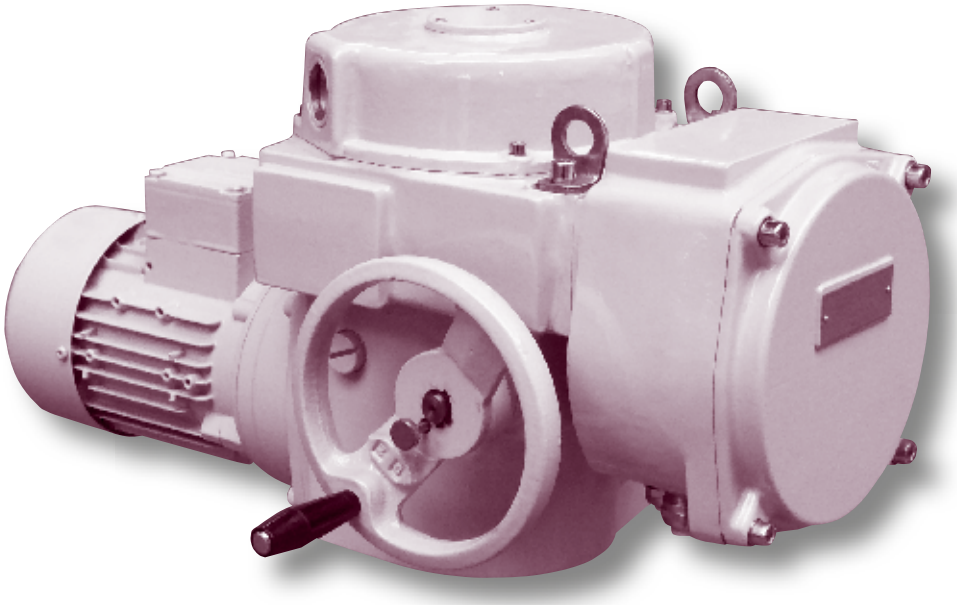
ZPA PEČKY, a.s.

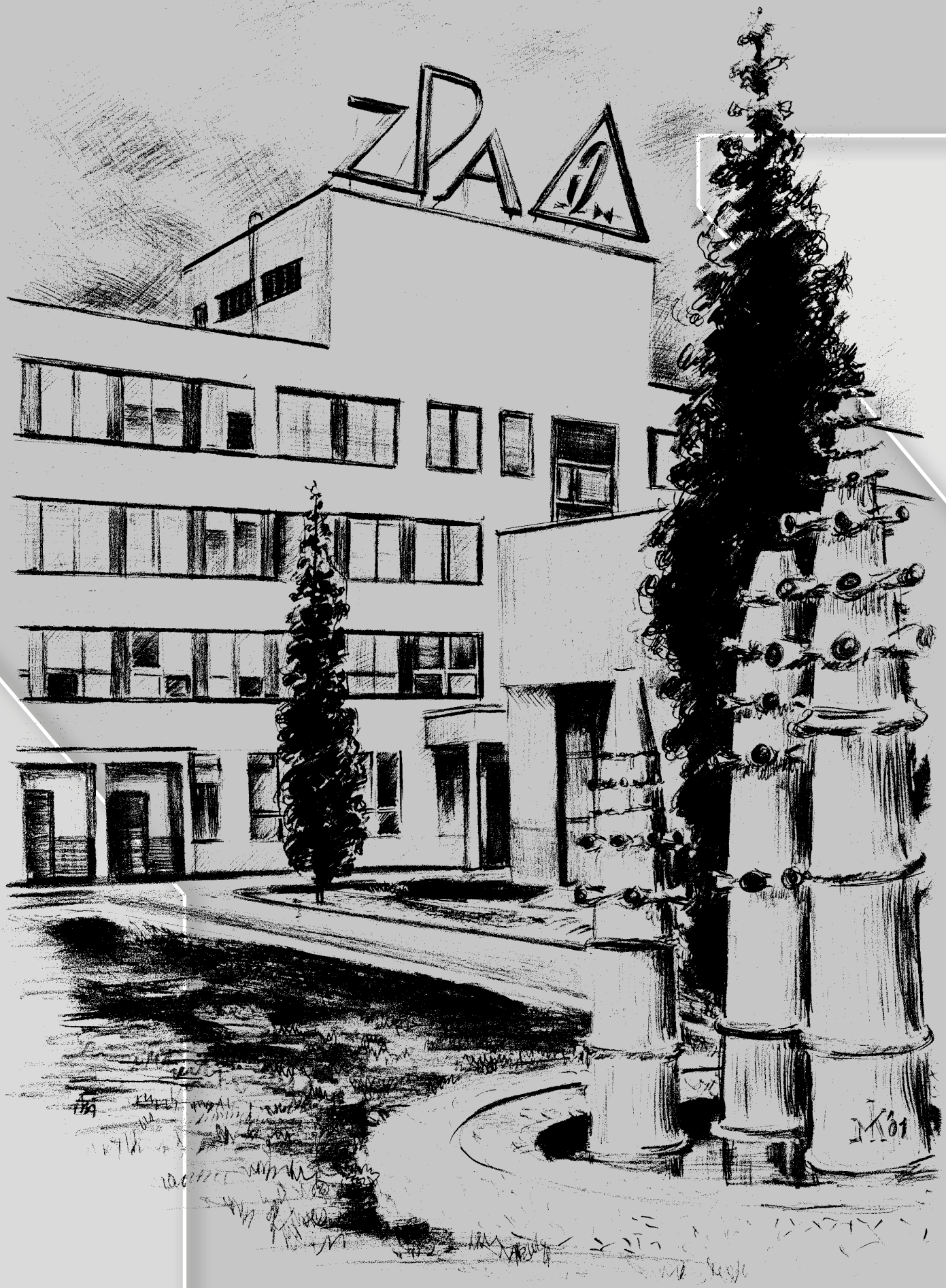


INSTALLATION INSTRUCTIONS

Electric multi-turn rotary actuators for nuclear power stations outside active zones

MODACT MOA

Type numbers 52 020 - 52 026



ZPA Pečky, a.s. is certified company in accordance with ISO 9001 as amended.

CONTENS

1. USE

The **MODACT MOA** rotary electrical actuators of the multi-revolution type are designed for remote control of the special valves and gateways in the attended areas of the nuclear power plants with the VVER or RBMK reactors.

2. WORK ENVIRONMENT

The actuators must operate reliably in the environment characterized as follows:

Working temperature	-20 °C to +55 °C
Atmospheric pressure	85 to 100.8 kPa
Relative air humidity	up to 75 % at +55 °C

3. TECHNICAL PARAMETERS

Main technical characteristics are listed in the table.

Electric motor supply voltage	3 x 400 V / 50 Hz
	or 3 x 380 V / 50 Hz
Degree of protection	IP 55

For the resistance against seismic shocks, against the action of deactivating agents, and other parameters see the Technical Conditions No. TP 422-99-008/87a.

4. WORK POSITION

The operating position of **MODACT® MOA** actuators is discretional with application of grease.

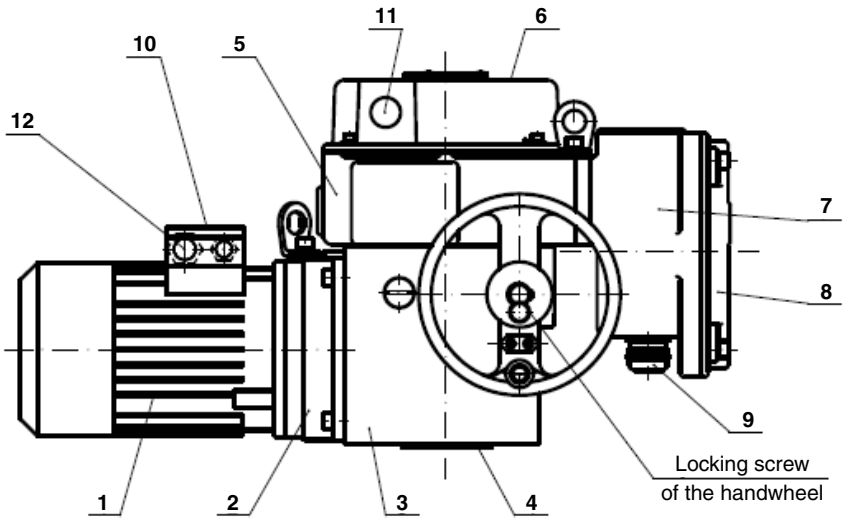
Actuators with grease are identified with label stating “Filled with grease”, located on the power box on the hand wheel side.

Actuators with oil filling, position is limited only by the electric motor axis inclination – max. 15° below horizontal line. This prevents possible clippings and impurities in oil bath from reducing the service life of electric motor shaft seal.

In case of installation with electric motor above horizontal level, oil bath must be supplemented so as to secure motor pinion’s lubrication.

Actuators with oil bath are not identified by any label.

Noise: Sound pressure level A max. 85 dB *(A)*
Sound power level A max. 95 dB *(A)*



Explanatory notes:

1 – Three-phase asynchronous electric motor
2 – Counter gear set box
3 – Power gear
4 – Hand control wheel
5 – Control box
6 – Control box cover
7 – Terminal box
8 – Terminal box cover
9 – Cable bushings
10 – Electric motor terminal board
11 – Position indicator
12 – Cable bushing

Fig. 1 – ***Actuator assembly***

5. DESCRIPTION

The **MODACT MOA** aactuators are designed to be mounted directly on a valve with the attachment via a flange per ISO 5210 and a C/E-shaped coupling in accordance with DIN 3210. Arrangement of a part of the actuator is shown in Figure 1. Using a counter-gear 2 the three-phase asynchronous motor 1 drives the central wheel of the differential gear installed in the actuator support box *(power gear)* 3. During the motorized operation the planet differential crown gear is held in its invariable position by a self-locking worm gearing. Hand wheel 4, attached to the worm, makes it possible to operate the actuator manually while the motor is running. The hollow output shaft is fixed to the planet gear driver. The output shaft reaches to the control box 5 where all the actuator controls are gathered – positional, signalling, and torque switches, resistance or current transmitter, and heating resistor. Operation of position and signalling switches is derived, through mechanisms, from the output shaft rotation.

The operation of torque switches is derived from the axial displacement of the *"floating worm"* of manual control, which is sensed and transferred to the control box by a handle. Control elements are accessible upon removal of cover 6 of this box. The terminal board box 7 is also hidden under the lid 8. The cable inlets are secured using the cable bushings *(9).* Electric motor is fitted with a separate terminal board 10 and a cable bushing. Output shaft position can be identified on position indicator 11.

The actuator's various operational functions such as tripping by torque, tripping by position, signalling, remote position reporting *(resistance or current transmitter)* are provided by mechanical groups *(units).* These are located on the control board *(Figure 2),* fitted inside the control box.

Control units are differentiated by function as follows:

a)	torque tripping unit	12
b)	signalling unit	13
c)	transmitter setting mechanism	14
d)	resistance transmitter with mechanical position indicator	15
e)	position unit	16
f)	heating element	17

The above units are universal, applicable to the **MODACT MOA** actuators of all sizes.

Important notice

Micro switches applied in the various units do not allow two voltages with varying values or phases to be connected to the contacts of one micro switch. These micro switches can only be used as switches, interrupters or selectors for one circuit.

Description and function of control units

a) The torque tripping unit *(Figure 3)* as an independent assembly unit, it consists of base plate 19, which carried micro switches 20 and at the same time creates bearings for torque control shaft 22 and locking shaft 29.

Torque control shaft transfers motion of the floating worm from power gear, using segments 23 or 24 and handles 45 or 46, to micro switches MZ or MO. Tripping torque value is adjusted by rotating the segments against the tripping handles. For possible tripping torque set-up outside the manufacturing plant, segments 23 are provided with a scale providing individually for each actuator indications of points for setting up the maximum and minimum torque. The torque setting is

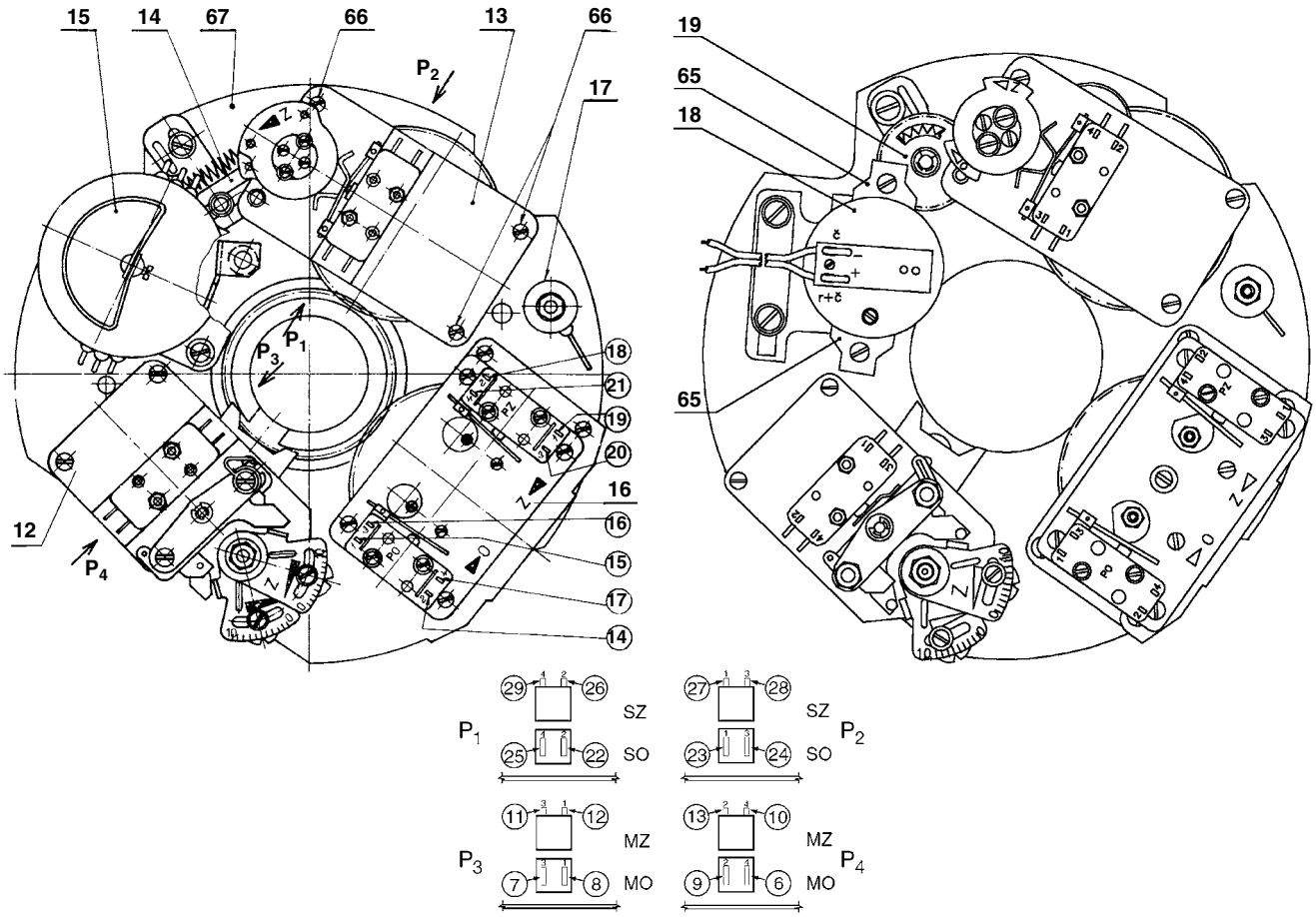


Fig. 2 – ***Control board***

then directly indicated by the notches in the segments. Increments on the scale only serve to provide a more accurate division between the maximum and minimum torque levels, and thus to enable a more precise set-up of the tripping torque outside the manufacturing plant if no loading bench is available. Segment 23 is intended for "closing" direction, segment 24 for *"opening"* direction.

