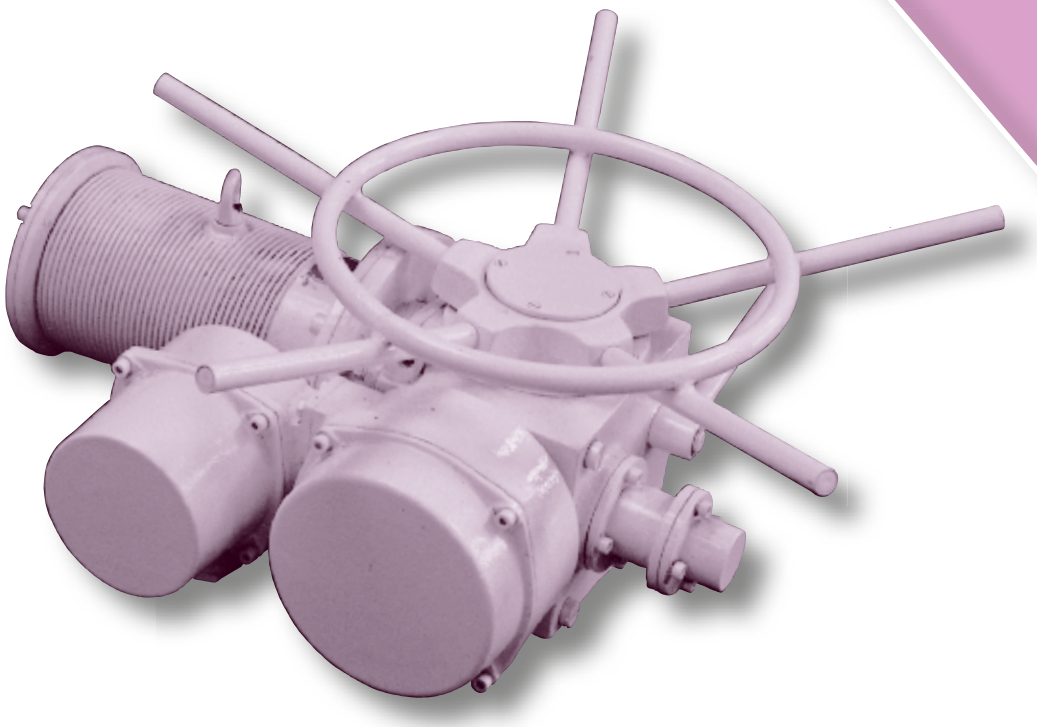
ZPA PEČKY, a.s.

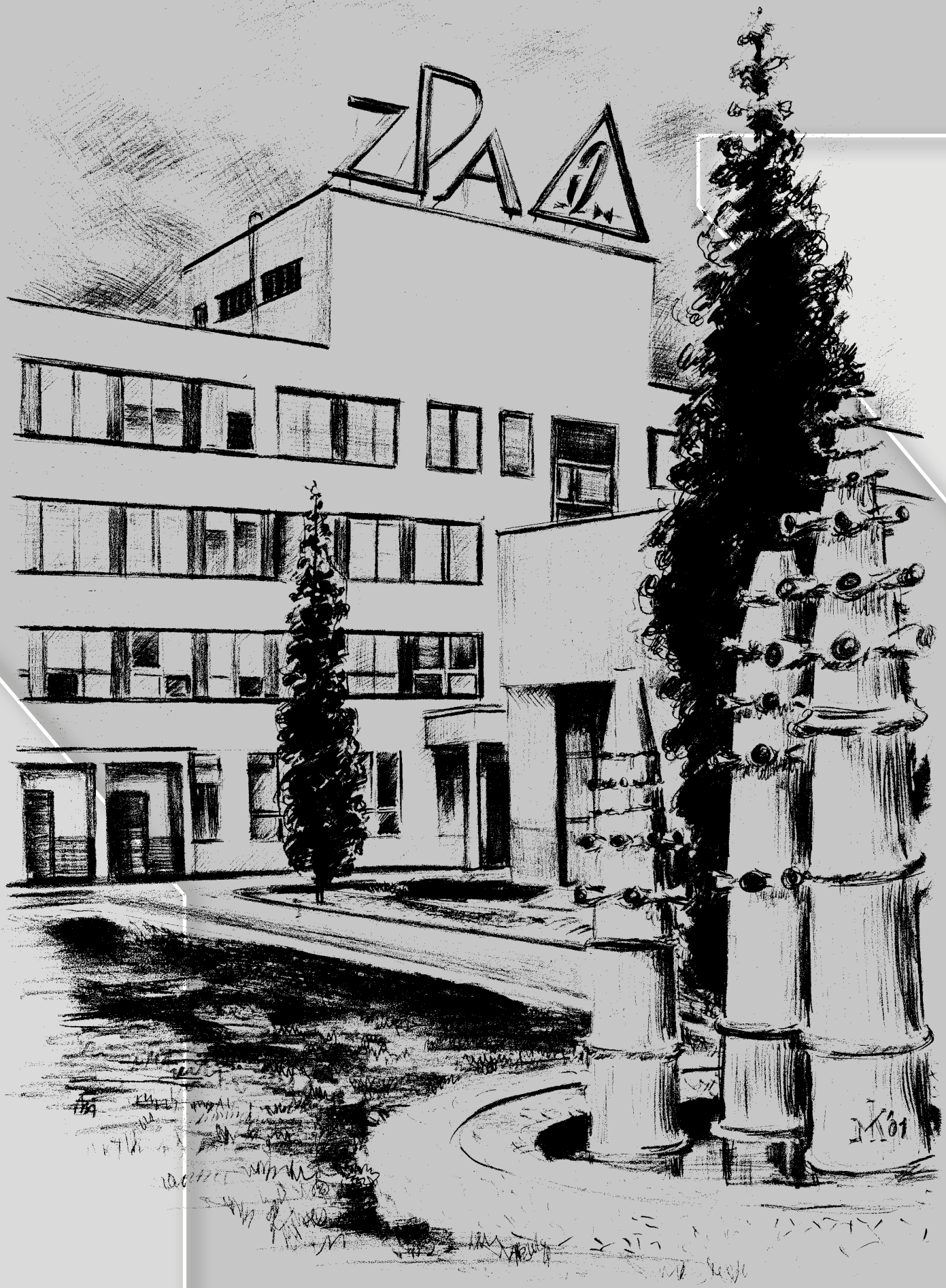


INSTRUCTION FOR ASSEMBLY AND OPERATION

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

MODACT MOA OC

Type numbers 52070.3xxx - 52074.3xxx



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

CONTENS

Operating instructions establish guidelines for the placement, connection, adjustment, operation, maintenance and repairs of electrical actuators. The fundamental assumption is that the installation, operation, maintenance and inspections are carried out by qualified personnel designated for operation and work on the electrical equipment and the professional supervision is carried out by a person qualified and demonstrably instructed.

1. APPLICATION

The **MODACT MOA OC** rotary electrical actuators of the multi-revolution type are designed for remote control of the special valves located in hermetic boxes or under a shell of nuclear power plants with the VVER or RBMK reactors. **MODACT MOA OC** are designed for safety circuits as well as for normal use.

2. OPERATING CONDITIONS PARAMETERS

Normal operating mode:

temperature	+5 °C to +70 °C
pressure	85 to 103.2 kPa
relative humidity	up to 95 ±3 %
radiation level	up to 1 Gy / hr

Working mode of a small scale accident:

	VVER reactors	RBMK reactors
temperature	up to 90 °C	up to 105 °C
pressure	up to 170 kPa	up to 150 kPa
relative humidity		steam air
radiation level		up to 1 Gy / hr
mode duration	5 hr	6 hr

Working mode of a large scale accident:

temperature	150 °C
pressure	up to 500 kPa
relative humidity	steam-air mixture
radiation level	$1x10^3$ Gy / hr
mode duration	10 hr

Further information about the parameters of the work environment is listed in the Technical Conditions.

