



**Explosion - Proof Electric Rotary
Multi-turn Actuators**

MODACT MO EEx

Type numbers 52 120 - 52 125

CERTIFICATE **TUV NORD**

Management system as per
EN ISO 9001 : 2008

In accordance with TÜV NORD 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,
switch boards and sheet metal working.**

Certificate Registration No. 04 100 950161
Audit Report No. 624 362/300

Valid until 2012-09-24
Initial certification 1995-03-01

Certification Body
at TÜV NORD CERT GmbH

Praha, 2009-09-25

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

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APPLICATION

The **MODACT MO EEx** electric rotary multi-turn actuators 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.

They can be operated in an environment with a danger of explosion of explosive gaseous atmosphere in zone 1 and zone 2 according to ČSN EN 60079-10 (332320). The actuators are designed as a device of group **II**, category **2G** in compliance with standards ČSN EN 60079-0:2004, ČSN EN 60079-1:2004, and ČSN EN 60079-7:2004 for explosive gaseous atmosphere.

The actuators marked

- label of protection against explosion and symbols of the group and category of the device Ex II 2G or Ex I M2
- according to version for surrounding temperature -25 °C to +55 °C: with marking Ex de IIC T4
-50 °C to +55 °C: with marking Ex de IIB T4
- as modification for using in mines of group **I**, category **M2** with marking Ex de I

The actuators MODACT MO EEx with electric motors AVM (Tab. 1) or 4KTC (Tab. 2) are available for surrounding temperature from -50 °C to +55 °C (in the version without position transmitter or with current transmitter CPT1/AF), too. In the type designation, there are letters F (52 12x.xxxxF) at the last place of their complementary type number.

Designation of explosion-proof properties by these actuators is Ex de IIB T4 (according to ČSN EN 60 079-0).

On agreement with the manufacturer, the actuators MODACT MO EEx are available for surrounding temperature from -60 °C to +55 °C (actuators with electric motors AIM – Tab. 4, in the version without position transmitter only).

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 60079-0 Electrical devices for explosive gaseous atmosphere. General requirements.

ČSN EN 60079-1 Electrical devices for explosive gaseous atmosphere. Explosion-proof closure „d“.

ČSN EN 60079-7 Electrical devices for explosive gaseous atmosphere. Secured version „e“.

ČSN EN 60079-10 Electrical devices for explosive gaseous atmosphere. Specification of dangerous areas.

ČSN EN 60079-14 Regulations for electrical devices in areas with a danger of explosion of flammable gases and vapours.

ČSN IEC 60721 Types of environment for electrical devices.

ČSN 33 0371 Non-explosive mixtures. Classification and testing methods.

ČSN 34 3205 Operation of electric rotating machines and work 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.

e Designation of the type of protection against explosion, secured version according to ČSN EN 60 079-7.

II Designation of the group of explosion-proof electric device according to ČSN EN 50 014.

B,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.

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).

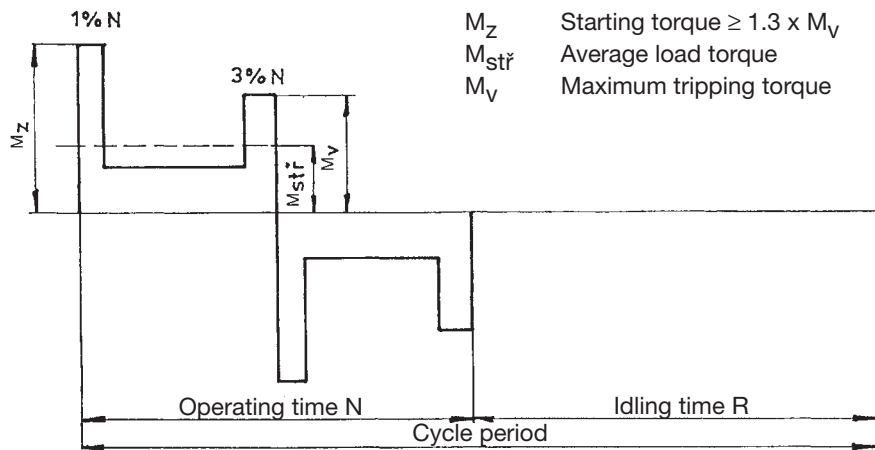
- 1) AA7 – Simultaneous effect of ambient temperature of -25 °C to $+55\text{ °C}$ with relative humidity from 10 % upwards
- 2) AB7 – Ambient temperature to Point 1); minimum relative humidity 10 %, maximum relative humidity 100 % with condensation
- 3) AC1 – Altitude $\leq 2,000$ m above sea level
- 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 occurrence of animals (insects, birds, small animals)
- 11) AM2 – Harmful effect of escaping vagabond currents
- 12) AN2 – Medium solar radiation with intensities $> 500\text{ W/m}^2$ and $\leq 700\text{ W/m}^2$
- 13) AP3 – Medium seismic effects; acceleration $> 300\text{ Gal}$ $\leq 600\text{ Gal}$
- 14) BA4 – Personal abilities; instructed staff
- 15) BC3 – Frequent contact with the earth potential; persons coming frequently into contact 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 $+50\text{ °C}$ 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 $N/N+R$ 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.



Course of operating cycle

Service life of actuators

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

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 or 4.

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 $\pm 10\%$ of the rated value and the supply voltage frequency should be within $\pm 2\%$ 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, 2 or 4 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 reversion, 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 towards the 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, 2 or 4. 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 continuously 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 mm². Maximum cross-section of connecting conductors to terminals of the electric motors is 10 mm² 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 permissible 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.U _n , 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. 3.

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).

ORDERING INFORMATION

Technical specification of the order:

When ordering, please specify the following:

- Number of actuators required
- Actuator designation
- Uniform Classification Number Code (9-digit), according to the Table of design variant Nos 1, 2, 4 and 3
- Supply voltage and frequency of electric motor
- Tripping torque adjustment (If another tripping torque than the maximum is required by the customer).

Example of specification in the order:

In the order, the MODACT MO EEx explosion - proof rotary multi-turn actuator, Type No. 52 122, in an aluminium design variant with the tripping torque ranging from 160 to 250 Nm and the output shaft adjusting speed of 16 RPM, in standard design with Shape C connecting dimensions, fitted with all units and a potentiometer of 1 x 100 ohm, with the required tripping torque differing from the maximum one, designed to operate at the supply voltage of 3 x 230/400 V at 50 Hz, should be specified as follows:




Actuator 52 122 . 7012, torque-limit switches set to 200 Nm, supply voltage of electric motor 3 x 230/400 V, 50 Hz, aluminium design.

The delivery will include the required electric actuator as specified by the example in the order; no special tools or spare parts are supplied with the actuator. Spare parts should be ordered separately.

Product certification on testing the type

The explosion-proof electric actuators have been certified and the test certificates issued by the Physical Technical Testing Institute (PTTI), Ostrava - Radvanice, State Testing Laboratory No. 210.

