



INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS



Electric multi-turn actuators SO 2, SOR 2

TEST CERTIFICATE

ELECTRIC MULTI-TURN ACTUATOR SO 2, SOR 2	
Type number 062.	Power supplyVHz
Serial number	Max. load torqueNm
Production year	Switching-off torqueNm
Wiring diagram	Operating speed min ⁻¹
.....	Adjusted number of revolutions
.....	Transmitter (potentiometer)
Warranty period months	Input signal.....
Serial number of electric motor	
Serial number of transmitter	
Serial number of position controller	
Tests made in accordance with TP 74 0964 00	
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

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The Installation, Service and Maintenance Instructions are drawn up according to requirements of EC Executive Nr. 2006/42/EC "Uniform requirements for machines and devices from the point of view of safety and health care", to save life and health of users and to avoid material damages and exposure environment to danger.

1. General Information

1.1 Purpose and Application

Electric multi-turn actuators (hereafter referred to as **EA**), types **SO 2** respectively **SOR 2 with controller** are high performance electro-mechanical products, designed for direct assembly on controlled devices . EA of SO 2 types are provided for remote control of closing bodies, and EA of SOR 2 types for automotive control of regulating bodies. They are equipped by measuring and technological processes controlling means; the information carrier on their input and/or output is unified analogue direct current, or voltage signal. They can be used in heating, energy, gas, air-conditioning and other technological equipments, for which are suitable due to their manufacturing qualities. They are assembled by means of flange and connecting component in accordance with ISO 5210 , resp. DIN 3338, resp. OST 26-07-763 .



1. It is forbidden to use the EA as a lifting mechanism!
2. Switching of actuator by a semiconductor components/switches have to be consulted with producer.

1.2 Safety Instructions



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

Electric actuators are according to directive LVD 2006/95/EC and standard IEC 61010-1 assigned for installation category II (overvoltage category).

Effects of the Products upon Environment

Electromagnetic compatibility (EMC): the product complies with the requirements of the Directive 2004/108/EC 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 EN standards as well; EN 61000-6-2, EN 61000-6-4, EN 61000-3-2 and EN 61000-3-3.

Vibrations caused by the product: the product invokes negligible vibrations

Noise produced by the product: the voice level A at the service place max. 78 dB (A).

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



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



Instructions for operating stuff training

Operation can be performed by skilled personal only trained by production plant, resp. by contracting service center!

Warning for safe utilization

Protection of the Product

EA SO2 and SOR 2 has no own protection against short circuit. That is why the power supply has to contain a suitable protection device (a breaker or a fuse) that can also serve as a main switch.

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

1.3 Warranty Conditions

The supplier is responsible for the completeness of the delivery and warrants the parameters of the products that are stated by the technical conditions (TC) or the parameters agreed in the agreement.

The supplier is not responsible for decline of quality caused by the purchaser while storing, unprofessional installation or incorrect operation.

1.4 Under-Guaranty and After-Guaranty Service

All our products can be serviced by the professional service staff of our firm that provides installation, operation, service, checking and troubleshooting.

The under-guaranty service is provided by the service department of the producer on the basis of a written claim.

While claiming it is advised to present the following:

- basic data from the nameplate (type and serial numbers)
- period in operation, ambient conditions (temperature, humidity,...) operation mode including switching frequency, type of switching (position or thrust), adjusted switching thrust).
- a kind of failure - a description of the claimed failure
- a copy or a transcription of Installation Certificate.

It is advised to perform the **after-guaranty service** by the service department of the producer or by a contracted service firm.

1.5 Operation Conditions

1.5.1 Location of the Products and Operation Position

The EA can be built-in and operated in the sheltered places of industrial objects without any temperature or humidity control and with a protection against direct climate exposure (e.g. direct sunshine). except the special version designed for waste water treatment plants, water management, the selected chemical plants and tropic conditions.



Warning:

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

When installed in the areas with relative humidity more than 80%, in open air under a shelter it is needed to connect the space heater directly – without a thermal switch.

EA can be built-in and operated in any position. Standard position is with vertical axis of the output part and with the control part placed above.

1.5.2 Operation Environment

CLIMATE GROUPS AND TYPES

According to standard IEC 60 721-2-1 electric actuators are delivered in the executions listed below:

1. **"standard"** for group climate **reduce** (R)+ meet for type climate warm temperate (WT) and in addition warm dry (WDr), much warm dry (MWDr) and extremely warm dry (EWDr) with temperature-25 till +55 °C
2. **"cold"** for group climate **moderate** (M) suit for types climate cold temperate (CT), warm temperate (WT), warm dry (WDr) and much warm dry (MWDr) with temperature -40 till +40 °C
3. **"universal"** for group climate **great** (G) meet for types climate cold (C), cold temperate (CT), warm temperate (WT), warm dry (WDr), much warm dry (MWDr), warm dampy (WDa) and warm dampy equal (WDaE) with temperature -50 till +40 °C
4. **"marine"** for group climate **world-wide** (WW) meet for types climate cold (C), cold temperate (CT), warm temperate (WT), warm dry (WDr), much warm dry (MWDr), extremely warm dry (EWDr), warm dampy (WDa) and warm dampy equal (WDaE), by your leave temperature -50 till +55 °C, (except type climate extremely cold (EC))

in addition in sense GOST 15 150- 69:

5. **"tropical"** meet for dry and dampy tropics, for types climate warm temperate (WT), warm dry (WDr), much warm dry (MWDr), extremely warm dry (EWDr), warm dampy (WDa) and warm dampy equal (WDaE) by your leave temperature -25 till +55 °C

Category of location

- executions **"Standard"**, **"Cold"**, **"Universal"** and **"Tropical"** are intended for location **under the shelter** (category 2)
- execution **"Marine"** is intended for location **on the open space** (category 1)

Atmosphere type

- executions **"Standard"**, **"Cold"**, **"Universal"** and **"Tropical"** are intended for location in atmosphere type **II industrial**
- execution **"Marine"** is intended for location **in** atmosphere type **III sea**, type **IV seaindustria**

(In accordance with IEC 60 364-3:1993)

the EA **SO 2** have to resist external effects and operate reliably:

In the conditions of the following types of environment:

- mild to hot dry with temperature in range -25°C to +55°C AA 7*
- colt up to moderately hot and dry with temperatures at the range of -50°C to 40°C..... AA 8*
- with relative humidity 10 to 100 %, including the condensation of up to 0,028 kg water content per 1 kg of dry air at 27 °C, with temperatures from -25°C up to +55°C AB 7*
- with relative humidity of 15÷100%, including the condensation of up to 0,036 kg water content per 1 kg of dry air at 33 °C direct exposed to a possible rainfall, with temperatures from -50°C up to +40°C AB 8*
- with height above sea level 2 000 m, with barometric pressure range 86 to 108 kPa AC 1*
- with spraying or jet water from all directions--(protection enclosure IP x5) AD 5*
- with shallow immersion – (protection enclosure IP x 7) AD 7*
- with strong dustiness – with a possibility of influences of inflammable, non-conducted and non-explosive dust; the middle layer of dust; the dust drop more than 350 but not more than 1000 mg/m² per day (products with protection enclosure of IP 6x)..... AE 6*
- with atmospheric occurrence of corrosive and pollution media (with high degree of atmosphere corrosive aggressiveness); important presence of corrosive pollution..... AF 2*
- with permanent exposure to either large quantity of corrosive or contaminating chemicals and salt mist; the version designed for marine conditions, waste water treatment plants and some chemical plants AF 4*
- with a possibility of influences of mechanical stress:
 - medium sinusoid vibrations with frequency in range 10 up to 150 Hz, with shift amplitude of 0,15 mm for $f < f_p$ and acceleration amplitude 19,6 m/s² for $f > f_p$; (transition frequency f_p is from 57 up to 62 Hz)AH 2*
 - medium impacts, shocks and vibrations AG 2*
- with serious danger of plants and moulds growing..... AK 2*
- with serious danger of animals occurrence (insects, birds, small animals)AL 2*
- with detrimental influence of radiation:
 - of stray current with intensity of magnetic field (direct and alternating of power supply frequency) to 400 A.m⁻¹ AM 2*
 - of sun radiation with intensity > 500 a ≤ 700 W/m² AN 2*
- with effects of medium seismic activity with acceleration > 300 Gal ≤ 600 Gal AP 3*
- with indirect danger of storm activityAQ 2*
- with fast moving of air and strong winds AR 3 , AS 3*
- with persons frequent touching earth potential (persons often touch conductive parts or they stand on the conductive basement) BC 3*
- without any danger media with object BE 1*

* Marking in accordance with IEC 60 364-3:1993

1.5.3 Power Supply and Operation Modes

Power supply:

Electric motor 230/220 V AC $\pm 10\%$, 3x400/3x380 V AC $\pm 10\%$, resp. 24 V AC /DC $\pm 10\%$

Control part 230 $\pm 10\%$ resp. 24 V AC /DC $\pm 10\%$

Frequency of power supply 50 resp. 60** Hz $\pm 2\%$

** Stroke speed will increase 1,2 times, and torque will decrease 1,2 times

Duty cycles (according to EN 60304-1 (IEC 60034-1):1996) :

EA SO 2 are designed for **remote control**:

- with short operation S2-10min
- with interrupted operation S4-25%, max. 90 cycles/hour

EA SO 2, SOR 2 with controllers are designed for **automotive control**

- with interrupted operation S4-25%, 90 to 1200 cycles/hour

Note: 1. The duty cycles consists of the kind of load, the loader and the frequency of switching.

2. Once EA SO 2 is connected to the external controller unit, also use it as a control EA where the maximum load torque reaches the 0.8 multiple of the maximum loading torque for remote operated EA SO2.

1.6 Packaging, Transport, Storing and Unpacking

The **EA SO 2** are delivered in solid packages, assuring the resistance according to the requirements of standards EN 60654.

The package is made by a box. The products in the boxes can be packed on pallets (the pallet is returnable). The following information is given on the outside of the package:

- the producer
- the name and the type of the product
- number of pieces
- other data – inscriptions and labels.

The forwarder is obliged to protect the packed products loaded into transport means against spontaneous motion, in case of an open transport mean they are to be protected against rainfalls and flowing water. Location and fixing of the products in transport means should guarantee their fixed position, avoid possibility of mutual bumps and bumps against the walls of the transport means.

The transport in non-heated and non-pressurized transport means with conditions in range:

- temperature: -25°C to $+70^{\circ}\text{C}$ (special versions -50°C to $+45^{\circ}\text{C}$)
- humidity: 5 to 100% with maximum water content of 0.028 kg/kg of dry air
- barometric pressure: 86 to 108 kPa .

After receiving of the EA check whether during their transport or storing no damage occurred. Compare the data on their nameplates with the accompanying documentation/the purchase agreement (the order). In case of any discrepancy, failure or damage inform about the fact the producer immediately.



If not installed immediately the EA and their equipment should be stored in dry, well-conditioned sheltered areas, protected against impurities, dust and soil humidity (with keeping them on shelves or pallets), chemical and unauthorized impacts, at ambient temperature from -10°C to $+50^{\circ}\text{C}$ and at relative air humidity max. 80 %, in special version at temperature -50°C do $+40^{\circ}\text{C}$.

- 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.

1.7 Appreciation of the product and packing

The product is made of recyclable. The single parts of the package and the product should not be thrown away after its lifetime but sorted according to the related regulations and rules about environment protection and delivered for next treatment.

The product itself as well as its package is not a source of spoiling of environment and they do not contain any dangerous waste.

2. Description, Functioning and Specifications

2.1 Descriptions and Functioning

The EA **SO 2** are of the compact design with several connected modules. They consist of two functionally different main parts.

The gear part is made of flange with a coupling for connection with the controlled part and gearings placed in the bottom case; on the opposed side there are led drive mechanisms for units of the controlled part.

The control part (Fig. 1) is located on the control board (1), which contains:

- an electric motor (2) (for the single-phase version it is with a capacitor)
- contactors for the version with 3-phase electric motor
- a torque unit (5) – controlled by axial motion of a worm gear
- a position-signalling unit (3) with a position transmitter (6) - resistive , capacitive or an electronic position transmitter (7) and with a mechanical local position indicator (4)
- a space heater with (8) with thermal switch.
- electric connection is realised using **terminal boards** (10) (located in the control area) and cable bushings, or **connector** with cable bushings

Additional accessories:

Manual control: made up by a handwheel with a worm gearing

Local electric control module (Fig.12)

The **SOR 2** version is equipped with an **electronic controller** (9). The position controller allows automatic position adjustment of the EA output part depending upon the input signal value and provides also additional functions.

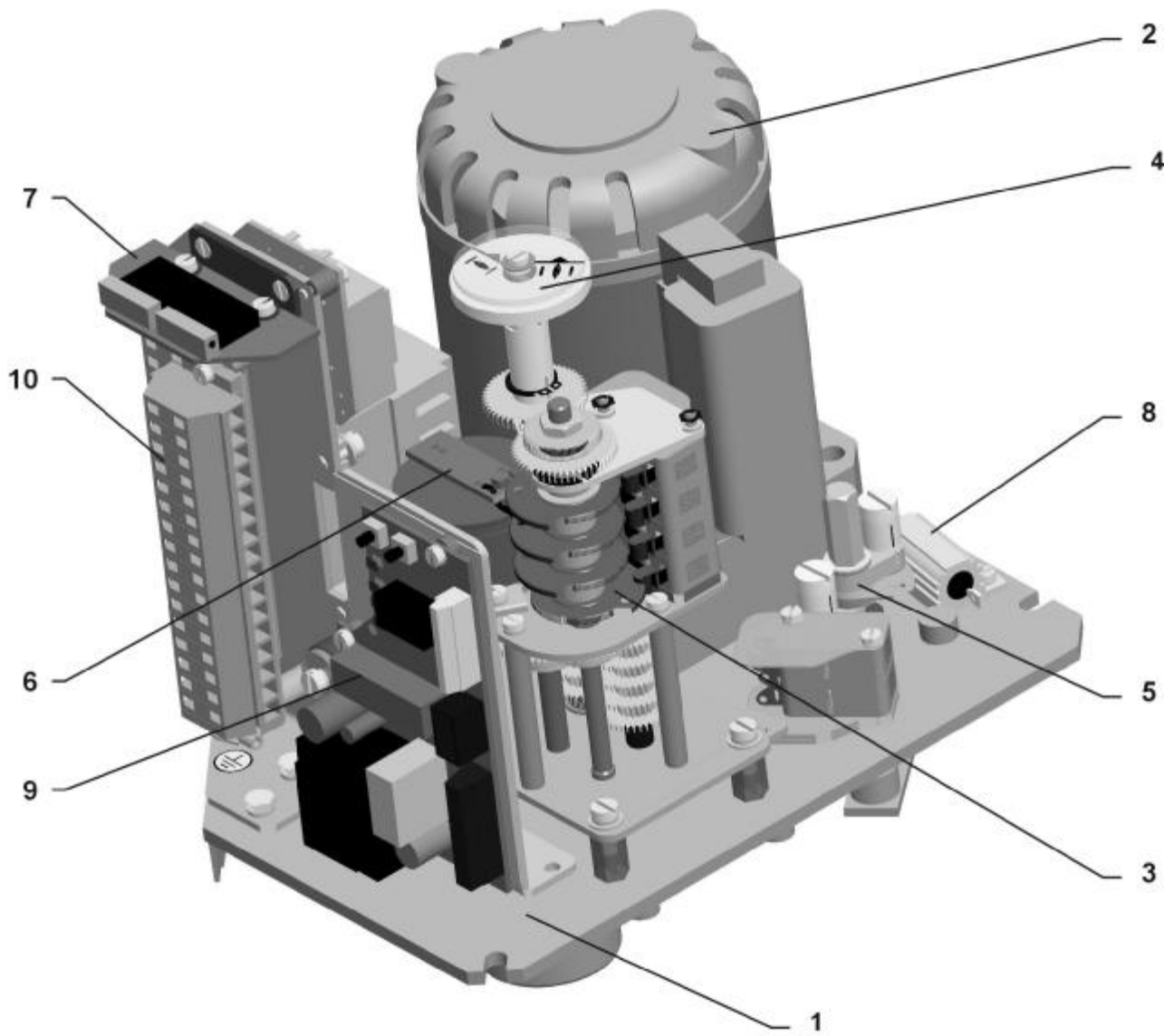


Fig.1

2.2 Specifications

Basic Specifications are given in the table 1.