Explanatory notes:

5 – Resistance position transmitter Vishay
11 – Local position indicator
12 – Torque tripping unit
13 – Signalling unit
14 – Transmitter setting mechanism
15 – Resistance transmitter with mechanical position indicator

16 – Position unit
17 – Heating resistor
18 – Current transmitter CPT 1AAE
19 – Driving gear
65 – Contact plates
66 – Fixing bolts
67 – Basic control board

The encircled numbers follow the terminal numbering on the terminal board.

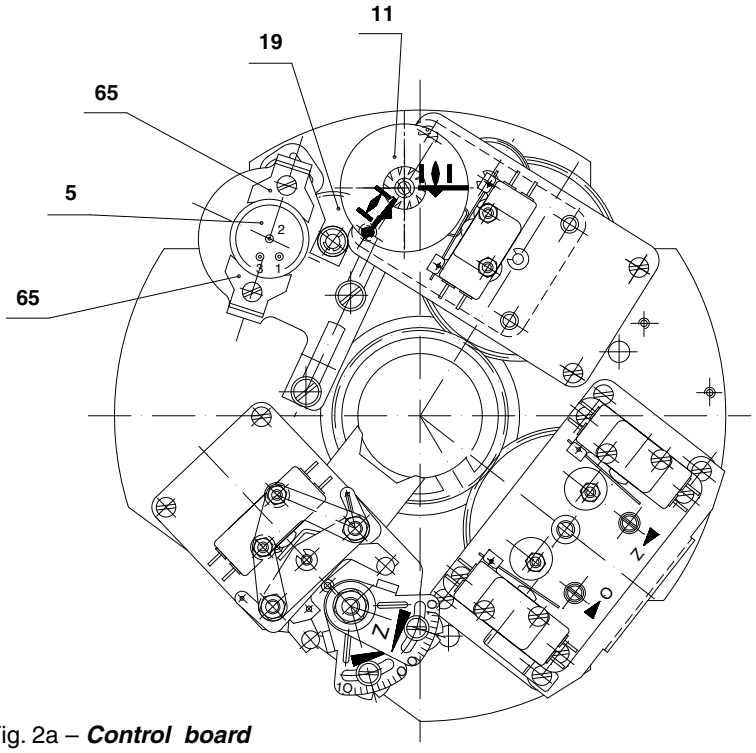


Fig. 2a – ***Control board***

The torque control unit is also fitted with a locking mechanism. The locking mechanism locks the torque switch once tripped and thus prevents it from re-triggering and thus also the actuator from pulsing. The locking mechanism also prevents the torque switch, after actuator rotation reversing, from tripping, and thus enables the electric motor's breakaway torque to be fully utilized. The locking mechanism operates in both directions of motion of the actuator's output shaft, both in limit positions and in the interim position, over 1 to 2 revolutions of the output shaft, after reversing of its motion.

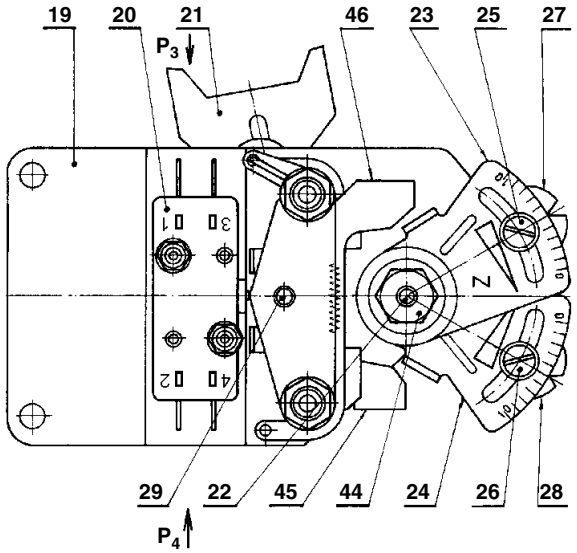
With a load in the form of a counter-moment attached to the actuator output shaft the torque-operated shaft 22 and thus also the segments 23 and 24 will move a bit round and hence the motion is transferred to the tripping lever 45 or 46. Should the torque on the actuator output shaft reach the value to which the torque tripping unit is set, the tripping lever will depress the push-button of the respective micro-switch, which disconnects the electric motor from the mains and the actuator stops.

Torque unit setting procedure

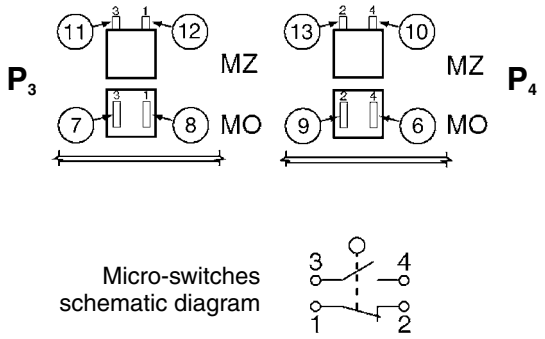
To set the tripping torque to another value, differing from the default value set at the manufacturing plant, proceed as follows: release locking nut 44 *(Figure 3),* and the relevant locking screw 25 *(for "closing" direction)* or 26 *(for opening direction).* Subsequently, put a screwdriver into the recess in the top segment 23 or 24 and rotate the segment until the recess in segment 27 or 28 points at the relevant point on the scale. This point is identified by dividing the difference between the maximum and minimum adjustable torque in Nm by the number of increments between the maximum and minimum torque signs. This approach shows us how many Nm of tripping torque falls on one increment on the scale. By interpolation, identify the point on the scale, to which the recess in segment 27 or 28 should point.

The coloured line on the scale that is closer to number 10 indicates the setting point of maximum tripping torque, the other line identifies the setting point of minimum torque. The torque control unit must never be set up in a way that the recess in the bottom segment lies outside the area between the two coloured lines on the scale.

Once the tripping torque has been set up, tighten locking screw 25 or 26 and locking nut 44.



Numbers in circles correspond to terminal numbers on the terminal board. Micro switches do not allow two voltages with varying values or phases to be connected to the contacts of one micro switch.



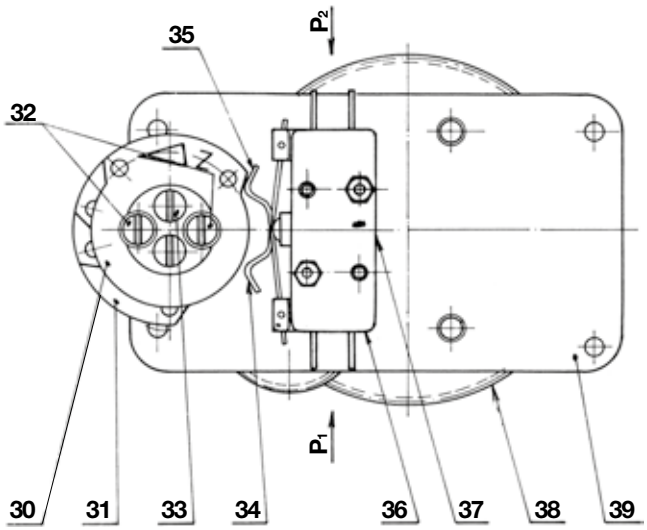
Explanatory notes:

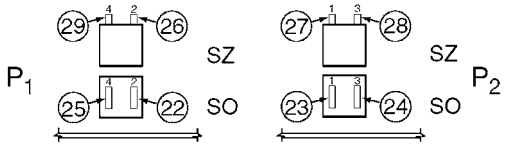
19 – Base plate
20 – Micro switches MZ, MO
21 – Adjuster
22 – Torque control shaft
23 – Top "closing" segment
24 – Top "opening" segment
25 – Locking "closing" screw
26 – Locking "opening" screw
27 – Bottom "closing" indicator
28 – Bottom "opening" indicator
29 – Locking shaft
44 – Locking nut
45 – Tripping "opening" handle
46 – Tripping "closing" handle

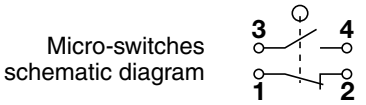
Fig. 3 – ***Torque unit***

b) The signalling unit *(Figure 4)* secures transmission of electric signal of the actuator input shaft's position. The unit is driven by gear 38 from the output shaft through a gearbox to cams 30, 31, controlling micro switches 36 *(SO)* and 37 *(37).* The switching moment of signal switches can be selected in any point of the actuator's working stroke, except the narrow area around end positions *(signal switch must switch before the position switch while the output shaft is still moving).*

Top cam 37 operates for the *"closing"* direction and bottom cam 36 pertains to *"opening"* direction. Signalling unitin Figure 4 is designed as a separate installation assembly. It is installed on bracket 39, below which gears are fitted, organized according to the kinematic diagram *(Figure 5).* The transmission is set up so that adjusting gear K3 can be moved to various levels *(I, II, III, IV, V)* once locking screw 47 is released. By adjusting wheel K3, the setting range of signalling switches and transmitter will change depending on the working stroke. Next to the Figure 5 there is a table with the ranges of settings for the individual positions of the adjusting wheel K3.



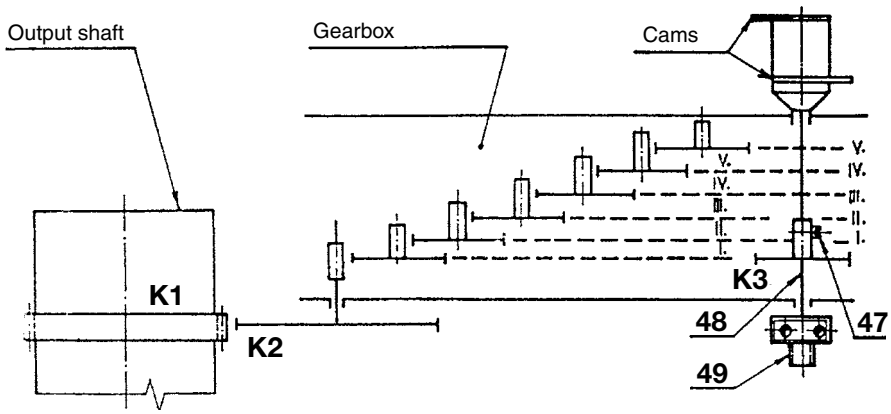




Numbers in circles correspond to terminal numbers on the terminal board.
Micro switches can be used only as single-circuit micro switches. Two voltages with different values or phases must not be led to the contacts of one micro switch.

Explanatory notes:
30 – Cams for "closing" direction
31 – Cams for "opening" direction
32 – Screws for cams for "closing" direction
33 – Screws for cams for "opening" direction
34 – Handle for "opening" direction
35 – Handle for "closing" direction
36 – Micro switch for "opening" (bottom) direction
37 – Micro switch for "closing" (top) direction
38 – Gear (driving gear)
39 – Unit support

Fig. 4 – ***Signalling unit***



Explanatory notes:
K1 – Gear
K2 – Driving wheel
K3 – Shifting wheel
47 – Locking screw of adjusting gear
48 – Cam shaft
49 – Pinion with friction clutch

Note:
Position of adjusting gear for actuators ser. No. 52020 for the various gears is specified on left-hand side of figure 6, for other serial numbers on the right.

Fig. 5 – ***Cinematic diagram of gears***

Table for setting the operating stroke in the signalling unit gearbox

Gear	Type number			
	52 020	52 021 52 022	52 024 52 025	52 026
I	2 - 2.5	2 - 6.5	2 - 5	2 - 2.2
II	2.5 - 10.5	6.5 - 22	5 - 17	2.2 - 7.5
III	10.5 - 35	22 - 72	17 - 55	7.5 - 24
IV	35 - 111	72 -220	55 - 190	24 - 82
V	111 - 250	220 - 250	190 - 240	82 - 100

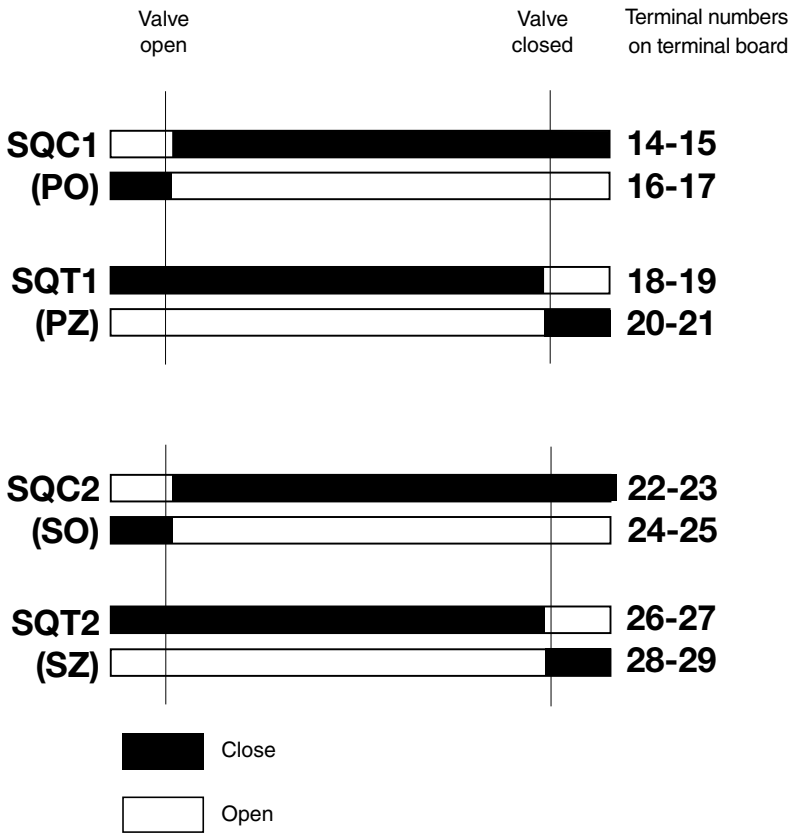


Fig. 6 – ***Working diagram of position and signalling switches***

Signalling unit adjustment

If the set up range of signal switches and transmitter needs to be changed, you have to change the position of adjusting wheel K3. To re-adjust wheel K3, you must partially slide the signalling unit out of the control box *(the length of wires connected to micro switches allows it).* This can be done after removing four screws 66 (*Figure 2),* which hold the unit on the base plate. Once the signalling unit is readjusted to the necessary range, reinstall the unit. Before re-tightening screws 66, the check wheels K1 and K2 *(Figure 5)* for correct meshing. At the lower end of the cam shaft 48 there is a pinion 49 which is connected to the shaft 48 via and adjustable friction clutch. The movement for propulsion of the resistance transmitter is sensed from this pinion. For arrangement of the cams and micro-switches of the signalling unit see Figure 4. The protrusions of the cams 30 or 31 deflect the levers 34 or 35 that operate the SO 36 and SZ 37 micro-switches.

When setting up signalling and position switches and transmitter, it is always necessary to re-align the actuator output shaft to a position, in which the micro switches are supposed to switch or in which the required position of the transmitter adjuster is supposed to be reached.

When adjusting the signalling switches, first release screws 32 *(for SZ)* or 33 *(for SO)* – Figure 4.

Than the cam 30 or 31 are turned in the direction of the arrow, until the microswitch triggers. In this position, hold the cams and re-tighten the locking screws.