Legend:
1 – Three-phase asynchronous electric motor
2 – Power cabinet
3 – Clutch control lever
4 – Hand wheel
5 – Control box
6 – Terminal box
7 – P 36 cable outlet (cable ø 20–25 mm)
8 – Output shaft

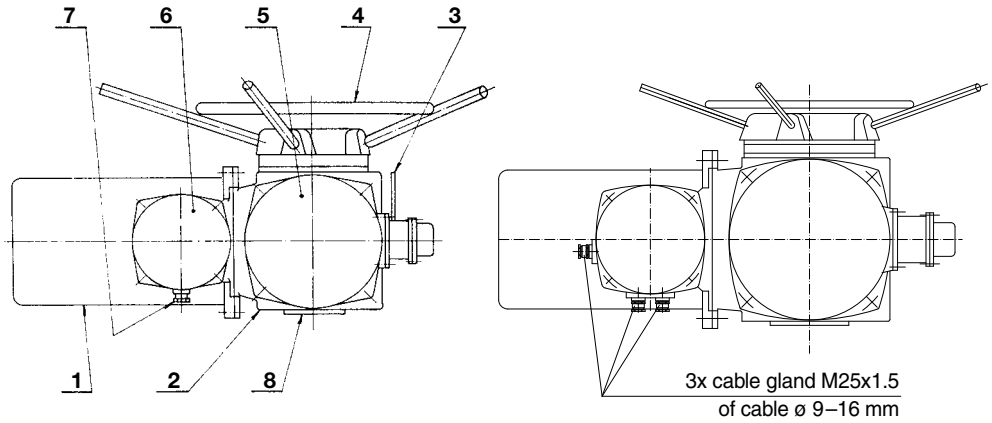


Fig. 1 – ***Actuator assembly***

Actuators **MOA OC** are standardly delivered with one-cable gland P36 *(for cable diameter 20–25 mm).* Variation with trhee-cable input M25x1,5 is necessary to mention in order.

3. TECHNICAL PARAMETERS

Main technical characteristics are listed in the table.

Electric motor supply voltage	3 x 400 *(380)* V / 50 Hz *(or as indicated on the label)*
Degree of protection	IP 67

Other technical parameters are listed in the Technical Conditions.

4. OPERATING POSITION

Operating position **MODACT MOA OC** actuators is optional if the electric motor is not under the actuator, i.e. the electric motor axis is not lower than 15 degrees below the horizontal level.

5. DESCRIPTION

The actuators are designed for direct mounting to the valve. The connection is made via a flange with B3 shape according to ISO 5210 *(Shape E according to DIN 3210),* shape C according to DIN 3338. The arrangement of parts is shown in Fig 1. The three-phase asynchronous electric motor 1 drives a worm wheel via a countershaft gear, which is coupled to the output shaft of the actuator 8 through a switching clutch. Thereby the motor control transmits motion from the electric motor to the output shaft. The countershaft gear, worm, worm wheel, switching clutch and the output shaft are placed in the power cabinet 2. The switching clutch is provided with control lever 3 located outside on the side of the power cabinet, which also allows connecting the output shaft with the hand wheel 4 and thus manual control. In manual control it is necessary to push the control lever according to the instructions. Turning the hand wheel clockwise closes the valve. After the start-up of the electric motor the control lever and thus the clutch automatically return to the motor control position. To allow tripping of the electric motor upon reaching the desired torque on the output shaft, the worm is axially movable and axially sprung in both directions of movement. Its shifting distance then depends on the torque of the output shaft and the characteristics of the springs. The movement of the worm, which is then a measure of the torque at the output shaft, is transmitted to the control cabinet, where it is used for switching of the torque switches.

The output shaft is connected by means of the transmission gear with the units of positional and signalling switches, thereby enabling the electric motor to trip after reaching the desired position of the output shaft and remote indication of its position. All operating units, i.e. the torque control unit, position switching unit and signalling unit are located in the control cabinet 5. The contacts of theirs micro switches are completely interconnected with the actuator terminal board, which is located in the terminal box 6. This terminal board is also connected to the terminals from the electric motor *(electric motor does not have its own terminal board).*

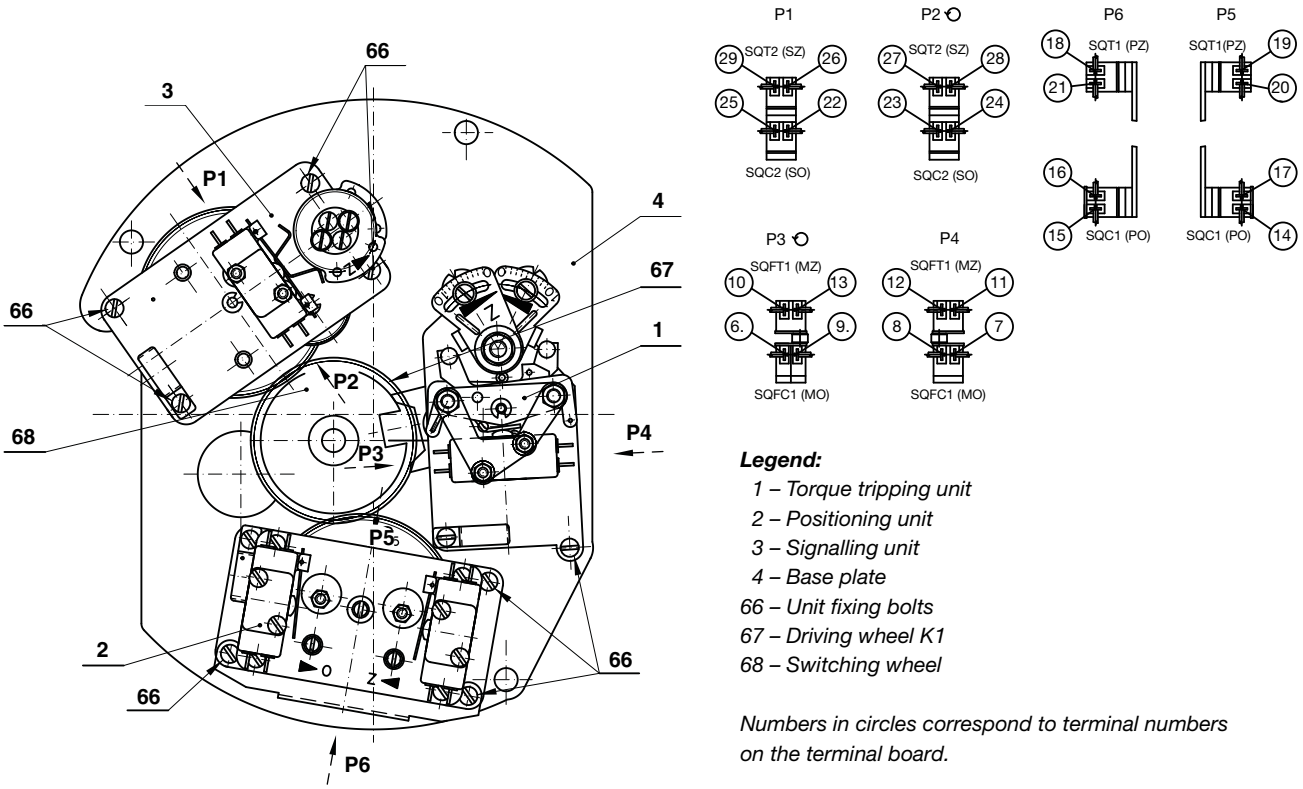
The terminal box has one cable gland P 36 *(7),* which allows the sealing of the connection cable for connecting control and signalling circuits, and electric motor power supply.

The individual control units consist of mechanical drives and dedicated micro switches. They are positioned on a common control board *(Fig. 2).*

According to function they are the following:

– Torque tripping unit 1
– Limit tripping unit 2
– Signalling unit 3

These units are universal for all sizes of the actuators are mounted on a common base plate 4.



