925	3,9			
			375	250	500 - 630				3	1420	6,4			
			600	400	630 - 1000				2,2	1420	4,7			
	40		300	200	300 - 500				4	1440	8,2			
			375	250	500 - 630				3	1420	6,4			
			600	400	630 - 1000				2,2	1420	4,7			
	60 ⁴⁾		300	200	300 - 500				4	1440	8,2			
			375	250	500 - 630				3	1420	6,4			
	100 ⁴⁾		600	400	630 - 1000				2,2	1420	4,7			
		300	200	300 - 500	4				1440	8,2				
				375	250				500 - 630			3	1420	6,4

Remarks:

- 1) State the switching - off torque in your order by words. If not stated it is adjusted to the maximum rate of the corresponding range.
Starting torque is min. 1, 3 multiple of maximum switching-off torque of selected range.
- 2) Applies to voltage 3x400V AC.
- 3) State individual number of working revolutions in the order. Provided customer doesn't specify otherwise, EA will be set on 20 working revolutions.
- 4) We are not recommended for modulating duty.

Other specifications:

Protection enclosure of EA: IP 66 EN/IEC 60 529)

Mechanical ruggedness:

sinusoid vibrations..... see Chapter 1.10.2

resistance by drops 300 drops with acceleration of 5 m.s⁻²

Self-locking:declared in range 0% to 100% 100 % switching - of torque

Motor's thermal protection:thermistor PTC

Electric control:

remote control - movement of output part of the electric actuator is controlled :

- by binary inputs 24 V DC, or
- by unified input signal 0/4/12 up to 20mA, 4 up to 12mA resp. 20 up to 0/4/12 mA, 12 up to 4mA or 0/2 up to 10V, resp. 10 up to 0/2 V according to version.

Power supply of electronics:

- Power supply DMS3 Z3 is used for three phase versions and feeds the electronic modules built in EA.
- It provides the 24V DC, 100 mA output voltage.

Power sources contain a protective fuse with parameters according to chapter 2.2.2 Electric connection.

Position sensing:

- - contactless absolute magnetic.

End positions adjustment:

End position relays are preset to a specified working stroke. It is possible to set up (with keys situated on the control unit or through with keys situated on the electric local control, resp. program after connecting the EA with PC) the switching-off in end positions as follows:

- C = Torque + O = Torque
- C = Torque + O = Position
- C = Position + O = Torque
- C = Position + O = Position

Notes:

- C = Torque - shutting off at end limit - torque „Closed“
- O = Torque - shutting off at end limit - torque „Opened“
- C = Position - shutting off at end limit - position „Closed“
- O = Position - shutting off at end limit - position „Opened“

Factory's setup of switching-off in end positions is described in the chapter "Adjusting of actuator".

Torque sensing:

- contactless absolute magnetic.

Disengaging torque adjusting:

Disengaging torque is factory adjusting to a maximum value with the $\pm 10\%$ tolerance shown on the name plate of the appropriate EA.

The user is allowed to modify the switching-off torque value within the range 50 - 100%, stepped by 10%.

Torque blocking:

The switching-off from torque can be blocked within a certain range of the stroke starting from a stroke end position (max.5%), for time agreed on, in range of 0 to 20 sec..

Output relay :

- 3x relays (standard) (**READY, R1, R2**) max. 250 V AC/1 A/cos phi=1; max. 30 V DC/2A
- relays **READY, RE1, RE2, RE3, RE4 and RE5** max. 250 V AC/1 A/cos phi=1; max. 30 V DC/2A
- relays are free programmable (their function can be changed with buttons on the control unit, with buttons on the electric local control, or through a PC with the program).

READY relay: - programme selections option – error indication, error or warning, error or not remote, error or warning or not remote. READY relay factory set is shown in the chapter 3 "Adjusting of actuator". Relay READY on the control unit and supply unit are doubled (it is not possible to set different functions on these units)

R1, R2, RE1, RE2, RE3, RE4 and RE5 relay: - programme selections option – disabled, Position O (position open), Position C (position close), Torque O (torque open), Torque C (torque close), Torque O or Torque C, Torque O or Position O, Torque C or Position C, opens, closes, movement, movement – flasher, to position, from position, warning, control – remote, control – local, (not valid for EA without local control), control OFF.

Relay R1 is doubled with relay RE1 and relay R2 is doubled with relay RE2. Individual relay factory set is shown in the chapter "Adjusting of actuator".

Transmitter (output signal)

Electronic position transmitter (EPV) passive - 2-wire connection (without inbuilt power supply)

Current signal.....	4 ÷ 20, resp. 20 ÷ 4 mA (DC)
Voltage at connection of EPV passive.....	18 up to 30 V DC
Load resistance	max. $R_L = 500 \Omega$
Tolerance of value of output signal of electronic transmitter in end positions:	$\pm 0,5\%$ ¹⁾ :
Tolerance of linearity of transmitter	$\pm 1\%$ ¹⁾
Hysteresis of transmitter	max. 1 [%] ¹⁾

1) from nominal value of transmitter referred to output values

Galvanic separation..... output signal is galvanically separated from input control signal

Program possibilities of output signal (N) : 4 ÷ 20 mA, 20 ÷ 4 mA . Factory's setup of output signal is described in the chapter "Adjusting of actuator".

Electronic position controller (N) – actuation by input control signal

Input control signals - analogue: 0 - 20 mA (0 – 10 V by version)
 4 - 20 mA (2 – 10 V by version)
 12 - 20 mA
 4 - 12 mA
 20 - 0 mA (10 – 0 V by version)
 20 - 4 mA (10 – 2 V by version)
 20 - 12 mA
 12 - 4 mA

Input resistance for signal 0/4/12 to 20 mA. 4 to 12 mA and 20 to 0/4/12 mA, 12 to 4 mA : Rin = 120 Ω

Input resistance for signal 0/2 to 10 V and 10V to 0/2 V: Rin = 30 kΩ

Tolerance of controller's linearity: 0,5 %

Dead of controller: 1 – 10 % - (adjustable)

Factory's setup of input signal is described in the chapter "Adjusting of actuator".

Control by binary inputs 24 V DC:

by feeding of 24 V DC to terminals **CLOSE** and **OPEN**.

Programming possibilities of binary inputs I1 and I2 (change is possible only through the programme of PC or using buttons local control)

- for the input **I1** : DISABLED; ESD; DBL (local releasing, remote releasing - not valid for EA without local control); STOP

- for the input **I2**: DISABLED; ESD; DBL (local releasing, remote releasing - not valid for EA without local control); 2P (the EA can undergo control for the opening direction or closing with the controller ON and I2 input activated with 24 V DC voltage supplied to the terminals to OPEN or CLOSE).

Factory's setup is described in the chapter "Adjusting of actuator".

Programmable FAILURE REACTION: OPEN, CLOSE, STOP, SAFE POSITION

Factory's setup is described in the chapter "Adjusting of actuator".

Adjustable elements :

The EA is possible to adjust with or resetting to different parameters operating the control unit buttons, local control buttons (following the version) or once it is connected to the PC using the programme and the communication cable connected to the EA control unit communication connector and the EA cover removed.

Space heater (E1)

Space heater - supply voltage:..... cca 18 V AC

Space heater power output: cca 10 W/55°C

Electronic board provides switching of heating element. It is possible to change switching temperatures of the switch from –40°C to +70°C with help of PC and particular software. Factory's setup for shut down of heating element (thermostat) is +25°C.

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“.

Number of revolutions of manual hand wheel for 1 output revolution 26 (MOR 3PA-Ex), 62 (MOR 3.4PA-Ex), 95,5 (MOR 3.5PA-Ex) and 31 (MOR 5PA-Ex).

Output part backlash: < 5 ° (at 5 % of switching torque load)

Grease: see chapter 5.2 Maintenance - extent and periodicity.

2.2.1 Mechanical Connection

- with flanges ISO 5210, DIN 3338 resp. GOST R 55510.
Main and connecting dimensions are given in the **dimensional drawings**.

2.2.2 Electric connection

To the terminal board (X, X1, X2) – screwless terminals

PE, U, V, W – terminals of supply (3x400 V AC)

9,10,11,12 (0 V, +24 V) – 2x terminals of output voltage 24 V DC (100 mA)

16,17,18,19,20 (COM, CLOSE OPEN, I1, I2) – terminals of control inputs 24 V DC on the control unit

21,22,23 (+IN, -IN, SH) – terminals of output current signal resp. voltage signal

24,25 (+L, -L) – terminals output current signal (passive) 4-20 mA

26,27,28,29,30 (COM, NO, NC, R1, R2) – of relay terminals READY, R1, R2 on the control unit

13,14,15,1,2,3,4,5,6,7,8 (COM, NO, NC, COM1, RE1, RE2, RE3, RE4, COM5,NO,NC) – terminals of relay READY, RE1, RE2, RE3, RE4, RE5 on the supply board

Max. number screwless terminals is 34.

Connecting cables size to screwless terminal board is 0,08 - 2,5 mm².

Wire stripping length of the wires for screwless terminals is from 8 to 9mm.

Attention: Thermic resistance incoming wires must be minimum +90°C.

Wire cross-section conversion table (mm ² – AWG)	
Wire cross-section	
mm ²	AWG
0,05	30
0,2	24
0,34	22
0,5	20
0,75	18
1,5	16
2,5	14

Tightening torque conversion table (N.m – lbs.-in)	
Tightening torque	
N.m	lbs.-in
0,2	2,7
0,3	4
0,5	7

Cable glands:**MOR 3PA-Ex, MOR 3.4PA-Ex, MO 3.5PA-Ex, MOR 5PA-Ex**

- M25x1,5 and M16x1,5 (see fig.1).

There must be included power switch or motor circuit breaker to the power supply, which should be selected according to the electric motor power for the output parameters according to Table 1 resp. 1a and following Table (e.g. motor-overcurrent circuit breaker MIS 32 - ... manufacturer SEZ; P25M manufacturer Schneider respectively PKZM01 fy Eaton). It must be placed as close as possible to the device, easily accesible to the operator and marked as an disconnecting device of actuator.

Table selection of fuse to electric motor

Single-phase electric motor	Three-phase electric motor					Adjustable range of circuit-breaker
	220 V	380 V	440 V	500 V	660 V	
220 V	220 V	380 V	440 V	500 V	660 V	Adjustable range of circuit-breaker
230 V	230 V	400 V			690 V	
240 V	240 V	415 V				
	(kW)					(A)
-	0,09	0,12	0,18	0,18	0,25	0,4...0,63
0,06...0,09	0,09...0,12	0,18...0,25	0,25...0,37	0,25...0,37	0,37...0,55	0,63...1
0,12	0,18...0,25	0,37...0,55	0,37...0,55	0,55...0,75	0,75...1,1	1...1,6

Protection terminal:

During start-up - during installation of device:



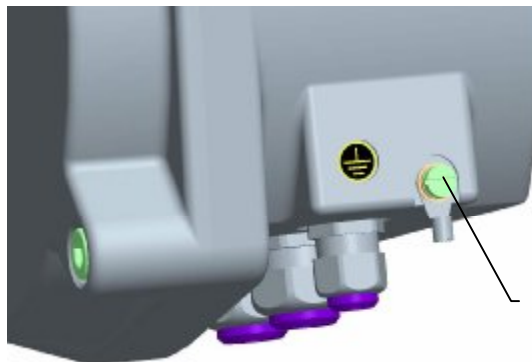
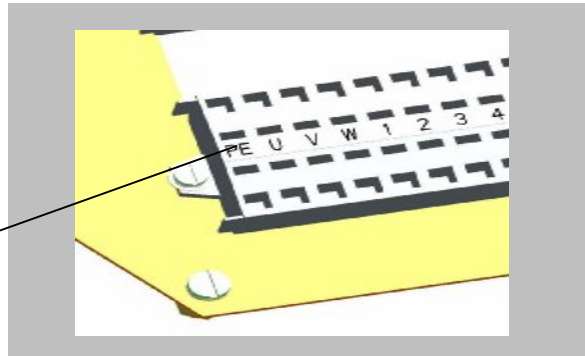
- for safety operation of the actuator use EA be unavoidable connect external and internal ground terminal. The position of the external a internal ground terminal can be seen in fig. 4. For forcing - in wires in external ground terminal be needed use pliers HP3 for insulated eyelet (firm CEMBRE).

- a switch / circuit breaker must be installed on the power supply line, as close as possible to the device, easily accessible to operators and identified as the actuator isolation switch.

External and internal, are together connected and marked with the mark of protection grounding.

The electric connection should be made according to wiring diagrams pasted into the upper cover resp. terminals box of the EA.

INTERNAL
PROTECTION
TERMINAL



EXTERNAL
PROTECTION
TERMINAL

Fig.4

Fuses:

Power supply board of actuator is equipped with fuses F3 and F4. Location of the fuse on the power supply board can be seen in Fig.5.

Fuses values and parameters:

	FUSES	F3	F4	F5	F6	F7-1	F7-2
MOR 3PA+Ex	SIZE	Automatic reset fuse as short-circuit protection for external supply for customer	NANO ² SMD	5x20mm	5x20mm	6,3x32mm	
	WITH REVERSING CONTACTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	-	
	WITH THYRISTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	10A FF 500 V	
MOR 3.4PA-Ex	SIZE		NANO ² SMD	5x20mm	5x20mm	6,3x32mm	
	WITH REVERSING CONTACTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	-	
	WITH THYRISTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	20A FF 500 V	
MOR 3.5PA-Ex	SIZE	Automatic reset fuse as short-circuit protection for external supply for customer	NANO ² SMD	5x20mm	5x20mm	6,3x32mm	
	WITH REVERSING CONTACTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	-	
	WITH THYRISTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	10A FF 500 V	
MOR 5PA-Ex	SIZE		NANO ² SMD	5x20mm	5x20mm	6,3x32mm	
	WITH REVERSING CONTACTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	-	
	WITH THYRISTORS		1A T 125 V	0,4A F 250 V	1A F 250 V	20A FF 500 V	

F3 - fuse external power supply for the customer

F4 - fuse of space heating

F5 - fuse the secondary (10 V AC) transformer

F5 - fuse the secondary (18 V AC) transformer

F7 - fuse thyristor module

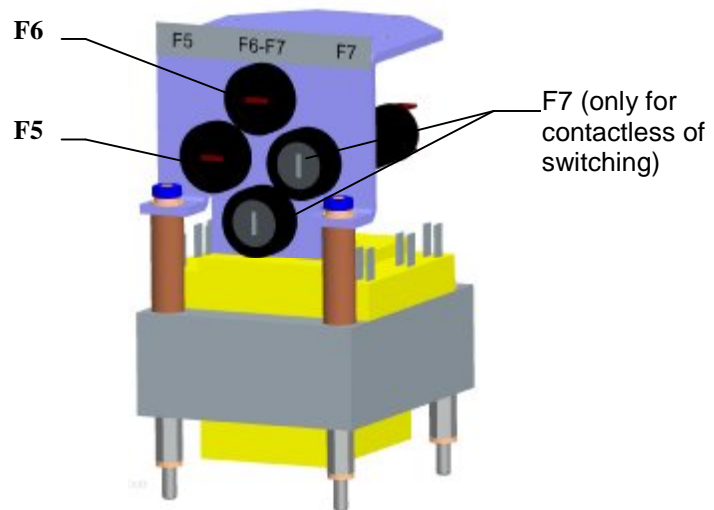
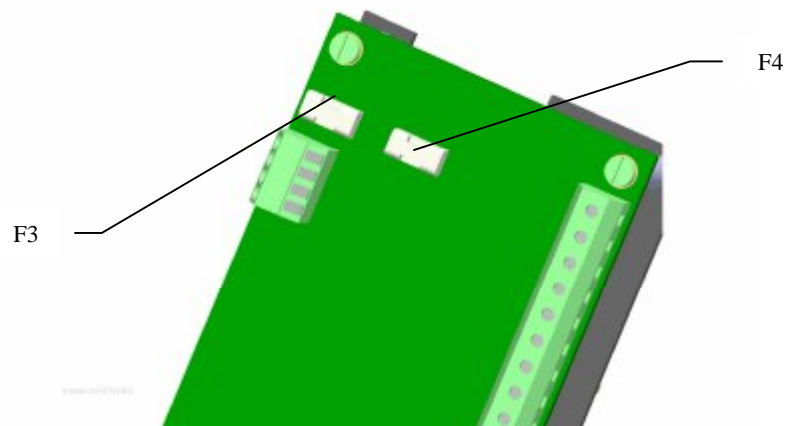


Fig.5

3. Installation and dismantling of actuator



Abide by safety measures!

Notes:

Repeatedly verify whether placing of EA corresponds to chapter "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 name plate) are in compliance with the valve parameters.
- In case of inconsonance, perform adjusting according to the chapter Adjusting of actuator.

3.1 Installation

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

3.1.1 Mechanical connection to the armature

Put on the hand wheel before assembly. In case that required shape of mechanical connection is designed by adapter (with flange F16, F14 or F10) at first is necessary to fix this adapter to connecting flange of EA by the screws.

Mechanical connection – shape of connecting element A, B, C, D, E (eventually B3) 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 end position „CLOSED“; shift armature into identical end position after electric connection.
- Put EA on armature, so as output shaft reliably fits into clutch of armature after electric connection.

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:

- If the rising spindle of armature is in end 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 end position „CLOSED“; shift armature into identical end position after electric connection.
- 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 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

Follow up with connecting the EA with mains or master system.



1. Follow instructions in the chapter Requirements for professional qualification....
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. (The cable Ölflex 440P 1.5 7G with thermal Insulation resistance -50° C to +90 ° C is assembled in the factory.)*
3. Cables to terminal boards or connectors lead through screw cable glands.
4. *Before initiation EA into operation internal and external protection terminals are needed to be connected.*
5. *Feeding cables are to be fixed to the solid construction at most 150 mm from the cable glands.*
6. *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.*
7. *Reversation of the EA is sure, if the period between switching-off and switching-on of power supply for the reversed movement of the output part is minimally 50 ms.*
8. *The EA are delivered with cable glands, which in case of tight putting on the leads assure protection enclosure up to IP 68. For required protection enclosure it is needed to use rings according to the actual cable diameter.*
9. *Sealing areas of cover of the control part have to be clean before repeated fastening*

Connecting with the master system:

EA can be controlled by: - analogue signals through the built-in position controller
- binary inputs 24 V DC

EA is connected according to wiring diagram under the cover of EA.

Notes:

1. *For connecting of input control signals and output signals it is necessary to use shielded wires with Galvanised Steel Wire Braid Ξ GSWB, e.g. type cable „Bruflex® HSLCH“, 4x0,5 (fy Bruns Kabel).*
1. *The EA are delivered with cable glands, which in case of tight putting on the leads assure protection enclosure up to IP 68. For required protection enclosure it is needed to use rings according to the actual cable diameter.*
2. *While fixing the cable it is needed to count with allowed bend radius to avoid damaging or deformation of the sealing element of the cable gland. The leads are to be fixed with the solid construction at most 150 mm from the cable glands.*
3. *The face areas of the control part cover have to be before re-mounting clean, coated with grease without any acid (e.g. vaseline) and sealing not damaged to avoid joint corrosion.*

Important Notice

1. During set up, repairs and maintenance you must secure the actuator properly in such way that it is isolated from power source, so the risk of injury by electric current or by actuator movement is avoided.



In version **MOR X.XPA-Ex** it is necessary to do **calibration** in operation according by enclosure assure the optimal function.



