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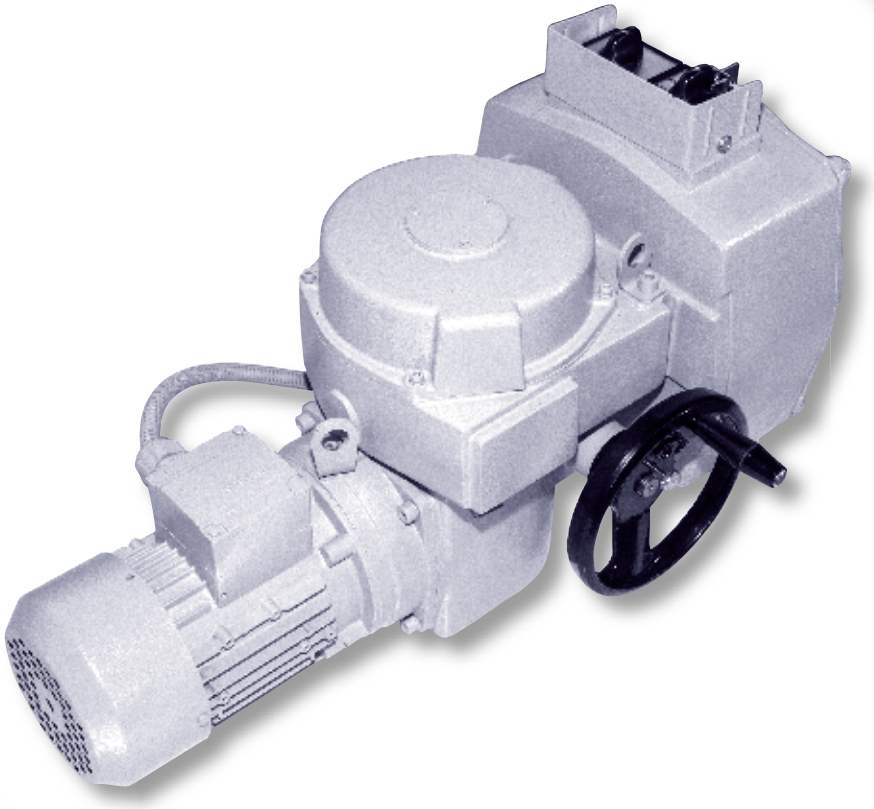


MOUNTING INSTRUCTIONS

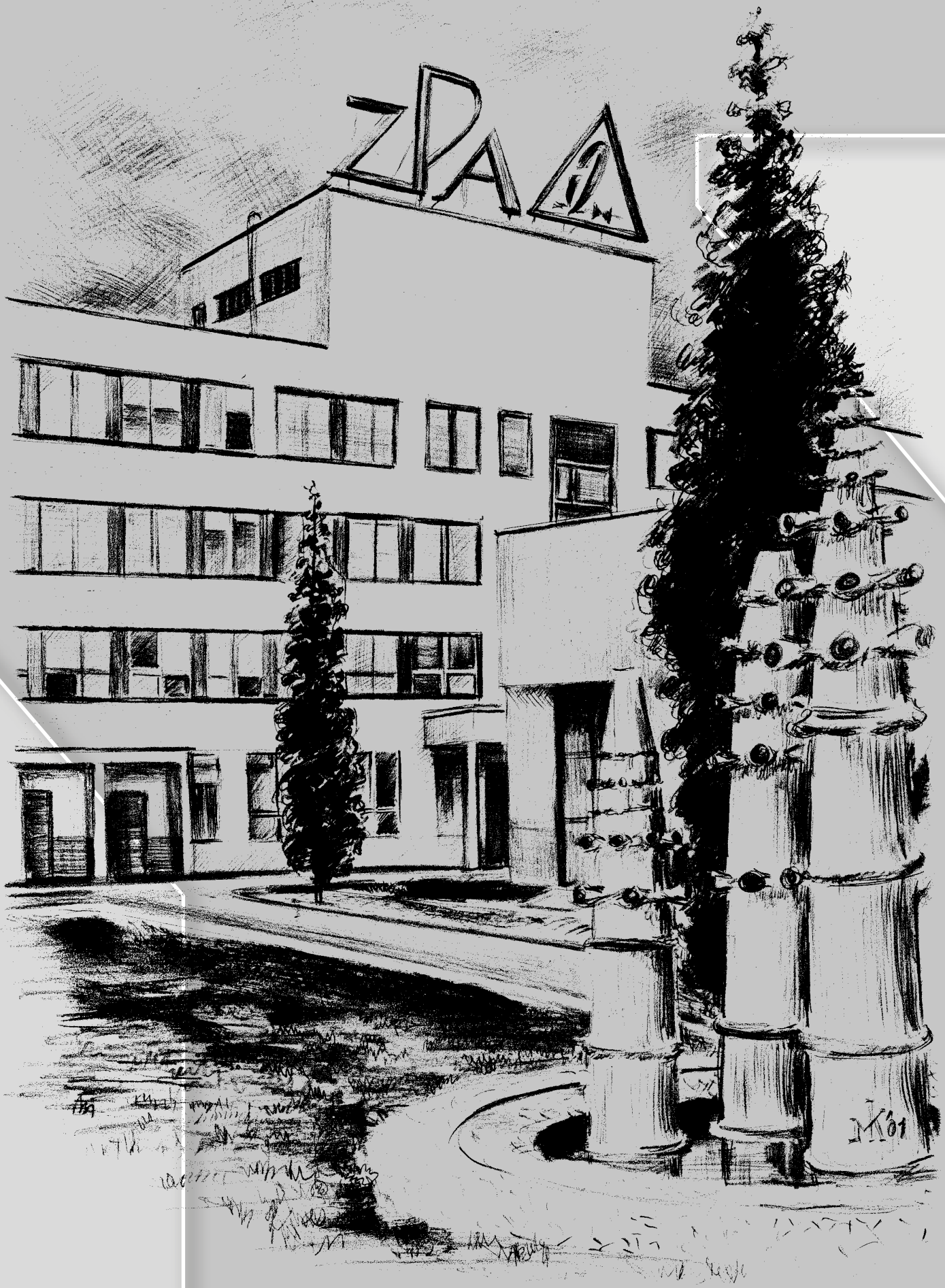
Electric Multi-turn Actuators

MODACT MON, MOP
MODACT MON, MOP CONTROL

Type numbers 52 030 - 52 036

MODACT MONJ

Type numbers 52 030 - 52 032



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1. APPLICATION

MODACT MON, MOP, MONJ series actuators are intended for actuating valves or other appliances suitable for control using actuators' rotary reverse movement. Other application than for operating valves must be consulted with manufacturer. Actuators may work in remote-controlled circuits. Actuators fitted with current transmitter may also work in automatic control circuits in S4 – 25%; 1,200 h^{-1} operating mode.

Depending on the relevant version, **MODACT MON, MOP, MONJ Control** actuators may be fitted with position regulator, reversing contactors, electric motor current protection, and electronic brake. Control elements, working in regulating circuits, can be set depending on the analogue input signal value of position regulator. They can be also delivered only with reversing contactors, or with reversing contactors and electronic brake.

2. WORKING ENVIRONMENT, OPERATING POSITION

Working environment

MODACT MON, MOP, MONJ actuators are resistant to operating conditions and external impact classes AC1, AD5, AD7, AE4, AE6, AF2, AG2, AH2, AK2, AL2, AM-2-2, AN2, AP3, BA4 and BC3 pursuant to ČSN 33 2000-5-51 ed 3.

When located in outdoor areas, we recommend you to provide a light shelter to prevent direct impact of atmospheric conditions. The shelter should overreach the actuator's ground plan by at least 10 cm at the level of 20 to 30 cm.

When actuators are located in a working environment with temperatures below +10°C, with relative humidity exceeding 80%, below a shelter, or in tropical areas, it is always necessary to use thermal element that is mounted to all actuators.

Actuators can be applied in premises with inflammable and non-conductive dust unless such environment adversely influences the electric motor's function. In such case, the CSN 34 3205 standard must be consequently adhered to. Dust should be wiped off when the dust layer thickness reaches about 1 mm.

Notes:

Sheltered areas are considered those where the fall of atmospheric precipitations under the angle up to 60° from vertical axis is prevented.

Electric motor must be located in areas providing free access of cooling air so that warm air blown out is not re-aspired by the electric motor. Minimum distance from wall for fresh air access is 40 mm. The area where the electric motor is located must be sufficiently large, clean and ventilated.

Ambient temperatures

MON, MON Control actuators are fabricated for ambient temperatures from -25 °C to +70 °C, from -40 °C to +60 °C or from -60 °C to +60 °C.

MOP actuators are fabricated for ambient temperatures from -25 °C to +60 °C.

MONJ actuators are fabricated for ambient temperatures reaching from -25 °C to +70 °C.

Relative humidity from 10 % to 100 % with condensation.

External impact classes

Basic characteristics – extract from ČSN 33 2000-5-51 ed 3

1) AC1 – above-sea level ≤ 2000 m
2) AD5 – spouting water; water may spout in all directions
   AD7 – shallow immersion, possible sporadic partial or full coverage *(only for MOP)*
3) AE4 – light dust formation
   AE6 – strong dust formation *(only for MOP)*
4) AF2 – occurrence of corrosive or polluting agents is atmospheric; presence of corrosive pollutants is significant
5) AG2 – mean mechanical strain; in normal industrial operations
6) AH2 – mean vibrations; in normal industrial operations
7) AK2 – serious risk of plant and moulds growth
8) AL2 – serious risk of occurrence of animals *(insects, birds, small animals)*
9) AM-2-2 – normal level of signal voltage. No additional requirements.
10) AN2 – mean solar radiation. Intensity > 500 and ≤ 700 W / m^2
11) AP3 – mean seismic impacts; acceleration > 300 Gal ≤ 600 Gal
12) BA4 – capability of persons; instructed persons
13) BC3 – frequent contact of persons with ground potential; persons often touch foreign conductive parts or stand on conductive substrate

Corrosion protection

Actuators are standardly delivered with surface treatment corresponding to category of corrosion aggressiveness C1, C2 and C3 according to ČSN EN ISO 12944-2.

On customer's request is possible to do surface treatment correcponding to category of corrosion aggressiveness C4, C5-I and C5-M.

In following table is provided and overview of environment for each categories of corrosion aggressiveness according to ČSN EN ISO 12944-2.

Corrosion aggressiveness level	Example of typical environment	
	Outdoor	Indoor
C1 (very low)		Heated buildings with clean atmosphere e.g. offices, shops, schools, hotels.
C2 (low)	Atmosphere with low level of pollution. Mostly outdoor areas.	Unheated buildings, in which may occur condensation, e.g. stocks, sports halls.
C3 (middle)	Urban industrial atmospheres, mild pollution of sulfur dioxide. Seaside areas with middle salinity.	Production areas with high humidity and low air pollution, e.g. food industry, processing factories, breweries.
C4 (high)	Industrial areas and seaside areas with middle salinity.	Chemical plants, swimming pools, seaside shipyard.
C5-I (very high – industrial)	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with predominantly continuous condensation and high air pollution.
C5-M (very high – seaside)	Seaside areas with high salinity.	Buildings or areas with predominantly continuous condensation and high air pollution.

Operating position

MODACT® MON, MOP, MONJ actuators filled with grease can be operated in any position. Actuators with grease are identified with label stating “Filled with grease”, located on the power box on the hand wheel side.

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

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

Actuators with oil bath are not identified by any label.

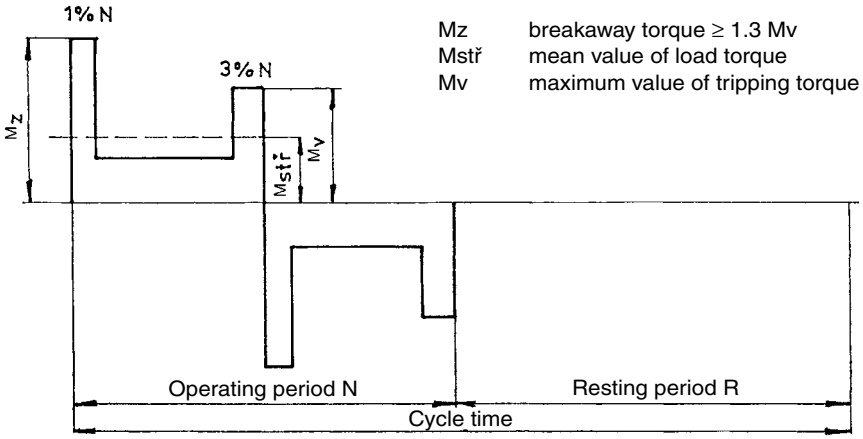
3. OPERATING MODE, ACTUATOR SERVICE LIFE

Operating mode

Actuators can operate with S2 load type as per ČSN EN 60 034-1; see course of load on diagram below. Period of operation at +50 °C is 10 minutes and mean load torque value is maximally 60 percent of the maximum tripping torque value.

Actuators may also work in interrupted operating mode with S4 start-up as per ČSN EN 60 034-1 *(e.g. in case of gradual valve opening action etc.)*. Maximum number of switching actions at automatic regulation is 1,200 cycles per hour with a load factor of 25 % *(proportion of operating period to rest period 1:3).* Mean load torque value equals maximally to 40 percent of the maximum tripping torque. Longest operating cycle *(N+R)* is 10 minutes; load factor *(N/N+R)* is maximally 25 %.

Maximum mean value of load torque equals to rated torque of actuator.



Mz breakaway torque ≥ 1.3 Mv
Mstř mean value of load torque
Mv maximum value of tripping torque

Operating cycle course

Actuators service life

Actuator intended for closing valves must be able to execute at least 10,000 operating cycles *(Close - Open - Close).*

Actuator intended for regulation purposes must execute at least 1 million cycles with operating period of *(with input shaft in motion)* at least 250 hours. Service life in operating hours *(h)* depends on load and number of switching operations. High frequency of switching operations may have a negative impact on regulation accuracy. To achieve the longest possible fault-free service life, we recommend you to set switching frequency to the lowest possible number necessary for the relevant process. Reference information on service life, derived from set-up regulation parameters, is specified in the table below.

Actuators service life for 1 million starts

service life [h]	830	1,000	2,000	4,000
number of starts [1/h]	maximum number of starts1,200	1,000	500	250

4. TECHNICAL SPECIFICATIONS

Feeding voltage

Actuators feeding voltage:

MODACT MON, MOP: 3 x 230 / 400 V, +10 %, -15 %, 50 Hz, ±2 %
3 x 220 / 380 V, +10 %, -15 %, 50 Hz +3 % -5 %

MODACT MONJ: 1 x 230 V, +10 %, -15 %, 50 Hz, ±2 %
1 x 220 V, +10 %, -15 %, 50 Hz +3 % -5 %

Upon agreement with supplier, actuators can be supplied also to comply with another feeding voltage and frequency. More details can be found in Technical Conditions.

Ingress protection

Ingress protection of actuators: **MODACT MON, *(MODACT MON Control),* MODACT MONJ** – IP 55
MODACT MOP *(MODACT MOP Control)* – IP 67

Noise

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

Tripping torque

Tripping torque is set up by manufacturer as per customer's requirement pursuant to Version Table 1 or 2. If tripping torque adjustment is not required, maximum value of tripping torque is set up.

Breakaway torque

Breakaway torque is a calculated value, determined by electric motor's breakaway torque, actuator's total ratio and effectiveness. Actuator can produce breakaway torque after run reversing operation for 1 to 2 revolutions of the output shaft, while torque tripping is interlocked. This may occur either in end position or in any optional intermediate position.

Self-locking function

Actuator is self-locking provided that load acts against the motion of the actuator's output shaft. Self-locking function is provided by a roller lock, which immobilizes actuator's rotor even in case of manual operation.

With respect to safety regulations, it is unacceptable to apply actuators for operating transport lifting equipment with possible transport of persons, or for equipment where persons may be present below the lifted load.

Rotation direction

When looking at the input shaft from the control box, "closing" direction is equal to clockwise rotation direction.

Working stroke

Working stroke is specified in Table 1 or 2.

Raising spindle

Actuators with A and C-shape installation dimensions can be adjusted to install actuator on valve with raising spindle, which overreaches the top end of the actuator output shaft in the valve's end position. Room for raising spindle of valve is obvious from dimensional sketches. When necessary, operator may install a protective cylindrical cover for raising spindle, replacing the cover of openings in the control box. Protective cover for raising spindle is not included in the scope of actuator delivery.

Manual operation

Manual operation is carried out by hand wheel directly *(without clutch)* and can take place also while the electric motor is running *(output shaft motion is determined by the differential gear's function).* When rotating the hand wheel in clockwise direction, the actuator's output shaft also rotates in clockwise direction *(looking at the shaft into the control box).* If the valve nut has a left-hand thread, the actuator will close the valve.

Torque values in actuators are set up and work if the actuator is energized.

If manual operation is used i.e. if actuator is operated mechanically, the torque set up will not work and valve may be damaged.

5. ACTUATOR FEATURES

Torque switches

Actuators are fitted with two torque switches *(MO, MZ),* each for one direction of actuator output shaft motion. Torque switches may work in any point of the operating stroke except where they are interlocked *(Breakaway torque).*

Tripping torque value can be set up within the range specified in Table 1 or 2. Torque switches are interlocked in the event that once switched off they lose load torque. This provides protection of actuator against so-called "pulsing".

Position switches

Position switches PO, PZ delimit the working stroke of the actuator *(one switch for each limit position).*

Position signalling

Actuator's output shaft position is signalled by two signal switches SO, SZ – each for one output shaft motion direction. Switching point of micro switches can be set up in the entire range of working stroke, except a tight range before micro switch tripping point, which deactivates the electric motor.

Position transmitters

Actuators **MODACT MON, MOP, MONJ** may be delivered without position transmitter or they can be provided with position transmitter:

a) Resistance transmitter 1 x 100 Ω

Technical parameters:

Position sensing	by resistance
Rotation angle	0° – 320°
Linearity	≤ 1 %
Contact resistance	max. 1.4 Ω
Permissible voltage	50 V DC
Maximum current	100 mA

b) Passive current transmitter type CPT 1Az. Current loop feeding is not part of the actuator. Recommended feeding voltage is 18 to 28 V DC, with maximum loop load resistance of 500 Ω. Current loop must be earthed in one point. Feeding voltage does not need to be stabilized, however, it must not exceed 30 V, otherwise the transmitter may be destructed.

Range of CPT 1Az is adjusted using potentiometer on the transmitter's body, and output value is adjusted by rotating the transmitter accordingly.

Technical parameters of CPT 1Az:

Position sensing		by capacity
Working stroke		adjustable 0° – 40° to 0° – 120°
Non-linearity		≤ 1 %
Non-linearity including gears		≤ 2.5 % *(for max.stroke 120°).*
Hysteresis including gears		≤ 5 % *(for max. stroke 120°)*
(Non-linearity and hysteresis relate to signal value of 20 mA.)		
Load resistance		0 – 500 Ω
Output signal		4 – 20 mA or 20 – 4 mA
Feeding voltage for	Rz 0 – 100 Ω	10 – 20 V DC
	for Rz 400 – 500 Ω	18 – 28 V DC
Maximum feeding voltage ripple		5 %
Maximum power input of transmitter		560 mW
Insulation resistance		20 MΩ at 50 V DC
Electrical resistance of insulation		50 V DC
Temperature of working environment		-25 °C to +60 °C
Temperature of working environment – extended range		-25 °C to +70 °C *(other ranges upon request)*
Dimensions		ø 40 x 25 mm

c) Active current transmitter type DCPT3. Current loop feeding is part of the actuator. Maximum load resistance of loop is 500 Ω. For **MODACT MON, MOP, MONJ Control** versions with ZP2.RE5 regulator, the current transmitter is used as position sensor.

DCPT3 is easy to adjust by means of two pushbuttons with LED on the transmitter body.

Technical parameters of DCPT3:

Position sensing	contactless, magnetoresistant
Working stroke	adjustable from 60°to 340°
Non-linearity	max. ±1 %
Load resistance	0 – 500 Ω
Output signal	4 – 20 mA, or 20 – 4 mA
Feeding	15 – 28 V DC, < 42 mA
Working temperature	-25 °C to +70 °C
Dimensions	ø 40 x 25 mm

Transmitters CPT 1Az and DCPT3 are connected by two-wires, i.e. transmitter, power supply and load are connected in series. User must provide connection of two-wire circuit of current transmitter to ground of the adjacent regulator, computer etc. Connection must be provided only in one point in any part of the circuit, outside the electric actuator.

Position indicator

Actuator can be equipped with local position indicator.

Heating element

Actuators are equipped with a heating element to prevent water vapour condensation. Heating element is to be connected to 230 V power supply.

Local control

Local control serves to operate the actuator from the place of installation. Local control consists of two switches: switch1 has positions: “remote control – off – local control”, switch 2: “opening – stop – closing”. Switch 1 can be integrated as 2-pole or 4-pole switch. Switches are located in terminal box.

Position regulator

Position regulator, integrated in the actuator, enables the position of the actuator output shaft and thus also the actuated fitting to be controlled by an input analogue signal.

The regulator’s basic component is a microcomputer, programmed to regulate the actuator, to identify and lever error statuses and to easily set regulation parameters.

In case of power failure, the regulator will not regulate. Parameters and diagnostic data are written in regulator memory, where they are stored. After power up, data will be automatically loaded from regulator memory.

In the regulator’s circuits, input signal is compared with feedback signal from the position transmitter of the actuator input shaft. If a discrepancy is found between the input and feedback signal, the regulator switches one of the integrated contactors in the electric motor so that the actuator’s shaft is set to a position corresponding to the value of the input signal. If the feedback signal corresponds to the input signal, the actuator will stop.

Regulation parameters are adjusted using function buttons on regulator or by means of a personal computer connected to the regulator through communication module, while adjusting the parameters.

Dynamic brake

Brake is an optional equipment of **MODACT MON, MOP Control** actuators. Upon contactor disconnection, it incites dynamic braking torque in the electric motor for several tenths of second. It significantly reduces rundown time and thus makes regulation more precise. No braking torque is applied when actuator is stopped.

Autonomous brake **BAM-002** is used for actuators without regulator. For its function, the brake needs supplementary auxiliary contacts of contactors as well as an additional over-current relay contact. It is designed for electric motors 3 x 230 / 400 V with output up to 550 W.

For actuators with regulator ZP2.RE5, simpler controlled brakes BR2 are used. They are interconnected with regulator that gives them actuation impulse.

The corresponding version is selected depending on the electric motor version:

BR2 550 up to the output of 550 W,

BR 2.2 up to the output of 2.2 kW.

If outputs higher than 2.2 kW need to be braked, special versions of electric motors with electromagnetic brake must be applied.

Electric motor switching, contactor unit

Control versions of actuators have integrated reversing contactor combinations. These consist of two contactors and an over-current relay. The combination also includes mechanical interlocking, which prevents both contactors from switching at the same time. This could happen for instance as result of wrong connection of jumpers in the terminal box. Interlocking is not designed for long-term function. Over-current relay protects the electric motor from overloading and is designed according to its output.

Depending on the actuator version, contactors are controlled by regulator, local control switch or by external input. Standard control voltage is 230 V/50 Hz and is transferred through contacts of position and/or torque micro switches. Thus, these micro switches do not need to be led out of the actuator.