Type verification ES certificates

MO EEx 52 120	- number PTTI 02 ATEX 0043 X
MO EEx 52 121, MO EEx 52 122	- number PTTI 02 ATEX 0044 X
MO EEx 52 123, MO EEx 52 124	- number PTTI 02 ATEX 0107 X
MO EEx 52 125	- number PTTI 02 ATEX 0108 X
Type of explosion-proof design:	 II 2 G EEx de IIC T4,  II 2G EX DE IIB T4,  I M2 EX DE I.

Type tests and verifications carried out according to the following standards:

ČSN EN 60079-0	Electrical devices for explosive gaseous atmosphere. General requirements.
ČSN EN 60079-1	Electrical devices for explosive gaseous atmosphere. Explosion-proof closure „d“.
ČSN EN 60079-7	Electrical devices for explosive gaseous atmosphere. Secured version „e“.
ČSN EN 60079-10	Electrical devices for explosive gaseous atmosphere. Specification of dangerous areas.
ČSN EN 60079-14	Regulations for electrical devices in areas with a danger of explosion of flammable gases and vapours.
ČSN IEC 60721	Types of environment for electrical devices.
ČSN 33 0371	Non-explosive mixtures. Classification and testing methods.
ČSN 34 3205	Operation of electric rotating machines and work with them.

The Test (Type) Certificate numbers to which the certificates apply are always quoted on a label attached to the fixed enclosure (control box) of the electric actuator. The results of type tests and verifications have been included in the test reports by PTTI Ostrava-Radvanice.

Table 1 – MODACT MO EEx electric actuators with AVM motors
– basic technical parameters and designs

Basic outfit:		1 electric motor type AVM		2 torque-limit switches (OPEN and CLOSE)		2 anti-condensation heaters		2 position-limit switches (OPEN and CLOSE)						
Type designation	Torque [Nm]		Speed [RPM]	Working stroke [revolutions]	Electric motor					Weight [kg]		Type number		
	tripping	starting			Type AVM	Power [kW]	Speed [1/min]	In (400 V)	I _z In	Design		basic 1 2 3 4 5	supplementary 6 7 8 9	
			cast-iron	aluminium										
MO EEx 40/90 - 25	20 - 40	90	25	2 - 250 (2 - 620)	71MK04	0,25	1360	0,75	3,4	–	47	52120	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	52121	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		2 - 250 (2 - 620)	80MK06	0,37	910	1,1	3,3	70		57	52122
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	90L08		0,75	695	2,6	3,3	126	113	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	2 - 240 (2 - 470)	112M06	2,2	945	5,4	5,0	146	126	52123	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	52124	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		2 - 240 (2 - 470)	132M08+	3,0	725	7,3	5,5	239	–	52125	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: – The rated torque is 60 % of the maximum tripping torque in duty S2 and 40 % of the maximum tripping torque in duty S4.
– The 6th, 7th and 9th places of the type number should be completed with respective digit or letter from Table 3.
– Design variants operating at another supply voltage than that given in the table, are available upon special request.
– Electric motors designated in the table with + have built-in thermistors PTC connected to the terminal cover on two non-exposive bushings. This built-in heat protection, in combination with the control system, shall isolate the electric motor from the mains supply if temperature of the electric motor winding exceeds 145 °C during thermal overloading caused by failures.

Table 2 – MODACT MO EEx electric actuators with 4KTC motors
– basic technical parameters and designs

Basic outfit:		1 electric motor type 4KTC		2 torque-limit switches (OPEN and CLOSE)		2 anti-condensation heaters		2 position-limit switches (OPEN and CLOSE)		Type number			
Type designation	Torque [Nm]		Speed [RPM]	Working stroke [revolutions]	Electric motor					Weight [kg]		Type number	
	tripping	starting			Type 4KTC	Power [kW]	Speed [1/min]	In (400 V)	$\frac{I_z}{I_n}$	Design		basic	supplementary
								cast-iron	aluminium	1 2 3 4 5	6 7 8 9		
MO EEx 40/90 - 25	20 - 40	90	25	2 - 250 (2 - 620)	71A - 4	0,25	1355	0,75	3,8	–	49	52120	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	52121	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	2 - 250 (2 - 620)	80A - 6	0,37	925	1,1	3,3	76	63	52122	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	52123	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		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	–		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: – The rated torque is 60 % of the maximum tripping torque in duty S2 and 40 % of the maximum tripping torque in duty S4.
– The 6th, 7th and 9th places of the type number should be completed with respective digit or letter from Table 3.
– Rated currents for different feeding voltages than those given in the table are available on request at the manufacturer.
– Electric motors have built-in thermistors PTC connected to the terminal box cover on 2 terminals. If, in case of thermal overloads caused by failures, the electric motor winding is heated up to more than to 145 °C this built-in thermal protection, in cooperation with the control system, will disconnect the electric motor from the supply mains.
– Connection of the winding of electric motors 4KTC can be either of star or delta type (data in this table assume an electric motor for supply voltage 3 x 400 V in star connection). Supply voltages and currents for both types of connection are specified on the 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 Tables 1, 2 or 4											
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	

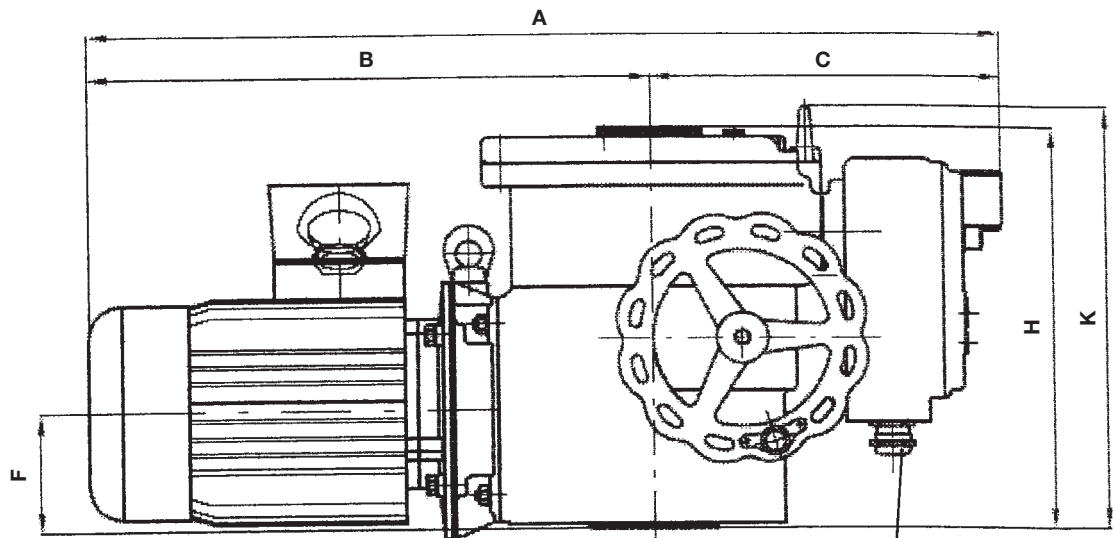
* Design with this designation for working stroke 2 – 240 rev. – basic design.