Abide by instructions of valve producers, whether switching-off in end positions is to be realised with position or torque switches.

3.2 Dismantling



Attention!

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

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

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

- Disconnect the EA from mains.
- Disconnect the leads from the EA terminal boards and loosen the cables from cable glands.
- 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. Adjustment of actuator



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!

After mechanical connection, electrical connection and checking of connection and function start setting and adjustment of the device. The adjustment can be performed at a mechanically and electrically connected EA. This part describes adjustment of EA to specified parameters in case that any unit of EA is reset. Laying of adjusters of the control board is shown on Fig.6.

Adjustment is possible:

- by operating the control unit buttons (see Fig. 6);
- by operating the local control panel buttons (see Fig. 7) – only for the EA s equipped with local control;
- through the programme once the EA is connected to the PC using the communication cable.

For the specific adjustment procedure or individual parameters reset see individual appendixes **74 1053 02 & 74 1076 02.**

For facilitating the simple setting of required operation parameters, the control unit is equipped with :

- four setting buttons: **MENU, P, O, C**
- six signal lamps according (LED diode) to **Fig. 6.**

Status indication by means of LED diodes:

- **LED ERROR** (red) – blinks red in case of failure eventually lights in the parameter setting mode
- **LED OPEN / MENU** (green) – in the ON/OFF mode it lights with a control action for the **opening** direction eventually blinks with accessing the MENU mode
- **LED CLOSE / PAR** (red) – in the ON/OFF mode it lights with a control action for the **closing** direction eventually blinks besides the chosen parameter in the menu and lights up at writing the parameter into the memory
- **LED I1 / SEL** (yellow) – permanent lights with active input I1, or blinks in the mode of parameters set up.
- **LED I2** (yellow) – permanent lights with active input I2
- **LED POWER** (green) – it light on at leading the power supply.

Electronics - programme selections option

- **relay R1; R2:** disabled; open position; close position; torque-open; torque – close; torque open or torque close; torque open or position open; torque close or position close; open; close; movement; movement flasher; to position; from the position; warning; remote control; local control; control shut off.
- **relay READY:** errors, errors or warnings, errors or no remote, errors or warnings or no remote.
- **output signal** (from EPV passive): 4 to 20 mA; 20 to 4 mA.
- **control programme options** (regulating): 2P, 3P, 3P/2P I2
- **input control signal** (N): 0/4/12 to 20 mA, 4 to 12 mA, resp. 0/2 to 10 V.
- **input I1:** DISABLED; ESD; DBL (local releasing - not valid for EA without local control), STOP
- **input I2:** DISABLED; ESD; DBL (local releasing - not valid for EA without local control), 2P (for control programme option 3P/2P I2 allows control using the binary 24V DC inputs with I2 input activated).
- **FAILURE REACTION:** OPEN, CLOSE, STOP, SAFE POSITION

The identical functions cannot be set on I1 & I2 inputs in addition to the OFF state (e.g., if the ESD function is set on I1 input, it is not possible to select the ESD function on I2 input at the same time.

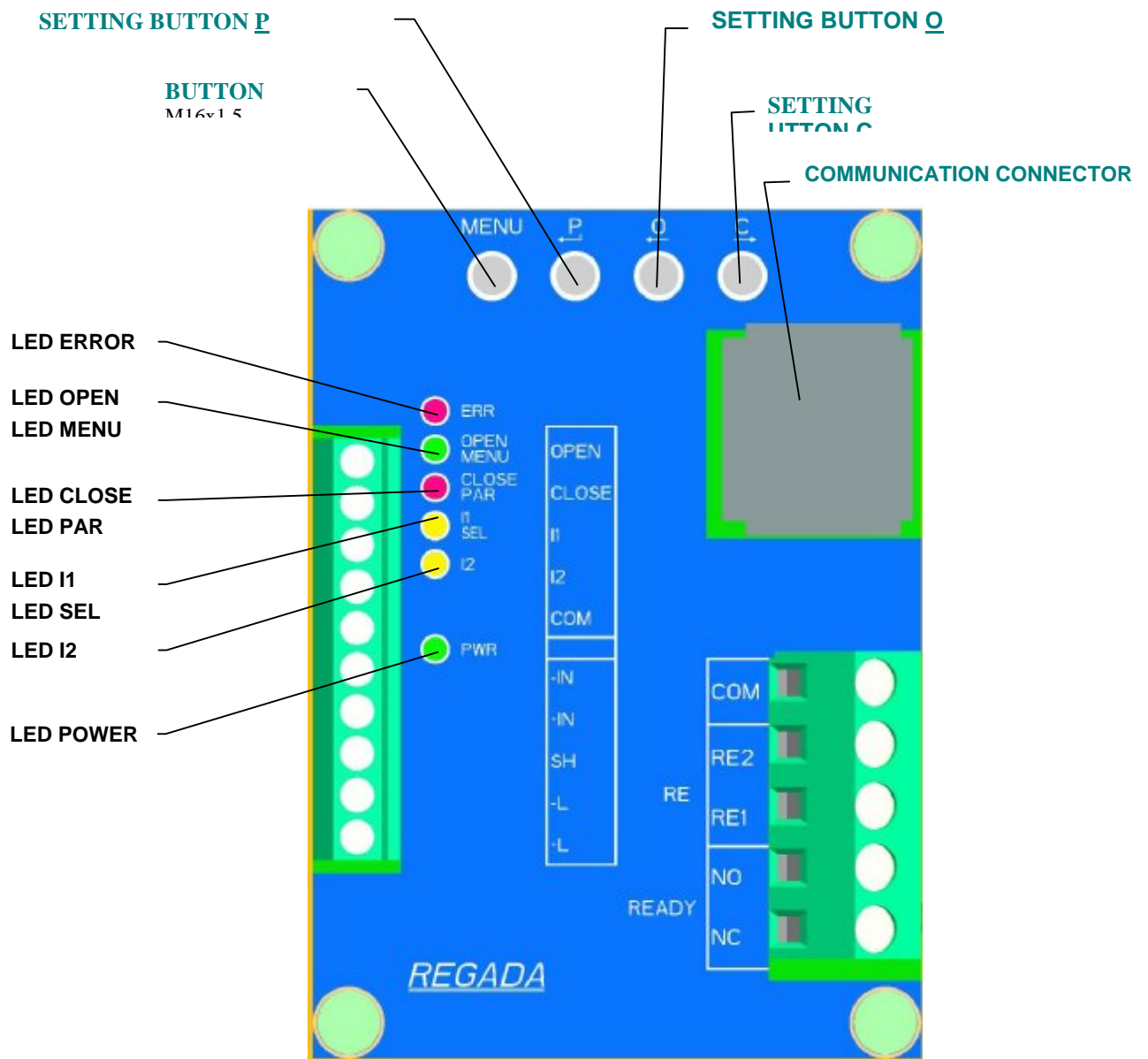


Fig. 6

4.1 EA control set-up options (regulating)

2P CONTROL

Setting-up: **2P** control + other functions, in addition to **STOP** on I1 outlet:

The EA moves either to the OPEN or CLOSE direction with **24V DC** voltage supplied to terminals **OPEN** or **CLOSE**. The EA stops if power supply is cut-off or the end position is reached.

2P PULSE CONTROL

Setting-up: **2P** control + **STOP** function on I1:

The EA moves either to the OPEN direction or closes with **24V DC** voltage pulse supplied on connectors **OPEN** or **CLOSE**. The EA stops – shutting off - once the 24V DC voltage is supplied on I1 connector (STOP) or the set end position is reached.

3P CONTROL (REGULATING)

Setting-up: **3P** control + other functions, in addition to STOP on I1 and other ones in addition to 2P on I2 input:

The EA moves either to the OPEN or CLOSE direction with **0/4/12 to 20 mA, 4 to 12 mA (0/2-10V) input control signal** supplied on terminals **+IN, -IN**. The EA stops once the required position is reached (corresponding with the input control signal supplied) or the set end position is reached.

Note: *The EA fails to stop in case that the STOP function is selected on I1 input with 3P control mode and 24V DC voltage supplied on I1 terminal.*

3P/2P switched over to I2

Setting-up: **3P/2P** control switched over to **I2** (**2P** function is automatically selected for **I2** input function in selecting this control option) + other functions in addition to STOP on I1.

The EA moves either to the OPEN or CLOSE direction with **0/4/12 to 20 mA, 4 to 12 mA (0/2-10V) input control signal** supplied on terminals **+IN, -IN**. The EA stops once the required position is reached (corresponding with the input control signal supplied) or the set end position is reached.

The EA stops to respond to **0/4/12 to 20 mA, 4 to 12 mA (0/2 to 10 V) input control signal** and rests in case of **I2 active input** (with 24V DC constantly ON or OFF – as per I2 function set-up to ACTIVE – or supplied on I2 connector). The EA is allowed to move either to the **OPEN** or **CLOSE** direction with **24V DC** voltage supplied to terminals **OPEN** or **CLOSE**. The EA stops if power supply is cut-off or the end position is reached. The EA stops to respond to the input control signal and fixes its position once the supply voltage on I2 is OFF.

3P/2P switched over to I2 (PULSE 2P)

Setting-up: **3P/2P** control switched over to **I2** (**2P** function is automatically selected for **I2** input function in selecting this control option) + other functions in addition to **STOP** on I1:

The EA moves either to the OPEN or CLOSE direction with **input control signal 0/4 – 20 mA (0/4/12 to 20 mA, 4 to 12 mA (0/2-10V))** supplied on connectors **+IN, -IN**. The EA stops once the required position is reached (corresponding with the input control signal supplied) or the set end position is reached.

The EA stops to respond to **0/4/12 to 20 mA, 4 to 12 mA (0/2-10V) input control signal** and rests in case of **I2 active input** (with 24V DC constantly ON or OFF – as per I2 function set-up to ACTIVE – or supplied on I2 terminal). The EA is allowed to move either to the OPEN or CLOSE direction with **24 V DC** voltage pulse supplied connectors **OPEN** or **CLOSE**. The EA stops once the 24V DC voltage is supplied on I1 terminal (STOP) or the set end position is reached.

The EA stops to respond to the input control signal and fixes its position once the supply voltage on I2 is OFF.

4.2 Procedure for setting individual parameters and the register of errors and warnings

- is given in the separate attachment 74 1053 02 resp. 74 1076 02 of these operating instructions.

The factory default setting of individual programmes shown in Table 2 & 3, as long as otherwise specified by the customer:

Table 2

Factory default settings of individual parameters in version without local control; possibility to set-up by operating the control unite buttons.

For the individual parameters set-up see appendix 74 1053 02.

MENU	NAME	FACTORY SETTING-UP	
1	TORQUE	100% of value shown on name plate for OPEN & CLOSE direction	
2	END LIMIT	<ul style="list-style-type: none"> - C = Position + O = Position - end position switching closed and open from position if valve type is not specified - C = Torque + O = Position - closed in end by torque position and end position switching open from position for single-seat valves - C = Torque + O = Torque – switching in both end positions by thrust for double-seat valves 	
3	TORQUE BLOCKING	<ul style="list-style-type: none"> - 2 sec. blocking time - 5% blocking position for OPEN & CLOSE direction 	
4	RELAY READY	- errors (READY COM-NO relay contacts closed in error free conditions)	
5	RELAY R1,R2,RE1,RE2,RE3,RE4,RE5	<ul style="list-style-type: none"> - position O for relay R1, RE1 - position C for relay R2, RE2 - from position 95% for relay RE3 - to position 5% for relay RE4 - disabled for RE5 relay 	
6	CPT (output signal)	4 to 20 mA	
7	REGULATION – (according to specification)	2P	3P
	ANALOG INPUT	-	4 to 20 mA (2 to 10 V)
8	DEAD ZONE	-	3 %
9	FAILURE REACTION	STOP	

Other parameters set-up is possible to change only by using the PC software

TITLE	FACTORY SETTING-UP
DIRECTION OF ROTATION	clockwise.
THERMOSTAT TEMPERATURE	25 °(space heater OFF temperature)
INTERNAL DEAD ZONE	2 % (only for 3P)
SAFE POSITION	0 %
FUNCTION I1	ESD
ACTIVE I1	high level
FUNCTION I2	DISABLED
ACTIVE I2	high level
THERMAL FUSE FAILURE	functionless with this EA type
THERMAL FUSE RESET	functionless with this EA type
CYCLE MODE	DISABLED
CYCLE RUNNING TIME	10 s
CYCLE PAUSE	50 s
CYCLE POSITION O1	0 %
CYCLE POSITION O2	100 %
CYCLE POSITION C1	0 %
CYCLE POSITION C2	100 %
O AND C TOLERANCE	1 %
CREATE BACKUP	START
RESTORE FROM BACKUP	START
RESTORE FACTORY SETUP	START
ACTIVE ERRORS	CLEAR

Table 3

Factory default settings of individual parameters in version with local control; possibility to set-up by operating the local control buttons. For the individual parameters set-up see appendix 74 1076 02.

MENU	NAME	FACTORY SETTING-UP	
1	LANGUAGE	English (select language on LCD display)	
2	POSITION O	work angle range set as per EA specification	
3	POSITION C		
4	REG. CALIBR.	START	
5	END LIMIT	- C = Position + O = Position - end position switching closed and open from position	
6	TORQUE O	100% of value shown on name plate	
7	TORQUE C	100% of value shown on name plate	
8	BLOCK. TIME	2 s	
9	BLOCK. POS. O	5 %	
10	BLOCK. POS. C	5 %	
11	CPT (output signal)	4 to 20 mA	
12	REGULATION-(according to specification)	2P	3P
13	ANALOG. INPUT	-	4 to 20 mA
14	DEAD ZONE	-	3 %
15	INT. DEAD Z.	-	2 %
16	FAIL. REACT.	STOP	
17	SAFE POSIT.	0 %	
18	FUNCTION I1	ESD	
19	ACTIVE I1	high level	
20	FUNCTION I2	DISABLED	
21	ACTIVE I2	high level	
22	THERMO. FAIL. (THERMAL FUSE FAIL)	functionless with this EA type	
23	THERMO. RESET (THERMAL FUSE RESET)	functionless with this EA type	
24	RELAY READY	errors	
25	RELAY 1	Position O (POSITION OPEN)	
26	RELAY 1 POS.	0 %	
27	RELAY 2	Position C (POSITION CLOSE)	
28	RELAY 2 POS.	0 %	
29	RELAY 3	FROM POSITION	
30	RELAY 3 POS.	95 %	
31	RELAY 4	TO POSITION	
32	RELAY 4 POS.	5 %	
33	RELAY 5	DISABLED (OFF)	
34	RELAY 5 POS.	0 %	
35	CYCLE MODE	DISABLED	
36	CYCLE RUN. T.	10 s	
37	CYCLE PAUSE	50 s	
38	OC TOLERANCE	1 %	
39	INFORMATION	TORQUE	
40	RESTORE BACK.	START	
41	CREATE BACK.	START	
42	RESTORE FACT.	START	
43	ACTIVE ERR:	CLEAR	

Other parameters set-up not possible to change using the PC software

NAME	FACTORY SETTING-UP
DIRECTION OF ROTATION	clockwise.
THERMOSTAT TEMPERATURE	25 °(space heater OFF temperature)
CYCLE POSITION O1	0 %
CYCLE POSITION O2	100 %
CYCLE POSITION C1	0 %
CYCLE POSITION C2	100 %
LCD CONTRAST	0

Warning 1: When the input control signal is set to the value 0 , 20 mA (0 to 10 V), or 20 , 0 mA (10 to 0 V) and the input control signal fails, then the EA keeps the position as with a 0 mA (0 V) input signal (EA doesn't recognise between input signal fail and 0 mA (0 V) input signal).

Warning 2: Calibration process doesn't run if triggered in time when the EA is overloaded (EA is switched- off from overloading). In such case error is needed to be corrected i.e. the EA must be moved in a position in which EA is not switched – off from overloading, and to start the calibration again.

Warning 3: Calibration process must be performed at any change of the operating stroke value of more than 10%.

Warning 4: Operate adjusting button P on the control to activate the calibration process or start it from MENU 4 in the version with local control (use the buttons on local control) or from the programme once the EA is connected to the PC. All calibration start methods have been equal.

Rotation direction definition of the electric actuator's output element

Electric actuator is set by the producer in the following way: while looking at the output shaft of the actuator from the upper cover side, the output shaft moving in the direction "Close" is rotating clockwise. It means that the direction of rotation of the actuator is set as **clockwise**

In case the direction of rotation shall be changed the parameter „Direction of rotation of the actuator“ must be adjusted as **anticlockwise**. This parameter can be adjusted through the PC only by use of the EHL Explorer SW. The PC must be connected to the actuator via communication cable and the window "Parameters" used for direction adjustment.

4.3 Putting an EA into operation when the EA is set up and connected with the armature already in the manufacturer (starting the calibration)

If EA is delivered from manufacturing plant joined with valve, or with control device, **calibration** must be performed to ensure correct operation, under actual pipeline conditions.

The procedure is as follows:

- fit the given assembly into the specified technology complex
- connect the EA on the supply voltage electrically according to the wiring diagram and chapter Electric connection....
- introduce the EA into an half-position (see Note 2 presented above)
- switch on the supply voltage
- start the EA calibration by pressing the **P** button on the control unit **for 2 seconds as minimum** until LED ERROR (red), LED MENU (green) and LED PAR (red) light up – see also the procedure in the separate attachment No.74 1053 02
- release the **P** setting button
- after releasing the **P** button the calibration procedure starts – inertia measuring
- after the calibration procedure is finished, the EA is prepared for its operation and starts to response to control inputs
- if changes to some parameters would be necessary, proceed please according to the instructions given in the separate attachment No. **74 1053 02**.

4.4 Putting an EA into operation when the parameter setting done by the producer suit to your needs

When an EA is delivered from the producer without armature and the setting of stroke (stroke end positions) and other parameters done by the producer suit Your needs, please proceed as follows:

- connect the EA with the armature to be controlled (**according to chapter 2**) and fit this assembly into the specified technology complex
- connect the EA electrically according to the wiring diagram and chapter Electric connection ...
- introduce the EA into an half- position (see Note 2 presented above)
- switch on the supply voltage
- start the EA calibration by pressing the **P** button on the control unit **for 2 seconds as minimum** until LED ERROR (red), LED MENU (green) and LED PAR (red) light up – see also the procedure in the separate attachment No. 74 1053 02
- release the **P** setting button
- after releasing the **P** button the calibration procedure starts

- after the calibration procedure is finished, the EA is prepared for its operation and starts to response to control inputs
- if changes to some parameters would be necessary, proceed please according to the instructions given in the separate attachment No. 74 1053 02.

