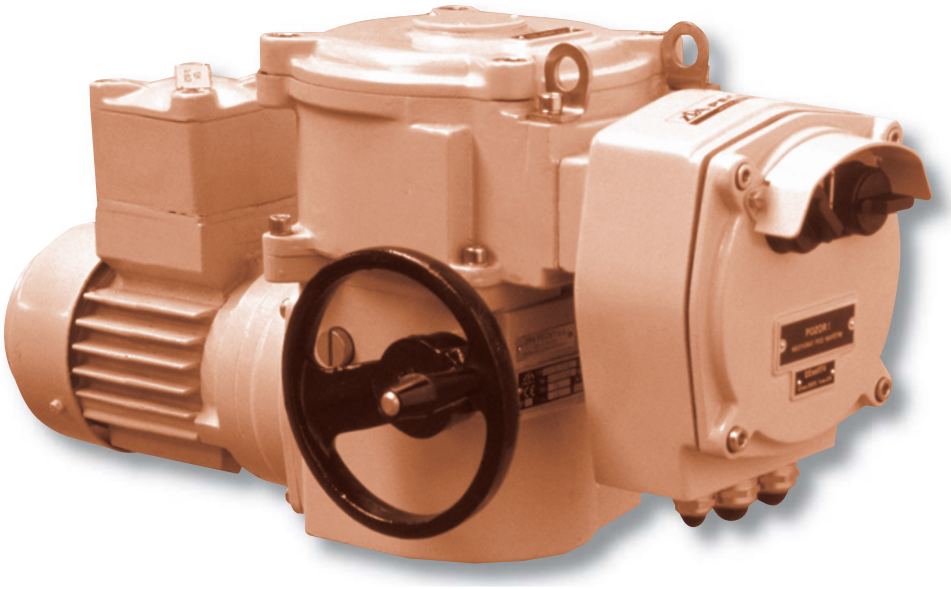
ZPA PEČKY, a.s.



MOUNTING AND OPERATING INSTRUCTIONS

Electric rotary multi-turn actuators
Explosion-proof design

MODACT MO EEx

Type Numbers 52 120 - 51 125

CERTIFICATE

Management system as per
EN ISO 9001 : 2000

In accordance with TÜV CERT procedures, it is hereby certified that

ZPA Pečky, a.s.
Třída 5. května 166
289 11 Pečky
Czech Republic

applies a management system in line with the above standard for the following scope

Development and production of electric actuators, enclosures and sheet metal production.

Certificate Registration No. 04 100 950161
Audit Report No. 624 362/200

Valid until 2009-09-28
Initial certification 1995-03-01

G. Bräutigam
TÜV CERT Certification Body
at TÜV NORD CERT GmbH

Praha, 2006-09-29

This certification was conducted in accordance with the TÜV CERT auditing and certification procedures and is subject to regular surveillance audits.
TÜV NORD CERT GmbH Langemarckstrasse 20 45141 Essen www.tuev-nord-cert.com

TGA-ZM-30-96-00

The Mounting and Operating Instructions specify basic principles for mounting, connection, adjustment, operation, maintenance, and repairs of electric explosion-proof actuators. A fundamental prerequisite is that assembly, operation, maintenance, and revisions are performed by skilled technicians qualified for operation and works on explosion-proof electric devices and the works are supervised by a professionally qualified expert instructed in a demonstrable way.

APPLICATION

The **MODACT MO** electric rotary multi-turn actuators in explosion-proof design **EEx** de IIC T4 are specially intended for controlling devices by a reversing rotary motion, e.g. slide valves and valves, and, in connection with an appropriate gearbox, also flap or ball valves, and other devices for which they are suitable due to their properties.

The actuators operate in remote control circuits; they can also be used in a mode of interrupted run with starting-up S4 according to ČSN 35 0000, Part 1 (e.g. in gradual opening the valve, etc.). In this control mode, the mean value of load torque does not exceed 40 % of the maximum tripping torque with load factor of 25 %. The maximum switching rate in 1200 h^{-1}.

The actuators are intended for works in an environment with a danger of occurrence of explosive gaseous atmosphere according to ČSN EN 60079-14 and ČSN EN 60079-10 (ČSN 33 2320) in the zone 1 (former designation SNV1).

This applies to explosion-proof electric devices of the Group II, Category 2 in rooms with probable occurrence of explosive atmosphere created by gases, vapours or mist - "G". The actuators are designated with a mark of protection against explosion and symbols of the group and category of classification Ex II2G.

Nomenclature:

Environment with explosion danger - environment in which an explosive atmosphere can be created

Explosive gaseous atmosphere - a mixture of flammable substances (in the form of gases, vapours or mist) with air under atmospheric conditions in which, after initialization, burning spreads out to non-consumed mixture.

Maximum surface temperature - The highest temperature created during operation under the most unfavourable conditions (however within approved limits) on any surface part of the electric device, which could induce ignition of surrounding atmosphere.

Closure - All walls, doors, covers, cable bushings, shafts, rods, pull-rods, etc. which contribute to the type of protection against explosion and/or to the level of protection (IP) of the electric device.

Explosion-proof closure "d" - Type of protection in which the parts capable of causing ignition of an explosive atmosphere are installed inside the closure; in case of internal explosion this closure should withstand pressure of the explosion and prevent spreading of the explosion into the surrounding atmosphere.

Secured design "e" - Type of protection against explosion with additional measures adopted for increased safety against non-permissible temperature increase and formation of sparks or arcs inside and on external parts of the electric device which, under normal operating conditions, does not form sparks or arcs.

Standards

The following basic standards apply to explosion-proof actuators:

ČSN EN 60079-14	Regulations for electric devices in locations with danger of explosion of flammable gases and vapours.
ČSN IEC 60721	Types of environment for electric devices.
ČSN EN 50 014	Explosion-proof electric devices. General conditions.
ČSN 33 0371	Non-explosive mixtures. Classification and testing methods.
ČSN EN 50 018	Explosion-proof electric devices. Explosion-proof closure.
ČSN EN 50 019	Explosion-proof electric devices. Secured design.
ČSN 34 3205	Operation of rotary electric machines and works with them.

Designation of explosion-proof properties

It consists of the following symbols:

EEx	Electric device complies with the standard ČSN EN 50 014 and related standards for various types of protection against explosion.
d	Designation of the type of protection against explosion, explosion-proof closure according to ČSN EN 50 018.
II	Designation of the group of explosion-proof electric device according to ČSN EN 50 014.
C	Designation of the sub-group of the group of explosion-proof electric device according to ČSN EN 50 014.
T4	Designation of temperature class of explosion-proof electric device of the Group II according to ČSN EN 50 014.

Specification of actuators

The following plates are attached to the actuators:

1. Data plate of explosion-proof closures includes

- name and address of the manufacturer
- type designation of the product (type number)
- serial number (including code of year of production)
- number of certificate of explosion-proof device
- designation Ex II 2G
- designation of protection against explosion – EEx de IIC T4
- number (mark) of testing laboratory
- designation of electric protection of the actuator
- mark of conformity CE

2. Rating plate includes

- data on electric power circuit (voltage, current, and power of electric motors)
- data on electric control circuit (voltage, current)
- data on position transmitter (resistance, voltage and/or current)
- data on current frequency

3. Name plate includes

- name of the manufacturer
- type designation of the product (type number)
- serial number
- year of production
- rated value of tripping torque [Nm]
- rated speed of shifting [min^{-1}]
- rated working stroke [rev.]
- designation of actuator protection (IP)
- actuator weight [kg]
- mark of conformity CE

4. Warning plate includes

ATTENTION!
DO NOT OPEN UNDER VOLTAGE!

5. Plates with designation of explosion-proof properties

EEx d IIC T4
EEx e IIC T4

6. Manufacturer's plate

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MADE IN CZECH REPUBLIC

OPERATING CONDITIONS

The **MODACT MO EEx** actuators should withstand the effect of operating conditions and external influences, Classes AA7, AB7, AC1, AD5, AE5, AF2, AG2, AH2, AK2, AL2, AM2, AN2, AP3, BA4, BC3 and BE3N2, according to ČSN Standard 33 2000-3 (mod. IEC 364-3:1993).

If the actuator is to be installed in the open-air space it should be provided with light roofing for protection against the effect of direct solar radiation.

If the actuator is used at a location with an ambient temperature under - 10 °C and/or relative humidity above 80%, at a sheltered location, or in the tropical atmosphere, the anti-condensation heater built-in in all actuators, should always be used. One or two heater elements should be connected, as required.

Installation of the actuators at a location with incombustible and non-conducting dust is only possible if this has no adverse effect on their function. Herewith, the standard ČSN 34 3205 should strictly be adhered to. It is advisable to remove dust whenever its layer becomes about 1 mm thick.

Notes:

A sheltered location is considered a space where atmospheric precipitations are prevented from falling at an angle of up to 60° from the vertical.

The location of the electric motor should be such that cooling air has free access to the motor and no heated-up blown-out air is drawn in the motor again. For air inlet, the minimum distance from the wall is 40 mm. Therefore, the space in which the motor is located should be sufficiently large, clean and ventilated.

Classes of external influences:

Basic characteristics - as extracted from ČSN Standard 33 2000-3 (mod. IEC 364-3:1993).

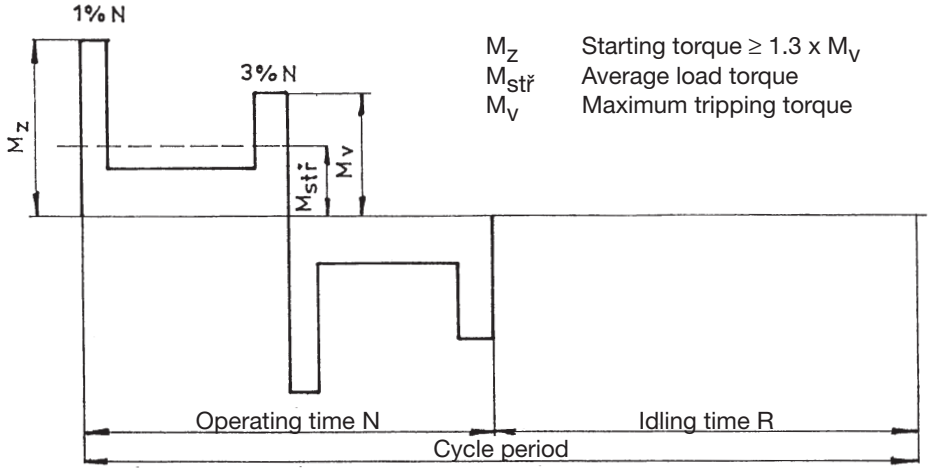
1) AA7 - Simultaneous effect of ambient temperature of - 25 °C to + 55 °C with relative humidity from 10 % upwards
2) AB7 - Ambient temperature to Point 1); minimum relative humidity 10%, maximum relative humidity 100% with condensation
3) AC1 - Altitude ≤ 2,000 m above sea level
4) AD5 - Splashing water in all directions
5) AE5 - Small dust content in air; medium layers of dust; daily dust fall out more than 35 mg/m^2, but not exceeding 350 mg/m^2
6) AF2 - Corroding atmosphere and pollutants; the presence of corroding pollutants is significant.
7) AG2 - Intermediate mechanical stress; in common industrial plants
8) AH2 - Medium vibrations; in common industrial plants
9) AK2 - Serious risk of growth of vegetation and moulds
10) AL2 - Serious danger of occurance of animals (insects, birds, small animals)
11) AM2 - Harmful effect of escaping vagabond currents
12) AN2 - Medium solar radiation with intensities > 500 W/m^2 and ≤ 700 W/m^2
13) AP3 - Medium seismic effects; acceleration > 300 Gal ≤ 600 Gal
14) BA4 - Personal abilities; instructed staff
15) BC3 - Frequent contact with the earth potential; persons coming frequently into contat with „live“ parts or standing on a conducting base
16) BE3N2 Risk of explosion of combustible gases and vapours; according to ČSN EN 60079 - 10 (33 23 21), Zone 1.

OPERATION MODE

According to ČSN EN 60 034-1, the electric actuators can be operated in the S2 load category. The run time at temperature +50 °C is 10 min, the mean load torque is max. 60 % of the value of the maximum tripping torque M_V.

According to ČSN EN 60 034-1, the electric actuators can also be operated in S4 load category (interrupted operation with starting-up). The load factor $\frac{N}{N+R}$ is max. 25 %; the longest operating cycle N+R is 10 min (the course of load is shown in the picture).The maximum number of switching actions in automatic control mode is 1200 h^{-1}. The mean load torque with load factor 25 % and ambient temperature of 50 °C shall not exceed 40 % of the maximum tripping torque M_V.

The highest mean load torque is equal to rated torque of the actuator.



M_Z Starting torque ≥ 1.3 x M_V
$M_{stř}$ Average load torque
M_V Maximum tripping torque

Course of operating cycle

Service life of actuators

Service life of actuators is 6 years, at the most.

The actuator intended for shut-off valves must be able to perform at least 10,000 operating cycles (C - O - C).

The actuator intended for regulating purposes must be able to perform at least 1 million cycles with operation time (during which the output shaft is moving) at least 250 hours. Service life in operating hours (h) depends on load and number of switching. Not always, high frequency of switching influences positively accuracy of regulation. For attaining the longest possible faultless period and service life, frequency of switching is recommended to be set to the lowest number of switching necessary for the given process. Orientation data of service life derived from the set regulation parameters are shown in the following table.

Service life of actuators for 1 million starts				
Service life [h]	830	1 000	2 000	4 000
Number of starts [1/h]	Max. number of starts 1200	1 000	500	250

TECHNICAL REQUIREMENTS

General requirements

The electric actuators should comply with technical specifications of TP 12-02/97. The basic technical parameters are given in Tab. 1, 2.

Supply voltage

The actuators have been designed to operate at supply voltage of 3 AC 380 to 690 V/50 Hz. However, they are available in design variants operating at another three-phase AC supply voltage, upon special request. The supply voltage of the electric motor should be within the tolerance limits of ±10% of the rated value and the supply voltage frequency should be within ± 2% of the rated value. Within this supply voltage range, all parameters are kept up except the starting torque which varies with the square of the supply voltage deviation from the rated value. This dependence is directly proportional to the supply voltage variation; no larger supply voltage and frequency fluctuations are permitted.

Operating position

The actuator can operate in any position provided that the electric motor is not under the actuator, i.e., the electric motor axis should not be more than 15° below the horizontal plane. When the actuator is installed with the electric motor upwards oil should be added to ensure lubrication of the motor pinion.

Tripping torque

At the factory, the tripping torque has been adjusted as shown in Tab.1, according to the customer's requirements. If no tripping torque adjustment has been specified by the customer the maximum tripping torque is adjusted.

Starting torque

The starting torque of the actuator is a calculated value determined by the starting torque of the electric motor and the total gear ratio and efficiency of the actuator. After run reversation, the actuator can produce a starting torque for the duration of 1 to 2 revolutions of the output shaft when torque-limit switching is locked. This can take place in either end position or in any intermediate position.

Self-locking

In compliance with the standard specifications, the actuator is self-locking provided that the load is only applied in the opposite direction to the output shaft motion of the actuator. Self-locking is provided by an arresting roller device that stops the electric motor rotor even in the manual control mode.

For safety reasons, it is strictly prohibited, to use the actuators for driving lifting appliances that may be used for transport of persons or equipment in cases where people might be present under the lifted load.

Manual control

Manual control is performed directly by a handwheel (without clutch). It can be used even when the electric motor is running (the resulting motion of the output shaft is determined by the function of the differential gear). When the handwheel is rotated clockwise the output shaft of the actuator also rotates clockwise (when looking at the shaft towardsthe control box). On condition that the valve nut is provided with left-hand thread, the actuator closes the valve.

Position-limit switches

The OPEN and CLOSE position-limit switches limit the actuator working stroke, each being adjusted to operate in one end position.

Torque-limit switches

The actuator is fitted with two torque-limit switches each of which acts only in one direction of motion of the actuator output shaft. The torque-limit switches can be set to operate at any point of the working stroke except the region in which they are locked (see Starting torque).

The tripping torque can be adjusted within the range shown in Tab.1. The torque-limit switches are locked if the load torque is lost after they have been brought into the OFF-position. This feature secures the actuator against the so-called "pumping".

Position signalling

For signalling position of the actuator output shaft, two signalling switches, i.e. the OPEN signalling switch and the CLOSE signalling switch, are used. Each of these switches acts only in one direction of output shaft rotation. The operating point of the microswitches can be set within the whole working stroke range except the narrow band before the operating point of the microswitch used to switch off the electric motor.

Sense of rotation

When looking at the output shaft in the direction towards the control box, the CLOSE direction of rotation is identical with the clockwise sense.