Table 1: Basic Specifications

Type/ type number	Operation speed $\pm 10\%$	Number of revolutions	Maximum load torque	Switching torque $\pm 10\%$	Weight	Electric motor ¹⁾																	
						Supply voltage	Nominal			Capacitor capacity													
							Power output	Speed	Current														
[rev/min]	[rev]	[Nm]	[Nm]	[kg]	[V]	[W]	[1/min]	[A]	[μ F/V]														
1	2	3	5	6	7	8	9	10	11	12	13												
SO 2	type No. 062	3,125 to 320	12,0 – 18,5	12,0 – 18,5	12,0 – 18,5	Single-phase	230	60	2750	0,7	7/400												
												Three-phase	3x400	90	2750	0,35	-						
																		Single-phase	230	60	2750	0,7	7/400
																		Single-phase	230	180	1250	1,6	6,5
						Single-phase	230	60	2750	0,7	7/400												
												Three-phase	3x400	90	2750	0,35	-						
																		Single-phase	230	180	1250	1,6	6,5
																		Single-phase	230	180	2650	0,6	-

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

Other specifications:

Protection enclosure of EA: IP 65 resp. IP 67 (EN 60 529)

Mechanical ruggedness

sinusoid vibrations with frequency of 10 to 150 Hz with shift amplitude of 0,15 mm for $f < f_p$

..... with acceleration amplitude of $19,6 \text{ m/s}^2$ for $f > f_p$

..... (transition frequency f_p should be in range 57 to 62 Hz)

Resistance by drops 300 drops with acceleration of 5 m.s^{-2}

Self-locking: the EA is not self-locked

Protection of the motor by the thermal switch

Brakes of the EA:electro-magnetic brakes

Clearance of the output part: max.5° at 5% load of the switching-off torque

Electric control:

- remote control (the output element of the EA is controlled with supply voltage) (SO 2), resp. SOR 2 with built-in controller - by feeding of unified signal
- Adjustment of the limit positions

Precision of limit position switchesadjustment working stroke $\pm 5\%$ of max. set stroke
 Additional position relays adjustmentcca 1 revolution beneath the limit switches
 Hysteresis of position switches max. 5% of the max. stroke of the chosen range

Failure of the customer to specify the particular operating speed parameter in more details the speed are set to the value according to the 3rd degree of the selected range – see Table 2.

Adjustment of the torque switches:

If other adjustment not specified the switching torque is set to the maximum value with tolerance of $\pm 10\%$.

Switches – standard version D38:

supply voltage 250 V(AC); 50/60 Hz; 6(4) A; $\cos \varphi=0,6$, resp.: 24 V (DC); T=L/R=3ms
 min. current 100mA

Switches – gold-plated contacts – special version D41:

supply voltage 0,1(0,05) A, max. 250 V AC;
 0,1 – 24 V DC; T=L/R=3ms
 min. current 5mA

Space heaters (E1)

The space heater – supply voltage:.... according to the supply voltage of the motor (max. 250 V AC);
 Heating power: cca 20 W/55°C

Thermal switches of the space heaters (F2)

Supply voltage:according to the supply voltage of the motor (max. 250 V AC, 5 A)
 Temperature of switching on: $+20^{\circ}\text{C} \pm 3 \text{ K}$
 Temperature of switching off: $+30^{\circ}\text{C} \pm 4 \text{ K}$

Manual control:

- with a handwheel after pressing the detent button. Rotate the handwheel clockwise to move the output shaft in the direction „Z“.

Electric control:

- remote control (the output element of the EA is controlled with supply voltage)

Position transmitter**Resistive – potentiometer:**

Resistance (single **B1**):..... 100 Ω , 2000 Ω
 Resistance (double **B2**): 2x100 Ω , 2x2000 Ω
 Operating life of transmitter 10^6 cycles
 Load capacity: 0,5 W up to 40°C (0 W/125°C)
 Maximum current of sliding contact max. 35 mA
 Maximum supply voltage:..... $\sqrt{P \times R}$ V DC/AC
 Potentiometer linearity error:..... $\pm 2,5 [\%]$ ¹⁾
 Potentiometer hysteresis:max.2,5 [%]¹⁾
 for **SO 2** "O" (open)..... $\geq 93\%$, "Z" (closed) $\leq 5\%$
 for **SOR 2** "O" (open)..... $\geq 85\%$ and $\leq 95\%$; "Z" (closed) $\geq 3\%$ and $\leq 7\%$

Capacitive (B3): non-contact, life 10^8 cycles**2-wire connection** with power supply or without power supply

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

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

Output signal values at limit positions: "O".... 20 mA (clamps 81,82)
 "Z"..... 4 mA (clamps 81,82)

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

Electronic positional transmitter (EPV) - converter R/I (B3)**a) 2-wire version - without built-in power supply, or with built-in power supply**

Current signal	$4 \div 20$ mA (DC)
Power supply voltage (at version without build-in power supply)	$15 \div 30$ V DC
Power supply voltage (at version with build-in power supply).....	24 V DC \pm 1,5%
Load resistance (at version without build-in power supply).....	max. $R_L = (U_n - 9V) / 0,02A$ [Ω] (U_n - power supply voltage [V])
Output signal values at limit positions:	"O".... 20 mA (clamps 81,82) "Z"..... 4 mA (clamps 81,82)
Values tolerance of output signal of EPV	"Z" +0,2 mA "O" \pm 0,1 mA

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

Current signal	$0 \div 20$ mA (DC)
Current signal	$4 \div 20$ mA (DC)
Current signal	$0 \div 5$ mA (DC)
Power supply voltage (at version without built-in power supply)	24 V DC \pm 1,5%
Load resistance	max. 3 k Ω
Output signal values at limit positions:	"O".... 20 mA or 5 mA (clamps 81,82) "Z"..... 0 mA or 4 mA (clamps 81,82)
Values tolerance of output signal of EPV and capacitive transmitter	"Z" +0,2 mA "O" \pm 0,1 mA
EPV and capacitive transmitter linearity error:.....	\pm 2.5 % ¹⁾
EPV and capacitive transmitter hysteresis:	max. 2,5 % ¹⁾

¹⁾ from rated value of transmitter referred to output values

Electronic position controller (N)**Controller software equipment:****A) Function and parameters**programmable **functions:**

- with functional buttons SW1, SW2 and LED diodes D3, D4 directly placed on controller
- with computer or terminal equipped with corresponding programme, using RS 232 interface.

programmable **parameters:**

- control signal
- response to SYS-TEST signal
- mirroring (ascending/descending characteristics)
- insensitiveness
- EA limit positions (only with computer and ZP2 programme)
- way of regulation

B) Operation states of controller**Error message** from error memory: (using LED diodes and RS 232 and personal computer)

- control signal missing or faulty
- input value of current control signal under 3.5 mA
- existence of SYS-TEST signal
- activity of switches
- failure of feedback position transmitter

Statistic data: (using RS 232 and personal computer)

- number of controller operation hours
- frequency of relay switching in direction "opening"
- frequency of relay switching in direction "closing"

Supply voltage: terminal 61 (L1) -1(N) - 230 V AC $\pm 10\%$ **Frequency:** 50/60 Hz $\pm 2\%$ **Input control signals - analogue:** 0 - 20 mA

..... 4 - 20 mA

..... 0 - 10 V

(Actuator opens at rising of control signal.)

Controller linearity: 0.5 %**Controller insensitiveness:** 1 - 10% (adjustable)**Feedback (position transmitter):** resistive 100 up to 10,000 Ω

..... current 4 up to 20 mA

Power outputs: 2x relay 5A/250 V AC**Digital outputs:** 4x LED (supply, error, adjustment, "opening", "closing" - with two-color LED)**Error status:** control switch 24 V, 2W - POR**Reaction at error situation:** transmitter error - error message LED**Control signal missing:** error message LED**SYS mode:** error message LED**Adjusters:** communication connector

..... 2x calibrating and adjusting button

2.2.1 Mechanical connection:

- with flanges (ISO 5210, DIN 338, OST 26-07-763)

Main and connecting dimensions are given in the dimensional drawings.

2.2.2 Electric connection

- **with terminal board (X):** max. 32 terminals - connecting cable size max. 2.5 mm²;
2 cable bushings – M20x1,5 (øD = 8 to 14,5 mm)
- **with connector (XC):** max. 32 terminals - connecting cable size max. 0.5 mm²
2 cable bushings – M20x1,5 (øD=8 až 14,5 mm);

øD = connecting cable diameter

With protection terminal: external and internal, mutually connected and marked with protection earthing mark

Electric control: Main and connecting dimensions are given in the **dimensional drawings**.

3. Installation and Dismantling of the Actuator



Follow safety regulations!

Note:

Check again whether the EA is placed in accordance with the Chapter "Operation Conditions". If the installation conditions are different than recommended it is needed to consult the situation with the producer.

Before starting the installation onto the valve:

- Check again whether the EA was not damaged while storing.
- Check compliance of the stroke adjusted by the producer and the connecting dimensions of the EA with the parameters of the valve.
- In case of any difference perform the adjustment according to the Chapter "Adjustment".

3.1 Installation

The EA are adjusted by the producer to the parameters stated on the nameplate.
Put on the handwheel before assembly.

3.1.1 Mechanical Connection for Flanged Version

- Defat the abutting areas of the connecting flange of the EA valve or the gear carefully;
- Lubricate the output shaft of the valve/gear with a grease not containing any acids;
- Set the EA to the limit position "closed", set the valve to the same position;
- Put the EA onto the valve with the output shaft reliably stalled in the valve coupling/gear;

Attention! Do not adjust EA on an armature forcibly because of damage of the gear!

- Use the hand wheel to turn the EA to fit the openings in the EA and valve flanges if needed;
- Check whether the connecting flange abuts with the valve/gear.
- Fix the flange with four screws (with mechanical strength min 8G) fixed the way the actuator can be moved. Tighten the screws equally in cross.
- At the end check the correctness of the fixture with the valve with rotating the hand wheel.

3.1.2 Electric Connection with Mains or Checking of Functions

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



1. Follow instructions given in the Chapter "Requirements for Professional Qualification...!"

2. While laying electric wiring follow instructions for heavy-current appliances installations!

3. Cables should be brought to terminal boards or connectors with cable screwed bushings!

4. Before the EA is put into operation join the internal and external earthing terminals!

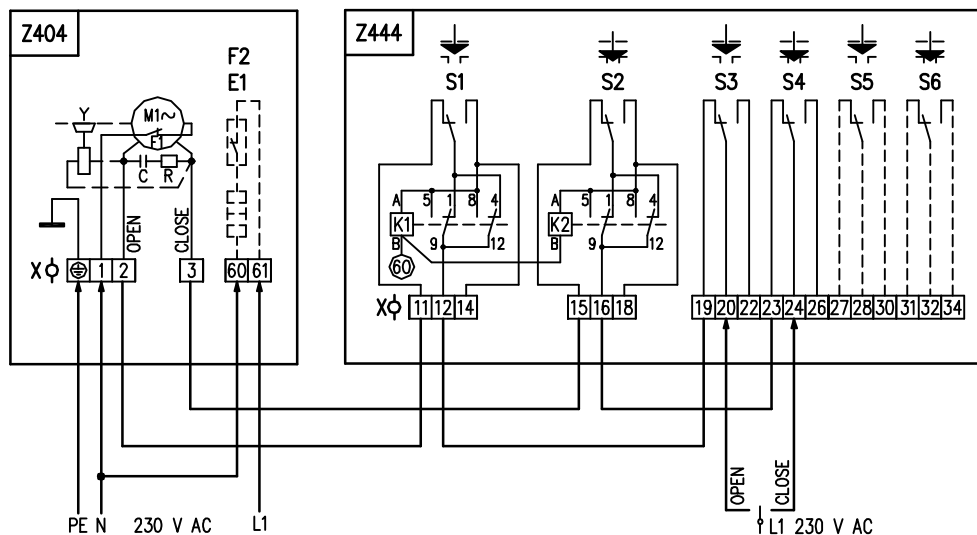
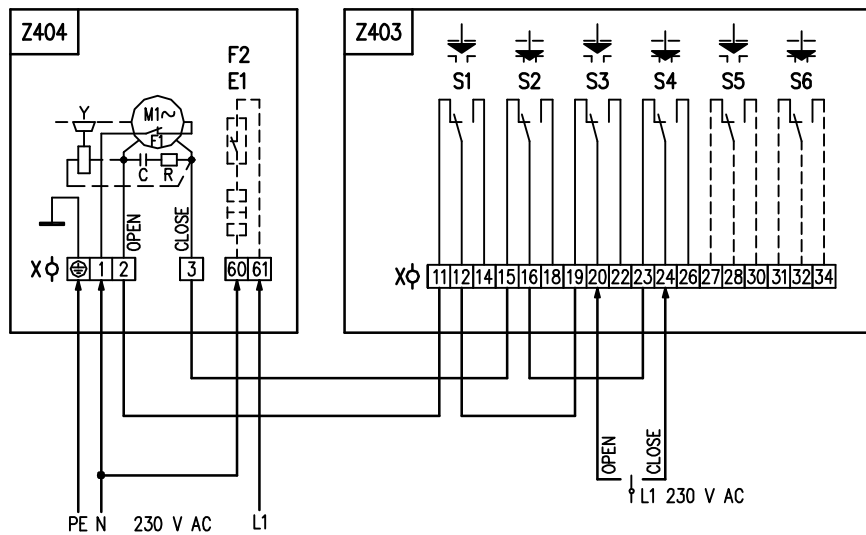
5. The inlet cables should be fixed onto a fixed construction max. 150 mm from the bushings!