4.5 Putting an EA into operation when it is necessary to do a change to the angle (setting new end positions), and the other parameter setting done by the producer suits to your needs

When an EA is delivered from the producer without armature, and the setting of other parameters done by the producer suit to your needs, and it is necessary to do a change to the EA stroke, proceed as follows:

- connect the EA with the armature to be controlled (according to chapter 2) and fit this assembly into the specified technology complex,
- connect the EA electrically according to the wiring diagram and chapter Electric connection... ,
- turn on the power supply, without connection of the control signals fed into EA (input control signal - EA reports error/warning No.2 - no binary input),
- set the EA (*using manual control**) to end position **closed** and push button **C** for at least **2s**, until LED ERROR (red), LED MENU (green) and LED PAR (red) come on – the **closed** end position is thus recorded in memory – see description in separate annex **No. 74 1053 02**,
- release the **C** setting button,
- set the EA (*using manual control**) to end position **opened** and push button **O** for at least **2s**, until LED ERROR (red), LED MENU (green) and LED PAR (red) come on – the **opened** end position is thus recorded in memory – see description in separate annex **No. 74 1053 02**,
- release the **O** setting button,
- **introduce** the EA into an intermediate position (see *Note 2* presented above),
- by pressing the **P** pushbutton on the control unit for at least **2s** activate the EA calibration until LED ERROR (red), LED MENU (green) and LED PAR (red) come on – see also description of the procedure in separate annex **No. 74 1053 02**,
- release the adjustment pushbutton **P** - upon release of the **P** pushbutton, the calibration process is started,
- turn on the control signals, EA is ready for operation and responds to control inputs,
- if any of the parameters need to be changed, proceed according to the instructions in separate annex **No. 74 1053 02**,

* *This applies to setting of EA to be controlled by 2P and 3P or 3P/2P switched by I2, at the same time with standard setting of menu 9 FAILURE REACTION: STOP!*

4.6 Setting other parameters

If changes to some parameters would be necessary, proceed please according to the instructions given in the separate attachment No 74 1053 02.

4.7 Error messages from the control unit

The EA electronics makes possible to identify some failures of EA. The failure is signalled by flickering LED ERROR (red) on the control unit (**Fig.6**). An error has also been indicated on the LED display. An error is indicated on the LCD display in the local control EA version.

The list of errors and warnings and the way for identifying a given error as well are presented in the separate attachment No. 74 1053 02. For identifying the reason of the error, the EA can be connected to a PC and the program helps you find the type of the error.

The list of errors and warnings compiled by the producer is presented in table 4 (chapter 5.4).

The list of errors and warnings and the way for identifying a given error as well are presented in the separate attachment No 74 1053 02.

A field serviceman is only entitled to change the errors and warnings set using the programme once the EA is connected to the PC.

5. Service, maintenance and troubleshooting

5.1 Service



1. In general it is provided that service of the EA is performed by a qualified worker in accordance with requirement given in Chapter 1!

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 electricians, or manually on their assembly position. Manual control is executed via hand wheel.
- The operators must take care for performing of prescribed maintenance and for protection of EA during operation against harmful ambient effects and atmospheric exposure, which exceeds the scope of acceptable effects described in chapter „Operation 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 name plate values and excessive vibration of EA.

Manual control:

If needed (during adjusting, function checking, failure etc.) the staff can change setting of the controlled body using the handwheel. While rotating the handwheel clockwise the output part moves in the direction "closed".

Before manual control must be realized locking screw. Fasten locking screw after finishing of manual control.

Electric local control: - additional equipment (Fig.7)

If necessary in the case of accession, function check and so on, it is possible to preset EA or change some parameters by local electric control with secured power feeding.

It is possible to control after removing of 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”**, which is displayed on 2 rows LCD (6). Signalling motion and failure of the EA is also indicated by LEDs diode (7).

Mode **“Shut off”** – it is possible to change some parameters in this mode in particular menus.

Mode **“Local”** – it is possible to control EA by the local buttons in this mode - (3) **OPEN**, (5) **STOP**, (4) **CLOSE**.

Mode **“REMOTE”** – it is possible to control EA by the commands from superior remote system

Proceeding in setup of particular parameters in the mode **“SHUT OFF”** is described in the independent amendment No. 74 1076 02, which is delivered together with EA equipped by local electric control.

When you finish the work in the **“REMOTE”** mode put the padlock on the button (2) again. This measure would be received because of potential unauthorized person's intervention.

Note: Modes of Local or Remote control is conditioned by program choices of inputs I1 and I2. In the case that inputs I1 or I2 are programmed for “Local releasing”, it is only possible to control the EA by local control with active input I1 or I2.

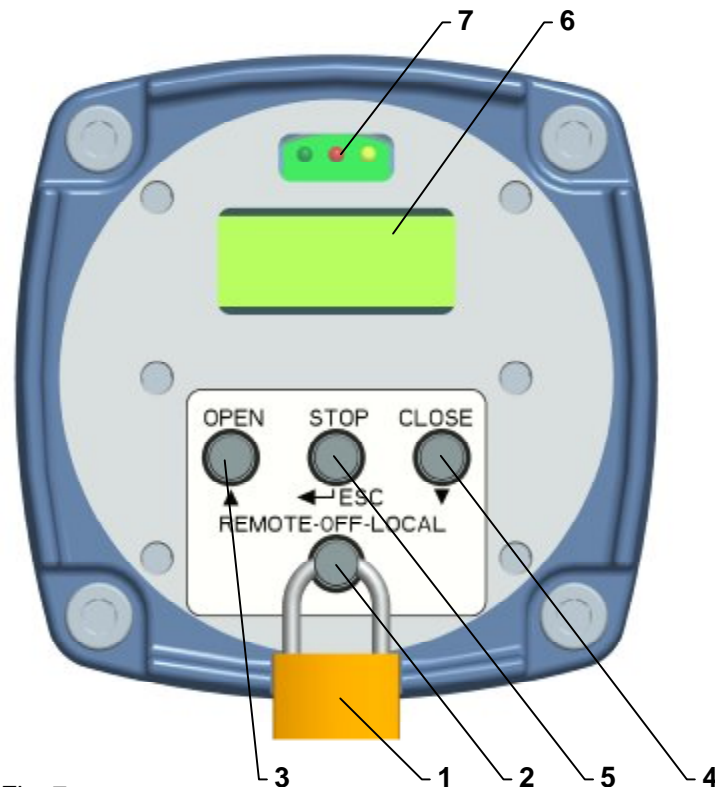


Fig. 7

5.2 Maintenance – scope and regularity

All screws and nuts affecting tightness and protection (IP) must be tightened during the inspection and maintenance. Similarly, once a year should be checked and if necessary tightened mounting screws of the terminal wires and assuring of the slip-on joints with wires. The interval between two preventive inspections is four years.

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

The grease in the supplied actuators is designed for the lifetime of the product.

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

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

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

Lubrication:

- the gearbox:
 - in versions with temperatures -25°C till $+55^{\circ}\text{C}$ - Madit PP-80 (Slovnaft)
 - in versions with temperatures -40°C till $+40^{\circ}\text{C}$ - Avia SYNTOGEAR PE 68
- gears of transmission unit and drive mechanism on the control board:
 - in versions with temperatures -25°C till $+55^{\circ}\text{C}$ - grease μ HF 401/0, resp. GLEITMO585
 - in versions with temperatures -40°C till $+40^{\circ}\text{C}$ - grease ISOFLEX TOPAS AK 50



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 once 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.

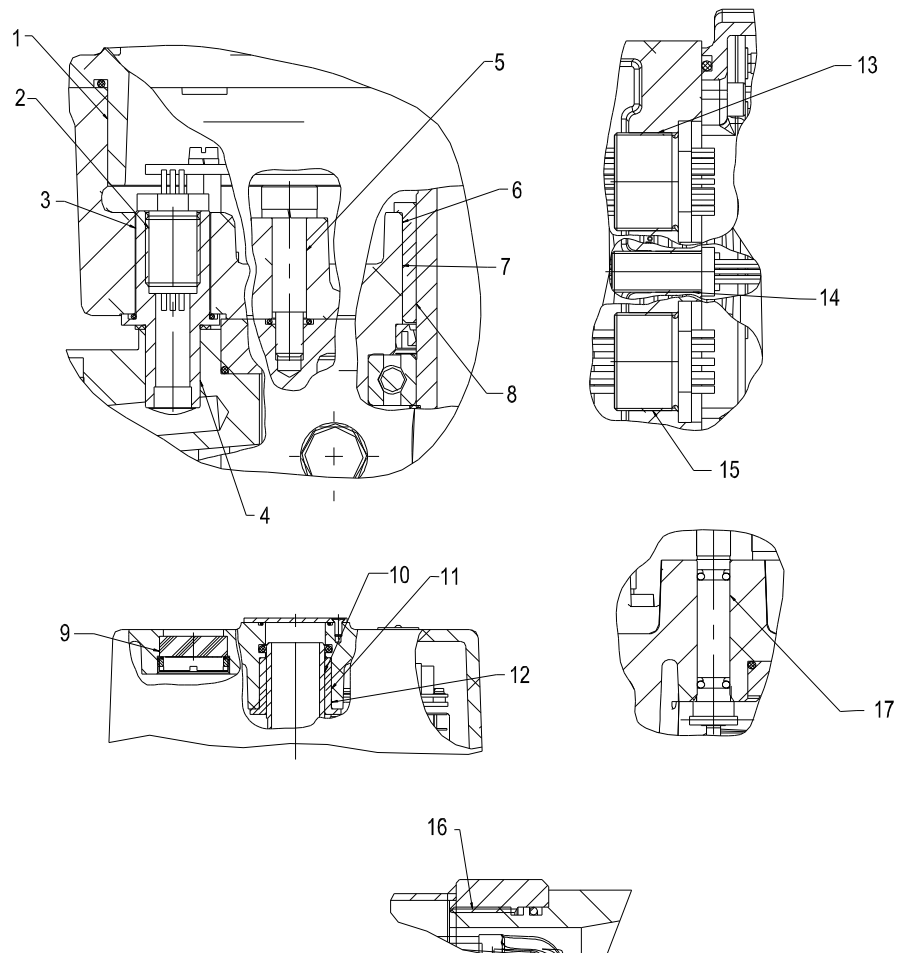
5.3 Maintenance to assure inexplosiveness



- A an hour before removing of the actuator cover it is needed to switch power supply off. The given period is required to assure cooling of the electric motor and the space heater below the admissible temperature value of the temperature class T4 (+135 °C) resp. T5 (+100 °C).
- The fixing screws of the upper cover have to be always in full numbers, i.e. 4 pcs, with flexible washers and tightly fastened.
- The actuators with damaged closing surfaces, e.g. scratches, rifts, etc. have to be immediately put out of operation.
- While connecting and disconnecting of the EA check the sealing rings of the cable glands – damaged and worn sealing should be replaced by original rings!
- 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.
- Reparation of EA (basically the parts the resisting closures consist with, have substantial influence on safety) is allowed perform only by producer, witch according to certificated documentation and by performing of required tests (inclusive of static pressure test of resisting clouser parts guarantee the fulfil required standardes and rules for this products.

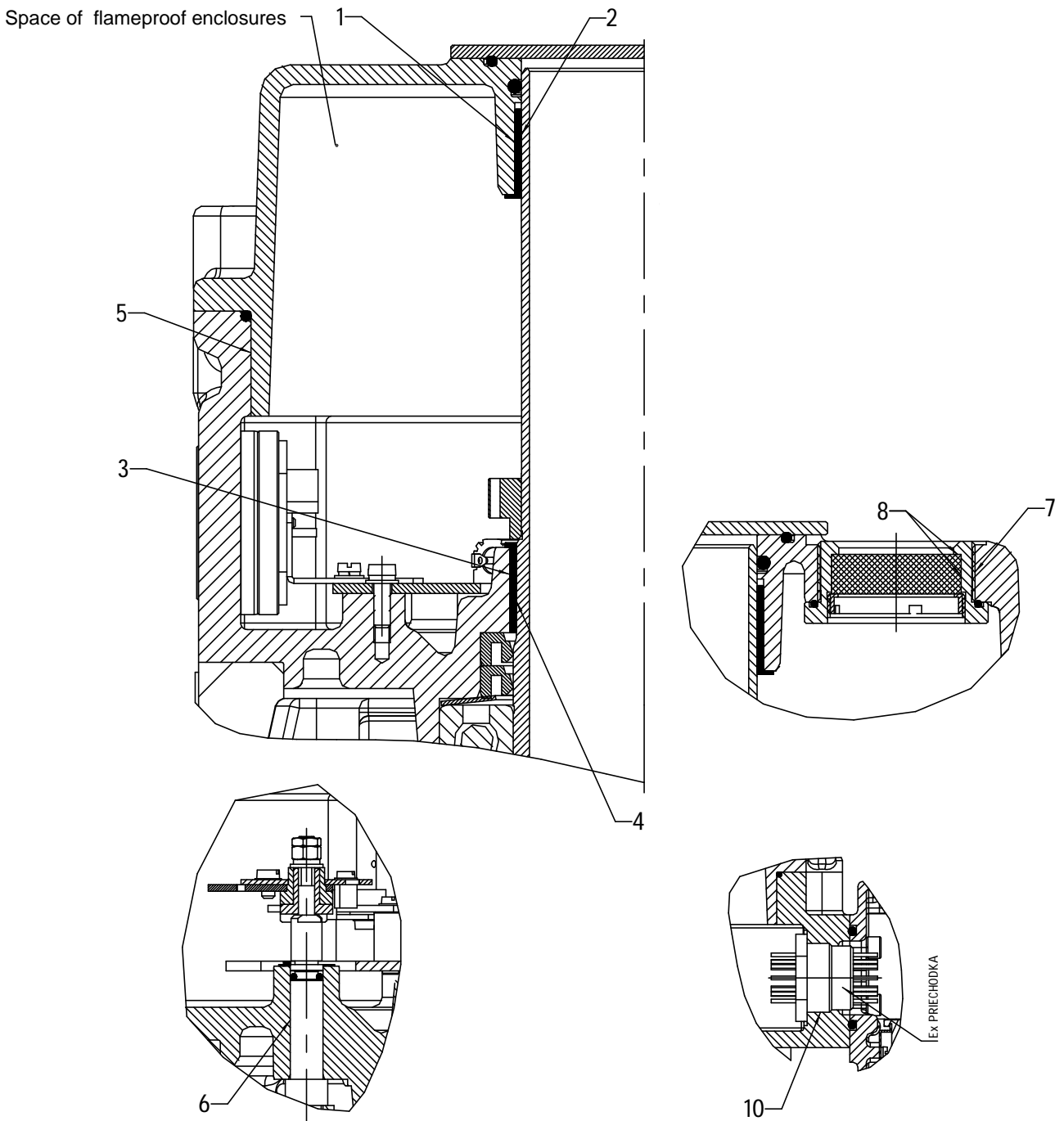
Gap of flameproof enclosure MOR 3PA-Ex, MOR 3.4PA-Ex, MOR 3.5PA-Ex are between:

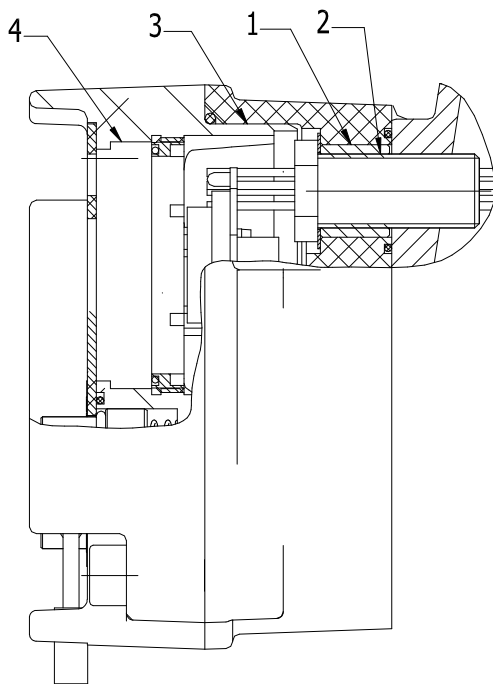
1. cover and control box
2. bushing body and bushing (single phase version)
3. control box and bushing body (single phase version)
4. inter - flange and bushing body (single phase version)
5. control box and screw
- 6., 7. control box and insert Ex
- 8.,10. insert Ex a output shaft
9. cover and aperture
- 11.,12. cover and insert Ex
- 13., 14., 15. control box and bushing
16. cover and inter - flange (single phase version)
17. control box and shaft



Gap of flameproof enclosure MOR 5PA-Ex are between:

- cover of control box Ex and sheath of shaft and cover of control box
- sheath of shaft cover control box and output shaft
- control box and sheath of shaft control box
- sheath of shaft control box and output shaft
- cover of control box and control unit
- control box and shaft of disengaging torque
- cover of control box and indicator body
- indicator body and window
- control box and indicator body
- control box and Ex-bushing



Gap of flameproof enclosure of local control EA MOR X.XPA-Ex are between:

1. Bushing tube – rear cover of local control
2. Threaded joint – Bushing and bushing tube
3. Front cover and rear cover
4. Aperture and front cover.

Enclosure joint surfaces are designed according to the requirements of table 2 and 3, EN 60079-1,

To seal the gaps against entry of fluids and dust, O-rings are used from the outside except for the gap of flameproof

enclosure.

**Caution:**

After disassembly and re-assembly of control box cover (see gap of flameproof enclosure 1 in chapter 5.3) and terminal box cover, the sealing O-ring must be replaced according following table:

O-Ring	Dimension	Standard	Material	Producer
Cover and control box	202,79x3,53	AS 568B/B S	NBR	TRELLERORG SEALING
Terminal box cover	190x3	STN 02 9281.9	MVQ	Rubena Náchod
Local control	105x3	STN 02 9281.9	MVQ	Rubena Náchod

5.4 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.

Note:

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

The EA electronics makes possible to identify some failures of the electric actuator. The control unit blinking LED ERROR indicates the failure (**Fig. 6**) or the error is displayed on the LED (**see Fig. 3,3a**), or the LCD display (**see Fig. 7**). The list of errors and warnings and the way for identifying a given error as well are presented in the separate attachment No 74 1053 02.

The list of errors and warnings compiled by the producer is presented in **table 4**. A change to the list of errors and warnings in the EA is only possible within a service intervention, through the program installed in a PC.

Table 4 setting error flags and warning flags as at the delivery		
PARAMETER	ERROR	WARNING
ESD		X
Analog Input		X
Wrong command	X	
Torque		X
Torque check		X
Torque calibration	X	
Regulator calibration		X
Stroke (turns sum)	X	
Wrong position	X	
Spin	X	
Spin direction	X	
RAM	X	
ROM	X	
EEPROM		X
Bus	X	
I2C	X	
Reset		X
Voltage +5V		X
Parameters	X	
Set mode		X
Relay		X
Temperature <		X
Temperature >		X
Phase	X	
Power frequency	X	
Thermal fuse	X	
Manual control	X	
Position module	X	
Position module type	X	
Position sensor 1	X	
Position sensor 2	X	
Position sensor 3	X	
Position sensor 4	X	
Torque module	X	
Torque module type	X	
Torque sensor	X	
LED module	X	
LED module type	X	
LCD module	X	
LCD module type	X	
Power Supply/Relay module	X	
Power Supply/Relay module type	X	

Notes: **X** – the error or warning flag is activated.

With the **error flag**, the EA takes the position defined for the FAILURE REACTION function eventually stops (depending on the kind of the error), and it will not operate until the error is removed.

With the **warning flag**, the EA continues in operation.

The user is advised on error or warning through the READY relay (according to the relay setting), eventually through the program after connecting the EA with a PC.

Note 1: In some cases having the error removed the electric actuator must be restarted by switching-off the voltage supply to the electric actuator for about 3 sec.

For repairing eventually the electronics use the fuse – see chapter 2.2.2.

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 manufacturer or by a contracted service centre!