Rising spindle

In the design variants with connecting dimensions, Shapes A, B1 and C, the actuators can be adapted for mounting to the valve with a rising spindle that projects over the upper end of the actuator output shaft in the end position of the valve. The space reserved for the rising spindle is clearly shown in the dimensional sketches. The user should mount a cylindrical guard of the rising spindle instead of the port cover at the control box top, if required. This guard has not been included in the delivery of the actuator.

Anti-condensation heater

Consisting of two elements (see the circuit diagram), the anti-condensation heater should be connected to the AC mains of 230 V. In applications where a temperature exceeding 35 °C is expected only one heater element should be connected.

Dimensions of the actuators

The dimensions of the actuators are given in Appendices, including connecting dimensions.

Position transmitters

a) Potentiometer of 1 x 100 ohm - This is a single-path resistance transmitter with an overall path resistance of 100 ohm plus a maximum of 12 ohm **between terminals 50 and 52.**

The continnously variable drive of the transmitter ensures that the transmitter cursor is moved from one end position to the other at any adjustment of the working stroke (within the range shown in the table of design variants). In the „open“ position of the actuator, there is a minimum resistance between terminals 51 and 52 (with the transmitter cursor at the stop of 160°). In the „closed“ position of the actuator, there is a maximum resistance between terminals 51 and 52 (with the transmitter cursor at the stop of 0°).

b) Current transmitter CPT 1/A

Rated output signal		4 - 20 mA or 20-4 mA
Rated working stroke		0° - 60° to 0° - 120° (continuously adjustable)
Linearity, including gears		± 2.5 % (for a maximum stroke of 120°)
Hysteresis, including gears		≤ 5 % (for a maximum stroke of 120°)
(*The non-linearity and hysteresis are related to a signal value of 20 mA*).		
Load resistance		*R_{load} 0 to 500 ohm*
Supply voltage	for R_{load} = 0 - 100 ohm	10 to 20 V DC
	for R_{load} = 400 - 500 ohm	18 to 28 V DC
Maximum supply voltage ripple		5%
Maximum transmitter power demand		560 mW
Insulation resistance		20 Mohm at 50 V DC
Insulation strength		50 V DC
Operational environment temperature		- 25 °C to + 60 °C
Operational environment temperature - extended range		- 25 °C to + 70 °C

For the extended range, R_{load} should be increased to 500 ohm and the supply voltage should not exceed 25 V. At the operational environment temperature of - 25 °C to + 60 °C, the limit supply voltage is 30 V. If this value is

exceeded a damage to the transmitter may be caused. The voltage between the transmitter casing and the signal conductors should not exceed 50 V.

For the transmitter, a two-wire connection is used, i.e., the transmitter, the power supply and the load are connected in series. The user should secure that the two-wire circuit of the current transmitter is connected to the electric earth of the associated regulator, computer, etc. This connection should only be made at a single point in any section of the circuit, outside the actuator.

Actuator terminal board

The actuator is equipped with a terminal block for connection to external circuits. The connection can be realized by conductors of max. cross-section 4 mm^2. Maximum cross-section of connecting conductors to terminals of the electric motors is 10 mm^2 for all design variants of the electric actuators.

Actuator internal wiring

The internal wiring diagrams of the MODACT MO EEx actuators with terminal designation are shown in the Appendix.

Each actuator is provided with its internal wiring diagram on the inner side of the terminal box. The terminals are marked on a self-adhesive label attached to a carrying strip under the terminal block.

Current and voltage ratings of the potentiometer

The rated voltage of the position transmitter is 48 V_{DC}, but the maximum permisible current of 100 mA should not be exceeded.

Current and voltage ratings of the microswitches

The microswitches have been rated at 250 $V_{AC, DC}$ with the following maximum currents:

OPEN and CLOSE torque-limit microswitches:	
Type CHERRY ZD-432 - BGAA	250 V_{AC}/2 A, 250 V_{DC}/0.2 A
OPEN and CLOSE signalling microswitches:	
Type CHERRY D-433 - B8LD	250 V_{AC}/2 A, 250 V_{DC}/0.2 A
OPEN and CLOSE position-limit microswitches:	
Type CHERRY D-433 - B8LA	250 V_{AC}/2 A, 250 V_{DC}/0.2 A

Protective enclosure

The type of protective enclosure of the control and terminal boxes is IP 55, according to ČSN EN 60529 (idt. IEC 529:1989). The type of protective enclosure of the electric motor is IP 55 (or IP 54) according to ČSN EN 60034-5 (35 0000) (mod. IEC 34-5:1981).

Insulation resistance

The insulation resistance of electric circuits of the actuator with respect to the frame and to each other should be at least 20 Mohm. After a damp test, it should be at least 2 Mohm. For the insulation resistance of the CPT 1/A current transmitter, refer to Position transmitters.

Under cold conditions, the insulation resistance of the electric motor should correspond at least to the following equation, according to ČSN 35 0000 - 1 - 1, Paragraph 4.3 (mod. IEC 34-1:1994):

$$R_{is} = \frac{5\ U_N}{0.01\ P_N + 1000}\ [\text{Mohm}]$$

where in: U_N is the rated supply voltage [V]
P_N is the rated power output [kW]

Insulation strength of electric circuits

The insulation strength of electric circuits of the actuators should correspond to Technical Conditions TP 12-02/97.

Circuit of remote position transmitter 1 x 100 ohm	500 V, 50 Hz
Circuits of microswitches and anti-condensation heater	500 V, 50 Hz
Circuit of electric motor	1,000 V + 2.Un, at least 1,500 V at 50 Hz
Circuit of the current transmitter CPT 1/A	50 V DC

Deviations of basic parameters

Tripping torque	± 12% of the maximum range value
Adjusting speed	- 10% of the maximum range value + 15% of the rated value (in no-load operation)
Setting of signalling switches	± 2.5% of the maximum range value (for the ranges, refer to the Mounting instructions).
Hysteresis of signalling switches	max. 4% of the maximum range value
Setting of position-limit switches	25° of the angle of output shaft displacement (without the influence of running-down)
Hysteresis of position-limit switches	max. 45° of the angle of output shaft displacement
Transmitter non-linearity, incl. gears	± 2.5% of the nominal resistance
Transmitter hysteresis, incl. gears	max. 4% of the nominal resistance value

(Non-linearity and hysteresis apply to the resistance transmitter of 1 x 100 ohm).
For the data of the CPT1/A current position transmitter, refer to Position Transmitters.

Design variants

The individual design variants of the actuators are available, as specified by combinations of additional type numbers, according to Tab.2.

Protection

For protection against electric shock to ČSN 33 2000 - 4 - 41 (idt. HD CENELEC 384.4.41 S1:1980) (mod. IEC 364-4-41:1992), the actuators are provided with an internal protective terminal in addition to an external protective terminal, according to ČSN 18 6330. The electric motor is also fitted with a protective terminal. The protective terminals are provided with a mark, according to ČSN EN 60417 - 1 and 2 (013 760).

Noise

The maximum acoustic pressure level A is 85 dB (A). The maximum acoustic power level A is 95 dB (A).

DESCRIPTION

The electric actuators are designed for direct attachment on the controlled device. The actuators are connected by means of a flange and a clutch according to ČSN 18 6314. The actuator flanges also comply with ISO 5210. The following clutches are available for transmission of the output shaft motion to the valve:

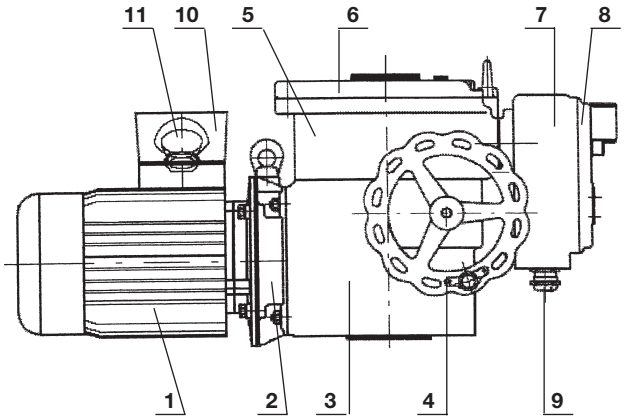
Shape A (with adapter), according to ISO 5210 and DIN 3210
Shape B1 (with adapter), according to ISO 5210 (shape B according to DIN 3210)
Shape B3 (without adapter), according to ISO 5210 (shape E according to DIN 3210)
Shape D (without adapter), according to DIN 3210
Shape C (without adapter), according to DIN 3338

The adapters are mounted between the actuator and the valve.

The electric actuator configuration is shown in Fig. 1. The three-phase asynchronous motor 1 drives, via the countershaft gearing 2, the sun gear of the differential gear unit installed in the actuator supporting box (power gearing) 3.

In the motor control mode, the crown gear of the planet differential unit is held in fixed position by a self-locking worm gearing. The handwheel 4 connected with the worm allows manual control even when the motor is running. The output hollow shaft is fixedly attached with the planet gear carrier. The output shaft is extended to the control box 5 where all elements of the electric actuator are installed – position-limit, signalling and torque-limit switches, resistance or current position transmitters, and anti-condensation heater. Operation of the position-limit and signalling switches is derived from rotation of the output shaft via special mechanisms.

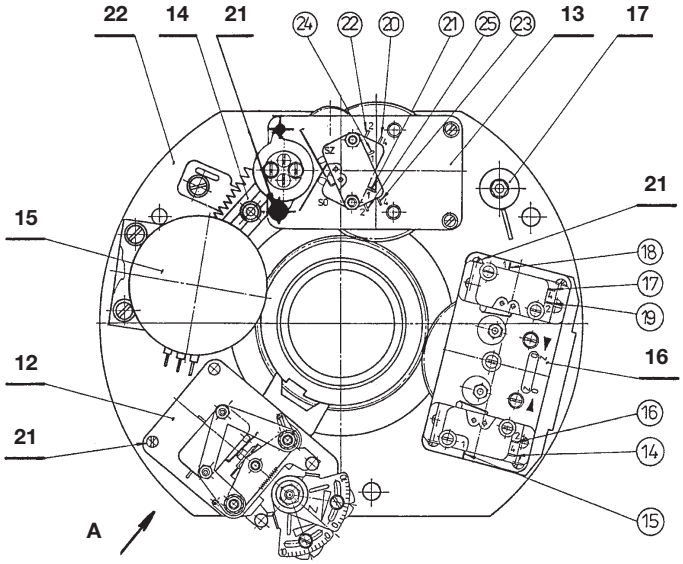
Operation of the torque-limit switches is derived from axial displacement of the “floating worm” of the manual control unit which is scanned and transferred to the control box by means of a lever. The control box forms an explosion-proof closure “d” with designation EEx d IIC T4. The terminal box in the secured design “e” has designation EEx e IIC T4. The control elements are accessible after removing the cover 6 of this box. Access to the terminal box is possible after removing the cover 8. The cable inlets are protected by cable bushings, size 2 x P21. The cable diameter 17 to 18 mm has been approved for the cable bushings. Individual operating functions of the electric actuator, e.g. torque-limit switching, signalling, remote indication of position (position transmitter), are ensured by mechanical groups (units) situated on the control board (Fig. 2, 2a) installed in the control box.



Legend:

1 - Three-phase asynchronous motor
2 - Countershaft gear box
3 - Power gearing
4 - Control handwheel
5 - Control box
6 - Control box cover
7 - Terminal box
8 - Terminal box cover
9 - Cable bushings P 21 (for control)
10 - Terminal board of electric motor
11 - Explosion-proof cable bushing (for motor)

Fig. 1 – ***Electric actuator configuration***

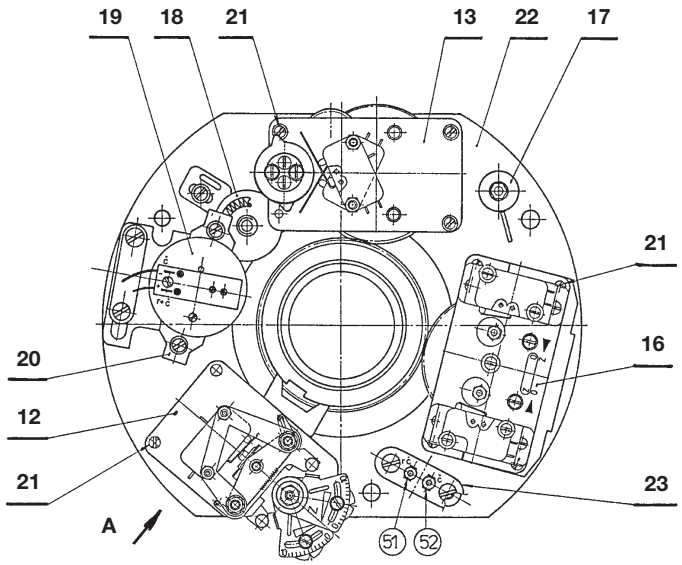


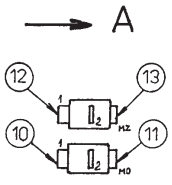
Legend:

12 – Torque-limit switching unit
13 – Signalling unit
14 – Transmitter shifting mechanism
15 – Potentiometer 1 x 100 ohm
16 - Position-limit switching unit
17 - Anti-condensation heater
21 – Fixing screws
22 – Basic control box

The encircled figures correspond to numbers of terminals on the terminal board and apply also to the control board with the current transmitter.

Fig. 2 – ***Control board – Design with potentiometer 1 x 100 ohm***





Legend:

12 - Torque-limit switching unit
13 - Signalling unit
16 - Position-limit switching unit
17 - Anti-condensation heater
18 - Driving gear
19 - Current transmitter CPT 1 / A (4 – 20 mA)
20 - Shim plates
21 - Fixing screws
22 - Basic control box
23 - Holder

For electric actuators type no. 52 120 the supporting plate of the transmitter CPT 1/A is turned round by 180 ° against the figure.

Fig. 2a – ***Control board – Design with current transmitter CPT 1 / A (4 - 20 mA)***

The following control units are distinguished according to their function:

a) Torque-limit switching unit (12)
b) Signalling unit (13),
c) Position-limit switching unit (16),
d) Potentiometer shifting mechanism (14),
e) Position transmitters – resistance 1 x 100 ohm (15) or current transmitter CPT1/A (19),
f) Anti-condensation heater (17).

All the above units are universal for all sizes of the electric actuators MO EEx.

Description and function of control units

a) Torque-limit switching unit (Fig. 3). It is designed as an independent assembly unit and consists of the base plate 24 carrying micro-switches 25; at the same time it acts as bearings for the torque control shaft 27 and the locking shaft 34.

The torque control shaft transmits motion of the floating worm from the power gearing to CLOSE (MZ) or OPEN (MO) micro-switches by means of segments 28 or 29 and levers 36 or 37. The tripping torque can be set by moving round the segments with respect to the tripping levers. For readjusting the tripping torque outside the factory, the segments 28, 29 are provided with a scale on which the points for setting the maximum and minimum torque are marked as lines individually for each electric actuator. The set torque is indicated by slots in the segments 32 and 33.

However, numbers on this scale do not provide direct indication of the tripping torque setting. The divisions on this scale serve only for finer dividing of the band between the points of maximum and minimum tripping torques and thus for more accurate resetting of the tripping torque outside the factory in case that a loading stand is not available. The segments 28 and 29 are intended for the direction “Close” and “Open”, respectively.

The torque-limit switching unit is also fitted with a locking mechanism which, after opening of the torque-limit switch, provides for its locking. In this way closing of the switch and thus pulsing of the electric actuator is prevented. Moreover, the locking mechanism prevents opening of the torque-limit switch after reversing the electric actuator run and thus enables full utilization of starting torque of the electric actuator. The locking mechanism operates in either direction of motion of the electric actuator output shaft in end positions as well as in intermediate position for the period of 1 – 2 turn of the output shaft after reversing its motion.

With the output shaft of the electric actuator loaded with counteracting torque, the torque control shaft 27 and thus the segments 28 or 29 are moved round. This displacement is transferred to the tripping lever 36 or 37. As the torque on the electric output shaft reaches the value to which the torque-limit switching units has been adjusted, the tripping lever depresses the button of respective micro-switch, the electric actuator is disconnected from the supply mains and the electric actuator stops.