6. Moment switching has not been equipped with the mechanical blocking mechanism, (except the wiring diagram Z444) therefore when releasing overload of the EA, the supply voltage connected to the electric motor needs to be disconnected.

7.) For proper EA functioning the torque (S1, S2) and position (S3, S4) limit switches must be serial connected into the electric motor control circuit – see the recommended connection for single phase electric motor (example connection 1).

8.) The output wires electric motor thermal protection must be connected into the electric motor control circuit on a such way that when the electric motor thermal protection opens (it means when the allowed electric motor winding temperature is exceeded) it will cause the disconnection of the electric motor supply voltage.

9) 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.



Example connection 1

Connection with the terminal board:

Before the connection remove the actuator case and check whether the type of current, power supply and frequency correspond with the data on the actuator nameplate.

Electric connection:

- The electric connection should be realized according to the wiring diagram stuck into the case of the EA;
- The electric connection should be performed through two cable bushings see No. 2.2.2.
- Once electrical services are completed put on the cover and fasten it evenly crosswise by bolts. Fasten the cable outlets to ensure specified shielding.

Electric connection to connector:

- Check whether the type of current, power supply and frequency correspond with the data on the actuator nameplate;
- Loosen the connector bodies;
- Bare ends of cables;
- Use the recommended tongs* to connect the connector sockets onto the cable ends;
- Fix the connectors and tighten;
- Tighten the cable leads to assure the protection enclosure.

Notes:

1. The EA are delivered with bushings which in case of correct tighten are onto the supply lead allow the protection enclosure of IP 68. To arrange the enclosure it is needed to use seal rings according to the actual size of cable and the required temperature.
2. The cable is to be fixed the way corresponding with its allowable bending radius not to damage or deform the sealing element of the cable lead. The supply leads have to be fixed onto a fixed construction max. 150 mm from the leads.
3. It is recommended to connect the remote transmitters with shielded wires.
4. The face areas of the control part cover should be clean before fixing it back.
5. The EA is reversible if the time interval between the power supply is switched off and on for the reverse direction of the output part motion is at least 50 ms.
6. The allowed delay after it is switched off, i.e. time from the switches reaction up to the motor without any voltage is 20 ms maximally.



Follow instruction of producers of valves, whether switching off in the limit positions should be arranged by the position or torque switches!

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

- After the EA is electrically connected to check the correct functions of the position and the torque switches S1 - S6 and if needed adapt the order of the single phase leads for the 3-phase electric motor.
- Set the valve manually into an mid-position.
- Connect the power supply to the terminal D2 for supplying the EA in the direction “opening” and follow the direction of the position indicator rotation in the control part of the EA . If the EA is connected properly the disc watched from above should rotate counterclockwisely and the EA output part should move in the direction “opening”. When EA is connected correctly, the position indicator of EA, looking from above, must rotate in the direction of symbols „open“ or „closed“ and at the same time the output component of EA must move to the direction „opens“. If not it is necessary to change the phase leads L1 and L3 on the terminals 2 and 4 mutually. After the exchange is made check the direction of the EA rotation.
- If any of the functions is not correct, check the switches whether they are wired properly according to the wiring diagrams.

3.2 Dismantling



***Before dismantling it is needed to disconnect power supply of the EA!
Do not connect and disconnect the EA when live not to cause any injury by electrical current!***

- Switch the A off the mains.
- Disconnect the leads from the terminal board of the EA and loosen the cable from the plugs.
- Loosen the fixing screws of the flange and screws of the EA coupling and split the EA and the valve.
- If sending the EA to repair put it into a package steady enough not to allow its damaging.

4. Adjustment



Keep safety regulations! Follow the prescribed procedure to assure that the EA is not connected to mains when live not to cause any injury by electrical current!

The adjustment is performed with the EA mechanically and electrically connected and the connection and functions were checked. The chapter describes the adjustment of the EA to the parameters given in the nameplate in case that any of its parts is out of tune. The adjusting parts on Fig.1.

4.1 Adjustment of the Torque Unit

The switching - off torques are adjusted by the producer for both directions, i.e. for the direction “opening” (the torque switch S1) as well as for the direction “closing” (the torque switch S2) to the specified value with tolerance of $\pm 10\%$. If not stated else they are adjusted to the maximum rate.

Adjustment and changing of settings of the torque unit to other torque values is possible using the adjusters according to Fig. 2. The switching - off torque can be only reduced with turning the adjusting screws with the scale against the adjustment lines on the torque unit arm. Setting to the longest line means that the switching - off torque is set to the maximum value. Setting to the lower line means reducing of the switching - off torque.



REGULATING
SCREW OF
TORQUE
SWITCH S2

REGULATING
SCREW OF
TORQUE
SWITCH S1

Fig.2

4.2 Adjustment of position-signalling unit (Fig.3)

The EA are in the production plant adjusted to a fixed stroke (according to the specification), given on the nameplate. Failure of the customer to specify the particular operating stroke parameter the selected operating speed are set to the 3rd stroke of the selected stroke line. While setting, adjusting and resetting follow these steps (Fig. 3):

- in the version with a resistant transmitter (Fig.4) disengage the transmitter;
- shift the sliding gear to the required speed as per Table 2, Fig. 3a by loosening the screw of the sliding gear and tighten it once resetting is over. When setting the sliding gear be particular about correct meshing with the given speed gear;
- loosen the nut (22) with simultaneous holding the central milled nut (23) and then loosen the nut (23) fixing the cams still having the Belleville springs which create axial thrust;
- reset the EA to the “Open” position and rotate the cam (29) clockwise (when viewing the actuating plate from above) until switch S3 switches over (25);
- reset the EA by the stroke where the “Open” position is to be indicated and turn the cam (31) clock-wise until switch S3 switches over (27);
- reset the EA to the “Closed” position and turn the cam (28) counter clockwise until switch S4 switches over (24);

- reset the EA back by the stroke where the “Closed” position is to be indicated and turn the cam (30) counter clockwise until switch S6 switches over (26);
- once the EA is adjusted manually tighten the central milled nut (23) to lock the cams and tighten the lock nut (22) while simultaneous holding the milled nut;
- swing the position indicator discs (31) for the given number of revolutions against the gauge mark on the top cover sight;
- once of the position- signalling unit is adjusted also adjust the position Transmitter, converter or position control device, if necessary (according to the accessories of the EA).

There is an option of bi-directional signalling at all operating stroke time, i.e. 100 %.

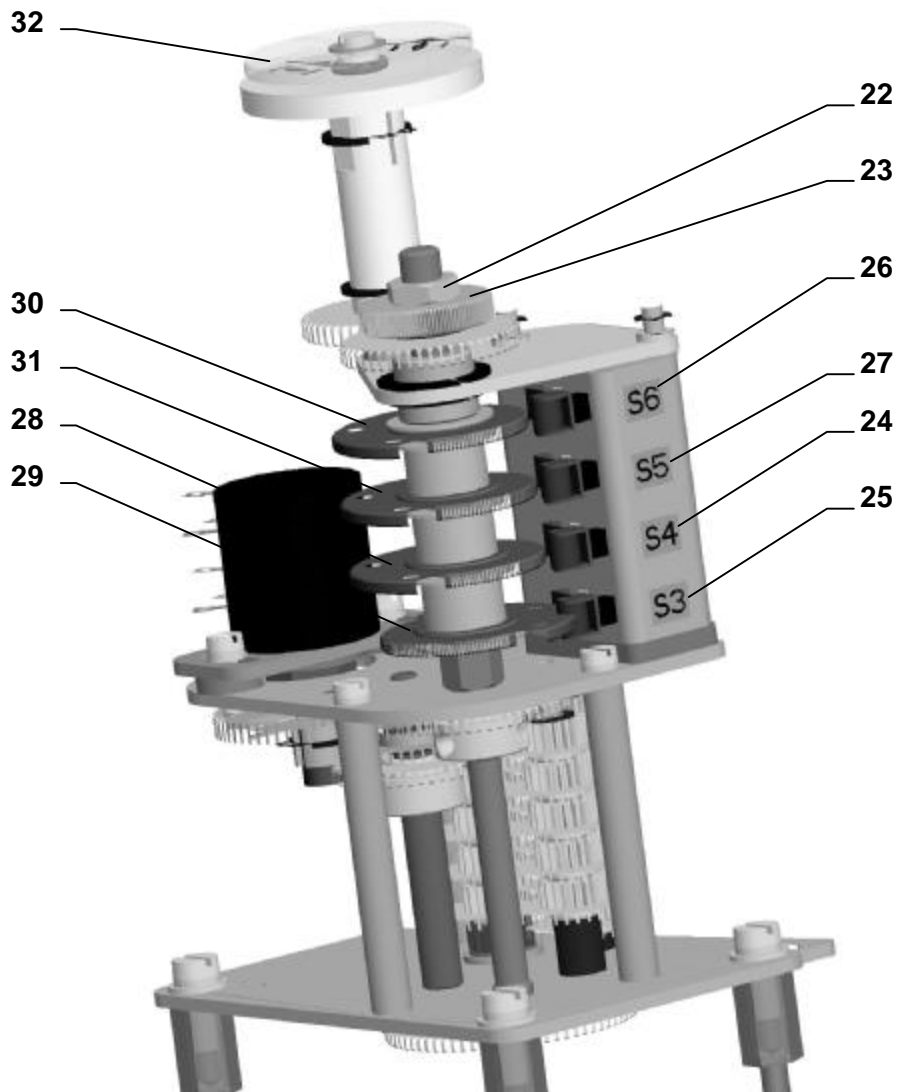


Fig.3

TABLE 2		
STROKE LINE	STROKE ANGLE	MAX. OPERATING SPEED
I.	1.°	3,125
	2.°	6,25
	3.°	12,5
	4.°	25
	5.°	50
	6.°	100
	7.°	200
II.	1.°	4
	2.°	8
	3.°	16
	4.°	32
	5.°	64
	6.°	128
	7.°	256
III.	1.°	5
	2.°	10
	3.°	20
	4.°	40
	5.°	80
	6.°	160
	7.°	320

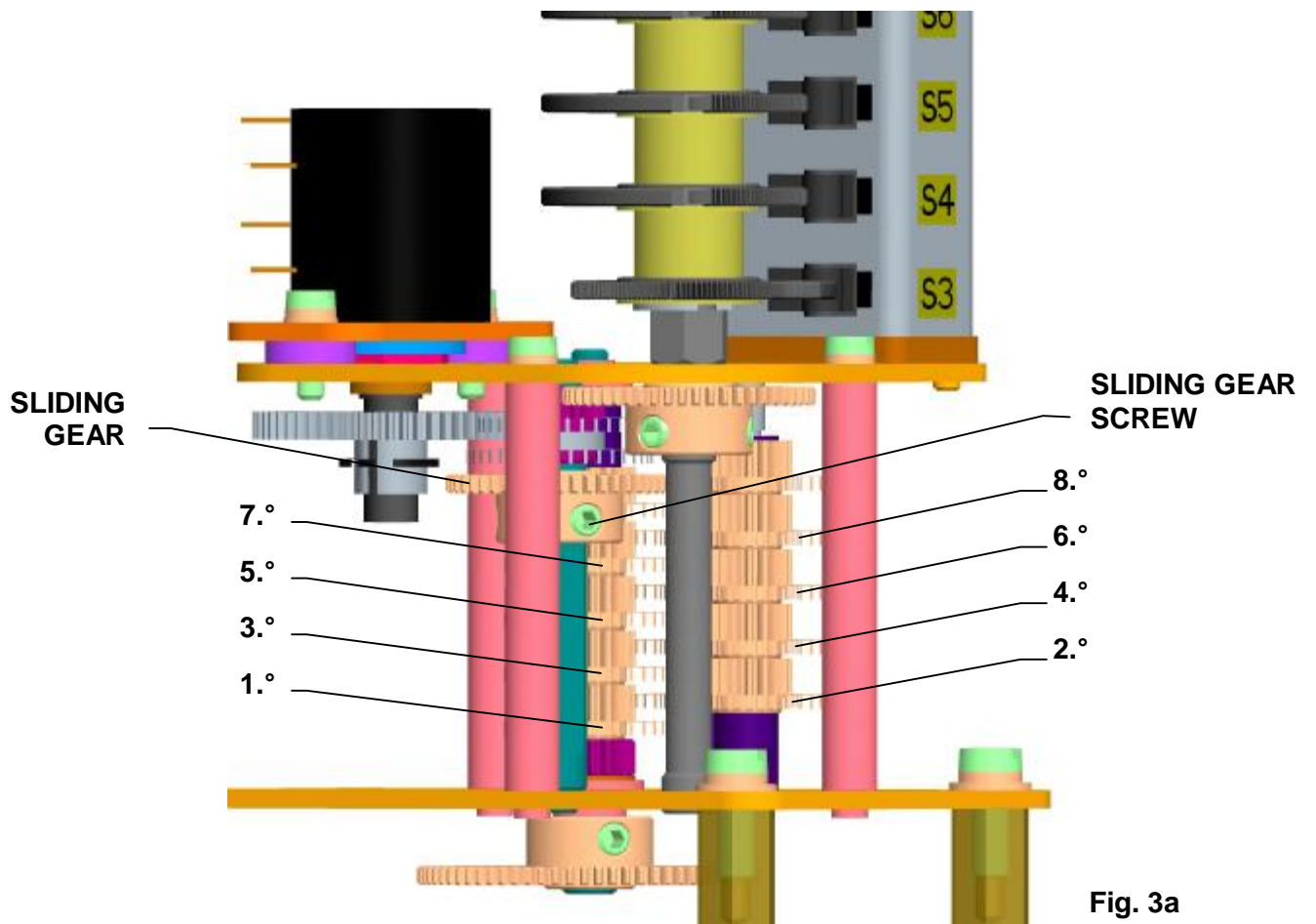


Fig. 3a

4.3 Adjustment of resistant transmitter (Fig.4)

The **resistant transmitter** is in the EA **SO 2** used to function as a remote position indicator; in the EA **SOR 2** to function as a feedback in the position controller.

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

Notes:

In case that the EA is unused within the complete operating speed range following the stroke selected on the particular stroke line, the "Open" limit position resistance value will undergo proportional reduction.

In the EA SOR 2 2000W resistant transmitters are used. In the other cases if the resistant branch is lead to the terminal board the resistance of the transmitters is according to the customer's specification.