Legend:

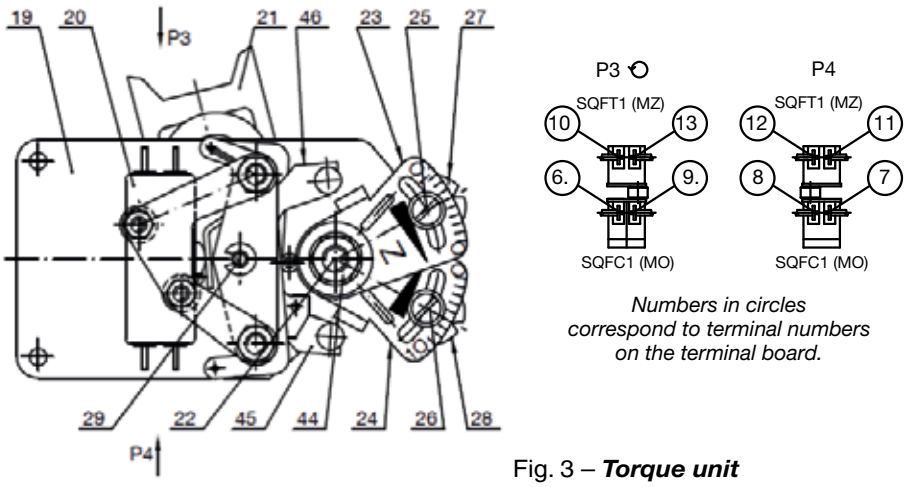
1 – Torque tripping unit
2 – Positioning unit
3 – Signalling unit
4 – Base plate
66 – Unit fixing bolts
67 – Driving wheel K1
68 – Switching wheel

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

Fig. 2 – ***Control board***

Description and function of control units

a) Torque tripping unit *(Fig. 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. 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 and 24 are provided with a scale providing individually for each actuator indications of points for setting up the maximum and minimum torque. The set up torque is indicated by recesses in segments 27 and 28. Figures on the scale do not give direct indication of the tripping torque. 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.



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

Legend:

19 – Base plate
20 – SQFT1 (MZ) tripping switches, SQFC1 (MO)
21 – Adjuster
22 – Torque control shaft
23 – Top “closing“ segment
24 – Bottom “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***

The torque tripping 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. Apart from that the locking mechanism 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. When the actuator's output shaft is loaded by a restoring torque, the torque control shaft 22 rotates slightly, thus making segments 23 and 24 rotate two, which transfer the motion to tripping handle 45 or 46. As soon as the torque on the actuator's output shaft achieves a value, to which the torque tripping unit has been set up to, the tripping handle will push the button of the relevant micro switch, which will disconnect the electric motor from power supply, and the actuator will stop.

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 *(Fig. 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.

Tripping torque must be set at a higher value than those that correspond to the individual type designation in Table no. 1!

b) Signalling unit *(Fig. 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 the gearbox to cams 30, 31, controlling micro switches 36 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 30 operates in the *"closing"* direction and the bottom cam 31 operates in the "opening" direction.

Signalling unit is designed as a separate installation assembly. It is installed on bracket 39, below which gears are fitted, organized according to the kinematic diagram *(Fig. 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 figure 6 is a table specifying setting ranges corresponding to the various positions of adjusting gear K3.

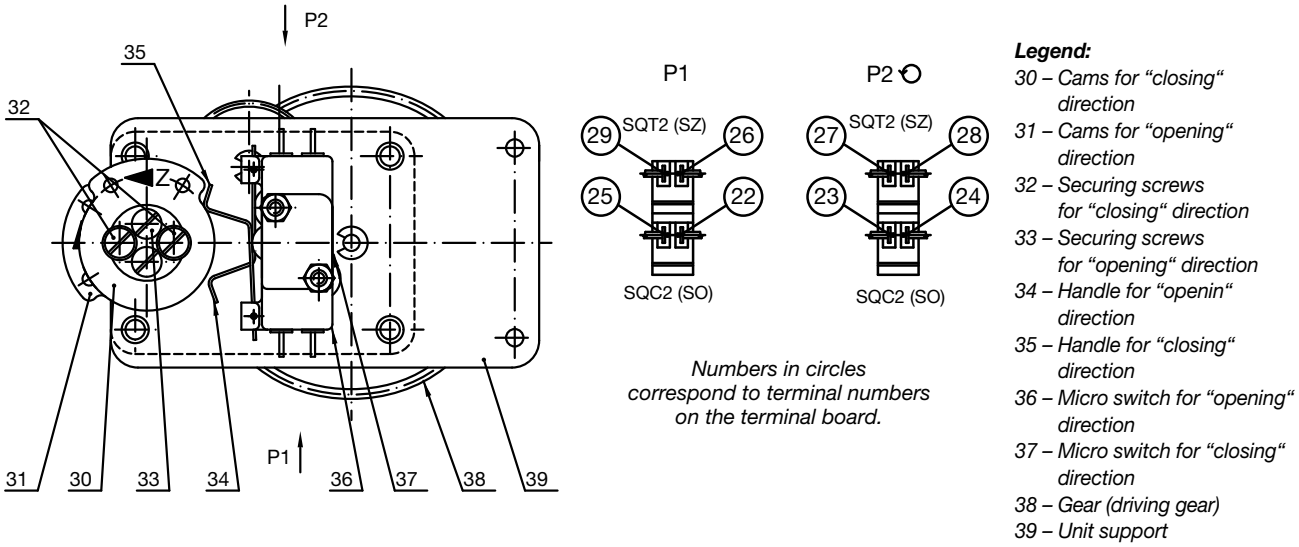
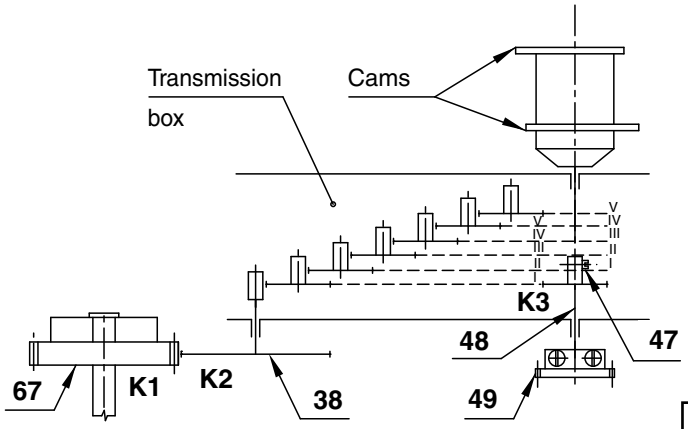


Fig. 4 – ***Signalling unit***

Signalling unit setting

If the set up range of signalling switches 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 *(Fig. 2),* which hold the unit on the base plate. After resetting the signalling unit to the required range the securing screw 47 of the adjusting wheel K3 *(Fig. 5)* is secured with the wire lock and the unit is mounted back to its place. Before re-tightening screws 66, the check wheels K1 and K2 *(Fig. 5)* for correct meshing.

Cams and micro switches of signalling unit are aligned as shown on Fig. 4. Cam toes 30 or 31 displace arms 34 and 35, which further operate micro switches 36, 37. When setting up signalling and position switches it is always necessary to re-align the actuator output shaft to a position, in which the micro switches are supposed to switch.



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

Note
Position of adjusting gear for actuators ser. No. 52 070 for the various gears is specified on left-hand side figure (the wheel is mounted upside down compared to other type numbers).

Gear	Type number		
	52 070	52 071 52 072	52 074
I	1 - 2,5	2 - 10	2 - 10,5
II	2,0 - 9,5	10 - 35	10 - 36
III	9 - 28	35 - 110	36 - 120
IV	28 - 95	110 -250	120 - 250
V	90 - 250		

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

When adjusting the signalling switches, first release the screws 32 *(for SQT2)* or 33 *(for SQC2)* – Fig. 4. Than the cam 30 or 31 are turned in the direction of the arrow, until the micro switch triggers. In this position, hold the cams and re-tighten the locking screws.

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.