Table 4 – MODACT MO EEx electric actuators with AIM motors
(for ambient temperature of -60 °C to +55 °C)
– basic technical parameters and designs

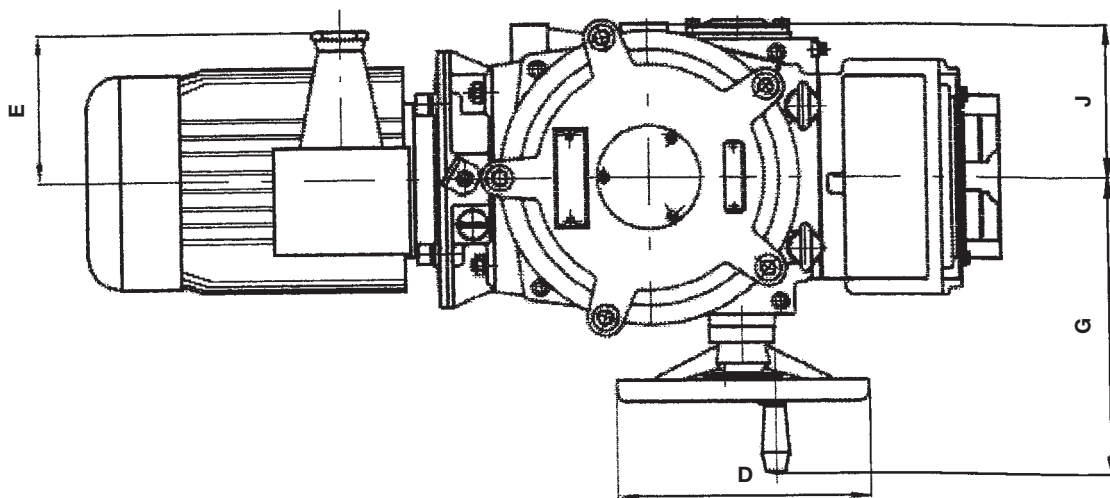
Basic outfit:		1 electric motor type 4KTC 2 anti-condensation heaters			2 torque-limit switches (OPEN and CLOSE) 2 position-limit switches (OPEN and CLOSE)							
Type designation	Torque [Nm]		Speed [RPM]	Working stroke [revolutions]	Electric motor					Weight [kg] Aluminium Design	Type number	
	tripping	starting			Type AIM	Power [kW]	Speed [1/min]	In (400 V)	$\frac{l_z}{l_n}$		basic 1 2 3 4 5	supplementary 6 7 8 9
MO EEx 40/50 - 27	20 - 40	50	27	2 – 250 (2 – 620)	A63B4	0,37	1500	1,2	4,0	46	52 120	x x P x
MO EEx 40/50 - 44	20 - 40	50	44		A63B4	0,37	1500	1,2	4,0	46		x x R x
MO EEx 63/80 - 27	40 - 63	80	27		A63B4	0,37	1500	1,2	4,0	46		x x S x
MO EEx 63/80 - 44	40 - 63	80	44		A63B4	0,37	1500	1,2	4,0	46		x x T x
MO EEx 100/130 - 27	63 - 100	130	27		A63B4	0,37	1500	1,2	4,0	46		x x U x
MOEEx 125/160 - 12	80 - 125	160	12		A63B4	0,37	1500	1,2	4,0	46		x x V x
MO EEx 100/130 - 42	63 - 100	130	42	2 – 250 (2 – 620)	A80S4	0,55	1500	1,7	4,3	46	52 121	x x P x
MO EEx 100/130 - 68	63 - 100	130	68		A80L4	1,1	1500	3,3	4,6	52		x x R x
MO EEx 100/130 - 105	63 - 100	130	105		A80B4	1,5	1500	4,5	4,8	52		x x S x
MO EEx 160/210 - 42	100 - 160	210	42		A80L4	1,1	1500	3,3	4,6	52		x x T x
MO EEx 160/210 - 68	100 - 160	210	68		A80B4	1,5	1500	4,5	4,8	57		x x U x
MO EEx 130/170 - 105	100 - 130	170	105		A80B4	1,5	1500	4,5	4,8	57		x x V x
MO EEx 160/210 - 136	100 - 160	210	136		A80A2	2,2	3000	5,5	6,0	58		x x X x
MO EEx 250/325 - 42	160 - 250	325	42		A80B4	1,5	1500	4,5	4,8	58		x x P x
MO EEx 250/325 - 83	160 - 250	325	83		A80A2	2,2	3000	5,5	6,0	58		x x R x
MO EEx 400/520 - 66	250 - 400	520	66		2 – 240 (2 – 470)	A100M 4	3,0	1500	8,5	7,0		106
MO EEx 400/520 - 101	250 - 400	520	101	A100B4		5,5	1500	14,0	6,6	119	x x R x	
MO EEx 630/820 - 66	320 - 630	820	66	A100B4		5,5	1500	14,0	6,6	119	52 124	x x P x
MO EEx 950/1235 - 65	630 - 950	1235	65	A100B4		5,5	1500	14,0	6,6	-	52 125	x x P x

- Notes:**
- The rated torque is 60 % of the maximum tripping torque in duty S2 and 40 % of the maximum tripping torque in duty S4.
 - The 6th, 7th and 9th places of the type number should be completed with respective digit or letter from Table 3.
 - Design variants operating at another supply voltage than that given in the table, are available upon special request.
 - Winding of the electric motors AIM can be connected in either “delta” or “star” (data in this table suppose an electric motor for feeding voltage 3 x 400 V with “star” connection). Feeding voltage and currents for both variants of connection are stated on the rating plate of the electric motor.

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

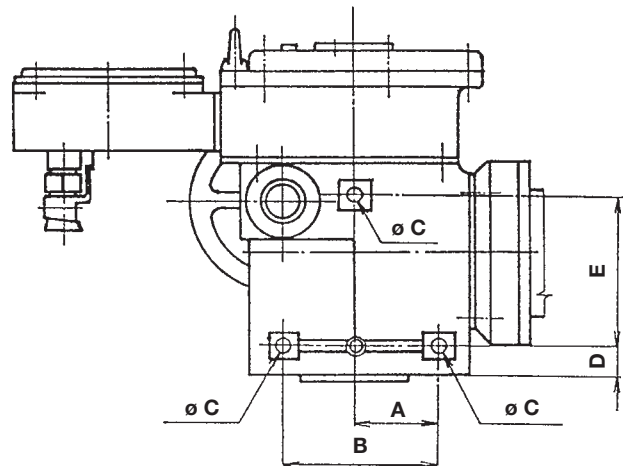


- 1 pc. M25 x 1,5; \varnothing 10 – 16 mm
- 1 pc. M25 x 1,5; \varnothing 14 – 18 mm
- 1 pc. M20 x 1,5; \varnothing 7 – 12 mm



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	\varnothing 160	\varnothing 200	\varnothing 250	\varnothing 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