Notice

After each handling with locking screws in the control part of the actuator, these screws must be secured from releasing by vibrations, by dropping quick-drying varnish on them. If these screws had previously been secured using the varnish, the old varnish layer rests must be removed while adjusting, and the surface must be duly degreased

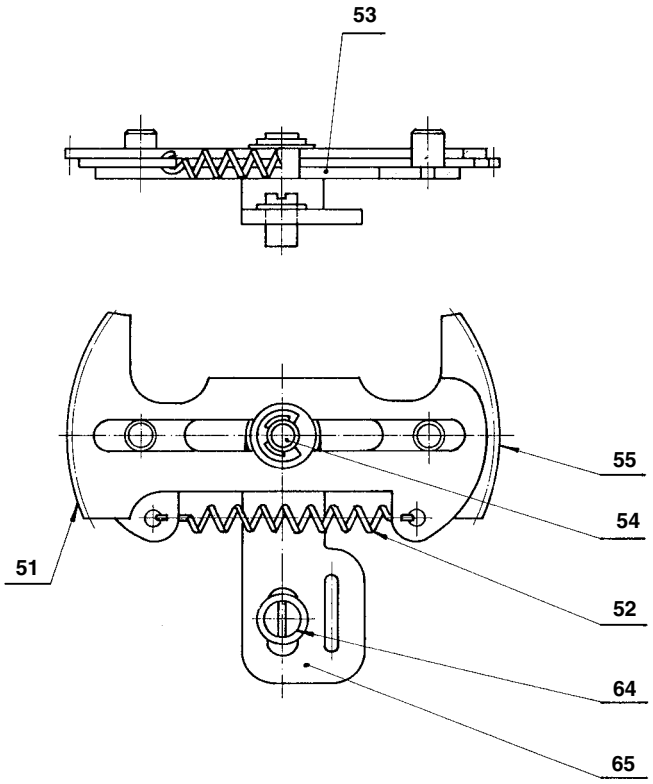
c) Resistance positional transmitter

I. Resistance transmitted including position indicator *(Figure 8)*

In the core of this unit there is a resistance transmitter 42 with its nominal value of the resistance signal equal to 100 Ω *(minimum of 93* Ω *).* The transmitter has a shaft led out on two sides. On the bottom end, pinion 43 is slid on the shaft, which can slip through on the shaft in both end positions of the transmitter, which is beneficial when adjusting this unit. The position indicator 40 is mounted on the upper end of the transmitter shaft. The indicator is fixed on the transmitter shaft with the screw 41. This makes it possible to set the position indicator relative to the view port in the control box lid.

Transmitter adjusting mechanism *(Figure 7)*

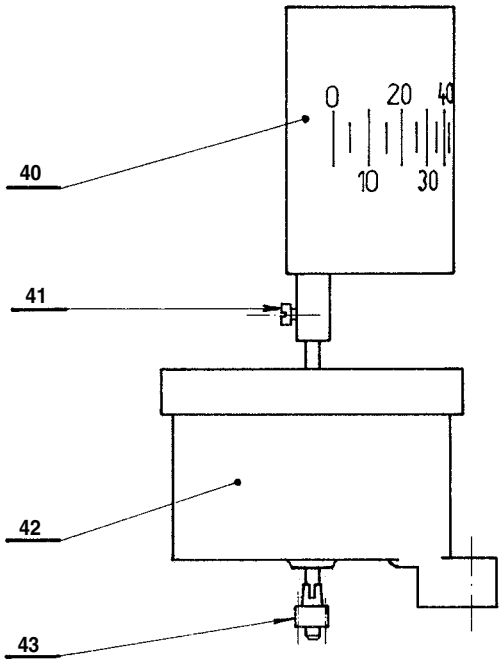
This mechanism consists of two toothed gates 51, 55 with the spring 52 hung in them. The bar with the pins 53 provides for linear movement of both gates. This assembly can be turned around the pin 54. The entire mechanism is mounted on the main control board 67 *(Figure 2).* The toothed gates are engaged with the transmitter pinion 43 *(Figure 7)* and pinion 49 *(Figure 5).* Position of pin 54 determines the gear ratio of the setting mechanism – i.e. for various values of working stroke of actuator and thus also for various turning of cam shaft in signalling unit, the transmitter turning angle and the local position indicator turning angle is always 160°. This enables the rated transmitter signal value of 100 Ω to be available for any working stroke value, i.e. 100 Ω.



Explanatory notes:

51 – Toothed gate
52 – Spring
53 – Bar and pins
54 – Adjusting pin
55 – Toothed gate
64 – Screw
65 – Adjusting handle

Fig. 7 – ***Resistance positional transmitter shifting mechanism***



Explanatory notes:

40 – Position indicator
41 – Indicator screw
42 – Resistance transmitter
43 – Transmitter pinion

Fig. 8 – ***Resistance transmitter with the position indicator***

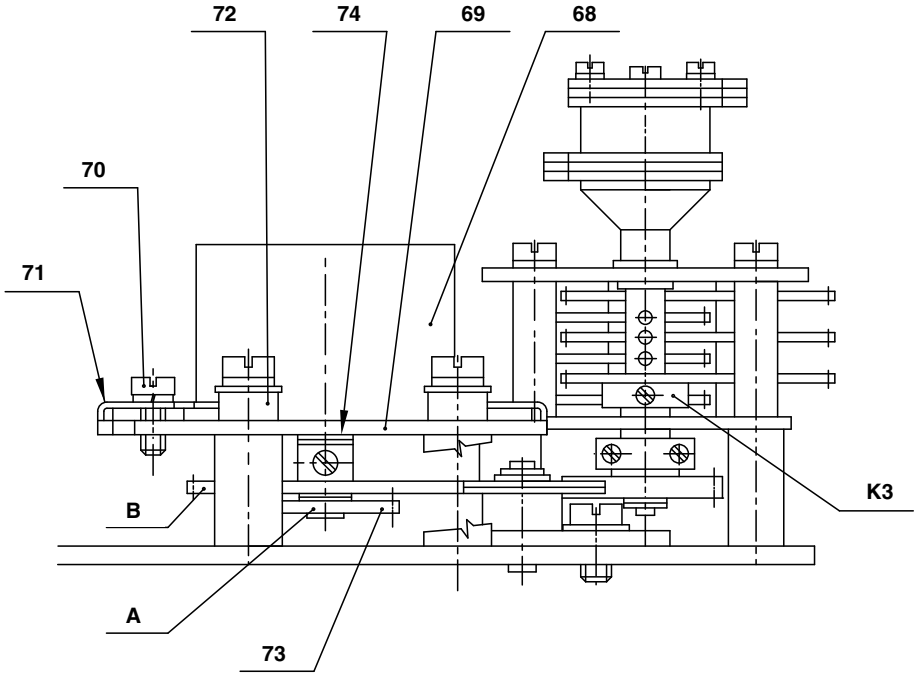
Resistance transmitted and position indicator setting

To set the position indicator proceed as follows: With the output shaft in the *"closed"* position slide out the gate 51 *(Figure 8)* by pressing it towards the transmitter, disengaging it from the pinion 49 *(Figure 5).* Then, turn the gate clockwise to the stop which forms a column under the signalling unit. Then, re-engage the gate with the pinion 49. The transmitter pointer should point to 0°. If it does not, move the gate 51 back before its stop and depress the gate 55. This will release the transmitter pinion and the transmitter pointer can be set near the mark 0° on the transmitter scale so that their teeth engage properly with each other, once the gate 55 gets engaged with the pinion. Carefully turn the transmitter shaft to make sure their clinching is correct. Then, we can again slide out the gate 51 from engagement, pushing it more vigorously towards the stop *(with the transmitter pointer moved to the mark 0° the pinion will slide through).* Then, re-engage the gate 51 with the pinion 49. In this position, the oval openings in the toothed gates go parallel with the oval opening in the main control board 67 *(Figure 2).* Now the transmitter is adjusted for the "closed" position. Then, loosen the screw 64 *(Figure 8),* position the shifting lever 65 towards the transmitter to the stop point and retighten the screw 64.

Re-set the actuator to the *"open"* position; the transmitter pointer is re-set to a position between 0° and 160°. Release screw 64 and turn aligning lever 65 anticlockwise until the transmitter indicator reaches 160°C sign. Subsequently re-tighten screw 64 again and drop quick-drying ink on it to prevent it from releasing. Thus the transmitter is set to *"open"* position. The position indicator is mounted on the resistance transmitter axis 42 *(Figure 8)* with the screw 41. This screw will be loosened in its *"open"* position, and the indicator is turned, so that the mark 100 on the indicator scale 40 would coincide with the color dot on the view port in the control box lid. Subsequently, tighten screw 41 and secure it in tightened position by dropping quick-drying varnish on it.

II. Vishay resistance transmitter

Alternatively, actuators **MOA** can be equipped with a Vishay resistance transmitter. This transmitter has a shaft led out on one side, with double wheel 73, consisting of toothed gears A and B, fixed on the end of the shaft. The principle of drive and adjustment of Vishay transmitter is identical to current transmitter CPT 1AAE. The only difference consists in sizes of toothed gears A and B of double wheel 73, and thus also in table including values for working stroke setting.



Description:
68 – Resistance transmitter
69 – Transmitter bracket
70 – Locking screw
71 – Contact plate
72 – Spacers
73 – Double wheel
74 – Spacer rings

Wheel on the transmitter – gears

Setting of position resistive transmitter

First of all you must set the appropriate gear from the output shaft of the actuator to transmitter shaft according to the required working stroke of the actuator shown in the following table.

Configuration is performed using the adjustable wheel K3 in the gearbox of the signal unit as per the previous paragraph b). Further, you must bring the necessary gear of the double wheel, affixed on the transmitter shaft, into meshing position. The wheel with the smaller diameter is marked A, the larger wheel is marked B.

The adjustment is made by moving the spacers 72 either under the transmitter bracket *(wheel A is engaged)* or above the transmitter bracket *(wheel B is engaged).* This is done at the position where the transmitter bracket is the most distanced from the gearbox.

Then the bolts securing the transmitter bracket are slightly tightened so as to be able to shift the transmitter bracket to a position where the A or B wheel are in engagement with the drive wheel. In this position, recheck the engagement of the wheels and possibly using the spacers on the shaft adjust the height of the wheelset to the free wheel. There must be a small play between the wheel A (or wheel B) and the driving wheel, so that the transmitter shaft is not stressed in the direction perpendicular to its axis. Then correctly tighten the mounting bolts of the transmitter bracket and secure with varnish.

Selection of gear of the wheel K3 and A, B wheels is performed according to the following table. If the required working stroke is in overlap of two zones, it is preferable to choose a lower band.

Table for setting the operating stroke of the position resistive transmitter

Gear	Wheel on the transmitter	Type number		
		52020	52021 - 52022	52023 - 52026
I	A	0,5 - 1,1	1,2 - 2,5	0,9 - 1,8
	B	0,9 - 1,9	2,3 - 4,6	1,7 - 3,4
II	A	1,7 - 3,5	4,0 - 8,2	3,1 - 6,4
	B	3,2 - 6,4	7,7 - 15,4	5,9 - 11,7
III	A	5,8 - 11,7	13,8 - 27,7	10,6 - 21,4
	B	10,4 - 20,8	25,6 - 51,3	19 - 38
IV	A	20 - 39,9	46,8 - 93,8	36,4 - 73
	B	37,4 - 74,8	86 - 172,2	68,5 - 137
V	A	67,1 - 134,2	155,4 - 311,1	122,9 - 245,7
	B	122,5 - 245,3	292 - 584,5	224,3 - 450

Upon setting the suitable gear adjust the resistive transmitter according to the following procedure:

Due to the graduated gear ratio of the signal unit the potentiometer cursor does not move in the entire range of the resistive track, but only in certain part.

When setting the signal unit to the end positions *"open"* and *"closed"* according to paragraph b) the resistive transmitter is automatically set to a specific value.

Final setting of the transmitter is performed in the following manner:

Adjust the output shaft of the actuator to the *"closed"* position. Then loosen the screws of the transmitter contact plates so that the entire transmitter can be rotated. Afterwards, rotate the transmitter to adjust it to the lowest resistance value *(approx. 4 Ω, not less)* and re-tighten screws on adapters. When you turn on the actuator or turn the handwheel to *"open"* the resistance begins to rise up to the resistance value corresponding to the end position *"open" (50 Ω to 98 Ω max).* Thereby the transmitter is adjusted.

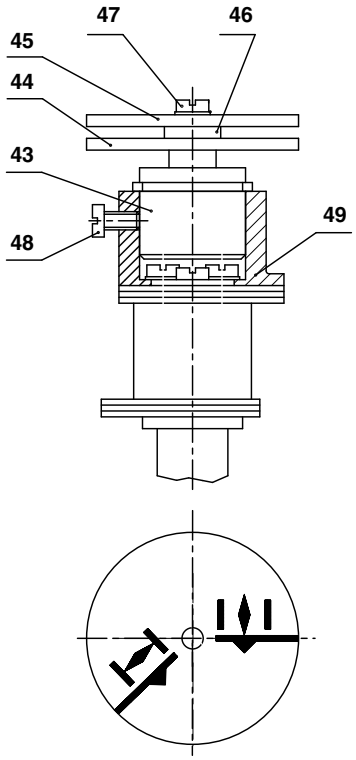
Local position indicator

Local position indicator *(Figure 8a)* serves to approximately determine the output shaft position. It is mechanically attached to cam shaft of signalling unit pos. 49, and can detached. When setting up cam shafts of signalling unit, the whole indicator assembly must be removed after releasing fixing screws pos. 48.

Position indicator setting

First of all, position and signalling unit must be adjusted as per point b) of Installation Manual. Once this unit has been adjusted, attach indicator assembly to cam shaft and adjust indicator according to the following procedure:

Adjust actuator output shaft to *“closed”* position. When actuator is in this position, after releasing screw pos. 47, set *“closed”* sign of bottom indicator against signalling unit’s pillar, indicated on figure 2a with bold print. *(The position of this pillar then corresponds to the position of the sign on the eye sight of the cover, once attached).* Tighten screw pos. 47 and move output shaft of actuator to *“open”* position. In this position, use the same approach to adjust *“open”* sign of the top indicator, again against the same signalling unit pillar. While doing so, make sure not to change the already set up position of bottom *“closed”* indicator. After attaching the cover, check the accuracy of signs setting against sign on eye sight, and adjust position if necessary. Now the indicator has been adjusted for both end positions.



Description:
43 – Indicator shaft
44 – Bottom "closing" indicator
45 – Top "opening" indicator
46 – Driving rubber collar
47 – Locking screw
48 – Fixing screw
49 – Top cam with opening

Fig. 8a – ***Position indicator***

Important advice:

If the MOA servomotors are to be used for control, it is necessary that in the end positions they are tripped by positional terminal microswitches!

If a tight seal is required, e.g. in the *"closed"* position, it is possible to switch off by torque, but with the following recommendation:

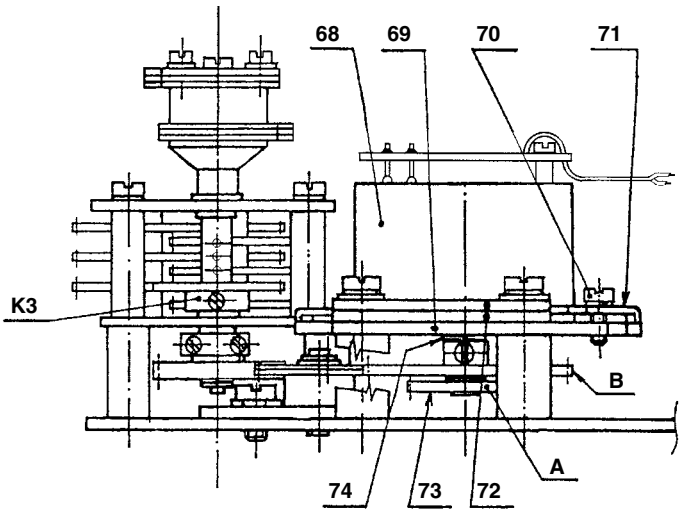
– regulation near the end of position *"CLOSED" (up to 10 %)* is undesirable
– for short valve strokes the torque blocking must be as short as possible. Therefore, for this purpose, it is better to use **MOA** actuators in the version 20 02x.xxxS1, where the blocking time between 1/4 and ½ of revolution of the output shaft of the actuator from the change of the direction of rotation.
– If the valve operation does not require torque blocking, we recommend ordering and using **MOA** actuators in 52 02x.xxxxSM version. In this design the blocking of torque switches is excluded to both sides of rotation.
– The electric actuators can be supplied with a modified torque unit – without torque blocking to the closed side.

Current position transmitter CPT 1AAE – adjustment

First of all you must set the appropriate gear from the output shaft of the actuator to transmitter shaft according to the required working stroke of the actuator shown in the following table on page 9. Configuration is performed using the adjustable wheel K3 in the gearbox of the signal unit as per the paragraph b) on page 6. of the Installation Instructions.

