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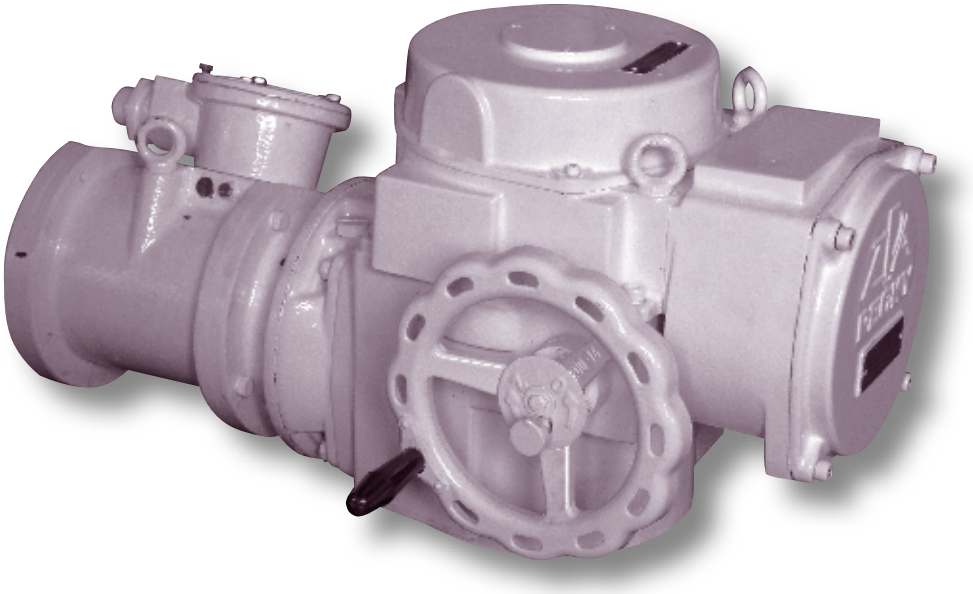
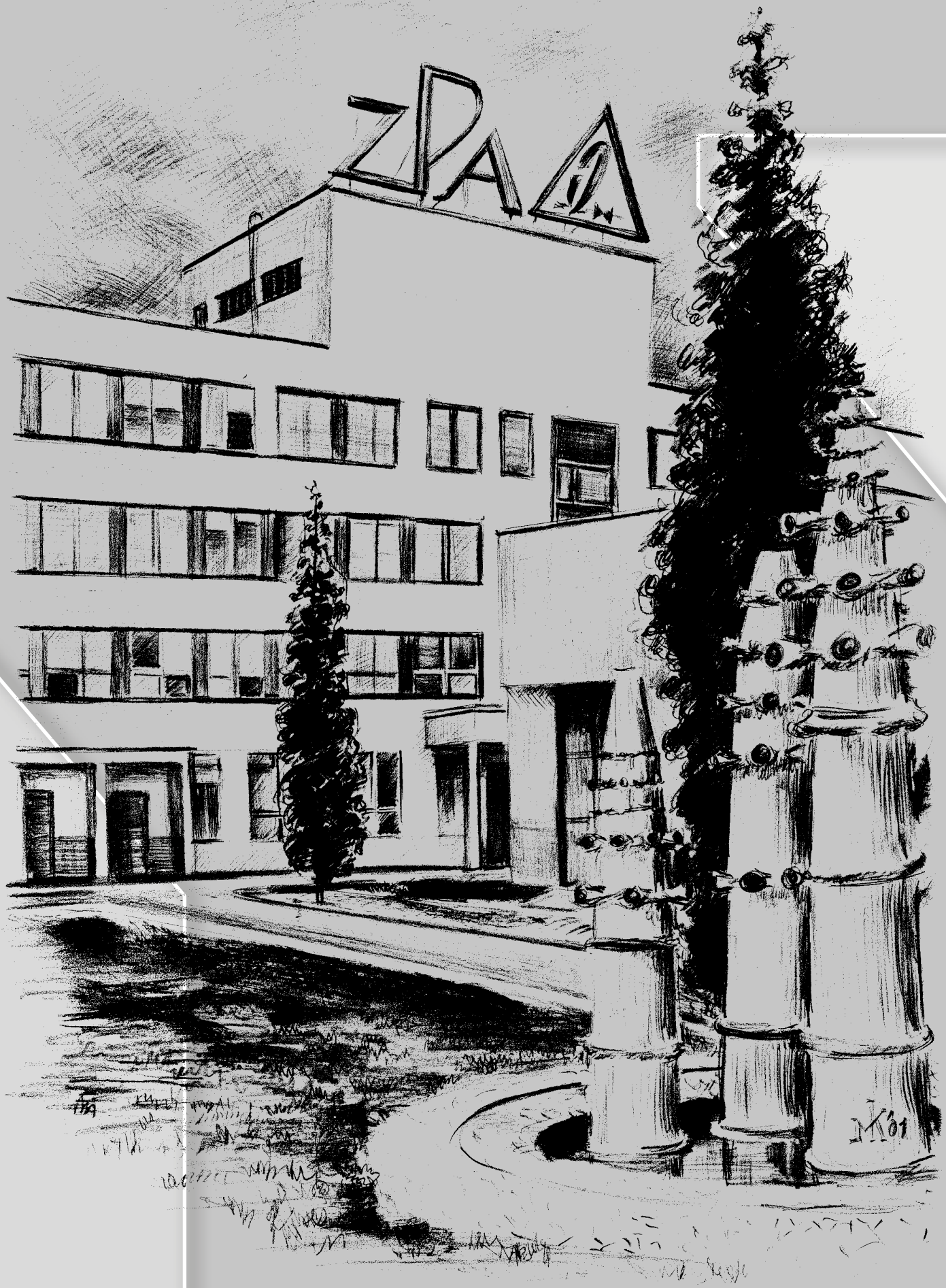


INSTALLATION INSTRUCTIONS

Electric actuators for special valves to be installed under hermetic containment of nuclear power plants operating reactors VVER or RBMK

MODACT MOA OC

Type numbers 52 070.7xxx - 52 076.7xxx



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Multi-turn actuators are designed to control shut-off valves, including valves of protective systems, located under the containment of nuclear power plants with VVER-type reactors and in the containment boxes of nuclear power plants with RBMK-type reactors.

1. USE

Rotary multirevolution electric actuators **MODACT MOA OC** are intended for remote control of special valves installed in hermetic boxes or under the containment of nuclear power plants operating reactors VVER or RBMK. They are intended for safety circuits as well as for normal use.

2. OPERATING ENVIRONMENT

Electric actuators must operate reliably both in normal operation modes and in emergency modes. Depending on the NPP and reactor type, the modes are described in detail in the specifications for electric actuators.

Normal operating mode:

Temperature	from 5 °C to 70 °C
Pressure	0.085 – 0.1032 MPa
Relative humidity	up to 95 ± 3 %
Radiation level	up to 1 Gy/h

Operating regime for failure in heat removal – reactors VVER:

Temperature	from 5 °C to 75 °C
Pressure	0.05 – 0.12 MPa
Relative humidity	up to 100 %
Radiation level	up to 1 Gy/h
Duration of regime	up to 15 h
Frequency of regime occurrence	once a year

Accident regime of small leakage *(reactor VVER):*

Temperature	up to 90 °C
Pressure	up to 0.17 MPa
Relative humidity	air-steam mixture
Radiation level	up to 1 Gy/h
Duration of accident regime *(accident pressure, temperature)*	up to 5 hours
Duration of post-accident regime *(post-accident pressure, temperature)*	up to 720 hours
Post-accident pressure	0.05 – 0.12 MPa
Post-accident temperature	from 5 to 60 °C
Frequency of regime occurrence	once in two years

Accident regime in boxes caused by dehermetization of the facility *(reactor RBMK)*

Temperature	up to 105 °C
Pressure	up to 0.15 MPa
Relative humidity	up to 100 %
Radiation level	up to 1 Gy/h
Duration of regime	6 hours
Frequency of regime occurrence	once in two years

Accident regime of great leakage – reactor VVER:

Temperature	up to 150 °C
Pressure	up to 0.5 MPa
Relative humidity	air-steam mixture
Radiation level	up to 1x 10^3 Gy/h
Duration of regime *(accident pressure, temperature)*	up to 10 hours
Duration of post-accident regime *(post-accident pressure, temperature)*	up to 720 hours
Post-accident pressure	0.05 – 0.12 MPa
Post-accident temperature	from 5 to 60 °C
Frequency of regime occurrence	once in 30 years

3. TECHNICAL PARAMETERS

The basic technical parameters are tabulated below.

Power supply voltage of electnc motor – 3 x 380V / 50 Hz

Type of protective enclosure – IP 55

Workposition

The operating position of the actuator with plastic lubrication can be any, with liquid oil - any, provided that the electric motor is not under the actuator.

The angle between the motor axis and the horizontal plane with the top at the end of the motor output shaft, plotted in the lower half-plane, should be no more than 15°.

Resistance against seismic shocks and other parameters are specified in the technical conditions of theese actuators.

4. DESCRIPTION

The actuators are designed for direct fitting onto the valve. The connection is realized by means of a flange:

Shape B3 according to ISO 5210 *(shape E according to DIN 3210)*

Shape C according to DIN 3338.

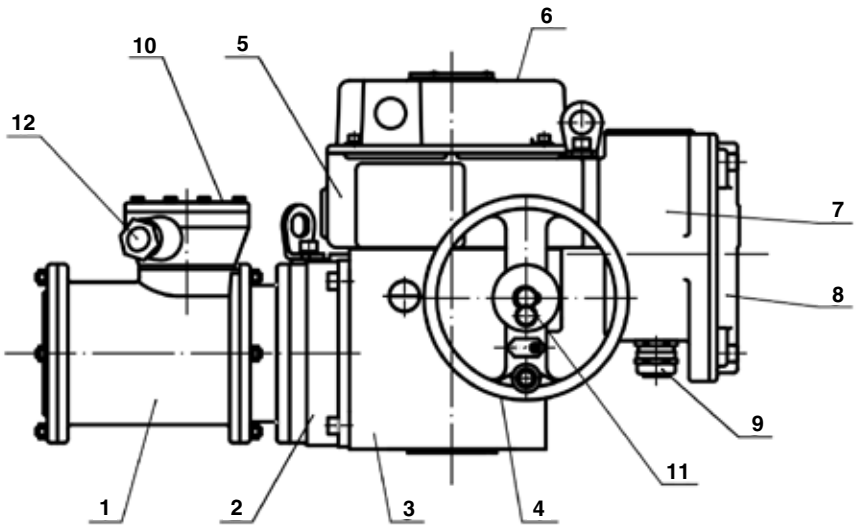
Particular dimensions are given in the annex to this catalogue. Actuators with connection according to the Russian standard GOST are also available.