6. ELECTRICAL PARAMETERS

External electrical connection

a) Terminal board

Actuator is fitted with a terminal board providing connection to external circuits. Terminal board is provided with screw terminals for connection of conductors with a maximum section of 4 mm^2. Terminal board is accessible upon removal of terminal box cover. All electrical control circuits of actuator are led to the terminal board. Terminal box is provided with cable bushings for electric connection of actuator. Electric motor is provided with separate box including terminal board and bushing.

b) Connector

Upon customer’s request, actuators **MODACT MON, MOP, MONJ** can be provided with a connector that enables connection of control circuits. Connector is provided with crimp terminals for connection of conductors with a maximum section of 4 mm2. ZPA Pečky, a.s. also supplies terminal counterpart for cable. Special crimping scissors are necessary for attaching a cable to this counterpart.

Internal electrical connection of actuators

Internal electrical wiring diagrams of **MODACT MON, MOP, MONJ** actuators including identification of terminals are included in the present Catalogue.

On the actuator, the internal wiring diagram is depicted on the inner side of the terminal box cover. Terminals are identified by numbers on adhesive stickers attached on carrying belt below the terminal board.

Current-carrying capacity and maximum voltage of micro switches

Micro switches maximum voltage is 250 V AC and DC at the following maximum current values:

MO, MZ	250 V AC / 2 A; 250 V DC / 0,2 A
SO, SZ	250 V AC / 2 A; 250 V DC / 0,2 A
PO, PZ	250 V AC / 2 A; 250 V DC / 0,2 A

Micro switches can be used only as single-circuit micro switches. Two voltages of varying values or phases must not be connected to the terminals of one micro switches.

Insulation resistance

Insulation resistance of electrical circuits against the ground or against each other at normal conditions must be at least 20 MΩ, after humidity test at least 2 MΩ. Insulation resistance of electric motor must be at least 1.9 MΩ. More details can be found in Technical Conditions.

Electric strength of electrical circuits' insulation

Circuit of position resistance transmitter		500 V, 50 Hz
Circuit of current transmitter		50 V DC
Circuits of micro switches and heat resistor		1,500 V, 50 Hz
Electric motor	Un = 1 x 230 V	1,500 V, 50 Hz
	Un = 3 x 230/400 V	1,800 V, 50 Hz

Deviations from basic parameters

Tripping torque	±12 % of maximum value of range
Setting speed	- 10 % of maximum value of range +15 % of rated value *(in idle run)*
Signal switches setting	± 2.5 % of maximum value of range *(ranges are specified in Installation Manual)*
Signal switches hysteresis	max. 4 % of maximum value of range
Position switches setting	± 25° of output shaft swivel angle *(no run-out impact)*
Position switches hysteresis	max. 45° of output shaft swivel angle

Protection

Actuators are provided with one internal and one external protective terminal serving as protection from electric shock as per CSN 33 2000-4-41 ed. 2. Also the electric motor is provided with one protective terminal. Protective terminals are identified with a sign complying with ČSN EN 60 417-1 and 2 (013760).

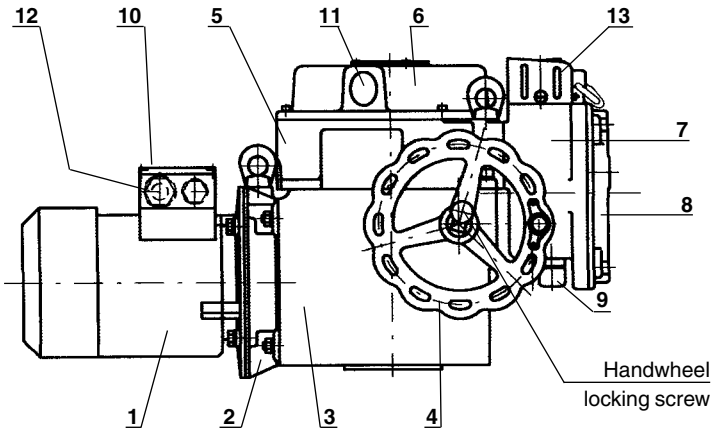
If actuator is not provided with over-current protection when purchased, such protection must be provided externally.

7. DESCRIPTION

Actuators with basic installation dimensions are designed for direct installation to valves. Connection of actuator with valve is enabled by a flange complying with ČSN EN ISO 5210 *(13 3090).* To transfer the motion of the actuator's output shaft to the valve, actuators are provided with C or D-shape couplings as per ČSN 18 6314 *(equivalent to DIN 3338),* or with E-shape couplings as per ČSN 18 6314; ČSN 18 6314; B3 as per ČSN EN ISO 5210 *(13 3090).* Using adapters, supplied as an option, A or B1 shape installation dimensions as per ČSN EN ISO 5210 *(13 3090)* can be obtained. Adapters are fitted between actuator and valve.

Three-phase asynchronous motor 1 drives the central wheel of the differential gear, through counter gear set 2. The central wheel is located in the actuator's bearing box *(power transmission 3)*.

While operated by motor, the ring gear of the planetary gear differential is held in a constant position by means of a self-locking worm gear. Hand wheel 4, connected with worm, allows manual control, even when motor is running. The hollow output shaft is firmly connected with the planetary gear and passes into control box 5, where all control elements of the actuator are concentrated – i.e. position, signalling and torque switches, resistant or current position transmitter and heating element. Operation of position and signalling switches is derived, through mechanisms, from the output shaft rotation.



Description:

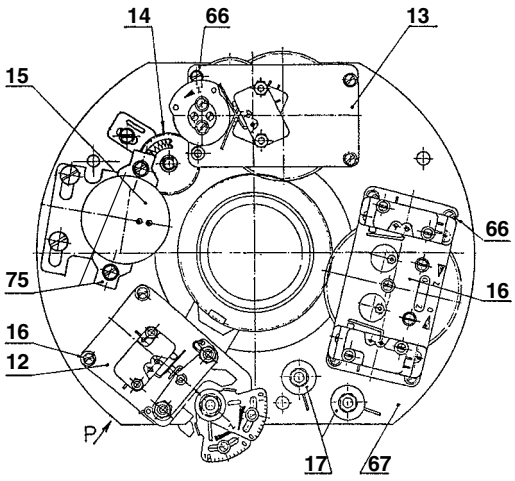
1 – electric motor
2 – counter gear set box
3 – power gear
4 – hand control wheel
5 – control box
6 – control box cover
7 – terminal box
8 – terminal box cover
9 – cable bushings P 16 (for control)
10 – electric motor terminal board
11 – position indicator
12 – cable bushing (for motor)
13 – local control block

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

The operation of torque switches is derived from the axial displacement of the “floating worm” of manual control, which is sensed and transferred to the control box by a lever. Control elements are accessible upon removal of cover 6 of this box. Also terminal box 7 is accessible upon removal of cover 8. Cable inlets are secured by means of cable bushings P 16 *(or P 21 and P 16 for versions with connector)*. Electric motor is fitted with a separate terminal board 10 and a cable bushing. Output shaft position can be identified on position indicator 11. The actuator's various operational functions such as tripping by torque, tripping by position, signalling, remote position reporting *(position transmitter)* are provided by mechanical groups *(units)*. These are located on the control board, fitted inside the control box.

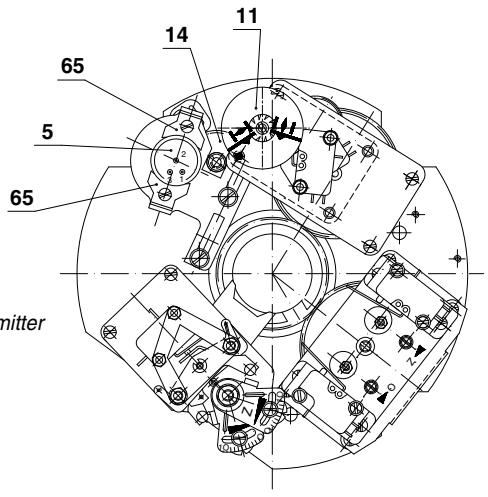
Important notice:

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



Description:

5 – Resistance position transmitter
11 – local position indicator
12 – torque tripping unit
13 – signalling unit
14 – driving gear
15 – current position transmitter (4 – 20 mA)
16 – position unit
17 – heating resistance
65 – pads
66 – fixing screws
67 – mother board



Actuators type no. 52 030 with current transmitter is the beam with transmitter turned 180 degrees opposite Fig. 2a.
Actuators type no. 52 031- 52 036 with resistance transmitter is the ebam with transmitter turned 180 degrees opposite Fig. 2b.

Fig. 2a - ***Control board - version with current position transmitter***

Fig. 2b - ***Control board – version with current position transmitter and position indicator***

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 levers 45 or 46, to micro switches MZ or MO. Tripping torque value is adjusted by rotating the segments against the tripping levers. To allow tripping torque setting outside the manufacturing plant, segments 23 are provided with a scale providing individually for each actuator indications of points for setting up the maximum and minimum torque. The set up torque is indicated by recesses in segments 27 or 28. Figures on the scale do not

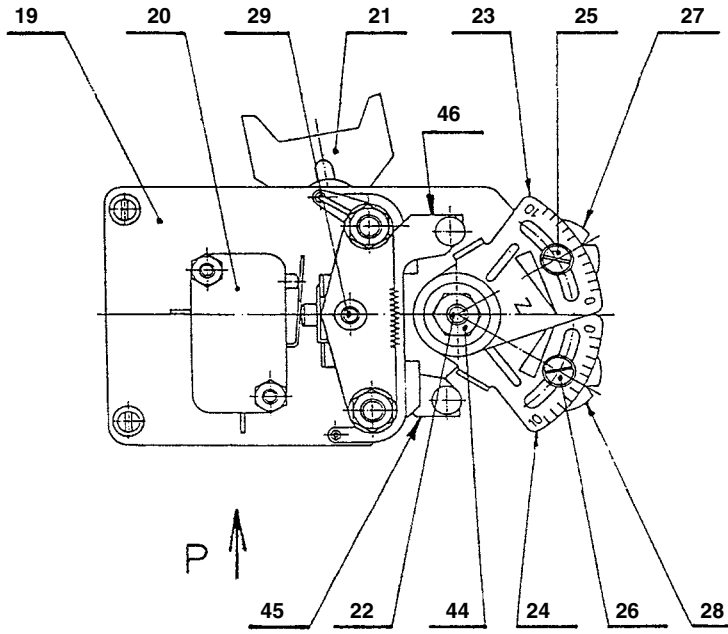
give direct indication of the tripping torque. Increments on the scale only serve to provide a more accurate division between the maximum and minimum torque levels, and thus to enable a more precise set-up of the tripping torque outside the manufacturing plant if no loading bench is available. Segment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

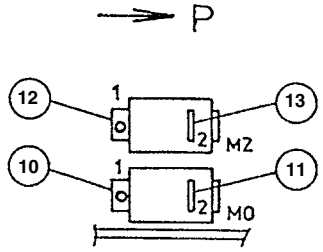
The torque control unit is also fitted with two locking mechanisms. The first mechanism locks the torque switch once tripped and prevents it from re-triggering and thus also the actuator from pulsing. The second locking mechanism prevents the torque switch, after actuator rotation reversing, from tripping, 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 or 24 rotate two, which transfer the motion to tripping lever 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 lever will push the button of the relevant micro switch, which will disconnect the electric motor from power supply, and the actuator will stop.

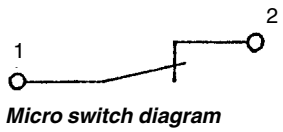
Torque unit adjustment procedure

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).*





Numbers in circles correspond to terminal numbers on the terminal board of the actuator. Micro switches can be used only as single-circuit micro switches.



Micro switch diagram

Description:
19 – base plate
20 – micro switches MZ, 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" segment by recess
28 – bottom "opening" segment by recess
29 – locking shaft
44 – locking nut
46 – tripping "closing" lever

Fig. 3 - ***Torque tripping unit***

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 can be 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, at 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.

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 a gearbox to cams 30, 31, controlling micro switches 36 *(SO)* and 37 *(37)*. The switching moment of signal switches can be selected in any point of the actuator's working stroke, except a narrow range around end positions

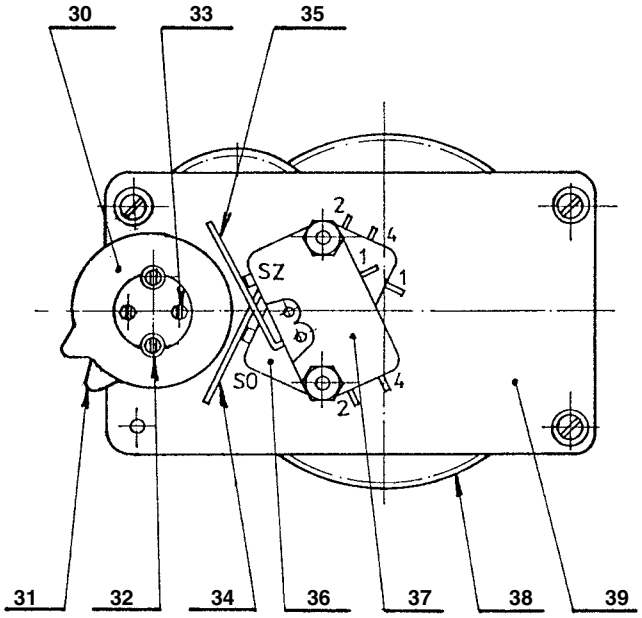
(signal switch must switch before the position switch while the output shaft is still moving). Top cam 37 pertains to "closing" direction and bottom cam 36 pertains to "opening" direction.

Signalling unit is designed as a separate 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 setting gear K3 can be moved to various levels *(I, II, III, IV, V)* once locking screw 47 is released. By adjusting gear K3, the setting range of signalling switches and transmitter will change depending on the working stroke. Next to figure 5 is a table specifying setting ranges corresponding to the various positions of setting gear K3.

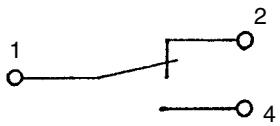
Signalling unit adjustment

If the set up range of signal switches and transmitter needs to be changed, you have to change the position of setting 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 three screws 66 *(fig. 2),* which hold the unit on the base plate. Once the signalling unit is readjusted to the necessary range, reinstall the unit. Before re-tightening screws 66, check wheels K1 and K2 *(fig. 5)* for correct meshing. Pinion 49 is slid on the bottom end of cam shaft 48 *(fig. 5)*, which is connected with shaft 48 by an adjustable friction clutch. Motion of this pinion is sensed for actuating the resistance or current transmitter. Cams and micro switches of signalling unit are aligned as shown on figure 4. Cam toes 30 displace levers 34 and 35, which further operate micro switches 36 *(SO)* or 37 *(SZ)*. When setting up signalling and position switches and transmitter, it is always necessary to set the actuator output shaft to a position, in which the micro switches are supposed to switch or in which the required position of transmitter is supposed to be reached.

When adjusting the signalling switches, first release screws 32 *(for SZ)* or 33 *(for SO)* – fig. 4. Then turn cam 30 or 31 - at micro switch SZ counter clockwise, at SO clockwise, until the micro switch switches. In this position, hold the cams and re-tighten the locking screws.



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



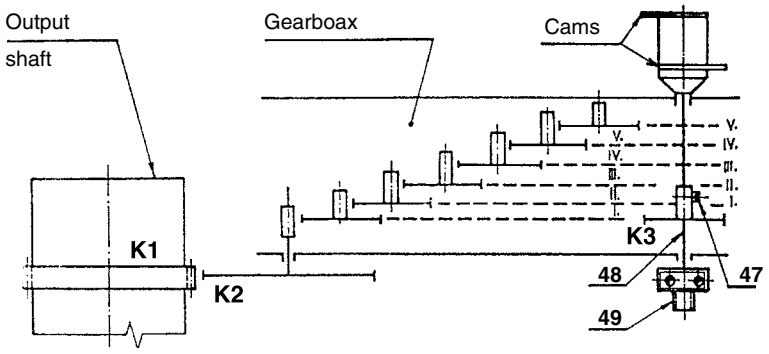
Micro switch diagram

Description:
30 – cams for "closing" direction
31 – cams for "opening" direction
32 – screws for cams for "closing" direction
33 – screws for cams for "opening" direction
34 – lever for "opening" direction
35 – lever for "closing" direction
36 – micro switch for "opening" (bottom) direction
37 – micro switch for "closing" (top) direction
38 – gear (driving gear)
39 –unit bracket

Fig. 4 - ***Signalling unit***

Warning:

After each manipulation 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.



Description:
K1 – gear
K2 – driving gear
K3 – setting gear
47 – locking screw of setting gear
48 – cam shaft
49 – pinion with friction clutch

Note:
Position of setting gear for actuators ser. No. 52 030 for the various gear ratios is specified on left-hand side of figure above, for other serial numbers on the right.

Fig. 5 - ***Kinematic diagram of gears***

Adjustment range of working stroke signalling unit

Gear ratio	Serial number			
	52 030	52 031 52 032	52 033 52 034 52 035	52 036
I	2 - 2,5	2 - 6,5	2 - 5	1 - 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

c) Position unit *(fig. 6)*

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

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

Handling and adjustment

Unit is adjustable in the range specified in Table No. 1, 2. Adjustment procedure is as follows:

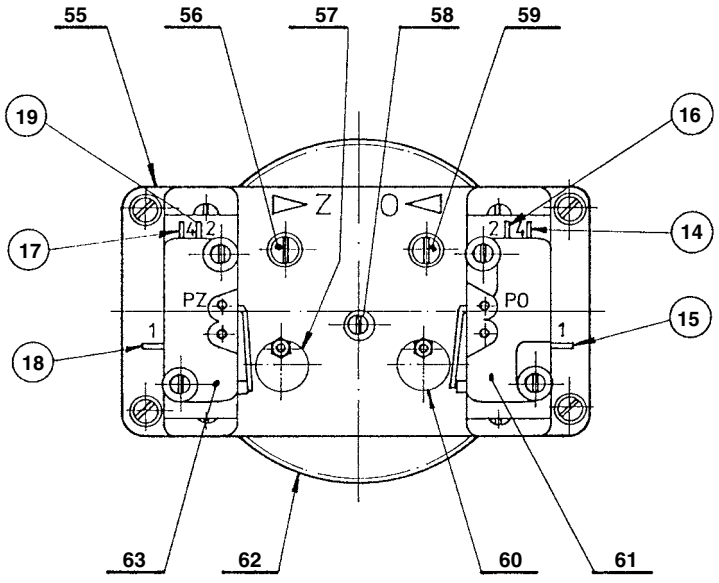
1) Once the actuator has been fixed to the valve, set valve to closed position using actuator.
2) In this position, push tripping rod 58 in vertical direction and then turn it by 90 degrees in any direction.
3) Turn set screw 56 in "Z" arrow direction until cam 57 pushes the spring of micro switch PZ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

Note:

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

If, prior to adjustment, cams are in such a position as indicated on 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 set screws 56 or 59 against arrows' direction until the cam's tip leaves the micro switch lever *(towards the closest set screw)* and the micro switch switches *(use suitable tester to make sure that micro switch has switched).*



Description:

55 – decade gear
56 – set screw "closing"
57 – tripping cam "closing"
58 – tripping rod
59 – set screw "opening"
60 – tripping cam "opening"
61 – micro switch PO
62 – driving wheel
63 – micro switch PZ

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

Micro switch diagram

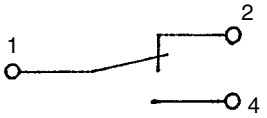
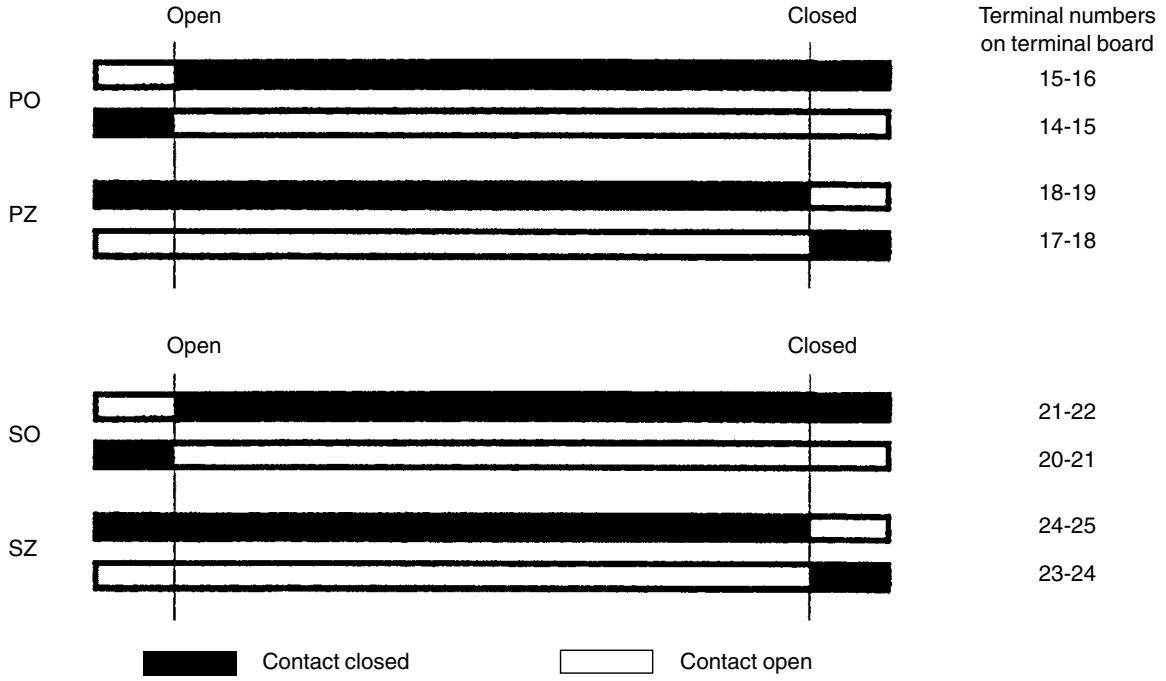


Fig. 6 - ***Position unit***

Then turn set screw 56 or 59 in arrow direction to turn the cam's tip back to the micro switch lever until the micro switch switches again *(micro switch button is pressed)*. Now the micro switch has been adjusted. Then slide tripping rod 58 out as described above.

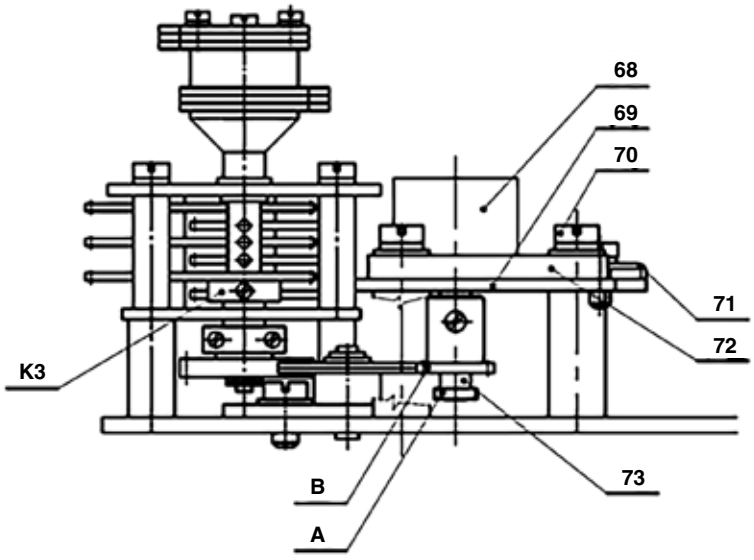


Working diagram of position and signalling switches

d) Position transmitters

Resistance position transmitter 1 x 100 Ω

This transmitter has one-sided driven shaft and on its conclusion is fixed double wheel 73 consisted of sprocket wheels A and B. Principle of drive and adjustment of transmitter is the same as at current transmitter CPT 1Az. Difference is only in sizes of sprocket wheels A nad B and double wheel 73 and in table of working stroke adjustment.