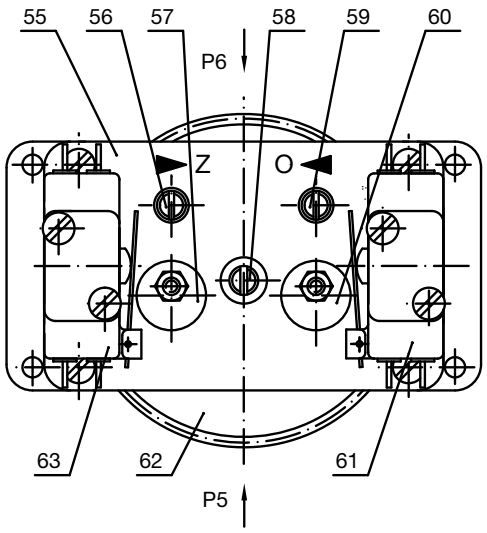
Notice

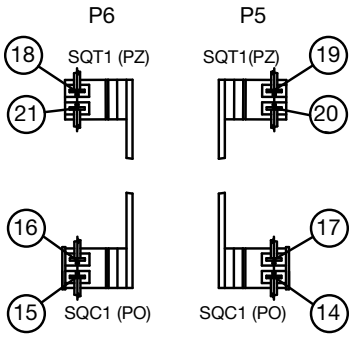
After each handling with locking screws in the control part of the actuator, these screws must be secured from releasing by vibrations, by dropping quick-drying varnish on them. If these screws had previously been secured using the varnish, the old varnish layer rests must be removed while adjusting,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

c) Position unit *(Fig. 6)*

This unit secures switches SQT1 *(PZ)* or SQC1 *(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.

This wheel turns stepwise the aligned gears, which control cam 57 *(60).* Cam turning to the roller of the switch SQT1 *(PZ)* or SQC1 *(PO)* will cause the switches to change over.





Legenda:
55 – Decade gear
56 – Set screw "Z"
57 – Tripping cam "Z"
58 – Tripping cam
59 – Set screw "O"
60 – Tripping cam "O"
61 – SQC1 switch (PO)
63 – SQT1 switch (PZ)

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

Fig. 6 – ***Positioning unit***

Handling and adjustment

The unit is adjustable in the range from 2 to 250 revolutions. 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 the adjusting shaft 56 in *"Z"* arrow direction until the cam 57 pushes the spring of micro switch SQT1 *(PZ)* 63.

d) Turn the tripping rod 58 by 90°. Tripping rod will slip out again. If tripping rod fails to slip out, just very slightly turn shaft 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 the adjusting shaft 59 in *"O"* arrow direction until cam 60 pushes the spring of micro switch SQC1 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 shaft 59 or 56.

Remark:

Stop turning the adjusting shaft 56, 59 at the moment of switching!

If, prior to adjustment, the cams are rotated by 270° compared to position in Fig. 6 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 the adjusting shaft 56 or 59 against arrows direction until the cam's tip leaves the micro switch lever *(towards the closest adjusting shaft)* and the micro switch switches *(use suitable tester to make sure that micro switch has switched).* Then turn adjusting shaft 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.

6. PACKING AND STORING

The actuators are packaged together with the valve on which they are mounted. The packaging method applicable to this valve 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. In the event of direct delivery of actuators without valves to the nuclear power plants the actuators are packaged according to a special regulation.

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. If stored for a period longer than 1 year we recommend the oil charge to be replaced prior to commissioning. 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.

7. CHECKING OF THE INSTRUMENT FUNCTION AND ITS LOCATION

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. Rotary actuators can operate in any position when the electric motor axis is not more than 15 degrees below the horizontal level. 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.

8. ATTACHMENT

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. ADJUSTMENT OF THE ACTUATOR

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 the actuator to power supply line, and shortly switch to verify correct rotation direction of the output shaft. When looking inside the control box, the drive wheel of the positioning units 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 positioning unit *(micro switch SQT1 (PZ) according to point 5c).*
4. Set output shaft to a position, where the signalling switch SQT2 *(SZ)* is supposed to change over. Adjust SQT2 *(SZ)* switch according to instructions specified under point 5b).
5. Turn the actuator output shaft by the required number of revolutions *(working stroke)* and set the switch to SQC1 *(PO) "open"* position as described under point 5c).
6. Set output shaft of the actuator to the position, where the signalling switch SQC2 *(SO)* is supposed to change over. Adjust the SQC2 *(SO)* switch according to instructions specified under point 5b). Setting of positioning and signalling switches must be checked repeatedly.

Important notices

a) After mounting the valve with the actuator on the pipeline use hand wheel of the actuator to set the valve into its central position. Short-term running of the electric motor must be used to detect whether the actuator output shaft rotates in the correct direction, i.e., whether it responds correctly to the shutdown using the appropriate torque or positioning switches. Verification can be performed by pressing the handle of the respective switch with a suitable tool preferably made of insulating material or at least with a handle made of insulating material.

   If the actuator does not rotate in the right direction, switch the two phase conductors at the terminal board of the actuator *(terminals 1, 2, 3).*

b) After mounting the valve with the actuator on the pipeline it is necessary to mount a pressure relief valve to the power cabinet of the actuator. For this purpose there is a power cabinet of the actuator provided with holes with plug bolts. A pressure relief valve is mounted into the uppermost hole instead of the plug bolt, whereby it must be ensured that the pressure relief valve axis is vertical.

c) The servo motor is equipped with gland outlet for sealing the supply cable, to which two rubber packing rings are supplied with the 23 and 26 mm openings. To seal the cable a sealing rubber ring is used according to the actual cable diameter. One ring is placed in the seal outlet, the other is located in the terminal box.

10. OPERATION

Correct operation of the **MODACT MOA OC** actuators is determined by operational conditions and is usually limited to giving impulses for the various functional tasks. If necessary *(e.g. during adjustment of the actuator)* change the position of the controlled member by means of the hand wheel. The hand wheel is placed into engagement by means of the lever located on the side of the power cabinet. It is necessary to press the lever towards the valve and simultaneously rotate the hand wheel into such position that the clutch and the handwheel teeth are mutually engaged.

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 parameters".*

11. MAINTENANCE

If the oil does not flow from the power cabinet due to bad sealing, the oil charge is stable. Checking of oil and refilling is carried out after two years. Oil charge should be changed after four years. The actuator is filled with PP 90 oil.

The amount of oil is shown in the following table:

Type number	Oil quantity in kg
52 070	2
52 071 52 072	3
52 074	4.8

Every four years it is necessary to lightly coat the teeth of the gear assemblies and rotary seats in the control cabinet with CIATIM 221 grease.

To increase the corrosion resistance also grease springs in the control cabinet. Grease must not be applied on the sliing seats in the torque unit.

In all inspections and maintenance it is necessary to properly tighten all the nuts and bolts that have an impact on the creation of sufficient pressure on the rubber sealing, ensuring hermetic tightness of the actuator.

Troubleshooting

Actuator is in its end position, does not start up, motor buzzes. Make sure that all electric motor terminals *(terminals 1, 2, 3)* are energized. In the event that the slider is blocked so that it cannot be released with a hand wheel or a motor, it is necessary to dismantle the actuator from the valve and release the spindle nut mechanically.

Operating and safety requirements

– It is forbidden to operate the electric actuator, if it is not provided with passport or installation instructions.
– Interval between two preventive inspections is four years.
– When installing the electric actuator it is necessary to ensure the safety conditions needed for performing inspections, repairs and manual control.
– It is prohibited to use electric actuator with parameters or in the environments exceeding the values defined in this installation manual. It is forbidden to use these actuators in control mode.
– It is forbidden to dismantle, maintain and treat the equipment, unless it the electric actuator is disconnected from the mains.
– During the operation, maintenance and repairs of the actuator the actuators must be properly grounded *(unless it is a repair of the actuator that has been properly disconnected from the mains by unplugging the power supply cable).*

12. PREVENTIVE INSPECTIONS AND ACTUATOR REPAIRS FOR NUCLEAR POWER STATIONS

Actuators life for nuclear power station - line MOA OC is determined to 40 years according to technical conditions.

Based realized qualifying examinations and longtime experiences from operation is recommended by the actuator manufacturer to realize during product life following range and periods of preventive inspections and repairs:

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

   is realized at actuator operator and includes these actviities:

   – visual inspection of actuator, if it is not broken, corroded, inspection of seal condition, fastening condition, check tighness of the cable grommets, tightening screw connections. In case of defects finding, remove these defects or determine the procedure of its removal.

   – after unscrewing the motor cover and terminal box and control box cover in actuator will be realized visual inspection of connection and conductors marking, check of internal wiring parts in actuator, tightning terminal box connections, check of protection conductors connections and check of conductors from protective interconnection system.