The layout of actuator parts is shown in Fig 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 and reaches to the control box 5 where all the actuator controls are gathered – positional, signalling, and torque switches. Operation of positional and signalling switches is derived from motion of the output shaft via relevant mechanisms.

The torque switches are activated from axial shif of the manual control “floating worm” whose position is sensed and brought over to the control box via a small lever. The inside controls are accessible once the lid 6 of the box is removed. The terminal board box 7 is also hidden under the lid 8. The cable inlets are secured using the cable bushings 9. The motor has a separate terminal board 10 and a cable bushing.

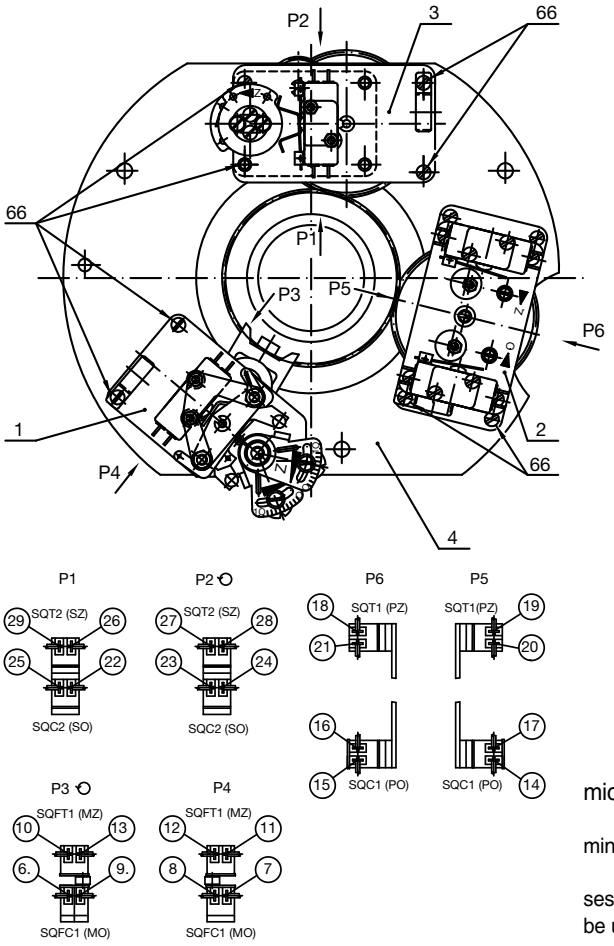
The individual actuator functions, such as deactivation at a particular torque or position value, signalling of position are provided by the mechanical assemblies *(units)*. These units are universal for actuators of all sizes and are available on the control panel *(fig. 2)* housed in the control box.



Legend:

1 – Electric motor
2 – Countershaft gearbox
3 – Power transmission gear
4 – Handwheel
5 – Control box
6 – Control box cover
7 – Terminal box
8 – Terminal box cover
9 – Cable bushngs
10 – Terminal board of electric motor
11 – Lock screw of handwheel
12 – Cable bushing (for motor)

Fig. 1 - ***Actuator assembly***



Legend:

1 – Torque-limit switching unit
2 – Position-limit switching unit
3 – Signalling unit
4 – Base plate
6 – Drive wheel
66 – Fixing screws of units

The individual control units consist of mechanical drives and microswitches.

The encircled numbers correspond to the terminal numbers on the terminal block.

The micro-switches used prevent two voltages of different values or phases from being brought to contacts of the same micro-switch. They can only be used as closing, opening or change-over switches for a single circuit.

Obr. 2 – **Servomotor control board**

4.1 Description and function of control units

a) Torque-limit switching unit *(Fig-3).* Constituting an independent mounting group, this unit consists of the base plate 19, which carries microswitches 20 and provides for bearings of the torque control shaft 22 and the arresting shaft 29. The torque control shaft transmits movements of the floating worm from the power transmission gear to the CLOSE torque-limit microswitch *(MZ)* or the OPEN torque-limit microswitch *(MO)* by means of segments -23- or -24- and levers -45- or -46-. By slightly rotating the segments to bring them into a position opposite the disconnecting levers, the amount of tripping torque can be adjusted. To permit the tripping torque to be readjusted off the factory, the segments 23 and 24 are provided with a scale on which the points of adjustment of both the maximum and minimum torque are marked individually for each actuator. The adjusted torque is marked by means of slots on segments 27 and 28.

The numbers on this scale do not indicate directly the adjustment of the tripping torque. The division marks on the scale serve only for a more accurate division of the zone between the points of maximum and minimum tripping torque,thus enabling more accurate off-factory readjustment of the tripping torque when no loading stand is available. The segment 28 is designed for the CLOSE direction whilst the segment 27 is designed for the OPEN direction.

The torque-timit switching unit is also fitted with a locking device that locks the torque-limit switch, after it has been switched off, to prevent undesired operation of the switch and thus pulsation of the electric actuator. Moreover, the locking mechanism prevents the torque-limit switch from operating after motor run reversing, so enabling the starting torque of the electric motor to be fully used. The locking mechanism works in both directions of rotation of the actuator output shaft both in the end positions and in an intermediate position for the duration of 1 to 2 revolutions of the output shaft after it has been reversed.

With the actuator output shaft loaded at the counteracting torque, the torque control shaft 22 turns slightly so that the segments 23 and 24, whose movements are transmitted to the tripping lever 45 or 46, also turn. When the torque on the actuator output shaft attains the value to which the torque-limit switching unit has been adjusted, the tripping lever actuates the lever of the respective microswitch so that the electric motor is disconnected from the AC rnains and the actuator is stopped.

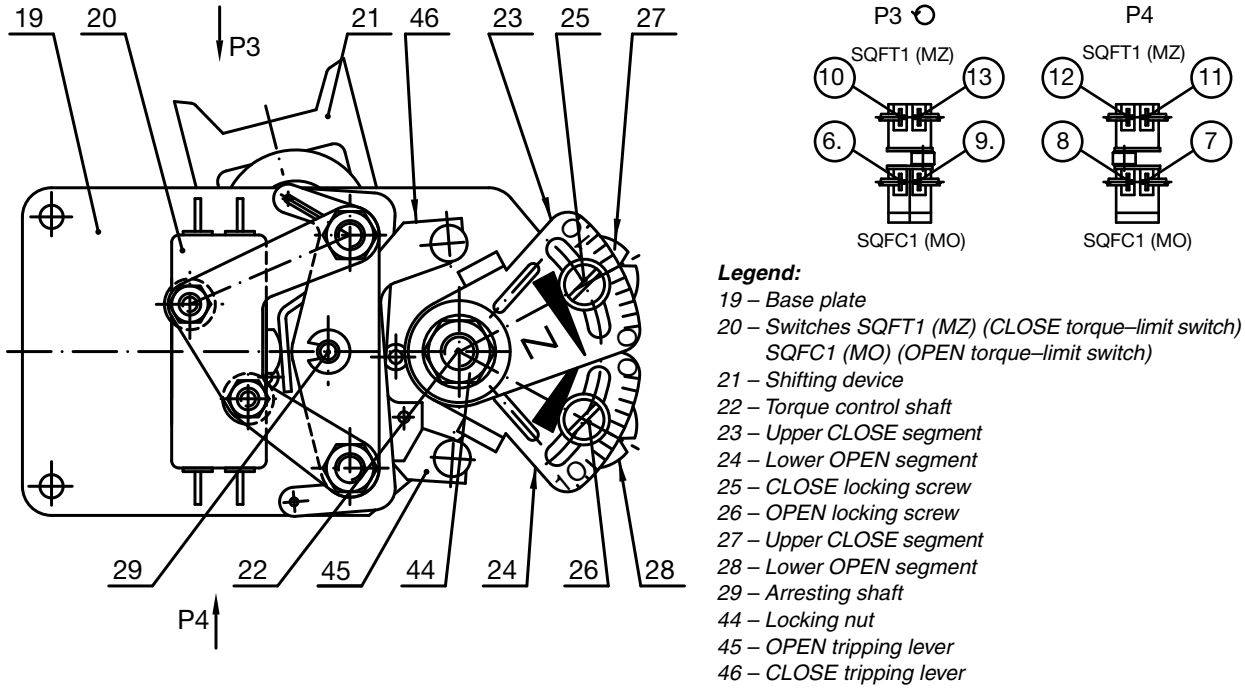
Adjusting procedure of the torque-limit switching unit

Adjustment of another tripping torque than that to which the unit has been adjusted at the factory is carried out so that the locking nut 44 *(Fig. 3)* and the locking screw 25 *(for the CLOSE direction)* or 26 *(for the OPEN direction)* are loosened. Then, by means of a screwdriver placed in a slot of the upper segment 23 or 24, the segment is turned till the slot in the segment 27 *(28)* tallies with the corresponding position on the scale. This position can be determined so that the difference between the maximum and minimum adjustable torque in Nm is divided by the number of scale divisions between the maximum and minimum torque marks. In this way, the number of Nm of the tripping torque per scale division is obtained so that, by interpolation, the scale position can be determined with which the slot in segment 27 or 28 should tally.

The mark > on upper segments -23- and -24- designates the side to which the set torque is increased or decreased, and what coloured line on the scale marks the point of setting maximum tripping torque and the point of setting minimum torque. The unit of torque control must never be set in such a way that the groove in the lower segment is beyond the range marked off by coloured lines on the scale.

After setting the tripping torque, tighten the safety bolt -25- or -26- and the lock nut -44-.

The tripping torque must not be set to values higher than those corresponding to respective type designations in Table no. 1!