Wheel on transmitter - gears (version with resistance position transmitter)

Resistance position transmitter – adjustment

First it is necessary to adjust suitable gear from actuator output shaft to shaft of transmitter, according to required working stroke of actuator – see following table.

Adjustment will be done with adjusting wheel K3 in gearbox of signalling unit according to previous point b). Then it is necessary to push into the shot needful wheel of double wheel, which is fixed on transmitter shaft. Wheel with less average is marked A, larger wheel is marked B. Adjusting will be done by moving pad 72 – either under beam of transmitter (into the

shot is wheel A) or above beam of transmitter (into the shot is wheel B). This will be done in a position, when beam of transmitter is most distant from gearbox. Then screws attaching beam of transmitter will be slightly tightened for moving beam of transmitter to the position, in which is wheel or wheel B into the shot with drive wheel. Shot of wheels must be checked out in this position. Between wheel A (event. B) and drive wheel must be small will, because of shaft, which will be strained in direction perpendicular to axis. Then tighten properly attaching screws beam of transmitter and secure with varnish. In case of required working stroke is in overlap of two zones, it is prefereable to choose lower zone.

After adjustment of suitable gear, adjust resistance transmitter according to following procedure: Due to more levels of gear ratio of signalling unit, potenciometer slider does not move always in whole range of resistance path, but only in its certain part. During adjusting of signalling unit to final position "open" and "closed" according to point b) will uccur automatically to certain adjustment of resistance transmitter. Final adjustment of transmitter will be done by following procedure: Adjust output shaft of actuator to position "closed". Then loosen the pin screws in the way, that will be possible to rotate by whole transmitter (transmitter is designed with stops and it is possible to rotate it only in range of 320 degrees). Followingly adjust the transmitter to lowest resistance value (circa 4 ohms, not less) and then tighten the pin screws. During power on of actuator or turning of handwheel on "open", resistance will increase to resistance value appropriate to final value "open" (50 ohms and max. 98 ohms). The transmitter is adjusted by this way.

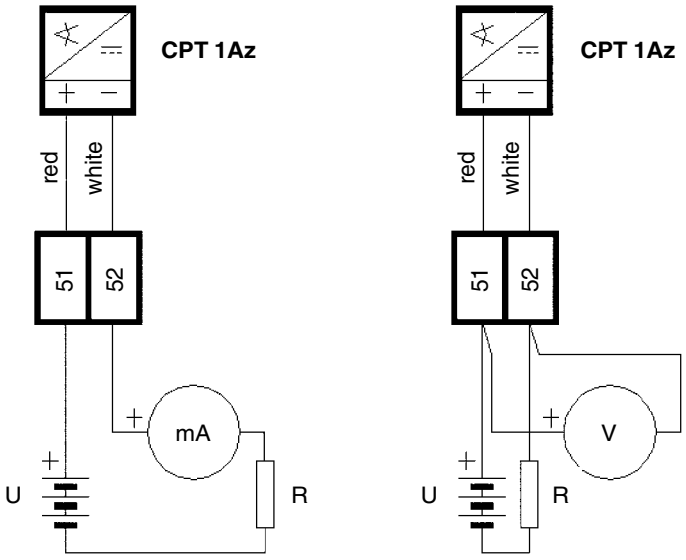
Adjustment range of working stroke for resistance position transmitter

Gear ratio	Gear on transmitter	Serial number		
		52 030	52 031–52 032	52 033–52 035
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

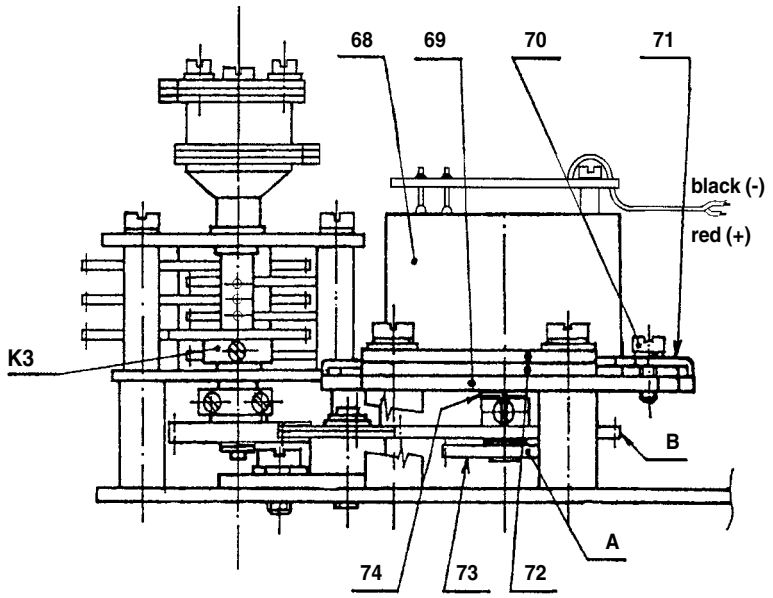
Current position transmitter CPT 1Az – adjustment

Before starting to adjust the current transmitter, end positions *(torque or position switches)* of actuator must be adjusted and connected to tripping circuits of electric motor. In case of external power supply source, it must be verified that it does not exceed the maximum value of 30 V DC *(limit value when CPT 1Az still will not be destructed).* Recommended value is 18 to 28 V DC.

Connect positive pole to positive pole of transmitter CPT 1Az and connect milli-ammeter with minimum accuracy of 0.5 %. Current loop must be grounded in one point. No grounding is displayed on drawing; this can be executed in any point of the circuit.



1. Set output shaft to “closed” position. When closing, the current signal value must drop. If it rises, release the transmitter body and turn it by approx. 180° to changeover to the dropping portion of the output curve. Adjust 4 mA by fine turning. Tighten adapters to secure transmitter from voluntary turning.
2. Set output shaft to “open” position and use potentiometer to set 20 mA on the transmitter body. The potentiometer’s range is 12 revolutions and has no dead stops, so it cannot be damaged by overturning.
3. Again verify current value in “closed” condition. If the value has changed too much, repeat points 1 and 2. If the necessary corrections are too extensive, this procedure must be repeated several times. Once set up, secure the transmitter from turning and drop varnish on locking screws.
4. Use voltmeter to check voltage on terminals of CPT 1Az. To maintain output signal integrity, voltage must not drop below 9 V even at power take-off of 20 mA. If this condition is not fulfilled, feeding voltage must be increased *(within the range of recommended values)* or the total resistance of current loop R must be reduced.



Description:
68 – current transmitter CPT 1Az
69 – transmitter bracket
70 – locking screw
71 – adapter
72 – oval spacers
73 – double wheel
74 – spacer rings

Fig. 7 - ***Wheel on transmitter - gears (version with current position transmitter)***

Table of working stroke adjustment for current position transmitter CPT 1Az

Gear ratio	Gear on transmitter	Serial number		
		52 030	52 031 - 032	52 033 - 035
I	A	0,9 -1,8	1,3 - 2,6	1 - 2
	B	1,6 - 3,3	2,4 - 4,8	1,8 - 3,7
II	A	2,1 - 4,2	4,4 - 8,8	3,4 - 6,8
	B	3,4 - 6,9	8 - 16	6,1 - 12,3
III	A	6,7 - 13,4	14,8 - 29,6	11,4 - 22,8
	B	11,6 - 23,3	27 - 54	20,8 - 41,7
IV	A	21,4 - 42,9	49 - 99	37,8 - 76,5
	B	39,2 - 78,5	90 - 181	69,5 - 139
V	A	75 - 144	167 - 334	129 - 258
	B	131 - 263	304 - 609	234 - 470

Warning!

Do not connect transmitter CPT 1Az without prior check of feeding voltage. Transmitter outlets must not be connected in the actuator with actuator ground conductor or earth, not even incidentally.

Prior to checking feeding voltage, first disconnect transmitter from power supply source. On actuator’s terminals, where the transmitter is connected to, determine voltage firstly using voltmeter with input resistance at least 1 MΩ. Voltage must lie between 18 to 25 V=, and must in no case exceed 30 V *(this would result in transmitter destruction).* Then connect transmitter so that the positive pole of power supply source is connected to positive pole of transmitter, i.e. to pin with red insulator *(r) + (closer to transmitter’s centre).* Terminal with white collar *(connected to terminal 52)* is connected to negative pole of transmitter *(white insulator)*. On newer versions, the red conductor is +, black conductor is -.

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

Then release screws on adaptors of transmitter so that the whole transmitter can be turned. Turn the whole transmitter to adjust current to 4 mA, and tighten adapter screws. Subsequently adjust actuator output shaft to “open” position. Use resistance trimmer in the front part of transmitter *(closer to the edge)* to set current to 20 mA. The trimmer’s range is 12 revolutions and has no dead stops, so it cannot be damaged by overturning.

If correction of 20 mA has been significant, repeat adjustments to 4 mA and 20 mA once again. Then disconnect the mA-meter. It is forbidden to turn the screw with varnish drops close to the centre. Properly tighten screws that lock the transmitter adapters, and use varnish to protect them from release.

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

Note:

The transmitter’s curve has two branches - a decreasing branch relatively to “Z” position, or a rising branch relatively to “Z” position. To select transmitter’s curve, turn the transmitter body.

Current position transmitter DCPT3 – adjustment

1. Limit positions adjustment

Before starting to adjust, it must be verified that end positions lie within the range between 60°and 340° of DCPT3 revolution. Otherwise, an error will be indicated after adjustment *(LED 2x).*

1.1. Position “4 mA”

Adjust actuator to the required position and push **“4”** button until LED blinks *(approx. for 2 sec).*

1.2. Position “20 mA”

Adjust actuator to the required position and push **“20”** button until LED blinks *(approx. for 2 sec).*

2. Running rotation adjustment

Running direction is determined by viewing from DCPT3 panel side.

2.1. Left-turning direction

Push **“20”** button, then button **“4”** and hold them both pressed until LED blinks.

2.2. Right-turning direction

Push **“4”** button, then button **“20”** and hold them both pressed until LED blinks.

When reversing the running rotation direction, end positions **“4 mA”** and **“20 mA”** remain saved, but the operating area *(DCPT3’s trajectory)* between these two points will change so as to supplement the original operating area. This may lead to exceeding the permitted range of operating area *(LED 2x)* - may be lower than 60°.

3. Error messages

In case of an error, LED will indicate the following error codes:

1x	Switch position outside operating area
2x	Wrong set up of operating area
3x	Outside magnetic field tolerance area
4x	Wrong EEPROM parameters
5x	Wrong RAM parameters

4. Calibration of currents 4 mA and 20 mA

During power up, hold buttons **“4”** and **“20”** pressed and release them after LED blinks once. Like this you enter menu described under 4.1 Calibration 4 mA.

4.1. Calibration of current 4 mA

Connect amp-meter to testing terminals. Push button **“20”**. Pushing button without interruption will trigger an auto-repeat command with current decrease. By releasing the button, you confirm the set-up of the currently active value.

4.2. Calibration of current 20 mA

Connect amp-meter to testing terminals. Push button **“4”.** Pushing button without interruption will trigger an auto-repeat command with current increase. By releasing the button, you confirm the set-up of the currently active value.

4.3. Toggling between calibration menus of 4 mA and 20 mA

Enter 4 mA calibration menu:

Push **“4”** button, then button **“20”** and hold them both pressed until LED blinks.

Enter 20 mA calibration menu:

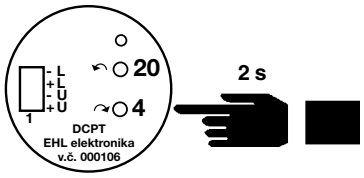
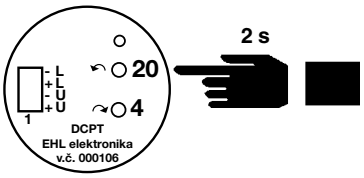
Push **"20"** button, then button **"4"** and hold them both pressed until LED blinks.

5. Entering standard parameters

During power up, hold buttons "4" and "20" pressed and release the after two LED blinks.

ATTENTION! During this approach, the transmitter calibration will also be overwritten, and thus needs to be carried out additionally!!!

Parameter setup

Position "4 mA" Set actuator to the required position *(mostly closed)* and push button 4 until LED blinks	
Position "20 mA" Set actuator to the required position *(mostly open)* and push button 20 until LED blinks	

e) Local position indicator

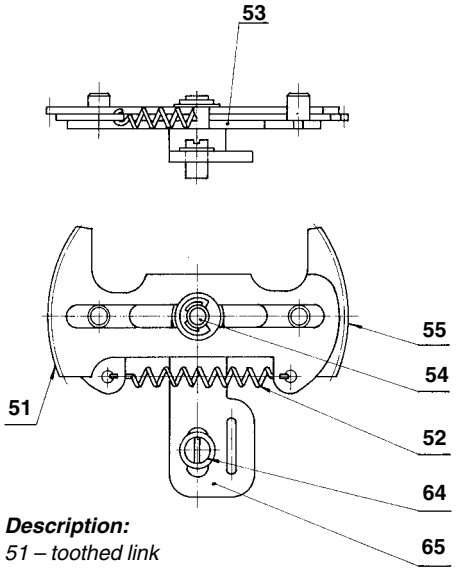
Local position indicator serves to determine the approximate position of output shaft.

Indicator – design without transmitter

At actuators MON without position transmitter is indicator *(Fig. 9)* fixed to control board. Its adjustment will be done using by adjusting mechanism *(Fig. 8)* followingly:

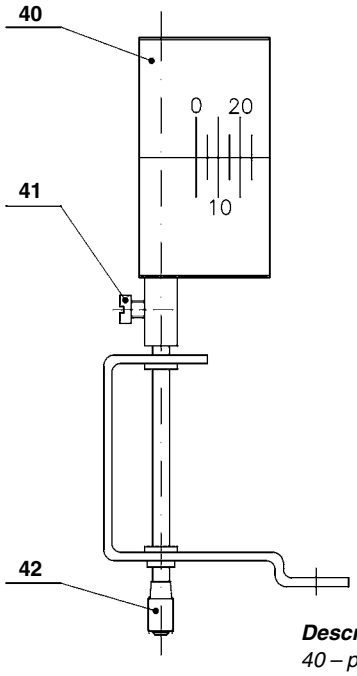
Position indicator adjustment

First it is necessary to make settings of signalling unit according to point b). Position indicator adjustment is done in the way, that we slide link of input shaft in position "closed" 51 (fig. 8), by pressing the link in direction to



Description:
51 – toothed link
52 – spring
53 – bar and pins
54 – setting pin
55 – toothed link
64 – screw
65 – setting lever

Fig. 8 - ***Adjusting mechanism of position indicator***



Description:
40 – position indicator
41 – indicator screw
42 – transmitter pinion

Fig. 9 - ***Position indicator***

indicator from shot with pinion 49 (fig. 5). Then turn the link clockwise to stop, which forms the column under the signalling unit. Then plug in to shot with pinion 49 again. Indicator shows to 0. If not, give back the link 51 before its stop and press the link 55. By that way the pinion of indicator is released and then adjust it near the symbol 0 on the scale. It is done by that way after taking a link to the shot with indicator pinion, their teeth fitted in correctly. Check it by careful turning by indicator shaft. Then eject link 51 from the shot again, and press it to the stop by using extra force. Bring the link to the shot with pinion 49 (fig. 5) again. In this position are oval holes in toothed links parallelly with oval hole on mother board control 67 (fig. 2). Transmitter for position "closed" is adjusted by these ways. Then release screw 64 (fig. 8), adjustable handle 65 (fig. 8), adjust towards to indicator to stop and screw 64 tighten again. Adjust actuator to position "open", where indicator will adjust to position between 0 and 100. Release screw 64 and turn by adjust handle 65 anticlockwisely as long as possible indicator hand is on symbol 100. Then tighten the screw 64 again and secure against release by using quick-drying paint. By this way is indicator adjusted to position "open" as well.

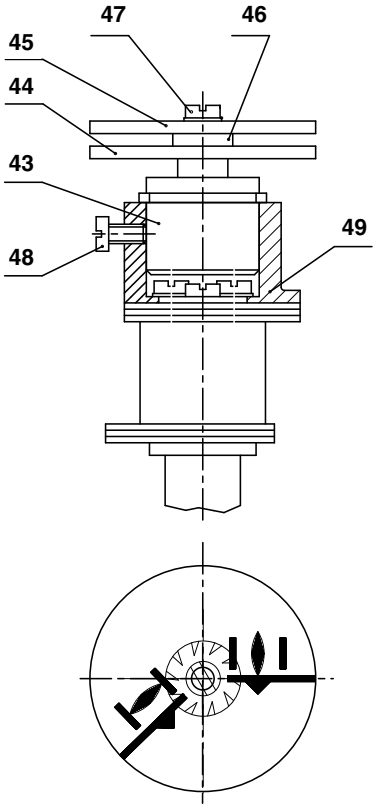
Indicator – design with position transmitter

At actuators MON with position transmitter is indicator *(Fig. 9a)* removably mechanically connected to shaft of cams of signalling unit pos. 49. When setting up cam shafts of signalling unit, the whole indicator assembly must be removed after releasing fixing screws pos. 48.

Position transmitter adjustment

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

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



Description:
43 – indicator shaft
44 – bottom “closing” indicator
45 – top “opening” indicator
46 – driving rubber collar
47 – locking screw
48 – fixing screw
49 – top cam with opening

Fig. 9a - ***Position indicator***

8. PACKAGING AND STORAGE

When shipping to domestic customers, actuators are transported unpacked. Covered means of transport or transport cases are used for actuators shipping.

When shipping to foreign customers, actuators must be provided with packing. Type and version of packing must be adapted to the transport conditions and distance to place of destination.

After receipt of actuators from manufacturer, actuators must be checked for possible damage suffered during transport. Compare if details on serial plates of actuator correspond with purchase order and accompanying documentation. 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 -25 °C and +50 °C, with relative humidity up to 80 %, free from corrosive gases and fumes, protected from harmful climate impacts. If stored for a period longer than 3 years, oil filling must be replaced prior to commissioning. Any manipulation 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.

9. FUNCTIONAL VERIFICATION AND LOCATION OF DEVICE

Before starting to install the device, again check actuator for any damage suffered in the course of storage. The function of electric motor can be verified by connecting it to power supply through a switch and by powering it up shortly. It is sufficient to observe if the electric motor starts up and if the output shaft starts rotating. Actuators must be located in an area providing easy access to hand wheel, terminal box and control box. Also, it must be verified again if the location meets the provisions of “Operating Conditions” section hereof. If local conditions require another method of installation, manufacturer’s approval must be obtained.

10. INSTALLATION ON VALVE

Set actuator onto the valve so that its output shaft reliably fits in 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 wiring diagram.Three lifting eyes are available on the actuator for manipulation with actuator in the course of installation on valve. However, these lifting eyes must never be used for suspending the actuator together with the valve.Actuator must be properly protected against overloading and against short-circuit.

11. ADJUSTING ACTUATOR WITH VALVE

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

Set-up and adjustment can only be carried out by personnel with the prescribed qualification. It is not permitted to carry out these works without having duly studied the present Installation Manual.

1) Set actuator manually into interim position.
2) Connect actuator to power supply line, and shortly switch on in the middle of its working stroke to verify correct rotation direction of the output shaft. When looking inside the control box, the input shaft will rotate clockwise, while moving in “closing” direction.
3) Electrically set actuator close to “closed” position, use hand wheel to arrive precisely at the “closed” position. In this “closed” position, adjust position unit *(micro switch PZ)* according to point 5c and adjust resistance or current transmitter as per point 7d.

4) Set output shaft to a position, where the signalling switch SZ is supposed to change over. Adjust SZ switch according to instructions specified under point 7b.

5) Turn the actuator output shaft by the required number of revolutions and set switch to PO “open” position as described under point 7c and resistance transmitter as described under point 5d. Several times verify the adjustment of position and signalling switches, and the adjustment of position transmitter.

6) Set output shaft to a position, where the signalling switch SO is supposed to change over. Adjust SO switch according to instructions specified under point 7b.

Warning:

To remove the control box cover, slide it along the extended axis of the actuator output shaft while avoiding any damage to position indicator. While installing valve onto pipe, use hand wheel of actuator to set the valve into its central position. Shortly run the electric motor to verify if the actuator is rotating in the correct direction. If this is not the case, change-over the two phase conductors on the electric motor terminal board and check limit switches for correct function.

12. OPERATION AND MAINTENANCE

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

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

At the latest six months after actuator commissioning and subsequently at least once a year, the screws connecting valve and actuator must be properly retightened. Screws must be tightened crosswise.

Lubrication

Consistent greases or gear oil PP80 *(see Table 1 or 2)* are to be used for lubricating actuators.

Lubricants

Actuator serial number	Number of output shaft setting cycles [min^{-1}]	Ambient temperature [°C]			
		-25 +70	-40 +60	-25 +60	-60 +60
52 030, 52 031, 52 032 52 033, 52 034	up to 40	M	M	M	M
	above 40	O	O	O	O
52 035	concerns all speeds	O	O	O	O
52 036	concerns all speeds	O	O	O	O

Note: *M – grease*
O – gear oil

Actuators with grease

Types and quantities of lubricants are specified in table below.

Lubricant included inside supplied actuators is intended for their entire service life. Lubricant does not need to be exchanged and its quantity does not need to be checked over the entire service life of actuators.

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

Actuator serial number	Quantity of lubricant *(kg)*	Type of lubricant for climate version and temperature		
		(-25 – +70 °C)	***(-40 – +60 °C)***	***(-60 – +60 °C)***
52 030	0,30	CIATIM – 201 GOST 6267-74 CIATIM – 221 GOST 9433-80		CIATIM – 221 GOST 9433-80
52 031, 52 032	0,50			
52 033, 52 034	0,70			

Note:

Lubricant Ciatim 221 is used for lubricating points of friction on rubber sleeves with metallic surfaces, roller brake and hub of outer gear in planetary differential (in points of friction with shaft and on surfaces).

Actuators with oil filling

Once a year check oil level and refill oil when necessary. Exchange oil after 500 hours of actuator operation, however, no longer than after 4 years. Actuator is filled with automotive gear oil PP 80 or with another oil with equivalent properties *(viscosity class 80W as per SAE /K 306a).*

Oil quantity:

Serial number	Oil quantity in l
52 030	1,3
52 031, 52 032	2,8
52 033, 52 034	6
52 035	12
52 036	12 +lubricant fat *

**) Adapter of actuator 52 036 is to be filled with lubricant PM MOGUL LV2-3, quantity: 3 kg.*

Maintenance

If actuator operates in dusty environment, dust must be regularly removed from its surface, to avoid insufficient cooling.

Teeth of gear sets inside gearbox of the signalling unit and bearings, where these gear sets are integrated, as well as the lever mechanism of resistance transmitter must be slightly greased once in two years.

Use lubricant fat CIATIM 201 or PM MOGUL LV 2-3 for lubrication. To lubricate bearings and toothed gears of current transmitter, use delicate watchmaker's oil. To increase resistance to corrosion, also apply lubricant fat to all springs in the controlling part. Adapter of actuator 52 036 is to be filled with fat PM MOGUL LV2-3, quantity: 3 kg.

13. PROBLEMS AND TROUBLESHOOTING

1) Actuator is in end position, does not start up, motor buzzes.

Check phase for possible interruption. If slider is jammed and if you cannot move it nor by hand wheel neither by motor, actuator must be dismounted and the lock must be released mechanically.