   – check transition resistance of protective conductor connections – R_trans < 0,1 Ohm.

   – check the unit on control box – transmission unit, control springs, circumeference of cam drive and lever mechanism is necessary to lubricate by the fat Ciatim 221. Add oil PP80 or equivalent oil to the gear-case.

   – make functional test of extreme positions by remote or local electrical control, while doing so to check adjustment and function of position, torque and signalling switches and adjustment of position indicator and position transmitter. Remove identified failures in adjustment and in function or determine the procedure for its remove.

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

   – at the actuator operator is possible to do small repairs - as for examle replacement of injured or worn parts like seal, microswithces, motor, bearings, gear wheels etc. Only professionally trained staff with valid certificate for this activity can do this activity.

3. **Total actuators rebuild** *(general repair)*

   – total actuators rebuild *(general repair)* is done in case of big actuator failure or in old actuators and substantially worn actuators. Its purpose is put actuator into condition approaching the new actautor with guaranteed technical parameters.

   – repair of this extension is recommanded to do at operationally important positions and emergency system positions, which are long-term exposed of increased thermal effects of radiant heat or corrosive effects for the purpose to keep permanent device reliability for throughout of determined lifetime *(e.g. hermetical zones spaces inaccessible during operation, partially or fully closed spaces of steam pipe, outdoor spaces etc.)*

   – this activity can be done only by actuator manufacturer, in exceptional cases by manufacturer determined and trained service organization.

   – for making rebuild activities are estabilished technological procedures at the manufacturer, but its way and range always depends on assessement of actuator state and requirements of customer.

   General repirs includes in most cases these activities:

   – replacement of sealing elements *(guferos and o-rings)*

   – replacement of lubricants

   – replacement of torque springs

   – replacement of control units, eventually of whole control board

   – replacement of connecting material

   – **at big rebuilds,** concerning to large quantities and actuator types, is suitable the rebuild procedure mutually agree and arrange the way of verification *(e.g. inspection and testing plan by rebuilt actuators).*

Table 1 – ***Basic technical parameters and characteristics of the MODACT MOA OC or RBMK, actuator, supply voltage 3x230 / 400 V, 50 Hz. Only cast iron design.***

Flange size	ACTUATOR								
	Type designation	Type number		Opening moment adjustment range	Actuator output shaft discplacement speed	Gear ratio between actuator shaft and electromotor	Gear ratio between actuator shaft and hand wheel	Maximum force on hand wheel	Breakaway torque	Weight of the actuator with electric motor
		Basic	Comple-mentary	[Nm]	[1/min]			N[1)]	[Nm]	[kg]
F 10	MOA OC 40-10	52 070.3xA0		20 – 40	10,3	1:89,4	1:1	160	90	53
	MOA OC 40-16	52 070.3x40			16	1:89,4			106	53
	MOA OC 40-25	52 070.3x00			25	1:57,3			66	53
	MOA OC 32-40	52 070.3x10		20 – 32	40	1:36,1			43	53
	MOA OC 40-63	52 070.3x20		20 – 40	63	1:22,6			67	63
	MOA OC 40-100+)	52 070.3x30			100	1:14,4			55	63
	MOA OC 50-25	52 070.3x50		25 – 50	25	1:57,3		250	106	53
	MOA OC 63-12	52 070.3x90		25 – 63	12,5	1:57,3			130	63
	MOA OC 63-25	52 070.3x60			25	1:57,3			169	63
	MOA OC 63-40	52 070.3x70			40	1:36,1			106	63
F 14	MOA OC 160-12	52 071.3x50		63 – 160	12,5	1:56,1	1:1	222	225	83
	MOA OC 160-25	52 071.3x00			25	1:56,1			265	83
	MOA OC 130-40	52 071.3x40		63 – 130	40	1:36,1			170	83
	MOA OC 160-40	52 071.3x10		63 – 160	40	1:36,1			340	105
	MOA OC 160-63	52071.3x20			63	1:23,2			210	105
	MOA OC 160-100+)	52 071.3x30			100	1:14,6			220	105
	MoA OC 250-12	52 072.3x00		125 – 250	12,5	1:56,1		347		105
	MOA OC 250-40	52 072.3x10			40	1:36,1			330	105
	MOA OC 250-63	52 072.3x20			63	1:23,2			420	118
	MOA OC 250-100+)	52 072.3x30			100	1:14,6			340	118
F 16	MOA OC 500-40	52 074.3x00		250 – 500	40	1:35,2	1:1	750	650	154
	MOA OC 630-40	52 074.3x10		250 – 630	40	1:35,2			1100	198
	MOA OC 630-63	52 074.3x20			63	1:23,7			823	198
	MOA OC 500-100+)	52 074.3x40		250 – 500	100	1:14,4			650	198
	MOA OC 360-120+)	52 074.3x50		250 – 360	120	1:12,3			470	198

x ... to be completed by the customer: 0 ... for shape C connecting dimension
1 ... for shape E connecting dimension
9 ... for ZPA connecting dimension (four teeth)

+) non-self-locking worm

for closing valves installed in the active zone of nuclear power plants with VVER reactors

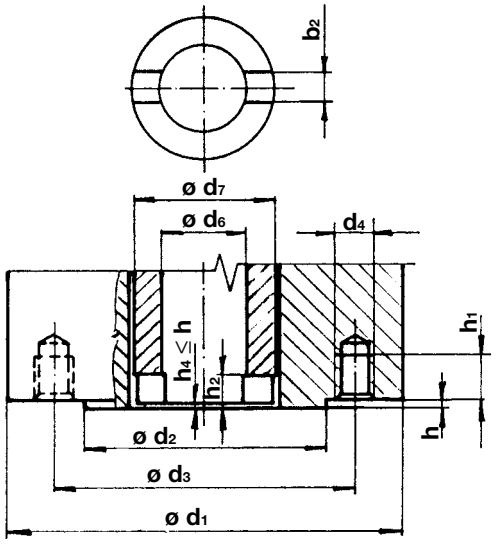
ELECTRIC MOTOR									
Type	Rated output [kW]	Electromotor of rotation speed [1/min]	Effect [%]	Power factor [cos φ]	Ratio of breakaway to nominal torque	Ratio of breakaway to nominal current	Rated current [A]	Electric motor weight [kg]	Break-away torque [Nm]
AJSI 89B-6Z	0,08	940	23,9	0,36	7,2	1,8	1,3	9,5	3,6
AJSI 89B-4Z	0,12	1425	48,6	0,36	8,4	3,6	1,0	9,5	4,0
AJSI 89B-4Z	0,12	1425	48,6	0,36	8,4	3,6	1,0	9,5	4,0
AJSI 89B-4Z	0,12	1425	48,6	0,36	8,4	3,6	1,0	9,5	4,0
AJSI 116B-4Z	0,3	1455	64	0,36	7,8	4,8	2,1	19,5	10
AJSI 116B-4Z	0,3	1455	64	0,36	7,8	4,8	2,1	19,5	10
AJSI 89B-4Z	0,12	1425	48,6	0,36	8,4	3,6	1,0	9,5	4,0
AJSI 116B-8Z	0,11	701	24	0,30	7,5	1,8	2,2	19,5	7,5
AJSI 116B-4Z	0,3	1455	64	0,36	7,8	4,8	2,1	19,5	10
AJSI 116B-4Z	0,3	1455	64	0,36	7,8	4,8	2,1	19,5	10
AJSI 116C-8Z	0,18	710	25,6	0,29	7,9	1,83	3,5	21	12
AJSI 116C-4Z	0,55	1403	66	0,43	6,2	4,5	3,0	21	16
AJSI 116C-4Z	0,55	1403	66	0,43	6,2	4,5	3,0	21	16
AJSI 145B-4Z	1,2	1425	76,3	0,51	6,7	6,2	4,5	40	32
AJSI 145B-4Z	1,2	1425	76,3	0,51	6,7	6,2	4,5	40	32
AJSI 145B-4Z	1,2	1425	76,3	0,51	6,7	6,2	4,5	40	32
AJSI 145B-8Z	0,3	725	35	0,26		2,75	4,0	40	20
AJSI 145B-4Z	1,2	1425	76,3	0,51	6,7	6,2	4,5	40	32
AJSI 180B-4Z	2,2	1386	80,5	0,59	6,5	5,7	7,2	54	63
AJSI 180B-4Z	2,2	1386	80,5	0,59	6,5	5,7	7,2	54	63
AJSI 180B-4Z	2,2	1386	80,5	0,59	6,5	5,7	7,2	54	63
AJSI 215B-4Z	3,7	1432	85,8	0,64	6,2	8,0	10,9	93	120
AJSI 215B-4Z	3,7	1432	85,8	0,64	6,2	8,0	10,9	93	120
AJSI 215B-4Z	3,7	1432	85,8	0,64	6,2	8,0	10,9	93	120
AJSI 215B-4Z	3,7	1432	85,8	0,64	6,2	8,0	10,9	93	120