Further, you must bring the necessary gear of the double wheel, affixed on the transmitter shaft, into meshing position. The wheel with the smaller diameter is marked A, the larger wheel is marked B.

The adjustment is made by moving the spacers with two holes either under the transmitter bracket *(wheel A is engaged)* or above the transmitter bracket *(wheel B is engaged).* This is done at the position where the transmitter support is the most distanced from the gearbox. Then the bolts securing the transmitter bracket are slightly tightened so as to be able to shift the transmitter bracket to a position where the A or B wheel are in engagement with the drive wheel. In this position, recheck the engagement of the wheels and possibly using the spacers on the shaft adjust the height of the wheelset



Explanatory notes:
68 – Current transmitter CPT 1AAE
69 – Transmitter bracket
70 – Locking screw
71 – Contact plate
72 – Oval spacers
73 – Double wheel
74 – Spacer rings

Wheel on transmitter – gears (version with current position transmitter)

Table for setting the working stroke of position resistive transmitter CPT 1AAE

Gear	Wheel on the transmitter	Type number		
		52 020	52 021 - 022	52 023 - 026
I	A	0,9 -1,8	1,3 - 2,6	1 - 2
	B	1,6 - 3,3	2,4 - 4,8	1,8 - 3,7
II	A	2,1 - 4,2	4,4 - 8,8	3,4 - 6,8
	B	3,4 - 6,9	8 - 16	6,1 - 12,3
III	A	6,7 - 13,4	14,8 - 29,6	11,4 - 22,8
	B	11,6 - 23,3	27 - 54	20,8 - 41,7
IV	A	21,4 - 42,9	49 - 99	37,8 - 76,5
	B	39,2 - 78,5	90 - 181	69,5 - 139
V	A	75 - 144	167 - 334	129 - 258
	B	131 - 263	304 - 609	234 - 470

to the free wheel. There must be a small play between the wheel A *(or wheel B)* and the driving wheel, so that the transmitter shaft is not stressed in the direction perpendicular to its axis. Then correctly tighten the mounting bolts of the transmitter bracket and secure with varnish.

The gear level of the wheel K3 and wheels A/B is chosen according to the table at the Figure 8. When the required working stroke overlaps two zones it is better to choose the lower one.

Upon setting the suitable gear adjust the current transmitter according to the following procedure:

Attention!

Do not connect the CPT 1AAE transmitter without having checked the supply voltage. Transmitter outlets must not be connected in the actuator with actuator ground conductor or earthed, not even incidentally.

1. Prior to checking feeding voltage, first disconnect transmitter from power supply source. On actuator's terminals, where the transmitter is connected to, determine voltage firstly using voltmeter with input resistance at least 1 MΩ. Voltage must lie between 18 to 25 V, and must in no case exceed 30 V *(this would result in transmitter destruction).* Then, connect the transmitter so that the source positive pole is connected to the positive pole of the transmitter, i.e. to the red/black conductor *(+)* – it is connected to the terminal 51 or the tip 41 for the version with a connector. The negative pole of the transmitter *(black conductor)* is connected to the terminal 52 or the tip 42 for the version with a connector.

2. Connect mA-meter, digital as far as possible, with an accuracy of at least 0.5 %, in series with the transmitter. Adjust output shaft to *"closed"* position. While doing so, the signal value must drop. If this is not the case, turn the output shaft in *"closing"* direction until the signal starts decreasing and until the output shaft reaches *"closed"* position.

Then loosen the screws of the transmitter contact plates so that the entire transmitter can be rotated. Turn the whole transmitter to adjust current to 4 mA, and tighten adapter screws. Subsequently adjust actuator output shaft to *"open"* position. Use resistance trimmer in the front part of transmitter *(closer to the edge)* to set current to 20 mA. The trimmer's range is 12 revolutions and has no dead stops, so it cannot be damaged by overturning.

If correction by 20 mA was significant, repeat adjustments to 4 mA and 20 mA once again. Then, disconnect the connected mA-meter. Do not turn the screw with varnish drops close to the centre. Properly tighten screws that lock the transmitter adapters, and use varnish to protect them from release.

After adjustment, use voltmeter to verify voltage on transmitter terminals. It must lie between 9 and 16 V at the current of 20 mA.

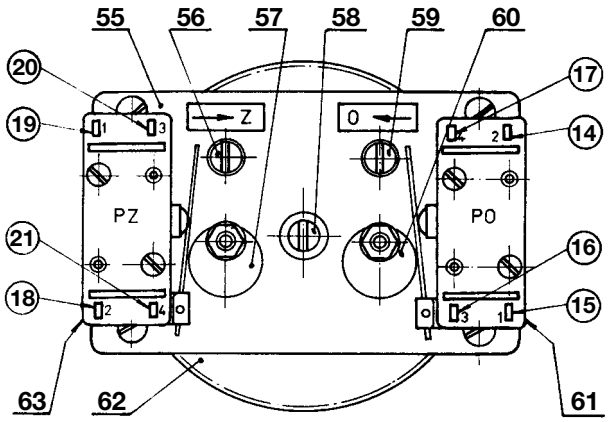
Note:

The transmitter's curve has two branches – a decreasing branch relatively to "Z" position, or a rising branch relatively to "Z" position. To select transmitter's curve, turn the transmitter body.

d) Position unit *(Figure 9)*

This unit secures switches PZ or PO to trip when the preset output shaft speed has been achieved. The unit's rotary motion is derived from the output shaft motion, by means drive wheel 62.

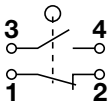
This wheel turns stepwise the aligned gears, which control cam 57 *(60).* Cam turning to lever of switch PZ and PO will make the switches change over.



Explanatory notes:

55 – Decade gear
56 – Set screw "Z"
57 – Tripping cam "Z"
58 – Tripping cam
59 – Set screw "O"
60 – Tripping cam "O"
61 – PO Switch
62 – Driving wheel
63 – PZ Switch

Micro switch scheme



Numbers in circles correspond to terminal numbers on the terminal board.

Micro switches can be used only as single-circuit micro switches. Two voltages with different values or phases must not be led to the contacts of one micro switch.

Fig. 9 – ***Position unit***

Handling and adjustment

The unit can be set within the range from 2 to 250 revolutions *(1 – 100 revolutions in the case of type No. 52 026).* Adjustment procedure is as follows:

a) Once the actuator has been fixed to the valve, set valve to closed position using the actuator.
b) In this position, push tripping rod 58 in vertical direction and then turn it by 90 degrees in any direction.
b) Turn set screw 56 in *"Z"* arrow direction until the cam 57 pushes the spring of micro switch PZ 63.
d) Turn tripping rod 58 by 90°. Tripping rod will slip out again. If tripping rod fails to slip out, just very slightly turn screw 56 or 59.
e) Use the actuator to move the valve by the required number of revolutions to open position.
f) Again push tripping rod 58 in vertical direction and then turn it by 90 degrees in any direction.
g) Turn set screw 59 in *"O"* arrow direction until cam 60 pushes the spring of micro switch PO 61.
h) Turn tripping rod 58 by 90°. Tripping rod will slip out again. If tripping rod fails to slip out, just very slightly turn screw 59 or 56.

Note:

Stop turning screw 56, 59 at the moment of switching!

If, prior to adjustment, cams are in such a position as indicated on Figure 9 or if cam has already pushed the micro switch button, it is advisable to proceed adjustment as follows:

After pushing and turning tripping rod 58, turn set screws 56 or 59 against arrows direction until the cam's tip leaves the micro switch lever *(towards the closest set screw)* and the micro switch switches *(use suitable tester to make sure that micro switch has switched).* Then turn set screw 56 or 59 in arrow direction to turn the cam's tip back to the micro switch lever until the micro switch switches again *(micro switch button)* is pressed. Now the micro switch has been adjusted. Then slide tripping rod 58 out as described above.

CONTROL block

CONTROL block extends the possibility of the use of **MOA** actuators with regulating valves in automatic control system circuits and complements the equipment of these actuators.

For **MOA** actuators, the CONTROL block is supplied as an independent assembly that is electrically interconnected with the relevant actuator, and controls its operation. The CONTROL block includes ZP2RE6 regulator with a feeding transformer and a switching block. The switching block may include SSR, or SSR with brake, or contactors. Optionally, the CONTROL block may also include a local control block.

CONTROL block technical data

Weight		8.1 kg
Surrounding Environment	– normal working temperature	from -20 °C to +50 °C
	– relative humidity	up to 90%
	– radiation dose per life	200 Gy/life
	– maximum dose rate	2,50E-03 Gy/hr.
Protection		IP 67
Maximum cable length between the CONTROL block and actuator		100 m

The specifications of the connecting cable between the CONTROL block and the actuator resistive transmitter – 3 cores with cross-section of 1 mm, shielded and suitable for the surrounding environment.

Wiring and adjustment manual of the CONTROL block is supplied separately.

6. PACKAGING AND STORAGE

The actuators are packaged together with the valve on which they are mounted. The packaging method applicable to this assembly must be included in the technical conditions for the valves with the actuator mounted. During the transportation of the actuators from the manufacturer's factory to the domestic valve manufacturer where the product is to be completed with the valve, the product must be covered. In such a case, the actuators are transported unpackaged.

After receipt of actuators from manufacturer, actuators must be checked for possible damage suffered during transport. Compare if data on serial plates of actuators correspond with the accompanying documentation and the purchase order. Possible discrepancies, defects or damage must be immediately reported to supplier.

If the packed actuator is not installed immediately after receipt, it must be stored in dust-free room with ambient temperature between -50 °C and +50 °C, with relative humidity up to 75 %, free from corrosive gases and fumes, protected from harmful climate impacts. Any manipulation with the actuators at temperatures lower than -25 °C is forbidden.

It is impermissible to store actuators outdoor or in areas unprotected from rainfall, snowfall and/or ice. Surplus preservative grease must be only removed before commissioning the actuator. When storing unpacked actuators for a period exceeding 3 months, we recommend you to insert a small bag with silica gel or another suitable desiccant material into the terminal box.

The actuators must be stored in the environment characterized by the 1K3, 1Z1, 1B2, 1C1L, 1S1, 1M1 classes of the climatic and other conditions pursuant to ČSN EN 60721-3-1.

At least once in a half-year during the storage period it has to be checked that the storage conditions are really observed, that no water infiltrates into the storeroom, for example. When the actuators are stored in their original intact packages the conservation has to be repeated in three-year intervals. Re-preservation is performed by applying a continuous layer of a suitable preservative oil on the uncoated parts of the actuator. Within this re-conservation, the bag with the drying agent must be dried up and put back into the package which has to be tightly closed or sealed with a tape. Where the actuator is stored for over one year, the oil has to be replaced in the power box before the product is put into service. Where the actuator is stored for over 4 years, all the rubber gaskets have to be replaced before the product is put into service.

After the end of storage and before mounting the electric actuator to a valve, remove the preserving agent from a connecting flange using a cloth soaked in suitable solvent.

7. VERIFICATION OF FUNCTION OF THE DEVICE AND PLACEMENT

Before starting to install the device, again check actuator for any damage suffered in the course of storage.

The function of electric motor can be verified by connecting it to power supply through a switch and by powering it up shortly. It is sufficient to observe if the electric motor starts up and if the output shaft starts rotating. Actuators must be located in an area providing easy access to manual control wheel, terminal box and control box. Also, i t must be verified again if the location meets the provisions of section *"Operating Conditions".* If local conditions require another method of installation, manufacturer's approval must be obtained.

For working position of rotary actuators see the paragraph *"Working position".*

8. INSTALLATION

Set actuator onto the valve so that its output shaft reliably fits into the valve coupling. Use four *(eight)* screws to connect actuator with valve. Turn hand wheel to check correct connection between actuator and valve. Remove cover of terminal box and carry out electrical connection of actuator according to internal connection diagram.

9. ACTUATOR ADJUSTMENT

Having fitted the actuator onto the valve and checked for correct mechanical connection, proceed with the actual set-up and adjustment.

1. Shift the actuator manually to an intermediate position,
2. Connect actuator to power supply line, and shortly switch to verify correct rotation direction of the output shaft. When looking inside the control box, the input shaft will rotate clockwise, while moving in *"closing"* direction.
3. Electrically set actuator close to *"closed"* position, use hand wheel to arrive precisely at the *"closed"* position. In this "closed" position set the positional unit *(PZ micro-switch)* as under 5e and the resistance transmitter as under 5d,
4. Set output shaft to a position, where the signalling switch SZ is supposed to change over. Adjust SZ switch according to instructions specified under point 5b.
5. Turn the actuator output shaft by the required number of revolutions and set switch to PO *"open"* position as described under point 5e and resistance transmitter as described under point 5d. Several times verify the adjustment of position and signalling switches, and the adjustment of resistive transmitter.
6. Set output shaft to a position, where the signalling switch SO is supposed to change over. Adjust SO switch according to instructions specified under point 5b.

Notice

The control box cover must be removed by sliding it along the extended axis of the actuator output shaft while avoiding any damage to position indicator. While installing valve onto pipe, use hand wheel of actuator to set the valve into its central position. Shortly run the electric motor to verify if the actuator is rotating in the correct direction. If not, swap over the two phase wires on the motor terminal board.

10. OPERATION AND MAINTENANCE

Correct operation of rotary actuators is determined by operational conditions and is usually limited to giving impulses for the various functional tasks. In the event of power supply interruption, change the position of the controlled valve by means of hand wheel. If the actuator is connected to automatic control circuit *(this does not mean regulating operation),* we recommend you to install elements for remote control in the circuit so that the actuator can be operated also in case of such automatic control circuit breakdown.

Operating personnel must ensure that the prescribed maintenance is carried out and that the actuator is protected against harming ambient impacts and weather conditions unspecified in section *"Operating Conditions".*

Torques in the actuators are set and operate if the actuator is energized. In the case that manual control is used, ie. the actuator is controlled mechanically, the torque setting does not work and can cause damage to the valve.

Maintenance

The actuators are lubricated with plastic consistent lubricants or gearbox oil PP 80.

Actuators with plastic grease

Types of lubricants and their use are specified in table below. Lubricant included inside the supplied actuators is intended for their entire service life.

Lubricant does not need to be changed and its quantity does not need to be checked over the entire service life of actuators.

Actuators with grease are identified with label stating “FILLED WITH PLASTIC GREASE”, located on the power box on the hand wheel side.

Actuator type number	Lubricatn quantity *(kg)*	Type of lubricant
52 020	0,30	CIATIM 201 and CIATIM 221 are used for all types
52 021, 52 022	0,50	
52 024	0,70	

Note: *Lubricant CIATIM 221 is used for lubricating points of friction on rubber sleeves with metallic surfaces, roller brake and hub of outer gear in planetary differential in 52 020 type actuators (in points of friction with shaft and on surfaces).*

Actuators with oil charge

If the oil does not flow from the gearbox due to bad sealing, the charge is stable. Exchange oil after 500 hours of actuator operation, however, no longer than after 10 years. Oil has to be checked on quarterly basis. The level of oil should be as high as the filling hole. The actuator is filled with PP 80 motor-car gearbox oil.

Oil quantities for individual type numbers:

Actuator type number	Oil quantity (l)
52020	1,3
52021	2,8
52022	2,8
52024	6
52025	12 or 14 (by origin)
52026	12 or 14 + grease – see below

Adapter of actuator 52 026 is to be filled with fat PM MOGUL LV2-3, quantity: 3 kg.

11. TROUBLESHOOTING

1. The actuator in its end position, does not start up, motor humming – check for a missing phase.
   If slider is jammed and if you cannot move it nor by hand wheel neither by motor, actuator must be dismounted and the lock must be released mechanically.

2. Upon actuator start-up from end position of the output shaft, actuator stops voluntarily.
   It must be made sure that recess in the switching wheel *(Figure 2)* stops in the end position of the output wheel of actuator *(after torque switch tripping)* prior to running onto advance mechanism 21 *(Figure 3).* This can be achieved by turning actuator output shaft to a suitable position while coupling actuator with valve, or by turning switching wheel to suitable position relative to output shaft. For this reason, the switching wheel has two grooves for a connecting key. Additionally, the switching wheel can also be reversed.