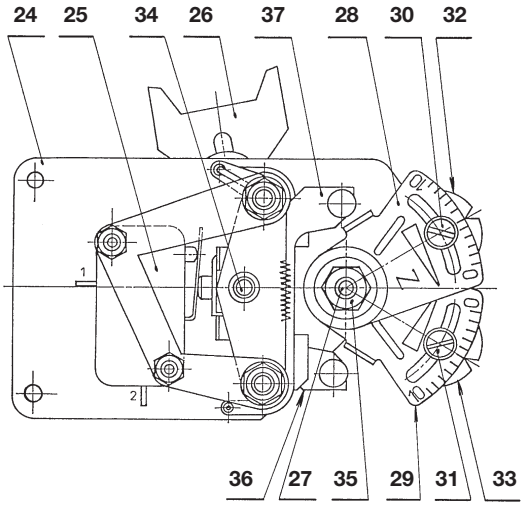


Diagram of micro-switches

Legend:

24 – Base plate
25 – CLOSE and OPEN torque-limit micro-switches
26 – Shifter
27 – Torque control shaft
28 – Upper CLOSE segment
29 – Upper OPEN segment
30 – CLOSE lock screw
31 – OPEN lock screw
32 – Lower CLOSE segment with slot
33 – Lower OPEN segment with slot
34 – Locking shaft
35 – Lock nut
36 – OPEN tripping lever
37 – CLOSE tripping lever

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

Adjustment of torque-limit switching unit

The tripping torque different from that to which the unit was set in the factory is adjusted as follows: Loosen the lock nut 35 (Fig. 3) and particular lock screw 30 (for direction CLOSE) or 31 (for direction OPEN). Insert a screwdriver into the slot in the upper segment 28 or 29 and rotate the segment until the slot in the segment 32 or 33 tellies with the respective scale division line. This point is determined in such a way that the difference between the maximum and minimum adjustable torques in Nm is divided by the number of the scale divisions between the marks for the maximum and minimum torques. The figure thus obtained indicates value in Nm of the tripping torque corresponding to one scale division. Interpolation is then used for determining the scale division line with which the slot in the segment 32 or 33 should tally.

The colour scale division line nearer to the number 10 indicates the point of setting the maximum tripping torque. The other division line indicates the point of setting the minimum tripping torque. The torque control unit must never be set in such a way that the lower segment slot is outside the band marked out by colour division lines on the scale.

After setting the tripping torque, retighten the lock screw 30 or 31 and the lock nut 35.

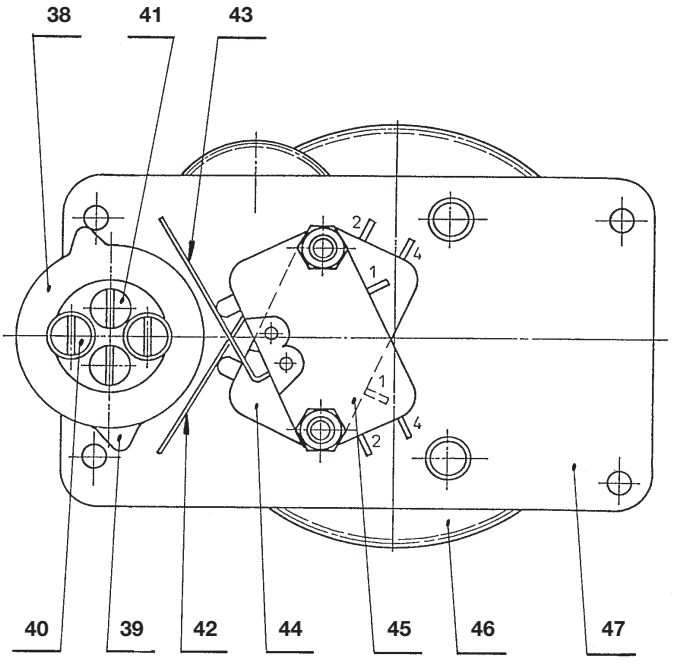
The set tripping torque values must not exceed those corresponding to respective type designations in table 1. (1a).

b) Signalling unit (Fig. 4) – This unit transmits electric signal for signalling position of the electric actuator output shaft. The unit is driven by the gear 46 from the output shaft via a multistage gearbox to the cams 38, 39 controlling the OPEN signalling micro-switch 44 and CLOSE signalling micro-switch 45. The moment of operation of the signalling switches can be chosen at any point of the working stroke of the electric actuator except the narrow band around the end positions (the signalling switch should close earlier than the position-limit switch, while the output shaft is still moving). The upper cam 38 and the lower cam 39 act in the CLOSE and OPEN direction, respectively.

The signalling unit (Fig. 4) is designed as an independent assembly. It is mounted on the supporting plate 47; the gearings fitted under it are arranged as shown in the kinematic diagram (Fig. 8). The gearing is assembled so that, after loosening the lock screw 57, the sliding gear K3 can be moved to different levels (I, II, III, IV, V). Moving of the gear K3 changes the range of setting the signalling switches and the transmitter according to the electric actuator working stroke. The tables at the Figs. 8 and 9 show the ranges of setting for respective positions of the sliding gear K3**.**

Adjustment of signalling unit

If the ranges of setting the signalling switches and the transmitter are to be modified it is necessary to change the position of the sliding gear K3. In resetting the gear K3 the signalling unit should be partially shifted out from the control box (length of inlet cables to the micro-switches is sufficient to allow for that). This can be



Legend:

38 – CLOSE direction cams
39 – OPEN direction cams
40 – Screws for CLOSE direction cams
41 – Screws for OPEN direction cams
42 – OPEN direction lever
43 – CLOSE direction lever
44 – Micro-switch (lower) for direction OPEN
45 – Micro-switch (upper) for direction CLOSE
46 – Drive gear
47 – Supporting plate of the signalling unit

Diagram of micro-switches

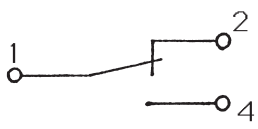


Fig. 4 – ***Signalling unit***

done after removing three screws 21 (Fig. 2) which fix the unit to the base plate. After adjusting the signalling unit to the required range, the unit is returned back. Before the screws 21 are retightened, correct meshing of the gears K1 and K2 should be checked (Fig. 8). The pinion 59 (Fig. 8) is put on the lower end of the cam shaft 58 (Fig. 8) which is connected with the shaft 58 by an adjustable friction clutch. From this pinion the motion is scanned for driving the resistance or current transmitter. Arrangement of the cams and micro-switches of the signalling unit is shown in Fig. 4. The shoulders of the cams 38, 39 deflect the levers 42 or 43 which control the signalling micro-switch OPEN (44) or CLOSE (45). In adjusting the signalling and position-limit switches and the transmitter it is always necessary to reset the electric actuator output shaft to the position where changing-over of the micro-switches should take place or required position of the transmitter is to be reached.

In adjusting the signalling switches proceed as follows: loosen the screw 40 (for the CLOSE signalling switch SZ) or 41 (for the OPEN signalling switch SO) – Fig. 4). Then, rotate the cam 38 or 39 in the arrow direction, i.e. in the counter-clockwise sense and clockwise sense for the CLOSE signalling micro-switch and OPEN signalling micro-switch, respectively, until the micro-switch closes. In this position hold the cams and retighten the lock screws.

Caution

After any manipulation with the lock screws in the electric actuator control section, the screws should be secured against loosening during vibrations by a drop of quickly drying varnish. In case these screws were secured with varnish earlier the old varnish should be removed during adjustment and the surface properly degreased.

c) Position-limit switching unit (Fig. 5)

This unit ensures tripping of the CLOSE or OPEN position-limit switches on reaching the preset number of turn of the output shaft. Rotary motion of the unit is derived from motion of the output shaft by the driving gear 55. This gear provides for a step-wise turning of the arranged gear wheels controlling the cam 50 (53). Turning of the cam against the lever of the CLOSE or OPEN position-limit switch causes changing-over of the switches.

Adjustment of position-limit switching unit

The unit can be adjusted within the range according to table 1. The adjusting procedure is as follows:

- After attaching the electric actuator on the valve, bring the valve into the CLOSE position by means of the electric actuator.
- In this position depress the tripping rod 51 in vertical direction and move it round by 90 ° to either side.
- Rotate the regulating screw 49 in the direction of the arrow “Z” (CLOSE) until the cam 50 depresses the spring of the CLOSE position-limit micro-switch 56.
- Move the tripping rod 51 round by 90°, the rod is shifted out again. If this is not the case turn the screw 49 or 52 slightly.

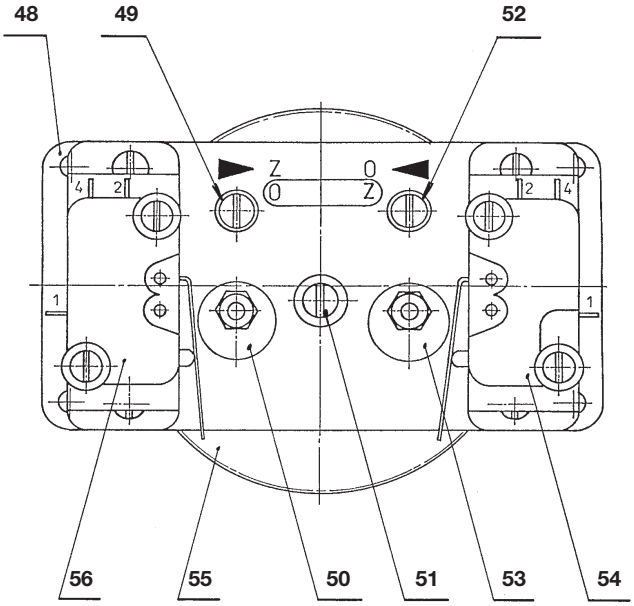
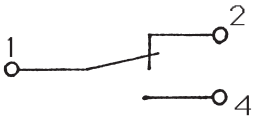


Diagram of micro-switches



Legend:

48 – Decadic transmission gearing
49 – CLOSE regulating screw
50 – CLOSE tripping cam
51 – Tripping rod
52 – OPEN regulating screw
53 – OPEN tripping cam
54 – OPEN position-limit micro-switch
55 – Driving gear
56 – CLOSE position-limit micro-switch

Fig. 5 - ***Step-wise position-limit switching unit***

- Readjust the valve by means of the electric actuator by a required number of turn into the OPEN position.
- Depress the tripping rod 51 again in the vertical direction and move it round by 90° to either side.
- Rotate the regulating screw 49 in the direction of the arrow “O” (OPEN) until the cam 53 depresses the spring of the OPEN position-limit micro-switch 54.
- Move the tripping rod 51 round by 90°, the rod is shifted out again. If this is not the case turn the screw 49 or 52 slightly.

Note:

Turning of the regulating screw 49, 52 should stop at the moment of changing-over!

If, before readjusting, the cams are in the position shown in Fig. 5 or the cam has already depressed the micro-switch button, the following procedure of adjusting is preferred:

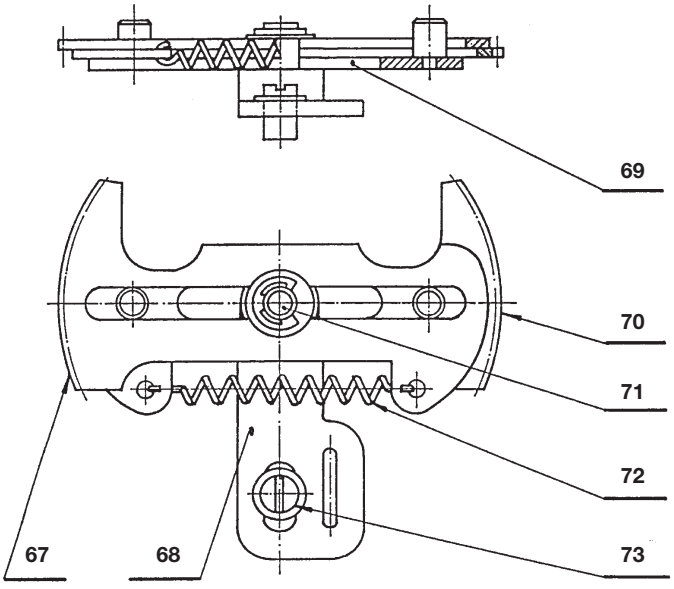
After depressing and positioning the tripping rod 51, turn the regulating screws 49 or 51 in the opposite direction of the arrow until the cam top moves out from the micro-switch lever (in the direction towards the pertaining regulating screw) and the micro-switch changes over (this can be checked by a suitable tester). By turning the regulating screw 49 or 52 in the arrow direction move the cam top back onto the micro-switch lever until the micro-switch changes over again (the micro-switch button is depressed). In this way the micro-switch is adjusted. Finally, shift out the tripping rod 51 as described above.

d) Adjusting mechanism of potentiometer (Fig. 6)

This mechanism includes two geared rockers 67, 70 on which the spring 72 is suspended. The bar with pins 69 provides for mutual sliding motion of both rockers. The assembly can move round on the pivot 71. The whole mechanism is mounted on the basic control plate 22 (Fig. 2). The geared rockers are in mesh with the transmitter pinion 75 (Fig. 7) and the pinion 59 (Fig. 8). Position of the pivot 71 determines the gear ratio of the sliding mechanism gearing, i.e. the angle of positioning of the transmitter and of the local position indicator is always 160 ° for different values of the working stroke of the electric actuator and, thus, for different positions of the cam shaft in the signalling unit. In this way it is ensured that the rated value of the transmitter signal, i.e. 100 ohm, is available for any working stroke.

e) Position transmitters (Fig. 7)

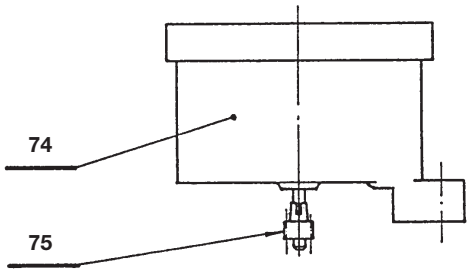
Basic component of this unit is the potentiometer 74 with the rated value of resistance signal 100 ohm. The transmitter has the shaft brought out on one side. Put on the lower end of the shaft, the pinion 75 can slip on the shaft at both end positions of the transmitter. This is advantageous in adjusting this unit.



Legend:

67 – Geared rocker
68 – Adjusting lever
69 – Bar with pins
70 - Geared rocker
71 – Adjustable pivot
72 – Spring
73 - Screw

Fig. 6 – ***Adjusting mechanism of potentiometer***



Legend:

74 - Potentiometer
75 – Transmitter pinion

Fig. 7 – ***Potentiometer 1 x 100 ohm***

Adjustment of potentiometer and position indicator

In adjusting the position transmitter proceed as follows: In the CLOSE position of the output shaft shift the geared rocker 67 (Fig. 8) out from engagement with the pinion 59 (Fig. 8) by pressing it down in the transmitter direction. Turn the rocker in the clockwise direction to the stop formed by a post under the signalling unit. Then, bring the rocker back into engagement with the pinion 59 again. The transmitter pointer should indicate 0°. If this is not the case, move the rocker 67 back from the stop and depress the rocker 70. In this way release the transmitter pinion and set the transmitter indicator near the mark 0° on the transmitter scale so that, after bringing the rocker 70 into engagement with the transmitter pinion, their teeth engage correctly. This can be checked by carefully turning the transmitter shaft. Then, shift the rocker 67 again out of engagement and, applying an excessive force, press it to the stop (The transmitter pinion starts slipping after the transmitter indicator has reached the mark 0°. Bring the rocker 67 again into engagement with the pinion 59 (Fig. 5). In this position, the oval holes in the geared rockers are parallel with the oval hole in the basic control plate 22 (Fig. 2). Now, the transmitter is adjusted for the position CLOSE. Then, loosen the screw 73 (Fig. 6), move the adjusting lever 68 (Fig. 6) towards the transmitter up to the stop, and retighten the screw 73.

Bring the electric actuator into the OPEN position with the transmitter pointer set to the position between 0 and 160°. Loosen the screw 73 and rotate the adjusting lever 68 counter-clockwise until the transmitter pointer tallies with the scale line 160°. Retighten the screw 73 and secure it against loosening by a drop of quickly drying varnish. Now, the transmitter is adjusted for the position OPEN.

Adjustment of current position transmitter CPT 1/A

First, a suitable gear transmission from the electric actuator output shaft to the transmitter shaft should be adjusted according to required working stroke of the electric actuator.

The adjustment is performed by means of the sliding gear K3 in the gearbox of the signalling unit according to Point. b).

Then, the required gear of the double gear fitted on the transmitter shaft should be brought into engagement. The gears with smaller and larger diameter are designated A and B, respectively (Fig. 9).

Readjustment is carried out by moving the two-holed oval shim plates either under or above the transmitter supporting plate (with the gear A or B in mesh, respectively). This should be done in a position where the transmitter supporting plate is at the far most distance from the gearbox.

Then, tighten slightly the screws fixing the transmitter supporting plate so that the transmitter supporting plate can be moved to the position where the gear A or B is in mesh with the driving gear. In this position, check the gears for correct meshing and, if necessary, adjust height of the double gear with respect to the driving gear by means of shims on the transmitter shaft. A small clearance should be left between the gear A (or B) and the driving gear so that the transmitter shaft is not under stress in the direction perpendicular to its axis. Finally, retighten properly the fixing screws of the transmitter supporting plate and secure them with a drop of varnish.

The gear stage of the gear K3 and the gears A, B are chosen according to the table. If the required working stroke falls within an overlap of two bands selection of the lower band is preferred.