Notes:

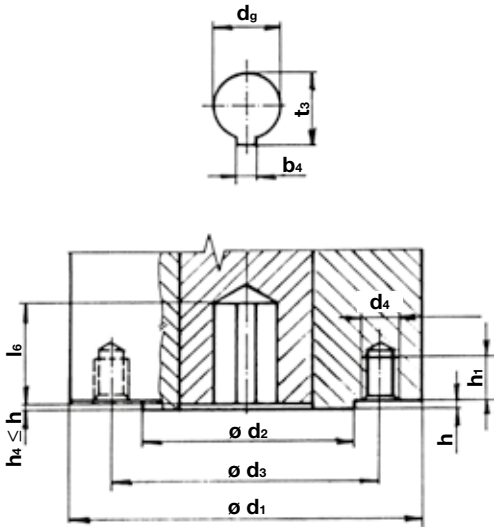
1) *The table shows one force from the pair of forces acting on the perimeter of the hand wheel; Actuator dimension – is determined by the size of the connecting flange according to ISO 5210.*
2) *The range of adjustment of the working stroke in all actuators is 2 - 250 rpm.*
3) *Connection of actuators – with packing gland on the terminal board.*
4) *The rated current is for the supply voltage of 400 V. For the supply voltage of 380 V In 380 = In 400 x 400/380.*
5) *The actuator mass tolerance is ± 5 %.*

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

SHAPE C
(acc. to DIN 3338)



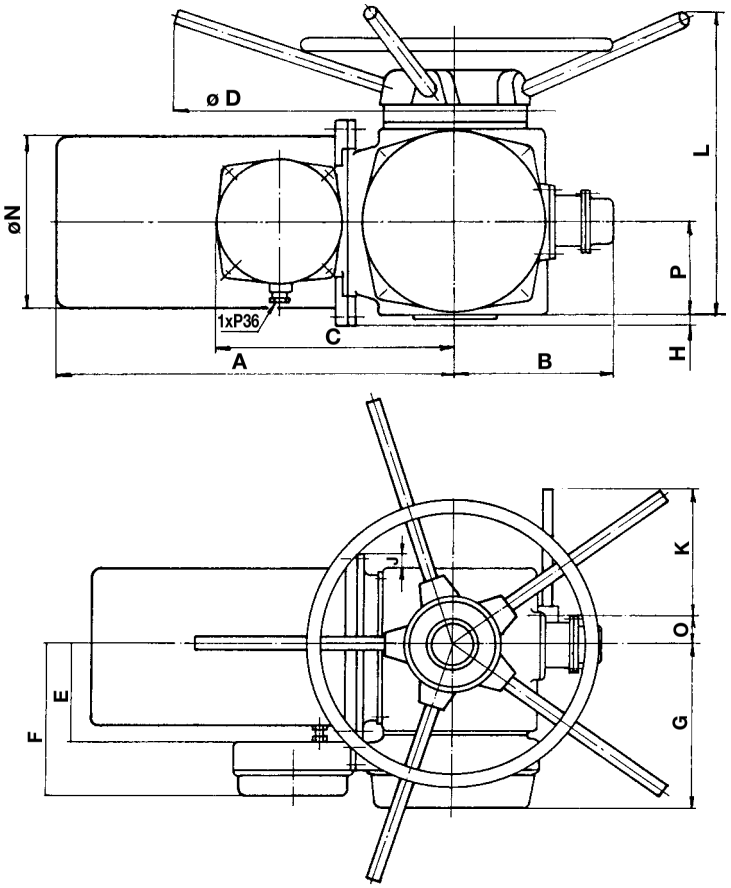
SHAPE B3
acc. to ISO 5210
(shape E acc. to DIN 3210)



Shape	Dimension	Type number		
		52 070	**52 071** **52 072**	**52 074**
C, E *(shared values)*	ø d_1 *(indic. values)*	125	175	210
	ø d_2 *(f8)*	70	100	130
	ø d_3	102	140	165
	d_4	M 10	M 16	M 20
	number of threaded holes	4	4	4
	h_1 min. 1.25 d_4	12.5	20	25
	h max.	3	4	5
C	ø d_7	42	60	80
	h_2	10	12	15
	b_2 *(H11)*	14	20	24
	ø d_6	30	41.5	52
E	ø d_9 *(H8)*	20	30	40
	1_6 min.	55	76	97
	t_3	22.8	33.3	43.3
	$b_4 Js_9$	6	8	12

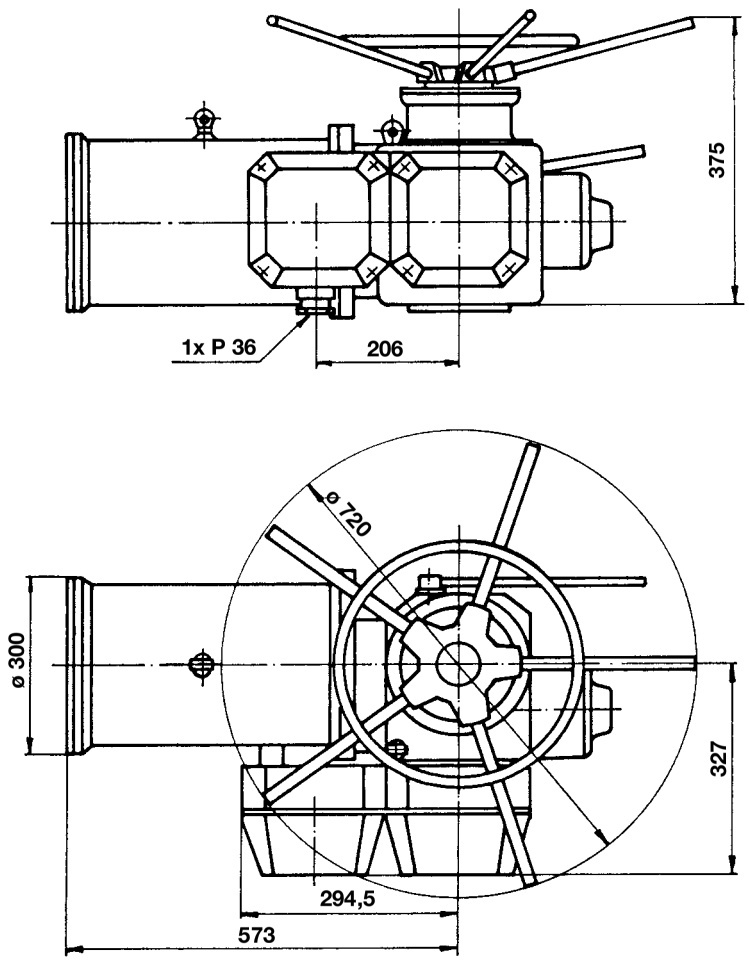
The d_6 a l_6 dimensions must not be smaller than indicated in the table.
Dimensions are indicated in mm.