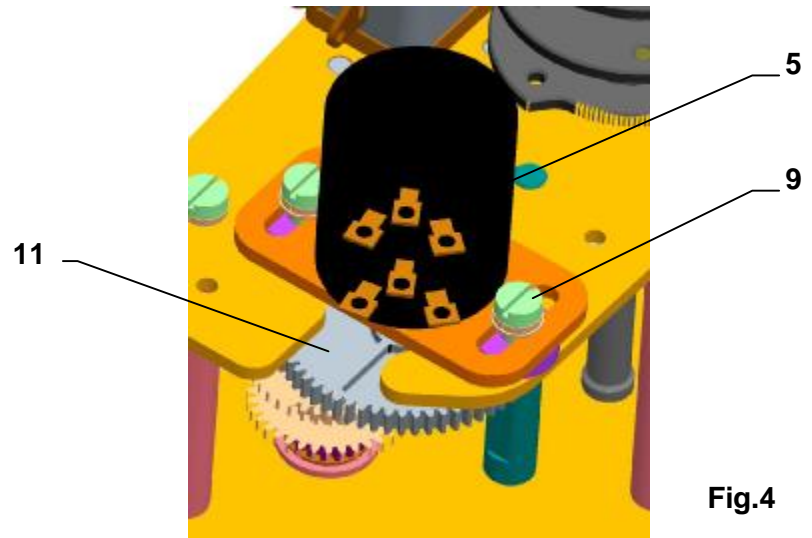


Fig.4

To adjust the transmitter follow these steps:

Loosen the fixing screws (9) of the transmitter holder and push the transmitter out of mesh.

Connect a meter for resistance measuring to the terminals 71 and 73 of the EA **SO 2** terminal board, or to the terminals 7 and 10 of the EA **SOR 2** terminal board.

Put the actuator to the position "closed" (with the handwheel, or with the local electric position control until the corresponding position switch S2 or S4 switches).

Rotate the transmitter shaft (11) until resistance of $\leq 5\%$ of the nominal transmitter resistance can be read on the meter in case of EA **SO 2**, and 3 up to 5% of the nominal transmitter resistance in case of EA **SOR 2** with EPV, i.e. with the resistant transmitter with the converter PTK1.

In the position put the transmitter to mesh with the drive wheel and fix the fixing screws on the transmitter holder.

Please check the resistance value in both of the final positions and in case of need repeat the procedure. Once the device is adjusted in a correct way disconnect the meter from the terminal.

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

4.4.1 EPV – the 2-wire version (Fig. 5)

The position transmitter with the converter PTK1 is in the plant adjusted to have the output current signal on the terminals 81-82 (the wiring diagram Z10a – without any power supply, or Z269a – with a power supply) as follows:

- in the position "open" 20 mA
- in the position "closed" 4 mA

If the transmitter requires a new adjustment follow these steps:

Adjustment of the EPV in Electric Actuators SO 2 without controller

- Put the actuator to the position "closed" and switch the power supply off.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (Fig. 5). The used transmitter resistance is 100 Ω.
- Switch the converter's power supply on.
- Turn the adjusting trimmer ZERO (Fig. 5) to adjust the output current signal rate measured on the terminals 81-82 to 4mA.
- Set the actuator to the position "open".
- Turn the adjusting trimmer GAIN (Fig. 5) to adjust the output current signal rate measured on the terminals 81-82 to 20mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

Note:

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

Adjustment of the EPV in Electric Actuators SOR 2 with controllers

- Disconnect the circuit with removing a jumper on the terminals 81 and 82.
- Disconnect the control signal from the terminals 86/87 and 88.
- Set the actuator to the direction "OPENING" or "CLOSING" with the handwheel, or with connecting power to the terminals 1 and 20 for the direction "OPENING" or 1 and 24 for the direction "CLOSING".
- Set the actuator to the position "CLOSING" and switch the converter off on the terminals 1 a 61.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y .
- Connect power supply to the terminals 1 and 61.
- Turn the adjusting trimmer ZERO to adjust the output current signal rate measured on the terminals 81-82 to 4mA.
- Set the actuator to the position "open".
- Turn the adjusting trimmer GAIN to adjust the output current signal rate measured on the terminals 81-82 to 20mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.
- Having the transmitter adjusted put the jumper again on the terminals 81 and 82 in case that the output signal wont be used (the circuit through the terminals 81 and 82 should be closed).
- Connect the control signal to the terminals 86/87 and 88.

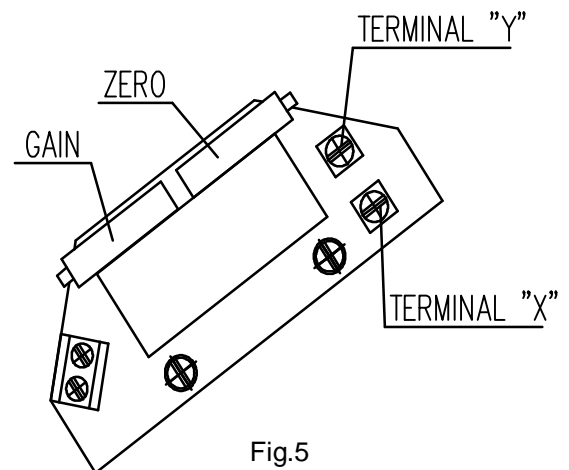


Fig.5

Note:

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

4.4.2 EPV – 3-wire version (Fig. 6)

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

- in the position "open" 20 mA or 5 mA
- in the position "closed" 0 mA or 4 mA

according to the specified version of the converter.

If the transmitter requires a new adjustment follow these steps:

- Put the actuator to the position "closed" and switch the power supply off.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (Fig. 6). The used transmitter resistance is 2000 W or 100 W.
- Switch the converter's power supply on.
- Turn the adjusting trimmer ZERO (Fig. 6) to adjust the output current signal rate measured on the terminals 81-82 to 0 mA or 4mA.
- Set the actuator to the position "open".
- Turn the adjusting trimmer GAIN (Fig. 6) to adjust the output current signal rate measured on the terminals 81-82 to 20mA or 5 mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

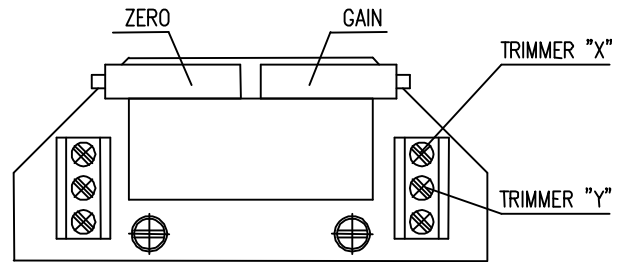


Fig. 6

Note:

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

4.5 Adjustment of Capacitive Transmitter CPT1/A

The chapter describes adjustment of the capacitive transmitter to the specified parameters (standard values of output signals) in case they are reset. The capacitive transmitter serves as a position transmitter of electric actuators with unified output signal of 4÷20 mA in electric actuators **SO 2**, or as a feedback of a position controller, or if required it functions also as a remote position transmitter of electric actuators with unified output signal of 4÷20 mA in electric actuators **SOR 2 with controllers**.

Note:

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

The capacitive transmitter CPT1/A is adjusted by the producer to the fixed operation stroke according to the order and wired according to the wiring diagrams placed into the cover. Check the power supply of the user after connecting to terminal of the terminal board before the transmitter is electrically checked. Adjustment of the capacitive transmitter can be performed when the position switches are adjusted. The adjustment is performed with the power supply of 230 V/50 Hz and ambient temperature of $20 \pm 5^\circ\text{C}$.

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

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

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

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



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

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

- Connect a mA meter of precision class 0,5 and loading resistance lower than 500Ω serially with the transmitter (pole "-"; terminal 82)
- Put the actuator to the position "CLOSED", the signal value should decrease.
- Check the signal value for the position "CLOSED" (4 mA).
- Tune the signal with loosening the fixing screws (15) and turning the trimmer (10) until the required value of 4 mA is reached. Tighten the fixing screws.
- Put the actuator to the position "OPEN", the signal value should raise.
- Check the signal value for the position "OPEN" (20 mA).
- Tune the signal with turning the trimmer (20) until the required value of 20 mA is reached.
- Check the signal value for the position "CLOSED" and then for the position "OPEN".
- Repeat the procedure until the change from 4 to 20 mA is reached with deviation less then 0,5 %.
- Disconnect the meter and lock the screws with a varnish.

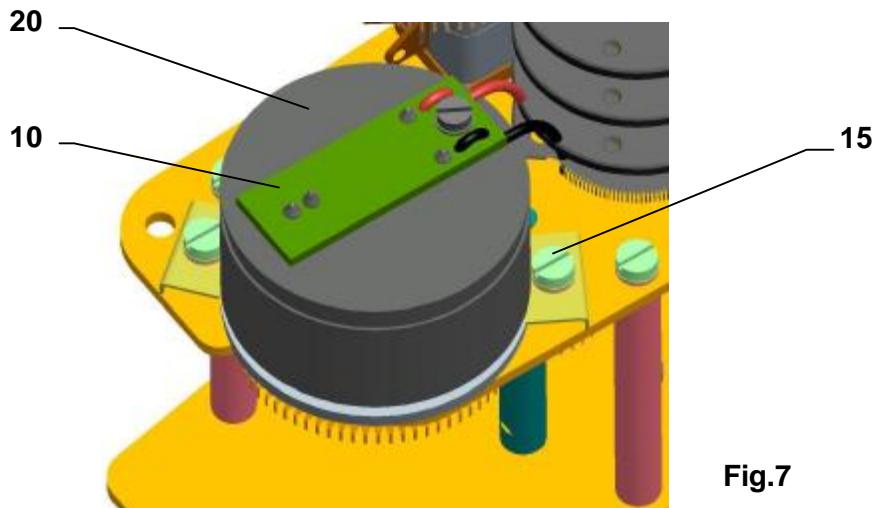


Fig.7

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

- 1.) Check the power supply: 230 V AC $\pm 10\%$ on the terminals 1,61, resp. 78,79
- 2.) While checking or adjusting the output signal of 4÷20 mA follow these steps:
 - Connect a mA meter of precision class 0,5 and loading resistance lower than 500 Ω on the terminals 81, 82.
 - Follow the procedure described in the previous chapter A.

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

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

- Disconnect the circuit on the terminals 81 and 82 removing the jumper.
- Connect power supply to the terminals 1 and 61.
- Disconnect the control signal from the terminals 86/87 and 88.
- Put the actuator to the direction "OPENING" or "CLOSING" with the handwheel or connecting power supply to the terminals 1 and 20 for the direction "OPENING", or 1 and 24 for the direction "CLOSING".
- Connect a mA meter of precision class 0,5 (e.g. digital) and loading resistance lower than 500 Ω on the terminals 81,82.
- Follow the procedure for the version without any power supply described in the previous chapter A.
- Having the transmitter adjusted put the jumper again on the terminals 81 and 82 in case that the output signal wont be used (the circuit through the terminals 81 and 82 should be closed).
- Connect the control signal to the terminals 86/87 and 88



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

In the version equipped with the controller device while using the feedback from transducer CPT; when using the output signal there has been no galvanic isolation of the signal from the input one!

Note:

The trimmer (20) can be used to adjust the output signal of the capacitive transmitter to any value of operation stroke in range from ca 40% up to 100% of the value of the operation stroke adjusted by the producer and stated on the actuator's nameplate.

4.6 Adjustment of position controller (Fig. 9)

The built-in position controller REGADA of new generation is a user-friendly control system to control actuators with an analogue signal. The controller takes advantages of high-power RISC processor MICROCHIP to perform all functions. It provides also continuous automotive diagnostics of the system, error messages as well as number of relay switching and number of controller's operation hours. Placing an analogue signal onto the input terminals of the terminal board 86 (GND, -) and 88 (+) causes that the EA output is reset.

Required parameters and functions can be programmed using function buttons SW1 - SW2 and LED diodes D3 - D4 placed directly on the controller, see Table 2.

4.6.1 Setting of controller

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

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

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

Laying of adjusters and signalling elements on the board of the REGADA controller is shown on Fig. 9:

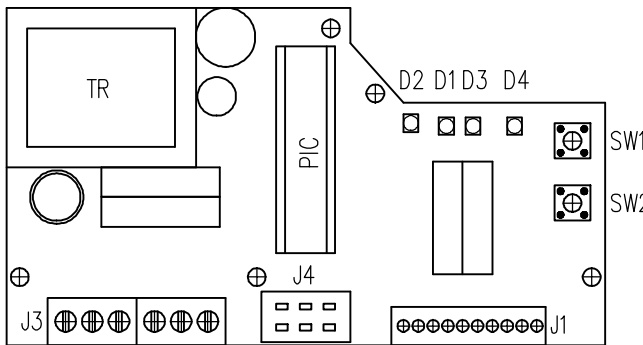


Fig. 9

SW1 button	starts an initialization routine and allows listing in the adjust menu
SW2 button	setting of parameters in the chosen menu
D1 diode	power on indication
D2 diode	motion to the direction "opening" indication (green) - "closing" (red) indication
D3 diode	(yellow light) number of blinking codes indicates chosen adjust menu
D4 diode	(red light) number of blinking codes indicates adjusted parameter of the controller from the chosen menu

Table 2:

D3 (yellow) diode number of blinking	Adjust menu	D4 (red) diode number of blinking	Adjusted parameter
1 blink	control signal	1 blink	0-20mA
		2 blinks	4-20 mA (*) (**)
		3 blinks	0-10V DC
2 blinks	response for signal SYS-TEST	1 blink	EA opens receiving signal SYS
		2 blinks	EA closes receiving signal SYS
		3 blinks	EA stops receiving signal SYS (*)
3 blinks	mirroring (ascending/descending characteristics)	1 blink	EA CLOSING at increasing of control signal
		2 blinks	EA OPENING at increasing of control signal (*)
4 blinks	insensitiveness of controller	1 to 10 blinks	insensitiveness of controller of 1-10% (3% set by the producer) (*)
5 blinks	way of regulation	1 blink	narrow torque
		2 blinks	narrow position (*)
		3 blinks	wide torque
		4 blinks	wide position

Notes:

1. The controller at autocalibration automatically sets the feedback type - resistant/current
2. (*) Parameters set in the production plant, if customer has not stated else.
3. (**) Input signal
4 mA - position "closed"
20 mA - position "open"

Standard setting of controller (programmed RESET of controller) - in case of any problems with setting of the parameters it is possible with pressing both **SW1** and **SW2** at the same time and then switching power on to set the standard parameters. Long press the push-buttons till the yellow LED starts flashing.

Controller setting procedure:

The **initialization routine** starts at the switched-on controller, zero system deviation and short pressing of the **SW1** button for ca 2 sec (i.e. until the diode **D3** got on). Loosing the button some of the default menus starts (usually control signal) what is shown with 1 blink on the **D3** diode as well as one of the default parameters (usually control signal of 4-20mA) what is shown with 1 blink on the **D4** diode. Then the required parameters of the controller can be changed according to Table 2: press shortly the **SW1** button to list the menu shown with the blinking number on the **D3** diode. press shortly the **SW2** button to set parameters shown with the blinking number on the **D4** diode.