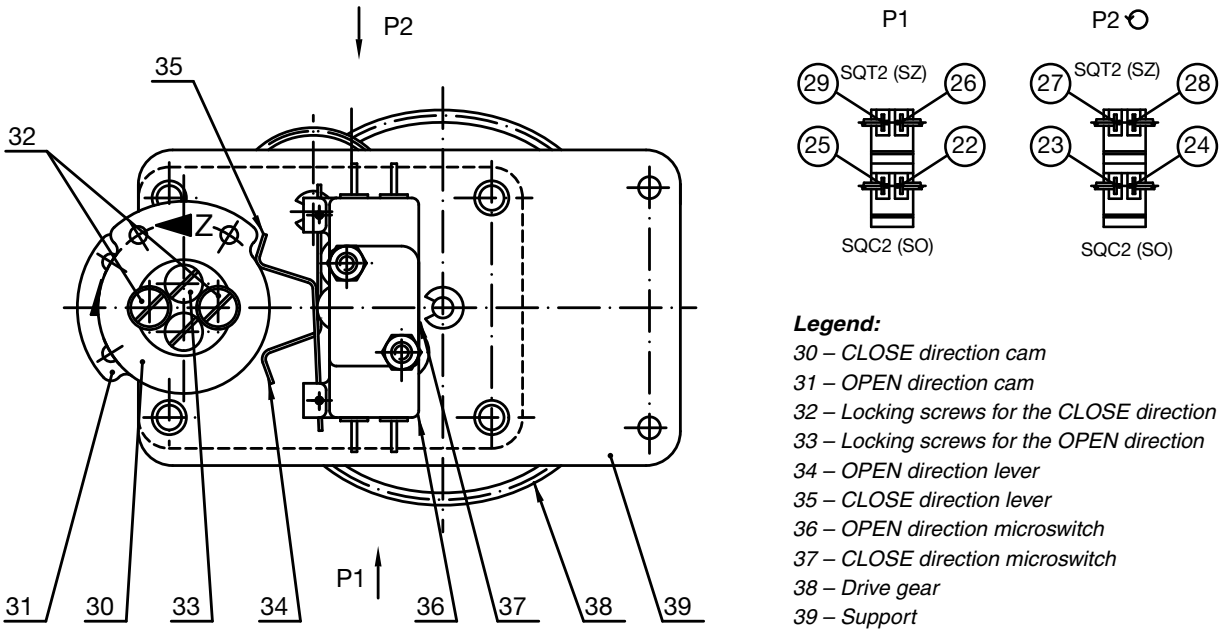
Legend:
19 – Base plate
20 – Switches SQFT1 (MZ) (CLOSE torque–limit switch)
SQFC1 (MO) (OPEN torque–limit switch)
21 – Shifting device
22 – Torque control shaft
23 – Upper CLOSE segment
24 – Lower OPEN segment
25 – CLOSE locking screw
26 – OPEN locking screw
27 – Upper CLOSE segment
28 – Lower OPEN segment
29 – Arresting shaft
44 – Locking nut
45 – OPEN tripping lever
46 – CLOSE tripping lever

The encircled numbers correspond to the terminal numbers on the terminal block.
Two voltages of different values or phases must not be connected to contacts of the same micro-switch.

Fig. 3 – ***Torque-limit switching unit***

b) Signalling unit *(Fig. 4)*. This unit secures the transmission of electric signals to indicate the position of the actuator output shaft. Drive of the signalling unit is provided through gear 38 from the output shaft via a multispeed gearbox to cams 30 and 31 actuating the microswitches 36 *(SO)* and 37 *(SZ),* respectively. The instant of closing the signalling switches can be selected at any point of the working stroke of the electric actuator off the narrow band around the end positions *(the signalling switch should operáte before the position-limit switch while the output shaft is still moving).*

The upper cam 30 operates in the CLOSE direction whilst the lower cam 31 operates in the OPEN direction.



Legend:
30 – CLOSE direction cam
31 – OPEN direction cam
32 – Locking screws for the CLOSE direction
33 – Locking screws for the OPEN direction
34 – OPEN direction lever
35 – CLOSE direction lever
36 – OPEN direction microswitch
37 – CLOSE direction microswitch
38 – Drive gear
39 – Support

The encircled numbers correspond to the terminal numbers on the terminal block.
Two voltages of different values or phases must not be connected to contacts of the same micro-switch.

Fig. 4 – ***Signalling unit***

The signalling unit has been designed as an independent assembly group. It has been assembled on support 39 under which there are gears in an arrangement shown in the kinematic scheme *(Fig. 5).* The gearing has been assembled so that, after loosening the lock screw 47, the adjustable gear K3 can be moved to different levels *(I - V).* By moving the gear K3, the adjustment range of the signalling switches and the transmitter can be changed, depending on the working stroke of the electric actuator. In Fig. 5, the adjustment ranges of the signalling switches are tabulated for the individual positions of the movable gear K3.

Adjustment of the siqnalling unit

If the adjustment range of the signalling switches is required to be changed the position of the movable gear K3 should be changed. For moving the gear K3, the signalling unit should be withdrawn from the control box *(the length of lead-in wires of the microswitches permits it).* To withdraw the unit, the 4 screws 66 *(Fig. 2)* by means of which the unit is attached to the base plate should be removed. After the signalling unit has been set to the required range screw 47 of the movable gear K3 *(Fig. 5)* should be secured by means of a safety wire pin and the unit should be restored and fixed in its position. With the screws 66 tightened, it is essential to check the gears K1 and K2 *(Fig. 5)* for correct engagement.

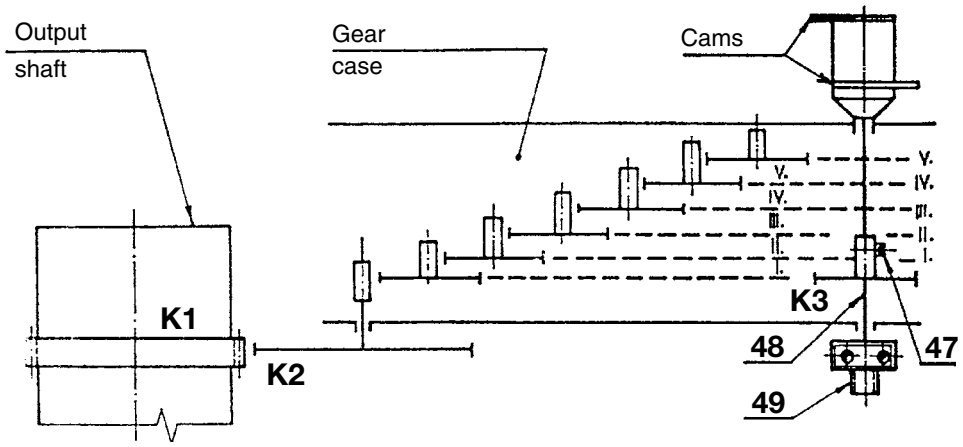
The arrangement of cams and microswitches of the signalling unit is shown in Fig. 4. Shoulders of the cams 30 or 31 displace levers 34 or 35 controling the microswitches 36 and 37, respectively. When setting the signalling and position-limit switches, the actuator outputs shaft should always be brought into the position in which operation of the microswitches should take place.

When adjusting the signalling switches. loosen the screws 32 *(for SQT2, (SZ))* or 33 *(for SQC2, (SO)) (Fig. 4)* first and then rotate the cam 30 or 31 in the direction shown by the arrowhead till the microswitch operates. In this position, the cams should be held while the locking screws are being tightened.

At the lower end of the cam shaft 48 is mounted a pinion 49 which is connected to the shaft 48 by an adjustable friction clutch. From this the pinion is sensed by motion and the resistance transmitter drive.

Warning!

After any handling of the locking screws in the control part of the electric actuator, these screws should be secured against loosening due to vibrations by means of a drop of quick-drying vamish. When the screws have been secured previously in this way old vamish residue should be removed prior to adjustment, the surfaces under the screws should be degreased as perfectly as possible and secured anew by a drop of vamish.



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

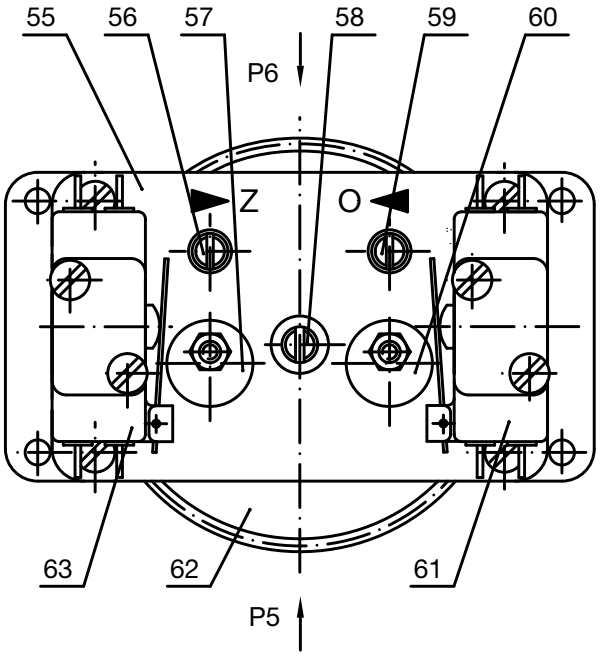
Note:
Position of adjusting gear for actuators ser. No. 52 070 for the various gears is specified on left-hand side of figure 6, for other serial numbers on the right.

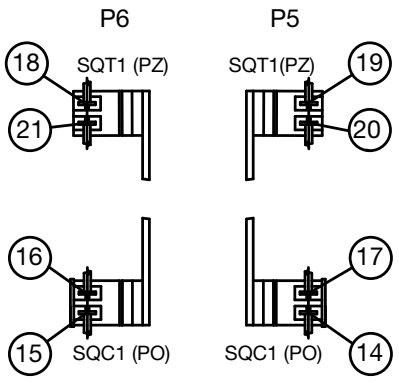
Table for setting the working stroke of the gearbox of the signalling unit

Gear	Type number			
	52 070	52 071 52 072	52 074 52 075	52 076
I	1-2,5	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. 5 – ***Cinematic diagram of gears***

c) Position-limit switching unit *(Fig. 6)* This unit provides for operation of the switches SQT1 *(PZ) (CLOSE position -limit switch)* or SQC1 *(PO) (OPEN position-limit switch)* when the adjusted number of revolutions of the output shaft has been reached. The rotary motion of the unit is derived from movements of the output shaft by means of the drive gear. This gear provides for step-by-step rotation of the arranged speed-change gears controlling cam 57 *(60).* Rotation of the cam as far as the roller of switch SQT1 *(PZ) (CLOSE position-limit switch)* or SQC1*(PO) (OPEN position-limit switch)* causes the switches to change over.





Legend:
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

The encircled numbers correspond to the terminal numbers on the terminal block.
Two voltages of different values or phases must not be connected to contacts of the same micro-switch.