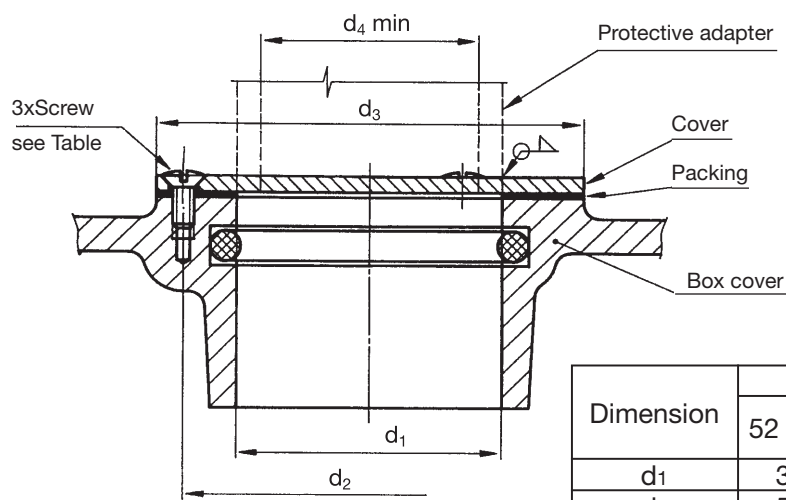


Dimension	Type number			
	52 120	52 121, 2	52 123, 4	52 125
A	61	90	110	120
B	110	160	210	240
$\varnothing C$	M 10	M 12	M 16	M 20
D	16	21	23	47
E	120	140	200	220

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

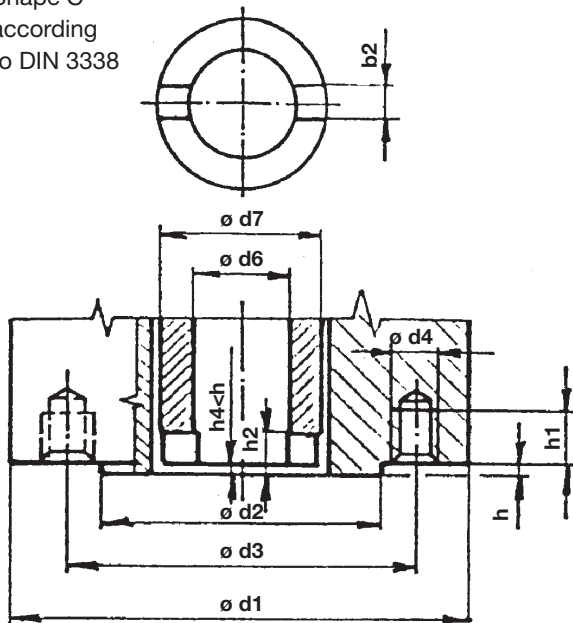
Screw ČSN EN ISO 2010	M4x10	M4x10	M5x10	M5x10
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Attachment dimensions of **MODACT MO EEx** electric actuators (basic design without adapter)

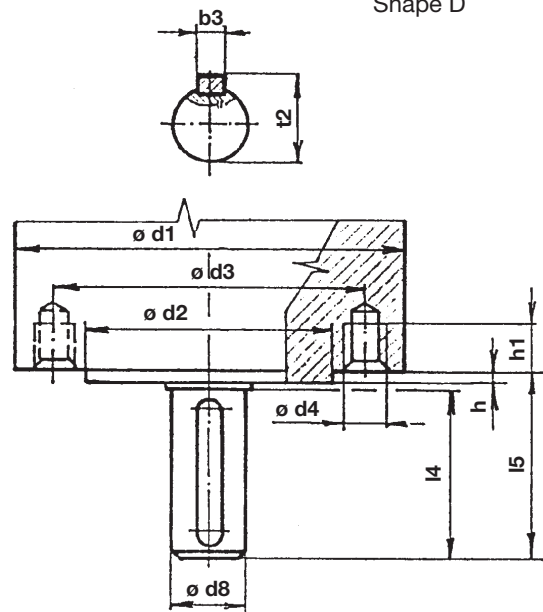
The electric actuators are designed for direct mounting onto the controlled device (valve etc.). They are attached by means of a flange or clutch according to ČSN 186314. The flanges of the electric actuators also comply with ISO 5210. The clutches for transmission of motion to the valve are:

- 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



Shape D



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

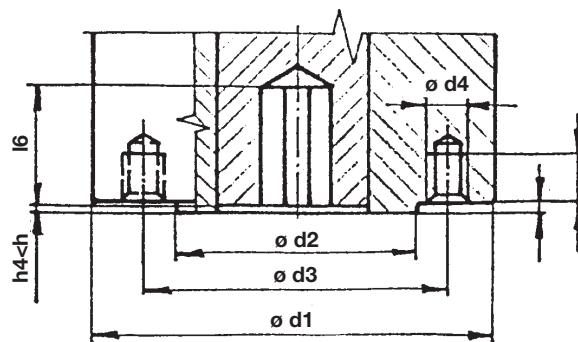
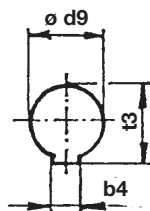
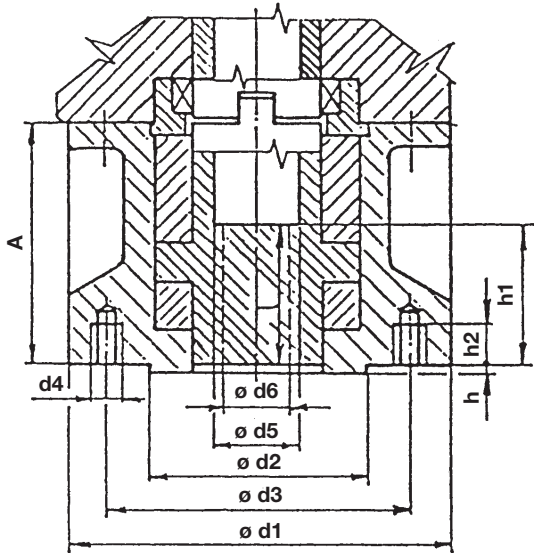


Table of connecting dimensions of the **MODACT MO EEx** electric actuators
(without adapters)

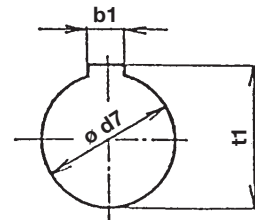
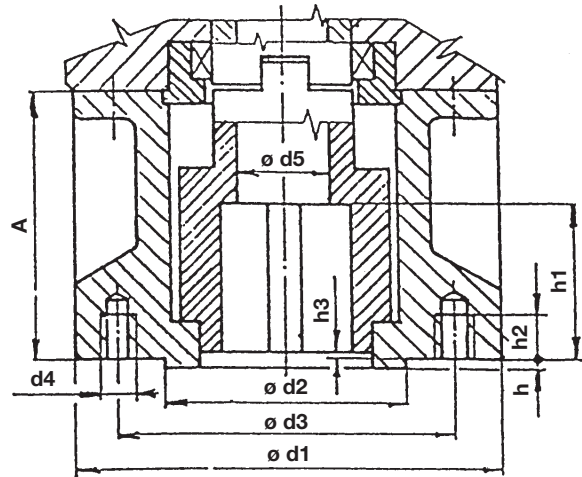
Shape	Dimension	Type number / Flange			
		52 120 F 10	52 121, 2 F 14	52 123, 4 F 16	52 125 F 25
C, D, B3 (identical dimensions)	\varnothing d1 (orientation value)	125	175	210	300
	\varnothing d2 f8	70	100	130	200
	\varnothing d3	102	140	165	254
	d4	M 10	M 16	M 20	M 16
	Number of tapped holes	4	4	4	8
	$h \begin{smallmatrix} 0 \\ -0,2 \end{smallmatrix}$	3	4	5	5
	h1 min. 1.25 d4	12.5	20	25	20
C	\varnothing d7	40	60	80	100
	h2 min.	10	12	15	16
	b2 H11	14	20	24	30
	\varnothing d6	28	41,5	53	72
D	\varnothing d8 g6	20	30	40	50
	l4	50	70	90	110
	t2 max.	22,5	33	43	53,5
	b3 h9	6	8	12	14
	\varnothing l6	55	76	97	117
B3	\varnothing d9 H8	20	30	40	50
	l6 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)