6. Accessories and spare parts

6.1 Accessories

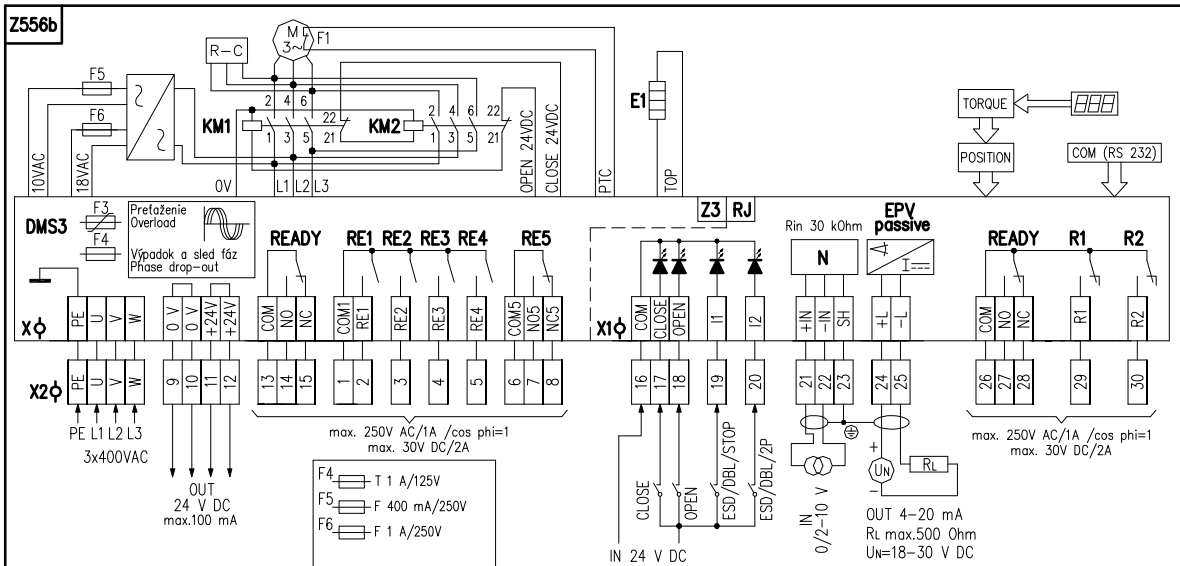
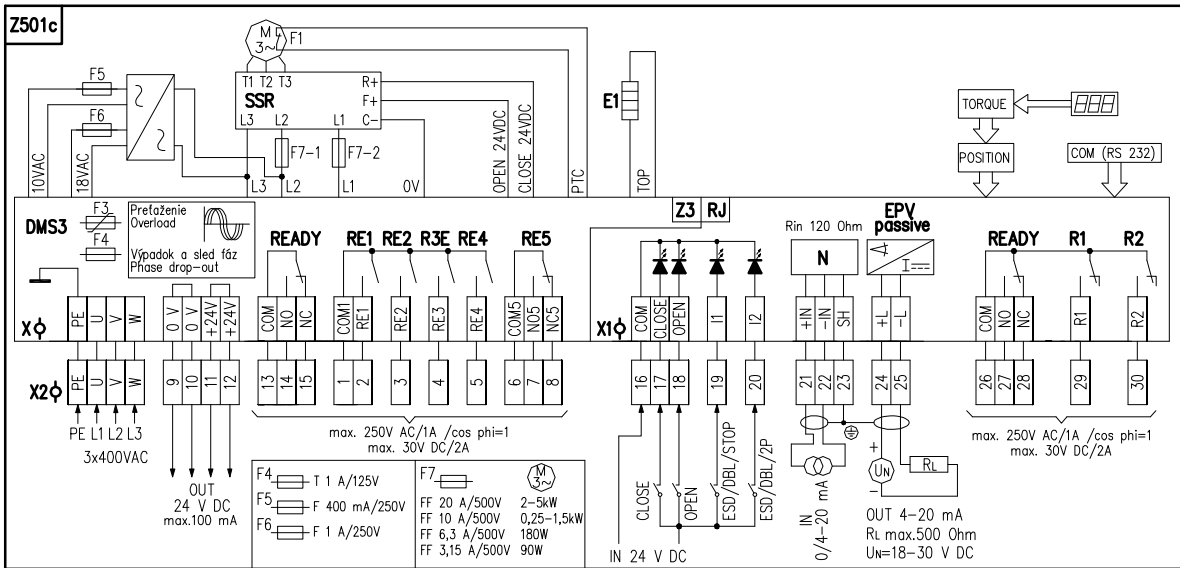
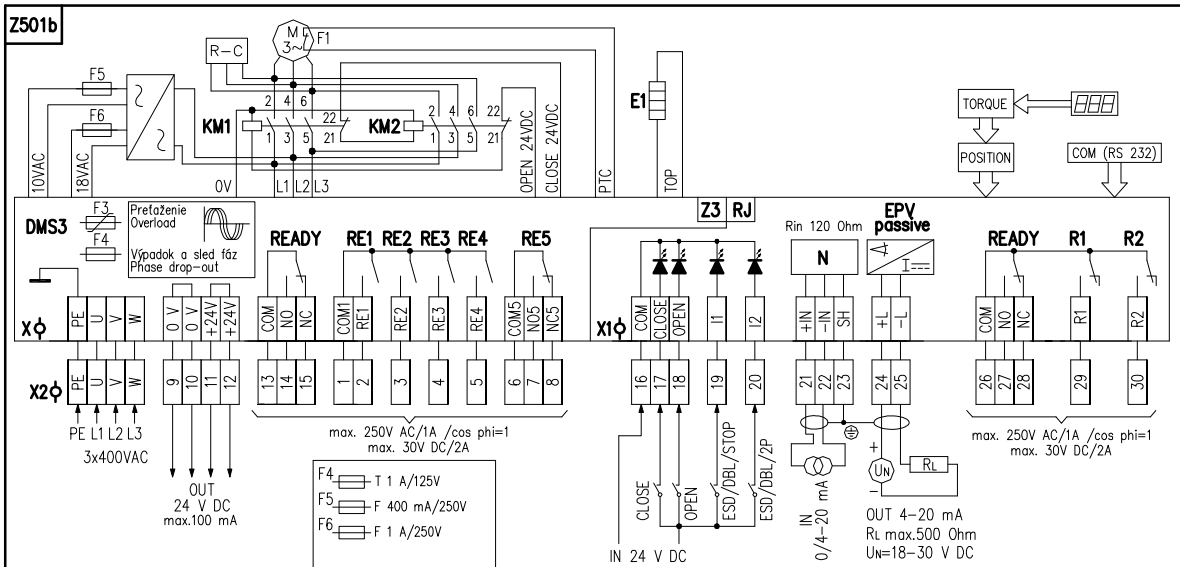
The EA is delivered with the service handle and communication cable DB-9F/RJ45 (communication cable must be ordered separately).

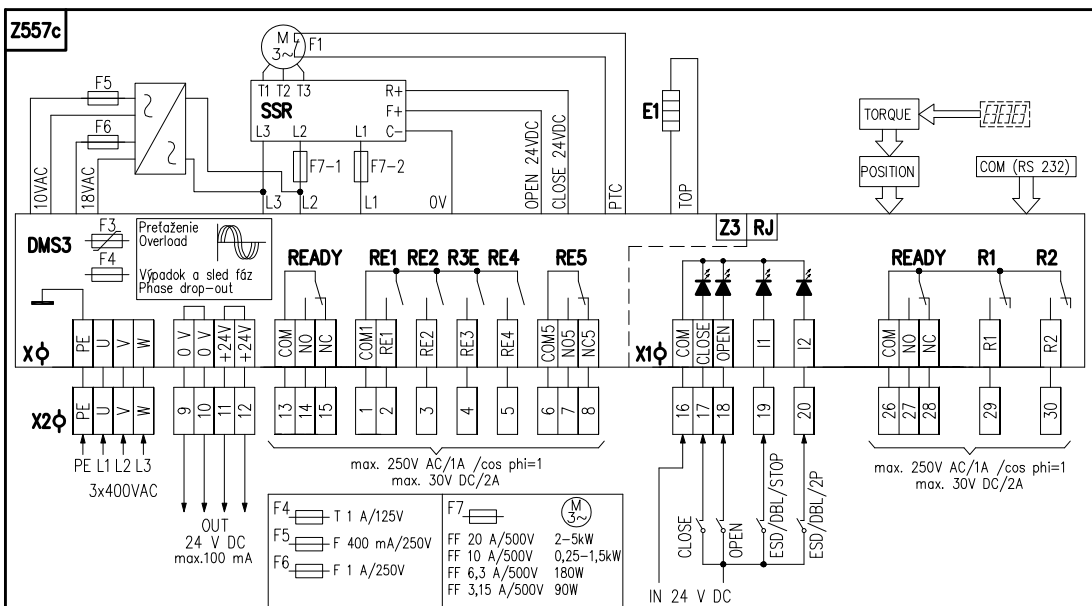
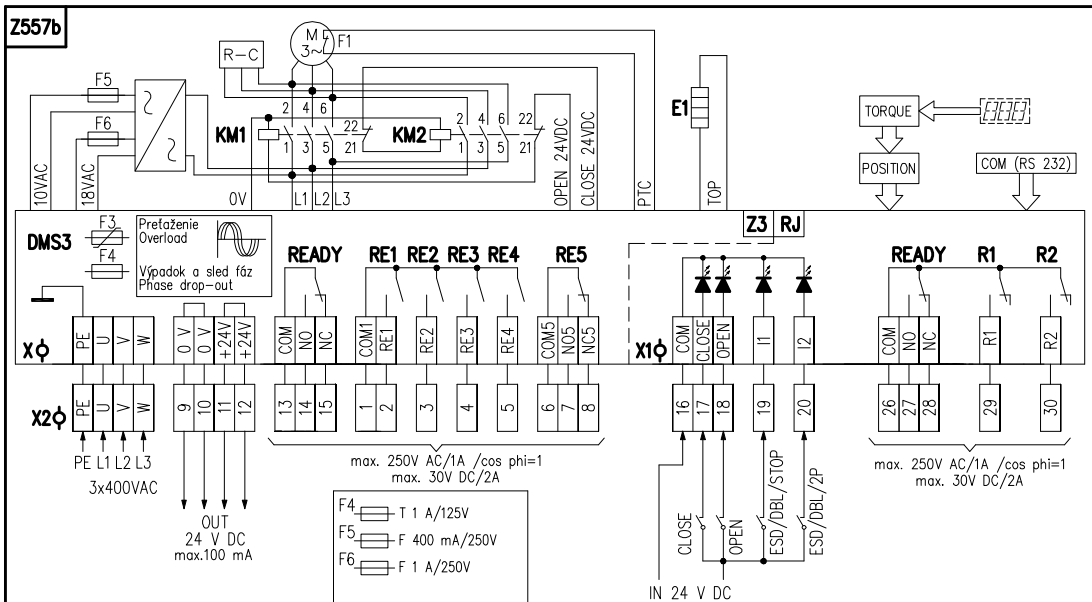
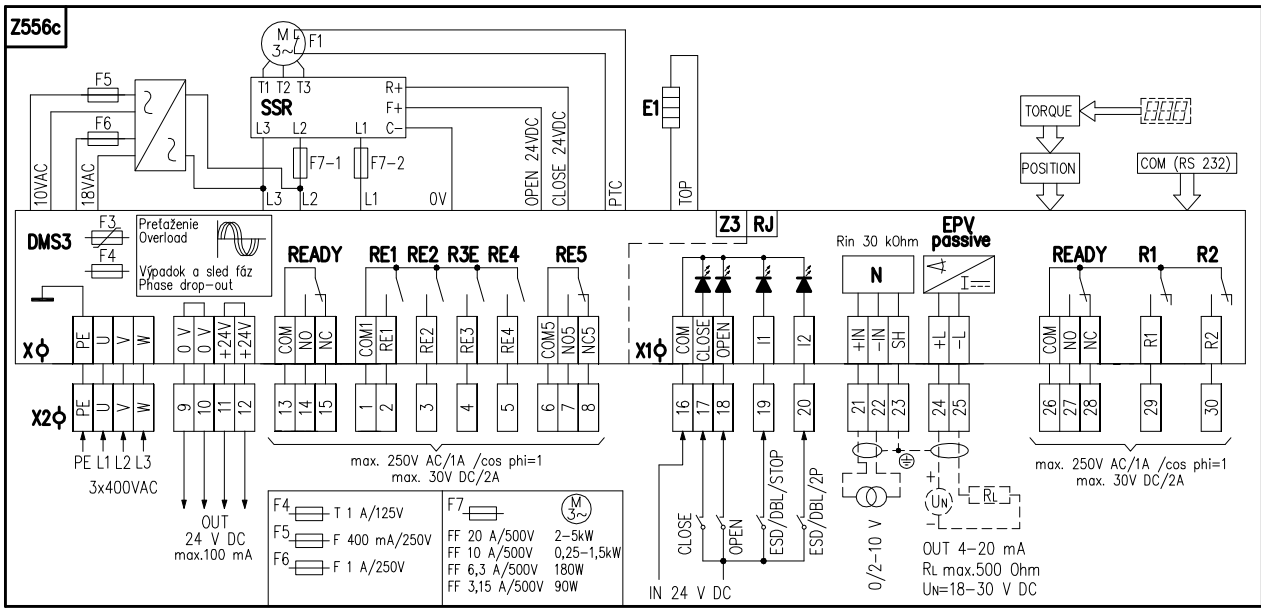
6.2 Spare part list

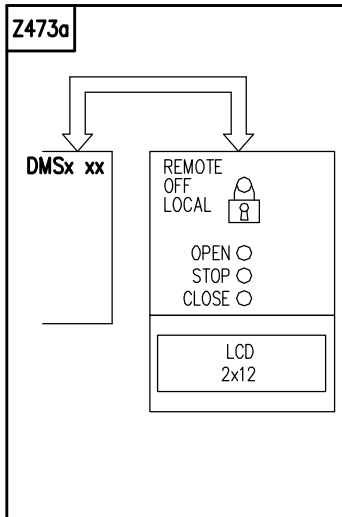
Table 6 Spare part			
Spare part	Order Nr.	Position	Figure
Electric motor; 40 W/90 VA; 230V AC; 50 Hz	63 592 076	2	1
Electric motor; 4KTC 71 A-4 (CD71M1-4);0,25kW, Δ/Y 230V/400V	63 592 xxx	M1	1
Electric motor ; 4KTC 71 B-4 (CD71M2-4);0,37kW, Δ/Y 230V/400V	63 592 xxx	M1	1
Electric motor; 4KTC 80 B-6 (CD80M2-6);0,55kW, Δ/Y 230V/400V	63 592 xxx	M1	1
Electric motor; 4KTC 80 B-4 (CD80M2-4);0,75kW, Δ/Y 230V/400V	63 592 xxx	M1	1
Electric motor; 4KTC 80 B-2 (CD80M1-2 X);1,1kW, Δ/Y 230V/400V	63 592 xxx	M1	1
Electric motor; 4KTC 90S-2 (CD80M2-2 X) ;1,5kW)Δ/Y 230V/400V	63 592 xxx	M1	1
Electric motor 4KTC 112 M-4 (CD 112M-4); 4 kW; ; Δ/Y 230V/400V AC; (MOR 5PA-Ex)	63 592 XXX	M1	1
Electric motor 4KTC 100 LB-4 (CD 100L2-4); 3 kW;; Δ/Y 230V/400V AC; (MOR 5PA-Ex)	63 592 XXX	M1	1
Electric motor 4KTC 112 M-6 (CD 112M-6); 2,2 kW;; Δ/Y 230V/400V AC; (MOR 5PA-Ex)	63 592 XXX	M1	1
Electric motor 4KTC 112 M-8 (CD 112M-8); 1,5 kW;; ; Δ/Y 230V/400V AC; (MOR 5PA-Ex)	63 592 XXX	M1	1
Electric motor 4KTC 112 M-4 (CD 112M-4X); 5 kW;; Δ/Y 230V/400V AC; (MOR 5PA-Ex)	63 592 XXX	M1	1
DMS3 Z3 source board of electronic 400V AC	64 051 073	9	3,3a
Control unit of the electronics DMS3 J1 (0/4/12 to 20 mA, resp.4 to 12 mA)	64 051 075	10	3,3a
Control unit of the electronics DMS3 J3 (0/2 - 10 V)	64 051 061	10	3,3a
Control unit of the electronics DMS3 J2 (without input and output)	64 051 060	10	3,3a
Position sensing unit DMS3 SM	64 051 088	11	3,3a
Torque sensing unit DMS3 ST	64 051 080	12	3,3a
DMS3 L2 LED display	64 051 081	16	3,3a
DMS3 LCD display	64 051 082	6	7
DMS3 H3.4 local control sensor	64 051 084	-	7
Contacteur	63 581 432	13	3,3a
Thyristor unit (Solid state)	63 581 442	13	3,3a
Casing KU 40x30 (MOR 3PA-Ex-3.5PA-Ex)	63 249 037	75	2
Casing KU 14x12 (MOR 3PA-Ex-3.5PA-Ex)	63 243 150	76	2
Ringlet 10 x 6 (MOR 3PA-Ex-3.5PA-Ex)	62 732 022	66	2
Sealing ring 16 x 28 x 7 (MOR 3PA-Ex-3.5PA-Ex)	62735 044	70	2
Sealing ring 40 x 52 x 7 (MOR 3PA-Ex-3.5PA-Ex)	62 735 043	68	2
Ringlet 32 x 2 (MOR 3PA-Ex-3.5PA-Ex)	62 731 097	77, 34	2
Ringlet 110 x 3 (MOR 3PA-Ex-3.5PA-Ex)	62 732128	-	-
Ringlet 130 x 3 (MOR 3PA-Ex-3.5PA-Ex)	62 732 095	78	2
O- Ringlet 202,79 x 3,53	62 732 156	-	-
O- Ringlet 190 x 3	62 732 009	-	-
O- Ringlet 105 x 3	62 732 390	-	-
Sealing (MOR 3PA-Ex-3.5PA-Ex)	04 A05 199	-	-
Cable glands M16x1,5	224A76292	34	1
Cable glands M20x1,5	63 456 596	34	1
Cable glands M25x1,5	63 456 597	34	1

7. Enclosures

7.1 Wiring diagrams







Legend:

- Z473a.....wiring diagram of electric local control
 Z501b.....wiring diagram of EA MOR X.XPA-Ex with reverse contactors for the ON/OFF control resp. for analogue input 0/4/12 up to 20 mA, 4 up to 12 mA and output signal 4 - 20 mA
 Z501c.....wiring diagram of EA MOR X.XPA-Ex with contactless switching for the ON/OFF control resp. for analogue input 0/4/12 up to 20 mA, 4 up to 12 mA and output signal 4 - 20 mA
 Z556b.....wiring diagram of EA MOR X.XPA-Ex with reverse contactors for the ON/OFF control resp. for analogue input 0/2 - 10 V and output signal 4 - 20 mA
 Z556c.....wiring diagram of EA MOR X.XPA-Ex with with contactless switching for the ON/OFF control resp. for analogue input 0/2 - 10 V and output signal 4 - 20 mA
 Z557b.....wiring diagram of EA MOR X.XPA-Ex with reverse contactors for the ON/OFF
 Z557c.....wiring diagram of EA MOR X.XPA-Ex with contactless switching for the ON/OFF

- COM(RS232) ...possibility for connecting the control unit to and PC
 EPV passive ...electronic position transmitter is passive with output current signal
 E1.....space heater
 F1.....motor`s thermal protection
 F3 –F7.2.....fuse of voltage supply source
 M.....single phase electric motor
 N.....controller
 POSITION.....position scanning
 R_{in}.....input resistance
 R_L.....load resistance
 SSR.....thyristor unit
 KM1, KM2.....coil of contactor
 U_N.....voltage for EPV
 READY.....READY relay (free-programmable)
 R1, R2, RE1, RE2, RE3, RE4, RE5...additional relays
 TORQUE.....thrust scanning
 DMS3.....electronic module
 X.....voltage supply source terminal board with screw terminals
 X1.....terminal board with screw terminals on the control unit
 X2.....screw terminal box on the additional relays board

Terminals:

- PE, U, V, W – terminals of supply (3x400 V AC)
 9,10,11,12 (0 V, +24 V) – 2x terminals of output voltage 24 V DC (100 mA)
 16,17,18,19,20 (COM, CLOSE OPEN, I1, I2) – terminals of control inputs 24 V DC on the control unit
 21,22,23 (+IN, -IN, SH) – terminals of output current signal resp. voltage signal
 24,25 (+L, -L) – terminals output current signal (passive) 4-20 mA
 26,27,28,29,30 (COM, NO, NC, R1, R2) – of relay terminals READY, R1, R2 on the control unit
 13,14,15,1,2,3,4,5,6,7,8 (COM, NO, NC, COM1, RE1, RE2, RE3, RE4, COM5,NO,NC) – terminals of relay READY, RE1, RE2, RE3, RE4, RE5 on the supply board
 Connecting cables size to screwless terminal board is 0,08 - 2,5 mm².