Fig. 6 – ***Position unit***

Handling and adjustment

The unit can be set within the range of 2 to 250 revolutions. The adjusting procedure is the following:

a) After the electric actuator has been attached to a fitting, bring the fitting into the CLOSE position by means of the actuator.
b) In this position, push down the tripping rod 58 in the vertical direction first and then rotate it through 90° to either side.
c) Rotate the arresting screw 56 in the direction of the arrowhead till the cam 57 depresses the spring of the switch SQT1 *(CLOSE position-limit switch)* 63.
d) Rotate the tripping rod 58 through 90° so that the rod is shifted out again. If this is not the case, turn the shaft 56 or 59 by a small amount.
e) By means of the electric actuator, displace the fitting by the required number of revolutions to bring it into the OPEN position.
f) Push the tripping rod 58 in the vertical direction again and then rotate it through 90° to either side.
g) Rotate the arresting screw 59 in the OPEN direction shown by the arrowhead till the cam 60 depresses the spring of the microswitch SQC1.
h) Rotate the tripping rod 58 through 90° so that it is shifted out. If this is not the case, tum the shaft 59 or 56 by a small amount.

Note:

The rotation of the arresting screw 56 or 59 should be stopped at the instant of switching-over.

If the cams are in the position shown in Fig. 6 prior to adjustment or if the cam has already depressed the pushbutton of the microswitch the following adjusting procedure may be of advantage: After pushing-down and rotating the tnpping rod 58, rotate the arresting shaft 56 or 59 in the opposite direction to that shown by the arrowhead till the cam at its top goes down from the microswitch lever *(towards the respective arresting shaft)* and the microswitch changes over. *(This can be checked by means of a suitable tester).* Then, by turning the arresting shaft 56 or 59 backwards in the direction of the arrowhead, run the cam at its top against the microswitch lever till the microswitch changes over again *(with the pushbutton of the microswitch depressed).* In this way, adjustment of the microswitch has been completed. Thereafter, throw out the tripping rod 58 as described above.

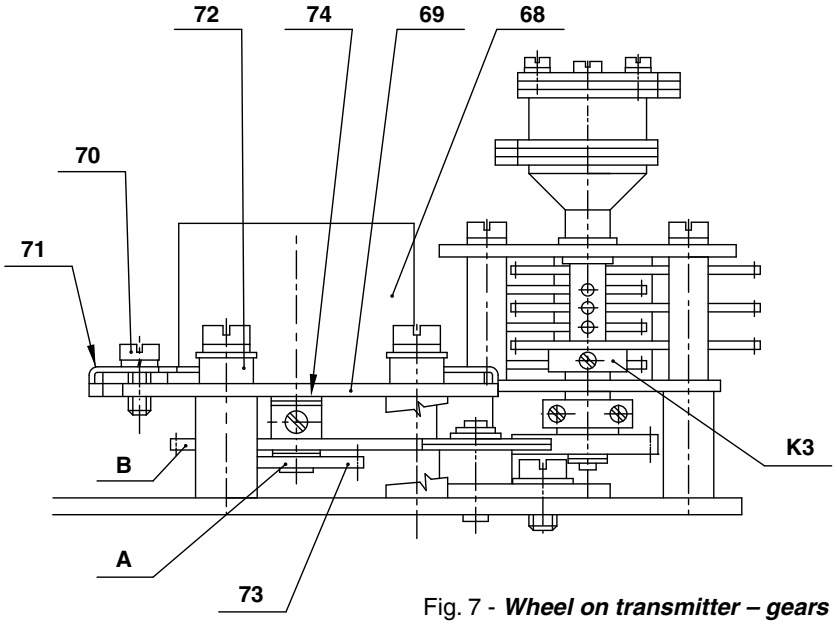


Fig. 7 - ***Wheel on transmitter – gears***

Description:
68 – Resistive transmitter
69 – Transmitter support
70 – Locking bolt
71 – Contact plate
72 – Spacers
73 – Wheelset
74 – Shims

d) Resistive position transmitter

Resistive position transmitter has a nominal value of 100 ohms of resistance signal. The transmitter has a single--sided shaft. At the end of the shaft there is a mounted wheelset 73 consisting of gears A and B.

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).

Furthermore, it is necessary to engage the wheel of the wheel set, which is attached to the transmitter shaft. 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 support *(wheel A is engaged)* or above the transmitter support *(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 support are slightly tightened so as to be able to shift the transmitter support 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 support 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 working stroke of position resistive transmitter

Gear	Wheel on the transmitter	Type number		
		52 070	52 071, 52 072	52 074, 52 075
I	A	0,5 - 1,0	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. Turn the transmitter then to set it to the lowest resistance value *(approx. 4 Ω, no less)* and tighten the screws of the contact plates. 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.

5. PACKING AND STORING

The electric actuators are packed together with the fitting to which they have been attached. The method of packing the fitting assembty with the attached actuator should be specified in the Technical Conditions for the actuator-fitting assembly. For transport of the electric actuators from the manufacturer to the domestic manufacture of fittings for completing with the fitting, covered conveyances should be used. In this case, the electric actuators can be transported unpacked. For direct delivery of electric actuators without fittings to nuclear power stations, the actuators should be packed, according to special packing instructions.

In case of delivery of the actuators to foreign customers, the actuators must be wrapped. Type of the wrapping and its realization must be adapted to transportation conditions and distance to the place of destination.

After acceptance of the electric actuators from the manufacturer, it is essential to check that no damage was caused to them during transport. It is advisable to compare the data on the actuator data plate with those contained in the accompanying documentation and order. Any discrepancies. defects or damage should be immediately reported to the supplier. In such case, putting into operation is excluded.

If the unpacked electric actuator is not installed immediately it should be stored at a dust-free location at a temperature of -25 °C to +50 °C with relative humidity up to 75% where there are no agressive gases or steams and which is safeguarded against detrimental weathering influences. Any handling of the electric actuators at a temperature below -25 °C is forbidden. The electric actuators should not be stored outdoors or at any location that is not protected against rain, snow and ice accretion. Remove excessive slushing only before the electric actuator is put into service. When storing unpacked electric actuators for more than 3 months, it is advisable to put a bag with Silicagel or another suitable desiccant in the terminal box.

6. FUNCTIONAL CHECKING OF THE EQUIPMENT AND LOCATION

Prior to installation, make sure that the electric actuator was not damaged during storing. The electric actuator can be subjected to a functional check by connecting it to the AC mains via a power switch and starting it for a short time. During this test, it is sufficient to check that the electric motor starts and causes the output shaft to rotate. Nevertheless, the actuators should be located so that there is an easy access to the control handwheel and the control box. It is also imperative to check that the location complies with the Operating Conditions. If another method of installation is required under the local conditions this should be consulted with the manufacturer.

7. MOUNTING TO A FITTING

Fit the electric actuator on the fitting so that the output shaft fits into the clutch of the fitting. Attach the actuator to the fitting by means of 4 screws. Rotate the handwheel to check the correct connection between the actuator and the fitting. Remove the top cover from the terminal box and connect the actuator, as shown in the internal and external wiring diagrams.

8. ADJUSTMENT OF ELECTRIC ACTUATOR WITH A FITTING

After the electric actuator has been attached to a fitting and its mechanical connection has been checked, it is possible to commence the adjusting procedure.

1. Bring the electric actuator into an intermediate position by the hand.
2. Connect the actuator to the power supply and, using a short starting up in the middle of the working stroke, verify correct sense of rotation of the output shaft. When viewing into the control box, the drive gear of the position-limit switching units, when moving in the CLOSE direction, should rotate clockwise.
3. Move the actuator electrícally into a position near the CLOSED position, the remaining amount of adjustment to the CLOSED position being completed by means of the handwheel. In the CLOSED position, set the position-limitswitching unit *(CLOSE position-limit switch SQT1),* according to Point 4c.
4. Bring the output shaft into the position in which the signalling switch SQT2 *(CLOSE signalling switch)* is requlired to change over. Adjustment of the switch SQT2 *(CLOSE signalling switch)* should be made, according to Point 4b.
5. Displace the actuator output shaft by the required num-ber of revolutions *(working stroke)* and set the OPEN position-limit switch SQC1, according to Point 4c.
6. Rotate the actuator output shaft into the position in which the OPEN signalling switch SQC2 is required to change over. Adjustment of the OPEN signalling switch SQC2 should be made, according to Point 4c.

   The adjust ment of the position-limit and signalling switches should be tested a number of times.

Significant notices

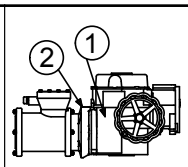
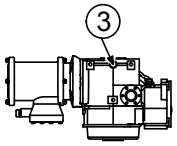
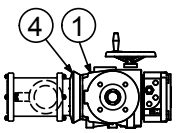
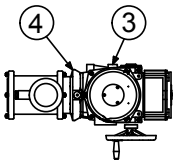
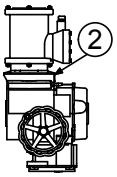
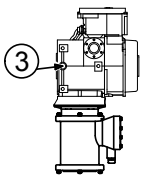
When mounting the fitting with the electric actuator onto piping, it is essential to bring the fitting into the middle position by means of the handwheel. By starting the actuator for a short time, check that the actuator output shaft rotates in the correct direction, i.e. whether it responds correctly to switching operations of the corresponding torque- and position-limit switches. This check can be initiated by depressing the lever of the respective switch. If the actuator does not rotate in the correct direction the two-phase conductors on the actuator terminal block (terminals 1,2,3) should be reversed.

Important warning

a) Pressure valve with attachment is supplied as a MOA OC actuator attachment. After fitting the valve with servomotor,it is necessary to install an overpressure valve on the power or front cabinet of the servomotor. For this purpose the actuator is equipped with holes with M16x1.5 cap screws. The pressure relief valve is mounted in the uppermost opening instead of the cap screw, taking care to ensure that the pressure valve axis is vertical.

   If the actuator is subsequently manipulated, an oil leak can occur through the overpressure valve. Therefore, it is recommended to replace the valve with the original plug prior to handling the actuator.