After changing of the parameters according to user's wishes, put the controller to **autocalibration** with pressing the **SW1** button for ca 2 sec (i.e. until the diode D3 got on). During this process the controller performs the feedback transmitter and turning sense checking, sets actuator to the positions "open" and "closed", measures inertia mass in the directions "opening" and "closing", and loads the adjusted parameters into the EEPROM memory. In case that during the initialization process an error occurs (e.g. in connection or adjustment) the initialization process will be interrupted and the controller with the **D4** diode reports about the type of the error. Else after finishing the initialization process the controller is put into the **regulation mode**.

Error messages of the controller with D4 diode at initialization

- 4 blinks improper connection of the torque switches
- 5 blinks improper connection of the feedback transmitter
- 8 blinks bad sense of actuator's turning direction or adverse connection of the feedback transmitter

4.6.2 Watching operation and error states

Watching operation and error states is possible with the EA open.

a) Operation status with the D3 LED diode signalling:

it is continuously lighting - the controller regulates

it is continuously not lighting - system deviation in the insensitiveness range - the EA has stopped

b) Error state with the D4 and D3 LED diodes signalling - D4 continuously lighting,

D3 indicates error state with blinking 1 blink (repeated)	indication of the "TEST" mode - the EA is put to the position according to the signal in the "TEST" menu (at connecting the 66 and 86/87 terminals)
2 blinks (repeating after short pause)	missing of control signal - the EA is put to the position according to the signal in the "TEST" menu
4 blinks (repeating after short pause)	torque switches activity indication (the EA switched-off with the torque switches in a mid-position)
5 blinks (repeating after short pause)	failure of the feedback transmitter - the EA is put to the position according to the signal in the "TEST" menu
7 blinks (repeating after short pause)	control signal (current at range 4-20mA less than 4mA (3.5mA)).

5. Service and Maintenance

5.1 Service



1. In general it is supposed that the EA is serviced by a qualified person as required in the Chapter 1!
2. After the EA is put into operation it is necessary to check whether during manipulation its surface finishing was not damaged – the damages should be eliminated to prevent the surface against deterioration caused by corrosion!

- The EA requires just an insignificant service. The reliable operation is determined by the correct putting into operation.
- The service of the EA results from the operation conditions and generally consists in treating the information for subsequent performing of a required function. The EA can be controlled by remote control electrically or manually on the place of their installation. The manual control is available with a hand wheel.
- The service staff should arrange the required maintenance and prevent the actuator during operation against impacts of environment and climate what exceed the frame of allowed influences stated in the Chapter “Operation Conditions”.
- It is necessary to avoid overheating of the EA surface, exceeding of parameters stated on the nameplate and abnormal vibrations of the EA.

Manual control:

- If the manual control is needed (adjustment, function checking, failures etc.) the staff can reset the regulated member using the handwheel. While rotating the handwheel clockwise the output element moves in the direction “CLOSING”.
- During the manual control it is needed to press the detent button – see Fig. 11. After the manual control the detent button is to be released.

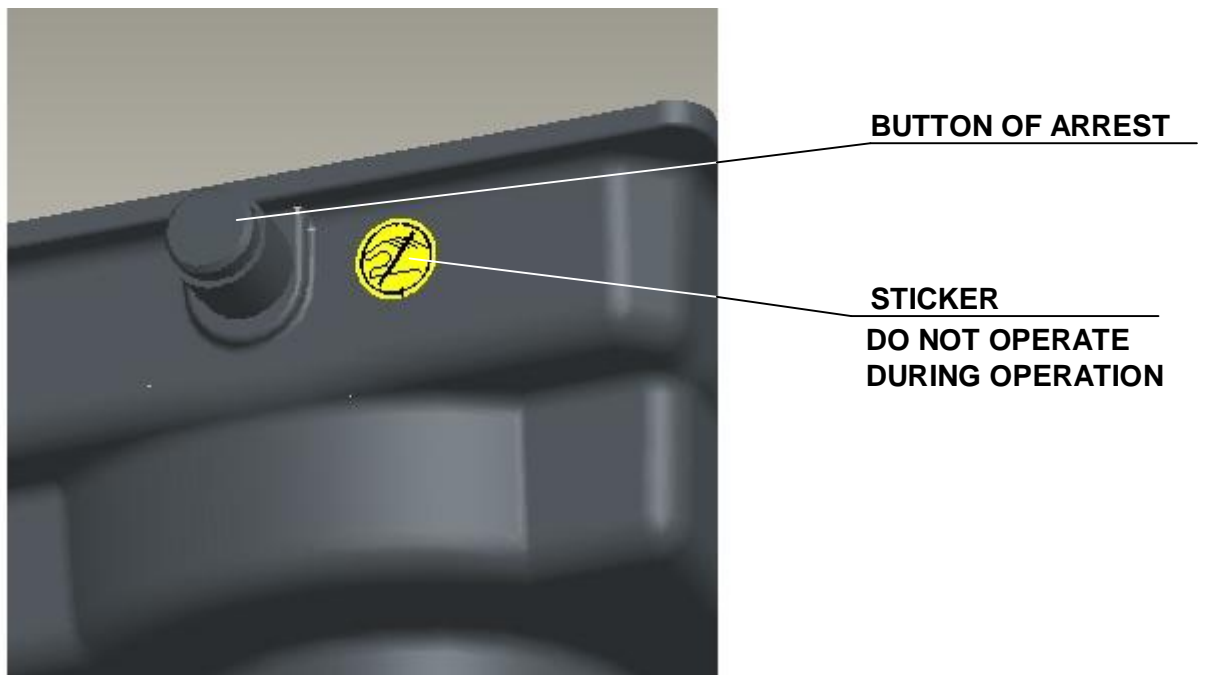


Fig.11



When the EA is driven by the electric motor it is forbidden to press the detent button. Pressing of the button can result in damaging of the EA.

Electric local control: - additional equipment

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

From terminal 83 of terminal board parent control system must be power-supplied. In opposite case it is not guaranteed disconnection of remote control after switching the mode switch to the mode "LOCAL". (applicable for Wiring diagram Z413 only)

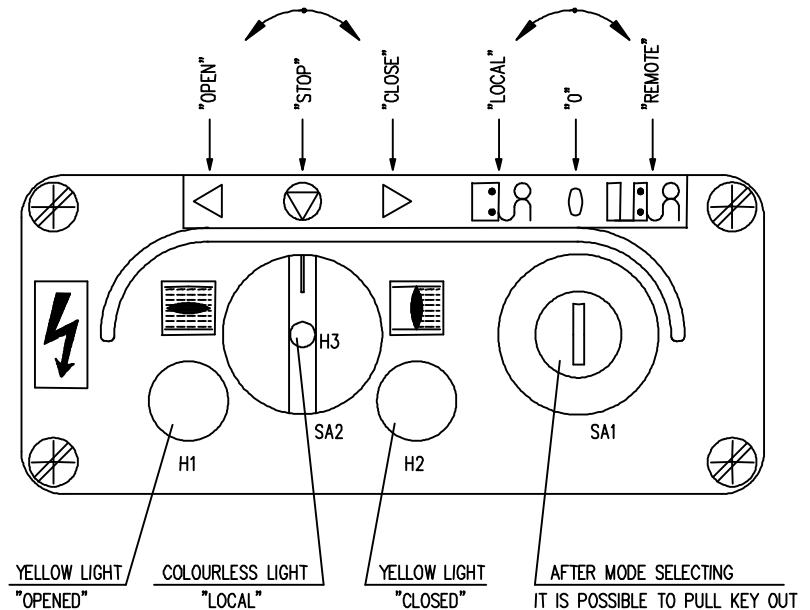


Fig. 12

5.2 Maintenance – Its Scope and Periodicity

During inspections and maintenance it is needed to tighten all screws and nut that influence tightness and protection enclosure.

Maintenance consists also in lubrication. Exchanging or filling the lubricator during first years of operation is not required. The exchange or filling the lubricator up is needed during inspections. The interval between two preventive inspections is four years.

Lubricators – grease HF 401/0 (GLEIT- μ) or GLEITMO 585 K.



The valve's stem should be lubricated independently on the EA maintenance

- Each 6 months it is advised to perform an inspection movement in the frame of the set operation stroke to check reliability of functioning, and to put it back to the origin position.
- If in the inspection regulations not stated else perform the inspection of the EA once a year and check and tighten all connecting and earthing screws to reduce heating.
- After 6 months of operation and then once a year it is advised to check the fixing screws between the EA and the valve whether they are tighten enough (tighten them in cross way).



- While connecting and disconnecting of the EA check the sealing rings of the cable leads – 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.

5.3 Troubleshooting

- In case of a mains failure the EA stands in the position where it was before the failure occurred. If needed the EA can be reset using the manual control (with the handwheel). When necessary EA can be manually operated (hand wheel), at doing this, pay attention to keep the movement of the EA output part within the range of the set stroke so as to avoid losing the adjustment of the limit position switches or position transmitter or regulator. After supply voltage recovery EA is prepared for operation.
- In case of a failure of a part of the EA the part can be replaced by a new one. The exchange is to be committed by the producer or a contracted service firm.
- In case of an EA failure, which cannot be eliminated directly in operation, follow instructions for under-guaranty and after-guaranty service.

For controller repair a F1,6 A subminiature fuse for PCB should be used, alternatively also F 2A, 250 V e.g. Siba type 164 050.1,6 or MSF 250, and for DB voltage source repair a M160 mA, 250V fuse, e.g. Siba, or MSF 250.

Failure	Cause	Troubleshoot
There are no revolutions of motor rotor when operating the push-buttons.	1. No voltage on the electric motor connectors.	Check connection and voltage presence.
	2. No voltage on the control part.	Check connection of the control part.
The EA fails to stop at the limit positions.	1. Incorrect setting-up of the switches.	Perform adjustment.
	2. The microswitch is defective	Replace the microswitch for a new one and adjust.
The EA stops at the mid-position.	There is an obstacle in the valve or part of it seizes.	Perform reversing of the EA, move it to the original direction and, in the case that the failure repeats, repair the armature.
There is no indication of reaching these positions in the final positions.	1. The LEDs fail to operate.	Replace the LEDs for new ones.
	2. Incorrect adjustment of the position signal switches.	Adjust the position signal switches.
		In case that some EA failures still remain, contact the service centres.

Note: If the EA has to be dismantled follow the procedure of the Chapter "Dismantling"



The EA can be dismantled to be repair purpose by qualified and trainer persons only! The training can be preformed by the producer or by a contracted service firm.