Notes:

Program possibilities for **R1, R2, RE1, RE2, RE3, RE4, RE5** relays: **DISABLED**, open position, close position, torque-open, torque – close, torque open or torque close, torque open or position open, torque close or position close, open, close, movement, movement flasher, to position, from position, warning, remote control, local control, control shut off.

Program possibilities for **READY** relay: errors, errors or warnings, errors or no remote, errors or warnings or no remote.

Program possibilities for output signal (from **EPV** passive): 4 to 20 mA, 20 to 4 mA.

Control programme options (regulating): 2P, 3P, 3P/2P switched over to I2

Program possibilities for **input control signal (N)**: 4 to 20 mA, (2 to 10 V), 20 to 4 mA, (10 to 2 V), 0 to 20 mA, (0 to 10 V), 20 to 0 mA. (10 to 0 V), 4 to 12 mA, 12 to 4 mA, 12 to 20 mA, 20 to 12 mA

Program possibilities for **inputs I1**: **DISABLED**, ESD, DBL (local releasing, remote releasing), (not valid for EA without local control), STOP.

Program possibilities for **inputs I2**: **DISABLED**, ESD, DBL (local releasing, remote releasing), (not valid for EA without local control), 2P (when controller is switch on) (for control programme option 3P/2P I2)) allows control using the binary 24V DC inputs with I2 input activated.

Program possibilities of FAILURE REACTION ESD: OPEN, CLOSE, STOP, SAFE POSITION.

The identical functions cannot be set on I1 & I2 inputs in addition to the disabled state (e.g., if the ESD function is set on I1 input, it is not possible to select the (ESD) function on I2 input at the same time.

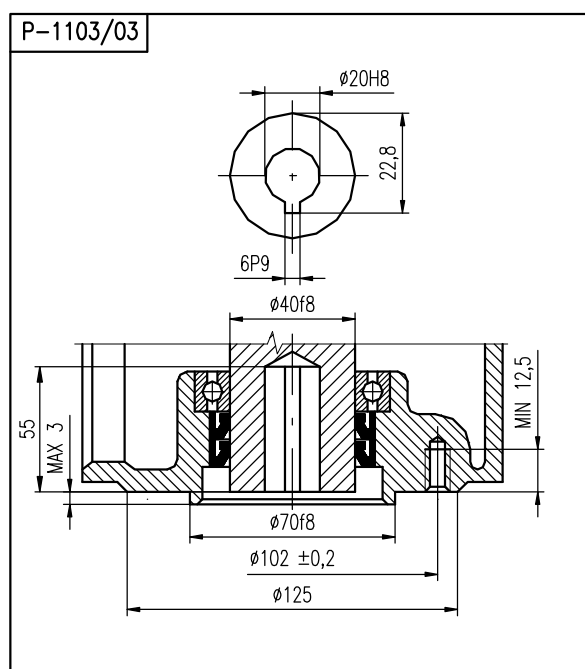
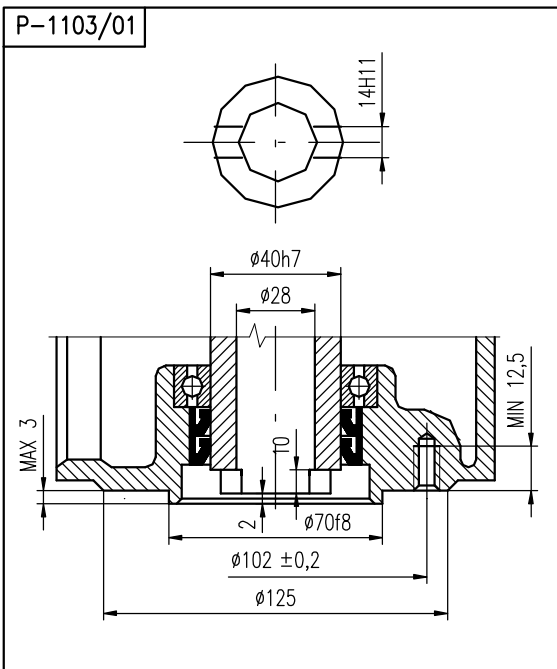
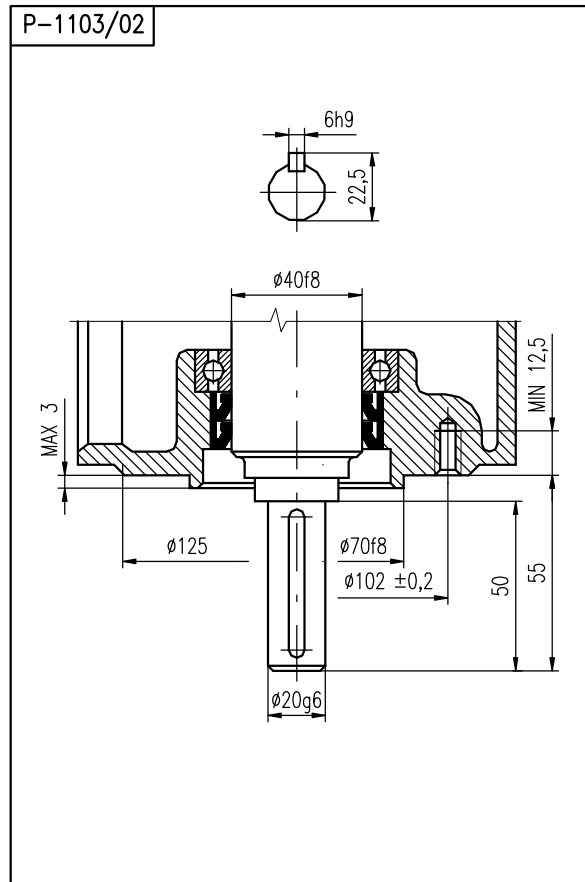
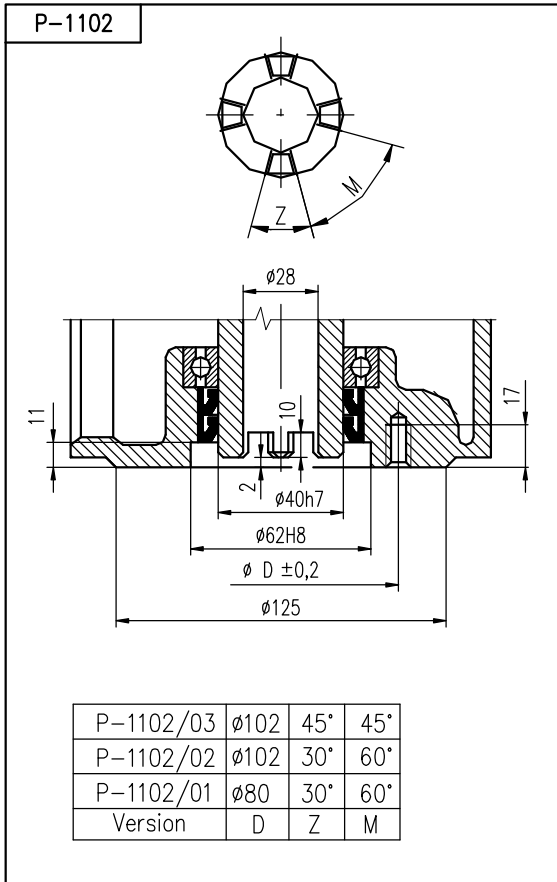
Relay READY on the control unit is doubled with relay READY on the power supply board.

Relay R1 and relay R2 on the control unit is doubled with relay RE1 and relay RE2 on the power supply board.

Mechanic connections for EA MOR 3PA-Ex without connect adapter

4 x tooth

F10 – shape D



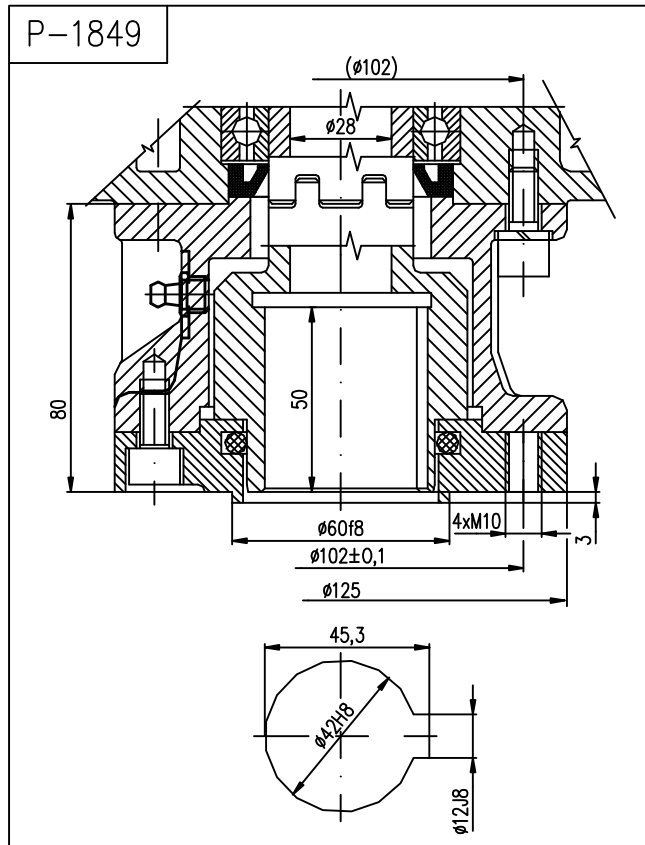
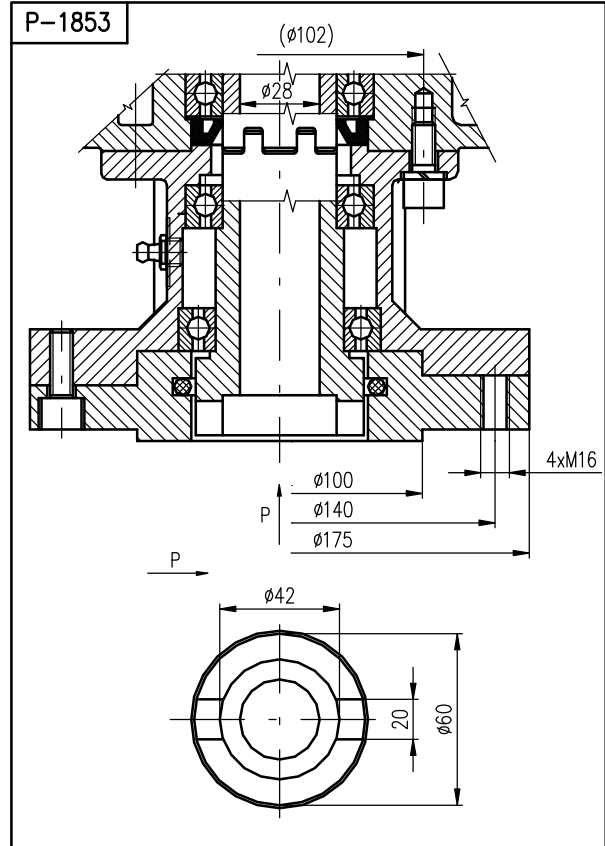
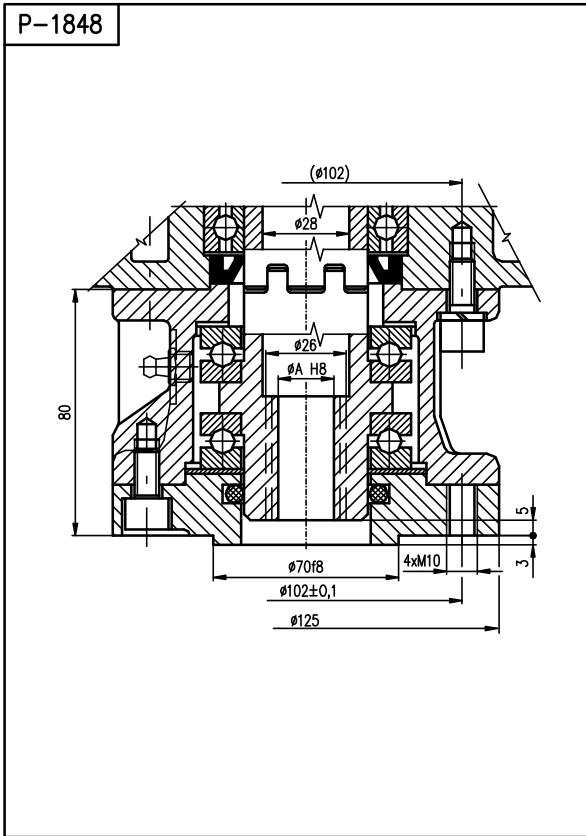
F10 – shape C; DIN 3338

F10 – shape E; ISO 5210

Mechanic connections for EA MOR 3PA-Ex with connect adapter

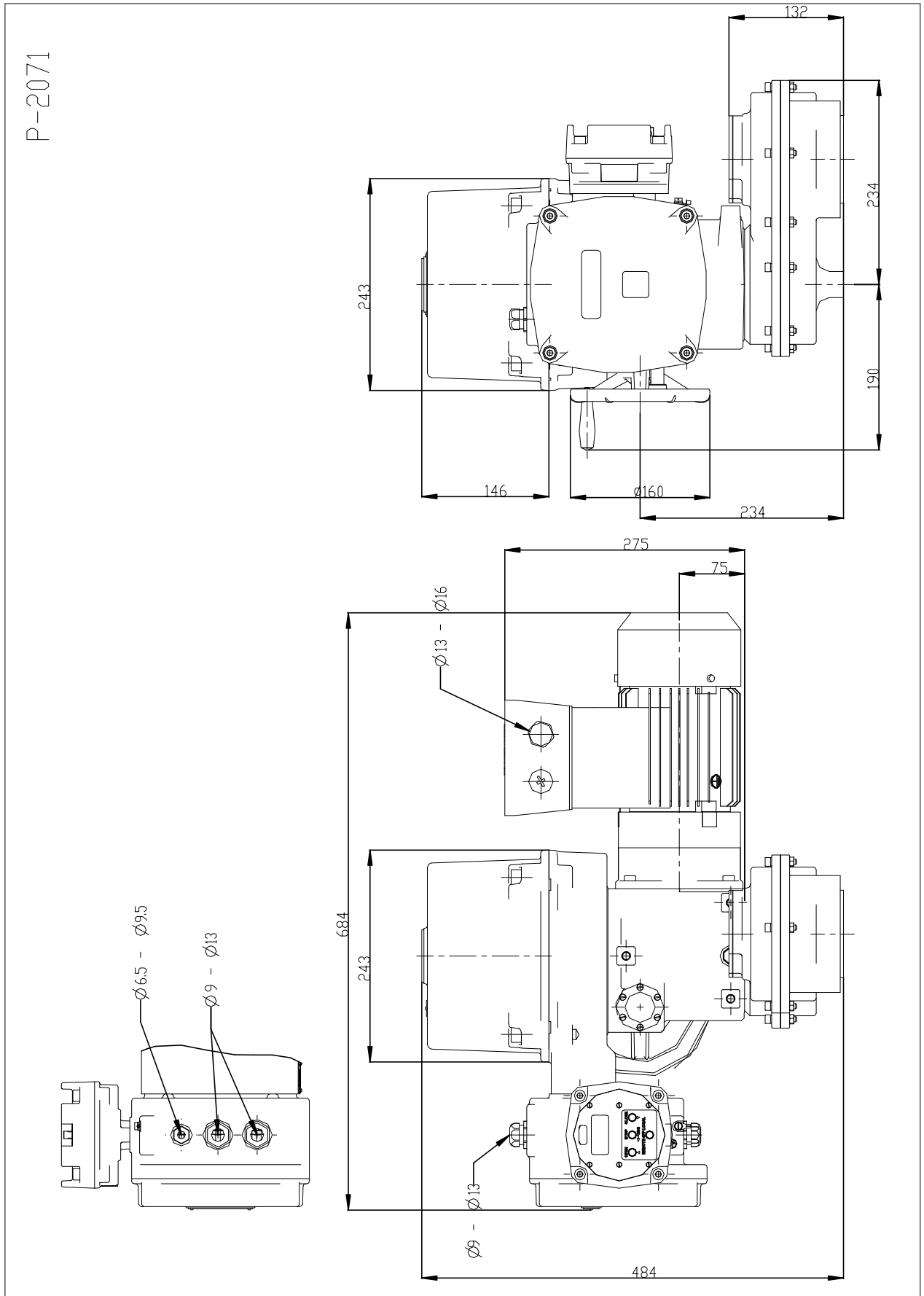
F10 – shape A

F14 – shape C



F10 – shape B1; ISO 5210

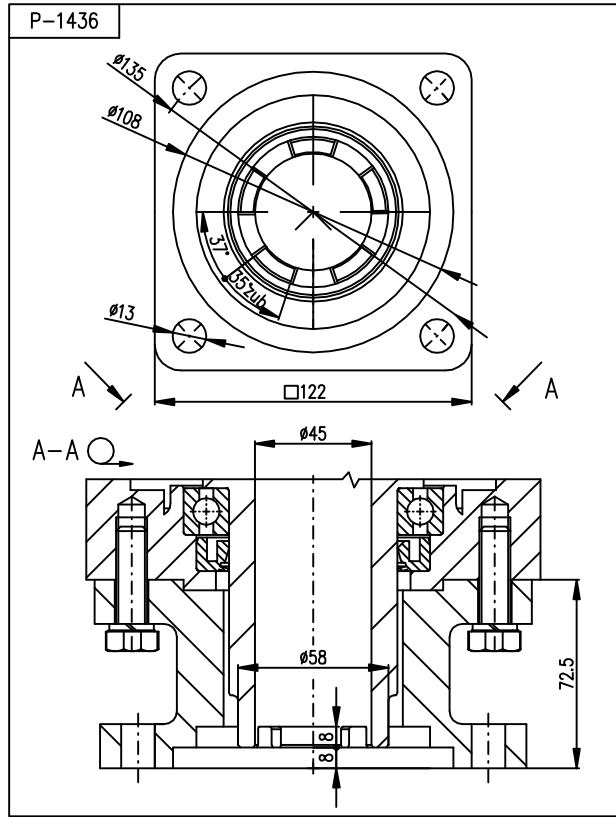
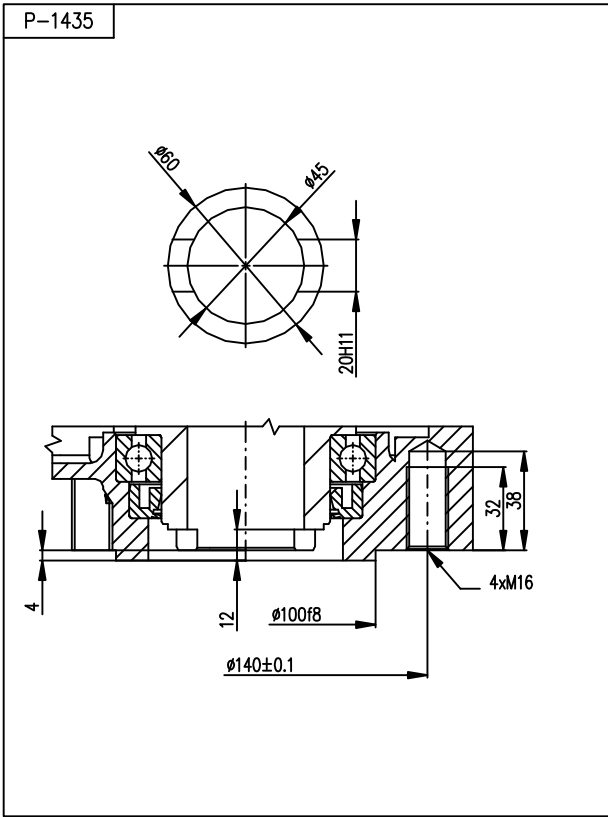
7.2.2 Dimension drawings for EA MOR 3.4PA-Ex