Safety valve placement table

						
	POSITION	**POSITION**	**POSITION**	**POSITION**	**POSITION**	**PROHIBITED**
ELECTRIC ACTUATORS	Electric motor horizontally Handwheel laterally Control box up	Electric motor horizontally Handwheel laterally Control box down	Electric motor horizontally Handwheel up Control box laterally	Electric motor horizontally Handwheel down Control box laterally	Electric motor up	Electric motor down
52 070	COUNTERSHAFT GEARBOX Can not be placed	COUNTERSHAFT GEARBOX Can not be placed	COUNTERSHAFT GEARBOX Can not be placed	COUNTERSHAFT GEARBOX Can not be placed	COUNTERSHAFT GEARBOX Can not be placed	COUNTERSHAFT GEARBOX Can not be placed
Placement of a safety VALVE	POWER TRANS-MISSION GEAR (1)	POWER TRANS-MISSION GEAR (3)	POWER TRANS-MISSION GEAR (1)	POWER TRANS-MISSION GEAR (3)	POWER TRANS-MISSION GEAR Can not be used filling/blowing	POWER TRANS-MISSION GEAR Can not be used filling/blowing
52 071-75	COUNTERSHAFT GEARBOX (2)	COUNTERSHAFT GEARBOX Can not be used filling	COUNTERSHAFT GEARBOX Can not be used filling	COUNTERSHAFT GEARBOX Can not be used filling	COUNTERSHAFT GEARBOX (2)	COUNTERSHAFT GEARBOX Can not be used filling
Placement of a safety VALVE	POWER TRANS-MISSION GEAR (1)	POWER TRANS-MISSION GEAR (3)	POWER TRANS-MISSION GEAR (1)	POWER TRANS-MISSION GEAR (3)	POWER TRANS-MISSION GEAR Can not be used current blowing hole	POWER TRANS-MISSION GEAR Can not be used current blowing hole

Explanations: (1) Filler hole in the power transmission gear (3) Blowing opening in the power transmission gear

(2) Filler hole in the countershaft gearbox Note: (4) The safety valve can be placed for design 52 070–52 075 with high countershaft gearbox.

b) When installing an electric motor above the horizontal plane it is necessary to fill the oil filling so that it is reliably securedLubrication of the motor sprocket. The amount of oil in the electro-up position is determined individuallyactuator sizes as follows:

type No. 52 070	type No. 52 071 type No. 52 072		type No. 52 074		type No. 52 075
Control speed (rpm):	Control speed (rpm):		Control speed (rpm):		Control speed (rpm):
16, 25, 40, 63	25	40, 70, 100	33	63, 95	20, 25, 36
0,4 litres	0,7 litres	0,6 litres	1,6 litres	1,2 litres	3,0 litres

Addition of the specified amount of oil is best done in the horizontal horizontal position of the servomotor through the hole afterUnscrewing the plug in the front cabinet, and then adding the servomotor to the position.

9. OPERATION AND MAINTENANCE

Operation of the rotary actuators comes out of the operational conditions, being mostly confined to deliverance of pulses for the individual functional tasks. In case of a blackout, the actuator can be shifted with its hand wheel. With the actuator in its automatic mode *(not the regulated one)* the circuit is recommended to contain the manual remote control devices, so that the actuator could be operated in the case of an automatic system failure.

The operators shall make sure that the prescribed maintenance is carried out, that the actuator is protected from the detrimental environmental and climatic effects which are not listed in the paragraph “Operating Conditions”.

Maintenance

The actuators are lubricated with plastic consistent lubricants.

The types of lubricant and amounts are listed in the table. Lubricants in the actuators supplied are designed to last the entire useful life of the unit.

During the time when the actuators are in use, it is not necessary to change or monitor the amount of the lubricant.
The actuators with plastic lubricant are labelled *“Filled: solid grease”* on the power box at the side of the hand-wheel.

Type number of actuator	Amount of lubricant (kg)	Type of lubricant
52 070	1,3	gear oil PP 90
52 071, 52 072	2,8	
52 074	6	
52 075	12	

Note: *The Ciatim 221 lubricant is designed for the friction points of rubber bushings against metal surfaces, roller brake, the hub of an outer gearwheel of a planetary-gear differential of 52 070 actuators (for locations of friction between the shaft and other surfaces).*

10. TROUBLESHOOTING

1. The actuator in its end position, does not start up, motor humming – check for a missing phase.
If the gate valve is wedged and cannot be torn off manually or with motor: de-install the actuator and release the obstruction.

2. After the actuator has started from the end position of the output shaft, it stops spontaneously. It is necessary to ensure that the slot in the change-over wheel *(fig. 2)* stops in the end position of the actuator output shaft *(after tripping of the torque-limit switch)* before it runs on the shifter 21. This is achieved by proper moving round the actuator output shaft during coupling the actuator with the valve or by proper moving round the change-over wheel with respect to the output shaft. For this, the change-over wheel is fitted with two grooves for a connecting spring. In addition, the change-over wheel can be overturned.

Operation instructions

– It is prohibited to put into operation an electric actuator in case it is not accompanied by a passport or if Instructions for assembly, operation, attendance, and maintenance that the user must follow are not available.

– Intervals between two preventative inspections of the actuator are four years.
– In installing the electric actuator, it is necessary to ensure condition required for carrying out inspection, repair, and manual control.
– It is prohibited to use the electric actuator with parameters or in the environment exceeding the values given in these Assembly instructions.
– It is prohibited by carry out disassembly, maintenance, and attendance unless disconnection of the actuator from the power supply is ensured.
– During operation, maintenance, and repairs, the actuators must be properly earthed.

11. PREVENTIVE INSPECTIONS AND REPAIR OF ACTUATORS FOR NPPS

The service life of the MOAOC series actuators is 40 years. Based on the qualification tests and long-term operating experience, the actuator manufacturer recommends that the following range and periods of preventive inspections and repairs be carried out over the useful life:

1. **Preventive inspections and revisions of actuators** – once in 3 years

It is performed by the operator of the actuators and includes the following activities:

– Visual inspection of the actuator for crack, corrosion, check of sealing status, fastening status, leakage check of cable glands, tightening of screw connections. In the event of a fault finding, remove these defects or set the removal procedure.
– After uncoupling the actuator cover, visual inspection of the wiring and marking of the wires, inspection of the internal parts of the actuators, tightening the terminal blocks, checking the connection of protective conductors and wires from the protective connection system are performed.
– Check the transient resistance of the protective conductor connections – $R_p < 0.1\ \Omega$.
– Control unit units – With CIATIM 221 is easy to lubricate the transmission unit, control springs, camshaft circumference and planes.
– Perform a functional test of both extreme positions by means of a remote or local electrical control, checking the setting and function of the position, torque and signaling switches and setting the position indicator and position transmitter. Identify deficiencies in the settings and remove the feature, or determine how to remove them.

2. **Minor repairs** – in case of loss of functionality or damage

The operator of the actuators can make minor repairs by replacing damaged or worn parts such as seals, microswitches, motor, bearings, gear wheels, etc. This can only be done by trained personnel with a valid certificate for this activity.

3. **General actuator repairs** *(overhaul)*

The overall actuator repairs *(overhaul)* are carried out in the event of a major actuator failure or in old and heavily worn actuators. Its aim is to put the actuator in a state close to the new actuator with guaranteed technical parameters.

It is advisable to correct this range in case of operationally important positions and positions of emergency systems that are exposed to increased radiant thermal effects or corrosive effects in order to maintain the continuous operational reliability of the equipment throughout the lifetime *(eg inaccessible, partially or fully closed Areas of steam piping, outdoor spaces, and the like)*.

This can only be done by the manufacturer of actuators, in exceptional cases by the manufacturer's authorized and trained service organization.

Typical technological procedures are introduced to perform reprocessing activities, but its mode and scope always depend on the condition of the actuator and the customer's requirements.

In most cases, the overhaul involves the following activities:

– Replacement of sealing elements (seals, O-rings)
– Replacing lubricant
– Changing torque springs
– Replacing the control units or the entire control panel
– Replacement of fasteners

For extensive repairs involving large quantities and types of actuators, it is advisable to agree on a reprocessing procedure and to agree on the way they are verified *(eg inspection and testing plans for remanufactured actuators).*

Table 1a – ***Basic technical parameters and characteristics of actuators type MODACT MOA OC, aluminium version, planet gearbox, electric motors 4AC***

ACTUATOR										ELECTRIC MOTOR							Start up-to -nominal moment ratio	Start up torque, not less
Size of connecting flange	Type designation	Type code		Torque tripping set range	Working stroke	Output shaft shifting rate	Gear ratio		Max. force on hand wheel	Weight	Type designation	Power	Nominal current	Motor speed	Efficiency	Power factor	Start up-to -nominal current ratio	
		Basic	Additional	[Nm]	[revs]	[revs/min]	from output shaft to motor	from output shaft to hand wheel	[N]	[kg]		[kW]	[A]	[1/min]	[%]	[cos φ]		
F 10	MOA OC 40-16	52 070.7x40		20 – 40	2 – 250	16	90	27	40	31	4AC-56B4A5	0,18	0,90	1400	48	0,60	2,5	2,5	100
	MOA OC 40-25	52 070.7x00				25	55												
	MOA OC 32-40	52 070.7x10		20 – 32		40	34		30									2,1	67
	MOA OC 63-25	52 070.7x60		40 – 63		25	55		60									2,0	110
	MOA OC 80-16	52 070.7x20		40 – 80		16	90		80										160
F 14	MOA OC 160-25	52 071.7x00		63 – 160		25	56		110	58	4AC80A4A5	1,30	4,60	1375	62	0,70	4,0	2,5	400
	MOA OC 160-40	52 071.7x10				40	36												
	MOA OC 160-70	52 071.7x20				70	20				4AC80B4A5	1,70	6,20	1400	64	0,65			
	MOA OC 160-100	52 071.7x30				100	14											2,1	336
	MOA OC 250-25	52 072.7x00		160 – 250		25	56		190		4AC80A4A5	1,30	4,60	1375	62	0,70		2,5	625
	MOA OC 250-40	52 072.7x10				40	36				4AC80B4A5	1,70	6,20	1400	64	0,65			
	MOA OC 250-70	52 072.7x20				70	20											1,9	475
F 16	MOA OC 400-33	52 074.7x00		250 – 400	2 – 240	33	43	31	210	88	4AC80B4A5	1,70	6,20	1400	64	0,65	4,0	2,0	800
	MOA OC 400-63	52 074.7x10				63	23			102	4AC100S4A5	3,20	8,40	1410	75	0,76	6,0		
	MOA OC 400-95	52 074.7x20				95	15			109	4AC100L4A5	4,25	11,0		77				
	MOA OC 630-33	52 074.7x40		400 – 630		33	43		330	105	4AC100S4A5	3,20	8,40		75				1260
	MOA OC 630-63	52 074.7x50				63	23			109	4AC100L4A5	4,25	11,0		77				
F 25	MOA OC 2000-20	52 075.7x30		1000 – 2000		20	70	54	720	208	4AC132SA4A5	7,50	16,3	1395	84	0,83	6,5	1,8	3600
	MOA OC 2000-25	52 075.7x40				25	56												
	MOA OC 2000-36	52 075.7x50				36	39				4AC132S4A5	9,50	22,0	1380	82	0,80	5,5		
F 30	MOA OC 4000-9	52 076.7x00		2000 – 4000	1 – 100	9	163	134	630	269	4AC132SA4A5	7,50	16,3	1395	84	0,83	6,5	1,8	7200
	MOA OC 4000-11	52 076.7x10				11	128												
	MOA OC 4000-16	52 076.7x20				16	90				4AC132S4A5	9,50	22,0	1380	82	0,80	5,5		