2) Upon actuator start-up from end position of the output shaft, actuator stops voluntarily.

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

Important notice:

Actuator ser. No. 52 036 was created by a modification of actuator ser. No. 52 035, with an adapter on provided on the output. Adapter is a single reduction gear with spur gearing. Adapter output shaft is at the same time the output shaft of actuator ser. No. 52 036. The operating part's activity is determined by the output shaft of driving actuator ser. No. 52 035. The following measures have been taken to provide the same rotation direction of output shaft of actuator ser. No. 52 036 as for other actuators of **MON, MOP** series:

1) Re-identification of control and adjusting elements on the control board. These elements are identified in a way corresponding to the rotation direction of output shaft of actuator ser. No. 52 036 *(i.e. adapter).*
2) Inner wiring of the control board of actuator has been modified to make the wiring diagram of actuator serial number 52 036 identical with other serial numbers 52 030 to 52 035. This means that actuator ser. No. 52 036 is connected to external control circuits in the same manner as actuators 52 030 to 52 035.

While adjusting actuator ser. No. 52 036, it must be taken into account that the functions of micro switches are reversed against sketches included in the Installation Manual - i.e. torque switch MZ is displayed on picture, for actuator ser. No. 52 036 actually corresponds to torque switch MO etc.

While turning the hollow shaft inside control box anticlockwise, the valve will close *(while output shaft of actuator ser. No. 52 036 actually rotates in clockwise direction)*. It is supposed that valve spindle is provided with left-hand thread. Direction of rotation of hand wheel is identical for all types of actuators.

Table 1 – Electric actuators MODACT MON, MOP – basic parameters

With 1TZ9002 *(1LE1002)* electric motors – supply voltage 3 x 230/400 V, 50 Hz, protection IP 55 *(MODACT MON)*, IP 67 *(MODACT MOP)*

Type ID	MON Control	Torque [Nm]		Setting speed	Working stroke	Type of lubricant	Electric motor					Weight	Serial number	
		Tripping	Break -away	[1/min]	[rev]		Type	Output [kW]	Revs [1/min]	I_n (400 V) [A]	$\frac{I_Z}{I_n}$	[kg]	basic	additional
													1 2 3 4 5	6 7 8 9 10
MON (MOP) 40/135-7	C	20 – 40	135	7	2 – 250		1TZ9002-0CD2	0,09	635	0,53	1,8	28	5 2 0 3 0 connecting dimension F10	x x V x N(P)
MON (MOP) 40/220-9	C		220	9			1TZ9002-0CC2	0,18	875	0,85	2,0	26		x x 0 x N(P)
MON (MOP) 40/135-15	C		135	15			1TZ9002-0CC2	0,18	875	0,85	2,0	26		x x 1 x N(P)
MON (MOP) 40/100-25	C		100	25			1TZ9002-0CB2	0,25	1365	0,80	3,0	24		x x 2 x N(P)
MON (MOP) 40/60-40	C		60	40		♦	1TZ9002-0CB2	0,25	1365	0,80	3,0	24		x x 3 x N(P)
MON (MOP) 40/95-50	C		95	50		♦	1TZ9002-0CA2	0,37	2755	1,06	3,4	26		x x 4 x N(P)
MON (MOP) 40/60-80	C		60	80		♦	1TZ9002-0CA2	0,37	2755	1,06	3,4	26		x x 5 x N(P)
MON (MOP) 80/135-7	C	40 – 80	135	7			1TZ9002-0CD2	0,09	635	0,53	1,8	28		x x K x N(P)
MON (MOP) 80/220-9	C		220	9			1TZ9002-0CC2	0,18	875	0,85	2,0	26		x x 6 x N(P)
MON (MOP) 80/135-15	C		135	15			1TZ9002-0CC2	0,18	875	0,85	2,0	26		x x 7 x N(P)
MON (MOP) 80/100-25	C		100	25			1TZ9002-0CB2	0,25	1365	0,80	3,0	24		x x 8 x N(P)
MON (MOP) 80/104-40	C		104	40		♦	1TZ9002-0CB3	0,37	1350	1,08	3,2	26		x x 9 x N(P)
MON (MOP) 70/95-50	C	40 – 70	95	50		♦	1TZ9002-0CA2	0,37	2755	1,06	3,4	26		x x A x N(P)
MON (MOP) 70/90-80	C		90	80		♦	1TZ9002-0CA3	0,55	2750	1,46	3,7	25		x x B x N(P)
MON (MOP) 125/160-7	C	80 – 125	160	7			1TZ9002-0CD3	0,12	625	0,82	2,0	26		x x L x N(P)
MON (MOP) 125/220-9	C		220	9			1TZ9002-0CC2	0,18	875	0,85	2,0	26		x x C x N(P)
MON (MOP)125/170-15	C		170	15			1TZ9002-0CC3	0,25	860	0,98	2,2	25		x x D x N(P)
MON (MOP) 125/165-25	C		165	25			1TZ9002-0CB3	0,37	1350	1,08	3,2	26		x x E x N(P)
MON (MOP) 115/150-50	C	80 – 115	150	50		♦	1TZ9002-0CA3	0,55	2750	1,46	3,7	25		x x H x N(P)
MON (MOP) 200/280-9	C	100 – 200	280	9			1TZ9002-0CC3	0,25	860	0,98	2,2	25		x x R x N(P)
MON (MOP) 200/270-15	C		270	15			1TZ9002-0CB3	0,37	1350	1,08	3,2	26		x x S x N(P)
MON (MOP) 200/300-25			300	25			1TZ9002-0CB6	0,55	1365	1,62	3,6	27		x x T x N(P)
MON (MOP) 140/180-50		100 – 140	180	50		♦	1TZ9002-0CA6	0,75	2780	1,81	4,5	26		x x Y x N(P)
MON (MOP) 95/125-7	C	63 – 95	125	7	2 – 250		1TZ9002-0CD2	0,09	635	0,53	1,8	49	5 2 0 3 1 connecting dimension F14	x x C x N(P)
MON (MOP) 100/210-9	C	63 – 100	210	9			1TZ9002-0CC2	0,18	875	0,85	2,0	49		x x 0 x N(P)
MON (MOP) 100/185-15	C		185	15			1TZ9002-0CC3	0,25	860	0,98	2,2	49		x x 1 x N(P)
MON (MOP) 100/130-25	C		130	25			1TZ9002-0DC2	0,37	915	1,23	2,7	41		x x 2 x N(P)
MON (MOP) 100/165-40	C		165	40		♦	1TZ9002-0DB2	0,55	1385	1,44	3,7	41		x x 3 x N(P)
MON (MOP) 100/140-63			140	63		♦	1TZ9002-0DB3	0,75	1385	1,85	3,6	42		x x 4 x N(P)
MON (MOP) 100/200-80			200	80		♦	1TZ9002-0DA3	1,1	2840	2,45	5,7	43		x x E x N(P)
MON (MOP)100/140-100			140	100		♦	1TZ9002-0EB0	1,1	1405	2,5	4,5	50		x x 5 x N(P)
MON (MOP)100/165-145			165	145		♦	1TZ9002-0EA0	1,5	2835	3,3	5,5	51		x x F x N(P)
MON (MOP) 125/160-7	C	100 – 125	160	7			1TZ9002-0CD3	0,12	625	0,82	2,0	49		x x D x N(P)
MON (MOP) 160/210-9	C	100 – 160	210	9			1TZ9002-0CC2	0,18	875	0,85	2,0	49		x x 6 x N(P)
MON (MOP) 160/200-16	C		200	16			1TZ9002-0DC2	0,37	915	1,23	2,7	50		x x 7 x N(P)
MON (MOP) 160/208-25	C		208	25			1TZ9002-0DC3	0,55	900	1,68	2,7	42		x x 8 x N(P)
MON (MOP) 160/225-40			225	40		♦	1TZ9002-0DB3	0,75	1385	1,85	3,6	42		x x 9 x N(P)
MON (MOP) 160/330-65			330	65		♦	1TZ9002-0EB4	1,5	1410	3,35	4,7	54		x x A x N(P)
MON (MOP) 160/275-80			275	80		♦	1TZ9002-0EA0	1,5	2835	3,3	5,5	46		x x H x N(P)
MON (MOP)160/215-100			215	100		♦	1TZ9002-0EB4	1,5	1410	3,35	4,7	54		x x B x N(P)
MON (MOP)160/280-130			280	130		♦	1TZ9002-0EA4	2,2	2855	4,7	6,5	54		x x J x N(P)

MON (MOP) 245/340-7	C	160 – 245	340	7			1TZ9002-0DD3	0,25	680	1,03	2,6	52		x x 6 x N(P)
MON (MOP) 230/300-9	C	160 – 230	300	9			1TZ9002-0DC2	0,37	915	1,23	2,7	50		x x 0 x N(P)
MON (MOP) 230/300-16	C		300	16			1TZ9002-0DC3	0,55	900	1,68	2,7	52		x x 1 x N(P)
MON (MOP) 250/325-25		160 – 250	325	25			1TZ9002-0EC0	0,75	940	2,3	3,8	45		x x 2 x N(P)
MON (MOP) 250/325-40			325	40		♦	1TZ9002-0EB0	1,1	1405	2,5	4,5	45		x x 3 x N(P)
MON (MOP) 230/300-70		160 – 230	300	70		♦	1TZ9002-0EB4	1,5	1410	3,35	4,7	54		x x 4 x N(P)
MON (MOP) 250/420-80		160 – 250	420	80		♦	1TZ9002-0EA4	2,2	2855	4,7	6,5	49		x x 5 x N(P)
MON (MOP)200/260-145		160 – 200	260	145	2 – 250	♦	1TZ9002-0EA4	2,2	2855	4,7	6,5	49	5 2 0 3 2	x x 7 x N(P)
MON (MOP) 400/640-7	C	230 – 400	640	7			1TZ9002-0ED4	0,55	675	1,58	3,0	55	connecting dimension	x x E x N(P)
MON (MOP) 370/480-10	C	230 – 370	480	10			1TZ9002-0DC3	0,55	900	1,68	2,7	53	F14	x x F x N(P)
MON (MOP) 400/740-16		230 – 400	740	16			1TZ9002-0EC4	1,1	925	3,15	3,8	55		x x H x N(P)
MON (MOP) 400/520-25			520	25			1TZ9002-0EC4	1,1	925	3,15	3,8	48		x x J x N(P)
MON (MOP) 400/510-40			510	40		♦	1TZ9002-0EB4	1,5	1410	3,35	4,7	48		x x K x N(P)
MON (MOP) 400/520-70			520	70		♦	1TZ9001-0EB6	2,2	1425	4,65	6,1	49		x x L x N(P)
MON (MOP) 320/420-140		230 – 320	420	140		♦	1TZ9001-0EA6	3,0	2895	6,0	7,9	49		x x M x N(P)
MON (MOP) 500/800-16		250 – 500	800	16			1TZ9002-1BD2	1,5	700	4,7	3,5	97		x x 0 x N(P)
MON (MOP) 470/610-25		250 – 470	610	25			1TZ9002-0EC4	1,1	925	3,15	3,8	90	5 2 0 3 3	x x 1 x N(P)
MON (MOP) 500/720-40		250 – 500	720	40		♦	1TZ9002-1BC2	2,2	940	5,7	4,6	93	connecting dimension	x x 2 x N(P)
MON (MOP) 500/670-63			670	63		♦	1TZ9002-1AB5	3,0	1425	6,3	5,4	90	F16	x x 3 x N(P)
MON (MOP) 500/770-100			770	100		♦	1TZ9002-1AB6	4,0	1435	8,6	5,8	97		x x 4 x N(P)
MON (MOP) 630/900-16		320 – 630	900	16			1TZ9002-1BD2	1,5	700	4,7	3,5	99		x x 0 x N(P)
MON (MOP) 630/1300-22			1300	22			1TZ9002-1BC2	2,2	940	5,7	4,6	103		x x 1 x N(P)
MON (MOP) 630/830-35			830	35			1TZ9002-1AB4	2,2	1425	4,9	5,1	97	5 2 0 3 4	x x 2 x N(P)
MON (MOP) 630/900-63			900	63	2 – 240	♦	1TZ9002-1BB2	4,0	1435	8,4	6,1	97	connecting dimension	x x 3 x N(P)
MON (MOP) 1000/1300-22		500 – 1000	1300	22			1TZ9002-1BC2	2,2	940	5,7	4,6	102	F16	x x 6 x N(P)
MON (MOP) 1000/1400-35			1400	35			1TZ9002-1BB2	4,0	1435	8,4	6,1	105		x x 7 x N(P)
MON (MOP) 1000/1500-63			1500	63		♦	1TZ9002-1BB6	5,5	1420	11,6	5,8	109		x x 9 x N(P)
MON (MOP) 1250/1780-45		630 – 1250	1780	45		♦	1TZ9002-1CC3	5,5	955	12,7	5,7	211		x x 0 x N(P)
MON (MOP) 1250/1650-70			1650	70		♦	1TZ9002-1CB2	7,5	1450	15,4	6,6	206	5 2 0 3 5	x x 1 x N(P)
MON (MOP) 900/1170-100		630 – 900	1170	100		♦	1TZ9002-1CB2	7,5	1450	15,4	6,6	206	connecting dimension	x x 2 x N(P)
MON (MOP) 1800/2400-70		1000 – 1800	2400	70		♦	1TZ9002-1CB6	11	1450	21,5	7,2	217	F25	x x 3 x N(P)
MON(MOP)1250/1650-100		630 – 1250	1650	100		♦	1TZ9002-1CB6	11	1450	21,5	7,2	217		x x 4 x N(P)
MON (MOP) 2500/3850-20		1000 – 2500	3850	20		♦	1TZ9002-1CC3	5,5	955	12,7	5,7	309		x x 0 x N(P)
MON (MOP) 2500/3600-30			3600	30		♦	1TZ9002-1CB2	7,5	1450	15,4	6,6	304	5 2 0 3 6	x x 1 x N(P)
MON (MOP) 2000/2600-40		1000 – 2000	2600	40	1 – 100	♦	1TZ9002-1CB2	7,5	1450	15,4	6,6	304	connecting dimension	x x 2 x N(P)
MON (MOP) 3900/5100-30		2000 – 3900	5100	30		♦	1TZ9002-1CB6	11	1450	21,5	7,2	315	F30	x x 3 x N(P)
MON (MOP) 2800/3600-40		1600 – 2800	3600	40		♦	1TZ9002-1CB6	11	1450	21,5	7,2	315		x x 4 x N(P)

1) *Rated torque is equal to 60% of maximum tripping torque for the operation of S2, and 40% of maximum tripping torque for the operation of S4.*
2) *As special version, you can order a modified version with working stroke adjustment range from 2 to 620 rev. for ser. No. 52 030-2; from 2 to 470 rev. for ser. No. 52 033-5; and from 1 to 300 rev. for ser No. 52036. This modification must be verbalized in purchase order.*
3) *Weight figures apply to version with connection dimensions C, D, E.*
4) *6th, 7th and 9th position of serial number will specify the relevant figure or letter as per Table 3.*
5) *The table shows the type of electric motors according to MEZ ie 1TZ9. On delivery the type of electric motor may also be marked according to SIEMENS, ie 1LE1. Other marking symbols are then identical.*
6) *Actuators MODACT MON, MOP Control are supplied in versions specified with letter C (column 2).*
7) *Upon agreement with manufacturer, you can order version with doubled position switches (without signalling) – must be verbalized in purchase order.*
8) *C – Control version in full optional version (current position transmission, regulator ZP2.RE5, contactors, brake). Other serial numbers can be supplied in Control version but with incomplete range of optional equipment.*
9) ♦ *– Symbol indicating oil filled actuators. Other actuators are filled with grease.*

Table 2 – Electric actuators MODACT MONJ – basic parameters

supply voltage 1 x 230 V, 50 Hz, ingress protection IP 55

Basic equipment: 2 selector switches PO, PZ; 2 torque switches MO, MZ; 1 electric motor *(brake motor also available on special order);* 1 heating element

Type ID	Control	Torque [Nm]		Setting speed	Working stroke	Lubriic. type	Electric motor					Weight	Serial number	
		Tripping	Break -away	[1/min]	[rev]		Type with start and run capacitor	Output [kW]	Revs [1/min]	I_n (230 V) [A]	$\frac{I_Z}{I_n}$	[kg]	basic	additional
													1 2 3 4 5	6 7 8 9 10 11
MONJ 40/75-25	C	20 – 40	75	25	2-250		JMO 71-4S	0,25	1400	1,89	3,4	27	52 030 connecting dimension F10	x x 2 x NJ x
MONJ 40/50-40	C		50	40			JMO 71-4S	0,25	1400	1,89	3,4	27		x x 3 x NJ x
MONJ 40/60-50	C		60	50		♦	JMO 71-2S	0,37	2880	2,53	3,9	27		x x 4 x NJ x
MONJ 40/60-80	C		60	80		♦	JMO 71-2M	0,55	2860	3,41	4,0	27		x x 5 x NJ x
MONJ 80/135-25	C	40 – 80	135	25			JMO 71-4M	0,37	1400	2,61	3,4	27		x x 8 x NJ x
MONJ 70/90-40	C	40 – 70	90	40			JMO 71-4M	0,37	1400	2,61	3,4	28		x x 9 x NJ x
MONJ 75/100-50	C	40 – 75	100	50		♦	JMO 71-2M	0,55	2860	3,41	4,0	28		x x A x NJ x
MONJ 110/143-25	C	80 – 110	143	25			JMO 71-4M	0,37	1400	2,61	3,4	28		x x E x NJ x
MONJ 100/130-40	C	63 – 100	130	40			JMO 80-4S	0,55	1395	3,85	3,8	41	52 031 connecting dimension F14	x x 3 x NJ x
MONJ 95/124-63		63 – 95	124	63		♦	JMO 80-4M	0,75	1400	4,7	4,0	42		x x 4 x NJ x
MONJ 100/130-80		63 – 100	130	80		♦	JMO 80-2M	1,1	2800	6,6	4,4	43		x x E x NJ x
MONJ 100/130-100			130	100		♦	JMO 90-4L	1,5	1400	8,68	3,5	50		x x 5 x NJ x
MONJ 95/124-145		63 – 95	124	145		♦	JMO 90-2S	1,5	2830	9,11	4,5	51		x x F x NJ x
MONJ 150/195-40		100 – 150	195	40			JMO 80-4M	0,75	1400	4,7	4,0	41		x x 9 x NJ x
MONJ 160/208-65		100 – 160	208	65		♦	JMO 90-4L	1,5	1400	8,68	3,5	42		x x A x NJ x
MONJ 160/208-80				80		♦	JMO 90-2S	1,5	2830	9,11	4,5	43		x x H x NJ x
MONJ 130/170-145		100 – 130	170	145		♦	JMO 90-2L	2,2	2850	13,02	4,8	51		x x J x NJ x
MONJ 250/325-40		160 – 250	325	40			JMO 90-4L	1,5	1400	8,68	3,5	45	52 032 connec. dim. F14	x x 3 x NJ x
MONJ 220/286-80		160 – 220	286	80		♦	JMO 90-2L	2,2	2850	13,02	4,8	49		x x 5 x NJ x

Actuators MODACT MONJ use single-phase electric motors with run and start capacitor. For two pole electric motors (approx. 2,800 rev/min), manufacturer guarantees 60,000 starting cycles, for four pole electric motors (approx 1,400 rev/min) 100,000 starting cycles. Afterwards, centrifugal disconnector of start capacitor must be exchanged – can be ordered at ZPA Pečky a.s.

If the actuator with single-phase electric motor is intended for regulation purposes, this lowered service life must be taken into consideration while setting up the regulation process (frequency of regulation interventions).

Please consult your expected operating mode of MONJ actuators with the Sales Department of ZPA Pečky, a.s.

♦ *– Symbol indicating oil filled actuators. Other actuators are filled with grease.*

Table 3 – Electric actuators MODACT, MON, MOP, MONJ

– installation dimensions, method of electrical connection

Serial number 5 2 0 3 X . X X X X X X

Installation dimensions	Version	
	Outlets	Connector
Shape A	5	F
Shape B1	6	G
Shape C	7	H
Shape D	8	J
Shape E	9	K

Table 3 – continuation

Serial number 5 2 0 3 X . X X X X X X

Local control block, position indicator	Design without transmitter	Resistance transmitter	Current transmitter 4–20 mA	Current transmitter 4–20 mA + source
Without local control block, without position indicator	1	K	B	A
Local position indicator	2	L	-	-
Local control block	4	M	E	C
Local control block and position indicator	6	N	-	-
Local control block for actuators **MODACT MON, MOP, MONJ Control**	7	P	H	D
Local control block and position indicator for actuators **MODACT MON, MOP, MONJ Control**	8	R	-	-

Tripping torque values, setting speeds and other technical parameters are specified in Table 1 or 2 including identification. This position will include figure or letter corresponding to the required parameters.

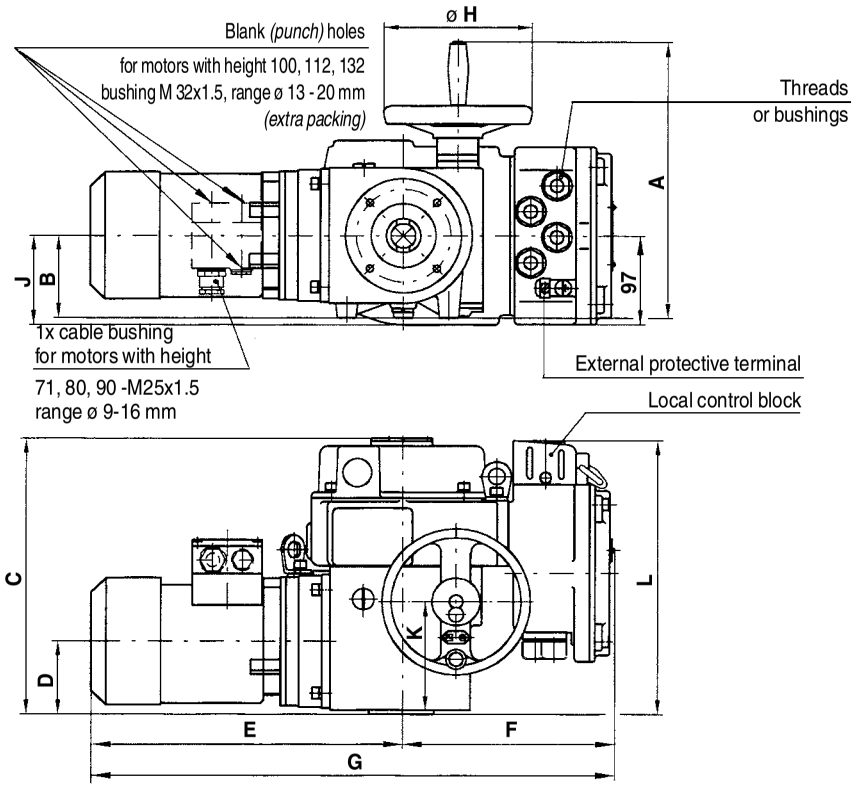
Signalling, position transmitter, flash lamp	MODACT MON, MOP, MONJ	MODACT MON, MOP, MONJ Control		
		Complete equipment[1)]	Without position regulator	Without position regulator and brake
W/O signalling, pos. transmitter and flash lamp	0	-	E	M
Position transmitter	1	A	F	N
Signalling switches	2	-	G	Q
Signalling switches and position transmitter	3	B	H	P
Flash lamp	4	-	I	R
Position transmitter, flash lamp	5	C	J	S
Signalling switches and flash lamp	6	-	K	T
Signalling switches, pos. transmitt. and flash lamp	7	D	L	U

Note: *[1)] Actuators MODACT MON, MOP, MONJ Control with regulator ZP2 RE5 – figure 5 will be specified.*

Letter N *(MODACT MON),* P *(MODACT MOP),* NJ *(MODACT MONJ)* will be specified universally for all versions.