6. Accessories and Spare Parts

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

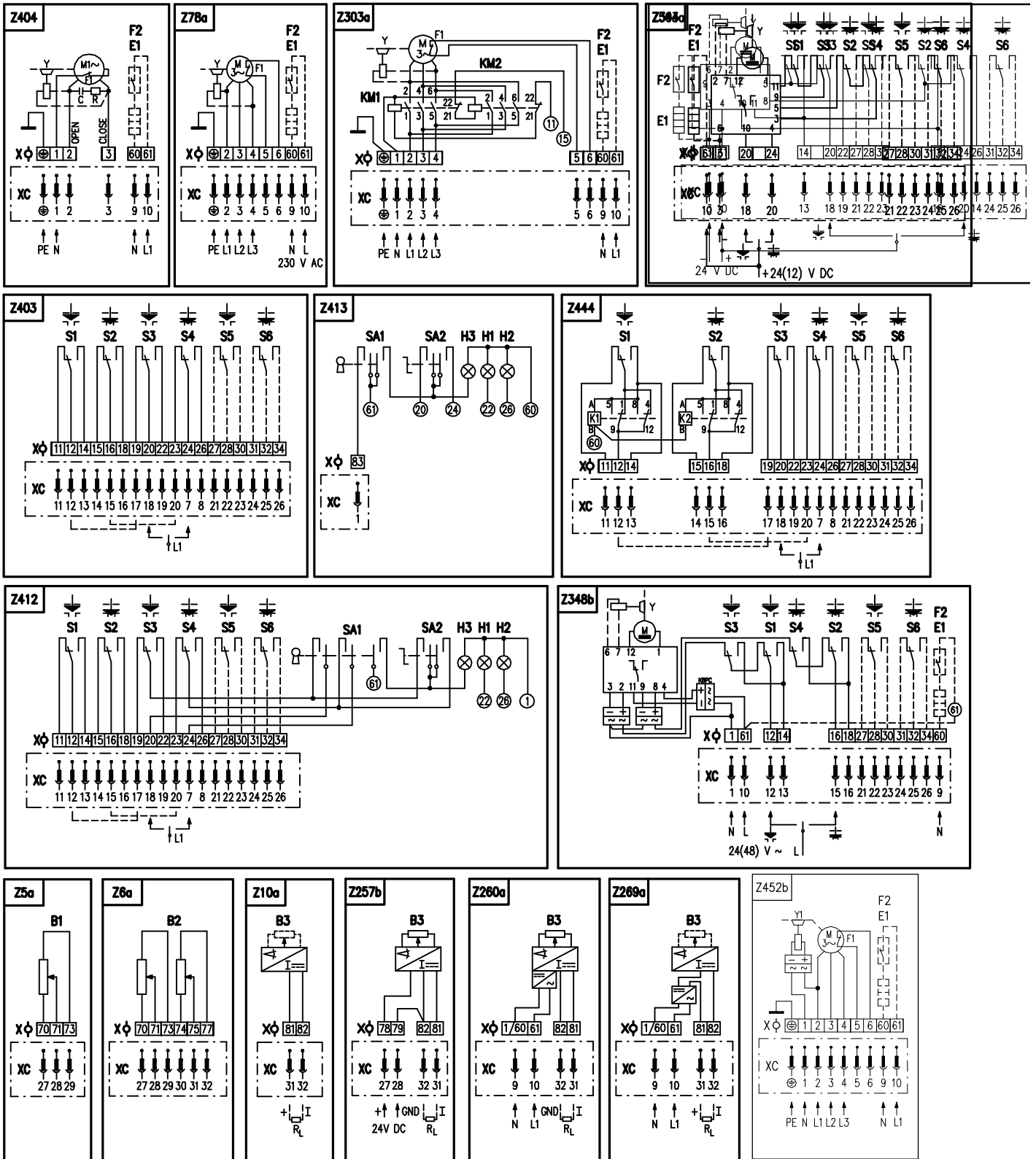
6.1 List of the Spare Parts

Table 3: Spare Parts

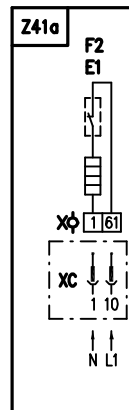
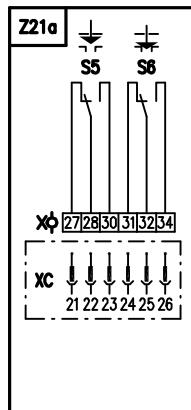
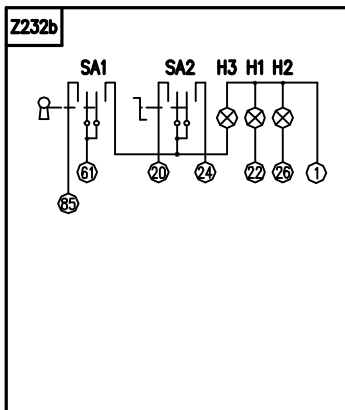
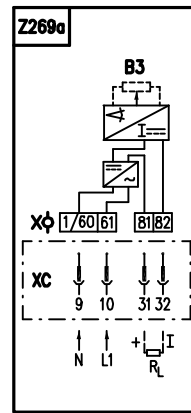
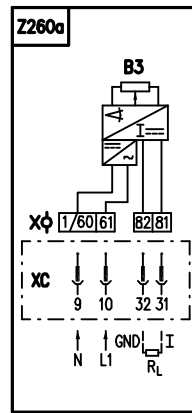
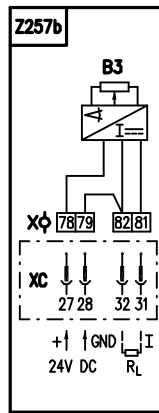
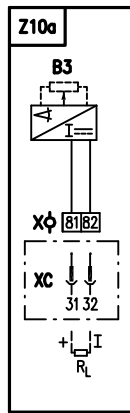
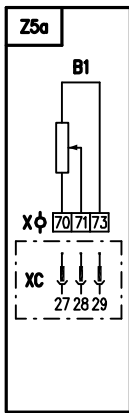
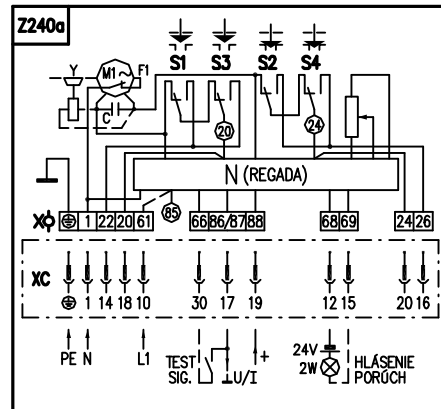
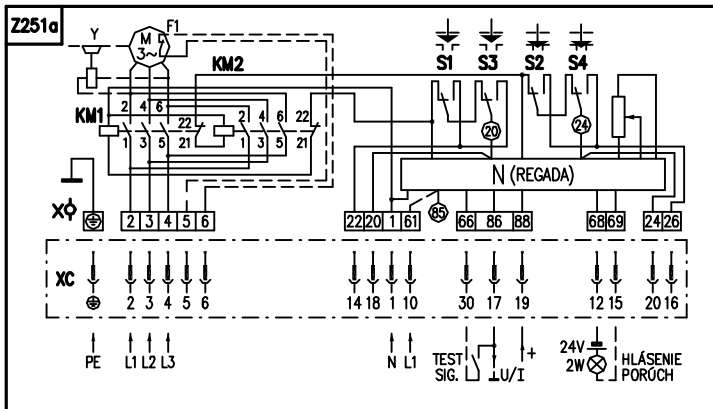
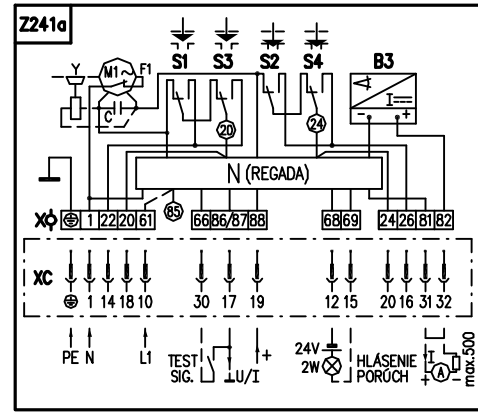
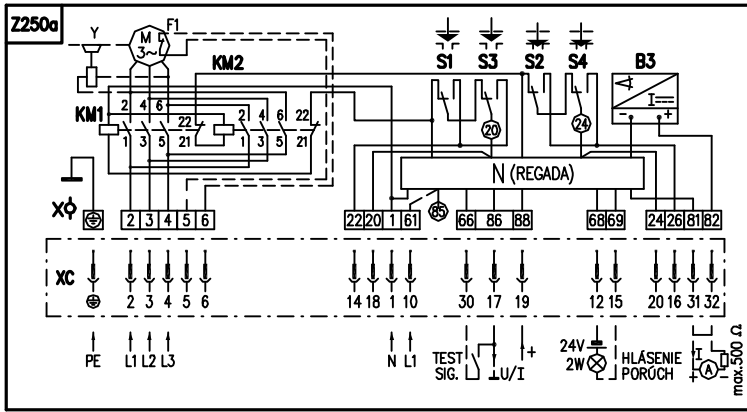
Spare part	Order Nr.	Position	Figure
Electric motor; 60 W/120 VA; 230V AC;	63 592 322	2	1
Electric motor; 90 W/150 VA; 3x400V AC;	63 592 328	2	1
Electric motor; 180 W/360 VA 230 V AC	63 592 394	2	1
Electric motor; 180 W/300 VA 3x400 V AC	63 592 117	2	1
Switch CHERRY D38 with the jingle bell	64 051 738	-	-
Switch CHERRY D41 with the jingle bell	64 051 470		
Capacitive Transmitter CPT1/A	64 051 499	-	-
Resistant wire transmitter (potentiometer) RP19; 1x100	64 051 812	-	-
Resistant wire transmitter (potentiometer) RP19; 1x2000	64 051 827	-	-
Resistant wire transmitter (potentiometer) RP19; 2x100	64 051 814	-	-
Resistant wire transmitter (potentiometer); 2x2000	64 051 825	-	-

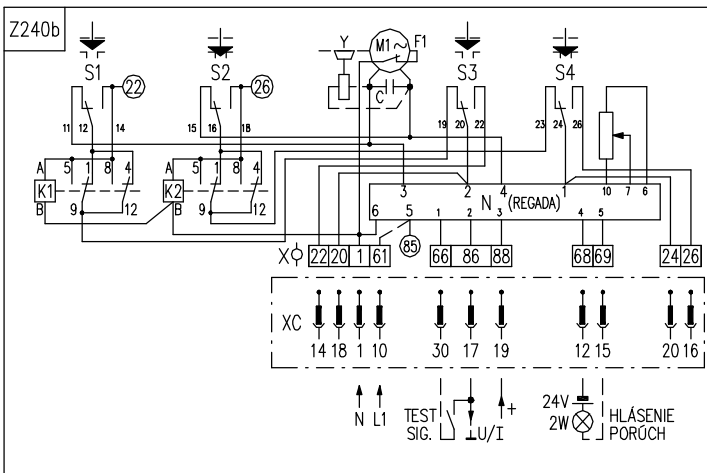
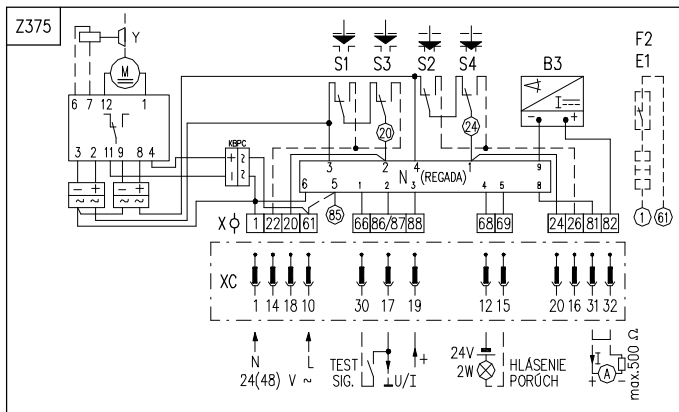
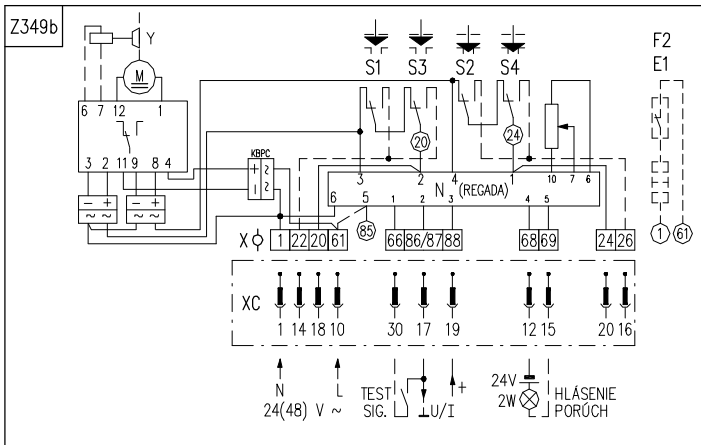
7. Enclosures

7.1 Wiring diagrams SO 2



7.2 Wiring diagrams SOR 2





Legend:

- Z5awiring diagram of single resistant transmitter
- Z6awiring diagram of double resistant transmitter
- Z10awiring diagram of resistive with current converter or capacitive transmitter - 2-wire without supply
- Z21awiring diagram of additional position switches connection for EA SOR 2
- Z41awiring diagram of space heater and space heater's thermal switch connection for EA SOR 2
- Z78a..... connection of EA SO 2 with 3~ phase electric motor without reverse contactor
- Z232bwiring diagram of electric local for EA SOR 2
- Z240awiring diagram of EA SOR 2 with controller with resistant feedback for 1-phase electric motor
- Z240b..... wiring diagram of EA SOR 2 with 1-phase electric motor, with controller, with resistant feedback and with relays for blocking of torque switches
- Z241awiring diagram of EA SOR 2 with controller with current feedback for 1-phase electric motor
- Z250awiring diagram of EA SOR 2 with controller with current feedback for 3-phase electric motor
- Z251awiring diagram of EA SOR 2 with controller with resistant feedback for 3-phase electric motor
- Z257bconnection of resistive transmitter with current converter – 3-wire without power supply
- Z260aconnection of resistive transmitter with current converter – 3-wire with power supply
- Z269aconnection of resistive transmitter with current converter or capacitive transmitter – 2-wire with power supply
- Z303a.....connection of EA SO 2 with 3~ phase electric motor with reverse contactor
- Z503aconnection of EA with electric motor 24 V DC

- Z348bconnection of EA with electric motor 24 V AC
 - Z349bwiring diagram of EA SOR 2 with controller with resistant feedback for electric motor 24 V AC
 - Z375wiring diagram of EA SOR 2 with controller with current feedback electric motor 24 V AC
 - Z376awiring diagram of EA SOR 2 with controller with resistant feedback for electric motor 24 V DC
 - Z377awiring diagram of EA SOR 2 with controller with current feedback electric motor 24 V DC
 - Z403connection of torque and position switches
 - Z404..... connection of the EA SO 2 with 1~ phase electric motor
 - Z412.....connection of torque and position switches with electric local control
 - Z413..... connection of the EA SO 2 with 3~ phase electric motor without reverse contactors with electric local control
 - Z444wiring diagram of torque and position switches with relays for blocking of torque switches
 - Z452b..... wiring diagram of EA SOR 2 with 3-phase electric motor and with reverse contactors
-
- B1resistive transmitter (potentiometer) single
 - R_L voltage-dropping resistor (for 230V only)
 - B2resistive transmitter (potentiometer) double
 - SA1 rotary switch with key
 - B3capacitive transmitter
 - SA2 rotary switch "remote-0-electric local" control
 - C capacitor
 - SA3 rotary switch "open-stop-closing"
 - E1 space heater
 - S1 torque switch "open"
 - F1 electric motor thermal protection
 - S2 torque switch "closed"
 - F2 space heater thermal switch
 - S3 position switch "open"
 - H1 indication of "open" limit position
 - S4 position switch "closed"
 - H2 indication of "closed" limit position
 - S5 additional position switch "open"
 - H3 indication of "electric local control"
 - S6 additional position switch "closed"
 - I/U input (output) current (voltage) signals
 - X terminal board
 - M electric motor
 - XC connector
 - N position controller
 - Y brake of electric motor
 - R resistor (for the version of 230 V AC)

Note 1 In case, that output signal from the capacitive transmitter (wiring diagram Z241a, Z 250a) is not used (incomplete circuit between terminal 81 and 82), it is required to connect clamps 81 and 82 by jumper (jumper is connected at manufacturing plant for connecting to terminal board only). By using output current signal from capacitive transmitter it is needed to remove jumper.

Note 2 Thermal protection of single-phase electric motors is standarty build-in in electric motor on the neutral cable. In case of EA version with thermal protection, it is leaded to the terminals 5 and 6.

Note 3: In case of version EA SO 2 equipped with the double resistance transmitter, terminal connectors 30 and 34 of the additional position switches have not been taken out.

Note 4: In the version equipped with the controller device while using the feedback from transducer CPT; when using the output signal there has been no galvanic isolation of the signal from the input one!

Note 5: Moment switching has not been equipped with the mechanical blocking mechanism, (except the wiring diagram Z444) therefore when releasing overload of the EA, the supply voltage connected to the electric motor needs to be disconnected.

Note 6: Wiring diagram Z444 shows the torque blocking relay connected into the torque switches circuit. The blocking relay disconnects voltage supplied to the motor upon the disconnecting torque is reached. Once the disconnecting torque is reached, the EA will switch-off in the given direction and is only possible to reverse it. To assure proper the blocking relay function, connect the zero conductor (N) to terminal connector 60.

Note 7: In case that galvanically separated output signal is needed it is necessary to use galvanical separation element (is not part of delivery), e.g. NMLSG.U07/B (producer SAMO Automation s.r.o.). After discussion this module could be supplied by EA producer.