X ... customer adds:

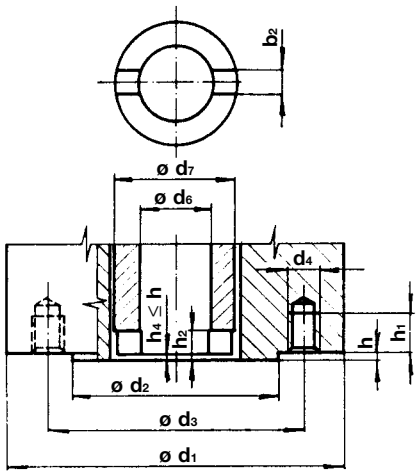
0 ... for C-dimensional connection dimension without transmitter
1 ... for the E dimension without the transmitter

Comment:

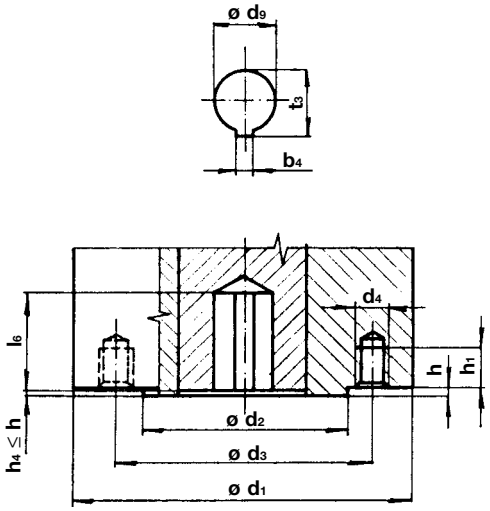
1) *The table shows one force from a pair of forces acting on the circumference of the handwheel. The size of the actuator is determined by the size of the connecting flange according to ISO 5210.*
2) *Connection of actuators - plug gland on the terminal block.*
3) *The specified rated current is for the 380 V supply voltage. For the 400 V supply voltageIs I_n 400 = I_n 380 x 380/400.*
4) *The stated weight of the actuators does not include the weight of the adapters. Weight tolerances ±5%.*

Connecting dimensions of electric actuators **MODACT MOA OC**

Shape C *(according DIN 3338)*



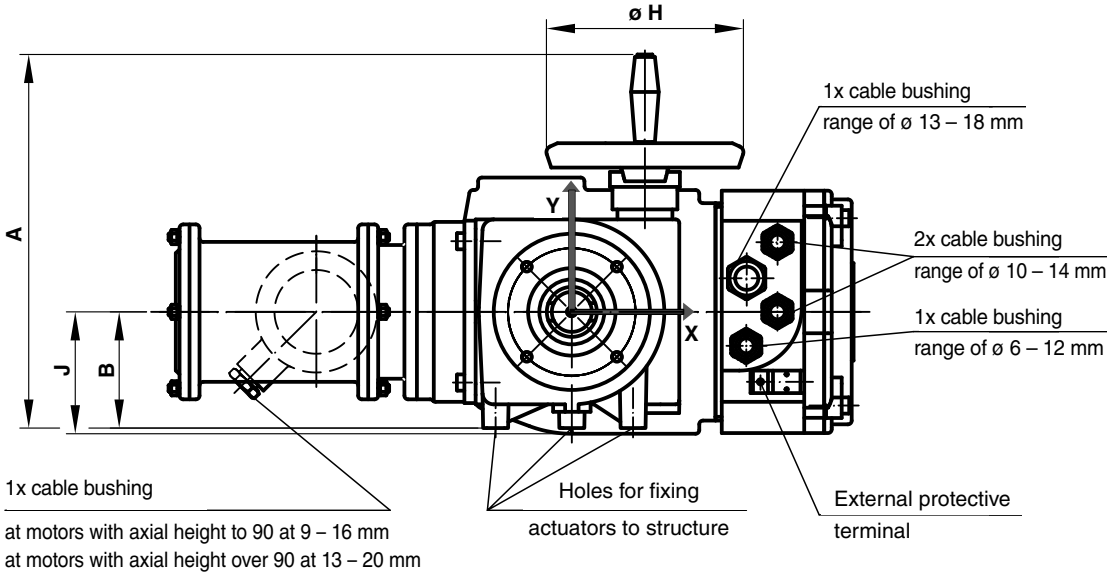
Shape B3 according ISO 5210
(Shape E according DIN 3210)

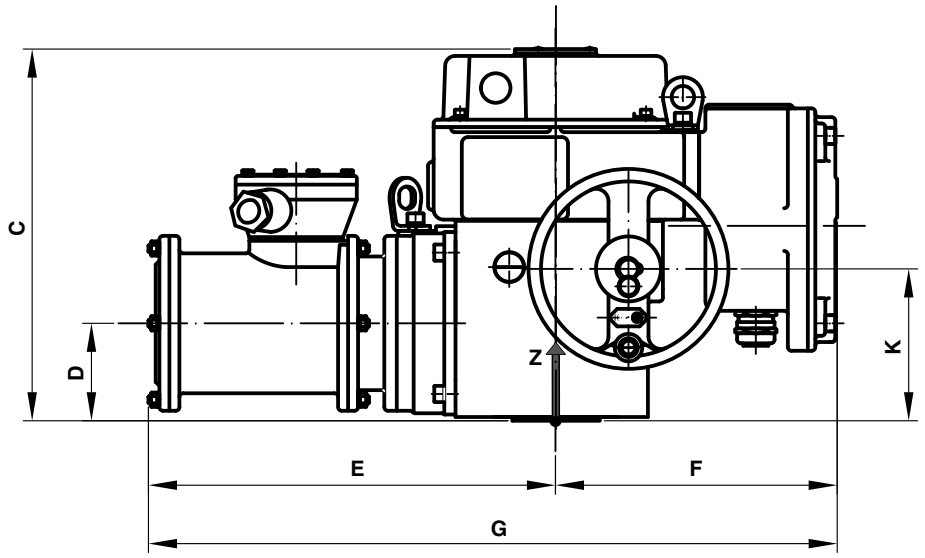


Shape	Dimension	Type number				
		52 070	**52 071 52 072**	**52 074**	**52 075**	**52 076**
Common values for both shapes C, B3 *(E)*	ø d_1 orient. hodnoty	125	175	210	300	390
	ø d_2f8	70	100	130	200	230
	ø d_3	102	140	165	254	298
	ø d_4	M 10	M 16	M 20	M 16	M 20
	number of threaded holes	4	4	4	8	8
	h1 min. 1,25 d_4	12,5	20	25	20	25
	h max.	3	4	5	5	5
Values for shape C	ø d_7	42	60	80	100	120
	h_2	10	12	15	16	18
	b_2 H11	14	20	24	30	40
	ø d6	30	41,5	53	72	72
Values for shape *(E)*	ø d_9 H8	20	30	40	50	60
	l_6 min.	55	76	97	117	127
	t_3	22,8	33,3	43,3	53,8	64,4
	b4Js9	6	8	12	14	18

The dimensions ø d_6 and l_6 must not be smaller than stated in the table.
The dimensions are given in mm.

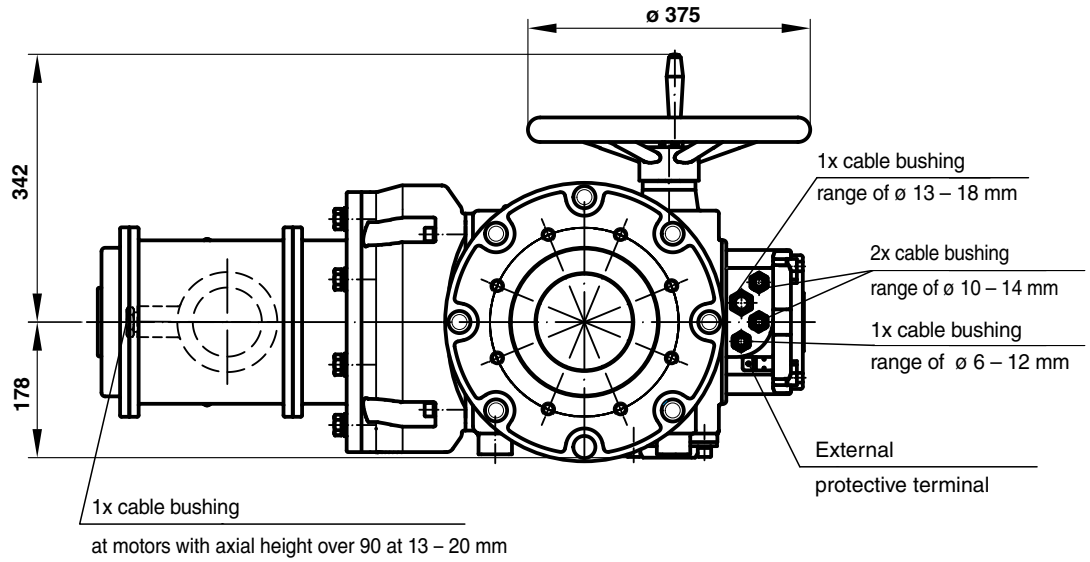
Dimensional sketch of actuators **MODACT MOA OC**
with planet gearbox *(Table 1a)*
Type Nos. 52 070.7xxx až 52 075.7xxx