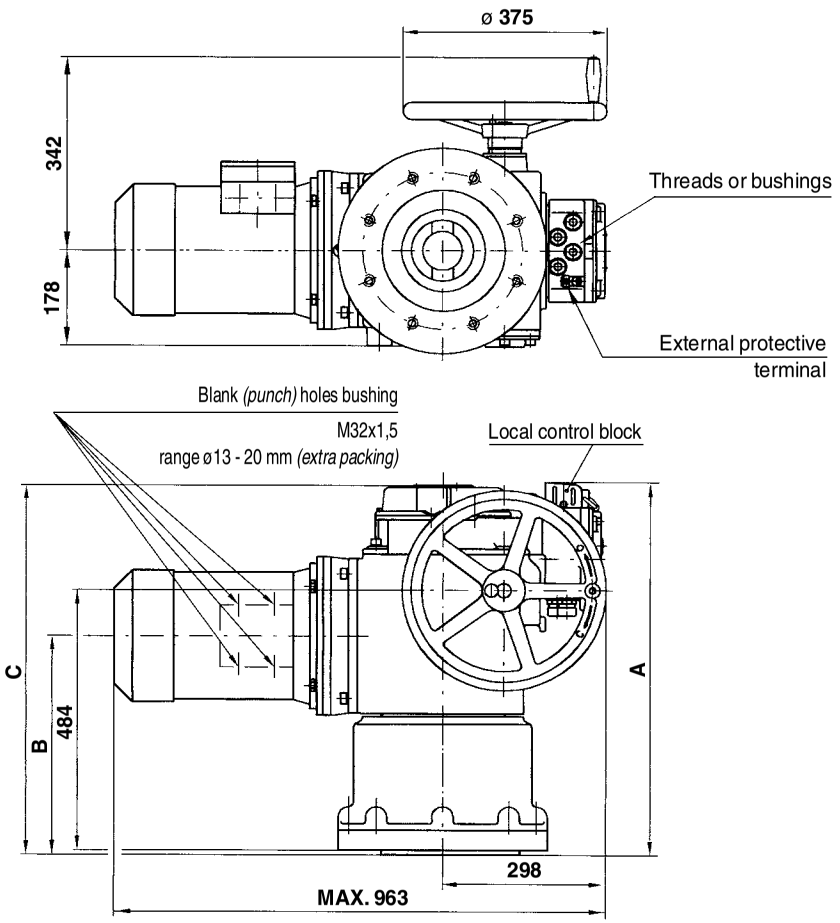
For surrounding temperature from -25 °C to +70 °C	without designation
For surrounding temperature from -40 °C to +60 °C	F1
For surrounding temperature from -60 °C to +60 °C	FF

Dimensional sketch of **MODACT MON, MOP** actuators, ser. No. 52 030.xxxxx up to 52 035.xxxxx *(version with terminal board)*



Type ID	A	B	C	D	E max.	F	G max.	ø H	J	K	L
52 030.xxxxN	305	90	300	78	344	228	572	160	99	120	300
52 031.xxxxN 52 032.xxxxN	376	120	328	92	469	228	697	200	-	144	328
52 033.xxxxN 52 034.xxxxN	440	145	382	123	560	258	818	250	-	190	387
52 035.xxxxN	540	178	442	153	745	298	1043	375	-	234	445

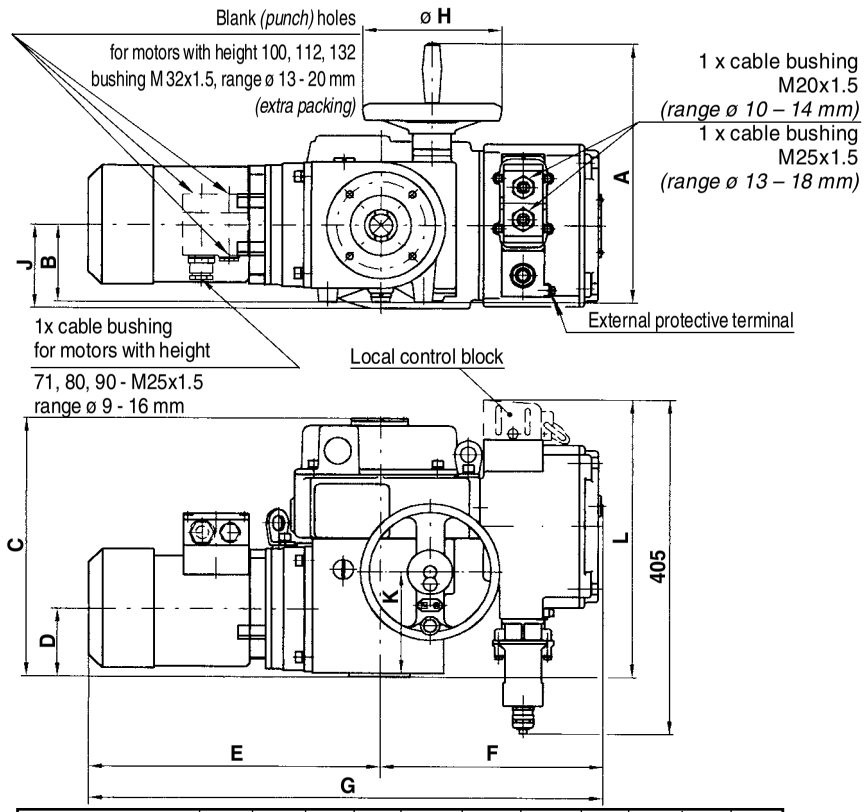
Dimensional sketch of **MODACT MON, MOP** actuators, ser. No. 52 036.xxxxx *(version with terminal board)*



Type ID	A	B	C
52 036.xxxxN shape A	757	463	750
52 036.xxxxN shape B_1, C, D, E	712	418	705

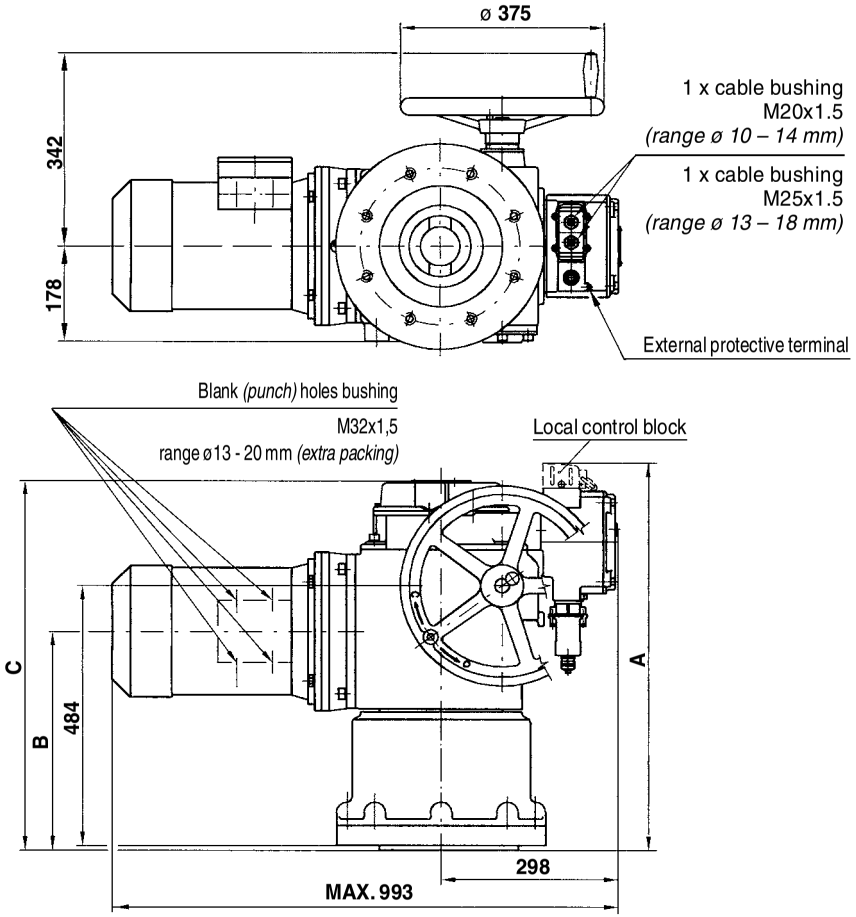
Note: *For actuators MODACT MON, MONJ, terminal box provides threads for bushings: 3 x thread M20 x 1.5; 1 x thread M25 x 1.5 (bushings are included in scope of delivery – extra packing). For actuators MODACT MOP, terminal box provides bushings: 1 pc M25 x 1.5 range ø 13 – 18 mm; 2 pc M20 x 1.5 range ø 10 – 14 mm; 1 pc M20 x 1.5 range ø 6 – 12 mm. A cable bushing is always supplied with electric motor (except actuator versions with interconnection of motor and terminal box. Connector is always fitted with cable bushings.*

Dimensional sketch of **MODACT MON, MOP** actuators
ser. No. 52 030.xxxxx – 52 035.xxxxx *(version with connector)*



Type ID	A	B	C	D	E max.	F	G max.	ø H	J	K	L
52 030.xxxxN	305	90	300	78	344	258	572	160	99	120	325
52 031.xxxxN 52 032.xxxxN	376	120	328	92	469	258	697	200	-	144	350
52 033.xxxxN 52 034.xxxxN	440	145	382	123	560	288	818	250	-	190	410
52 035.xxxxN	540	178	442	153	745	328	1043	375	-	234	470

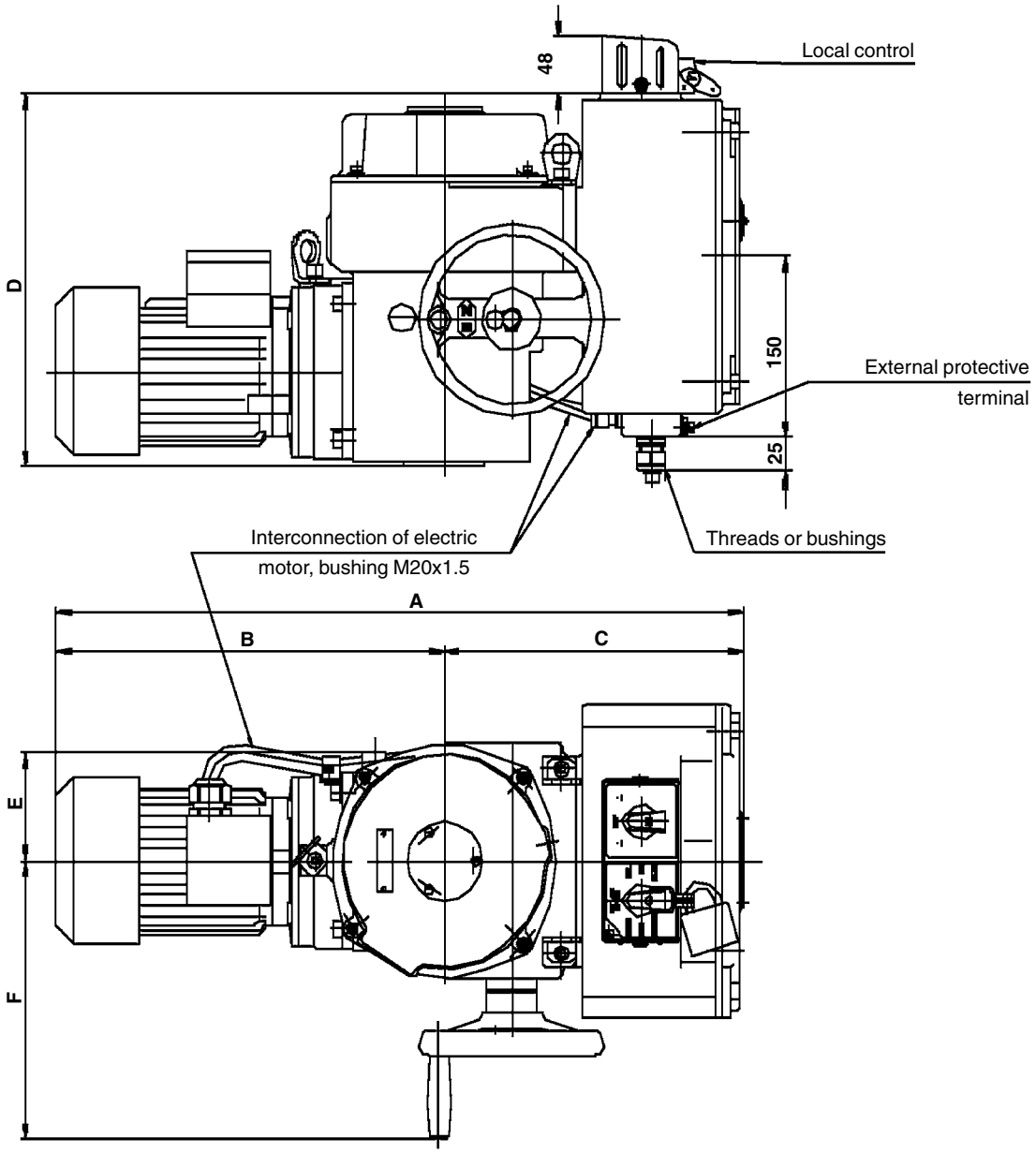
Dimensional sketch of **MODACT MON, MOP** actuators
ser. No. 52 036.xxxxx *(version with connector)*



Type ID	A	B	C
52 036.xxxxN shape A	785	463	750
52 036.xxxxN shape B_1, C, D, E	740	418	705

Upon customer's request, actuators MODACT MONJ, MON, MOP can be provided with HARTING connector that enables connection of control circuits. ZPA Pečky, a.s. also supplies terminal counterpart for cable. Special crimping scissors are necessary for attaching a cable to this counterpart *(supplied by HARTING, order No. 0999 000 0021; e-mail: info@contex.cz)*

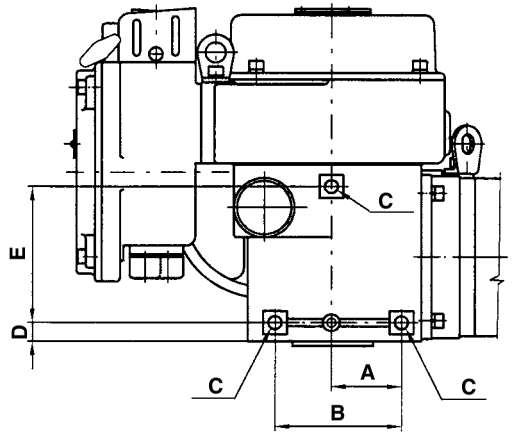
Dimensional sketch of **MODACT MON Control** actuators
ser. No. 52 030 – 52 033



Serial number	A	B	C	D	E	F
52 030	500	325	255	307	90	200
52 031, 52 032	630	382	255	316	120	355

Note: *The dimensions are maximal.*

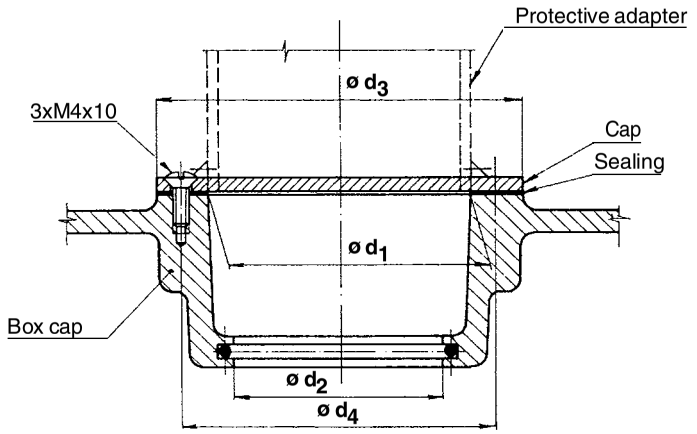
Openings for additional fixation of **MODACT MON, MOP** actuators
ser. No. 52 030.xxxxN – 52 035.xxxxN,
ser. No. 52 030.xxxxP – 52 035.xxxxP



Type ID	Dimensions (mm)				
	A	B	C	D	E
52 030.xxxxN	61	110	M10	16	120
52 031.xxxxN 52 032.xxxxN	90	160	M12	21	140
52 033.xxxxN 52 034.xxxxN	110	210	M16	23	200
52 035.xxxxN	120	240	M20	47	220

Note:
Openings for additional MODACT actuator fixation only serve to hold the actuators' weight and must not be subject to any other additional force.

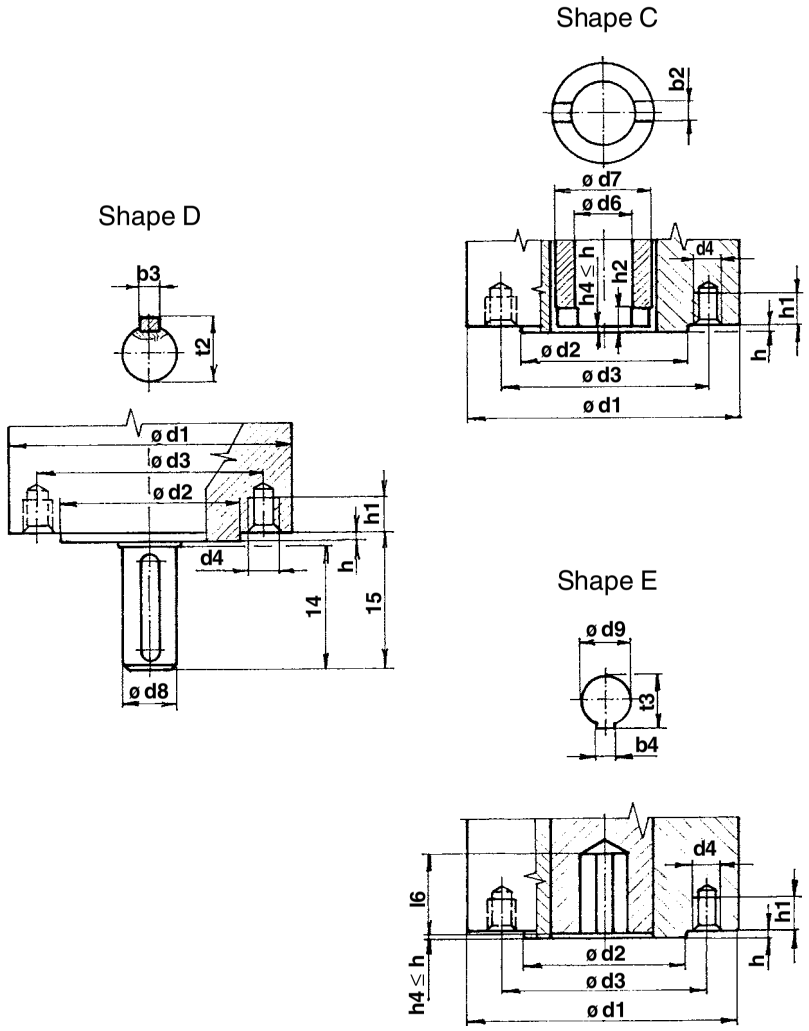
Modification for rising spindle



Dimen-sions [mm]	Serial number				
	52 030	52 031 52 032	52 033 52 034	52 035	52 036
ø d_1	45	60	80	90	90
ø d_2	35,5	50,5	75	80,5	80,5
ø d_3	65	80	110	110	110
ø d_4	55	70	100	100	100

Protective adapter *(including opening in cap)* to be provided by customer.

Installation dimensions of **MODACT MON, MOP** actuators,
ser. No. 52 030 – 52 036 – basicversion *(without adapter)*



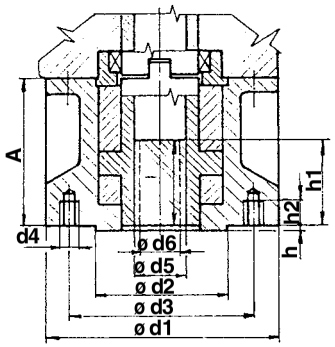
Actuators basic installation dimensions table
MODACT MON, MOP *(without adapter)*

Shape	Dimensions [mm]	Serial No.				
		52 030	52 031 52 032	52 033 52 034	52 035	52 036
C, D, E *(equal dimensions)*	ø d1 approximate value	125	175	210	300	390
	ø d2 f8	70	100	130	200	230
	ø d3	102	140	165	254	298
	d4	M 10	M 16	M 20	M 16	M 20
	number of thread holes	4	4	4	8	8
	h max	3	4	5	5	5
	h1 min. 1,25d4	12,5	20	25	20	25
C	ø d7	40	60	80	100	120
	h2	10	12	15	16	18
	b2 H11	14	20	24	30	40
	ø d6	30	41,5	53	72	72
D	ø d8 g6	20	30	40	50	60
	l_4	50	70	90	110	120
	t2 max	22,5	33	43	53,5	64
	b3 h9	6	8	12	14	18
	l_5	55	76	97	117	127
E	ø d9 H8	20	30	40	50	60
	l_6 min.	55	76	97	117	127
	t3	22,8	33,3	43,3	53,8	64,4
	b4 Js9	6	8	12	14	18

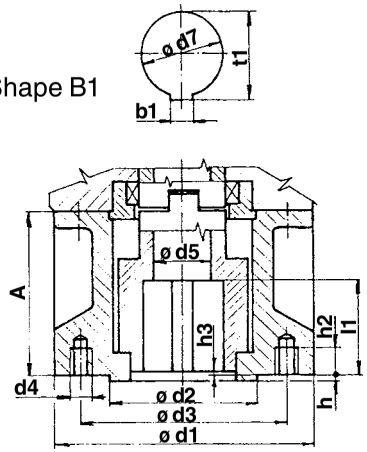
Dimensions ø d6 and l6 must not be lower than specified in Table.
Dimensions are specified in mm.