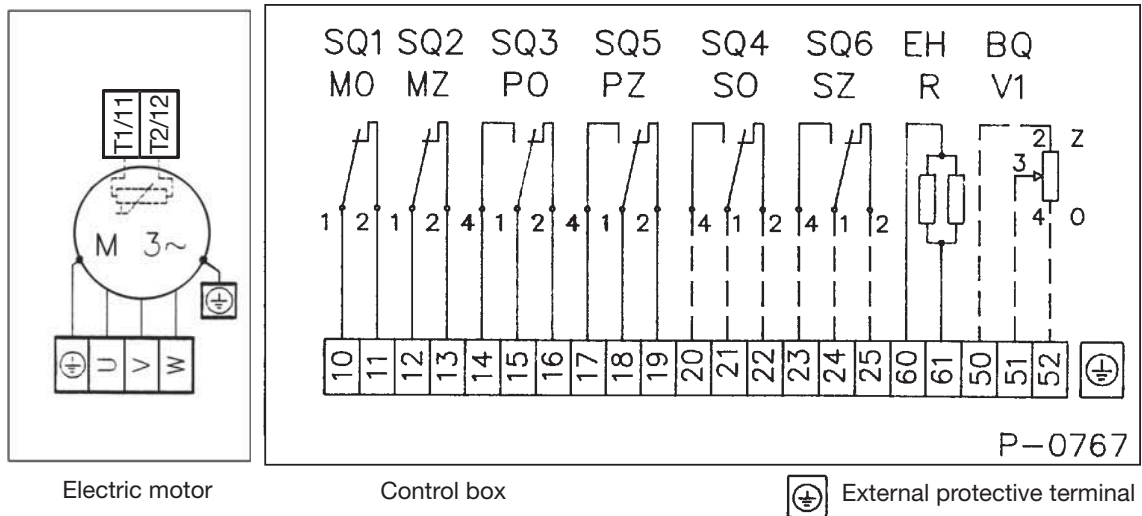


Assignment of adapters to electric actuators

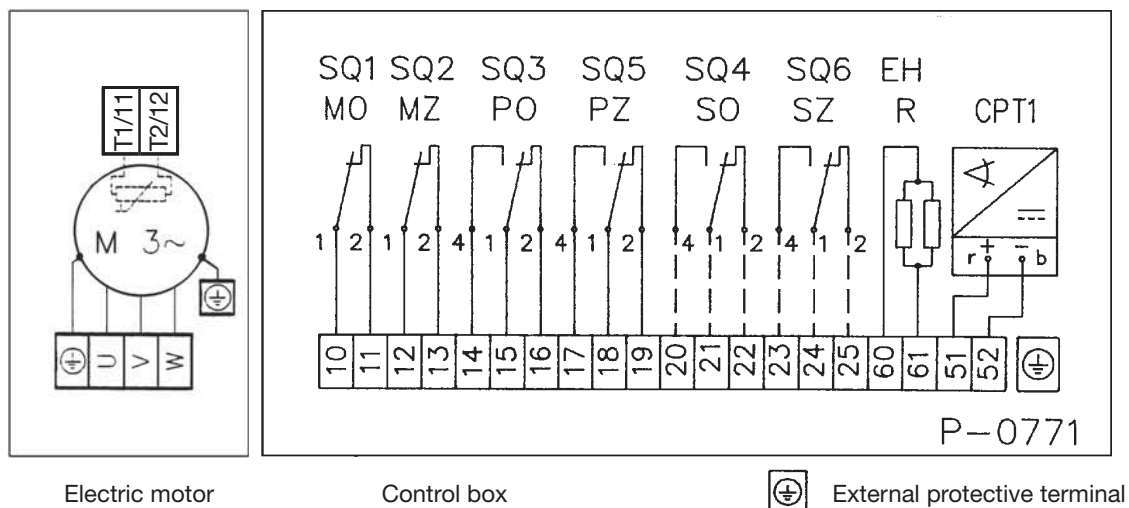
Shape	Dimension	Type number			
		52 120	52 121, 2	52 123, 4	52 125
A, B1 (identical dimensions)	ø d1	125	175	210	300
	ø d2 f8	70	100	130	200
	ø d3	102	140	165	254
	d4	M 10	M 16	M 20	M 16
	Number of holes d4	4	4	4	8
	h	3	4	5	5
	h2 min.	12.5	20	25	20
A	A	63.5	110	179	155
	ø d5	30	38	53	63
	ø d6 max.	26	36	44	60
	h1 max.	43.5	65	92	110
	l min.	45	55	70	90
B1	A	63.5	110	122	155
	ø d5	30	40	50	65
	l1 min.	45	65	80	110
	h3 max.	3	4	5	5
	b1	12	18	22	28
	ø d7 H9	42	60	80	100
t1	45.3	64.4	85.4	106.4	