Caution!

The transmitter CPT 1/A must not be connected without checking the supply voltage. The transmitter outlet conductors must neither be connected to the electric actuator frame nor to the earth, not even accidentally.

1) Before the supply voltage is checked, it is first necessary to disconnect the transmitter from the supply mains. Measure the voltage on terminals of the electric actuator to which the transmitter is connected – this can best be done using a digital voltmeter of input resistance at least 1 Mohm. This voltage should fall within the range of 18 – 25 V DC; in no case may it exceed 30 V (otherwise the transmitter can be damaged). Then, connect the transmitter so that the positive pole of the power source is connected to the positive pole of the transmitter, i.e. to the pin with red insulator (r) + (nearer to the transmitter centre). The terminal with white coating (wired to the terminal 52) is connected to the negative pole of the transmitter (white insulator). In the latest design variants the red conductor is plus and the black one is minus.
2) A milli-ammeter, preferentially a digital one with accuracy at least 0.5 %, is temporarily connected in series with the transmitter. The output shaft is moved to the position CLOSE. The signal value should

decrease. If this is not the case, the output shaft should be rotated in the CLOSE direction until the signal starts decreasing and the output shaft reaches the CLOSE position.

Then, loosen the screws of the transmitter shim plates so that the whole transmitter can be turned to set the current to 4 mA, and retighten the screws of the shim plates. Thereafter, move the output shaft of the electric actuator to the position OPEN. Using the resistance trimmer on the transmitter face (nearer to the edge) set the current to 20 mA. The trimmer has 12 turn and no stops. Hence, it cannot be damaged.

In case the correction of the current 20 mA was considerable repeat adjustment for 4 mA and 20 mA once again. Disconnect the milli-ammeter. The screw secured by a drop of varnish situated nearer to the centre must not be turned. Retighten the countershafts fixing the transmitter shim plates and secure with a drop of varnish against loosening.

After completing the adjusting procedure, check voltage on the transmitter terminals using a voltmeter. The voltage should fall within the range of 9 – 16 V with current 20 mA.

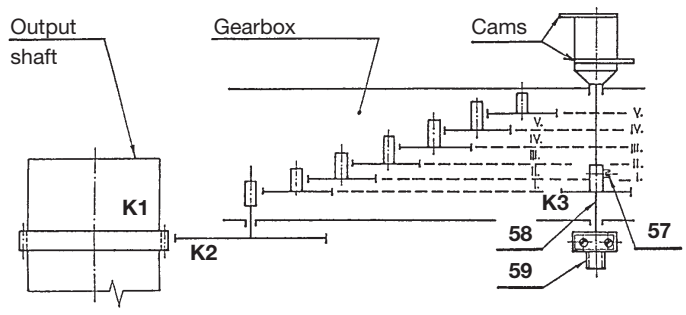
Note:

The transmitter characteristics has two branches: the descending one and the ascending one with respect to the CLOSE position. The characteristics is selected by turning the transmitter body.

Manual control:

The output shaft of the electric actuator can also be reset manually using the handwheel. By rotating the handwheel in the clockwise direction the valve is shut down (left thread in the valve is assumed). Before commencing the manual control, the lock screw (Fig. 1) should be loosened to provide for free turning of the handwheel. After the output shaft is brought to the required position, the lock screw should be retightened to fit with the nearest of the six holes of the locking flange.

Adjustment of working stroke - design variant with potentiometer



Legend:

K1 – Gear
K2 – Driving gear
K3 - Sliding gear
57 – Lock screw of sliding gear
58 – Cam shaft
59 – Pinion with friction clutch

Fig. 8 – ***Kinematic diagram of gears***

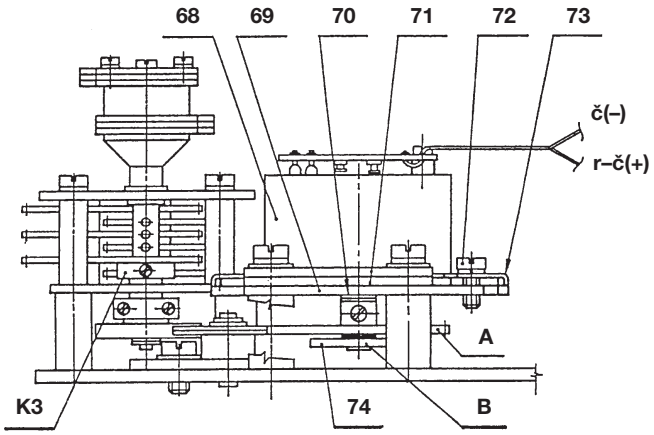
Ranges of adjusting the working stroke

Gear stage	Type number			
	52120	52121 52122	52123 52124	52125
I	2 - 2,5	2 - 6,5	2 - 5	2 - 5
II	2,5 - 10,5	6,5 - 22	5 - 17	5 - 17
III	10,5 - 35	22 - 72	17 - 55	17 - 55
IV	35 - 111	72 - 220	55 - 190	55 - 190
V-	111 - 250	220 - 250	190 - 240	190 - 240

Note:

For electric actuators, type no. 52 120, position of the sliding gear K3 for respective gear stages is shown on the left, for remaining type nos. on the right.

Adjustment of working stroke -design variant with current position transmitter



Legend:

60 – Current transmitter CPT 1/A
61 – Transmitter supporting plate
62 – Spacing shims
63 – Oval shims
64 – Lock screw
65 - Shim plate
66 – Double gear
K3 - Sliding gear

Fig. 9 – ***Gears on current transmitter – gears (version with current position transmitter)***

Adjustment ranges of working stroke

Gear stage	Gear on transmitter	Type number		
		52 120	52 121, 52 122	52 123–125
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

Operating diagram of position-limit and signalling switches

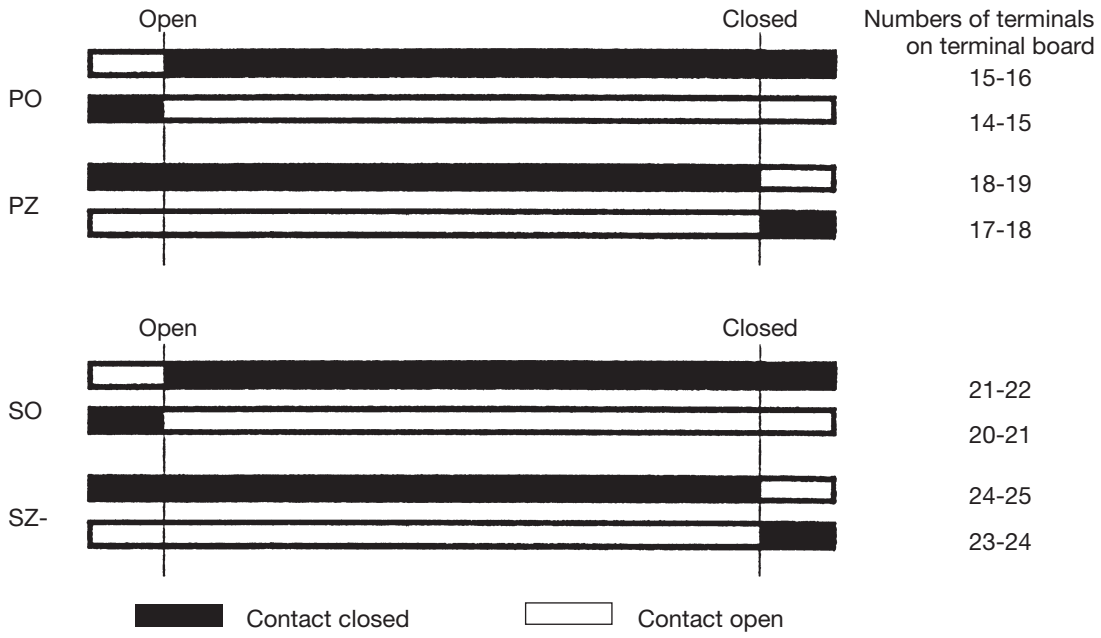


Fig. 10 – ***Operating diagram of position-limit and signalling switches***

PACKING AND STORING

For deliveries to domestic customers, the electric actuators remain unpacked. The actuators are transported by covered conveyances or in transport containers. For deliveries to foreign customers, the electric actuators should be packed. Type and design of packing should be adapted to transport conditions and distance to the place of destination. Upon receipt of electric actuators from the manufacturer, the customer should check them for any possible damage during transport. Data on the actuator rating plate should be compared with those stated in the order and accompanying documentation. Any possible discrepancies, defects or damages should immediately be reported to the supplier. In such case, the commissioning is impossible.

If the non-packed electric actuator is not installed outright it should be stored in a dust-free room with temperature ranging between -25 to +50 °C and relative humidity up to 80 %. The room should be free of caustic gases and vapours, and protected against detrimental climatic effects. If the electric actuator is to be stored for a period longer that 3 years it is necessary, prior to commissioning, to replace the oil filling. Any manipulation at temperatures below -25 °C is forbidden. The electric actuators must not be stored outdoors or in rooms not protected against rain, snow and ice accretions. Excessive slushing grease should be removed before the actuator is put into operation. If the unpacked electric actuators are to be stored for a period longer than 3 months it is recommended to put a bag with silica gel or another suitable desiccant into the terminal box.

CHECKING OF INSTRUMENT FUNCTION AND ITS LOCATION

Prior to installation, inspect the electric actuator to make sure that it has not been damaged during storage. Function of the electric motor can be checked by connecting it to the supply mains and starting it for a short time. It is sufficient to watch whether the electric motor starts running and the output shaft is turning. The electric actuators should be installed so that an easy access is provided to the control handwheel, terminal box and control box. It is also necessary to check that the installation complies with provisions of the paragraph “Operating conditions”. If another way of installation is required by local conditions, the manufacturer should be contacted.

ATTACHMENT TO VALVE

Place the electric actuator on the valve in such a way that its output shaft engages correctly into the valve coupling (clutch?). Attach the actuator to the valve using four (eight) screws. Loosen the lock screw of the handwheel and rotate it to perform a check of correct attachment of the electric actuator to the valve. Remove the terminal box cover and connect the electric actuator according to the wiring diagram.

For manipulation with the actuator during assembling with the valve, it is possible to utilize three suspension lugs fitted to each electric actuator. In no case, however, may these lugs be used for hanging the actuator with the valve.

ADJUSTMENT OF ELECTRIC ACTUATOR WITH VALVE

After fitting the electric actuator on the valve and checking its mechanical connection, the setting and adjusting is carried out as follows:

1) Bring the electric actuator manually into an intermediate position.
2) Connect the actuator to the supply mains and check a correct sense of rotation of the output shaft by a short start in the middle of the working stroke. When viewing into the control box the output shaft should rotate clockwise in the CLOSE direction.
3) Bring the actuator electrically near to the CLOSE position and complete adjustment to the CLOSE position by means of the handwheel. In this CLOSE position set the position-limit switching unit (CLOSE position-limit switch PZ) according to Point 5c and the potentiometer or current transmitter according to Point 5e.
4) Bring the output shaft into the position where the signalling switch SZ should change over. Adjustment of the CLOSE signalling switch SZ is carried out according to Point 5b.
5) Move the output shaft round by a required number of turn and adjust the OPEN position-limit switch PO according to Point 5c and the potentiometer according to Point 5e. Adjustment of the position-limit and signalling switches, and the position transmitter should be checked repeatedly.
6) Bring the output shaft into the position where the signalling switch SO should change over. Adjustment of the OPEN signalling switch SO is carried out according to Point 5b.

Caution!

When fitting the valve into piping, the valve should be set into its intermediate position using the electric actuator handwheel. By short starting of the electric motor make sure that the actuator rotates in correct direction. If this is not the case, reverse mutually two phase conductors in the electric motor terminal board.

OPERATION AND MAINTENANCE

Operation of rotary electric actuators is based on working conditions and is usually limited to transmission of pulses to respective functions. In case of a power supply failure, readjust the controlled device by the handwheel. If the electric actuator is connected into the automatic circuit (which does not imply the regulating mode) it is recommend to install devices for manual remote control into the circuit so that the electric actuator can be controlled even in case of a failure of the automatic device.

The operator should ensure that the electric actuator receives a prescribed maintenance, that it is protected against detrimental effects of the environment and climatic conditions which are not specified in the paragraph “Operating conditions”. Moreover, care should be taken to ensure that excessive heating-up of the surface of the explosion-proof closure of the motor and control box is prevented. It is necessary to make sure that rated values are not exceeded and excessive actuator vibrations are prevented.

Maintenance

Check the oil level at least once a year and refill if required. Oil replacement should be done after 500 hours of operation of the electric actuator, but not later than after two years of operation. The oil level should reach up to the filling hole. The electric actuator should be filled with the car gearbox oil PP80 or an equivalent oil of the same properties (viscosity class 80W according to SAE/J 306a).

The quantity of oil is shown in the table below:

Type number	Quantity of oil, kg
52 120	1.8
52 121, 52 122	3
52 123, 52 124	6.1
52 125	13

Every two years, it is necessary to lightly smear the trains of gears in the gearbox and the bearings on which these trains of gears are supported, as well as the lever mechanism of the potentiometer.

Lubrication is to be performed using the grease CIATIM 201 or PM MOGUL LV 2-3. The bearings and gears of the current transmitter should be lubricated with a fine watchmaker’s oil. To increase corrosion resistance, all springs and leaf actuators in the control section should be smeared with a lubricating grease.

Within half a year at the latest from putting the electric actuator into operation and then at least once a year, the screws fitting the actuator to the valve should be retightened. The screws are to be retightened in a crosswise manner.

FAILURES AND THEIR REMOVAL

1) The electric actuator is in its end position, it does not start, the motor is buzzing. Make sure that no phase conductor has been disconnected. If the slide valve is jammed and cannot be released by the handwheel or motor the electric actuator should be dismantled and the closure released mechanically.
2) After starting the electric actuator from the end position of the output shaft, the actuator stops spontaneously. In this case, it is necessary to ensure that the slot in the change-over gear (Fig. 2) stops in the end position of the output shaft (after opening of the torque-limit switch) before it runs onto the shifting device 26 (Fig. 3). This can be achieved by suitable turning of the actuator output shaft during connecting the actuator to the valve or by suitable turning of the change-over gear with respect to the output shaft. For this purpose the change-over gear is provided with two slots for the spline. Moreover, the change-over gear can be reversed.

Cleaning – Overhaul

The electric actuators modact EEx should be kept clean and care should be taken that they are not fouled with dirt and dust. Cleaning of the cooling fins of the motor frame should be carried out at regular intervals and as frequently as required by the operating conditions. From time to time, it is necessary to make sure that all connecting and earthing terminals are properly tightened to prevent overheating during operation. It is recommended that the electric actuator be subjected to the overhaul once a year unless otherwise specified in the inspection instructions of electric devices. Expected service life of bearings of the driving electric motor is 20,000 operating hours. During cleaning and making repairs, the protective coating of the winding faces should be checked and, as required, repaired by an insulating varnish.

Checking of parts of explosion-proof closure

All actuator parts forming the explosion-proof closure (cover and control box) should be checked to ensure that they are not broken or otherwise damaged (corroded, worn out etc.). With the electric actuator disconnected, the sealing ring of cable bushings (of electric motor and terminal box) should be checked. Material of the sealing rings is aging and, if its hardness exceeds 65° IRHD, the sealing rings should be replaced during reassembly. Defective parts of the closure must not be used again in reassembling the electric actuator.

During all major repairs of the explosion-proof closure that might affect its safety, it is recommend that the electric actuator EEx be forwarded to the manufacturer for repair. The manufacturer can, according to approved documentation and with prescribed tests, bring the closure back to the state corresponding to ČSN EN 50018 and ČSN EN 50019.

Forwarding to repair

After dismantling the electric actuator from the valve, pack it into a wax-coated paper and put it into a box securing it against movement, and attach the packing sheet. Other documentation, particularly description of the failure and its cause, condition under which the actuator was operated, should be sent by regular mail.

The modification of the rising spindle is shown on page 21. Necessary dimensions are given in the table.