Adapters for **MODACT MON, MOP** actuators ser. No. 52 030 – 52 035

Shape A



Shape B1

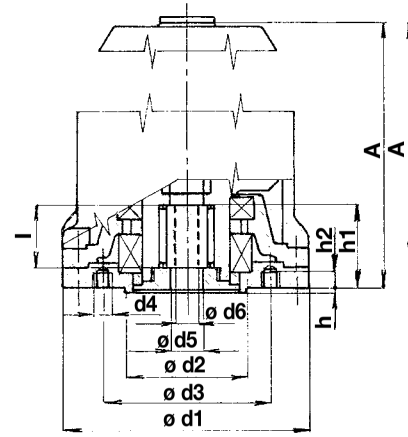


Allocation of adapters to actuators

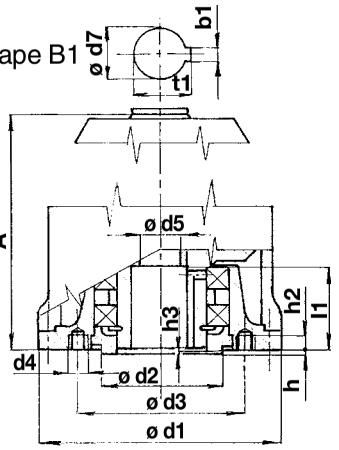
Shape	Dimensions [mm]	Serial No.			
		52 030	52 031 52 032	52 033 52 034	52 035
A, B1 *(equal dimensions)*	ø d1	125	175	210	300
	ø d2 f8	70	100	130	200
	ø d3	102	140	165	254
	d4	M 10	M 16	M 20	M 16
	Number of holes d4	4	4	4	8
	h	3	4	5	5
	h2 min.	12,5	20	25	20
A	A	63,5	110	179	155
	ø d5	30	38	53	63
	ø d6 max	28	36	44	60
	h1 max	43,5	65	92	110
	l min	45	55	70	90
B1	A	63,5	110	122	155
	ø d5	30	40	50	65
	l1 min	45	65	80	110
	h3 max	3	4	5	5
	b1	12	18	22	28
	ø d7 H9	42	60	80	100
	t1	45,3	64,4	85,4	106,4

Adapters for **MODACT MON, MOP** actuators ser. No. 52 036

Shape A



Shape B1



Shape	Dimensions [mm]	52 036
A, B1 *(equal dimensions)*	ø d1	390
	ø d2 f8	230
	ø d3	298
	d4	M 20
	Number of holes d4	8
	h	5
	h2 min.	25
A	A	740 1+)
	ø d5	72
	ø d6 max	70
	h1 max	165
	l min	110
B1	A	695 2+)
	ø d5	72
	l1 min	130
	h3 max	5
	b1	32
	ø d7 H9	120
	t1	127,4

Notes:

1+) - nut integrated in actuator

2+) - bushing integrated in actuator

Legend to wiring diagrams of actuators
MODACT MON, MOP, MONJ and **MODACT MON, MOP Control**

Legend to wiring diagrams:

SQ1 *(MO)*	– torque switch in “opening” direction	BMO	– local control block
SQ2 *(MZ)*	– torque switch in “closing” direction	CPT 1Az	– current position transmitter, analogue adjustable
SQ3 *(PO)*	– position switch in “opening” direction		
SQ5 *(PZ)*	– position switch in “closing” direction	DCPT3	– current position transmitter, digitally adjustable
SQ4 *(SO)*	– signalling switch in “opening” direction		
SQ6 *(SZ)*	– signalling switch in “closing” direction	DCPZ	– power supply of position transmitter
SA1 *(M/D)*	– selector Local/0/ Remote	ZP2.RE5	– electronic position regulator
SA2		BAM-002	– electronic brake
(OPEN/CLOSE)	– selector Open/0/ Close	BR2	– electronic brake
KO	– contactor for opening dir.	EH	– heating resistor
KZ	– contactor for closing dir.	M1~	– single phase electric motor
BQ1,BQ2 *(V1,V2)*	– resistance position transmitter	M3~	– three phase electric motor

Selectors positions: M – local control; D – remote control; Z, CLOSE – closed; O, OPEN – open

Optional accessories:

Local control block BMO

Position transmitter
- – resistance V1, V2
- – passive current transmitter CPT 1Az
- – active current transmitter DCPT3 + DCPZ
- – without transmitter

Signalling switches SO, SZ

Flash lamp B

Applied electric motors:

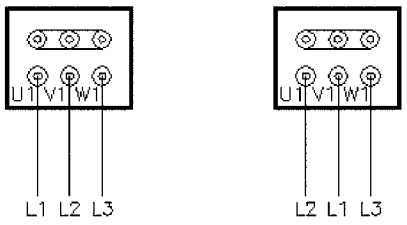
MON, MOP actuators use three phase electric motors with terminal boards.

For versions with terminal strip, electric motors are connected separately; for versions with connectors, electric motors are also connected through this connector.

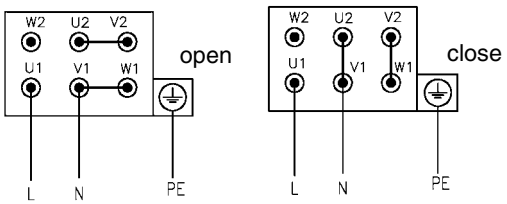
MONJ actuators use single phase electric motors with terminal boards.

For versions with terminal strip, electric motors are connected separately; for versions with connectors, electric motors are also connected through this connector.

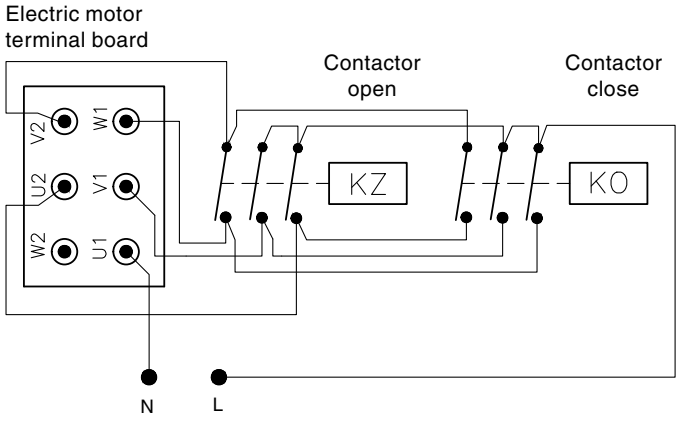
3-ph motor



1-ph motor

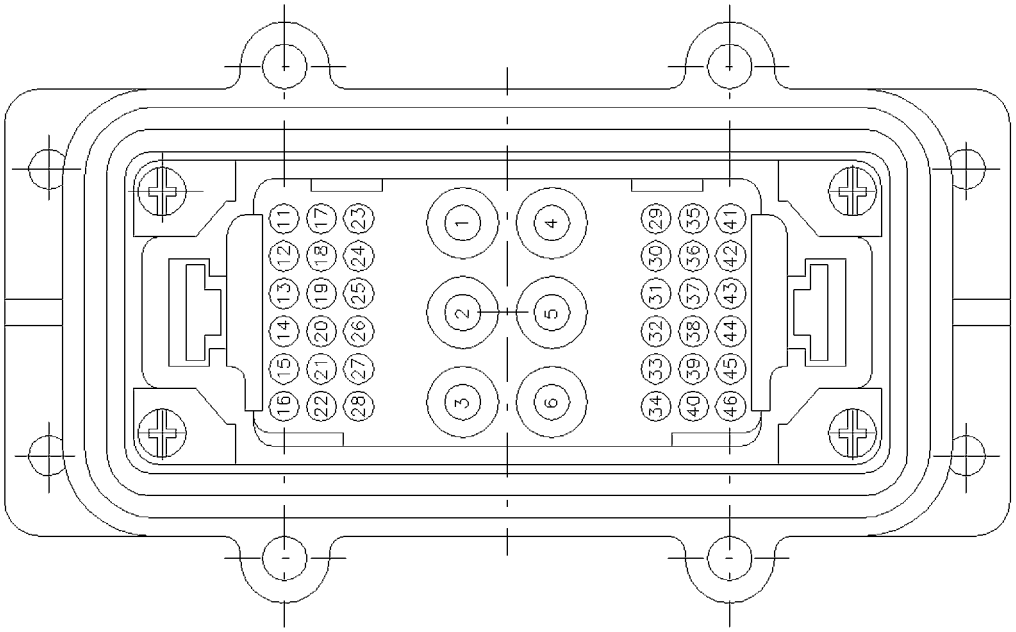


Example of single phase electric motor control
(actuators MODACT MONJ)



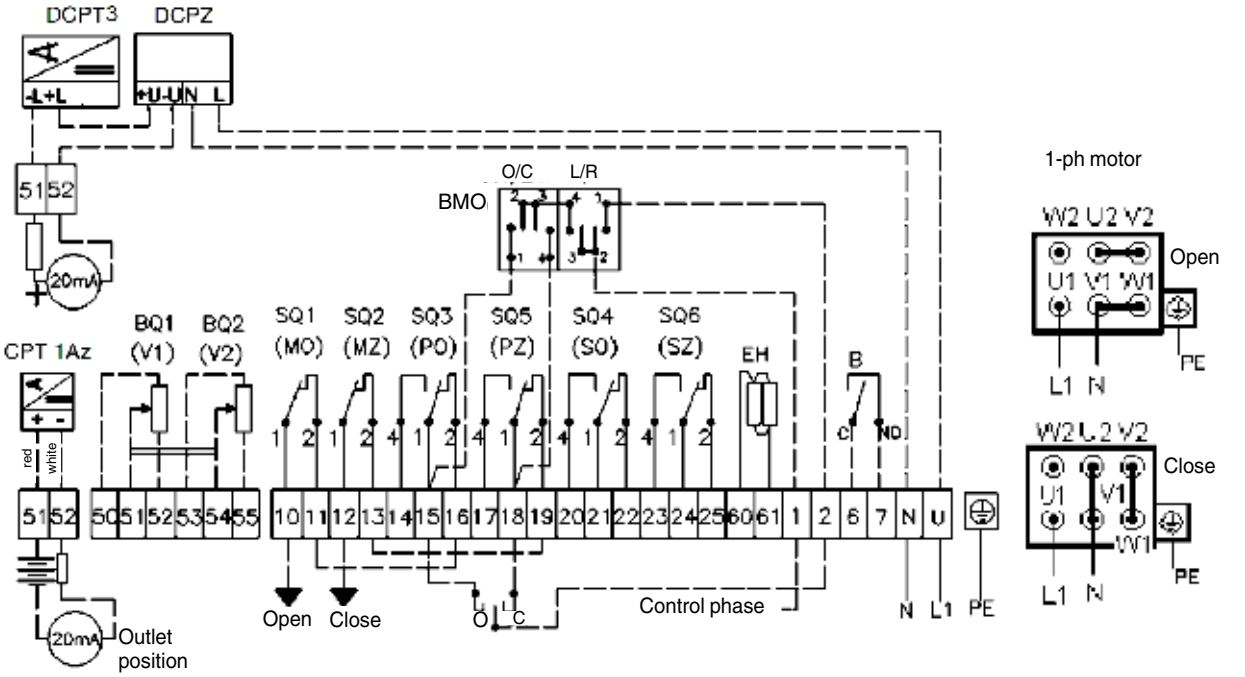
Example of power circuits connection for operating single phase electric motor, to select both directions of rotation. Control circuits are not part of the actuator.

Connector



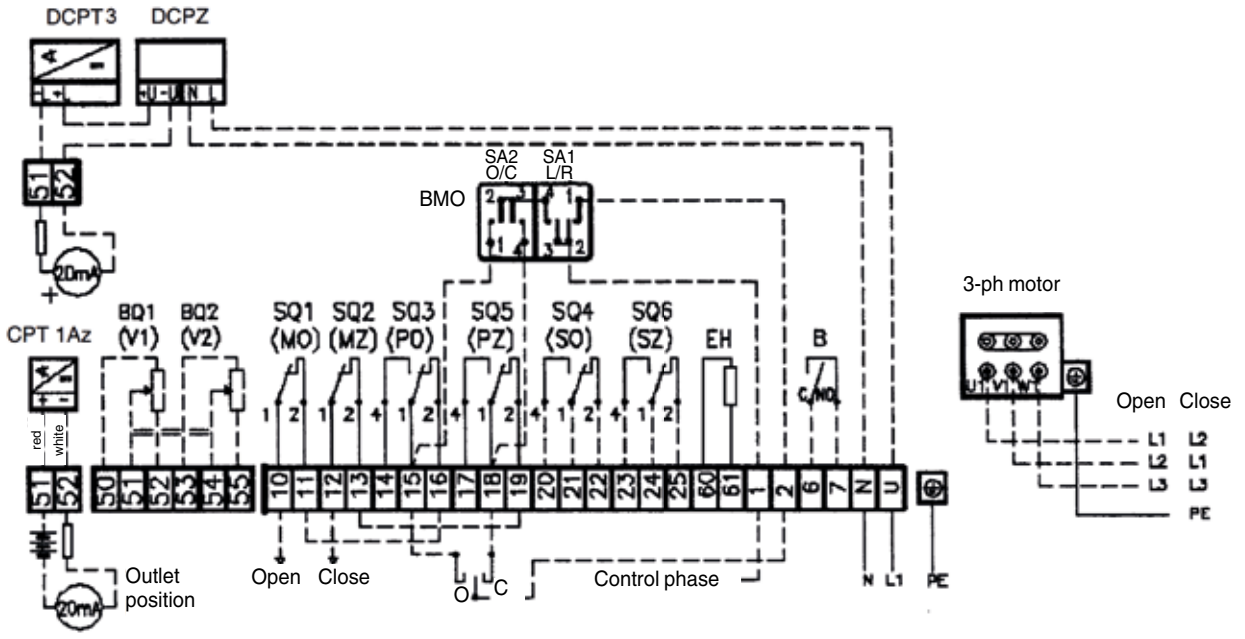
Connection of electric motors of **MODACT MONJ** actuators

– with terminal board **P3M-0937E**



Connection of electric motors of **MODACT MON, MOP** actuators

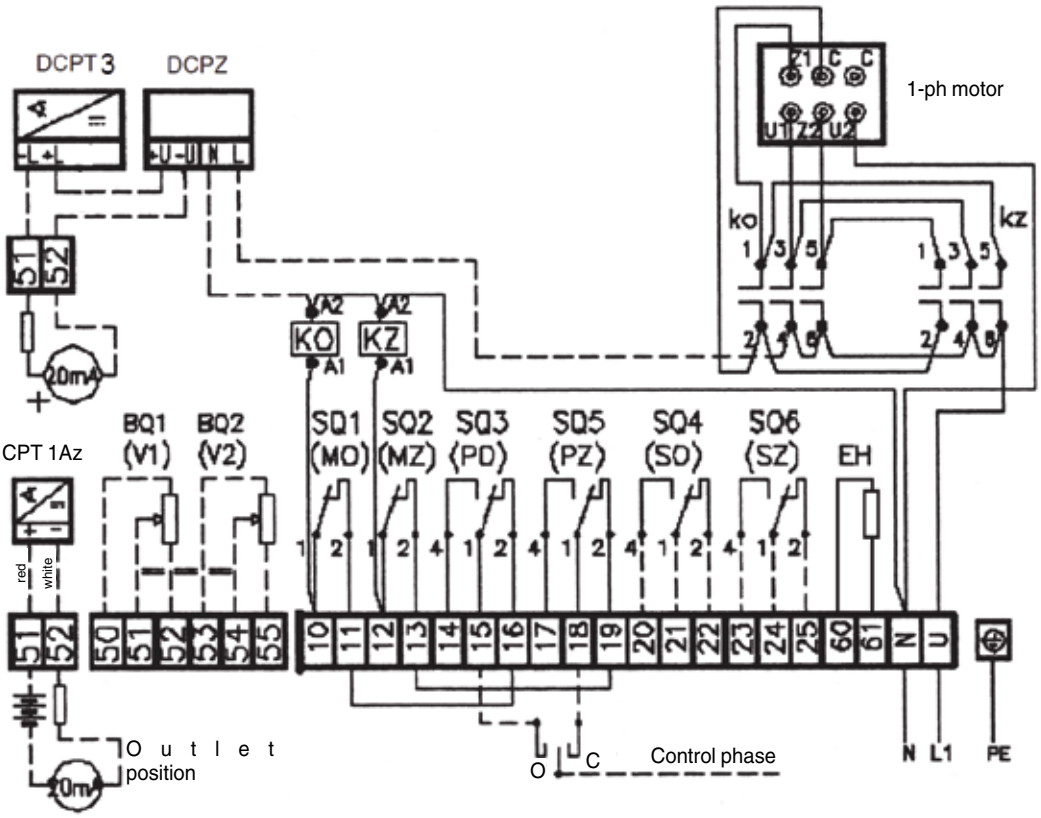
– with terminal board **P3M-0938E**



Connection of electric motors of **MODACT MONJ Control** actuators
– with contactors

– with terminal board

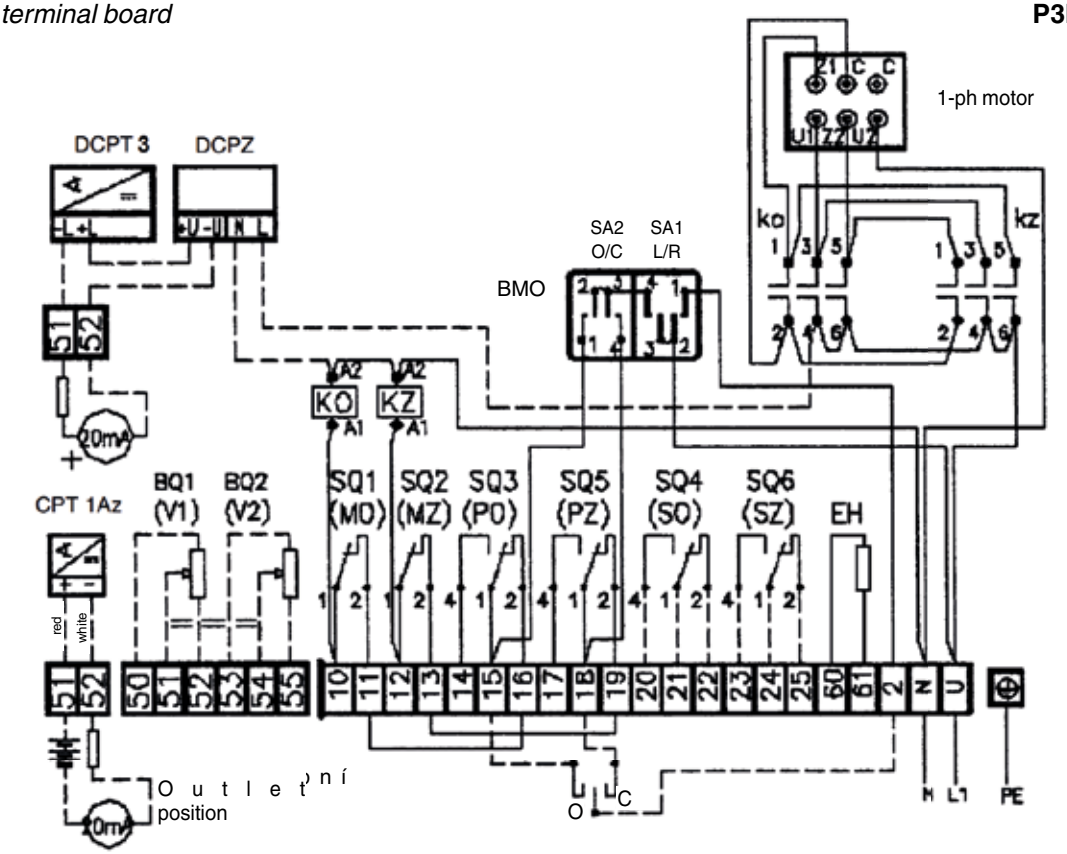
P3-0913E



Connection of electric motors of **MODACT MONJ Control** actuators
– with contactors and BMO

– with terminal board

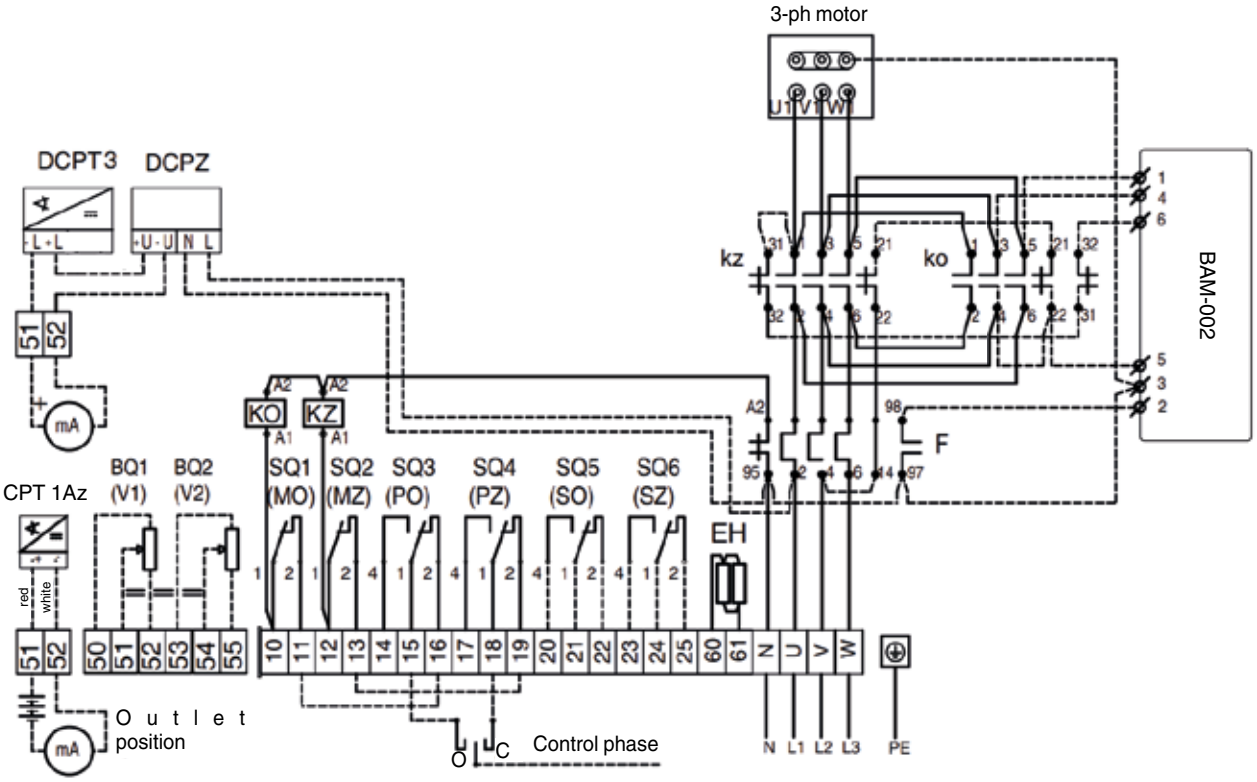
P3M-0914E



Connection of electric motors of **MODACT MON, MOP Control** actuators
– with contactors

– with terminal board

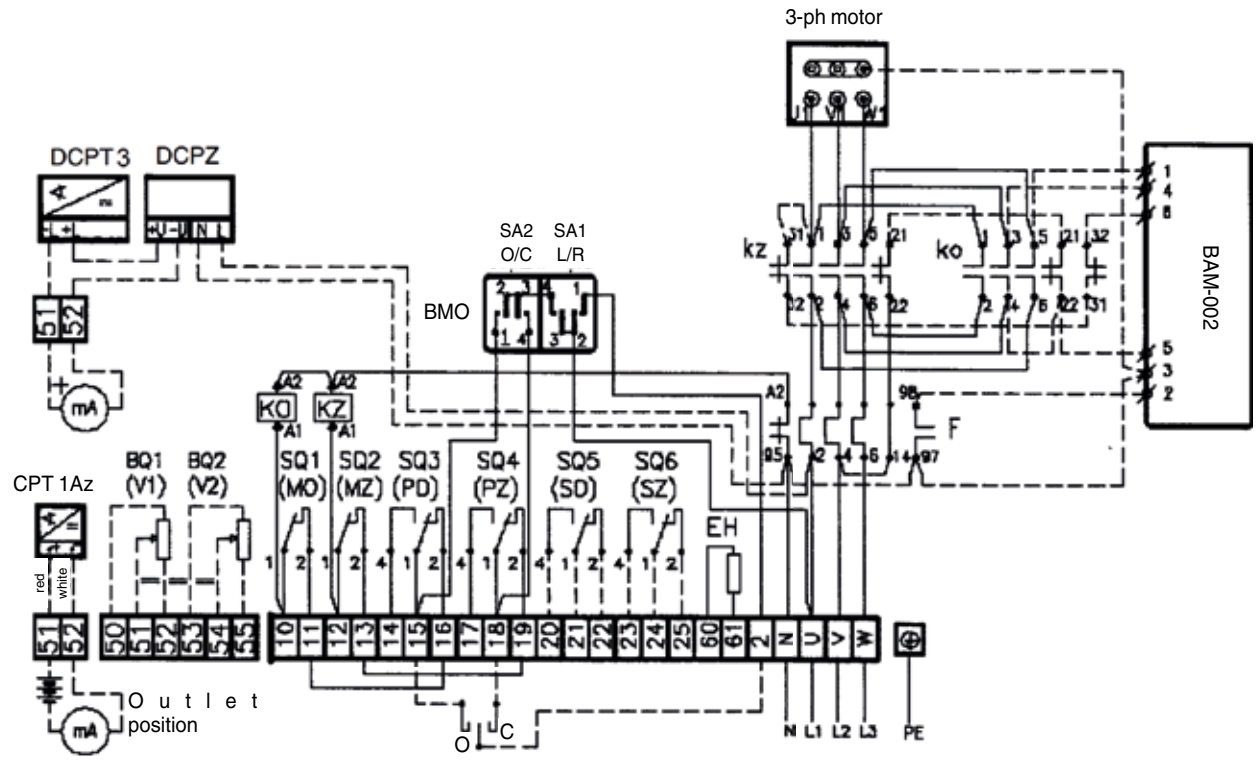
P3-0947



Connection of electric motors of **MODACT MON, MOP Control** actuators
– with contactors and BMO