Internal wiring diagrams of MODACT MO EEx electric actuators

– Design with resistance position transmitter 1 x 100 ohm



– Design with current position transmitter



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

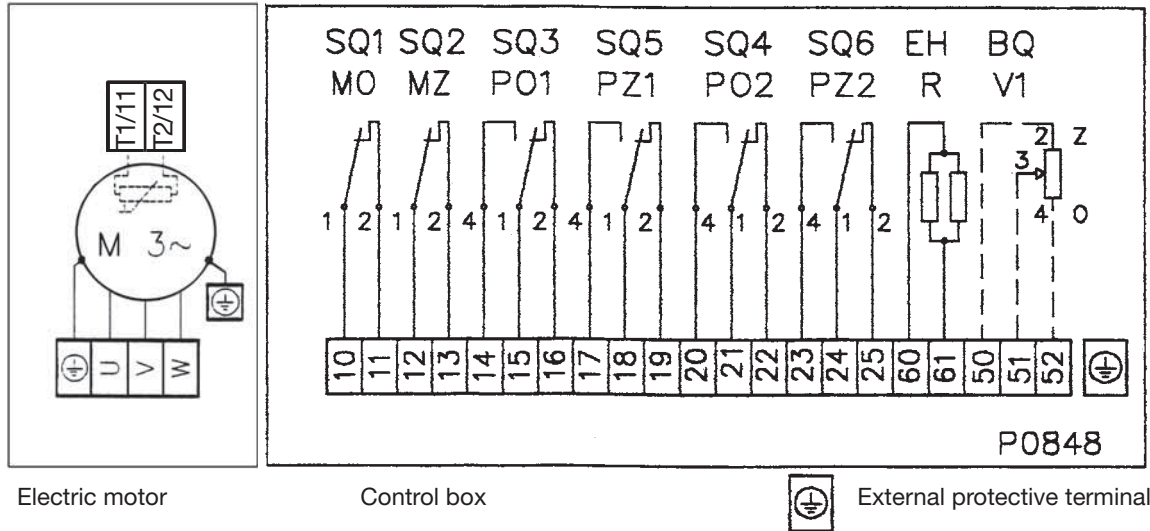
*) Some electric motors are fitted with thermistors (see Sheet 13, Note 4 of TP 12-02/92, dashed line on this sheet). The thermistors should be interconnected with the circuits of thermistor protection of motors (e.g. Siemens Sirius 3RN1). These circuits are not supplied by ZPA Pečky.

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.

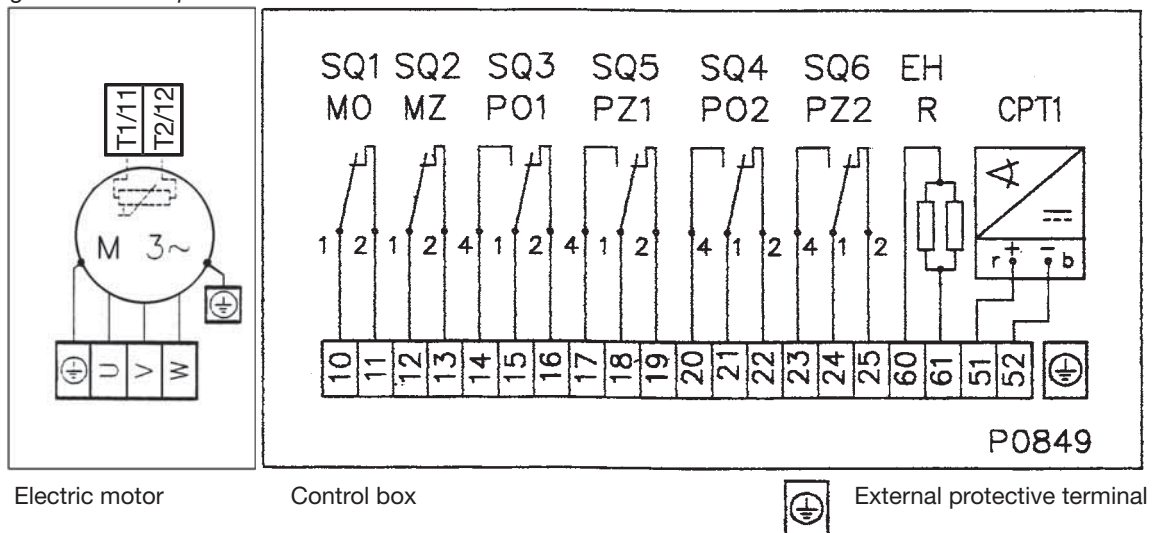
Internal wiring diagrams of **MODACT MO EEx** electric actuators
 Type No. 52 120 – 52 125. version without signaling change-over switches with
 two doubled position change-over switches.

The doubled position change-over switches (PO1, PO2, and PZ1, PZ2) always switches at the same time

– Design with potentiometer 1 x 100 ohm or without transmitter



– Design with current position transmitter CPT 1/A



LEGEND:

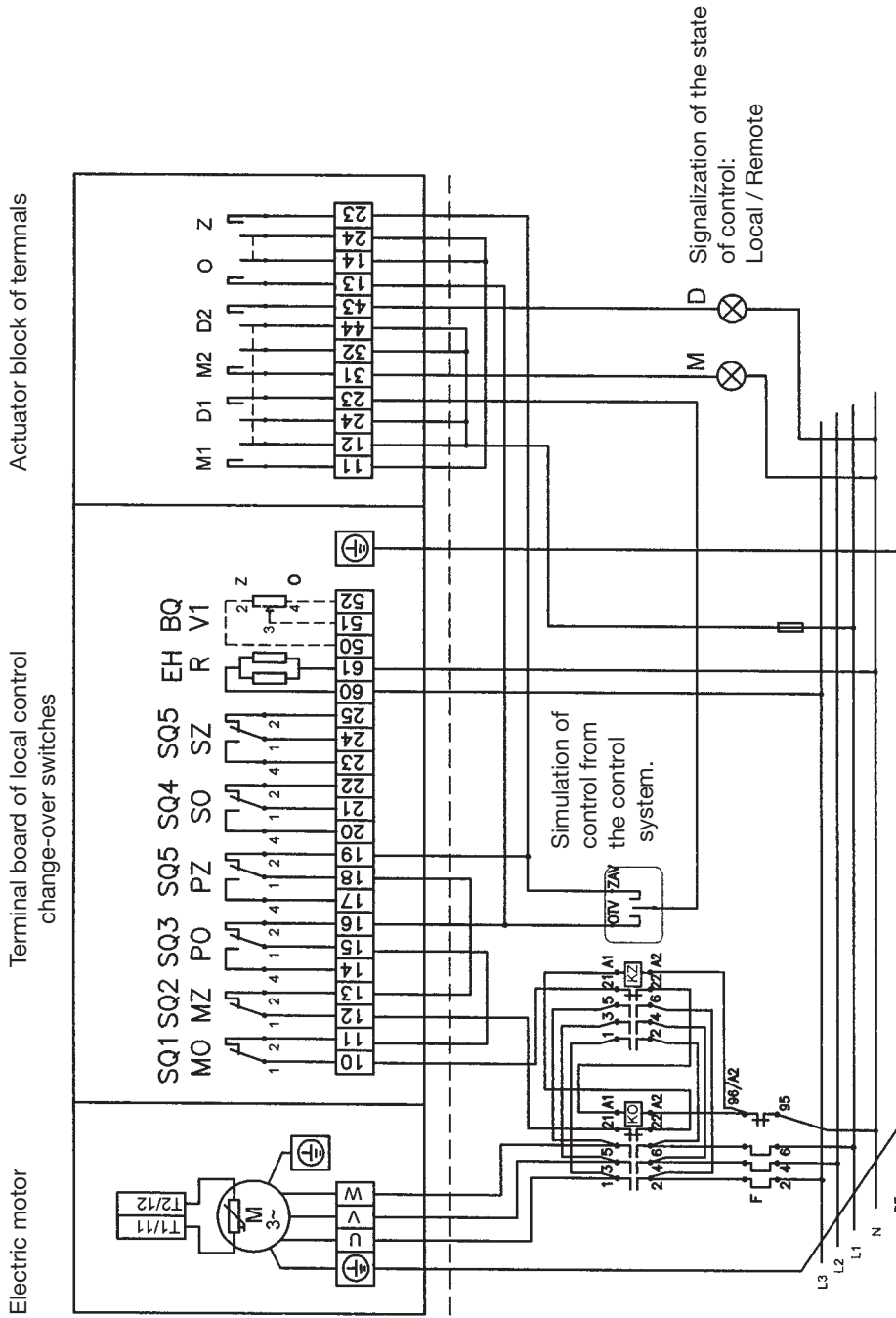
- BQ1 (V1) – position transmitter – resistance 1 x 100 ohm
- CPT1 – current position transmitter CPT 1/A 4 – 20 mA
- SQ1 (MO) – OPEN torque-limit switch
- SQ2 (MZ) – CLOSE torque-limit switch
- SQ3 (PO) – OPEN position-limit switch
- SQ5 (PZ) – CLOSE position-limit switch
- SQ4 (SO) – OPEN signalling 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"