Mechanic connections for EA MOR 3.4PA –Ex without connect adapter

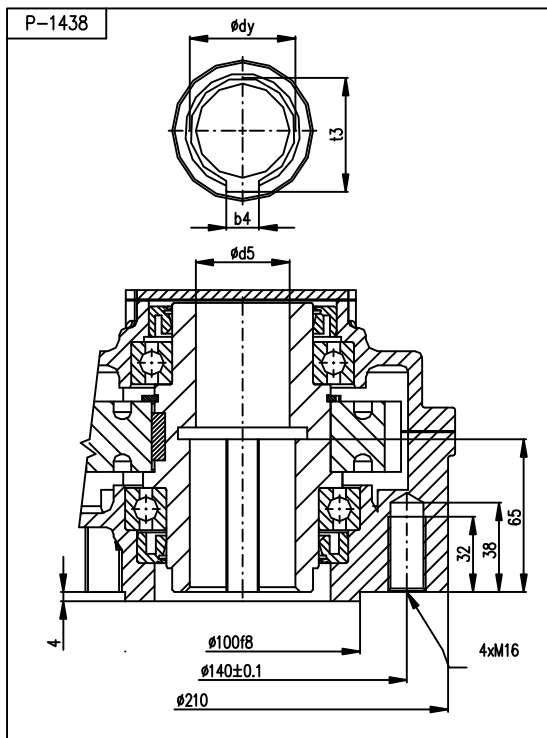
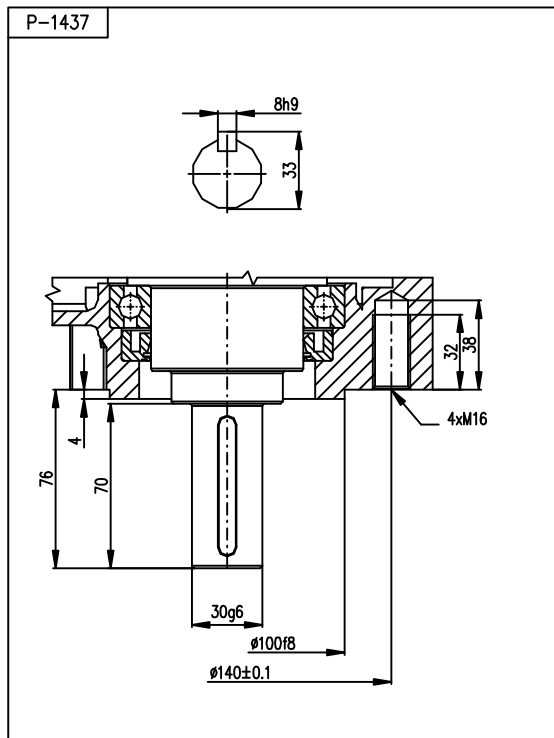
shape C; DIN 3338

5 tooth 35°/37° ; GOST R 555 10



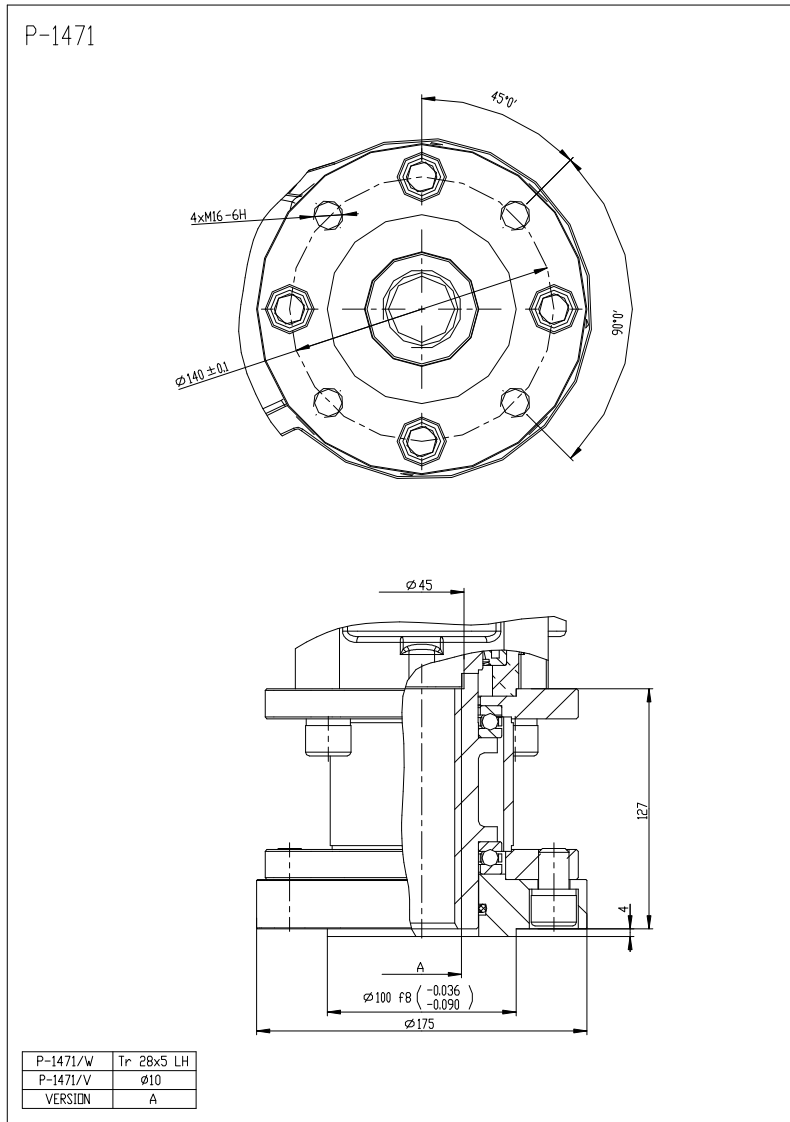
shape D

shape B2; B3; ISO 5210

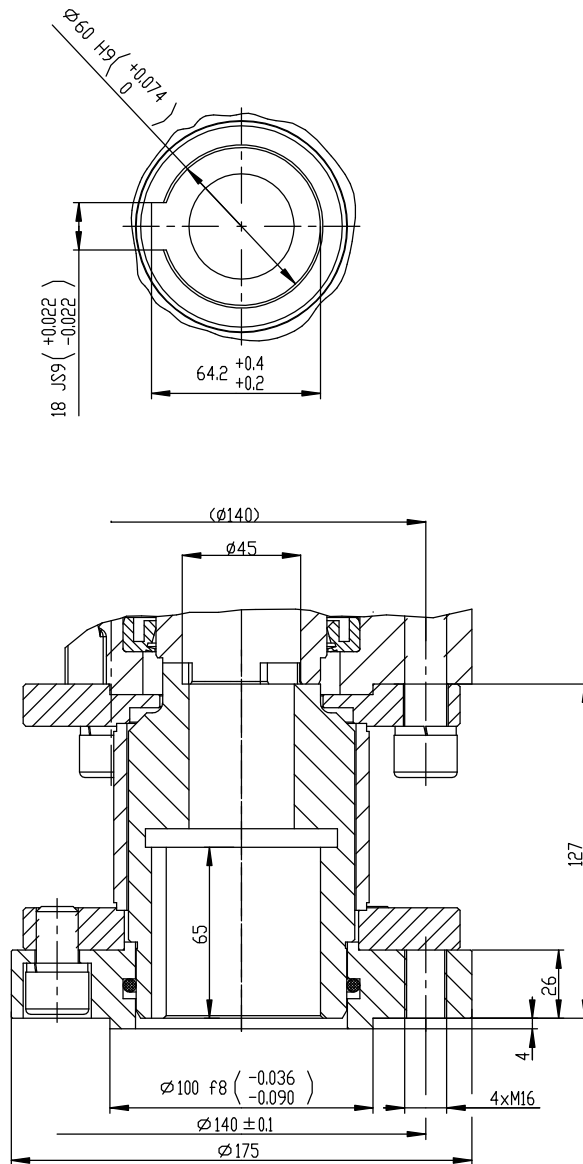


P-1438/N	45	40	14	48.6
P-1438/L	30	-	8	33.3
VERSION	dyH9	d5	b4Js9	t3

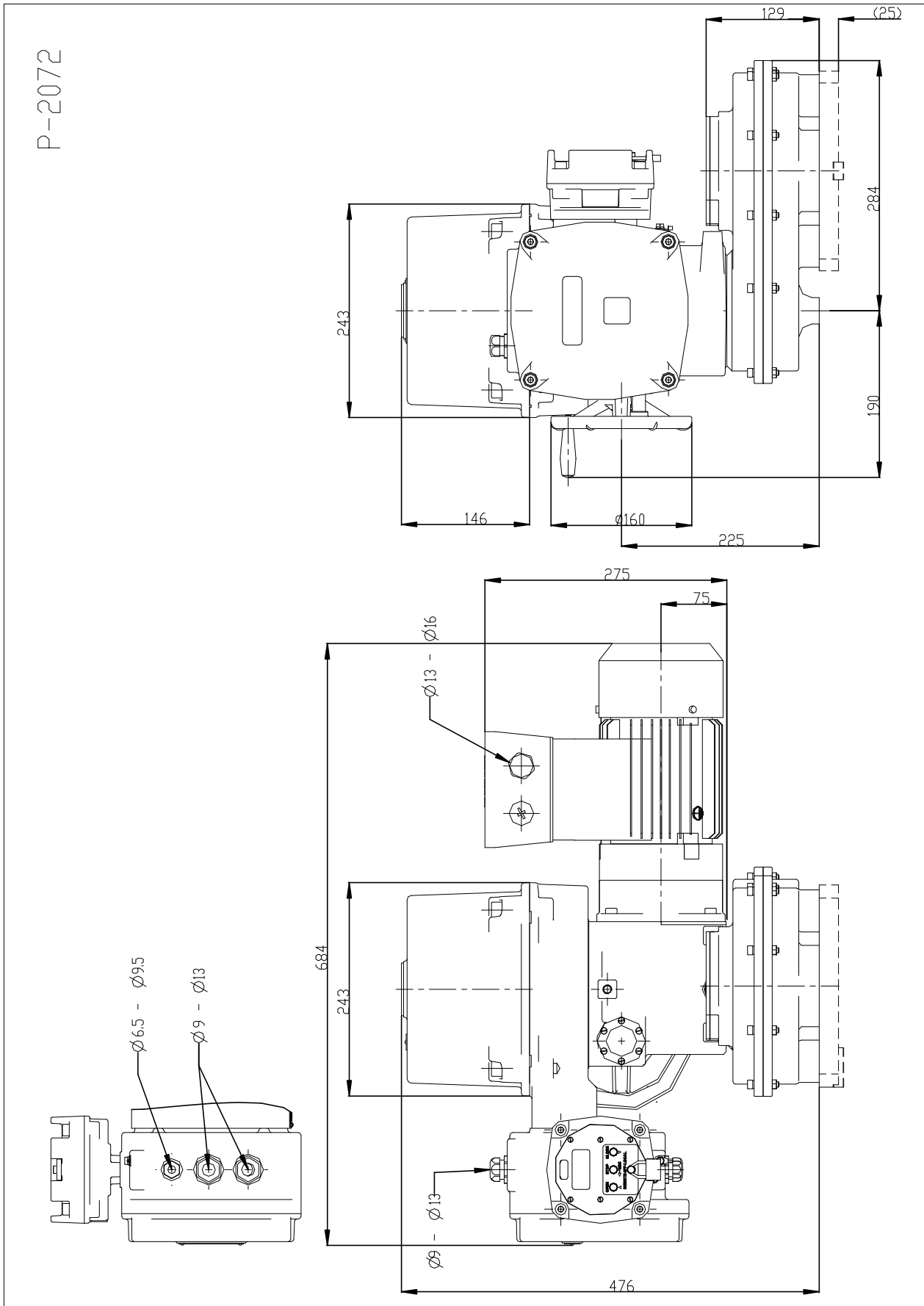
Mechanic connections for EA MOR 3.4PA-Ex with connect adapter



P-1463



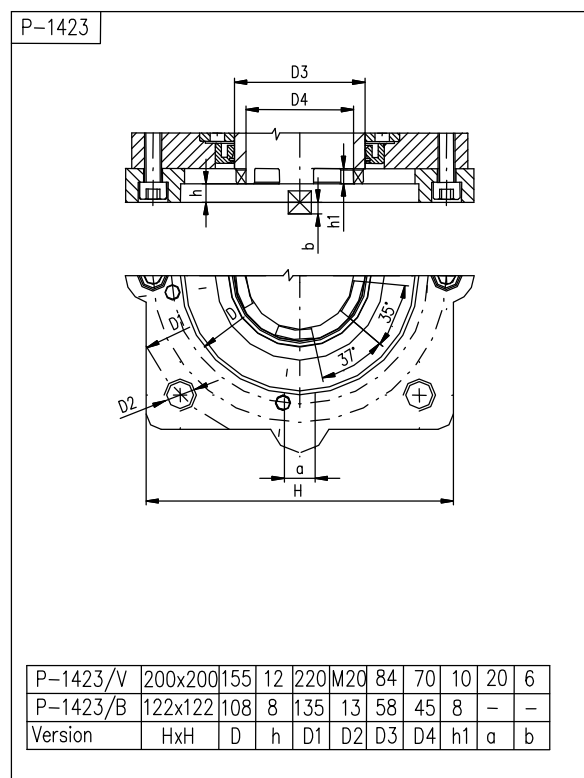
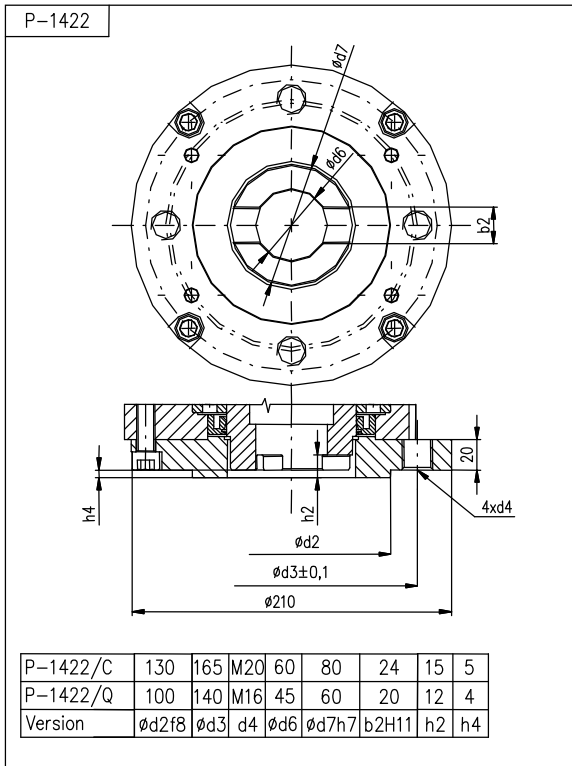
7.2.3 Dimension drawings for EA MOR 3.5PA-Ex