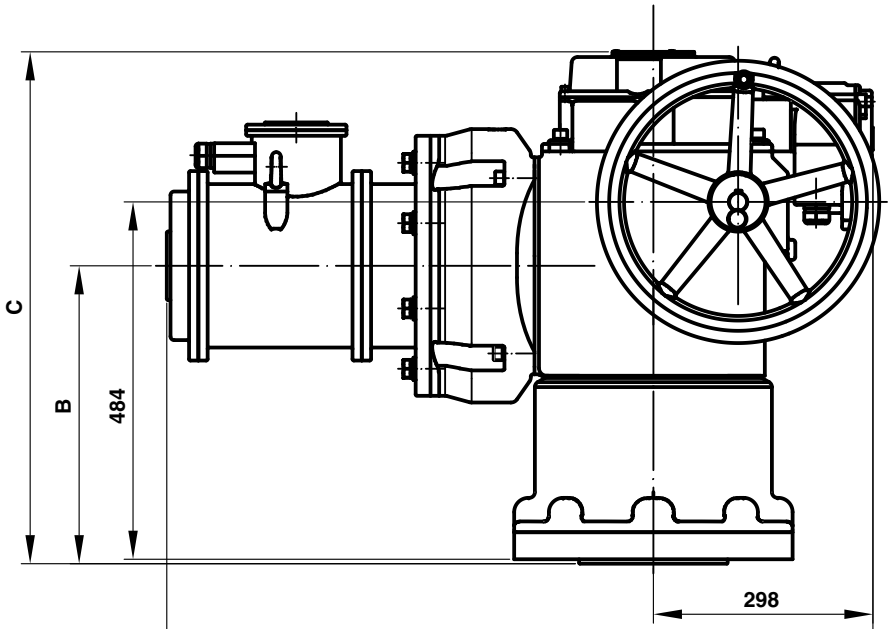




Type designation	A	B	C	D	E макс.	F	G макс.	ø H	J	K	L	N	P	x	y	z
52 070.7xxx	305	90	300	78	334	228	562	160	99	120	–	–	–	-52	5	135
52 071.7xxx 52 072.7xxx	376	120	328	92	436	228	664	200	–	144	–	–	–	-125	12	130
52 074.7xxx	455	145	382	123	519	258	777	250	–	190	–	–	–	-144	5	145
52 075.7xxx	540	178	442	153	598	298	896	375	–	234	–	–	–			

Dimensional sketch of actuators **MODACT MOA OC**
Type No. 52 076.7xxx



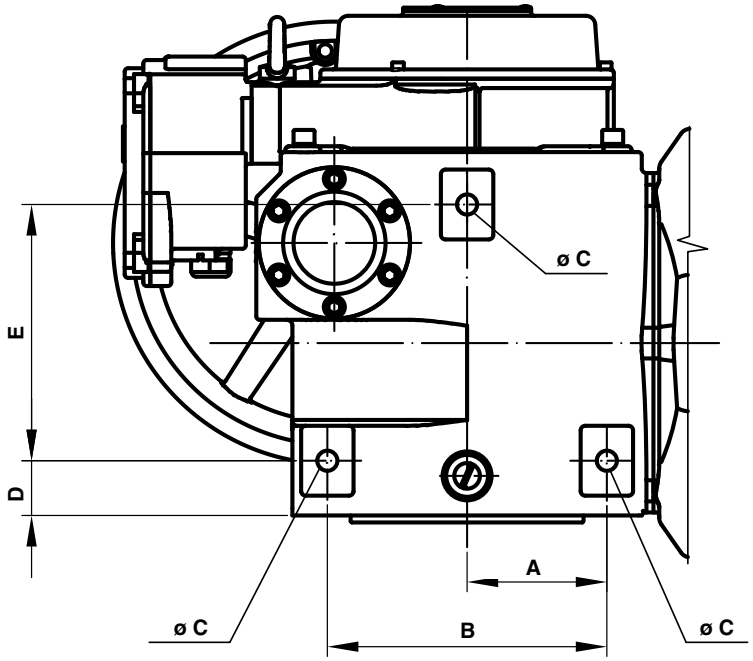


Type number	B	C
52 076.7xxx shape A	463	750
52076.7xxx shape B, C, D, E	418	705

Holes for fixing actuators to structure

Actuators **MODACT MOA OC** with planet gearbox and electric motors 1AC a 4 AC

(Type Nos. 52 070.7xxx – 52 076.7xxx)



	Type number				
	52 070.7xxx	**52 071.7xxx, 52 072.7xxx**	**52 074.7xxx**	**52 075.7xxx**	**52 076.7xxx**
Maximum force for accessory fixing of actuator	1000 N	2000 N	4000 N	6000 N	6000 N

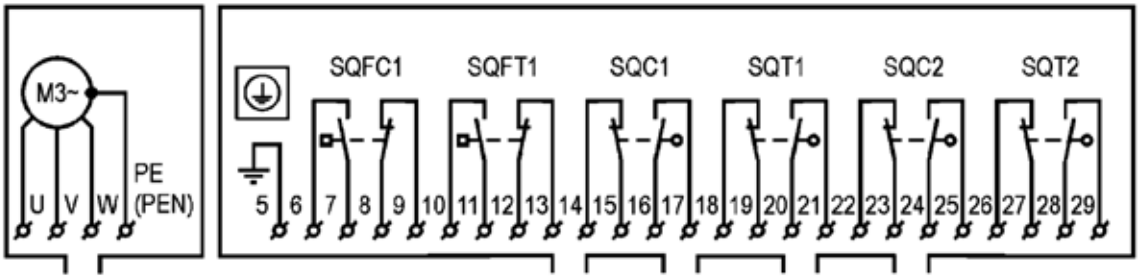
Type number	**Dimension [mm]**				
	A	**B**	**ø C**	**D**	**E**
52 070.7xxx	61	110	M 10	16	120
52 071.7xxx, 52 072.7xxx	90	160	M 12	21	140
52 074.7xxx	110	210	M 16	23	200
52 075.7xxx	120	240	M 20	47	220
52 076.7xxx	120	240	M 20	47	220

Note:

Total force higher than stated in the table must not act on the fixing elements of the actuator ø C.

Diagram of internal electric wiring of actuators **MODACT MOA OC**
aluminium version, planet gearbox,
with electric motors 4AC
Type Nos. 52 070.7xxx – 52 076.7xxx

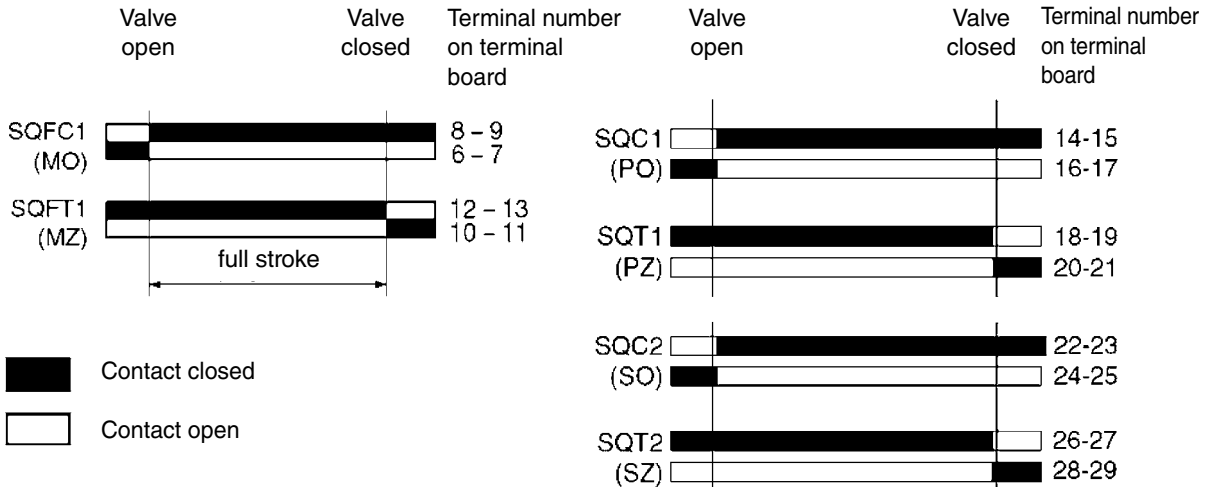
P0998



LEGEND:

SQFC1 *(MO)* – torque-limit switch “open”
SQFT1 *(MZ)* – torque-limit switch “close”
SQC1 *(PO)* – position-limit switch “open”
SQT1 *(PZ)* – position-limit switch “close”
SQC2 *(SO)* – position signalling switch “open”
SQT2 *(SZ)* – position signalling switch “close”
M – three-phase asynchronous motor

Operation diagram of torque, position-limit and signalling units



LIST OF SPARE PARTS OF MODACT MOA OC ELECTRIC ACTUATORS

WITH PLANET GEARBOX

Type No.	Designation of spare part	Drawing No. ČSN Standard	Pcs	Application
52 070	Sealing ring 125x3	PN 029281.2	1	Sealing between box of power gearing and flange with gearwheels
	Sealing ring 180x3	PN 029281.2	1	Gasket of board lid
	Sealing ring 130x3	PN 029281.2	1	Sealing between control box and box of power gearing
	Sealing ring 43x35	PN 029280.2	1	Sealing of output shaft in control box
	Sealing ring 10x6	PN 029280.2	2	Sealing of shaft of moment tripping
	Sealing ring 170x3	PN 029281.2	1	Gasket of the control box lid
	Ring “Gufero” 40x52x7	ČSN 029401.0	1	Sealing of output shaft in control box
	Gasket 44x35x4,5x28	2327344822	1	Gasket under lid of opening for rising spindle of valve
	Micro-switch D3031		1	Micro-switches SQFC1, SQC2
	Micro-switch D3031		1	Micro-switches SQT2, SQFT1, SQT1, SQC1
	Ring “Gufero” 40x52x7	ČSN 029401.0	2	Sealing of output shaft in box of power gearing
	Ring “Gufero” 16x28x7	ČSN 029401.0	1	Sealing of shaft of hand wheel
	Gasket 22x16,2	2327344819	2	Sealing of threaded plug *(for oil filling)*
	Sealing ring 125x5	PN 029281.2	1	Gasket between control box and box of terminal board
	Gasket 140x115x8,5x96	2327344821	1	Gasket between electric motor and flange with gearwheels
	Gasket 65x55x4,3x45	2327344820		Gasket under the manual control lid
52 071 + 52 072	Micro-switch D3031		1	Micro-switches SQFC1, SQC2
	Ring “Gufero” 60x75x8	ČSN 029401.0	2	Sealing of output shaft in box of power gearing
	Ring “Gufero” 22x32x7	ČSN 029401.0	1	Sealing of shaft of hand wheel
	Sealing ring 95x85	PN 029280.2	1	Gasket of insert with “gufero” rings in the power box
	Sealing ring 50x2	PN 029281.2	1	Sealing under lid of moment spring
	Sealing ring 22x16,2	2327344819	2	Sealing of threaded plug *(for oil filling)*
	Gasket according to motor	2327224023- os. height 80and90 2327224026- os. height 70	1	Gasket between electric motor and flange with gearwheels
	Sealing ring 125x5	PN 029281.2	1	Gasket between control box and box of terminal board
	Micro-switch D3031		1	Micro-switches SQT2, SQFT1, SQT1, SQC1
	Sealing ring 160x3	PN 029281.2	1	Sealing between box of power gearing and flange with gearwheels
	Sealing ring 180x3	PN 029281.2	1	Gasket of board lid
	Sealing ring 190x3	PN 029281.2	1	Sealing between control box and box of power gearing