Table 1 - MODACT MO EEx - basic technical parameters and designs

- actuators with AVM electric motors

Basic outfit:	1 electric motor - type AVM 2 anti-condensation heaters	2 torque-limit switches MO, MZ 2 position-limit switches PO, PZ

Type designation	Torque [Nm]		Speed [min^{-1}]	Working stroke [rev.]	Electric motor					Weight [kg]		Type number	
					Type AVM	Power [kW]	Speed [min^{-1}]	In (400 V)	Iz / In	design		basic 1 2 3 4 5	suppl. 6 7 8 9
	trip	start								cast iron	Al		
MO EEx 40/90 - 25	20 - 40	90	25	2 - 250 (2 - 620)	71MK04	0.25	1360	0.75	3.4	–	47	5 2 1 2 0	x x 1 x
MO EEx 40/80 - 40	20 - 40	80	40		71M04	0.37	1360	1.05	3.1	–	49		x x 2 x
MO EEx 63/90 - 25	40 - 63	90	25		71MK04	0.25	1360	0.75	3.4	–	47		x x 3 x
MO EEx 63/80 - 40	40 - 63	80	40		71M04	0.37	1360	1.05	3.1	–	49		x x 4 x
MO EEx 100/130 - 25	63 - 100	130	25		71M04	0.37	1360	1.05	3.1	–	49		x x 5 x
MO EEx 125/160 - 11	80 - 125	160	11		71MK04	0.25	1360	0.75	3.4	–	47		x x 6 x
MO EEx 100/130 - 25	63 - 100	130	25	2 - 250 (2 - 620)	80MK06	0.37	910	1.1	3.3	70	57	5 2 1 2 1	x x 1 x
MO EEx 100/130 - 40	63 - 100	130	40		80MK04	0.55	1390	1.45	4.2	71	58		x x 2 x
MO EEx 85/110 - 63	63 - 85	110	63		80M04	0.75	1380	1.9	3.9	71	58		x x 3 x
MO EEx 85/110 - 100	63 - 85	110	100		90LK04	1.1	1410	2.7	4.6	78	65		x x 4 x
MO EEx 160/210 - 16	100 - 160	210	16		80MK06	0.37	910	1.1	3.3	70	57		x x 5 x
MO EEx 160/210 - 25	100 - 160	210	25		80M06	0.55	910	1.6	3.4	70	57		x x 6 x
MO EEx 130/170 - 40	100 - 130	170	40		80M04	0.75	1380	1.9	3.9	71	58		x x 7 x
MO EEx 130/170 - 65	100 - 130	170	65		90LK04	1.1	1410	2.7	4.6	78	65		x x 8 x
MO EEx 130/170 - 100	100 - 130	170	100		90L04	1.5	1410	3.4	4.8	79	66		x x 9 x
MO EEx 160/210 - 125	100 - 160	210	125		90L02	2.2	2865	4.5	6.0	80	67		x x A x
MO EEx 250/325 - 10	160 - 250	325	10		80MK06	0.37	910	1.1	3.3	70	57	5 2 1 2 2	x x 0 x
MO EEx 250/325 - 16	160 - 250	325	16		80M06	0.55	910	1.6	3.4	71	58		x x 1 x
MO EEx 210/280 - 25	160 - 210	280	25		90LK06	0.75	940	2.1	3.9	81	68		x x 2 x
MO EEx 210/280 - 40	160 - 210	280	40		90LK04	1.1	1410	2.7	4.6	78	65		x x 3 x
MO EEx 210/280 - 65	160 - 210	280	65		90L04	1.5	1410	3.4	4.8	79	66		x x 4 x
MO EEx 250/330 - 80	160 - 250	330	80		90L02	2.2	2865	4.5	6.0	80	67		x x 5 x
MO EEx 400/520 - 16	250 - 400	520	16	2 - 240 (2 - 470)	90L08	0.5	695	2.6	3.3	126	113	5 2 1 2 3	x x 0 x
MO EEx 400/520 - 25	250 - 400	520	25		90L06	1.1	935	2.9	4.1	125	112		x x 1 x
MO EEx 500/650 - 40	250 - 500	650	40		112M06	2.2	945	5.4	5.0	146	126		x x 2 x
MO EEx 400/520 - 63	250 - 400	520	63		100L04	3.0	1435	6.5	5.9	132	112		x x 3 x
MO EEx 400/520 - 100	250 - 400	520	100		112M04+	4.0	1430	8.5	6.5	150	130		x x 4 x
MO EEx 630/820 - 16	320 - 630	820	16		100L08+	1.1	690	3.1	3.6	128	108	5 2 1 2 4	x x 0 x
MO EEx 550/715 - 25	320 - 550	715	25		100L06+	1.5	940	3.9	4.9	128	108		x x 1 x
MO EEx 630/820 - 63	320 - 630	820	63		112M04+	4.0	1430	8.5	6.5	150	130		x x 2 x
MO EEx 960/1250 - 32	630 - 960	1250	32		132M08+	3.0	725	7.3	5.5	239	–	5 2 1 2 5	x x 1 x
MO EEx 1100/1400 - 45	630 - 1100	1400	45		132MK06+	4.0	975	9.2	7.0	240	–		x x 2 x
MO EEx 1100/1400 - 63	630 - 1100	1400	63		132M06+	5.5	970	12.5	6.5	248	–		x x 3 x
MO EEx 920/1200 - 100	630 - 920	1200	100		132M04+	7.5	1455	15.5	6.8	243	–		x x 4 x

Notes:
- Rated torque is equal to 60 % of max. tripping torque in duty S2 and 40 % of max. tripping torque in duty S4.
- The 6th, 7th and 9th places of the type number should be completed with respective numbers from Table 3.
- Design variants operating at a voltage different from that given in the table are available upon special request.
- Electric motors designated in the table with + have built-in thermistors PTC connected to two explosion-proof bushings on the terminal cover. This built-in heat protection, in combination with the control system, shall isolate the electric motor from the supply mains in case that temperature of the electric motor winding exceeds 145 °C during thermal overloading caused by failures.

Table 2 - MODACT MO EEx - basic technical parameters and designs

- actuators with 4KTC electric motors

Basic outfit: 1 electric motor - type 4KTC; 2 anti-condensation heaters; 2 torque-limit switches MO, MZ; 2 position-limit switches PO, PZ

Type designation	Torque [Nm]		Speed [min^{-1}]	Working stroke [rev.]	Electric motor					Weight [kg]		Type number	
					Type 4KTC	Power [kW]	Speed [min^{-1}]	In (400 V)	Iz / In	design		basic 1 2 3 4 5	suppl. 6 7 8 9
	trip	start								cast iron	Al		
MO EEx 40/90 - 25	20 - 40	90	25	2 - 250 (2 - 620)	71A - 4	0.25	1355	0.75	3.8	–	49	5 2 1 2 0	x x A x
MO EEx 40/80 - 40	20 - 40	80	40		71B - 4	0.37	1350	1.05	3.8	–	50		x x B x
MO EEx 63/90 - 25	40 - 63	90	25		71A - 4	0.25	1355	0.75	3.8	–	49		x x C x
MO EEx 63/80 - 40	40 - 63	80	40		71B - 4	0.37	1350	1.05	3.8	–	50		x x D x
MO EEx 100/130 - 25	63 - 100	130	25		71B - 4	0.37	1350	1.05	3.8	–	50		x x E x
MO EEx 125/160 - 11	80 - 125	160	11		71A - 4	0.25	1355	0.75	3.8	–	49		x x F x
MO EEx 100/130 - 25	63 - 100	130	25	2 - 250 (2 - 620)	80A - 6	0.37	925	1.1	3.6	76	63	5 2 1 2 1	x x B x
MO EEx 100/130 - 40	63 - 100	130	40		80A - 4	0.55	1410	1.38	4.6	76	63		x x C x
MO EEx 100/130 - 63	63 - 100	130	63		80B - 4	0.75	1400	1.8	5.0	77	64		x x D x
MO EEx 100/130 - 100	63 - 100	130	100		90S - 4	1.1	1410	2.4	5.4	83	70		x x E x
MO EEx 160/210 - 16	100 - 160	210	16		80A - 6	0.37	925	1.1	3.6	76	63		x x F x
MO EEx 160/210 - 25	100 - 160	210	25		80B - 6	0.55	915	1.5	4.1	76	63		x x H x
MO EEx 160/210 - 40	100 - 160	210	40		80B - 4	0.75	1400	1.8	5.0	77	64		x x I x
MO EEx 160/210 - 65	100 - 160	210	65		90S - 4	1.1	1410	2.4	5.4	83	70		x x J x
MO EEx 160/210 - 100	100 - 160	210	100		90L - 4	1.5	1405	3.25	5.8	86	73		x x K x
MO EEx 160/210 - 125	100 - 160	210	125		90L - 2	2.2	2845	4.4	6.9	86	73		x x L x
MO EEx 250/325 - 10	160 - 250	325	10		80A - 6	0.37	925	1.1	3.3	76	63	5 2 1 2 2	x x A x
MO EEx 250/325 - 16	160 - 250	325	16		80B - 6	0.55	915	1.5	3.4	77	64		x x B x
MO EEx 250/325 - 25	160 - 250	325	25		90L - 6	1.1	915	3.0	4.1	87	74		x x C x
MO EEx 250/325 - 40	160 - 250	325	40		90S - 4	1.1	1410	2.4	5.4	83	70		x x D x
MO EEx 210/280 - 65	160 - 210	280	65		90L - 4	1.5	1405	3.25	5.8	86	73		x x E x
MO EEx 250/325 - 80	160 - 250	325	80		90L - 2	2.2	2845	4.4	6.9	86	73		x x F x
MO EEx 500/650 - 16	250 - 500	650	16	2 - 240 (2 - 470)	100LB - 8	1.1	695	3.25	3.8	135	122	5 2 1 2 3	x x A x
MO EEx 500/650 - 25	250 - 500	650	25		100L - 6	1.5	930	3.7	4.7	134	121		x x B x
MO EEx 500/650 - 40	250 - 500	650	40		112M - 6	2.2	960	5.0	6.1	153	133		x x C x
MO EEx 400/520 - 63	250 - 400	520	63		100LB - 4	3.0	1400	6.4	5.3	137	117		x x D x
MO EEx 400/520 - 100	250 - 400	520	100		112M - 4	4.0	1430	8.2	6.6	151	131		x x E x
MO EEx 550/715 - 16	320 - 550	715	16		100LB - 8	1.1	695	3.25	3.8	137	117	5 2 1 2 4	x x A x
MO EEx 630/820 - 25	320 - 630	820	25		100L - 6	1.5	930	3.7	4.7	137	117		x x B x
MO EEx 630/820 - 63	320 - 630	820	63		112M - 4	4.0	1430	8.2	6.6	151	131		x x C x
MO EEx 950/1235 - 32	630 - 950	1235	32		132M - 8	3.0	710	7.2	4.8	237	–	5 2 1 2 5	x x A x
MO EEx 950/1235 - 45	630 - 950	1235	45		132MA - 6	4.0	960	8.8	6.3	240	–		x x B x
MO EEx 950/1235 - 63	630 - 950	1235	63		132MB - 6	5.5	955	11.8	6.1	247	–		x x C x
MO EEx 950/1235 - 100	630 - 950	1235	100		132M - 4	7.5	1445	14.8	6.5	245	–		x x D x

Notes:
- Rated torque is equal to 60 % of max. tripping torque in duty S2 and 40 % of max. tripping torque in duty S4.
- The 6th, 7th and 9th places of the type number should be completed with respective numbers from Table 3.
- Design variants operating at a voltage different from that given in the table are available upon special request.
- Electric motors have built-in thermistors PTC connected to 2 terminals in the terminal box. This built-in thermal protection, in co-operation with the control system, will isolate the electric motor from the supply mains if temperature of the electric motor winding during thermal overload caused by failures exceeds 145 °C.
- Winding of the electric motors 4KTC can be connected either in “delta” or “star” type (data in this table assume an electric motor for feeding voltage 3 x 400 V in the “star” connection). Feeding voltages and currents for both connection variants are stated on the electric motor rating plate.

Table 3 - Specification of supplementary type number

Type number	5	2	1	2	x	.	x	x	x	x	x

Attachment dimensions		
Attachment dimensions	Shape A	5
	Shape B	6
	Shape C	7
	Shape D	8
	Shape E	9

Working stroke (turn)		
2 - 250 (2 - 240) – basic design	0	-
2 - 620 (2 - 470) – special design	-	A
2 - 250 (2 - 240) – with block of local control, M-D two-pole	1	-
2 - 250 (2 - 240) – with block of local control, M-D four-pole	2	-
2 - 620 (2 - 470) – with block of local control, M-D two-pole	-	B
2 - 620 (2 - 470) – with block of local control, M-D four-pole	-	C

Tripping torque, speed and other technical parameters, including designation, are given in Tab. 1 and 2

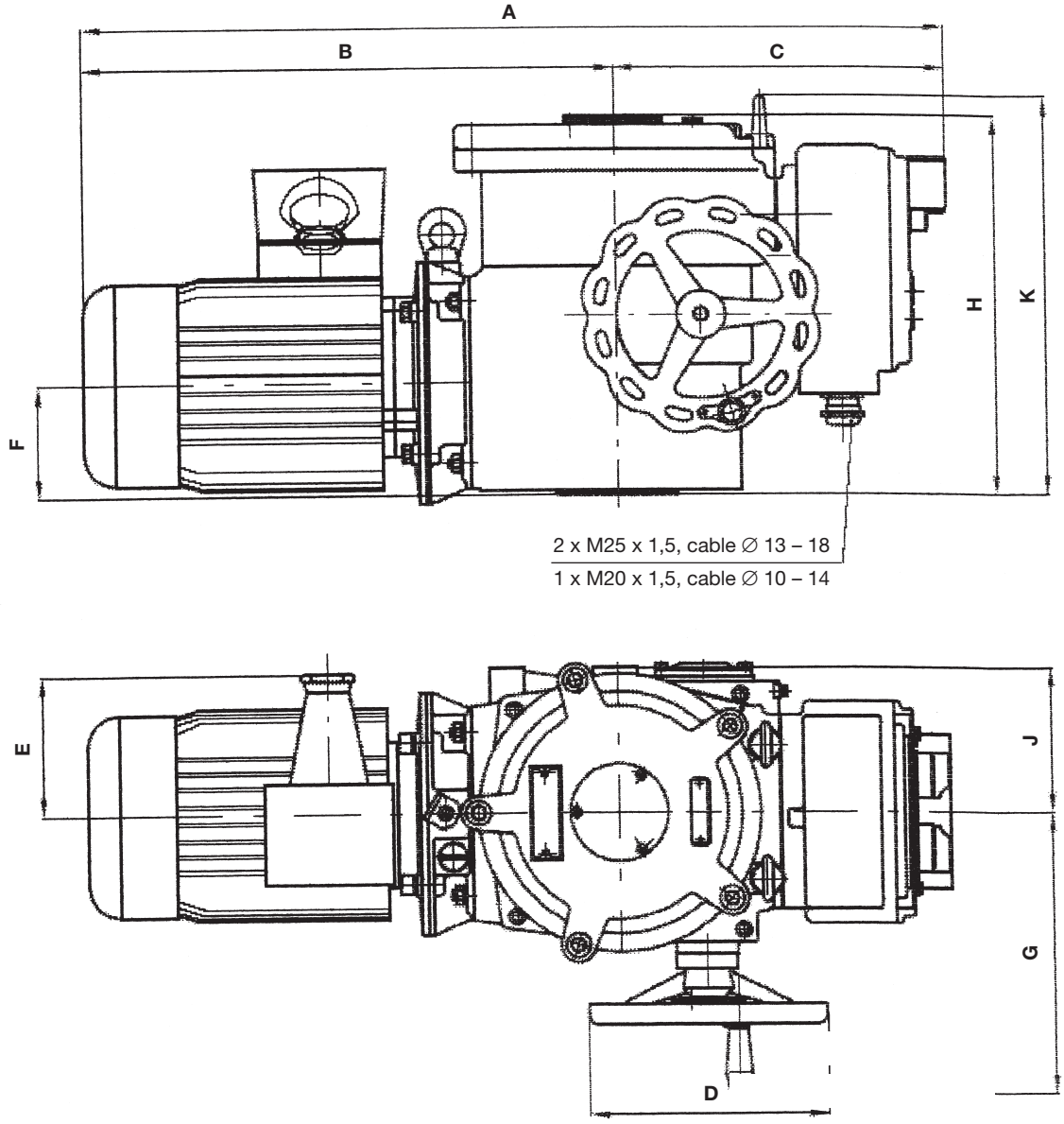
At this place, the figure or letter corresponding to required parameters should be given.

Signalling, position transmitter	
- without signalling and position transmitter (basic design)	0
- without position transmitter, with signalling	1
- with all units and potentiometer 1 x 100 ohm	2
- with all units and current transmitter CPT 1/A 4 – 20 mA	3
- without signalling, with potentiometer 1 x 100 ohm	4
- without signalling, with current transmitter CPT 1/A 4 – 20 mA	5
* Without signalling, with doubled position change-over switches, without position transmitter	6
* Without signalling, with doubled position change-over switches, with resistance position transmitter x 100 ohm	7
* Without signalling, with doubled position change-over switches, with current transmitter CPT 1/A	8

For ambient temperature of -50°C to +55°C	F

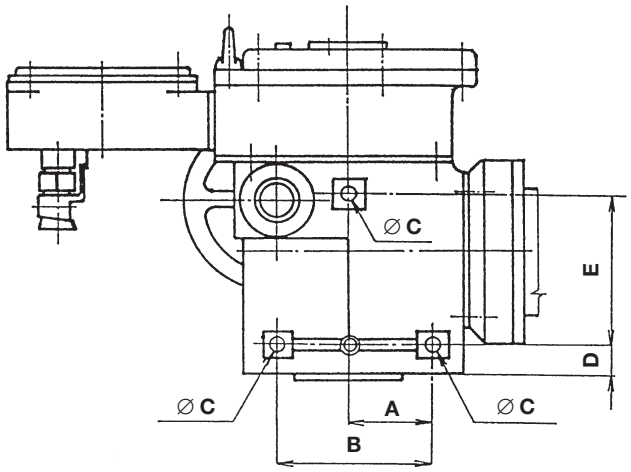
* Design with this designation for working stroke 2 – 240 turn – basic design.