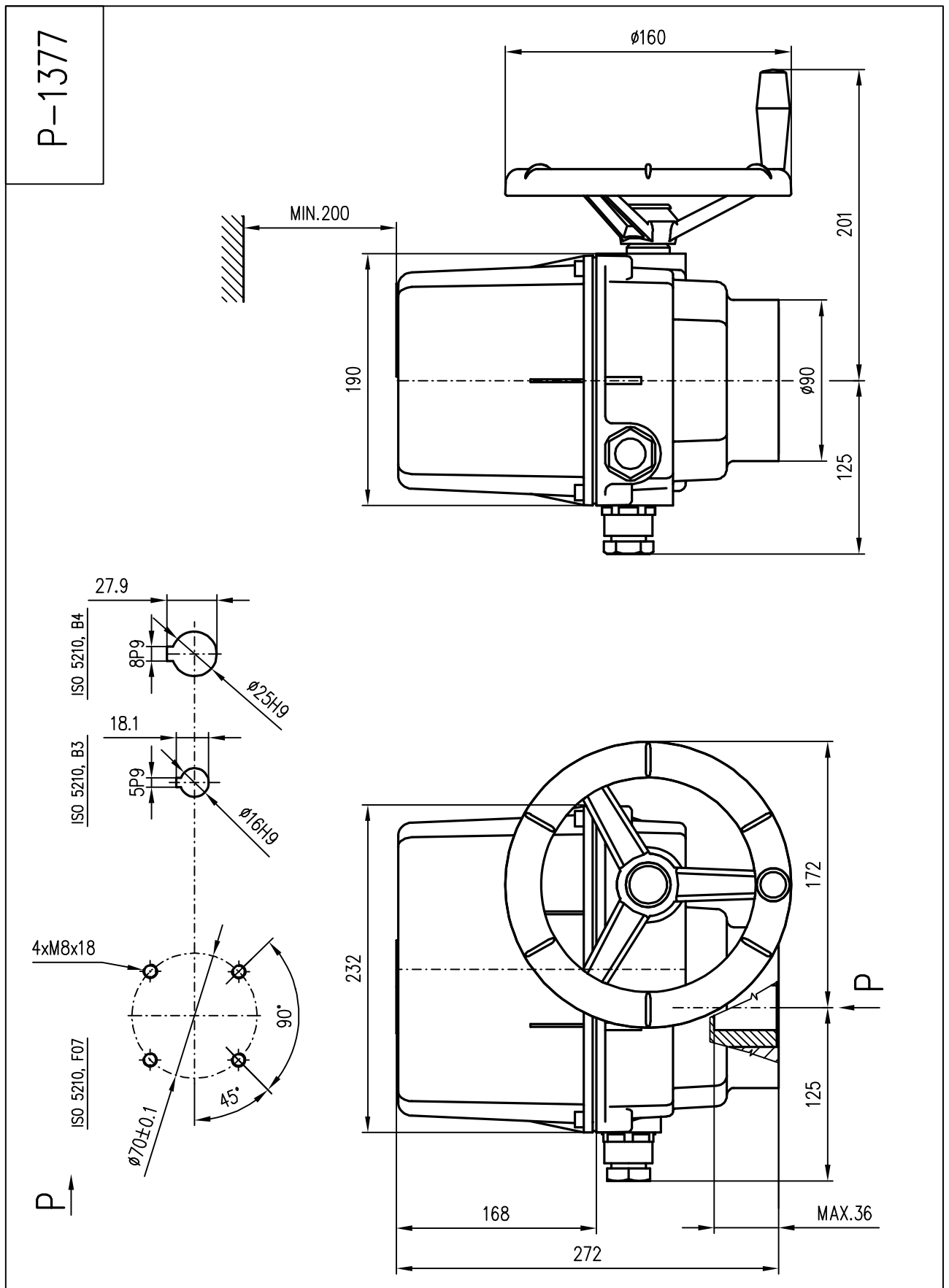
SWITCH OPERATION CHART

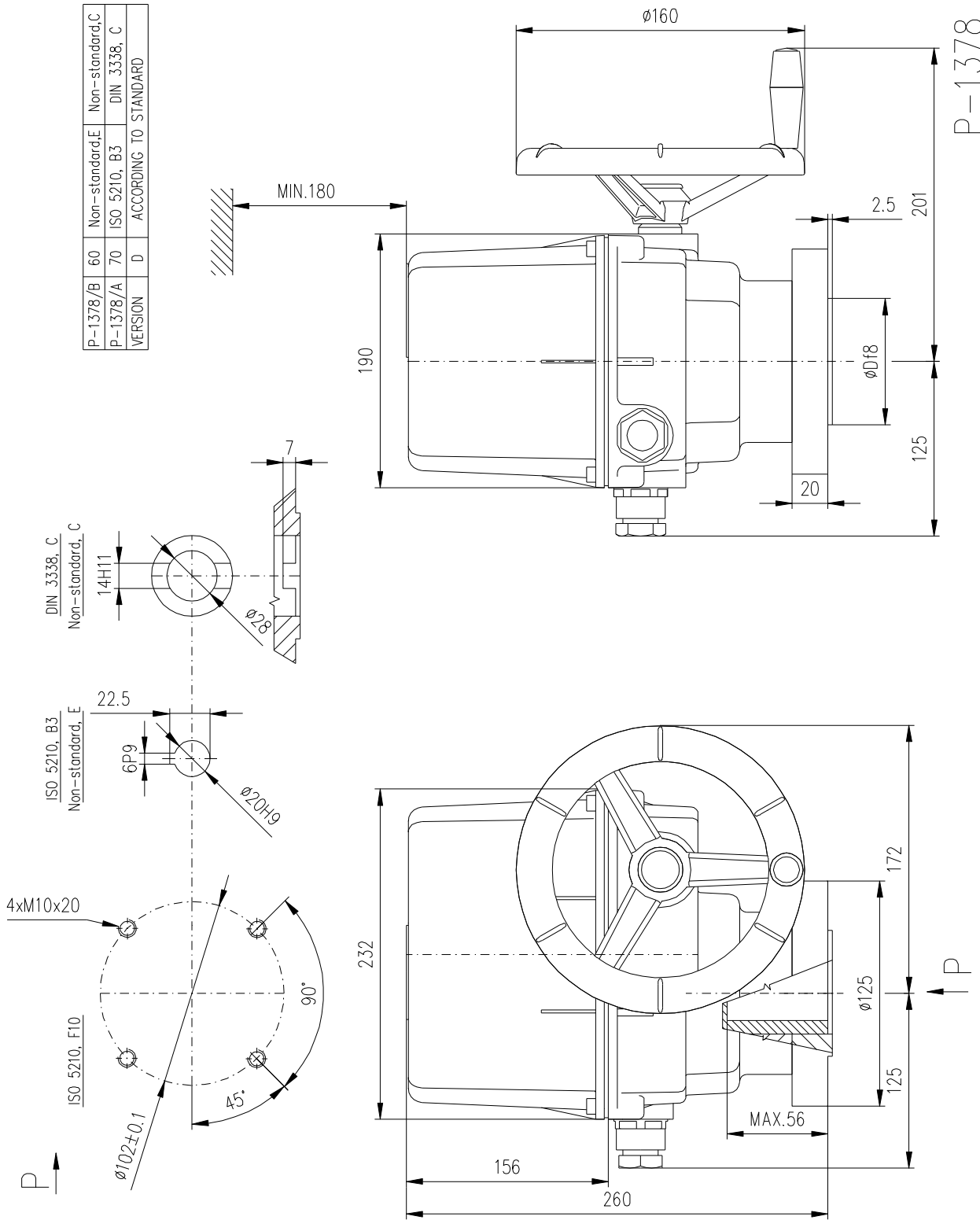
	terminals	open	close
S1	11 (M2) - 12		
	12 - 14		
S2	15 (M3) - 16		
	16 - 18		
S3	19 - 20		
	20 - 22		
S4	23 - 24		
	24 - 26		
S5	27 - 28		
	28 - 30		
S6	31 - 32		
	32 - 34		

Contact closed.