Type No.	Designation of spare part	Drawing No. ČSN Standard	Pcs	Application
	Ring “Gufero” 55x70x8	ČSN 029401.0	1	Sealing of output shaft in control box
	Sealing ring 10x6	PN 029280.2	2	Sealing of shaft of moment tripping
	Sealing ring 190x3	PN 029281.2	1	Sealing of control box lid
	Gasket 80x70x4,3x60	2327224019	1	Gasket under lid of opening for rising spindle of valve
	Sealing ring 60x50	PN 029280.2	1	Sealing of output shaft in control box lid
	Gasket 50x40x4,5x32,5	2327224018		Gasket under the manual control lid
52 074	Sealing ring 200x3	PN 029281.2	1	Sealing between box of power gearing and flange with gearwheels
	Sealing ring 180x3	PN 029281.2	1	Gasket of board lid
	Sealing ring 200x3	PN 029281.2	1	Sealing between control box and box of power gearing
	Ring “Gufero” 80x100x13	ČSN 029401.0	1	Sealing of output shaft in control box
	Sealing ring 10x6	PN 029280.2	2	Sealing of shaft of moment tripping
	Sealing ring 200x3	PN 029281.2	1	Sealing of control box lid
	Sealing ring 75x65	PN 029280.2	1	Sealing of output shaft in the control box lid
	Gasket 110x100x4,5x75	2327224022	1	Gasket under lid of opening for rising spindle of valve
	Micro-switch D3031		1	Micro-switches SQFC1, SQC2
	Ring “Gufero” 80x100x10	ČSN 029401.0	2	Sealing of output shaft in box of power gearing
	Ring “Gufero” 27x40x10	ČSN 029401.0	1	Sealing of shaft of hand wheel
	Sealing ring 70x2	PN 029281.2	2	Sealing under lid of moment spring
	Gasket 250x215x13x179,8	2327224020	1	Gasket between electric motor and flange with gearwheels
	Gasket 22x16,2	2327344819	2	Sealing of threaded plug *(for oil filling)*
	Gasket 60x50x4,5x40,5	2327224021		Těsnění pod víčko ručního ovládání
	Sealing ring 125x5	PN 029281.2	1	Gasket between control box and box of terminal board
	Micro-switch D3031		1	Micro-switches SQT2, SQFT1, SQT1, SQC1
52 075	Sealing ring 280x3 2327311741	PN 029281.2	1	Sealing between power drive box and flange with gearwheels
	Sealing ring 180x3 2327311318	PN 029281.2	1	Lid sealing of terminal box
	Sealing ring 260x5 2327311742	PN 029281.2	1	Sealing between control box and power drive box
	GUFERO sealing ring 85x120x12 2327352219	ČSN 029401.0	1	Output shaft sealing in control box
	Sealing ring 10x6 2327311101	PN 029280.2	2	Shaft sealing of torque switching
	Sealing ring 200x3 2327311736	PN 029281.2	1	Lid sealing of control box

Type No.	Designation of spare part	Drawing No. ČSN Standard	Pcs	Application
	Sealing ring 90x80 2327311113	PN 029280.2	1	Output shaft sealing in the lid of control box
	Sealing ring 32x22 2327311110	PN 029280.2	1	Shaft sealing of handwheel
	Sealing 2327224022	23465675	1	Lid seal hole for rising spindle valve
	Microswitch	D3031	1	Switches SQFC1, SQC2
	Microswitch	D3031	1	Switches SQT2, SQFT1, SQT1, SQC1
	GUFERO sealing ring 105x130x13 2327352177	ČSN 029401.0	2	Output shaft sealing in power transmission box
	GUFERO sealing ring 30x50x10 2327352218	ČSN 029401.0	1	Shaft sealing handwheel
	Sealing ring 90x2 2327311139	PN 029281.2	1	Lid sealing torque springs
	Sealing 2327224030	23354605	1	Sealing between electric motor and flange with gearwheels
	Sealing 16x22 2327344819	22465676	2	Sealing stoper with thread (for pouring oil)

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

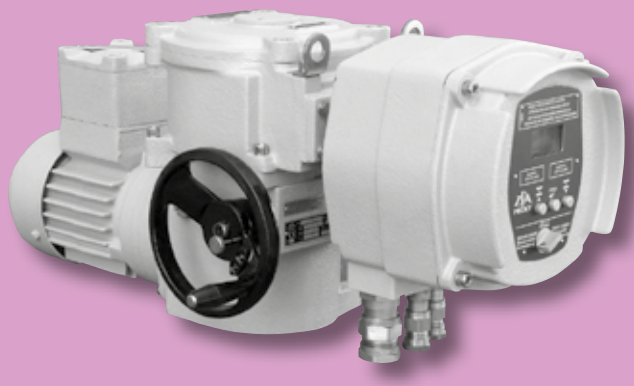
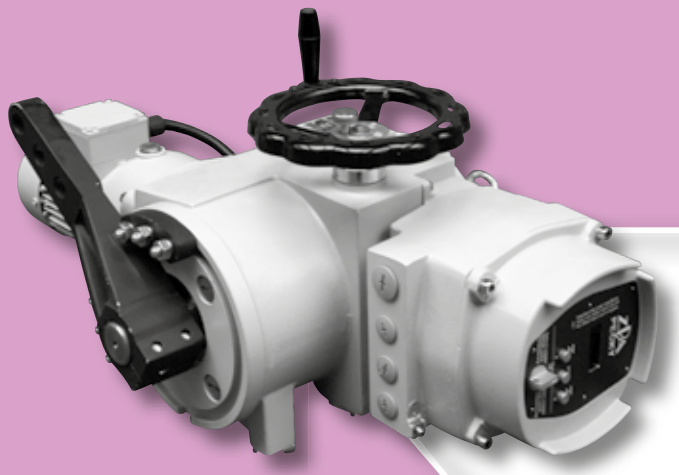
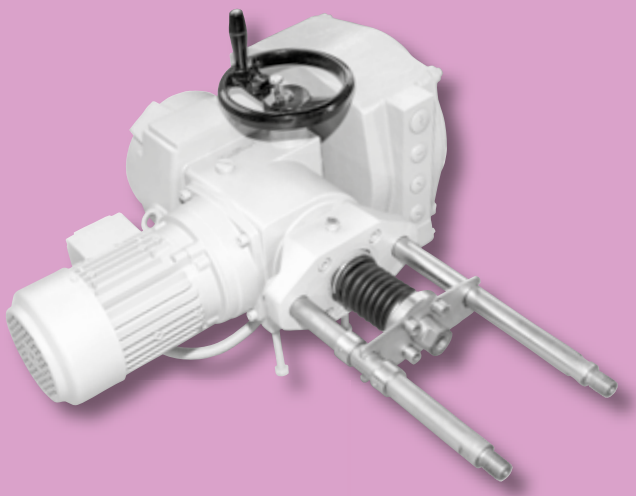
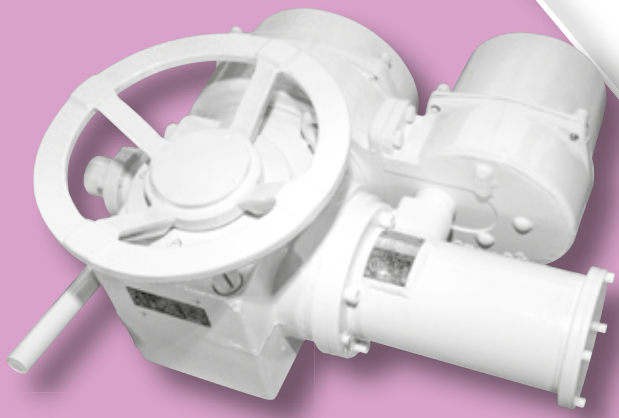
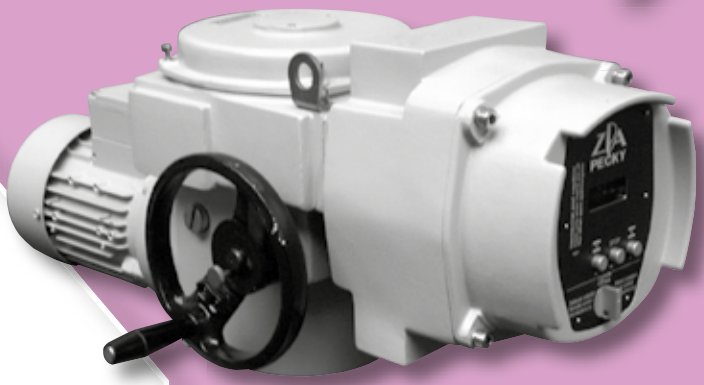
MODACT MPR Variant
Electric rotary (160°) lever actuators with a variable output speed

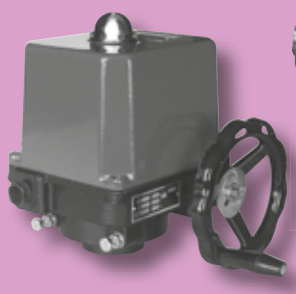
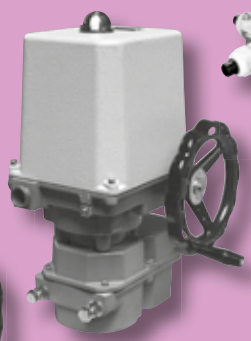
MODACT MPS, MPSP, MPSED, MPSPED
Electric rotary (160°) lever actuators with a constant output speed

MODACT MTN, MTP, MTNED, MTPED
Electric linear thrust actuators with a constant output speed

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

TRADITION • QUALITY • RELIABILITY

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