Table 1 – ***Basic technical parameters and characteristics of actuator type MOA***

Size of the actuator	ACTUATOR										
	Type designation	Type number [1,2]		Opening moment tripping range	Range of setting of the output revolutions	Actuator output shaft displacement speed	Grease type CIATIM 201	Voltage ratio		Maximum force on hand wheel [4]	Weight of the actuator with electric motor ŠL/AL [5]
		Basic	Supplemental	[Nm]	[revs]	[1/min]		from the output shaft to the electric motor	from the output shaft to the hand wheel	[N]	[kg]
F10	MOA 40-5	52 020 . YX42S		20 – 40	2 – 250	5		1 : 140	1 : 27	40	42/27
	MOA 40-9	52 020 . YX02S				9		1 : 112			42/24
	MOA 40-15	52 020 . YX12S				15		1 : 72			
	MOA 40-25	52 020 . YX22S				25		1 : 55			42/25
	MOA 40-40	52 020 . YX32S				40		1 : 34			43/26
	MOA 63-5	52 020 . YXD2S		40 – 63		5		1 : 140		70	42/27
	MOA 63-9	52 020 . YX52S				9		1 : 112		80	42/24
	MOA 63-15	52 020 . YX62S				15		1 : 72			
	MOA 63-25	52 020 . YX72S				25		1 : 55		60	42/25
	MOA 63-40	52 020 . YX82S				40		1 : 34			43/26
	MOA 160-8	52 020 . YX92S		100 – 160		8		1 : 122		150	42/24
	MOA 180-5	52 020 . YXA2S		100 – 180		5		1 : 140		170	42/25
	MOA 150-15	52 020 . YXB2S		100 – 150		15		1 : 72		110	
	MOA 150-24	52 020 . YXC2S				24		1 : 122			
F14	MOA 140-7	52 021 . YX02S		63 – 140		7		1 : 98		120	63/37
	MOA 160-9	52 021 . YX42S		63 – 160		9					
	MOA 160-16	52 021 . YX52S				16		1 : 56			65/40
	MOA 160-25	52 021 . YX62S				25		1 : 36			69/41
	MOA 160-40	52 021 . YX12S				40					70/43
	MOA 160-63	52 021 . YX22S				63	♦	1 : 22			75/49
	MOA 125-100	52 021 . YX32S		63 – 125		100	♦	1 : 14			75/49
	MOA 250-9	52 022 . YX42S		160 – 250		9		1 : 98		160	68/42
	MOA 250-16	52 022 . YX52S				16		1 : 56			70/44
	MOA 250-25	52 022 . YX62S				25		1 : 36			
	MOA 250-40	52 022 . YX12S				40				190	72/45
	MOA 220-63	52 022 . YX22S		160 – 220		63	♦	1 . 22		160	75/49
	MOA 250-80	52 022 . YX32S		160 – 250		80	♦	1 : 36		190	75/50
F16	MOA 400-16	52 024 . YX92S		250 – 400	2 – 240	16		1 : 42	1 : 62	210	130/85
	MOA 400-20	52 024 . YX02S				20		1 : 47			122/73
	MOA 400-40	52 024 . YX12S				40		1 : 23			122/79
	MOA 400-63	52 024 . YX22S				63	♦				125/83
	MOA 400-100	52 024 . YX42S				100	♦	1 : 15			127/88
	MOA 250-100	52 024 . YX32S		160 – 250			♦	1 : 14		130	125/98
	MOA 630-16	52 024 . YX72S		400 – 630		16		1 : 43		260	130/84
	MOA 630-20	52 024 . YX82S				20		1 : 47			120/78
	MOA 630-40	52 024 . YX52S				40		1 : 35			122/78
	MOA 630-63	52 024 . YX62S				63	♦	1 : 23		330	125/87
F25	MOA 1000-20	52 025 . YX42S		630 – 1000	2 – 240	20	♦	1 : 34	1 : 54	400	207/174
	MOA 1150-45	52 025 . YX02S		630 – 1150		45	♦	1 : 21			210/161
	MOA 1220-63	52 025 . YX22S		630 – 1220		63	♦	1 : 23			206/154
	MOA 800-63	52 025 . YX32S		630 – 800			♦				206/152
	MOA 2000-16	52 025 . YX52S		1000 – 2000		16	♦	1 : 60			233/178
	MOA 2000-21	52 025 . YX62S				21	♦	1 : 45			
	MOA 2000-24	52 025 . YX72S				24	♦	1 : 60			229/174
	MOA 2000-34	52 025 . YX82S				34	♦	1 : 43			
	MOA 2000-40	52 025 . YX92S				40	♦	1 : 38			223/194
	MOA 1600-70	52 025 . YXA2S		1000 – 1600		70	♦	1 : 21			
F30	MOA 2000-32	52 026 . YX02S		1250 – 2000	1 – 100	32	♦	1 : 45	1 : 134	400	318/237
	MOA 1850-42	52 026 . YX12S		1000 – 1850		42	♦	1 : 35			318/241
	MOA 4000-30	52 026 . YXA2S		2000 – 4000		30	♦	1 : 48			332/255
	MOA 3000-42	52 026 . YXB2S		1500 – 3000		42	♦	1 : 35			
	MOA 4000-9	52 026 . YX22S		2000 – 4000		9	♦	1 : 103			339/246
	MOA 4000-11	52 026 . YX32S				11	♦	1 : 139			335/242
	MOA 4000-14	52 026 . YX42S				14	♦	1 : 103			
	MOA 4000-17	52 026 . YX52S				17	♦	1 : 84			355/263

Notes: *1. Instead of Y the following shall be entered: 2 - tfor design with cast iron casing; 3 - for design with an aluminum casing.*
2. The following shall be entered instead of X:

Execution data		0	1	2	4	5	6	7	8	9	C	E
Connecting dimensions, shape		C	E	ZPA	C	E	C	E	C	E	C	E
Position transmitter	Resistance *)	Yes	Yes	Yes	No	No	No	No	No	No	No	No
	Resistive type Vishay	No	No	No	No	No	No	No	No	No	Yes	Yes
	Current	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Current transmitter power supply (only for design with aluminum casing)		No	No	No	No	No	Yes	Yes	No	No	No	No

**) Production with this resistance transmitter only until the end of 2018.*

ELECTRIC MOTOR

Type	Nominal output [kW]	Electro-motor rotation speed [1/min]	Rated current [6] [A]	Break-away current [A]	Effi-ciency [%]	Power factor [cos φ]	Ratio of break-away torque to nominal torque	Ratio of breakaway current to nominal current	Breakaway torque [Nm]	Electric motor weight [kg]
1LE1002-0CD2	0,09	635	0,53	0,95	39	0,63	1,8	1,8	2,52	5,0
1LE1002-0CC2	0,18	875	0,85	1,68	45	0,67	1,9	2,0	4,2	
1LE1002-0CB2	0,25	1365	0,80	2,40	61	0,73	1,8	3,0	3,0	
1LE1002-0CB3	0,37	1350	1,08	3,45	66	0,75	2,0	3,2	5,2	6,0
1LE1002-0CD2	0,09	635	0,53	0,95	39	0,63	1,8	1,8	2,52	5,0
1LE1002-0CC2	0,18	875	0,85	1,68	45	0,67	1,9	2,0	4,2	
1LE1002-0CB2	0,25	1365	0,80	2,40	61	0,73	1,8	3,0	3,0	
1LE1002-0CB3	0,37	1350	1,08	3,45	66	0,75	2,0	3,2	5,2	6,0
1LE1002-0CC2	0,18	875	0,85	1,68	45	0,67	2,0	2,0	4,2	5,0
1LE1002-0CD3	0,12	625	0,82	1,64	31	0,68	1,7		3,06	6,0
1LE1002-0CC3	0,25	860	0,98	2,15	52	0,71	2,0	2,2	5,6	
1LE1002-0CA2	0,37	2755	1,06	3,6	64	0,79	2,2	3,4	2,8	5,0
1LE1002-0CD3	0,12	625	0,82	1,64	31	0,68	1,7	2,0	3,06	6,0
1LE1002-0CC3	0,25	860	0,98	2,15	52	0,71	2,0	2,2	5,6	
1LE1001-0DC2	0,37	925	1,14	4,32	67	0,69	2,1	4,0	8,1	9
1LE1001-0DC3	0,55	935	1,65	7,17	73	0,66	2,5	4,4	14	12
1LE1001-0EB0	1,1	1425	2,5	14	81	0,78	2,3	5,6	17	13
1LE1001-0EB4	1,5	1435	3,3	21,1	83	0,79	2,6	6,4	26	16
1LE1001-0DC2	0,37	925	1,14	4,32	67	0,69	2,1	4,0	8,1	9
1LE1001-0DC3	0,55	935	1,65	7,17	73	0,66	2,5	4,4	14	12
1LE1001-0EC0	0,75		2,05	8,4	76	0,70	2,0	4,1	15,4	13
1LE1001-0EB4	1,5	1435	3,3	21,1	83	0,79	2,6	6,4	26	16
1LE1001-0EA4	2,2	2890	4,5	32	83	0,85	2,5	7,1	18,3	15
1LE1002-1BD2	1,5	700	4,65	15,5	70	0,66	1,6	3,3	32	29
1LE1001-0EC4	1,1	935	2,9	12,7	78	0,70	2,2	4,4	24,6	16
1LE1002-1BC2	2,2	940	5,7	22,1	78	0,72	2,3	4,1	53	25
1LE1002-1AB5	3,0	1425	6,3	34	82	0,85	2,4	5,4	48	22
1LE1002-1AB6	4,0	1435	8,6	56	83	0,81	3,2	6,5	86,4	27
1LE1002-1AB5	3,0	1425	6,3	34	82	0,85	2,4	5,4	48	22
1LE1002-1BD2	1,5	700	4,65	15,5	70	0,66	1,6	3,3	32	29
1LE1002-1AC4		940	3,9	15,6	75	0,74	2,0	4,0	30	19
1LE1002-1AB5	3,0	1425	6,3	34	82	0,85	2,4	5,4	48	22
1LE1002-1AB6	4,0	1435	8,6	56	83	0,81	3,2	6,5	86,4	27
1LE1002-1CD2	3,0	715	8,3	34	77	0,68	1,80	3,9	72	44
1LE1002-1CC3	5,5	955	12,7	66	83	0,75	2,5	5,2	137,5	48
1LE1002-1CB2	7,5	1450	15,4	101	86	0,82	2,6	6,6	127,4	44
1LE1002-1CC3	5,5	955	12,7	66	83	0,75	2,5	5,2	137,5	48
1LE1002-1CB2	7,5	1450	15,4	101	86	0,82	2,6	6,6	127,4	44
1LE1001-1CB6	11	1465	21	162	90	0,84	2,9	7,7	208	64
1LE1002-1CB2	7,5	1450	15,4	101	86	0,82	2,6	6,6	127,4	44
1LE1001-1CB6	11	1465	21	162	90	0,84	2,9	7,7	208	64
1LE1002-1CC3	5,5	955	12,7	66	83	0,75	2,5	5,2	137,5	48
1LE1002-1CB2	7,5	1450	15,4	101	86	0,82	2,6	6,6	127,4	44
1LE1001-1CB6	11	1465	21	162	90	0,84	2,9	7,7	208	64

3. Connection of actuators - with packing gland.

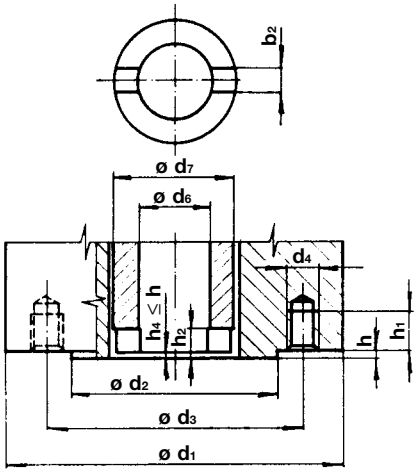
4. The table shows one force from the pair of forces acting on the diameter of the handwheel.

5. Weight in the numerator corresponds to design with cast iron casing, in the ratio - for design with aluminum casing.
The permitted tolerance of ± 5% from the value specified in the table, unless other teolerance is specified in the order or approved by the customer.

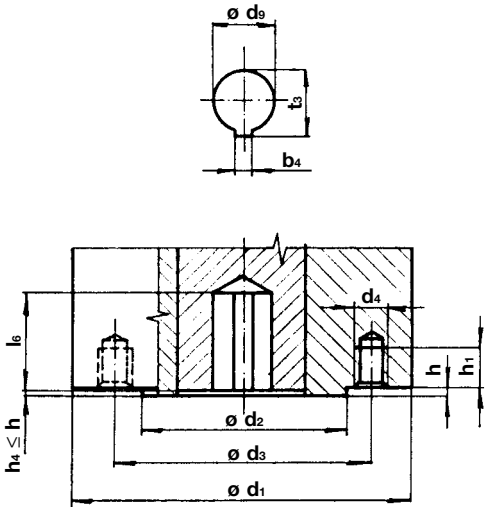
6. Rated current is given for the voltage 400 V, 50 Hz. For voltage U = 380 V rated current $I_n380 = I_n400 \times 400/380$.

Connecting dimensions of electric actuators **MODACT MOA,**
t. no. 52020 - 52026

SHAPE C



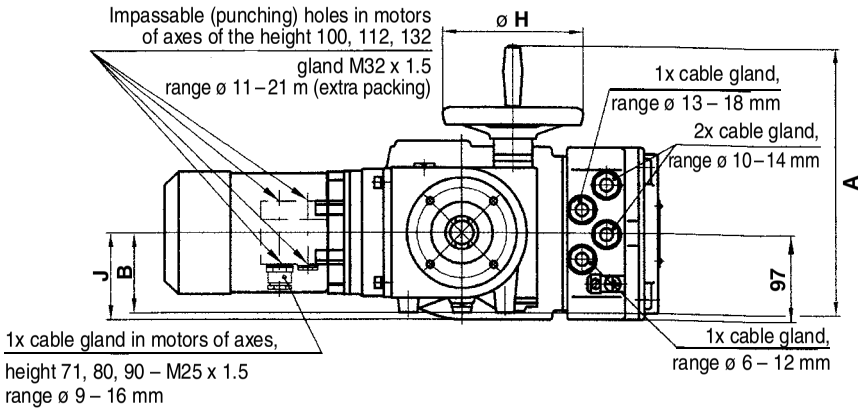
SHAPE E

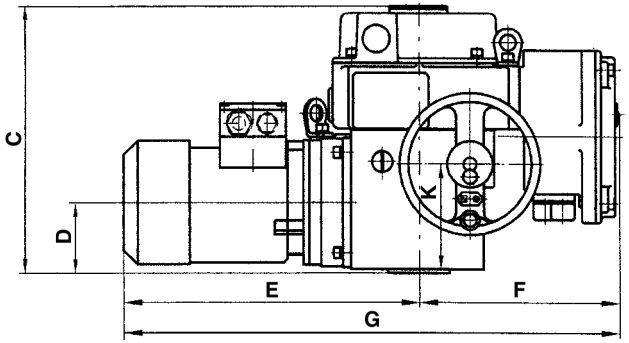


Shape	Dimension	Type designation and type numbers				
		MOA 40 ***(63)***	**MOA 160** **MOA 250**	**MOA 400** ***(MOA 630)***	**MOA 1250**	**MOA 2000**
		52 020	**52 021** **52 022**	**52 024**	**52 025**	**52 026**
C, E *(common data)*	ø d_1 indic. values	125	175	210	300	350
	ø d_2f8	70	100	130	200	230
	ø d_3	102	140	165	254	298
	ø d_4	M 10	M 16	M 20	M 16	M 20
	number of threaded holes	4	4	4	8	8
	h_1 min. 1.25 d_4	12.5	20	25	20	25
	h max.	3	4	5	5	5
C	ø d_7	40	60	80	100	120
	h_2	10	12	15	16	18
	b_2 H11	14	20	24	30	40
	ø d_6	28	41,5	53	72	72
E	ø d_9 H8	20	30	40	50	60
	1_6 min.	55	76	97	117	127
	t_3	22.8	33.3	43.3	53.8	64.4
	b_4Js_9	6	8	12	14	18

The dimensions ø d_6 diam. and l_6 should not be smaller than indicated in the table.
Dimensions are indicated in mm.