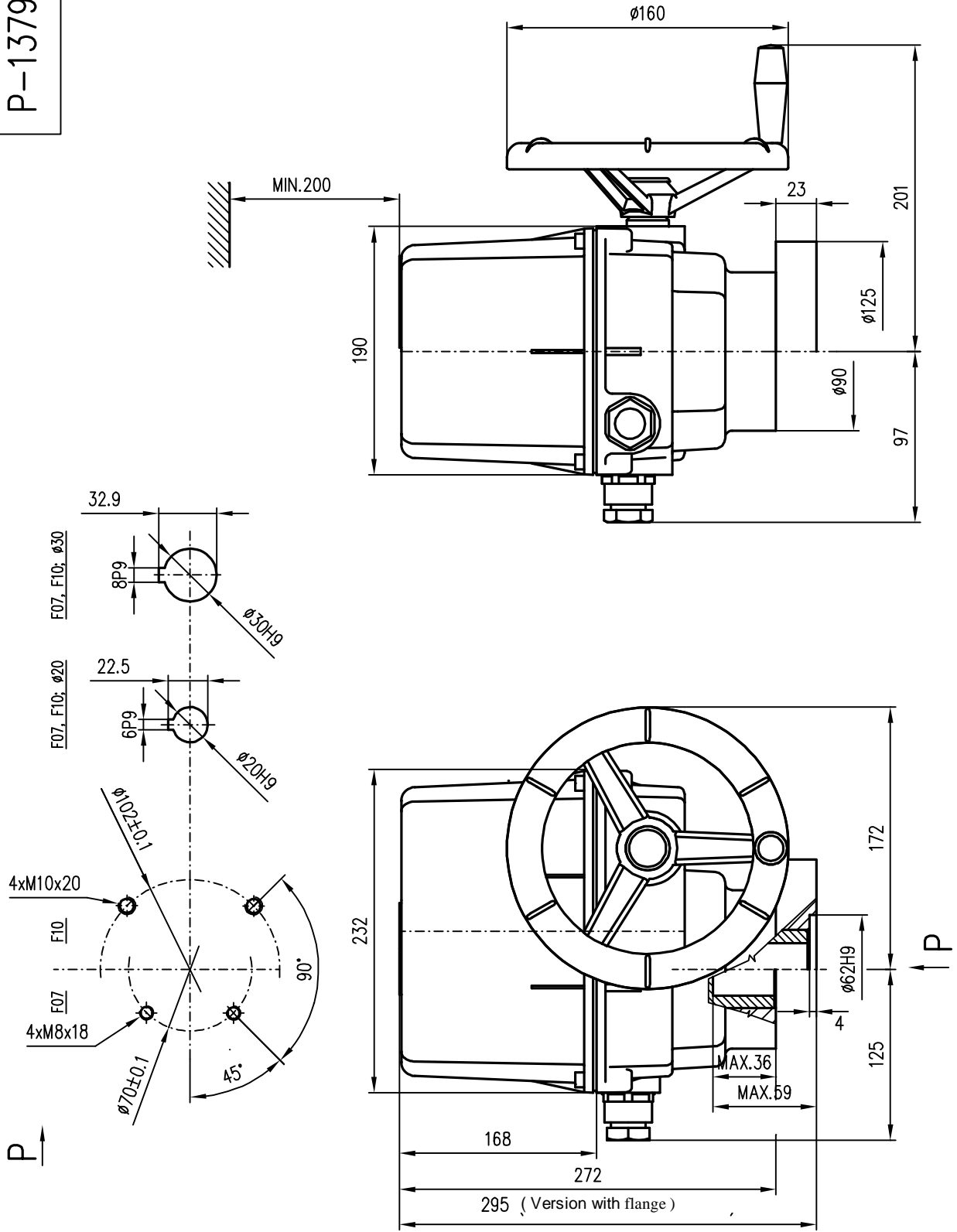
operating stroke

7.3 Dimensional drawings

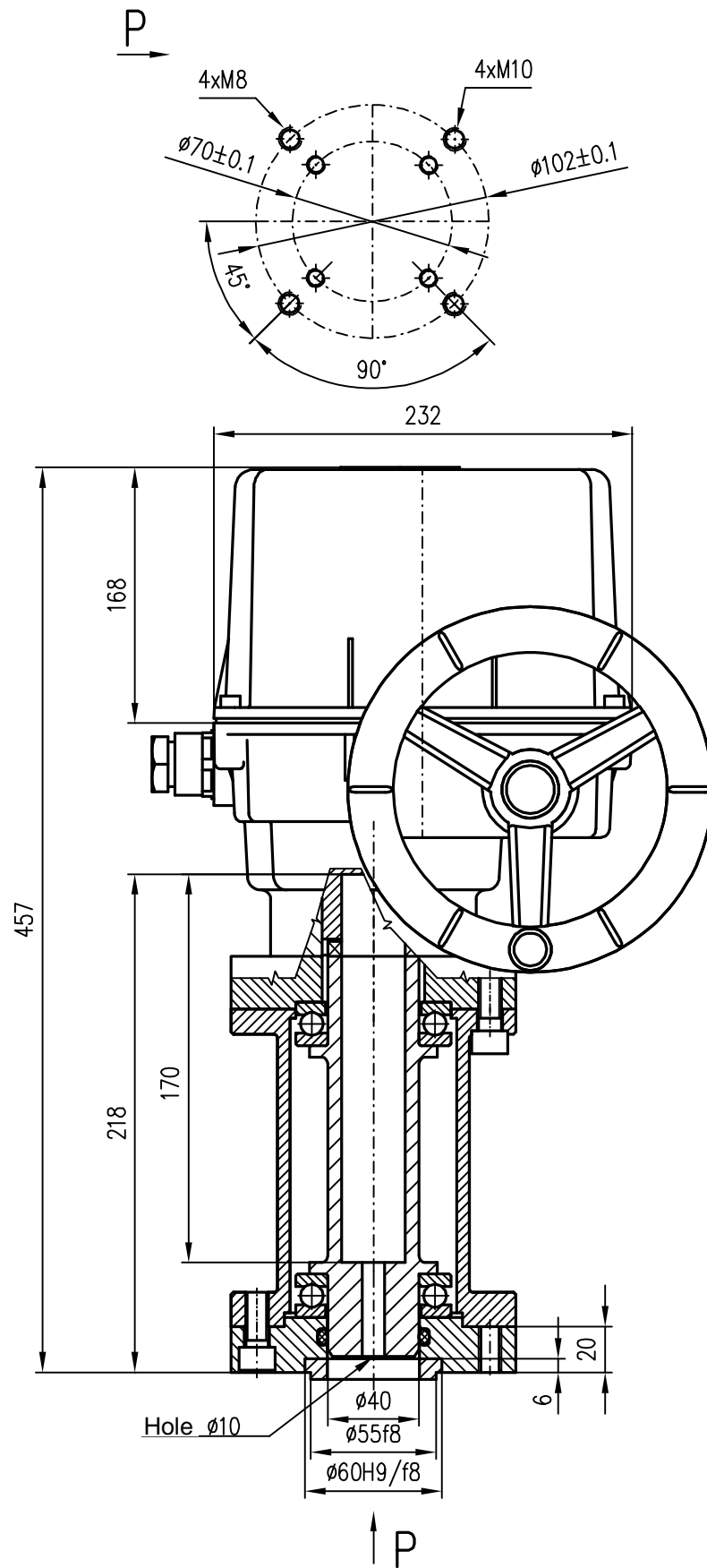




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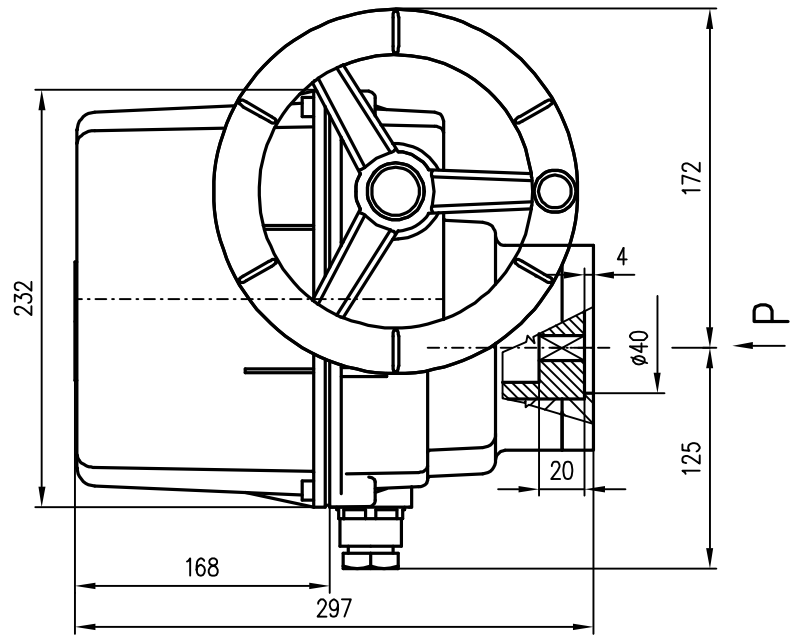
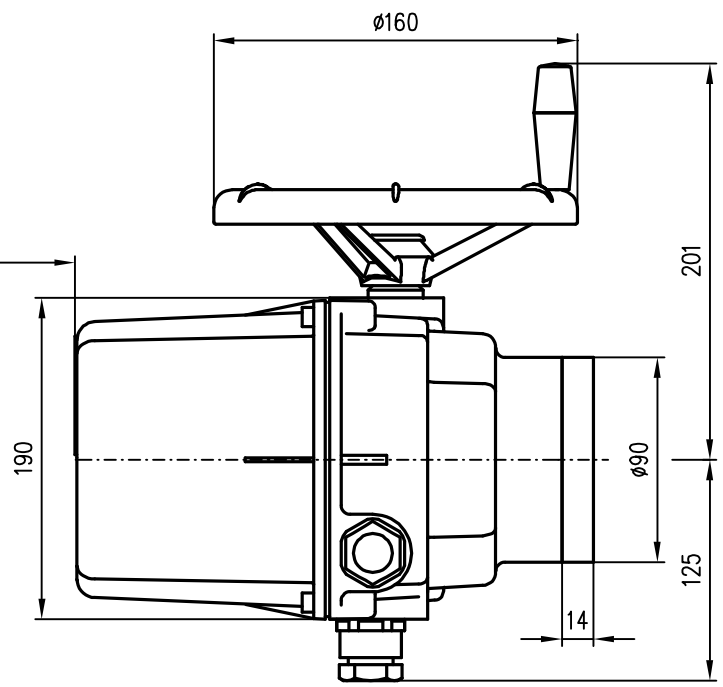
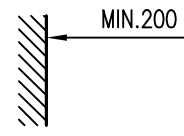
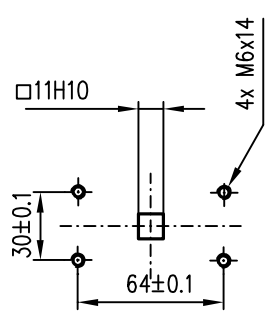


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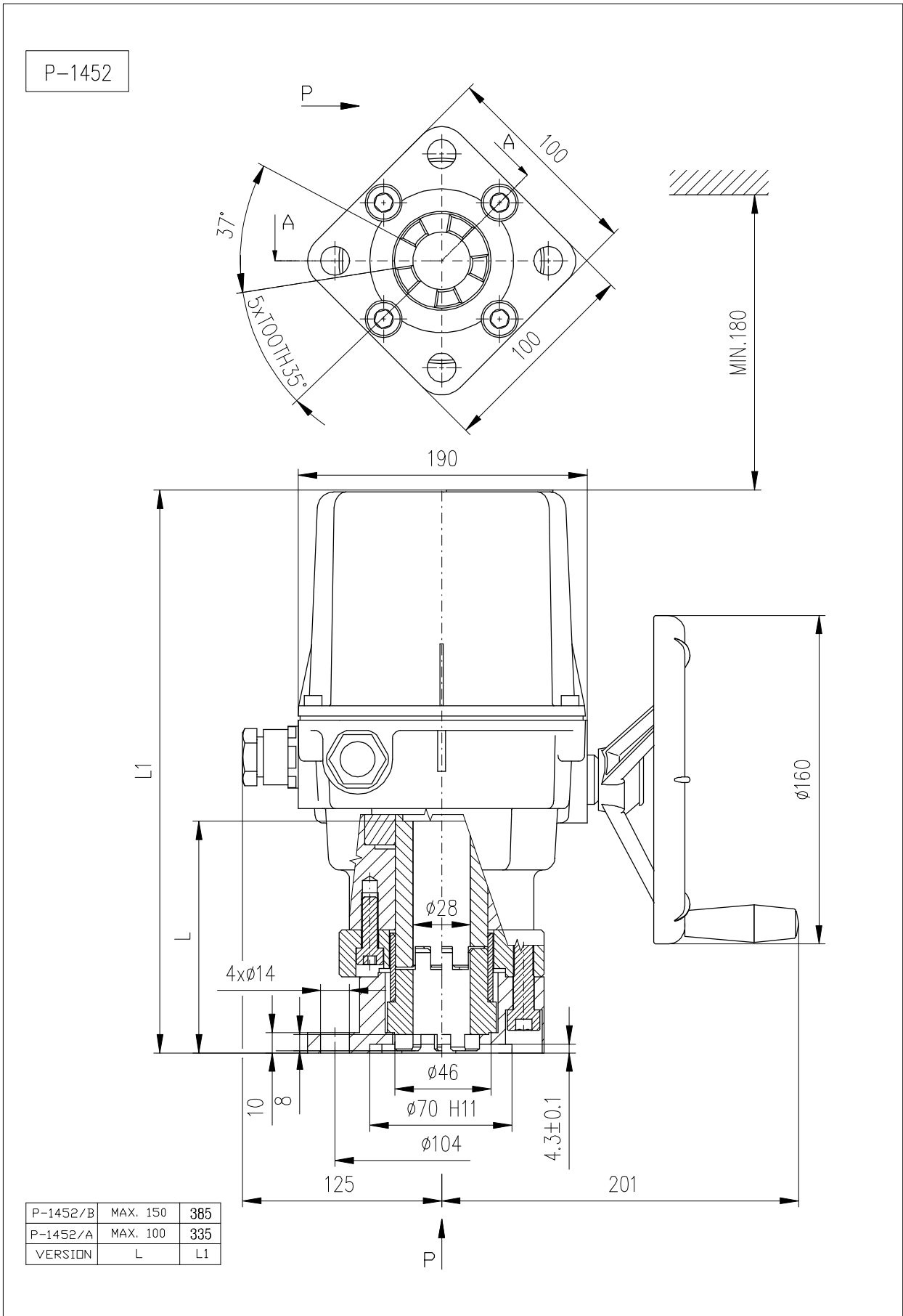
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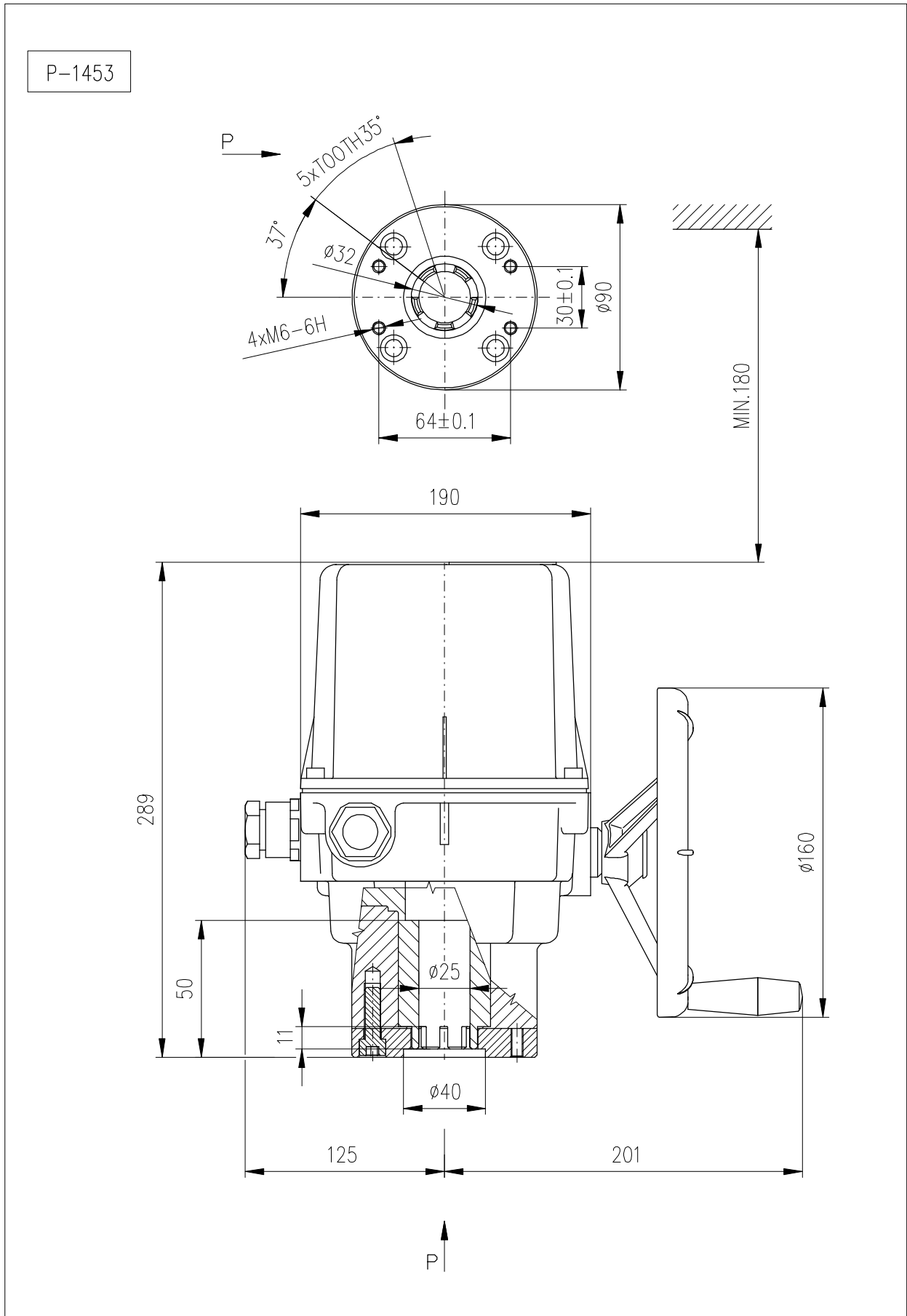


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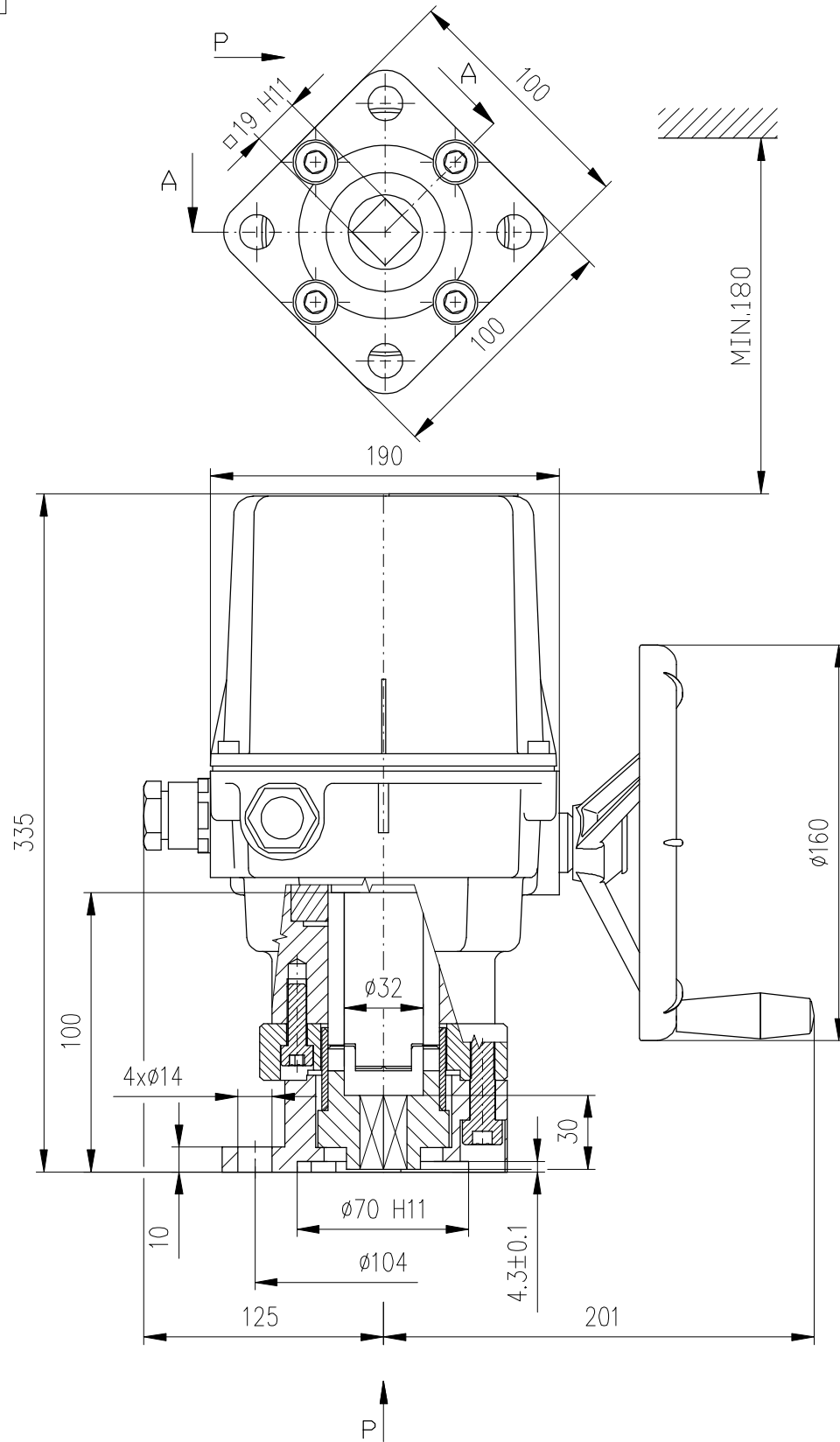
Dimensional drawing SO 2



Dimensional drawing SO 2



P-1454



7.4 Guarantee service check report

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

7.5 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:

7.6 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
Kopaninská 109
252 25 Ořech
PRAHA – západ
Tel.: +420 257 961 302
Fax: +420 257 961 301