– with terminal board

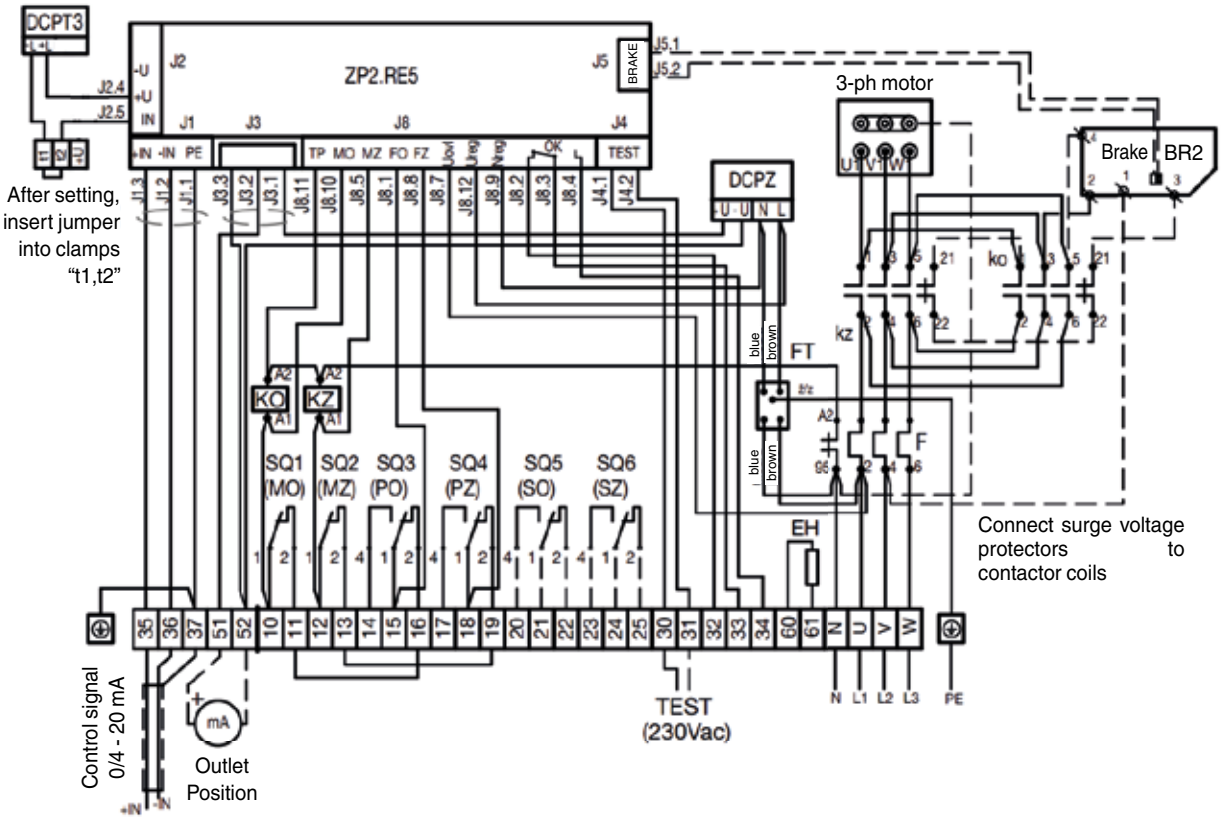
P3M-0948



Connection of **MODACT MON, MOP Control** actuators – with contactor and ZP2.RE5 regulator

– with terminal board

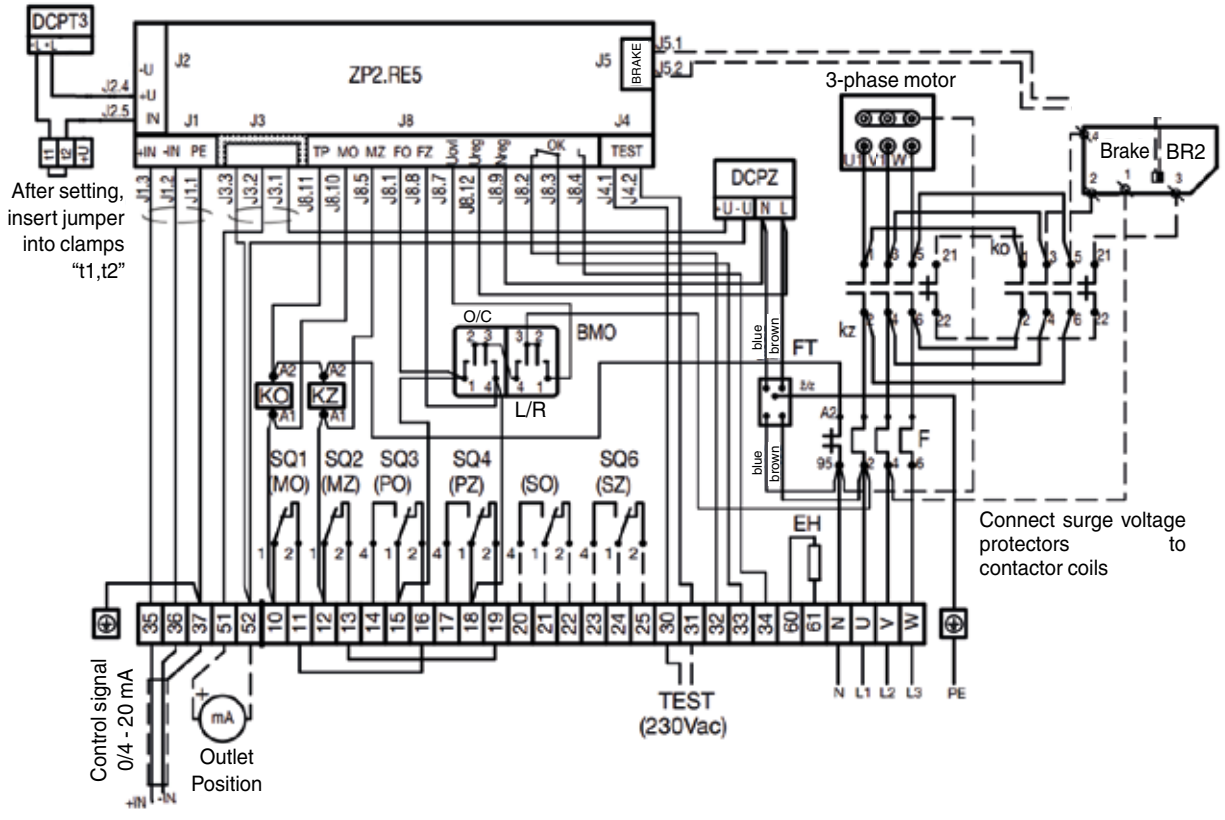
P3-0949



Connection of **MODACT MON, MOP Control** actuators – with contactor, ZP2.RE5 regulator and BMO

– with terminal board

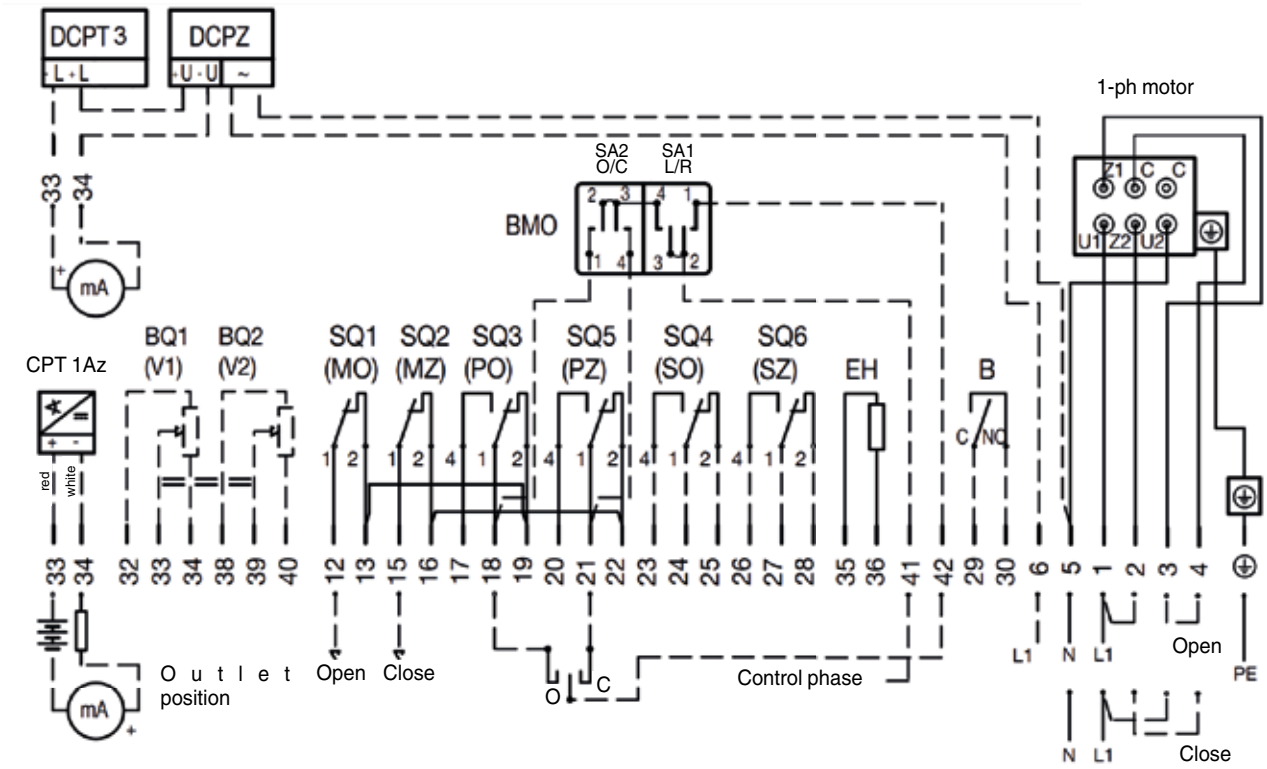
P3M-0950



Connection of electric motors of **MODACT MONJ** actuators

– with connector

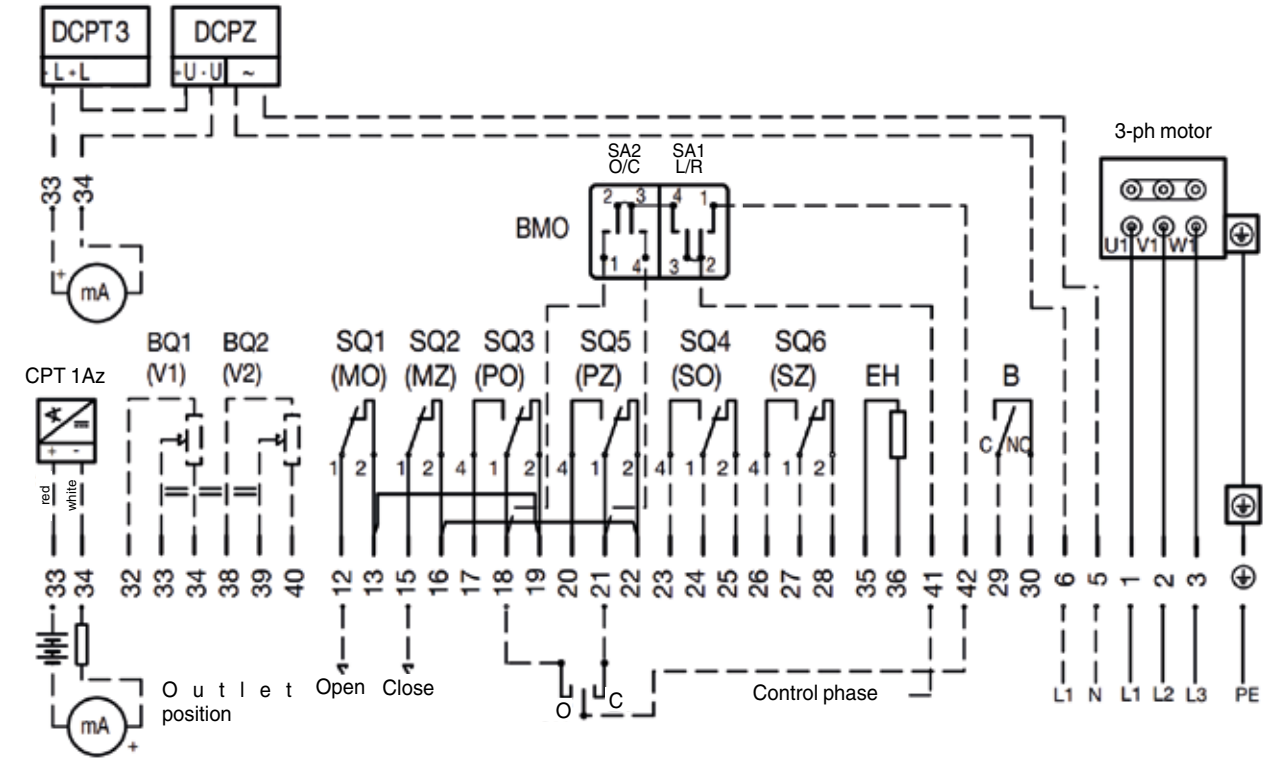
P3M-0939E



Connection of electric motors of **MODACT MON, MOP** actuators

– with connector

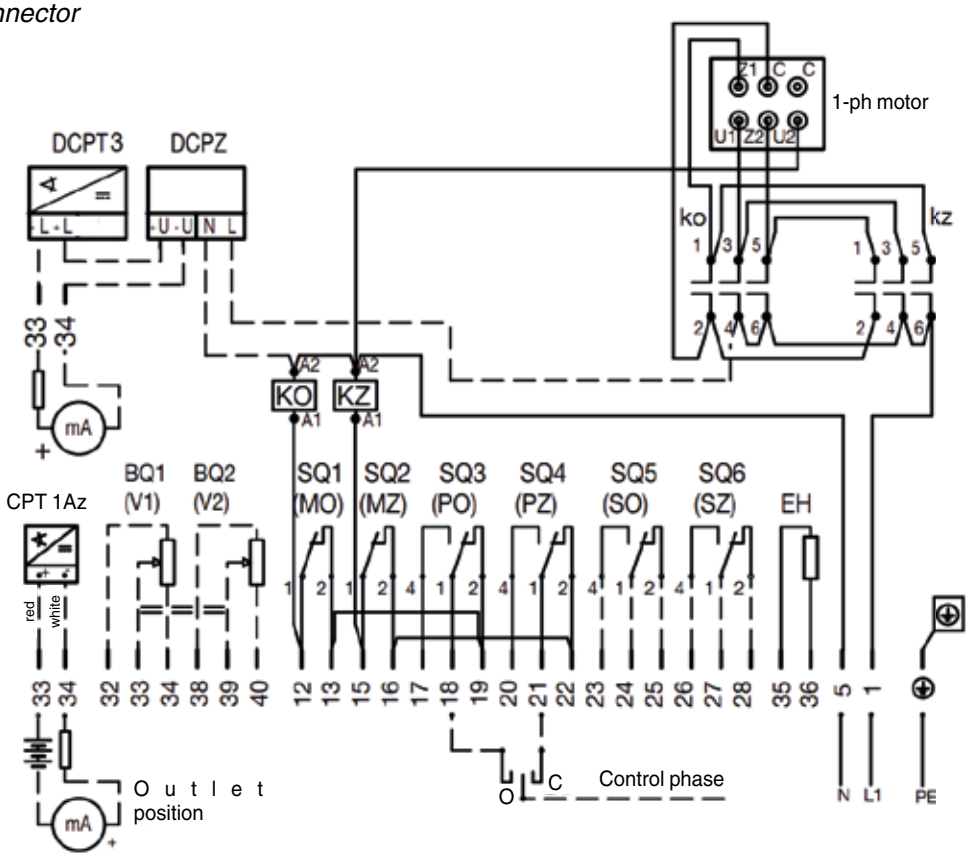
P3M-0940E



Connection of electric motors of **MODACT MONJ Control** actuators – with contactors

– with connector

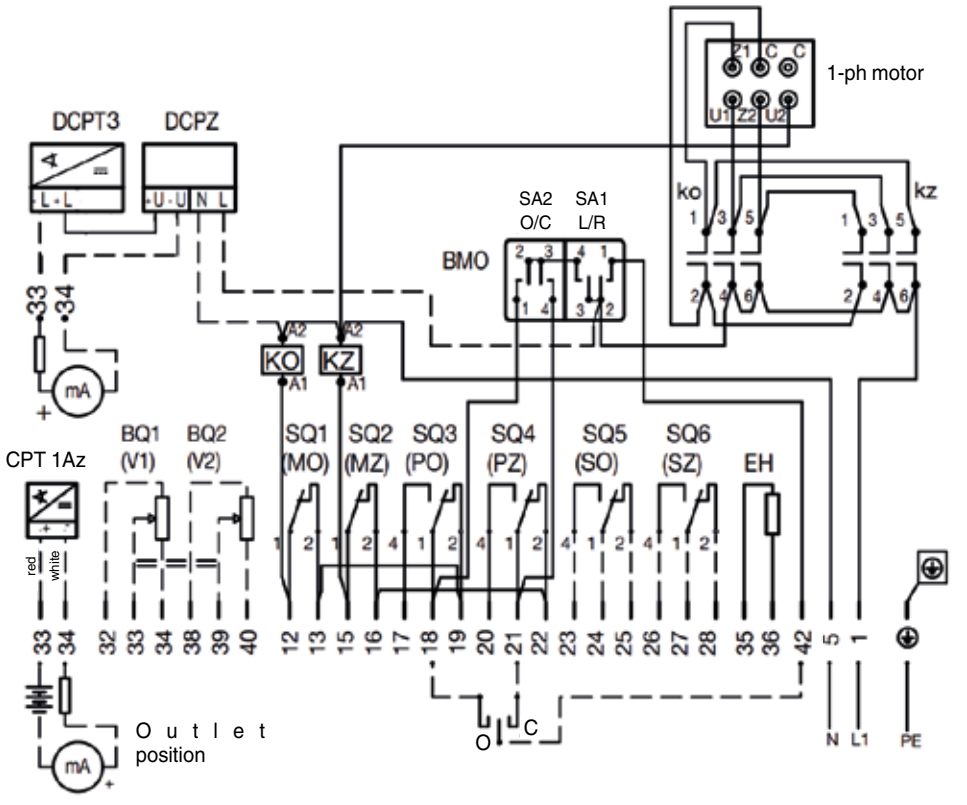
P3-0941E



Connection of electric motors of **MODACT MONJ Control** actuators – with contactors and BMO

– with connector

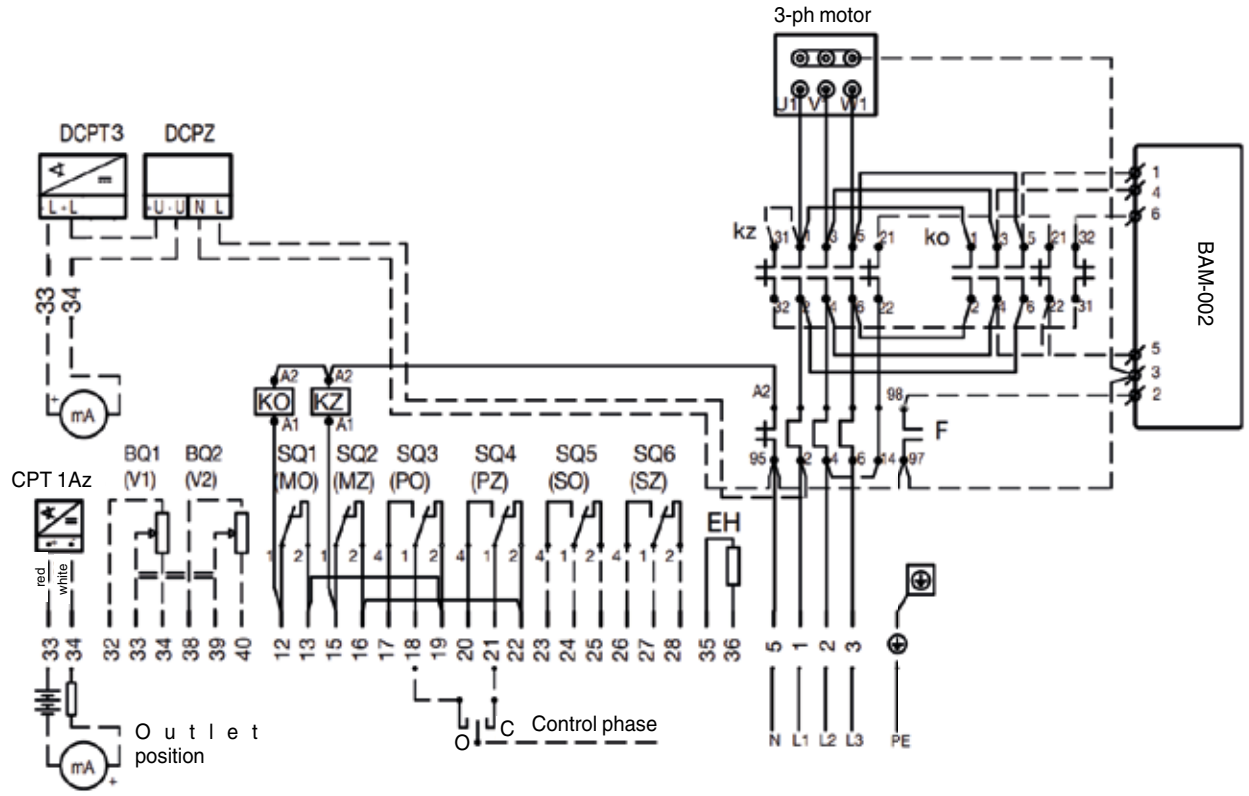
P3M-0942E



Connection of electric motors of **MODACT MON, MOP Control** actuators
– with contactors