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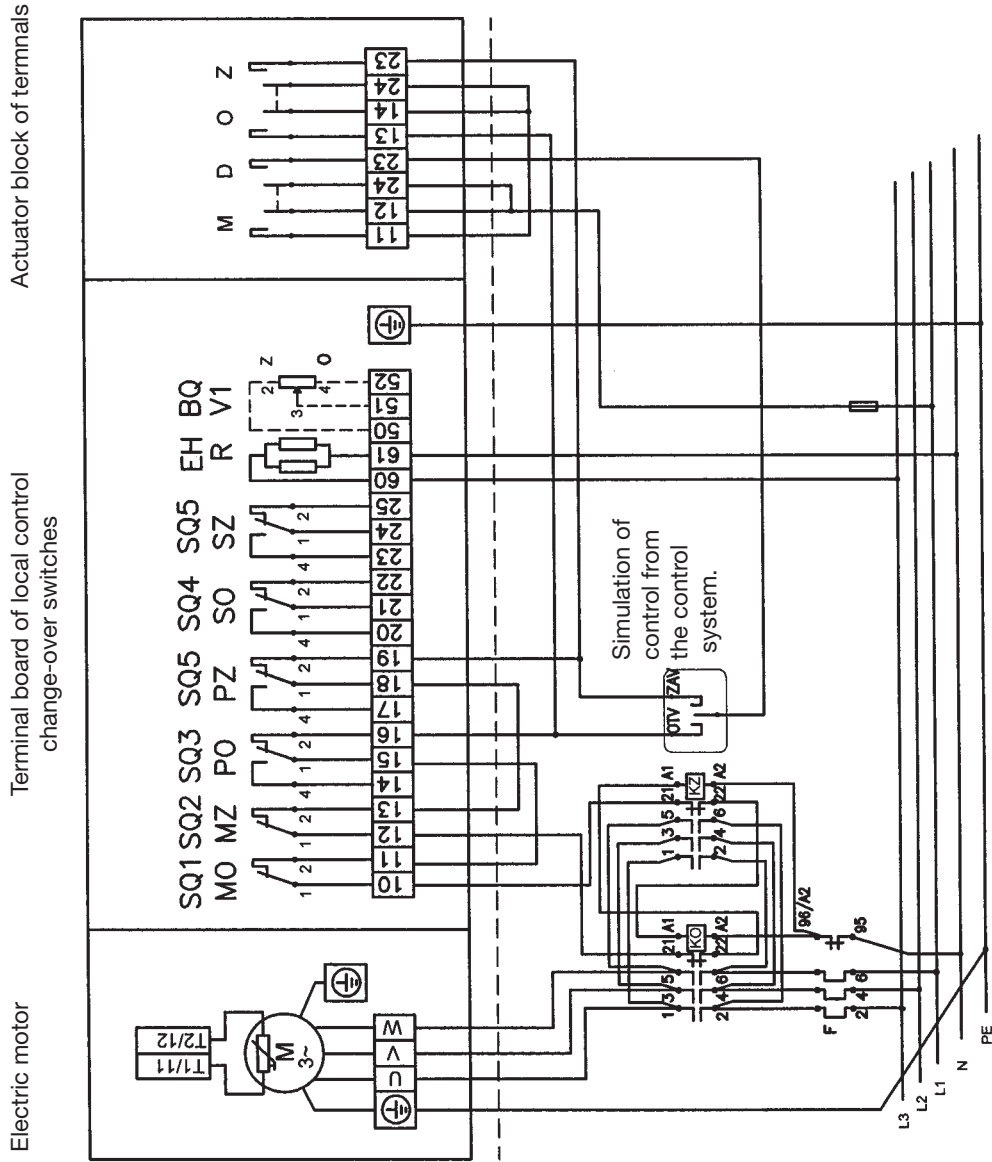


(Example of actuator wiring)

Wiring diagram of **MODACT MO EEx** electric actuators

- design with potentiometer 1 x 100 ohm,
- design with two-pole change-over switch "local - remote"