Dimensional sketch of electric actuators of **MODACT MOA** type, aluminum design – t. no. 52 020.3xxxS to 52 025.3xxxS cast iron design – t. no. 52 020.2xxxS to 52 025.2xxxS

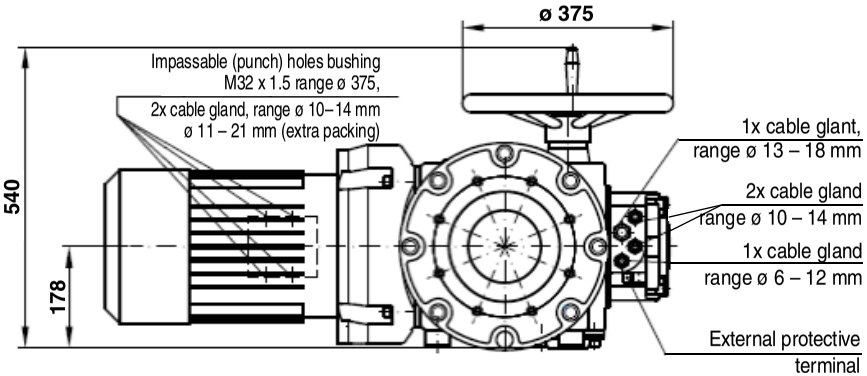


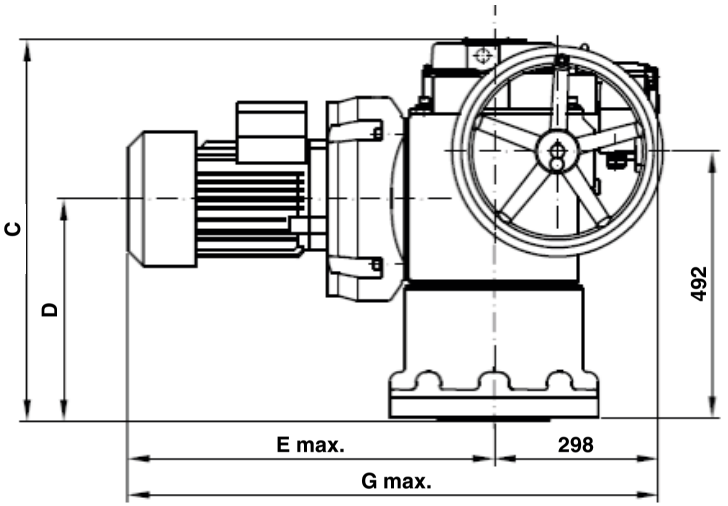


Type designation	A	B	C	D	E max.	F	G max.	ø H	J	K
52 020.2xxxS 52 020.3xxxS	290 305	90	300	78	344	228	572	160	99	120
52 021.2xxxS, 52 022.2xxxS 52 021.3xxxS, 52 022.3xxxS	360 376	120	328	92	469	228	697	200	-	144
52 024.2xxxS 52 024.3xxxS	435 440	145	382	123	560	258	818	250	-	190
52 025.2xxxS 52 025.3xxxS	523 540	178	442	153	745	298	1043	375	-	234

All the parameters has 10% tolerance.

Dimensional sketch of electric actuators of **MODACT MOA** cast iron design – t. no. 52 026.3xxxS aluminum design – t. no. 52 026.3xxxS

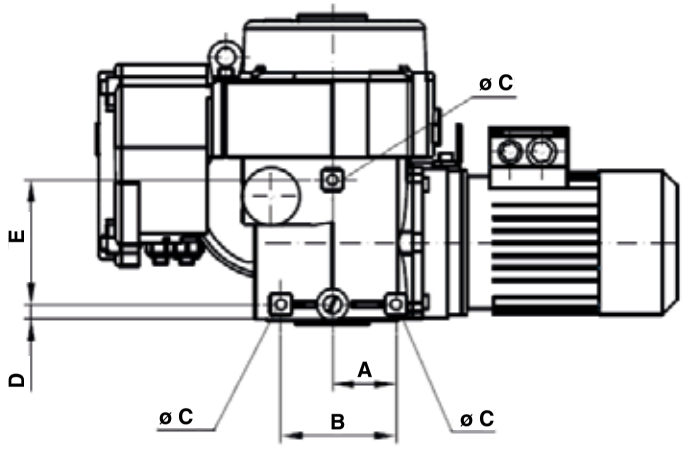




Type designation	C	D	E max.	G max.
52 026.2xxxS shape A	750	463	745	1043
52 026.2xxxS shape B, C, D, E	705	418	745	1043

All the parameters has 10% tolerance.

Holes for mounting **MODACT MOA** actuators to structure



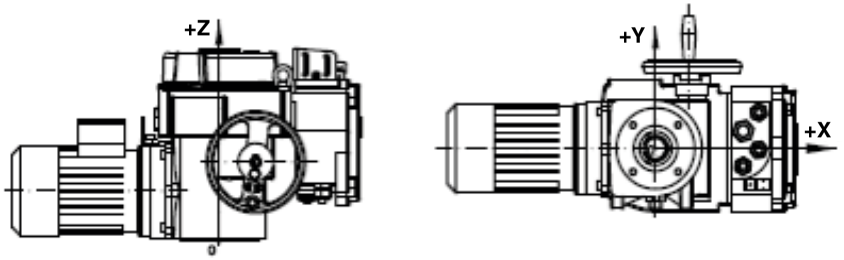
Type number	Dimension [mm]				
	A	B	ø C 1)	D	E
52 020	61	110	M 10	16	120
52 021, 52 022	90	160	M 12	21	140
52 024	110	210	M 16	23	200
52 025, 52 026	120	240	M 20	47	220

Note 1)
The fixing elements of the actuator ø C must not be subject to the overall force higher than indicated in the table.

Maximum force for additional fixing of the actuator

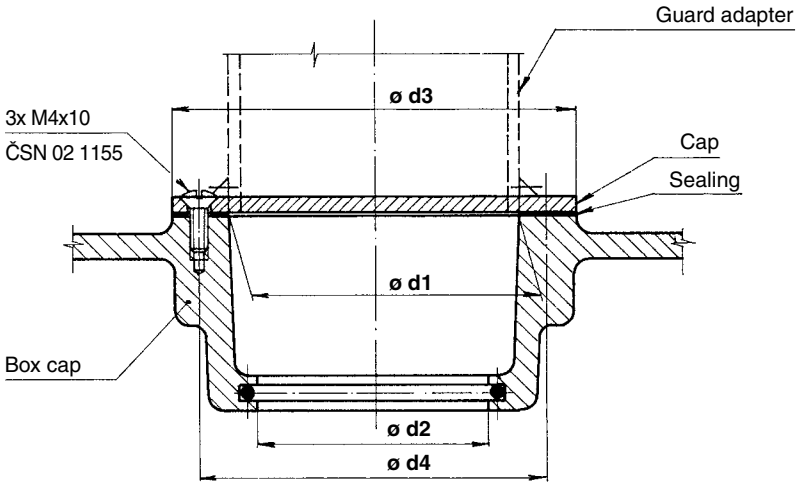
Type number	52 020	52 021 52 022	52 024	52 025 52 026
Force [N]	1000	2000	4000	6000

MODACT MOA actuator centre of gravity



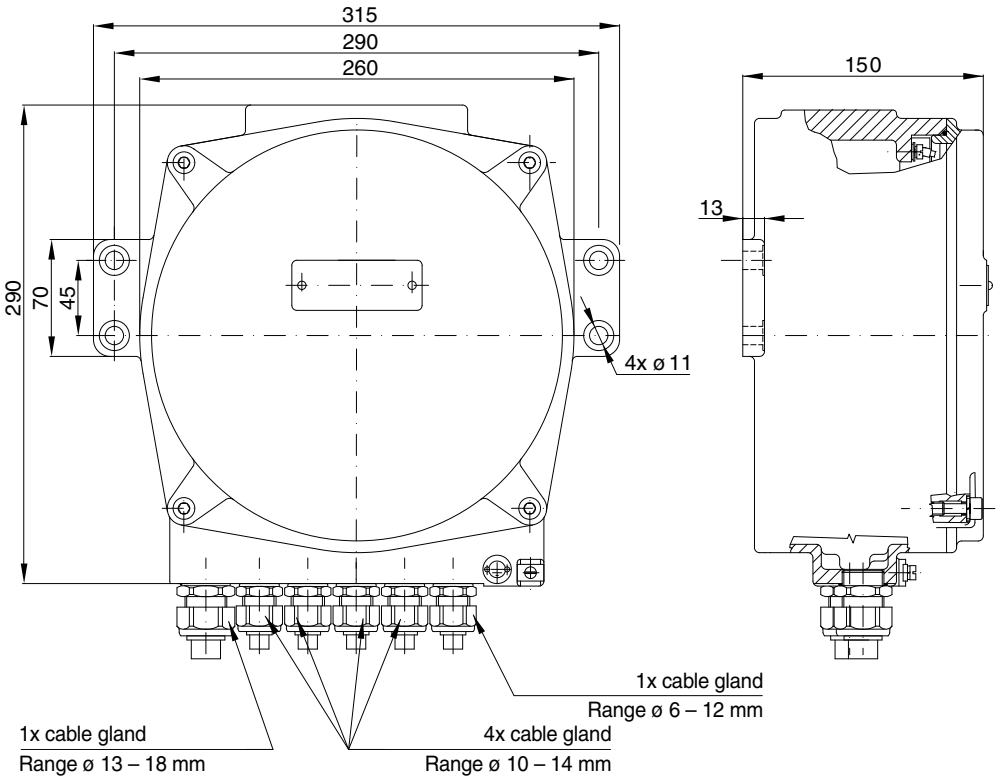
Type number of actuator	Centre of gravity coordinates			Actuator weight [kg]
	x [mm]	y [mm]	z [mm]	
52020.2022S	-56	2	114	42
52022.2012S	-79	0	120	72
52024.2042S	-132	5	136	127
52025.2022S	-153	6	161	206
52026.2002S	-97	0	331	318
52020.3x22S	-27	2	115	25
52022.3x12S	-48	10	105	45
52024.3x42S	-95	5	140	88
52025.3x22S	-165	6	145	154
52026.3x02S	-110	0	315	241

Modification for rising spindle



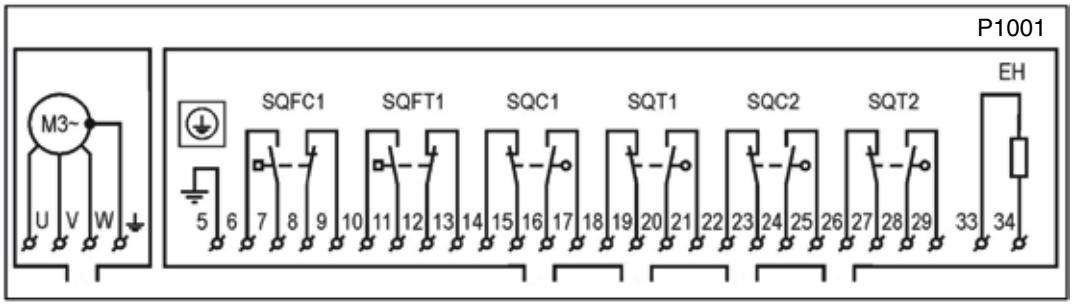
Dimension	Type number			
	52 020	52 021 52 022	52 024	52 025 52 026
ø d_1	44	60	90	98
ø d_2	35	50	75	86
ø d_3	65	80	120	110
ø d_4	55	70	160	100

Dimensional drawing of CONTROL block

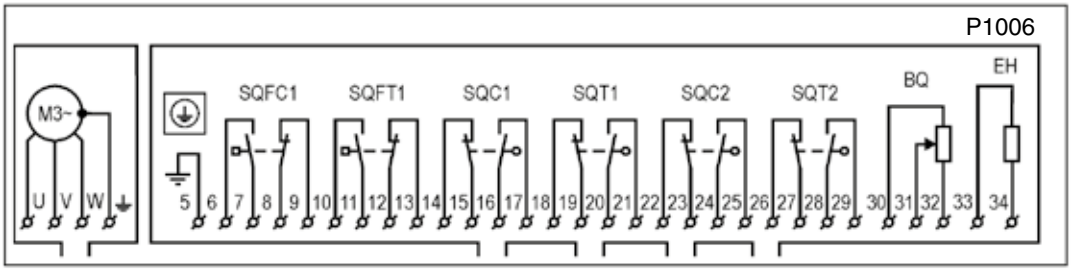


Internal wiring diagrams of **MODACT MOA** actuator connection

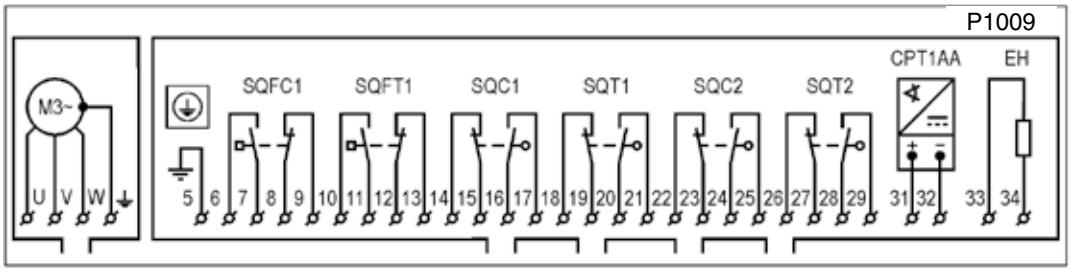
Without position transmitter



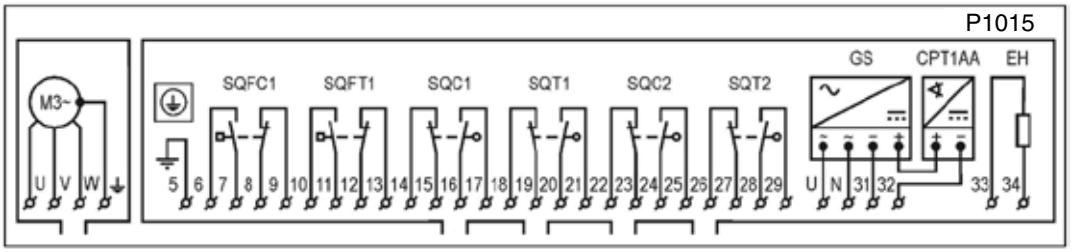
Position transmitter: resistance 100 Ω



Position transmitter: current 4 – 20 mA



Position transmitter: current 4 – 20 mA with power supply (only for aluminum design)



Legend

SQFC1 *(MO)* – torque switch “open”
SQFT1 *(MZ)* – torque switch “close”
SQC1 *(PO)* – position limit switch “open”
SQT1 *(PZ)* – position limit switch “closed”
SQC2 *(SO)* – position signalling switch “open”
SQT2 *(SZ)* – position signalling switch “closing”
BQ – remote transmitter *(potentiometer)*
M – three-phase asynchronous motor
EH – heating resistor
CPT1AA – current transmitter CPT 1AEE
GS – power supply for ZPT 01AAE

Notes:

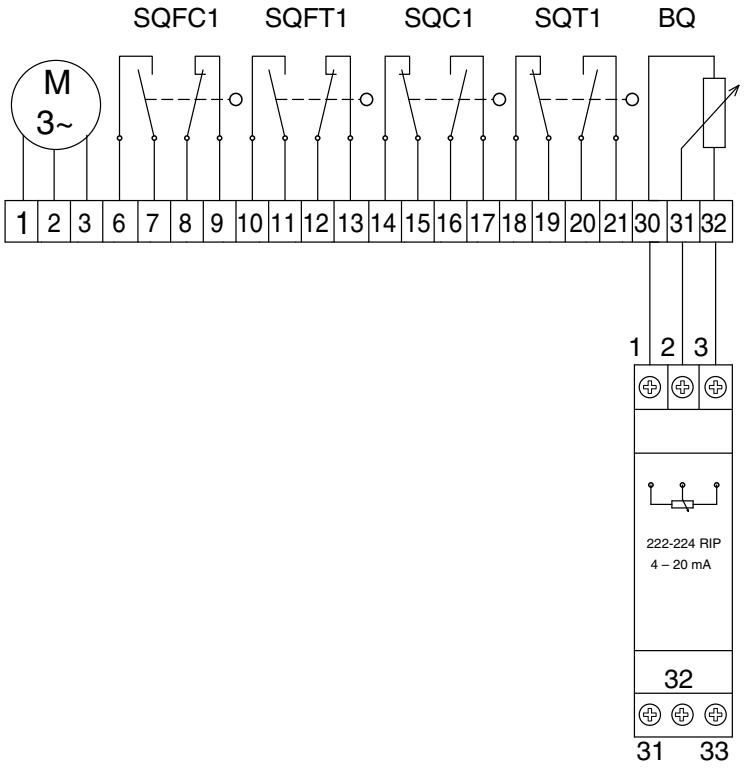
In the design with current transmitter the user must provide connection of two-wire circuit of current transmitter to ground of the adjacent regulator, computer etc. Connection must be provided only in one point in any part of the circuit, outside the electric actuator.