– with connector

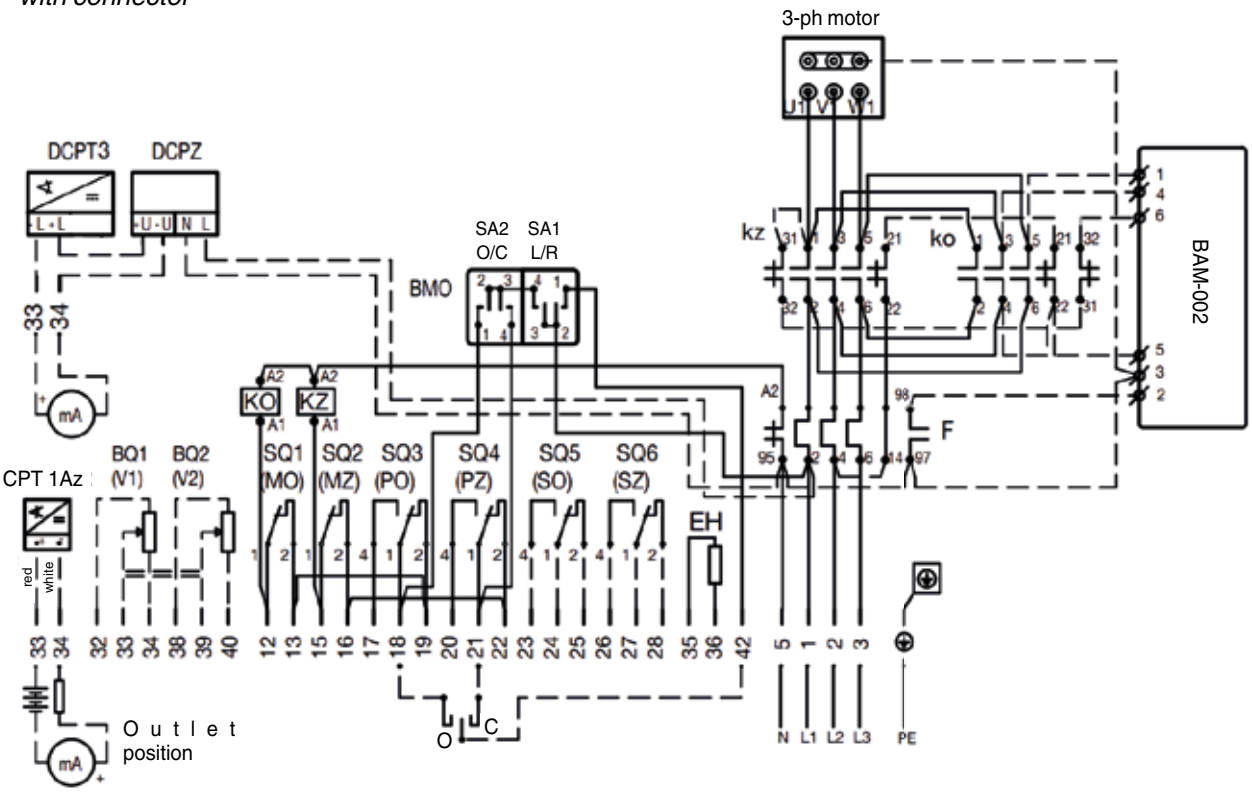
P3-0953



Connection of electric motors of **MODACT MON, MOP Control** actuators
– with contactors and BMO

– with connector

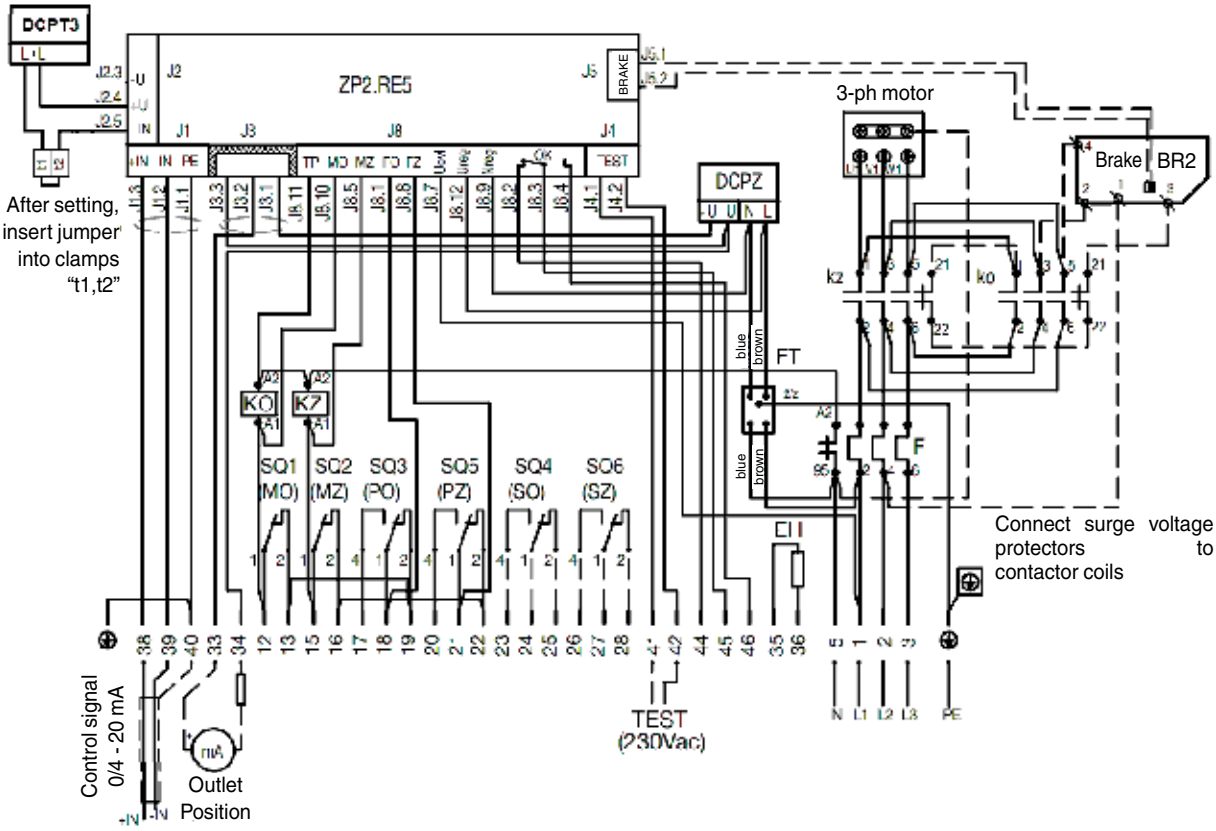
P3M-0954



Connection of electric motors of **MODACT MON, MOP Control** actuators – with contactor and ZP2.RE5 regulator

– with connector

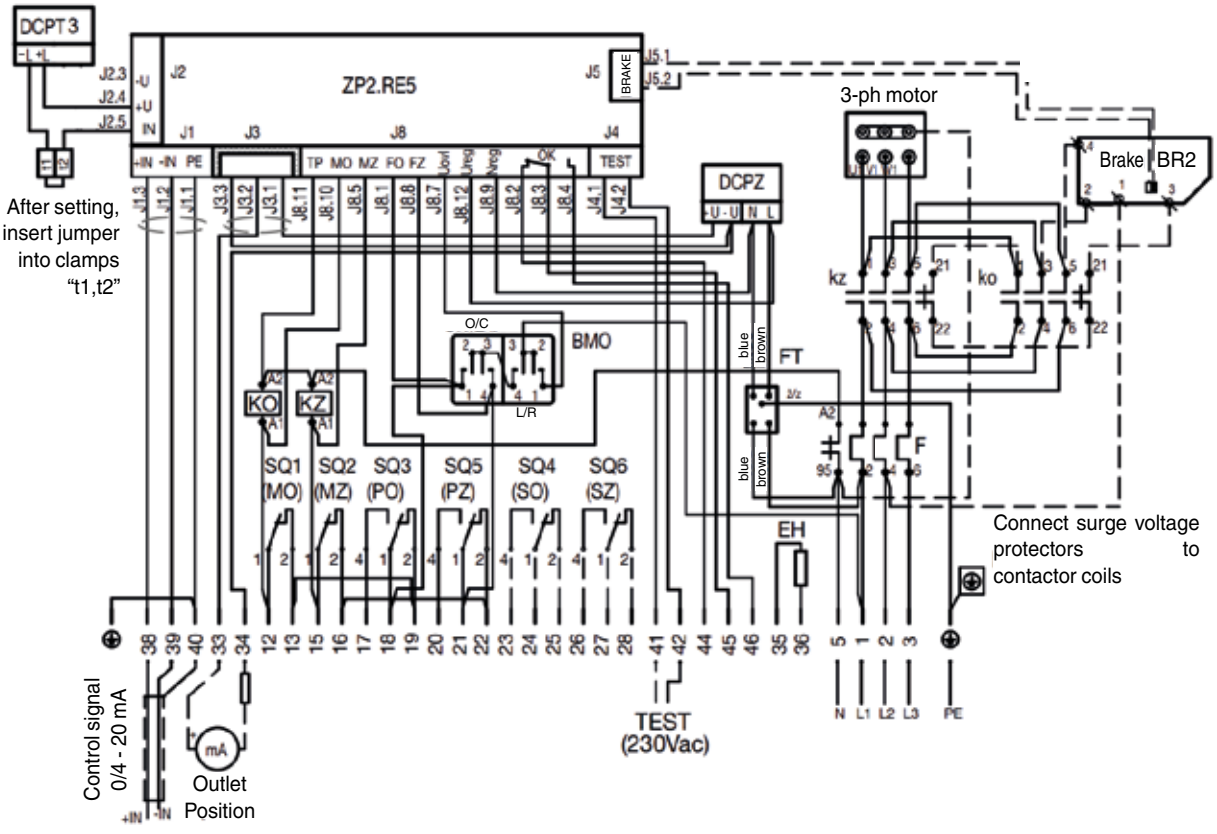
P3-0955



Connection of electric motors of **MODACT MON, MOP Control** actuators – with contactor, ZP2.RE5 regulator and BMO

– with connector

P3M-0956



List of signals on connectors of ZP2.RE5 regulator

J1 – control signal

J1.1	PE	earthing J1.2
J1.2	-IN	control signal -
J1.3	+IN	control signal +

J2 – position sensor

J2.1	+UR	resistance
J2.2	RIN	resistance
J2.3	-UR	resistance
J2.4	+24 V	current
J2.5	IIN	current

J3 – position transmitter

J3.1	+U
J3.2	Iout
J3.3	- U
J3.4	spare

J4 – input TEST *(24 V - 230 V)*

J4.1	TEST1
J4.2	TEST2

J5 – output of brake

J5.1	brake 1
J5.2	brake 2

J6 – development

J7 – communication

J8 – power connector

J8.1	FO	control output “opening”
J8.2	OK	contact relay OK *(NO)*
J8.3	OK	contact relay OK *(COM)*
J8.4	OK	contact relay OK *(NC)*
J8.5	MZ	control input “closing”
J8.6	N	spare
J8.7	UOVL	phase 230 V for control outputs FO, FZ
J8.8	FZ	control output “closing”
J8.9	N	supply of reg. 230 V *(N)*
J8.10	MO	control input “opening”
J8.11	TP	control input “thermal relay”
J8.12	UREG	supply of reg. 230 V *(L1)*

SPARE PARTS LIST

(for 5 years of operation)

Serial number 1	Title 2	Drawing or standard No. 3	pc. 4	Application 5
52 030	Seal ring 125x3 2327311049	PN 029281.2	1	Sealing between power transmission box and flange with gears
	Seal ring 180x3 2327311043	PN 029281.2	1	Sealing of terminal box cover
	Seal ring 130x3 2327311041	PN 029281.2	1	Sealing between control box and power transmission box
	Seal ring 43x35 2327311008	PN 029280.2	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	PN 029280.2	2	Sealing of torque tripping shaft
	Seal ring 170x3 2327311054	PN 029281.2	1	Sealing of control box cover
	Lip seal ring 40x52x7 2327352066	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 32x2 2327311037	PN 029281.2	1	Sealing of local position indicator glass
	Sealing 405052737414	224612280	1	Sealing below rising spindle hole cover of valve
	Eye sight 2332111121	4-62 847	1	Local position indicator cover
	Micro switch SAIA XGK12-88-J21 ICS 2337441060	Order from ZPA Pečky, a.s.	1	Torque switches MO, MZ
	Micro switch D433-B8LD 2337441098	Order from ZPA Pečky, a.s.	1	Selector switches PO, PZ signalling switches SO, SZ
	Lip seal ring 40x52x7 2327352066	ČSN 029401.0	2	Output shaft sealing in power transmission box
	Lip seal ring 16x28x7 2327352022	ČSN 029401.0	1	Hand wheel shaft sealing
	Sealing 16x22 405052105014	224580840	2	Threaded cap sealing *(for oil filling)*
	Seal ring 125x5 2327311404	PN 029281.2	1	Sealing between control box and terminal box
	Sealing	224591870	1	Sealing between electric motor and flange with gears
52 031 + 52 032	Eye sight 2332111121	4-62 847	1	Local position indicator cover
	Micro switch SAIA XGK12-88-J21 ICS 2337441060	Order from ZPA Pečky, a.s.	1	Torque switches MO, MZ
	Lip seal ring 60x75x8 2327352090	ČSN 029401.0	2	Output shaft sealing of power transmission box
	Lip seal ring 20x32x7 2327352027	ČSN 029401.0	1	Hand wheel shaft sealing
	Seal ring 95x85 2327311029	PN 029280.2	1	Sealing of insert with “git seal” rings in power box
	Seal ring 50x2 2327311028	PN 029281.2	1	Torque spring cover sealing

	Seal ring 16x22 405052105014	224580840	2	Threaded cap sealing *(for oil filling)*
	Sealings by motor	224642240 - 1LA708, 709 224623470 - 1LA707	1	Sealing between electric motor and flange with gears
	Seal ring 125x5 2327311404	PN 029281.2	1	Sealing between control box and terminal box
	Micro switch D 443-B8LD 2337441098	Order from ZPA Pečky, a.s	1	Selector switches PO, PZ signalling switches SO, SZ
	Seal ring 160x3 2327311048	PN 029281.2	1	Sealing between power transmission box and flange with gears
	Seal ring 180x3 2327311043	PN 029281.2	1	Terminal board cover sealing
	Seal ring 190x3 2327311056	PN 029281.2	1	Sealing between control box and power transmission box
	Lip seal ring 55x70x8 2327352083	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	PN 029280.2	2	Sealing of torque tripping shaft
	Seal ring 190x3 2327311056	PN 029281.2	1	Sealing of control box cover
	Seal ring 32x2 2327311037	PN 029281.2	1	Sealing of local position indicator glass
	Sealing size 3 405052785014	224610741	1	Sealing below rising spindle hole cover of valve
	Seal ring 60x50 2327311090	PN 029280.2	1	Output shaft sealing in control box cover
52 033 + 52 034	Seal ring 200x3 2327311044	PN 029281.2	1	Sealing between power transmission box and flange with gears
	Seal ring 180x3 2327311043	PN 029281.2	1	Sealing of terminal box cover
	Seal ring 200x3 2327311044	PN 029281.2	1	Sealing between control box and power transmission box
	Lip seal ring 80x100x13 2327352097	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	PN 029280.2	2	Sealing of torque tripping shaft
	Seal ring 200x3 2327311044	PN 029281.2	1	Sealing of control box cover
	Seal ring 75x65 2327310991	PN 029280.2	1	Output shaft sealing in control box cover
	Seal ring 32x2 2327311037	PN 029281.2	1	Sealing of local position indicator glass
	Sealing size 4 405052713614	224611130	1	Sealing below rising spindle hole cover of valve
	Eye sight 2332111121	4-62 847	1	Local position indicator cover
	Micro switch SAIA XGK12-88-J21 ICS 2337441060	Order from ZPA Pečky, a.s	1	Torque switches MO, MZ
	Lip seal ring 80x100x10 2327352096	ČSN 029401.0	2	Output shaft sealing in power transmission box
	Lip seal ring 27x40x10 2327352044	ČSN 029401.0	1	Hand wheel shaft sealing

	Seal ring 70x2 2327311058	PN 029281.2	2	Torque spring cover sealing
	Sealings by motor 405052088114	224591530 - 1LA710,711 224642240 - 1LA709	1	Sealing between electric motor and flange with gears
	Sealing 16x22 405052105014	224580840	2	Threaded cap sealing *(for oil filling)*
	Seal ring 125x5 2327311404	PN 029281.2	1	Sealing between control box and terminal box
	Micro switch D 433-B8LD 2337441098	Order from ZPA Pečky, a.s	1	Selector switches PO, PZ signalling switches SO, SZ
52 035	Sealing 405052104614	224593370	1	Sealing between electric motor and flange with gears
	Seal ring 280x3 2327311078	PN 029281.2	1	Sealing between flange with gears and power transmission box
	Seal ring 180x3 2327311043	PN 029281.2	1	Sealing of terminal box cover
	Seal ring 260x5 2327311046	PN 029281.2	1	Sealing between power transmission box and control box
	Lip seal ring 85x120x13 2327352098	ČSN 029401.0	1	Sealing of output shaft in control box
	Seal ring 10x6 2327311001	PN 029280.2	2	Sealing of torque tripping shaft
	Seal ring 200x3 2327311044	PN 029281.2	1	Sealing of control box cover
	Seal ring 90x80 2327311011	PN 029280.2	1	Sealing of output shaft in control box cover
	Seal ring 32x2 2327311037	PN 029281.2	1	Sealing of local position indicator glass
	Sealing 405052713614	224611130	1	Sealing below rising spindle hole cover of valve
	Eye sight 2332111121	4-62 847	1	Local position indicator cover
	Micro switch SAIA XGK12-88-J21 ICS 2337441060	Order from ZPA Pečky, a.s	1	Torque switches MO, MZ
	Micro switch D433-B8LD 2337441098	Order from ZPA Pečky, a.s	1	Selector switches PO, PZ signalling switches SO, SZ
	Lip seal ring 105x130x13 2327352109	ČSN 029401.0	2	Sealing of output shaft in power transmission box
	Lip seal ring 30x50x12 2327352054	ČSN 029401.0	1	Hand wheel shaft sealing
	Seal ring 90x2 2327311081	PN 029281.2	1	Sealing below torque spring cover
	Sealing 16x22 405052105014	22458084.0	2	Threaded cap sealing *(for oil filling)*
52 036	Spare parts for serial number 52 036 are identical with serial number 52 035, but are supplemented with:			
	Lip seal ring 150x180x15 2327352108	ČSN 029401.0	1	Sealing for gear box output shaft
	Lip seal ring 95x125x13 2327352107	ČSN 029401.0	1	Bottom sealing of central wheel
	Lip seal ring 105x130x13 2327352109	ČSN 029401.0	1	Top sealing of central wheel
	Sealing 405052747714	224612480	1	Top sealing of central wheel

	Sealing 405052743914	224612590	1	Sealing between flange with bearing and differential gear
	Sealing 405052743514	224612580	1	Sealing between flange and flange with bearing
POSITION TRANSMITTERS				
52 030-6	Resistance transmitter 1 x 100 Ω	2340510210	1	Installation on control board
	Resistance transmitter 2 x 100 Ω	2340510211	1	Installation on control board
	Current position transmitter CPT 1Az	2340510393	1	Installation on control board
	Current position transmitter DCPT3	214664480	1	Installation on control board
	Power supply for DCPT3	214651921	1	Installation in terminal box

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

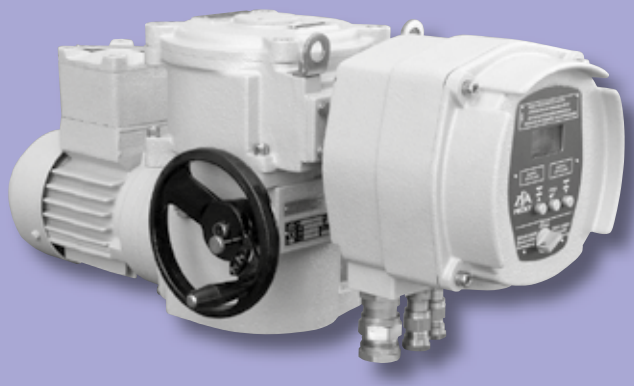
MODACT MPR Variant
Electric rotary (160°) lever actuators with a variable output speed

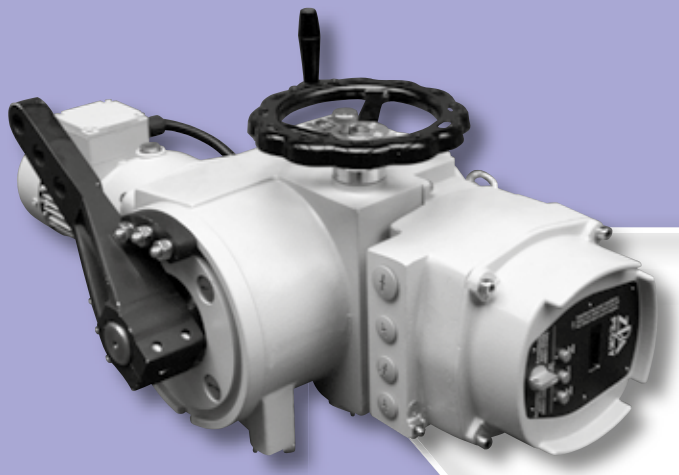
MODACT MPS, MPSP, MPSED, MPSPED
Electric rotary (160°) lever actuators with a constant output speed

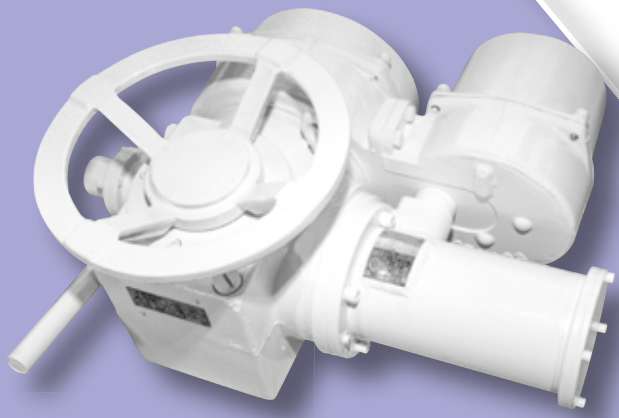
MODACT MTN, MTP, MTNED, MTPED
Electric linear thrust actuators with a constant output speed

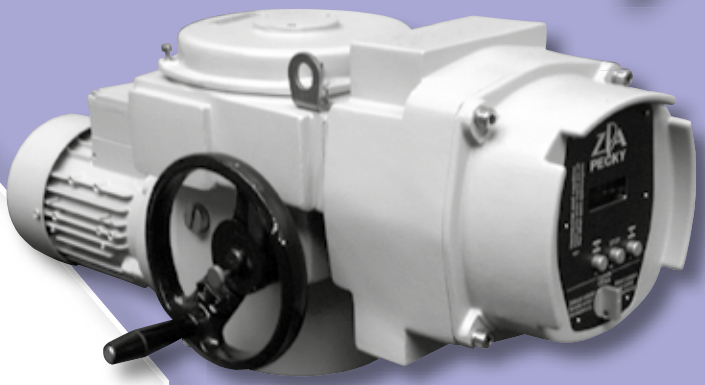
Deliveries of assembled actuator + valve (or MASTERGEAR gearbox) combinations

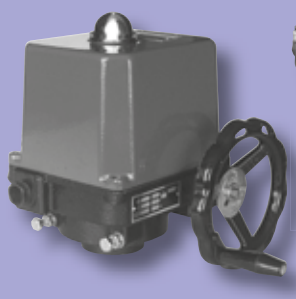
TRADITION • QUALITY • RELIABILITY

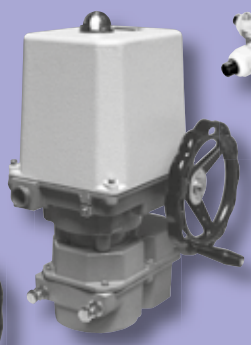












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