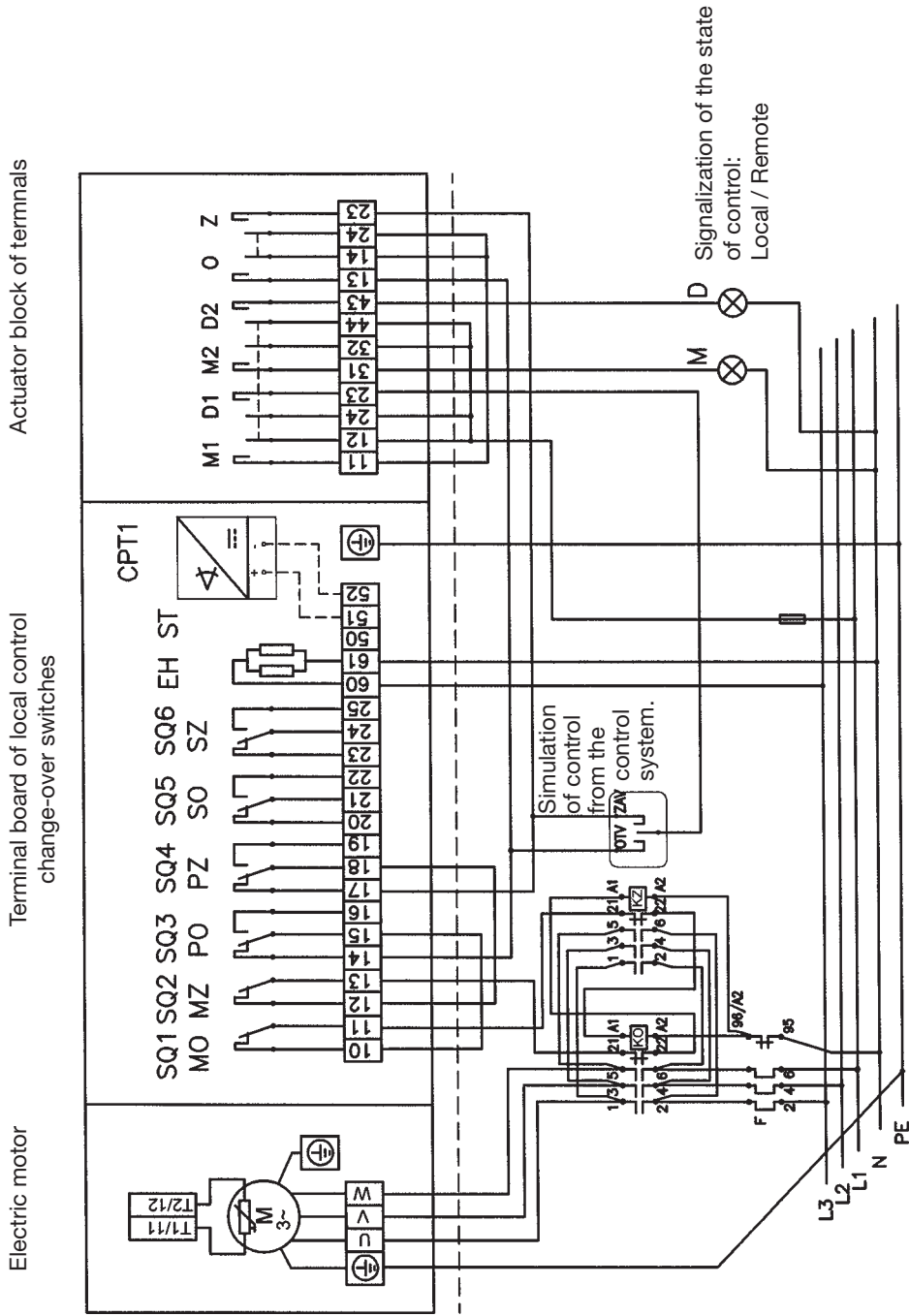
P-0910



(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

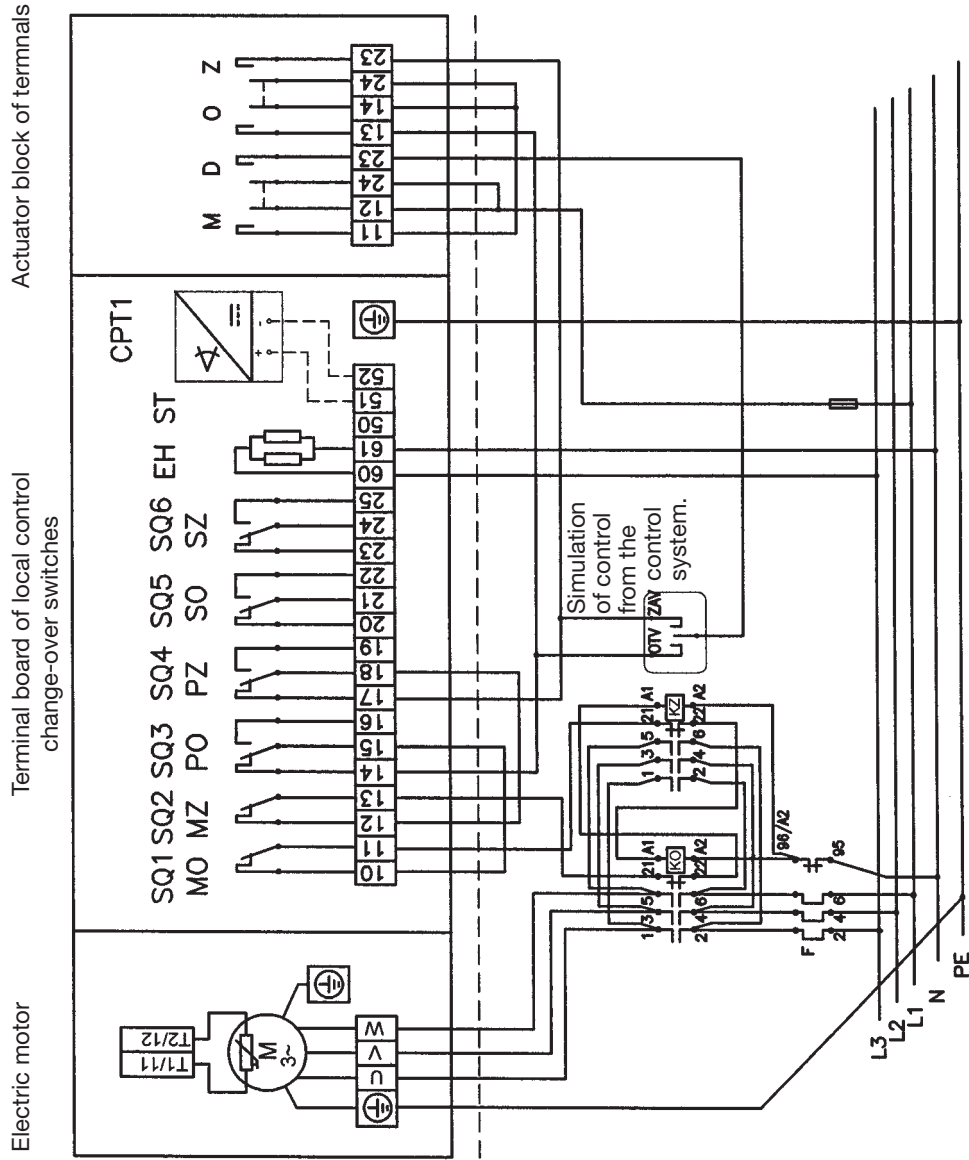


(Example of actuator wiring)

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)



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

SURVEY OF PRODUCED ACTUATORS

KP MINI, KP MIDI

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

MODACT MOK, MOKED, MOKP Ex

Electric rotary (90°) actuators for ball valves and flaps

MODACT MOKA

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

MODACT MONJ, MON, MOP, MONED, MONEDJ, MOPED

Electric rotary multi-turn actuators

MODACT MO EEX, MOED EEX

Explosion proof electric multi-turn actuators

MODACT MOA

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

MODACT MOA OC

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

MODACT MPR VARIANT

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

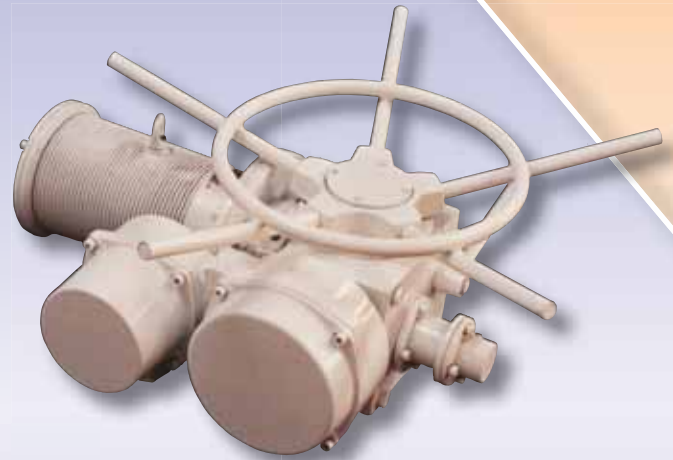
MODACT MPS KONSTANT, MPSED

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

MODACT MTN, MTP, MTNED, MTPED

Electric linear thrust actuators with a constant output speed

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



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