Dimensional sketch of **MODACT MO EEx** electric actuator



Dimension	Type number			
	52 120	52 121, 2	52 123, 4	52 125
A max.	569	708	832	966
B max.	340	462	573	684
C	239	246	259	282
D	∅ 160	∅ 200	∅ 250	∅ 375
E	130	130	165	165
F	80	92	123	153
G	215	256	310	362
H max.	306	318	382	438
J	90	120	145	178
K	315	335	400	442

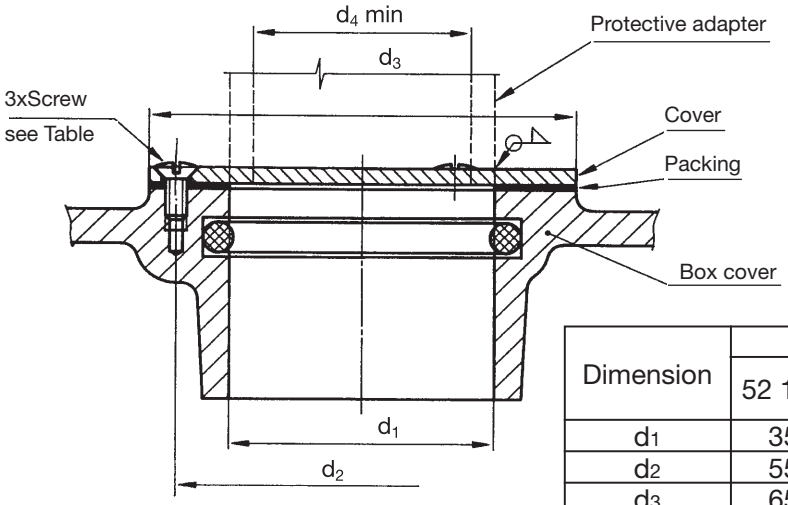
Holes for additional attachment of **MODACT MO EEx** electric actuator



Dimension	Type number			
	52 120	52 121, 2	52 123, 4	52 125
A	61	90	110	120
B	110	160	210	240
∅ C	M 10	M 12	M 16	M 20
D	16	21	23	47
E	120	140	200	220

Note:
The holes intended for additional attachment of MODACT electric actuators only serve for supporting the actuator weight and may not be subjected to load with any additional force.

Modification for rising spindle



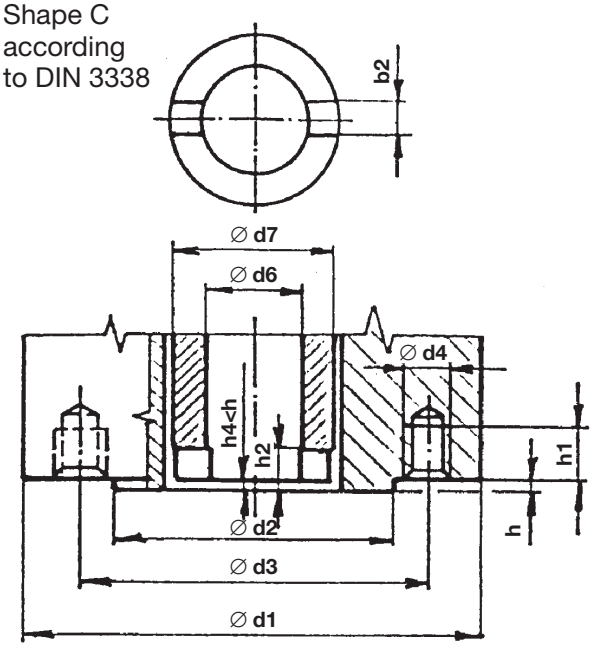
Dimension	Type number			
	52 120	52 121 52 122	52 123 52 124	52 125
d_1	35	50	75	80
d_2	55	70	100	100
d_3	65	80	112	112
d_4	28	41,5	53	72
Screw ČSN EN ISO 2010	M4x10	M4x10	M5x10	M5x10

Attachment dimensions of **MODACT MO EEx** electric actuators (basic design without adapter)

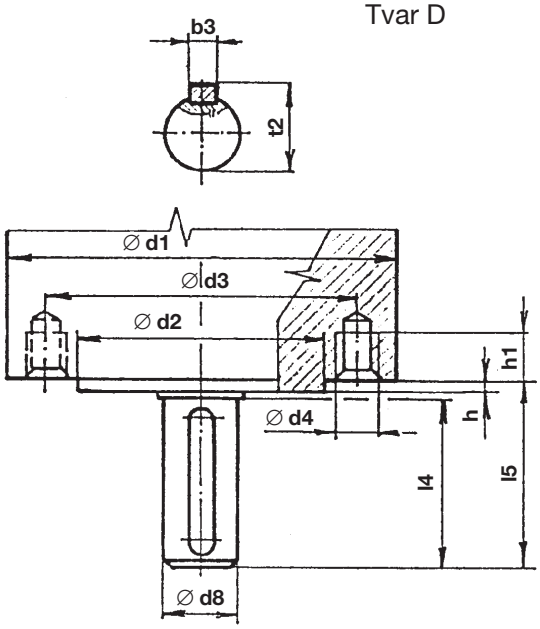
The electric actuators are designed for direct mounting onto the controlled device (valve etc.). They are attached by means of a flange or clutch according to ČSN 186314. The flanges of the electric actuators also comply with ISO 5210. The clutches for transmission of motion to the valve are:

Shape A	(with adapter), according to ČSN EN ISO 5210 (13 3090)
Shape B1	(with adapter), according to ČSN EN ISO 5210 (13 3090)
Shape B3	(without adapter), according to ČSN EN ISO 5210 (13 3090)
Shape D	(without adapter)
Shape C	(without adapter), according to DIN 3338

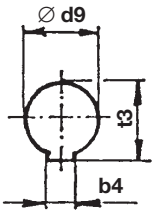
Shape C according to DIN 3338



Tvar D



Shape B3 according to ČSN EN ISO 5210 (13 3090)



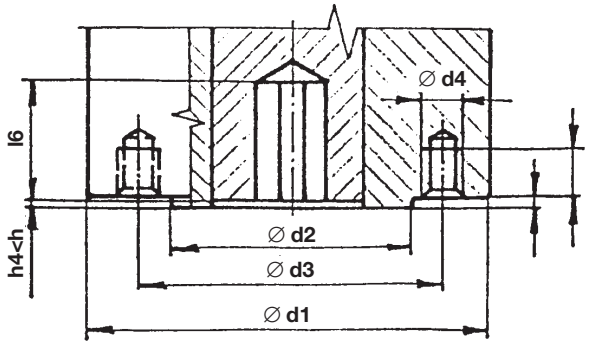


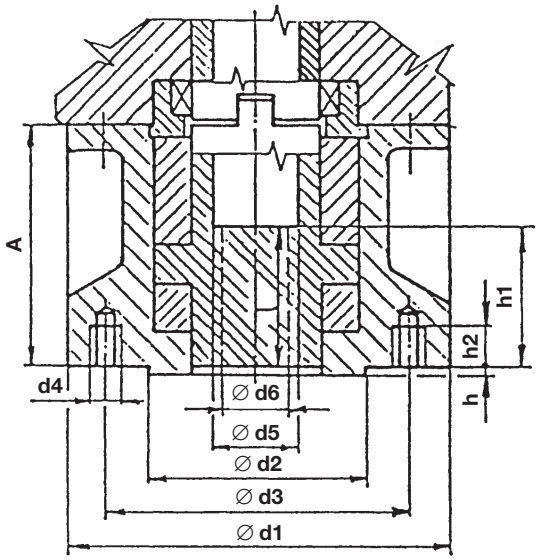
Table of basic attachment dimensions of **MODACT MO EEx** electric actuators

(without adapters)

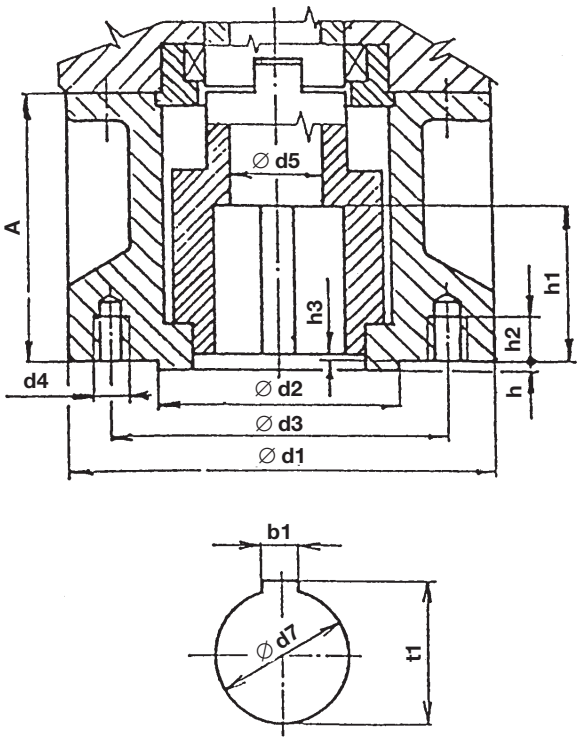
Shape	Dimension	Type number			
		52 120	52 121, 2	52 123, 4	52 125
C, D, B3 (identical dimensions)	∅ d1 (orient. value)	125	175	210	300
	∅ d2 f8	70	100	130	200
	∅ d3	102	140	165	254
	d4	M 10	M 16	M 20	M 16
	Number of threaded holes	4	4	4	8
	$h\ ^{0}_{-0,2}$	3	4	5	5
	h1 min. 1.25 d4	12.5	20	25	20
C	∅ d7	40	60	80	100
	h2 min.	10	12	15	16
	b2 H11	14	20	24	30
	∅ d6	28	41.5	53	72
D	∅ d8 g6	20	30	40	50
	l_4	50	70	90	110
	t2 max.	22.5	33	43	53.5
	b3 h9	6	8	12	14
	∅ l_6	55	76	97	117
B3	∅ d9 H8	20	30	40	50
	l_6 min.	55	76	97	117
	t3	22.8	33.3	43.3	53.8
	b4 Js9	6	8	12	14

Adapters to **MODACT MO EEx** electric actuators

Shape A
according to ČSN EN ISO 5210
(13 3090)



Shape B1
according to ČSN EN ISO 5210
(13 3090)

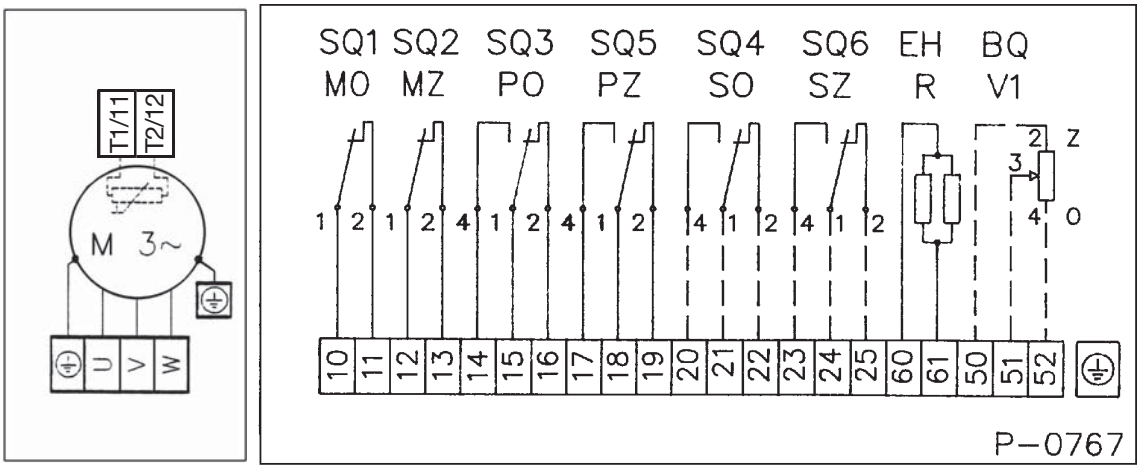


Assignment of adapters to electric actuators

Shape	Dimension	Type number			
		52 120	52 121, 2	52 123, 4	52 125
A, B1 (identical dimensions)	∅ d1	125	175	210	300
	∅ d2 f8	70	100	130	200
	∅ 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
	∅ d5	30	38	53	63
	∅ d6 max.	26	36	44	60
	h1 max.	43.5	65	92	110
	l min.	45	55	70	90
B1	A	63.5	110	122	155
	∅ d5	30	40	50	65
	l1 min.	45	65	80	110
	h3 max.	3	4	5	5
	b1	12	18	22	28
	∅ d7 H9	42	60	80	100
	t1	45.3	64.4	85.4	106.4

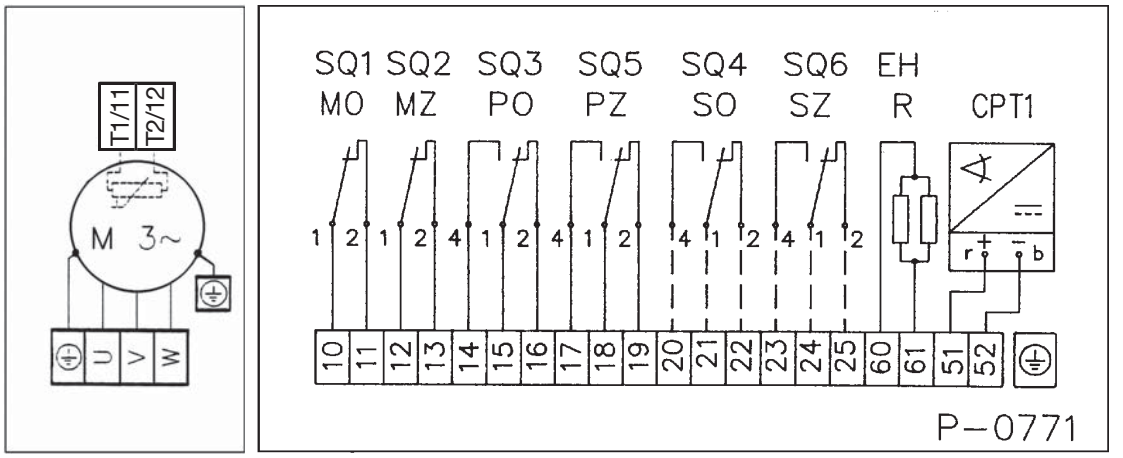
Internal wiring diagram of **MODACT MO EEx** electric actuators

- design with resistance position transmitter 1 x 100 ohm



Electric motor Control box External protective terminal

- design with current position transmitter



Electric motor Control box External protective terminal

LEGEND:

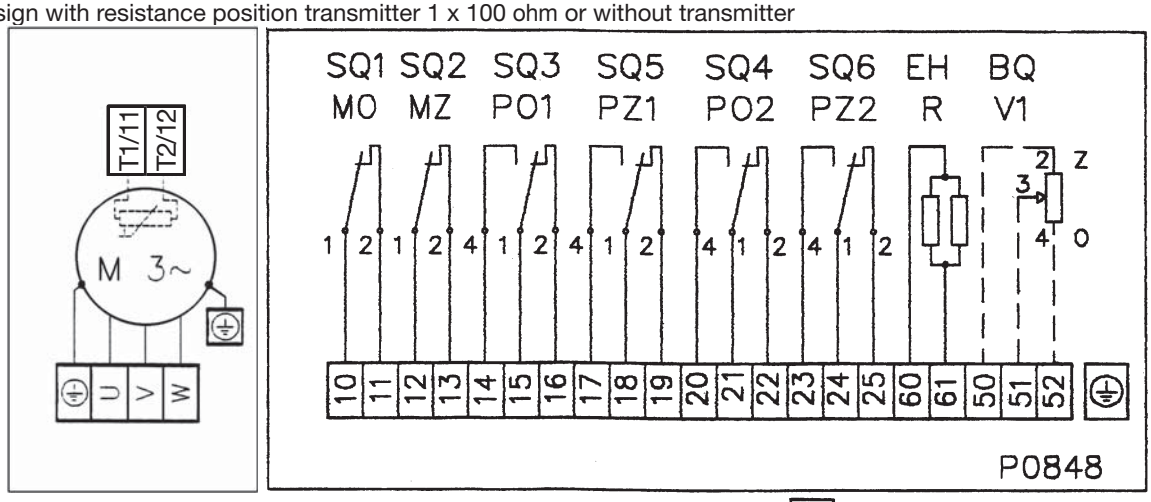
BQ1 (V1)	- position transmitter – resistance 1 x 100 ohm
CPT1	- current position transmitter
SQ1 (MO)	- OPEN torque-limit switch
SQ2 (MZ)	- CLOSE torque-limit switch
SQ3 (PO)	- OPEN position-limit switch
SQ5 (PZ)	- CLOSE position-limit switch
SQ4 (SO)	- OPEN signalling switch
SQ6 (SZ)	- CLOSE signalling switch
EH (R)	- anti-condensation heaters
T1, T2	- thermistors