Dimensional drawing of **MODACT MOA OC** electric actuators,
t. no. 52 070, 52 071, 52 072

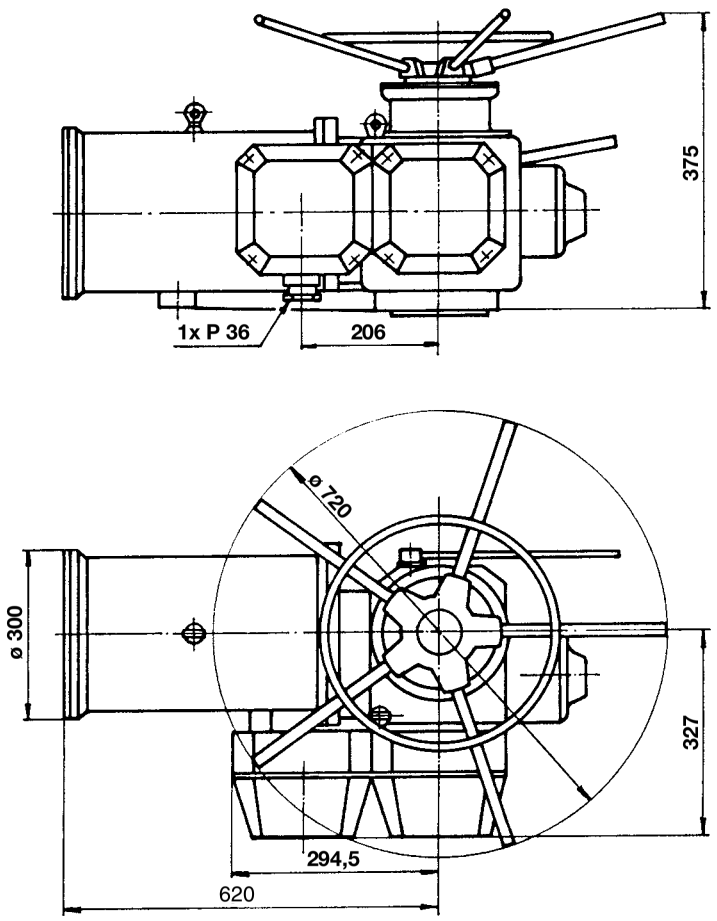


Type number	Dimension [mm]													
	A	B	C	D	E	F	G	H	J	K	L	ø N	O	P
52 070	365	185	290	250	100	283	240	-	-	150	255	153	30	90
52 071 52 072	488	206	290	720	128	295	252	21	23	240	300	225	37	105

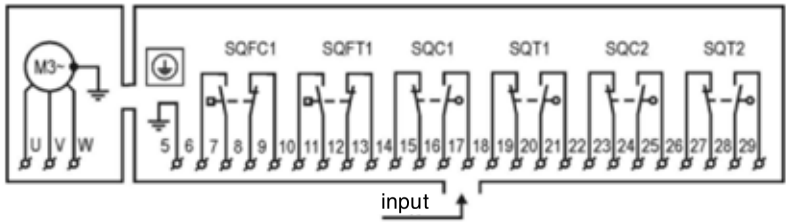
Dimensional drawing of **MODACT MOA OC** electric actuators,
t. no. 52 074.3x00



Dimensional drawing of **MODACT MOA OC** electric actuators,
t. no. 52 074.3x10, 52 074.3x20, 52 074.3x40 and 52 074.3x50



Internal wiring diagram of connection of actuators
MODACT MOA OC

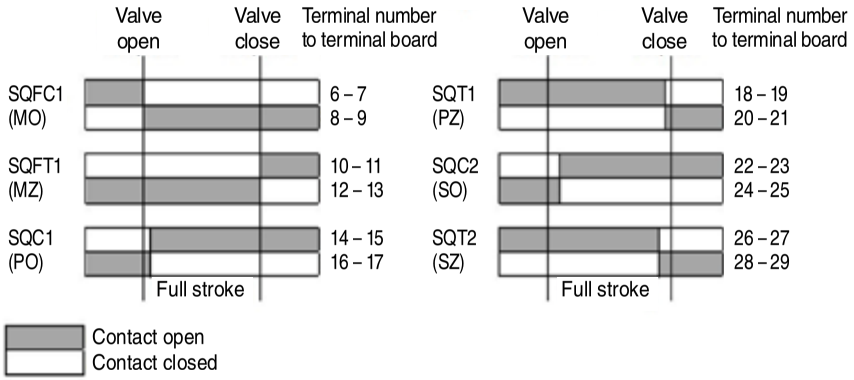


LEGEND:

SQFC1 *(MO)* – torque switch "open"
SQC1 *(PO)* – positioning switch "open"
SQC2 *(SO)* – position sig. switch "open"
M3~ – three-phase asynchronous electric motor
SQFT1 *(MZ)* – torque switch "closed"
SQT1 *(PZ)* – position switch "closed"
SQT2 *(SZ)* – position sig. switch "closed"

note for diagrams: Microswitches contacts in diagrams are shown in mkiddle position of output flange of actuator at torque less than adjusted tripping torque.

Operating diagram of microswitches



SPARE PARTS LIST OF MODACT MOA OC ACTUATORS

POWER AND CONTROL PART *(FOUR-YEAR OPERATION)*

Type no.	Name of spare part	Drawing no. or number of the ČSN	Number of material	Pcs	Use
52 070	Sealing ring 10x6	ČSN 029280.9	8918	2	Torque tripping shaft seal
	Sealing ring 30x22	ČSN 029280.9	8918	1	Position tripping shaft seal
	Sealing ring 16x12	ČSN 029280.9	8918	1	Shaft seal drive switch motor – hand wheel
	Sealing ring 75x65	ČSN 029280.9	8918	1	Sealing ring of the actuator centering
	Sealing ring 90x80	ČSN 029280.9	8918	1	Hand wheel shaft sealing
	Sealing ring 45x2	ČSN 029281.9	8918	2	Torque spring device cover sealing
	Sealing ring 52x3	ČSN 029281.9	8918	1	Torque spring device sealing
	Sealing ring 36x2	ČSN 029281.9	8918	1	Sealing of the hole for wires between the control cabinet and terminal cabinet
	Sealing ring 32x2	ČSN 029281.9	8918	1	Seal pipes for wires between the electric motor and the terminal cabinet
	Sealing ring 105x3	ČSN 029281.9	8918	1	Hand wheel flange sealing
	Sealing ring 150x3	ČSN 029281.9	8918	1	Sealing of terminal box cover
	Sealing ring 160x3	ČSN 029281.9	8918	1	Sealing between power transmission box and control box
	Sealing ring 190x3	ČSN 029281.9	8918	1	Sealing of control box cover
	"GUFERO" Sealing ring 42x55x8	ČSN 029401.0	40-90	2	Output shaft sealing in the actuator centering ring
	"GUFERO" Sealing ring 40x62x7	ČSN 029401.0	40-90	2	Output shaft sealing in the hand wheel
	"GUFERO" Sealing ring 12x22x7	ČSN 029401.0	40-90	1	Drive shaft sealing Position switches equipment
52 071 + 52 072	"GUFERO" Sealing ring 55x80x8	ČSN 029401.0	40-90	2	Hand wheel shaft sealing
	"GUFERO" Sealing ring 60x80x8	ČSN 029401.0	40-90	2	Output shaft sealing in the actuator centering ring
	"GUFERO" Sealing ring 12x22x7	ČSN 029401.0	40-90	1	Drive shaft sealing Position switches equipment
	Sealing ring 190x3	ČSN 029281.9	8918	1	Sealing of control box cover
	Sealing ring 160x3	ČSN 029281.9	8918	1	Seal between power and control cabinet
	Sealing ring 150x3	ČSN 029281.9	8918	1 + 1	Seal between the power transmission housing and the motor flange and terminal box cover sealing
	Sealing ring 130x3	ČSN 029281.9	8918	1	Hand wheel flange sealing
	Sealing ring 52x3	ČSN 029281.9	8918	1	Torque spring device cover sealing
	Sealing ring 45x2	ČSN 029281.9	8918	1	Sealing of the flange of the torque of the tripping shaft
	Sealing ring 36x2	ČSN 029281.9	8918	1	Sealing of the hole for wires between the control cabinet and terminal cabinet
	Sealing ring 32x2	ČSN 029281.9 for electric motors 0.55 kW and 1.2 kW	8918	2	Sealing of the pipes for wires between the electric motor and terminal cabinets
	Sealing ring 40x2	ČSN 029281.9 for 2.2 kW electric motor	8918	2	Sealing of pipe for wires between the electric motor and terminal cabinet