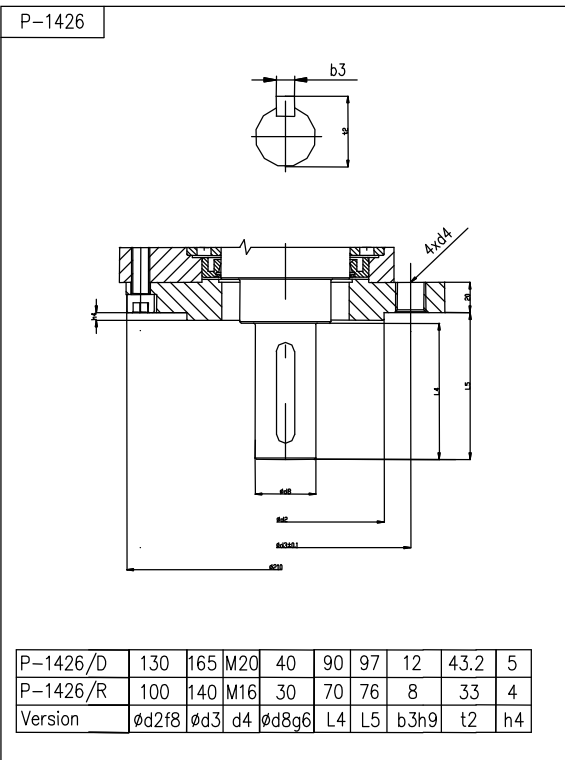
Mechanic connections EA MOR 3.5PA-Ex without connect adapter

shape C; DIN 3338

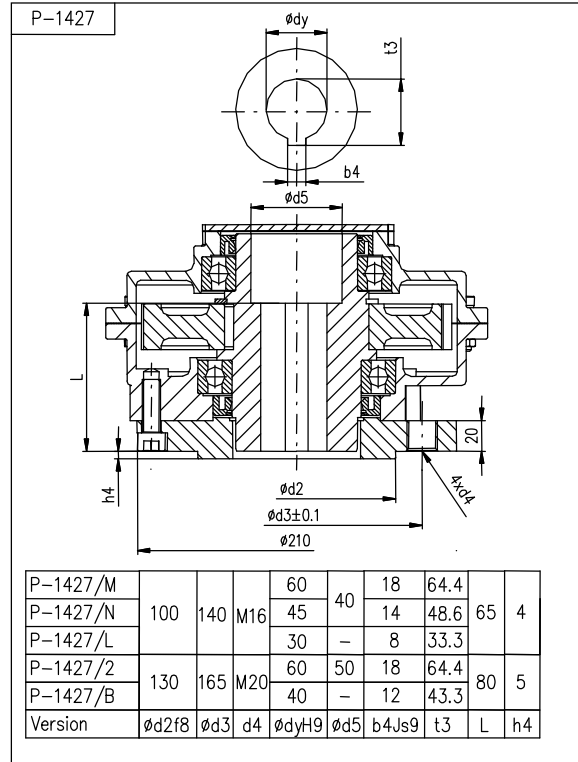
shape 5 tooth 35°/37°; GOST R 555 10



shape D



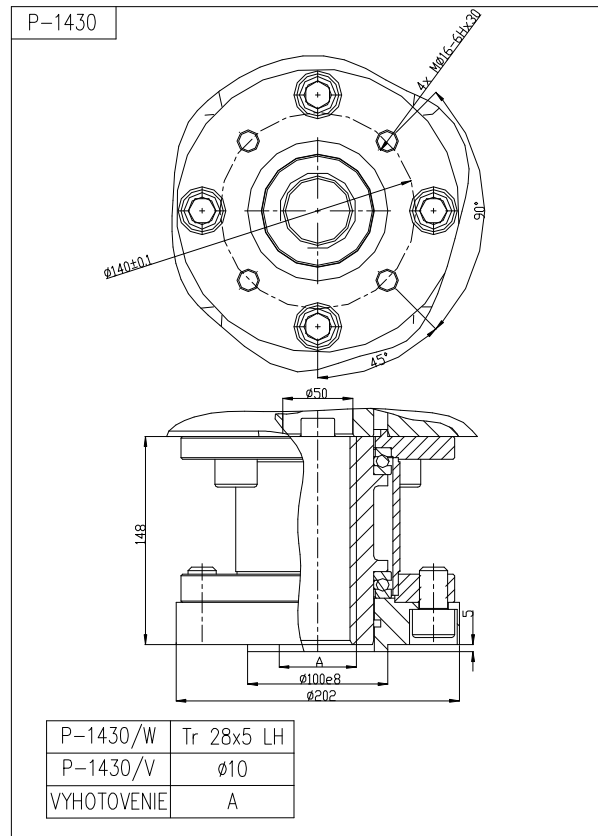
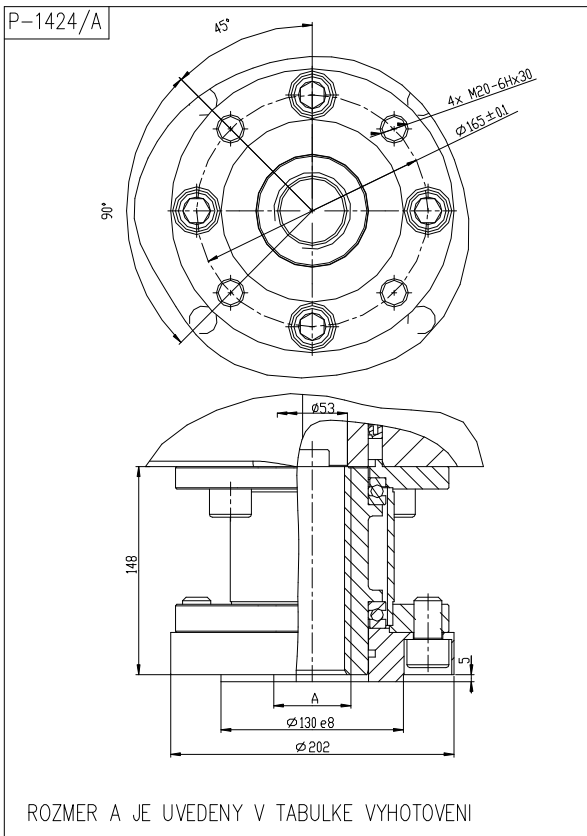
shape B1; B2, B3; ISO 5210



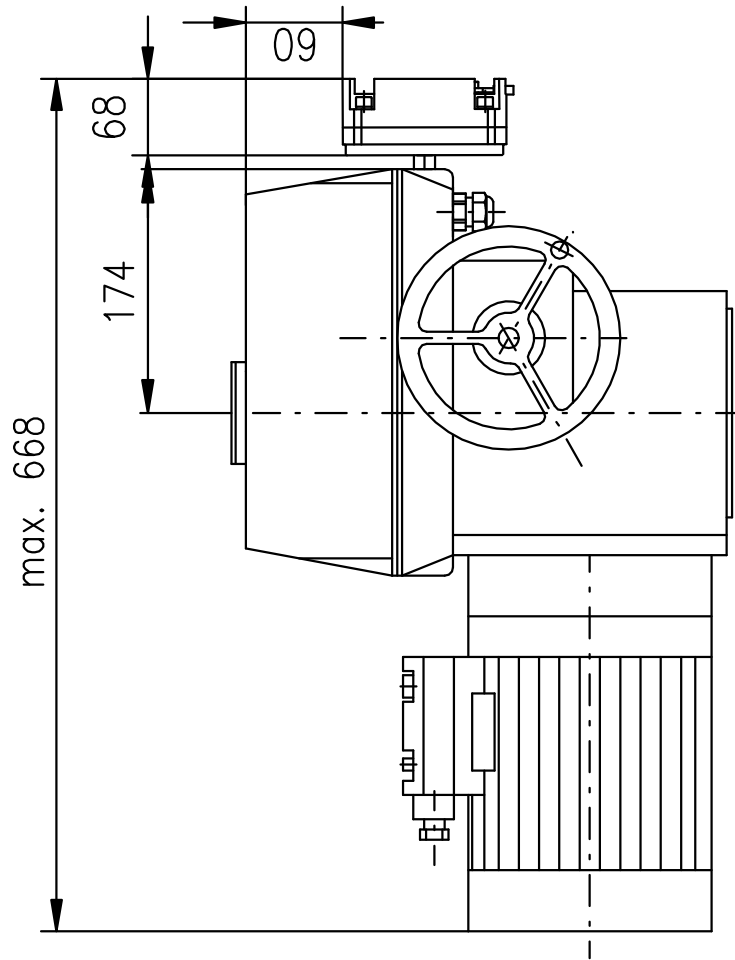
Mechanic connections for EA MOR 3.5PA-Ex with connect adapter

F16 – shape A; ISO 5210

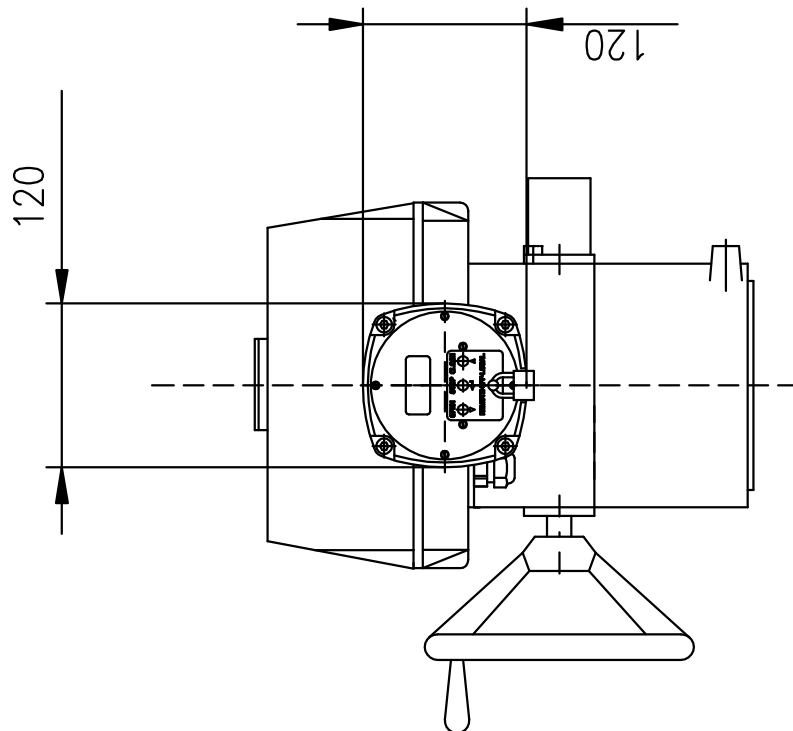
F14 – shape A; ISO 5210



EA MOR 3PA-Ex, MOR 3.4PA-Ex, MOR 3.5PA-Ex with local control

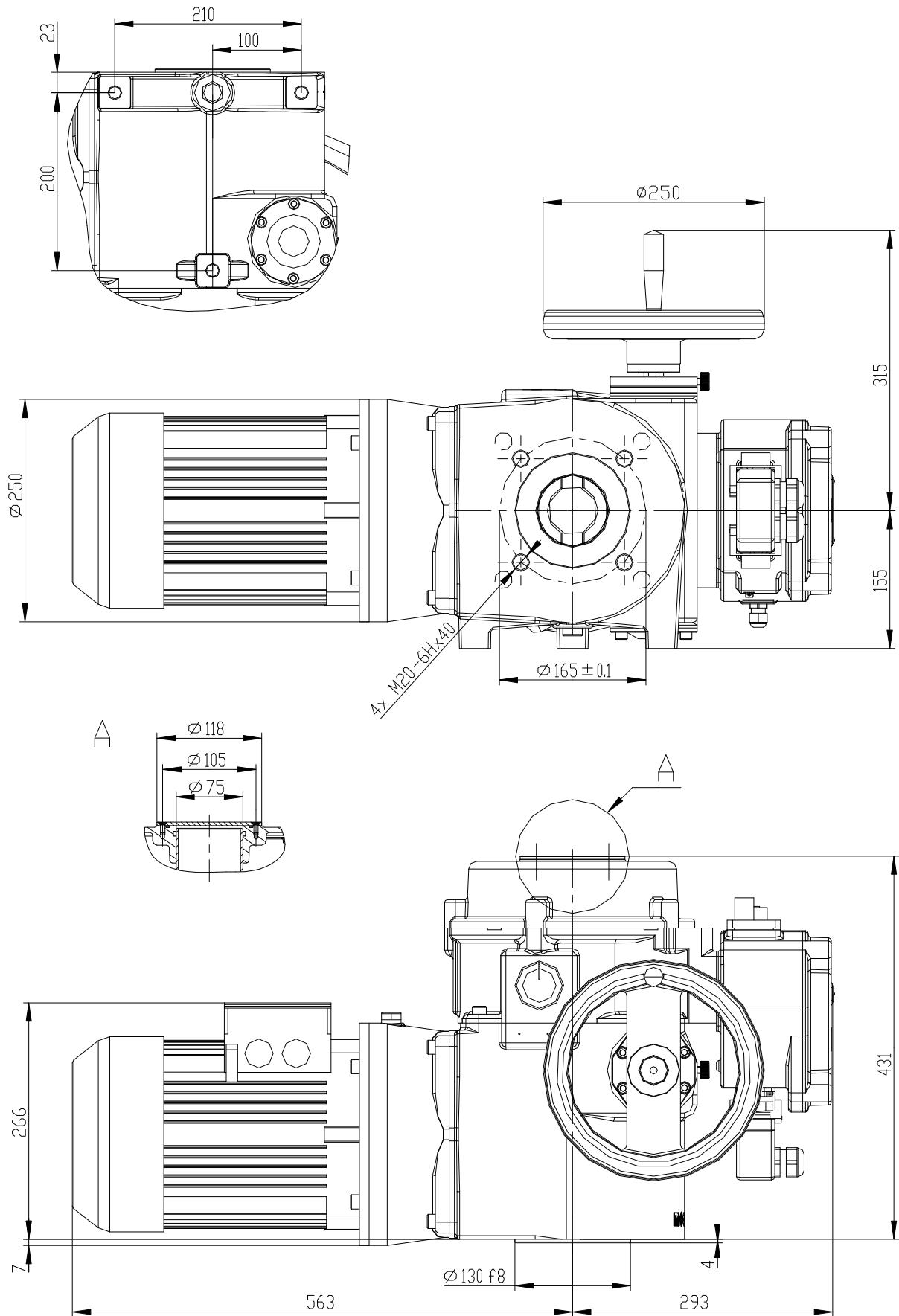


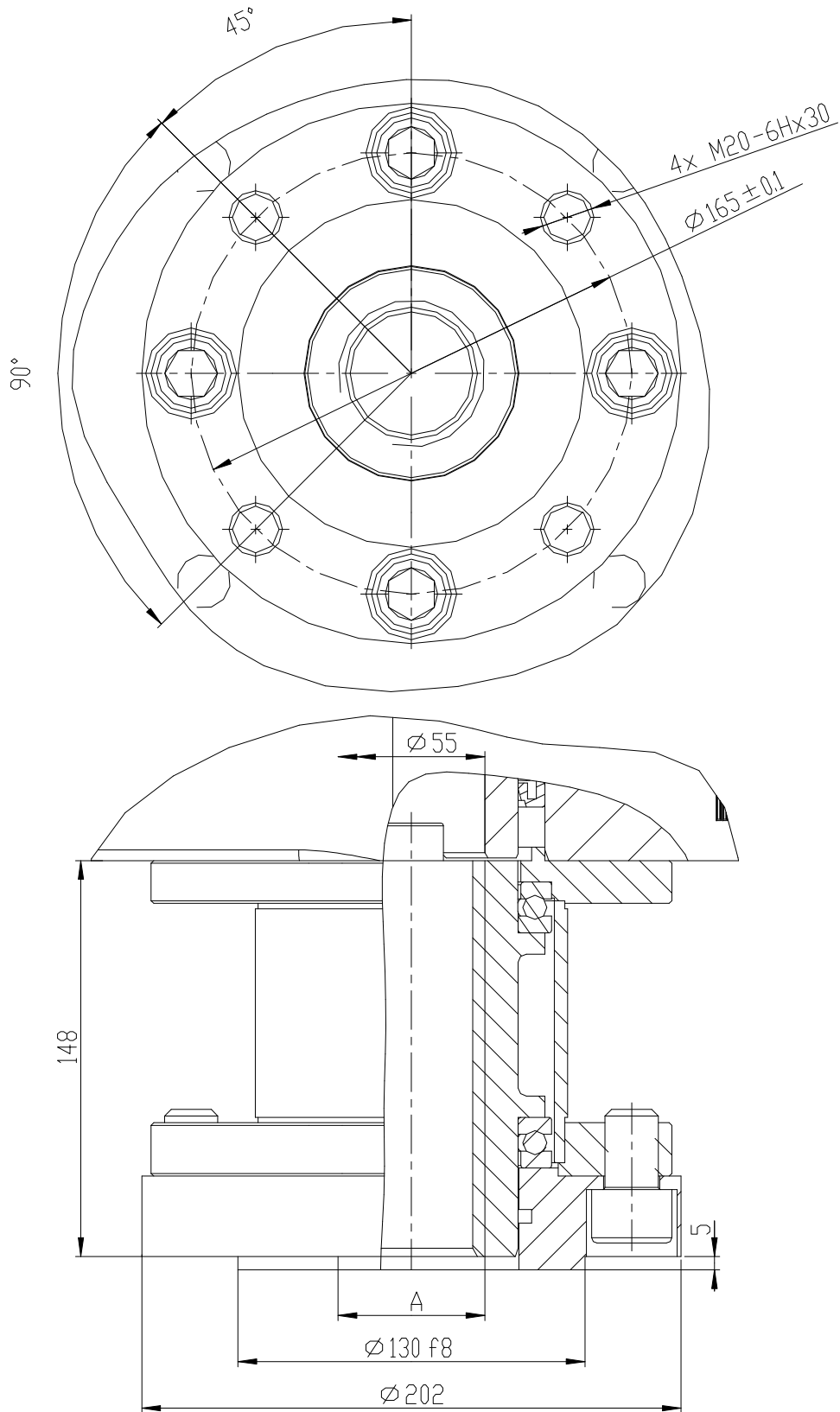
P-2069



7.2.4 Dimension drawings for EA MOR 5PA - Ex

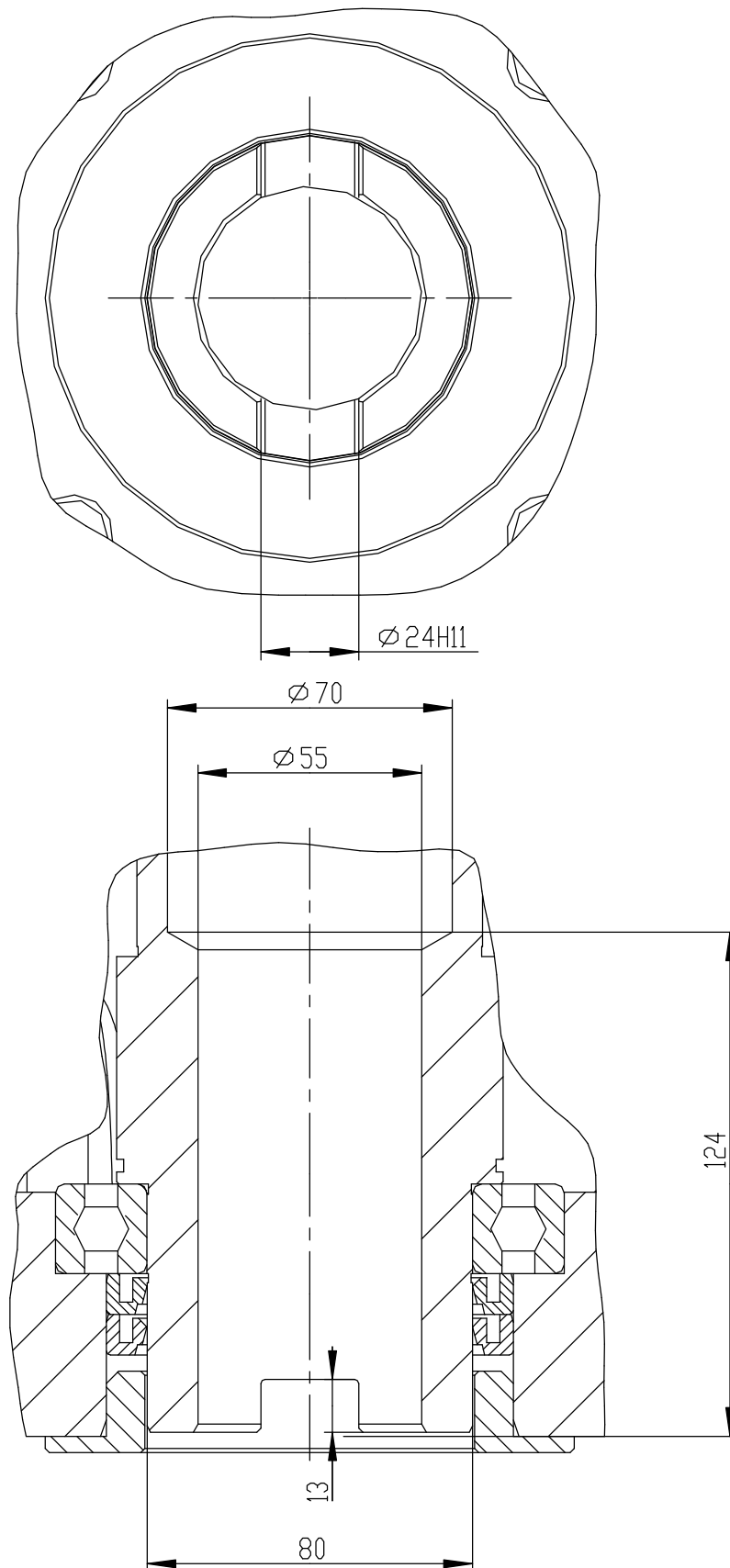
P-1424	EA	MOR 5PA –Ex Connections ISO 5210, DIN 3338 F16
P-1424/A	EA	MOR 5PA-Ex ISO 5210,shape A
P-1424/B	EA	MOR 5PA-Ex ISO 5210, shape B3
P-1424/C	EA	MOR 5PA-Ex DIN 3338 shape C
P-1424/D	EA	MOR 5PA –Ex shape D
P-1425	EA	MOR 5PA –Ex Connections GOST R 555 10φ220/4xM20
P-1425/1	EA	MOR 5PA-Ex shape five toot 35°/37°