Micro switches can be used only as single-circuit micro switches. Two voltages with different values or phases must not be led to the contacts of one micro switch. Contacts of the micro-switches are drawn in the intermediate position.

Transmitter 4 – 20 mA

The converter is delivered as a separate mounting block for **MOA OC** and **MOA** actuators with resistive transmitter position. It transforms the signal of the 100 Ω resistive transmitter to a unified signal of 4 – 20 mA. The supplied converters are made by Treston, in the 222-224 RIPa/SO/BT III/ZOV design. They have an extended range of adjustability, even only 30% of the travel of the resistive transmitter can be converted to the output signal of 4 – 20 mA.

The Annex includes technical data and instructions of the converter manufacturer, which must be observed during assembly.



Connection of the converter to the servomotor

Setting procedure

– Set the actuator limit switches and the resistive transmitter according to the Assembly Instructions.

– Connect the converter according to the manufacturer's recommendations and remove the cap that covers the two adjustment potentiometers.

– Set the range of the converter:

– adjust the actuator to the closed position and set the 4 mA current using the top potentiometer

– adjust the actuator to the open position and set the 20 mA current using the bottom potentiometer

– adjust the actuator to the closed and check the 4 mA current setting

– adjust the actuator to the open and check the 20 mA current setting

– if the values are set, cover the converter with the cap.

INDUSTRIAL SIGNAL CONVERTERS TO MOUNT ON DIN TS-35 (IP 20) rail

Converter for resistive transmitters with current output 4 – 20 mA 222-224 RIP

Use

The converters are designed to convert signal from the resistive transmitters to standardized current output of 4 - 20 mA.

Description

The signal from the variable resistor is brought to the input of the converter. The resistance of supply conductors is fully compensated. The circuit operates as a passive transmitter in current loop. The converter output serves also to its power supply. The converter is not equipped with galvanic isolation of input and output signal.

Working conditions

Temperature near the converter box may during operation reach a max. of +70 °C *(upon request of client for a fee up to +85 °C).* The converter can be located at any position.

Note

GND terminal must be well grounded *(on the chassis of the switchboard or to GND of the power supply).* For the converter with an input for potentiometer the maximum output current is at the connection of terminals no. 2 and 3.

Installation instructions

Activities under this section must be performed by at least knowledgeable personnel in accordance with section 5 of the Decree no. 50/1978 Coll., respectively 51/1978 Coll. The 222-224 RIP converter *(222-224 RIR)* is attached by sliding on the DIN TS35 rail. First, place the top pin of the box holder to the top edge of the rail and with a screwdriver *(max. 4 x 1 mm)* gently pull the lock of the bottom locking pin. Press the bottom part of the box to the bar and then release the lock. Doing so will snap the box to the rail. Similarly, you can remove the box from the rail. The connecting cables should be connected as shown in Fig 3. If it is necessary to readjust the measuring range of the converter, it is possible to set the span and zero of the converter using a clockmaker's screwdriver after previous removing the lid of the box. The position of the adjustment trimmers is shown in Figure 2. The recommended power supply for the converter is UNAZ stabilized power supply 24 V / 1.5 W *(manufacturer TRESTON s.r.o.).*

Technical data

input signal		potentiometer
sensor connection		three-wire a the potentiometer or rheostat *(fully compensated influence of connections).*
measuring ranges		see Table of measuring ranges
errors *(ČSN IEC 770)*	basic	0.1 %
	hysteresis	0.02 %
	repeatability	0.015 %
	linearity	0.08 %
temperature dependence *(ČSN IEC 770)*	zero error	0.15 % / 10 K
	margin error	0.1 % / 10 K
	maximum error	0.2 % / 10 K

temperature dependence *(ČSN IEC 770)*		< 0.008 % / 1 V
influence of load resistance		< 0.003 % / 100 Ω
supply voltage		12 to 30 VDC (*reverse polarity protection)*
maximum value of load resistance in current	loop at Vs = 24 V DC	600 Ω
max. resistance of supply conductors to resistance transmitter		1 000 Ω
input signal		4 to 20 mA
current at break of resistance transmitter		max. 30 mA

Measuring ranges

5 to 105 Ω
0 to 130 Ω
0 to 214 Ω
0 to 500 Ω
0 to 1000 Ω
0 to 2500 Ω
0 to 5000 Ω

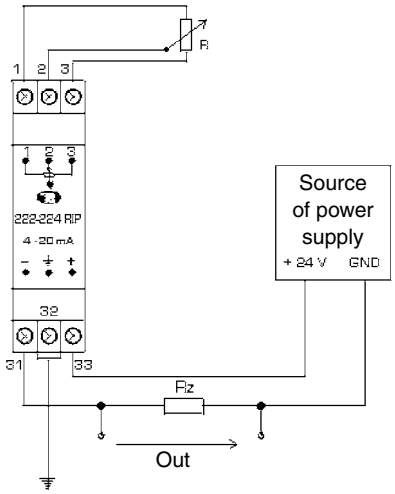
Device operating conditions

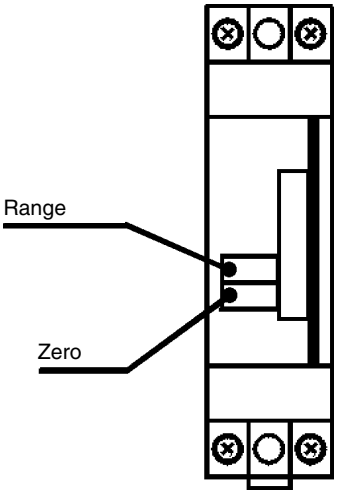
ambient temperature		0 to +70 °C *(-40 to +85 °C)*
relative humidity		40 to 70 %
atmospheric pressure		84 to107 kPa
protection		IP 20
permissible conductor cross section		0.35 to 4 mm^2
module width		22.5 mm
box material		NORYL
box resistance to temperature		dimensional stability up to +120 ° C
box resistance to fire		flame retardant plastic
resistance and stability against vibration	10 to 60 Hz	0.14 mm *(amplitude)*
	60 to 500 Hz	19.6 m/s^2 *(peak acceleration)*
Interference resistance		ČSN IEC 801-3, Level 3 *(Chapter 5)*
		ČSN IEC 801-4, Level 4 *(Chapter 5)*
		ČSN IEC 801-6, Level 2 *(Table 1, art. 5.1)*

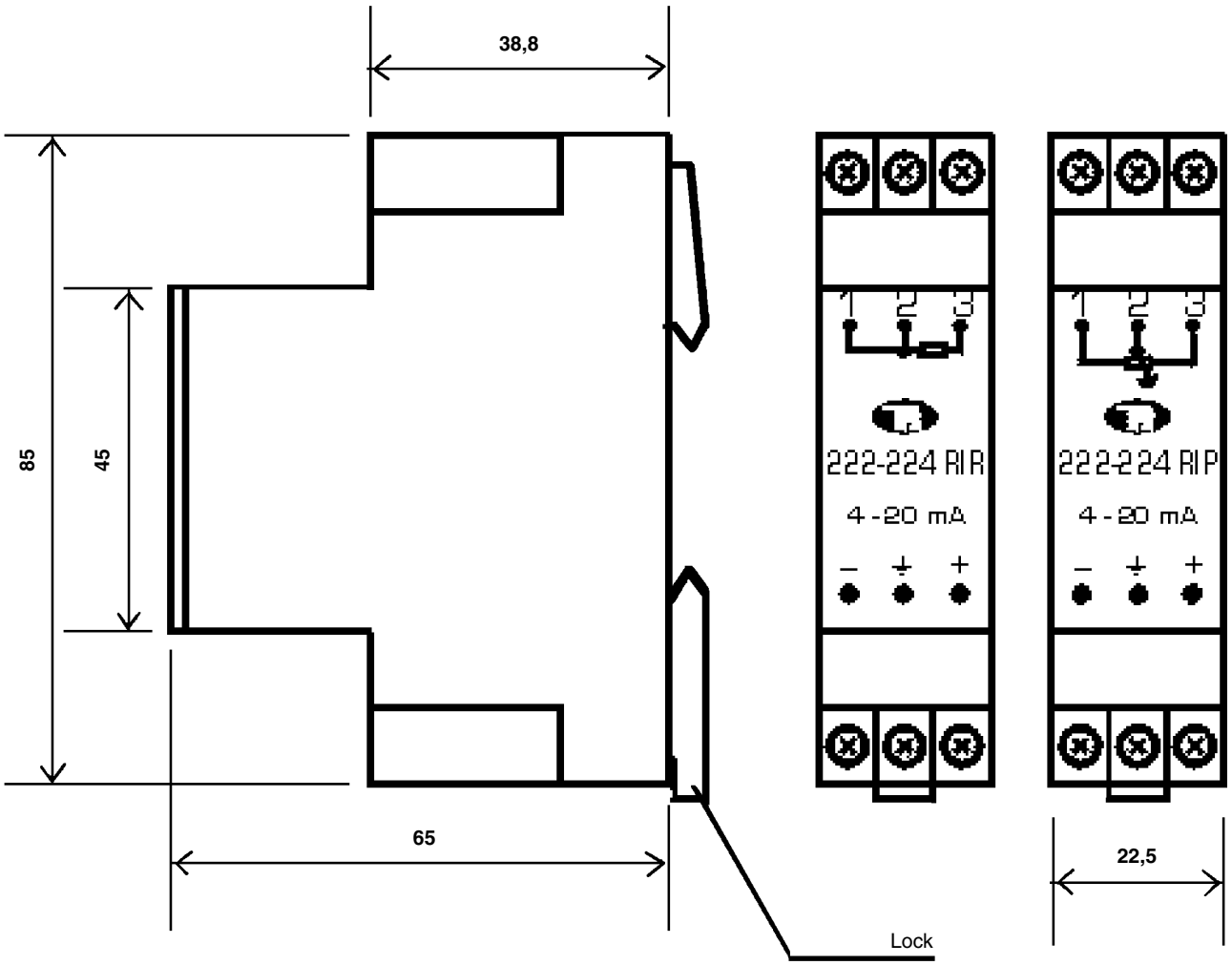
How to Order

The order must state the following: number of pieces
name
order part number in the table

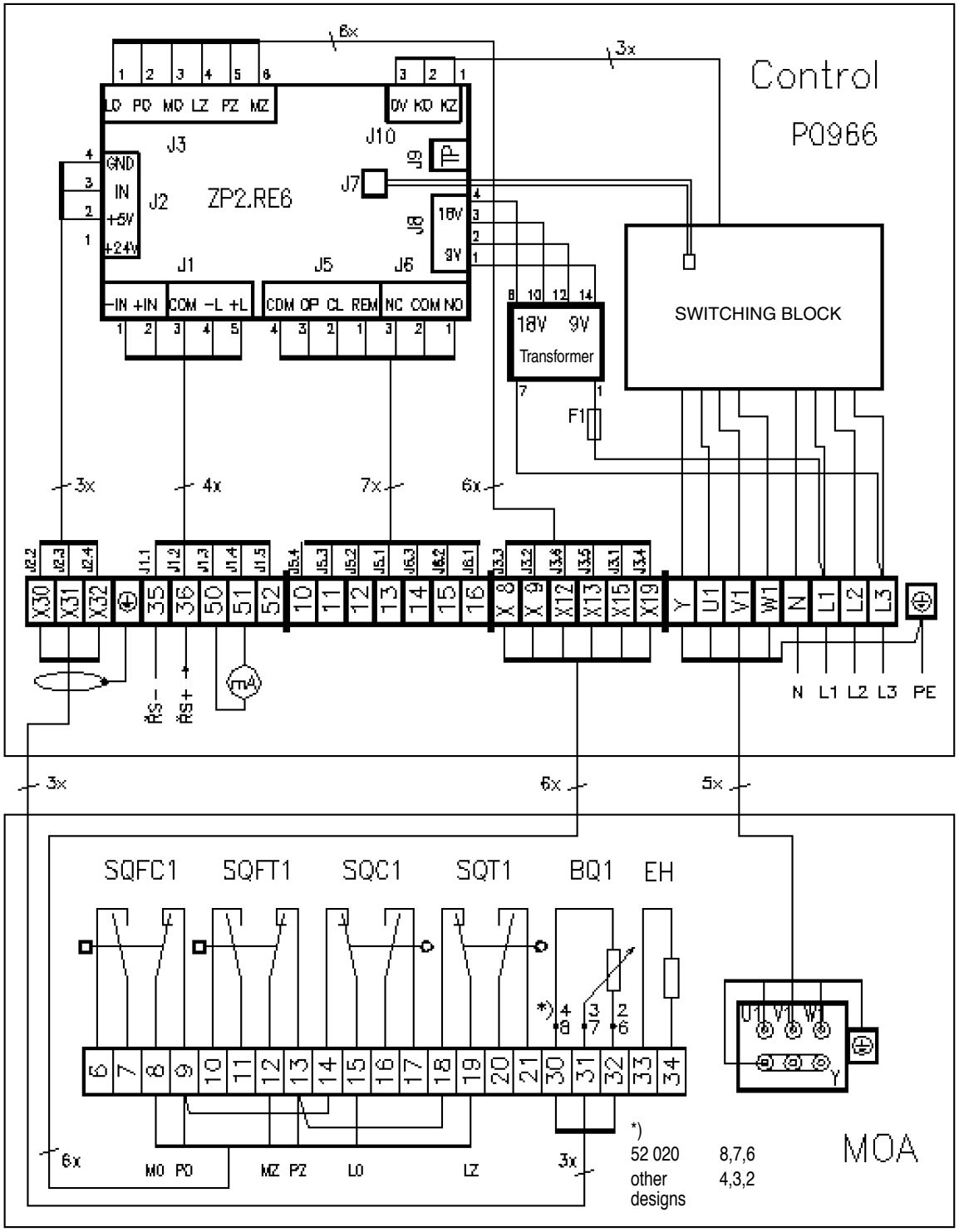
Sample order: 6 converters, MODEL 222-224 RIP
ord. no.: 222-224 RI P 5 to 105 Ω






38,8
85
45
65
Lock
222-224 RIR
4 - 20 mA
222-224 RIP
4 - 20 mA
22,5

Interconnection of actuators **MOA** and **MOA OC** with a Control block – Example of connecting to the MOA actuator



KEY TO SCHEMES

BQ 1	resistive transmitter
SQFC1	torque switch "open" *(MO)*
SQFT1	torque switch "closed" *(MZ)*
SQC1	position switch "open" *(PO)*
SQT1	position switch "closed" *(PZ)*
TH	thermocontact

Signals of connectors of the ZP2RE6 regulator:

Connect J1	**Control signal 4 – 20 mA position 4-20 mA**
J1.1 *(-IN)*	terminal 35 control signal -
J1.2 *(+IN)*	terminal 36 control signal +
J1.3 *(COM)*	terminal 50 output active position 4 – 20 mA
J1.4 *(-L)*	terminal 51 output position common
J1.5 *(+L)*	terminal 52 output possition passive 4 – 20 mA

Connect J2	**Input of resistive, or current position sensor**
J2.1 *(+24V)*	-
J2.2 *(+5V)*	R sensor
J2.3 *(IN)*	R sensor
J2.4 *(GND)*	R sensor

Connect J3	**Input torque and position switches of position sensor**
J3.1 *(LO)*	position "open" *(PO)*
J3.2 *(PO)*	common PO – MO
J3.3 *(MO)*	torque "open" *(MO)*
J3.4 *(LZ)*	position "closed" *(PZ)*
J3.5 *(PZ)*	common PZ – MZ
J3.6 *(MO)*	torque "open" *(MO)*

Connect J4	**Block of local control**
J4.1 *(+24 V)*	control phase
J4.2 *(D)*	phase for remote *(regulator function)*
J4.3 *(LZ)*	phase for locally close
J4.4 *(LO)*	phase for locally open

Connect J5	**Software-adjustable signal relays:**
J5.1 *(REM)*	terminal 13 Relay 1 output for ex. Remote control
J5.2 *(CL)*	terminal 12 Relay output 2 for example Closed position
J5.3 *(OP)*	terminal 11 Relay output 3 for example Open position
J5.4 *(COM)*	terminal 10 linked relay 1, 2, 3 contct

Connect J6	**Central fault relay:**
J6.1 *(NO)*	terminal 16 of switching contact
J6.2 *(COM)*	terminal 15 common contact
J6.3 *(NC)*	terminal 14 break contact

Connect J7	**Brake control**

Connect J8	**Power supply**
J8.1 *(9 V)*	power supply 9 V
J8.2 *(9 V)*	power supply 9 V
J8.3 *(18 V)*	power supply 18 V
J8.4 *(18 V)*	power supply 18 V

Connect J9	**Thermal fuse**
J9.1 *(TP230)*	input 230 V
J9.2 *(TP 24)*	24 V input
J9.3 *(TP 0)*	common input

SPARE PARTS LIST MOA ACTUATORS

Power and control part (five-year operation)

Type number	Part name and ČJK	Drawing or standard No.	Pcs	Use
52 020	Seal ring 125x3 2327311049	ČSN 029281.2	2	Sealing between power transmission box and flange with gears
	Sealing	224612300	1	Terminal board cover sealing
	Seal ring 130x3 2327311041	ČSN 029281.2	1	Seal between the control cabinet and cabinet power transmission
	Seal ring 43x35 2327311008	ČSN 029280.2	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	ČSN 029280.2	1	Sealing of torque tripping shaft
	Seal ring 170x3 2327311054	ČSN 029281.2	1	Sealing of control box cover
	“Git seal” ring 40x52x7 232735066	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 32x2 2327311037	ČSN 029281.2	1	Sealing of local position indicator glass
	Sealing	224612280	1	Sealing below rising spindle hole cover of valve
	Eye sight 2332111121	4-62847	1	Local position indicator cover
	Microswitch 2337441069	B 613-1	1	Microswitches SQFC1, SQC2
	Microswitch 2337441070	B 613-2	1	Microswitches SQT2, SQFT1, SQT1, SQC1
	Sealing ring 36x2 2327311038	ČSN 029281.2	1	Torque spring cover sealing
	“Git seal” ring 40x52x7 2327352066	ČSN 029401.0	2	Sealing of output shaft in power transmission box
	“Git seal” ring 16x28x7 2327352023	ČSN 029401.0	1	Handwheel shaft seal in the cast iron design
	“Git seal” ring 16x28x7 2327352022	ČSN 029401.0	1	Handwheel shaft seal in the alluminum design
	Seal 16/22	224580840	2	Threaded cap sealing (for oil pouring)
	Sealing	224612310	1	Seal between the control box and terminal board
52 021 + 52 022	Seal ring 160x3 2327311048	ČSN 029281.2	1	Sealing between power transmission box and flange with gears
	Sealing	224610540	1	Terminal board cover sealing
	Seal ring 190x3 2327311056	ČSN 029281.2	1	Seal between the control cabinet and cabinet power transmission
	“Git seal” ring 55x70x8 2327352083	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	ČSN 029280.2	1	Sealing of torque tripping shaft
	Seal ring 190x3 2327311056	ČSN 029281.2	1	Sealing of control box cover
	Seal ring 60x50 2327311090	ČSN 029280.2	1	Sealing of output shaft in control box cover
	Seal ring 32x2 2327311037	ČSN 029281.2	1	Sealing of local position indicator glass
	Sealing size 3	224610741	1	Sealing below rising spindle hole cover of valve
	Eye sight 2332111121	4-62 847	1	Local position indicator cover
	Microswitch 2337441069	B 613-1	1	Microswitches SQFC1, SQC2

Type number	Part name and ČJK	Drawing or standard No.		
	“Git seal” ring 60x75x8 2327352090	ČSN 029401.0	2	Sealing of output shaft of power transmission box
	“Git seal” ring 22x32x7 2327352034	ČSN 029401.0	1	Hand wheel shaft sealing
	Seal ring 95x85 2327311029	ČSN 029280.2	1	Seal inserts with "Git Seal" rings in the power box
	Seal ring 50x2 2327311028	ČSN 029281.2	1	Torque spring cover sealing
	Seal ring 16x22	224580840	2	Threaded cap sealing (for oil pouring)
	Sealing	224642240	1	Sealing between electric motor and flange with gears
	Sealing	223527530	1	Sealing between control box and terminal box
	Microswitch 2337441070	B 613-2	1	Microswitches SQT2, SQFT1, SQT1, SQC1
52 024	Seal ring 200x3 2327311044	ČSN 029281.2	1	Sealing between power transmission box and flange with gears
	Sealing	224610540	1	Terminal board cover sealing
	Seal ring 200x3	ČSN 029281.2	1	Seal between the control cabinet and cabinet power
	“Git Seal” ring 80x100x13 2327352097	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	ČSN 029280.2	1	Sealing of torque tripping shaft
	Seal ring 200x3 2327311044	ČSN 029281.2	1	Sealing of control box cover
	Seal ring 75x65 2327310991	ČSN 029280.2	1	Sealing of output shaft in control box cover
	Seal ring 32x2 2327311037	ČSN 029281.2	1	Sealing of local position indicator glass
	Microswitch 2337441070	B 613-2	1	Microswitches SQT2, SQFT1, SQT1, SQC1
	Seal ring 125x110 2327311019	ČSN 029280.2	1	Seal inserts with "Git Seal" rings in the power box
	Sealing size 4	224611130	1	Sealing below rising spindle hole cover of valve
	Eye sight 2332111121	4-62847	1	Local position indicator cover
	Microswitch 2337441069	B 613-1	1	Microswitches SQFC1, SQC2
	“Git Seal” ring 80x100x10 2327352096	ČSN 029401.0	2	Sealing of output shaft in power transmission box
	“Git seal” ring 27x40x10 2327352044	ČSN 029401.0	1	Hand wheel shaft sealing
	Seal ring 70x2 2327311058	ČSN 029281.2	2	Torque spring cover sealing
	Sealing	224591530	1	Sealing between actuator and flange with gears
	Seal 16/22	224580840	2	Threaded cap sealing (for oil pouring)
	Sealing	223527530	1	Seal between the control box and terminal board
52 025	Sealing	224593370	1	Sealing between actuator and flange with gears
	Seal ring 280x3 2327311078	ČSN 029281.2	1	Sealing between flange with gears and power transmission box
	Sealing	224610540	1	Terminal board cover sealing
	Seal ring 260x5 2327311046	ČSN 029281.2	1	Seal between the power transmission cabinet and control box
	“Git seal” ring 85x120x13 2327352098	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	ČSN 029280.2	1	Sealing of torque tripping shaft

	Seal ring 200x3 2327311044	ČSN 029281.2	1	Sealing of control box cover
	Seal ring 90x80 2327311011	ČSN 029280.2	1	Sealing of output shaft in control box cover
	Seal ring 32x2 2327311037	ČSN 029281.2	1	Sealing of local position indicator glass
	Sealing	224611130	1	Sealing below vertical spindle hole cover of valve
	Eye sight 2332111121	4-62847	1	Local position indicator cover
	Microswitch 2337441069	B 613-1	1	Microswitches SQC2, SQFC1
	“Git seal” ring 105x130x13 2327352109	ČSN 029401.0	2	Sealing of output shaft in power transmission box
	“Git seal” ring 30x50x12 2327352054	ČSN 029401.0	1	Hand wheel shaft sealing
	Microswitch 2337441070	B 613-2	1	Microswitches SQT2, SQFT1, SQT1, SQC1
	Seal ring 90x2 2327311081	ČSN 029281.2	1	Sealing below torque spring cover
	Seal 16/22	224580840	2	Threaded cap sealing (for oil pouring)
52 026	Spare parts for type number 52 026 are the same as for the type number 52 025, but complemented by:			
	“Git seal” ring 150x180x15 2327352108	ČSN 029401.0	1	Sealing for gear box output shaft
	“Git seal” ring 95x125x13 2327352107	ČSN 029401.0	1	Bottom sealing of central wheel
	“Git seal” ring 105x130x13 2327352109	ČSN 029401.0	1	Top sealing of central wheel
	Sealing	224612480	1	Sealing between actuator and differential gear
	Sealing	224612590	1	Sealing between flange with bearing and differential gear
	Sealing	224612580	1	Sealing between flange and flange with bearing

ZPA PEČKY, a.s.

Development, production and services of electric actuators and switchboards.
Top-quality sheet-metal processing (TRUMPF equipment), powder paint shop.

SURVEY OF PRODUCED ACTUATORS

KP MINI, KP MIDI
Electric rotary (90°) actuators (up to 30 Nm)

MODACT MOK, MOKED, MOKP Ex, MOKPED Ex
Electric rotary (90°) actuators for ball valves and flaps

MODACT MOKA
Electric rotary (90°) actuators for nuclear power stations
application outside containment

MODACT MON, MOP, MONJ, MONED, MOPED, MONEDJ
Electric rotary multi-turn actuators

MODACT MO EEx, MOED EEx
Explosion proof electric multi-turn actuators

MODACT MOA
Electric multi-turn actuators for nuclear power stations
application outside containment

MODACT MOA OC
Electric multi-turn actuators for nuclear power stations
application inside containment

MODACT MPR Variant
Electric rotary (160°) lever actuators with a variable output speed

MODACT MPS Konstant, MPSED
Electric rotary (160°) lever actuators with a constant output speed

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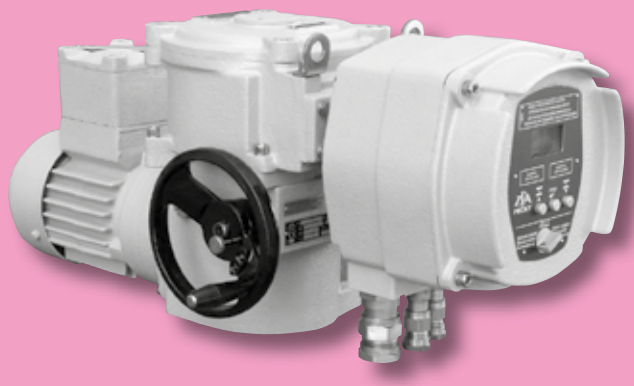
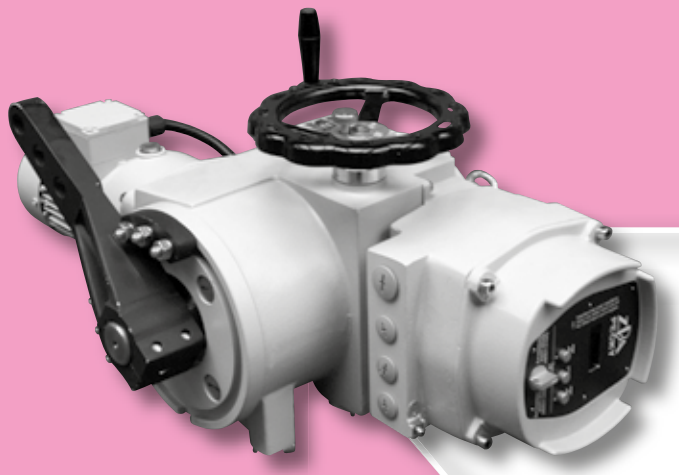
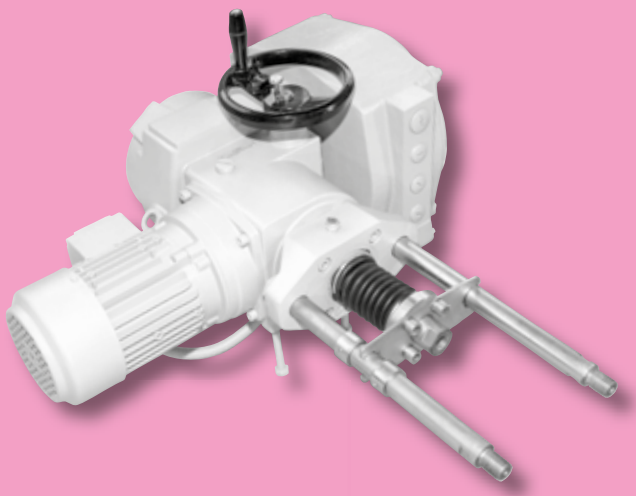
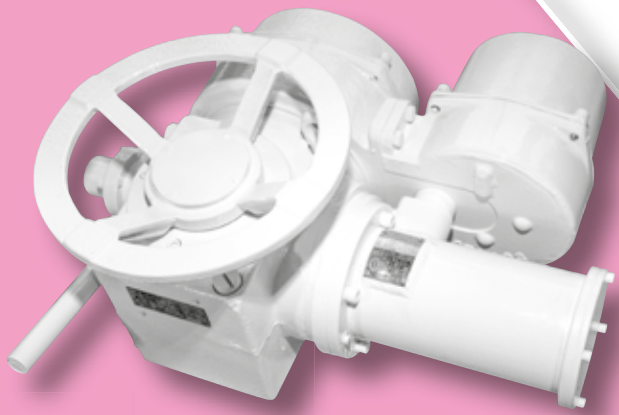
Deliveries of assembled actuator + valve (or MASTERGEAR gearbox) combinations

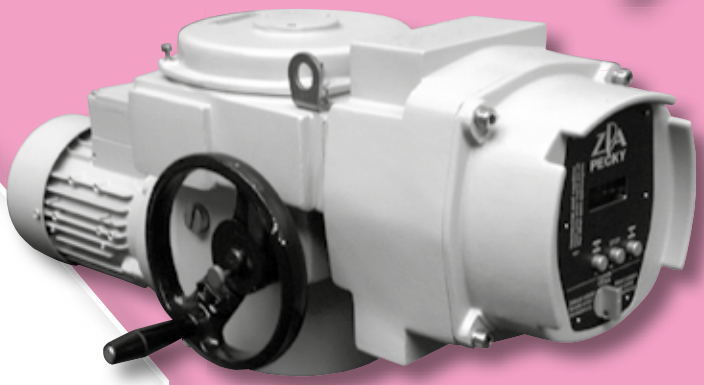
TRADITION • QUALITY • RELIABILITY

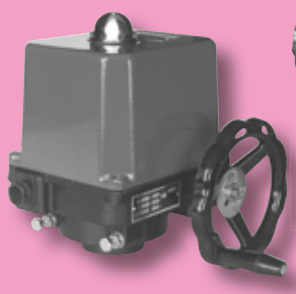


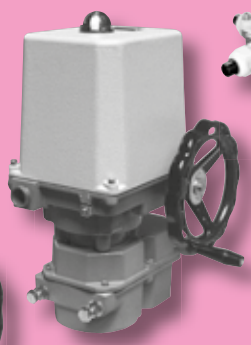












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