*) *Some electric motors are fitted with thermistors (see Sheet 13, Note 4 of TP 12-02/92, dashed line on this sheet). The thermistors should be interconnected with the circuits of thermistor protection of motors (e.g. Siemens Sirius 3RN1). These circuits are not supplied by ZPA Pečky.*

Note: *In the design version with the current transmitter CPT 1/A, the user shall provide for connection of the two-wire circuit of the current transmitter with electric earth of the associated regulator, computer etc. The connection should be realized only at a single point in any section of the circuit outside the electric actuator. Voltage between the electronics and the case of the current transmitter must not exceed 50 V DC.*

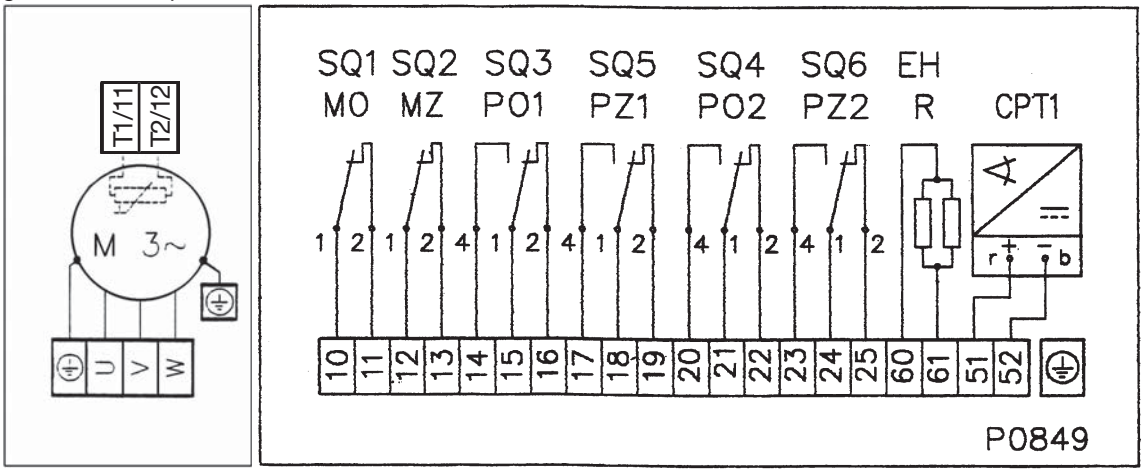
Wiring diagram of electric actuators modact MO EEx type numbers 52 120 – 52 125.
Design without signalling change-over switches, with two doubled position change-over switches.
The doubled position change-over switches PO1, PO2 and PZ1, PZ2 always switch at the same time

- design with resistance position transmitter 1 x 100 ohm or without transmitter



Electric motor Control box External protective terminal

- design with current position transmitter CPT 1/A



Electric motor Control box External protective terminal

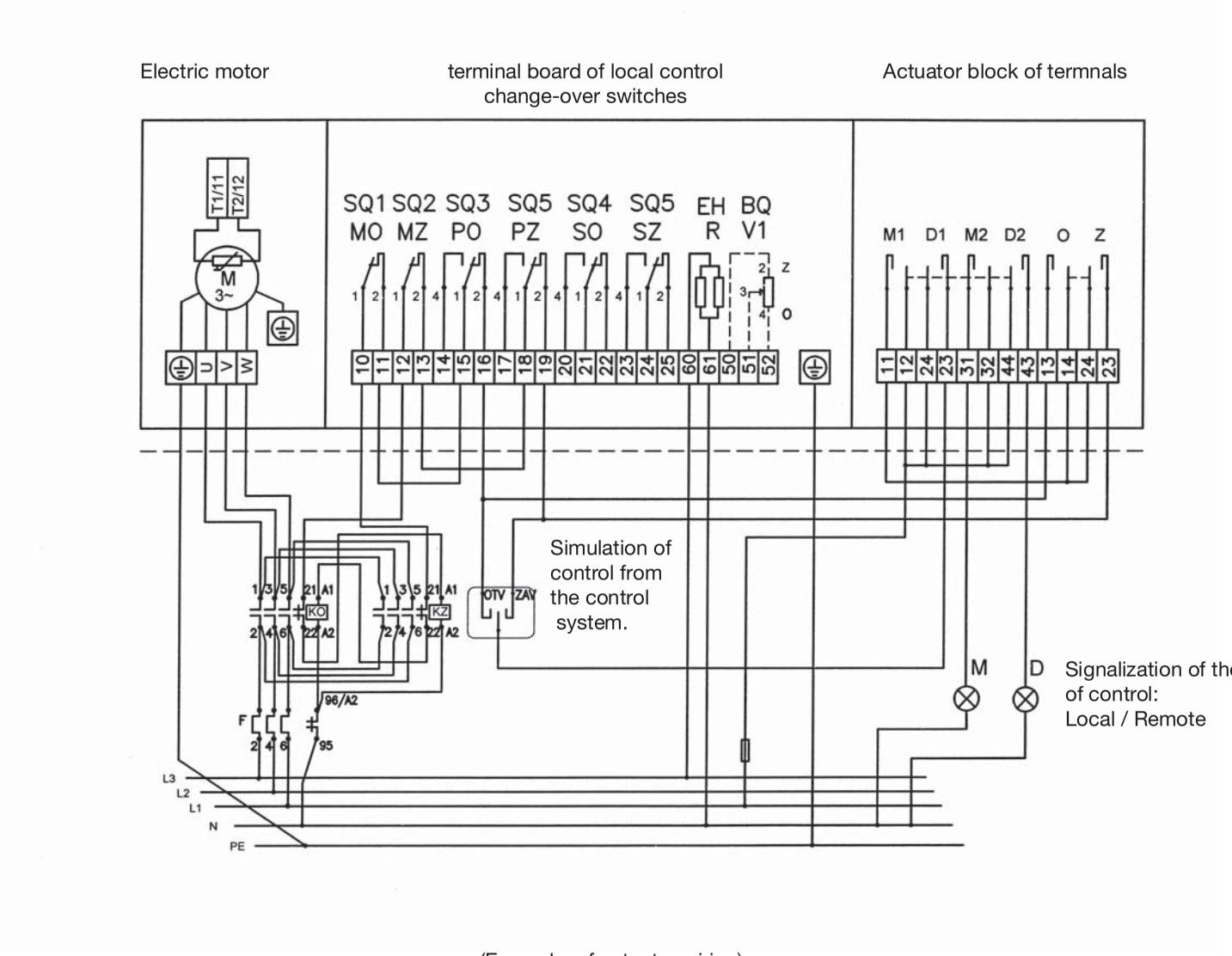
LEGEND:

BQ1 (V1)	- position transmitter – resistance 1 x 100 ohm
CPT1	- current position transmitter CPT 1/A 4 – 20 mA
SQ1 (MO)	- OPEN torque-limit switch
SQ2 (MZ)	- CLOSE torque-limit switch
SQ3 (PO)	- OPEN position-limit switch
SQ5 (PZ)	- CLOSE position-limit switch
SQ4 (SO)	- OPEN signalling switch
SQ6 (SZ)	- CLOSE signalling switch
EH (R)	- anti-condensation heaters
T1, T2	- thermistors

*) *Some electric motors are fitted with thermistors (see Sheet 13, Note 4 of TP 12-02/92, dashed line on this sheet). The thermistors should be interconnected with the circuits of thermistor protection of motors (e.g. Siemens Sirius 3RN1). These circuits are not supplied by ZPA Pečky.*

Note: *In the design version with the current transmitter CPT 1/A, the user shall provide for connection of the two-wire circuit of the current transmitter with electric earth of the associated regulator, computer etc. The connection should be realized only at a single point in any section of the circuit outside the electric actuator. Voltage between the electronics and the case of the current transmitter must not exceed 50 V DC.*

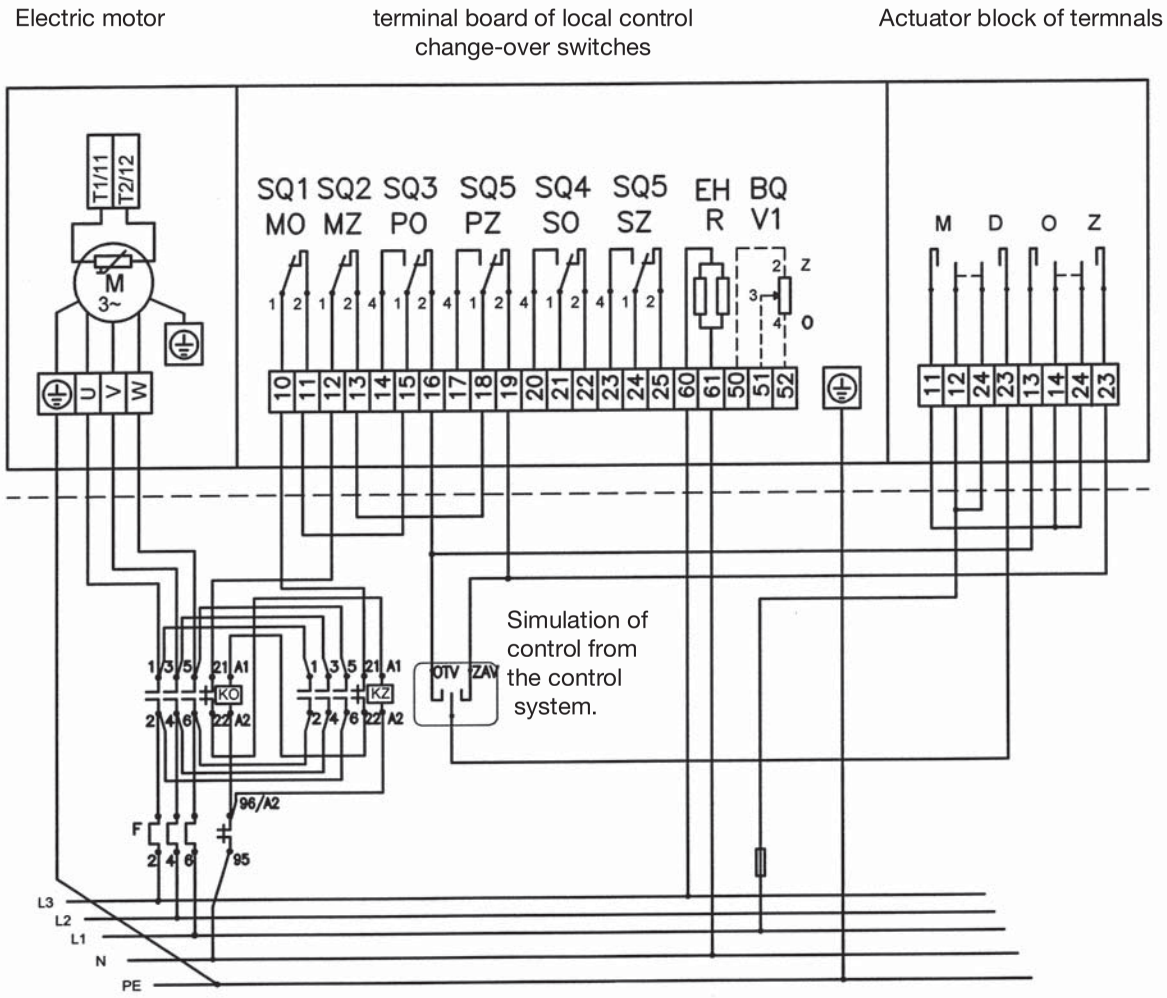
Wiring diagram of **MODACT MO EEx** electric actuators
- design with potentiometer 1 x 100 ohm,
- design with four-pole change-over switch "local - remote"



(Example of actuator wiring)

Wiring diagram of **MODACT MO EEx** electric actuators
- design with potentiometer 1 x 100 ohm,
- design with two-pole change-over switch "local - remote"

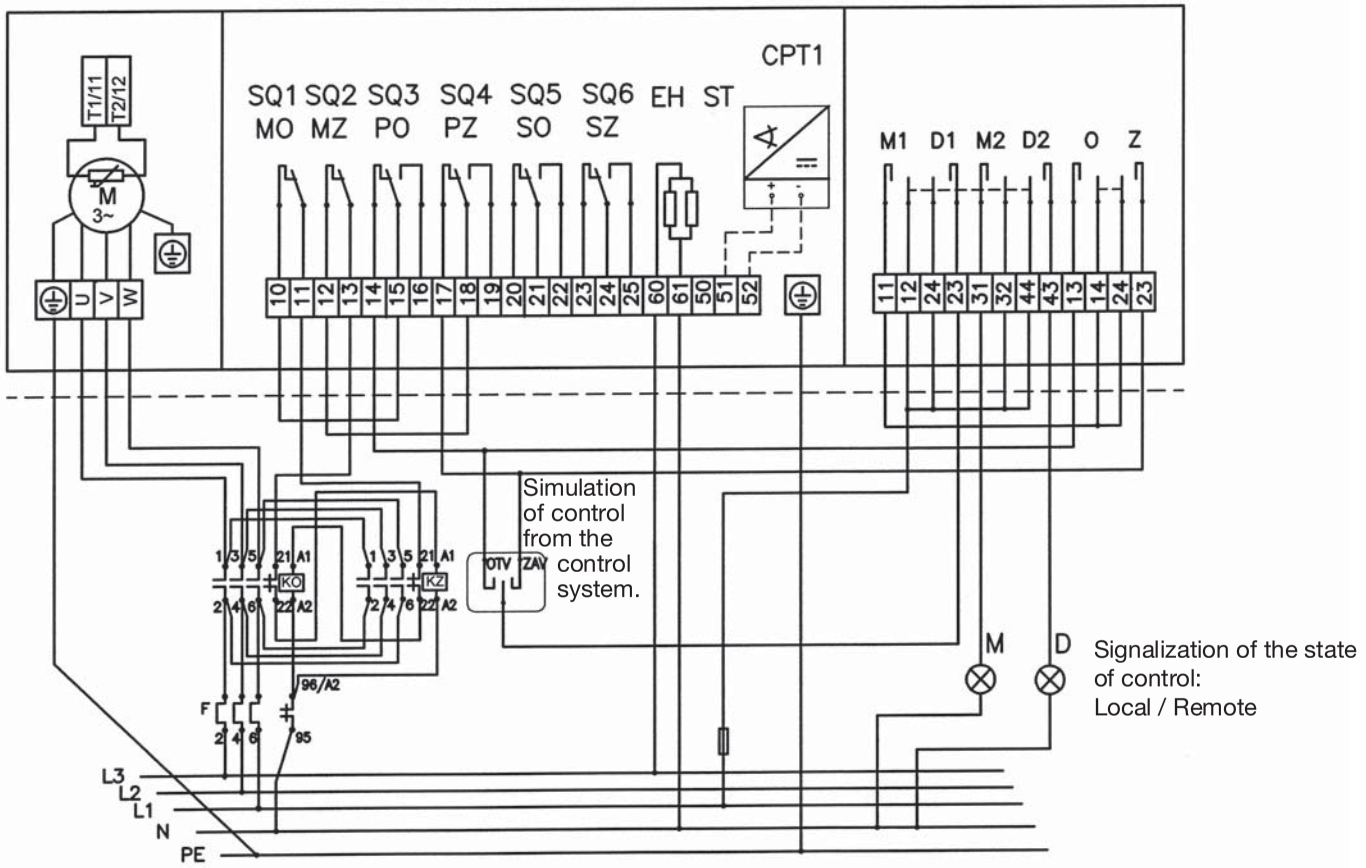
P-0910



(Example of actuator wiring)

Wiring diagram of **MODACT MO EEx** electric actuators
- design with current position transmitter
- design with four-pole change-over switch "local - remote"