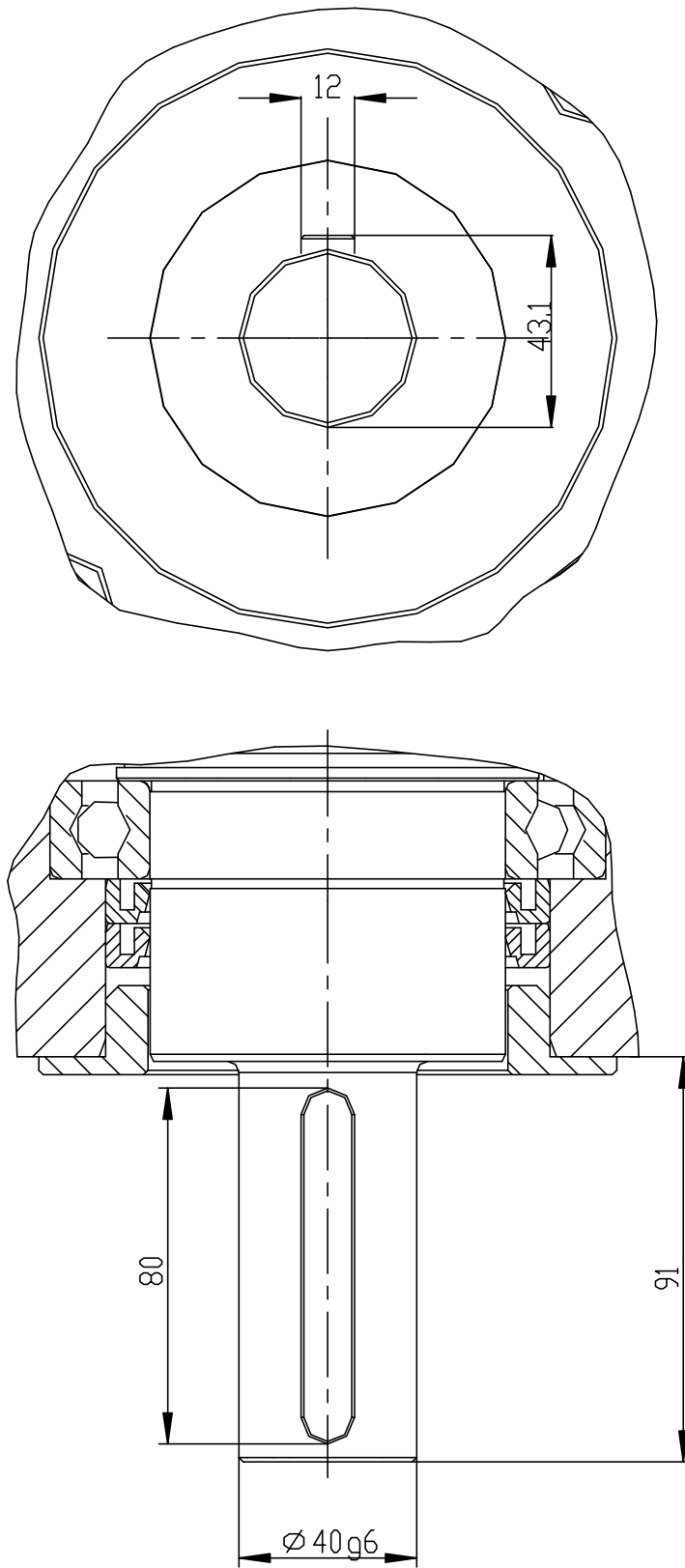


Dimension A is in table of version

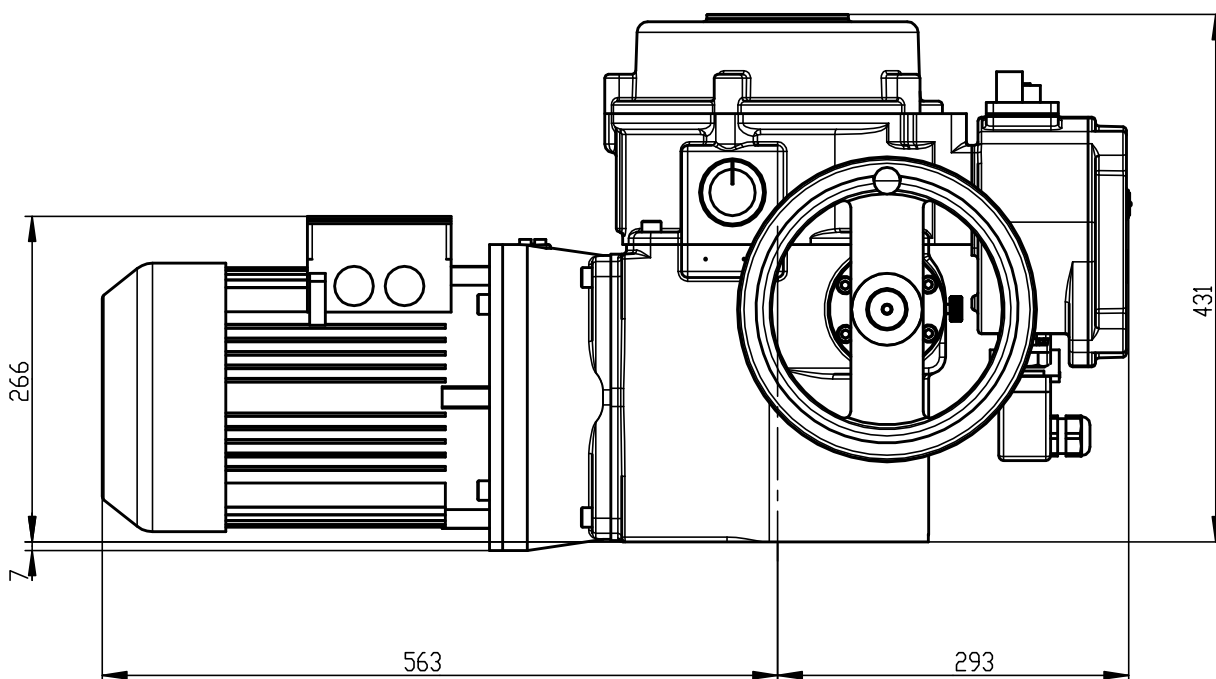
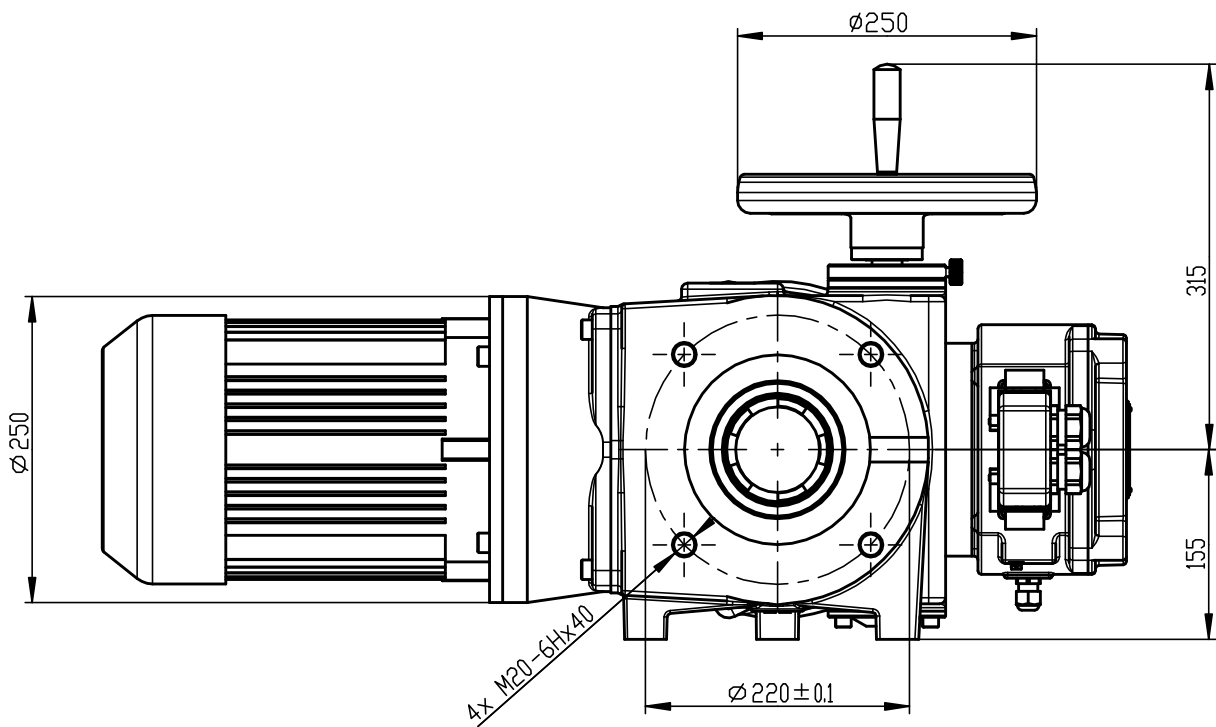
P-1424/A



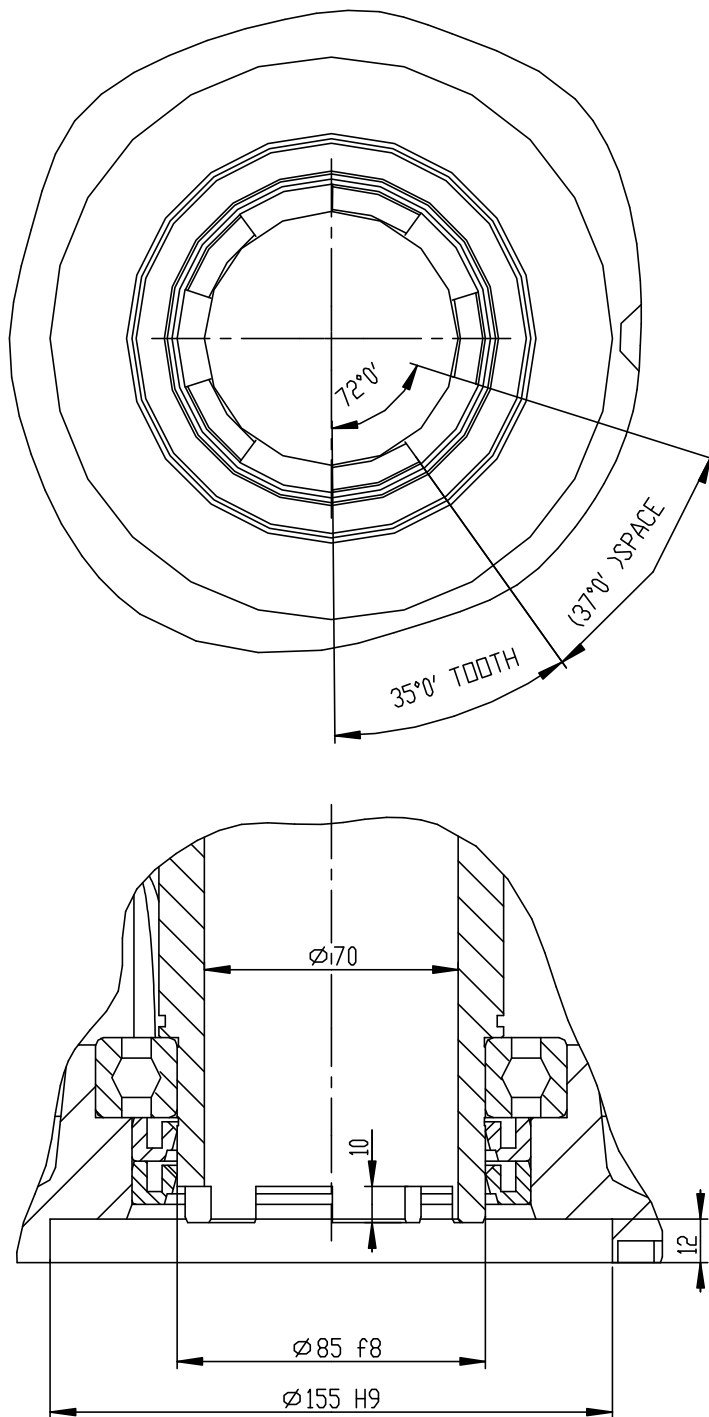
P-1424/C



P-1424/D

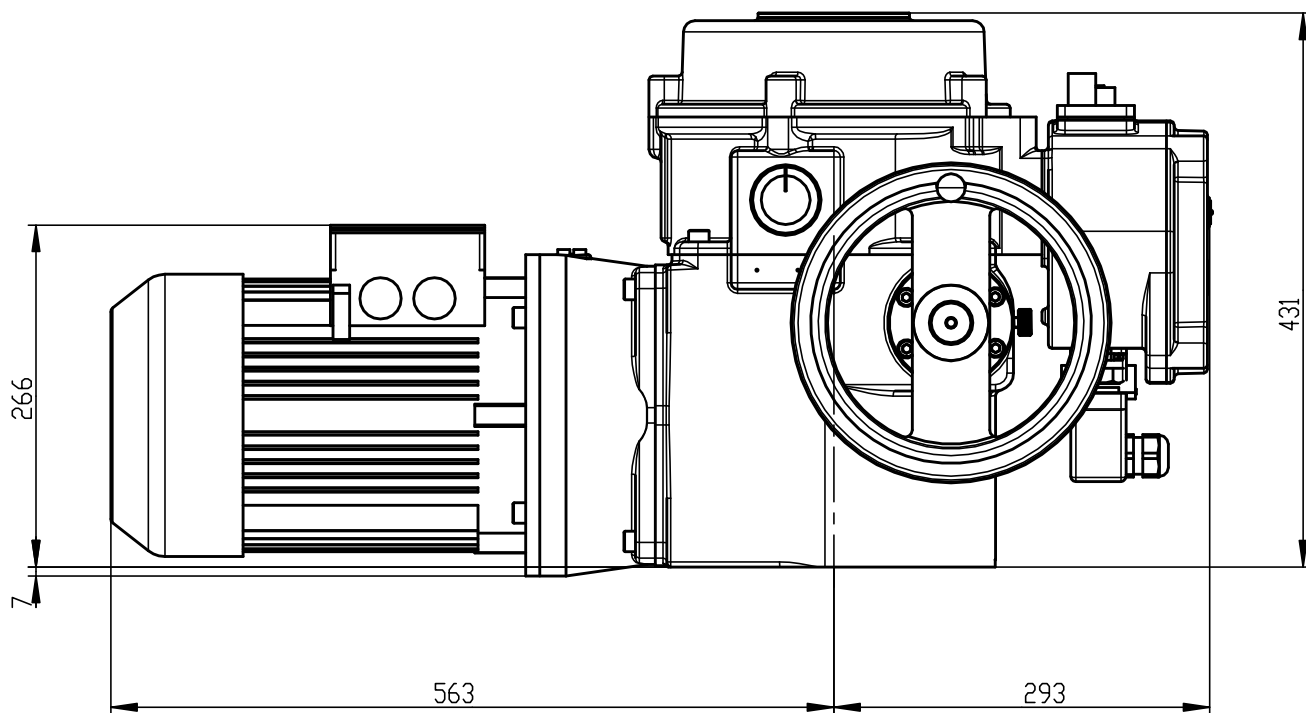
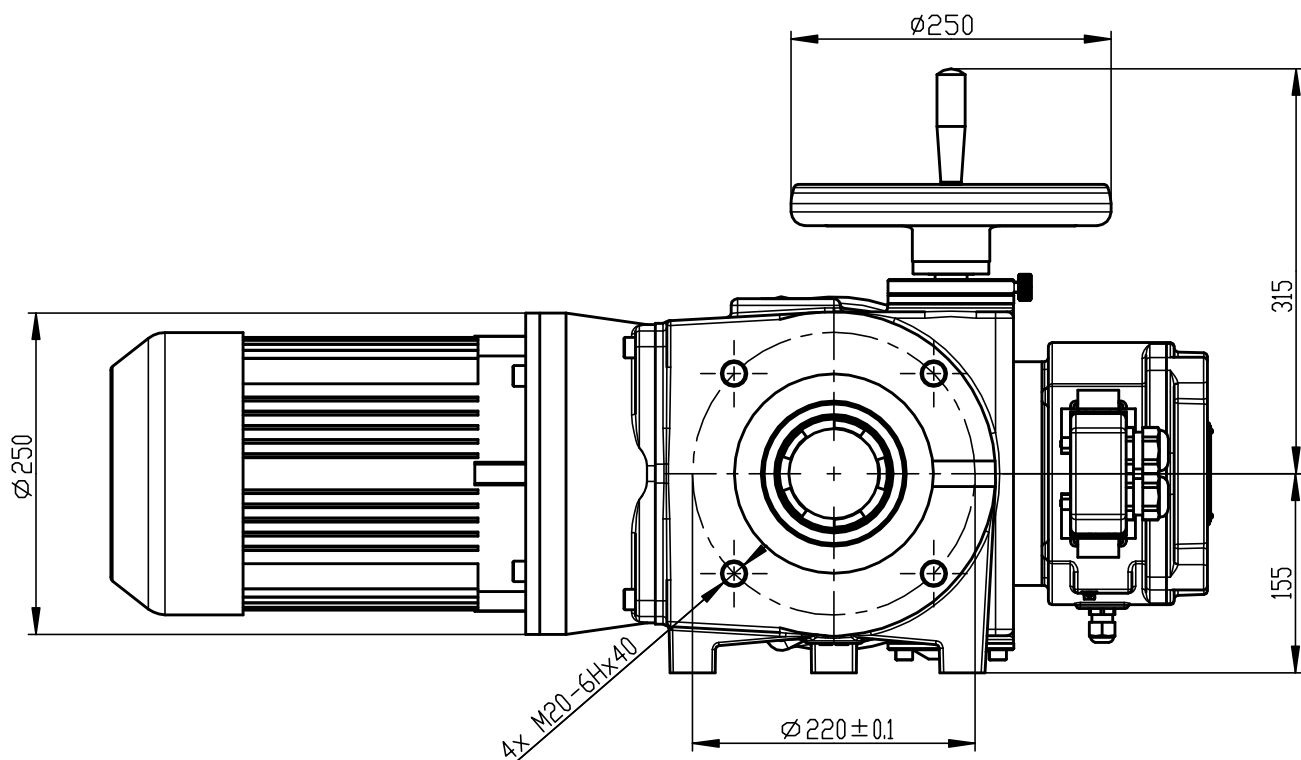


P-1425



P-1425

Dimensional connection drawings according to GOST R 555 10



7.3 Guarantee service check report

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

7.4 Post guarantee service check report

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

7.5 Commercial representation

Slovak Republic:

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

Czech republic:

REGADA Česká s.r.o. (Ltd.) – exclusive representation REGADA, s.r.o. (Ltd.) for sale of electric actuators

Regada Česká, s.r.o.

Kopaninská 109
252 25 Ořech
PRAHA – západ
Tel.: +420 257 961 302
Fax: +420 257 961 301