Type no.	Name of spare part	Drawing no. or number of the ČSN	Number of material	Pcs	Use
	Sealing ring 30x22	ČSN 029280.9	8918	1	Position switch drive shaft flange sealing
	Sealing ring 105x95	ČSN 029280.9	8918	1	Handwheel sealing
	Sealing ring 18x14	ČSN 029280.9	8918	1	Seal of the switch of hte drive electric motor - hand wheel
	Sealing ring 10x6	ČSN 029280.9	8918	2	Sealing of torque device shaft
	Sealing ring 90x3	ČSN 029281.9	8918	1	Sealing ring of the actuator centering
	Sealing ring 60x3	ČSN 029281.9	8918	1	Torque spring device sealing
52 074	"GUFERO" Sealing ring 75x100x10	ČSN 029401.0	40-90	2	Hand wheel shaft sealing
	"GUFERO" Sealing ring 80x100x10	ČSN 029401.0	40-90	2	Output shaft sealing in the actuator centering ring
	"GUFERO" Sealing ring 12x22x7	ČSN 029401.0	40-90	1	Drive shaft sealing position tripping switches equipment
	Sealing ring 190x3	ČSN 029281.9	8918	1	Sealing of control box cover
	Sealing ring 160x3	ČSN 029281.9	8918	1	Seal between power cabinet and control cabinet
	Sealing ring 150x3	ČSN 029281.9	8918	1	Sealing of terminal box cover
	Sealing ring 80x3	ČSN 029281.9	8918	1	Torque spring device cover sealing
	Sealing ring 45x2	ČSN 029281.9	8918	1	Torque tripping shaft flange sealing
	Sealing ring 40x2	ČSN 029281.9	8918	2	Seal pipes for wires between the electric motor and the terminal cabinet
	Sealing ring 30x22	ČSN 029280.9	8918	1	Position switch drive shaft flange sealing
	Sealing ring 145x130	ČSN 029280.9	8918	1	Handwheel sealing
	Sealing ring 25x21	ČSN 029280.9	8918	1	Seal of the switch of hte drive electric motor - hand wheel
	Sealing ring 10x6	ČSN 029280.9	8918	2	Sealing of torque device shaft
	Sealing ring 125x110	ČSN 029280.9	8918	1	Sealing ring of the actuator centering
	Sealing ring 90x3	ČSN 029281.9	8918	1	Torque spring device sealing
	Sealing ring 170x3	ČSN 029281.9	8918	1	Hand wheel flange sealing
	Sealing ring 16x12	ČSN 029281.9	8918	4	Electric motor mounting bolts sealing
	Parts for sealing cables and wires (for all types of actuators)				
	Sealing ring P 36/23	dwg.no. 23462178	1		Cable seal in the cable gland for cable with an outer diameter of 20-23 mm
	Sealing ring P 36/26	dwg.no. 23462179	1		Cable seal in the cable gland for cable with an outer diameter of 23-26 mm

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

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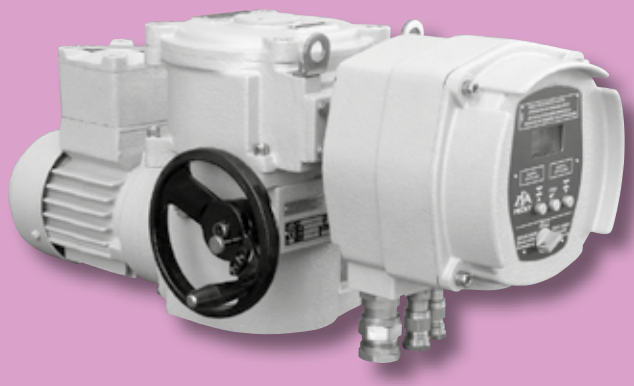
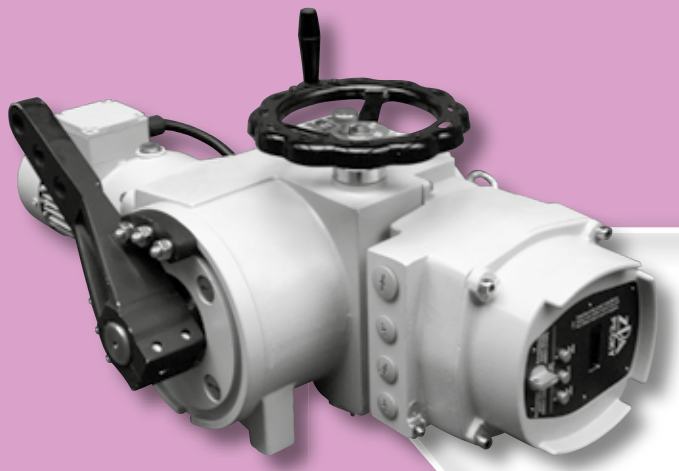
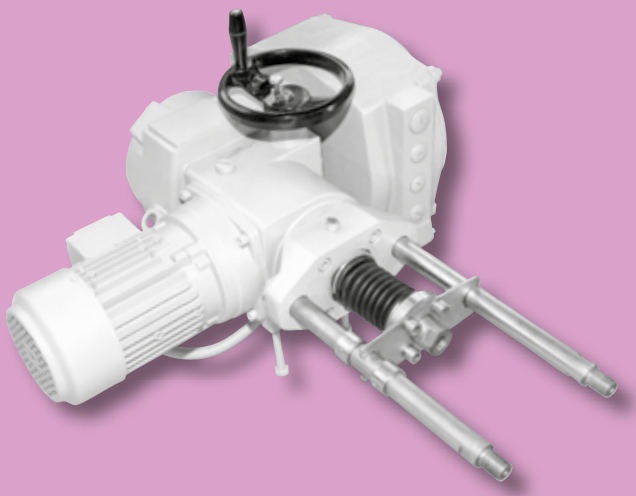
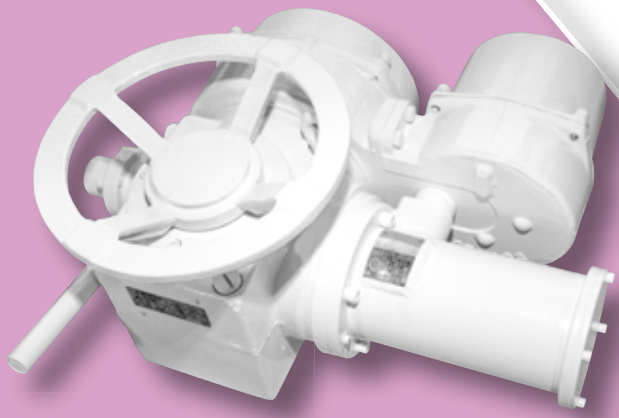
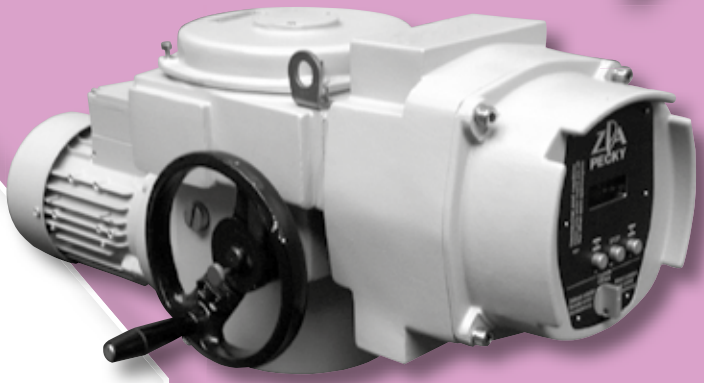
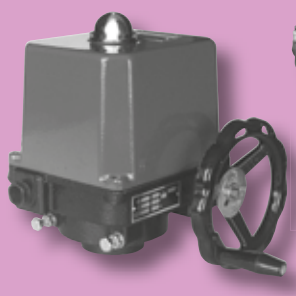
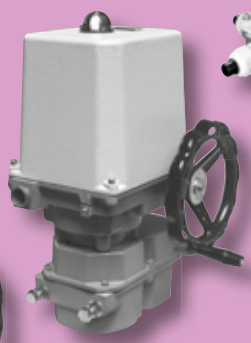
Electric rotary (160°) lever actuators with a constant output speed

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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