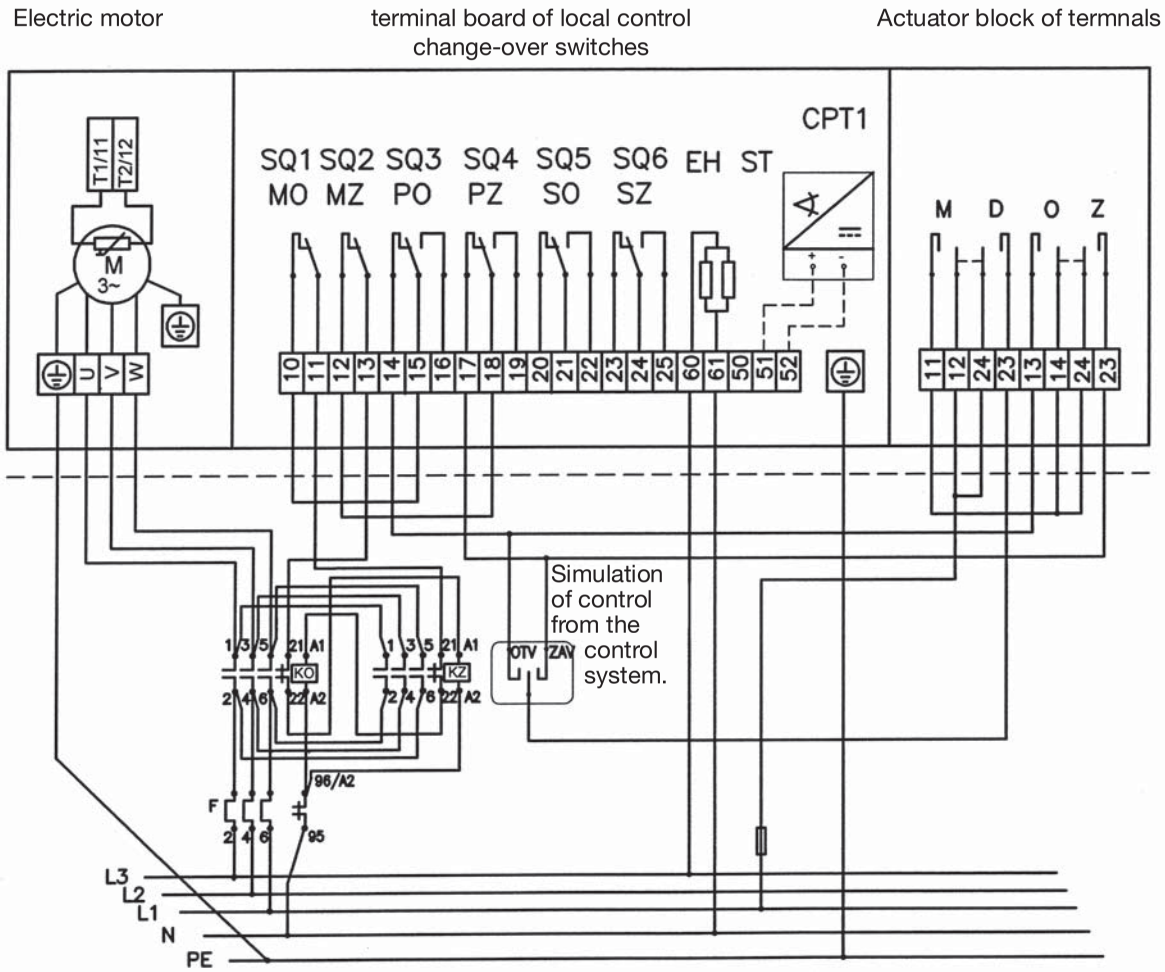
P-0911



(Example of actuator wiring)

Wiring diagram of **MODACT MO EEx** electric actuators
- design with current position transmitter
- design with two-pole change-over switch "local - remote"

P-0912



(Example of actuator wiring)

LIST OF SPARE PARTS

(for five year operation)

Type no.	Name	Drawing or standard no.	pcs	Application
1	2	3	4	5
52 120	Sealing ring 125x3 2327311049	PN 029281.2	2	Packing between power gear box and flange with gears
	Sealing ring 170x3 2327311054	PN 029281.2	1	Packing of terminal box cover
	Sealing ring 130x3 2327311041	PN 029281.2	2	Packing between control box, between flange and power gear box
	Sealing ring 43x35 2327311008	PN 029280.2	1	Packing of output shaft in control box
	Sealing ring 10x6 2327311001	PN 029280.2	2	Packing of torque-limit switching shaft
	Sealing ring 180x3 2327311043	PN 029281.2	1	Packing of terminal box cover
	„Gufero“ ring 40x52x7 2327352066	ČSN 029401.0	1	Packing of output shaft in control box
	Sealing ring 16x12 2327311025	PN 029280.2	1	Packing of handwheel shaft
	Packing	224612280	1	Hole cover gasket for rising spindle of valve
	Micro-switch SAIA XGK 12-88-J21 2337441060	available from ZPA Pečky a.s.	1	Open and Close torque-limit switches
	Micro-switch D 433-B8LD 2337441098	available from ZPA Pečky a.s.	1	Open and Close position-limit switches Open and Close signalling switches
	„Gufero“ ring 40x52x7 2327352066	ČSN 029401.0	2	Packing of output shaft in power gear box
	„Gufero“ ring 16x28x7 2327352022	ČSN 029401.0	1	Packing of handwheel shaft
	Packing 16x22	224580840	2	Packing of threaded plug (for oil filling)
	Packing	224635220	1	Packing between control and terminal boxes
52 121 + 52 122	Micro-switch SAIA XGK 12-88-J21 2337441060	available from ZPA Pečky a.s.	1	Open and Close torque-limit switches
	„Gufero“ ring 60x75x8 2327352090	ČSN 029401.0	2	Packing of output shaft in power gear box
	„Gufero“ ring 20x32x7 2327352027	ČSN 029401.0	1	Packing of handwheel shaft
	Sealing ring 95x85 2327311029	PN 029280.2	1	Packing of insertion with „Gufero“ rings in power gear box
	Sealing ring 50x2 2327311028	PN 029281.2	1	Packing of cover of torque-limit switching spring
	Sealing ring 16x22	224580840	2	Packing of threaded plug (for oil filling)

1	2	3	4	5
	Packing	224642240	1	Packing between electric motor and flange with gears
	Micro-switch D 433-B8LD 2337441098	available from ZPA Pečky a.s.	1	Open and Close position-limit switches Open and Close signalling switches
	Sealing ring 160x3 2327311048	PN 029281.2	1	Packing between power gear box and flange with gears
	Sealing ring 170x3 2327311054	PN 029281.2	1	Packing of terminal box cover
	Sealing ring 190x3 2327311056	PN 029281.2	1	Packing between control box and power gear box
	„Gufero“ ring 55x70x8 2327352083	ČSN 029401.0	1	Packing of output shaft in control box
	Sealing ring 10x6 2327311001	PN 029280.2	2	Packing of torque-limit switching shaft
	Sealing ring 200x3 2327311044	PN 029281.2	2	Packing of terminal box cover
	Packing, size 3	224610741	1	Hole cover gasket for rising spindle of valve
	Sealing ring 60x50 2327311090	PN 029280.2	1	Packing of output shaft in control box
52 123 + 52 124	Sealing ring 220x3 2327311045	PN 029281.2	1	Packing of control box cover
	„Gufero“ ring 80x100x10 2327352096	ČSN 029401.0	1	Packing of output shaft in control box
	Sealing ring 10x6 2327311001	PN 029280.2	2	Packing of torque-limit switching shaft
	Sealing ring 85x75 2327311087	PN 029280.2	1	Packing of output shaft in control box cover
	Sealing ring 25x21 2327310999	PN 029280.2	1	Packing of handwheel shaft
	Packing	224637080	1	Hole cover gasket for rising spindle of valve
	Micro-switch SAIA XGK 12-88-J21 2337441060	available from ZPA Pečky a.s.	1	Open and Close torque-limit switches
	„Gufero“ ring 80x100x10 2327352096	ČSN 029401.0	1	Packing of output shaft in power gear box
	„Gufero“ ring 27x40x10 2327352044	ČSN 029401.0	1	Packing of handwheel shaft
2327311058	Sealing ring 70x2	PN 029281.2	1	Packing of cover of torque-limit switching spring
	Sealing ring 200x3 2327311044	PN 029281.2	1	Packing between power gear box and flange with gears
	Packing 16x22	224580840	2	Packing of threaded plug (for oil filling)
	Packing	224635220	1	Packing between control and terminal boxes

1	2	3	4	5
	Micro-switch D 433-B8LD 2337441098	available from ZPA Pečky a.s.	1	Open and Close position-limit switches Open and Close signalling switches
	Packing	224591530	1	Packing between electric motor and flange with gears
	Sealing ring 200x3 2327311044	PN 029281.2	1	Packing between power gear box and control box
	Sealing ring 170x3 2327311054	PN 029281.2	1	Packing of terminal box cover
52 125	Micro-switch SAIA XGK 12-88-J21 2337441060	available from ZPA Pečky a.s.	1	Open and Close torque-limit switches
	Micro-switch D 433-B8LD 2337441098	available from ZPA Pečky a.s.	1	Open and Close position-limit switches Open and Close signalling switches
	Sealing ring 16x22	224580840	2	Packing of threaded plug (for oil filling)
	Packing	22459337	1	Packing between electric motor and flange with gears
	Sealing ring 280x3 2327311078	PN 029281.2	1	Packing between power gear box and flange with gears
	„Gufero“ ring 105x130x13 2327352109	ČSN 029401.0	2	Packing of output shaft in power gear box
	„Gufero“ ring 30x50x12 2327352054	ČSN 029401.0	1	Packing of handwheel shaft
	Sealing ring 30x22 2327311026	PN 029280.2	1	Packing of handwheel shaft
	Sealing ring 90x2 2327311081	PN 029281.2	1	Packing of torque-limit switching spring cover
	„Gufero“ ring 85x110x12 2327352099	ČSN 029401.0	1	Packing of output shaft in control box
	Sealing ring 260x5 2327311046	PN 029281.2	1	Packing between power gear box and control box
	Sealing ring 220x3 2327311045	PN 029281.2	1	Packing of control box cover
	Sealing ring 10x6 2327311001	PN 029280.2	2	Packing of torque tripping shaft
	Sealing ring 90x80 2327311011	PN 029280.2	1	Packing of output shaft in control box cover
	Packing	224637080	1	Hole cover gasket for rising spindle of valve
	Packing	224635220	1	Packing between control and terminal boxes
	Sealing ring 170x3 2327311054	PN 029281.2	1	Packing of terminal box cover

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
Electric rotary (90°) actuators (up to 30 Nm)

MODACT MOK, MOK-P, MOK-P EEx, MOKED
Electric rotary (90°) actuators for ball valves and flaps

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

MODACT MO EEx
Explosion proof electric multi-turn actuators

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

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

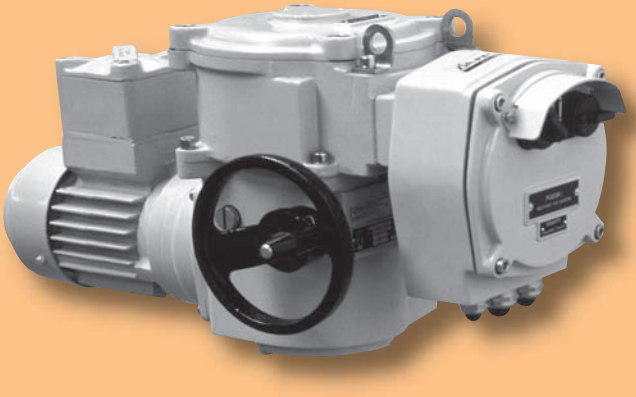
MODACT MPR Variant
Electric rotary (160°) lever actuators with a variable output speed

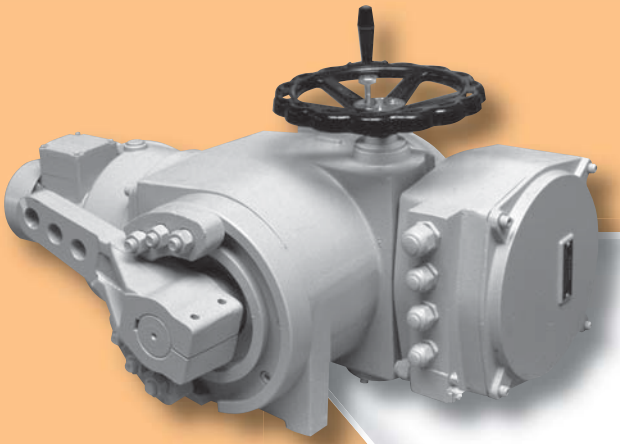
MODACT MPS Konstant
Electric rotary (160°) lever actuators with a constant output speed

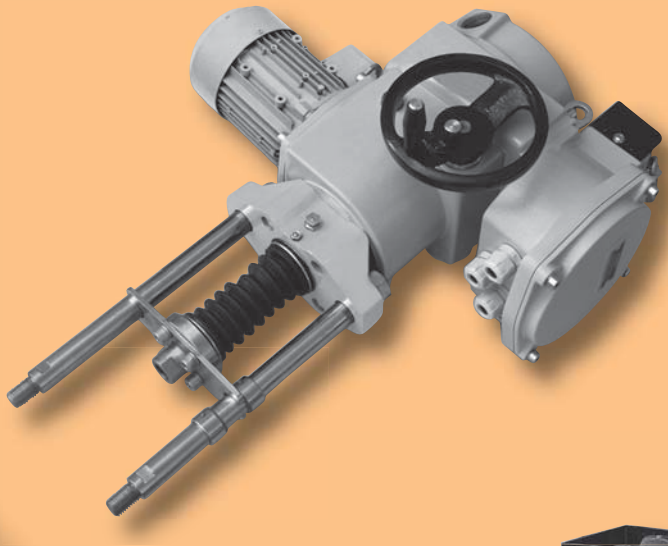
MODACT MTN, MTP, MTNED
Electric linear thrust actuators with a constant output speed

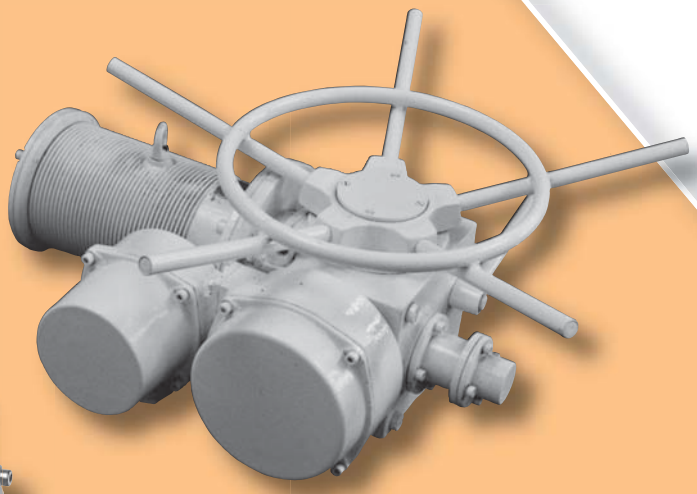
Deliveries of assembled actuator + valve (or MASTERGEAR gearbox) combinations

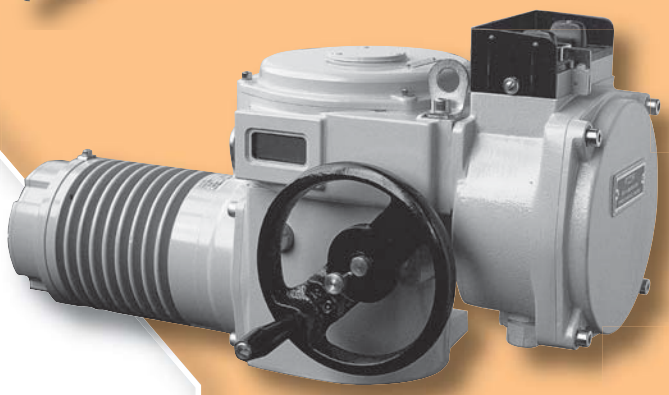
TRADITION • QUALITY • RELIABILITY

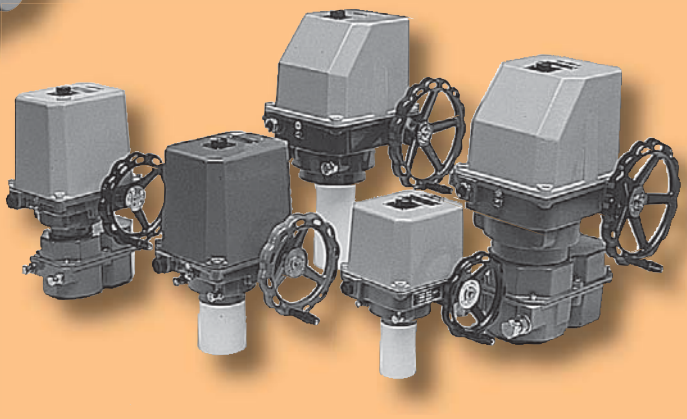












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