

**MOUNTING AND OPERATING
INSTRUCTIONS**

**Electric rotary multi-turn actuators
Explosion-proof design**

MODACT MOED EEx

Type numbers 52 120 - 51 125

CERTIFICATE **TÜV 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.
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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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TGA-ZM-07-06-00

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.

1) APPLICATION

The **MODACT MOED 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 are marked with a label of protection against explosion and symbols of the group and category of the device **Ex II 2G**.

- for surrounding temperature -25 °C to +55 °C: with marking **Ex d IIC T4**
- for surrounding temperature -50 °C to +55 °C: with marking **Ex d IIB T4**

Marking of actuators for surrounding temperature -50 °C to +55 °C is with the letter F at the 11th place of the type number, i.e. 52 120.xxxxEDF. The electronic outfit of the version Ex d IIB T4 should be discussed with the manufacturer.

Nomenclature:

Environment with explosion danger	– Environment in which an explosive atmosphere can be created
Explosive gaseous atmosphere	– A mixture of flammable substances (<i>in the form of gases, vapours or mist</i>) 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 (<i>however within approved limits</i>) 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 (<i>IP</i>) 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.
Zone 1	– A space where probability of occurrence of an explosive atmosphere of a mixture of flammable substances in the form of gas, vapour or mist with the air is occasional under normal operation.
Zone 2	– A space where occurrence of an explosive gaseous atmosphere formed of a mixture of flammable substances in the form of gas, vapour or mist with the air is improbable under normal operation; however, if this atmosphere is formed it will only persist for a short period of time.

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 60079-10	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

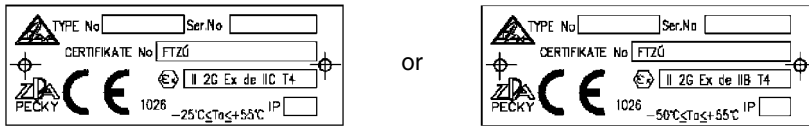
It consists of the following symbols:

- Ex Electric device complies with the standard ČSN EN 60 079-0 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 60 079-1.
- II Designation of the group of explosion-proof electric device according to ČSN EN 60 079-0.
- B, C Designation of the sub-group of the group of explosion-proof electric device according to ČSN EN 60 079-0.
- T4 Designation of temperature class of explosion-proof electric device of the Group II according to ČSN EN 60 079-0.

Data on actuators

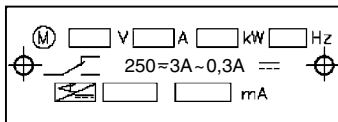
The actuators are fitted with the following plates:

1) Plate with data of non-explosive closures



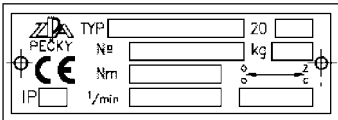
2) Instrument plate contains

- electrical data of power circuits (*voltage and frequency, current and output of electric motor*)
- electrical data of control circuit of micro-switches (*voltage, current*)
- position transmitter (*resistance, voltage and/or current*)

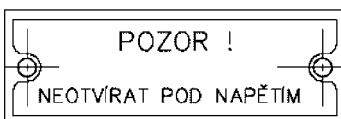


3) Rating plate contains

- manufacturer's name
- type designation of product (*type number*)
- serial number
- year of production
- rated value of tripping torque Nm
- rated speed of shifting 1/min
- rated working stroke rev.
- designation of protective enclosure of actuator IP
- weight of actuator kg
- mark of conformity CE

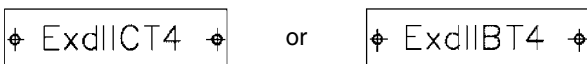


4) Warning plate



5) Plates on covers with marking of used protection against explosion

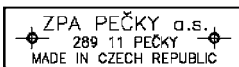
a) explosion-proof closure "d" of control box and terminal box without block of local control and display



b) explosion-proof closure “d” of terminal box with block of local control and display



6) Plate with marked manufacturer and manufacturer's address.



2) OPERATING CONDITIONS, OPERATING POSITION

Operating conditions

the **MODACT MOED 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.

When the actuator is installed on a free area it is recommended to fit it with a light shelter against direct impact of atmospheric effects. The shelter should overlap the actuator contour by at least 10 cm at the height of 20 – 30 cm.

When the actuators are to be installed in a working environment with temperature below -10 °C and in an environment with relative humidity above 80 %, it is always necessary to use an anti-condensation heater fitted to all actuators.

The electric actuators can be installed in areas with non-flammable and non-conductive dust, provided that this does not adversely influence their function. Here, it is necessary to strictly observe ČSN 34 3205. It is recommended to remove dust as soon as its layer is about 1 mm thick.

Classes of external influences

– as extracted from ČSN Standard 33 2000-3 (*basic characteristics*)

- 1) AA7 – Simultaneous effect of ambient temperature of -25 °C to +55 °C (-50 °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/m², but not exceeding 350 mg/m²
- 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 W/m² and ≤ 700 W/m²
- 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 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.

Operating position

Working position of actuators **MODACT® MOED EEx** actuators with plastic lubricant – any position.

The actuators with plastic lubricant are labelled “Filled: solid grease” on the power box at the side of the hand-wheel.

Actuators with oil charge – position limited only by slope of electric motor axis – max. 15° under the horizontal level. In this way, reducing of service life of rubber sealing of the electric motor shaft by possible fragments or impurities from the oil filling is prevented.

When the actuator is assembled with the electric motor above the horizontal plane the oil filling should be topped up so that reliable lubrication of the motor pinion is ensured.

The actuators with oil filling are not labeled.

3) OPERATION MODE, SERVICE LIFE OF ACTUATORS

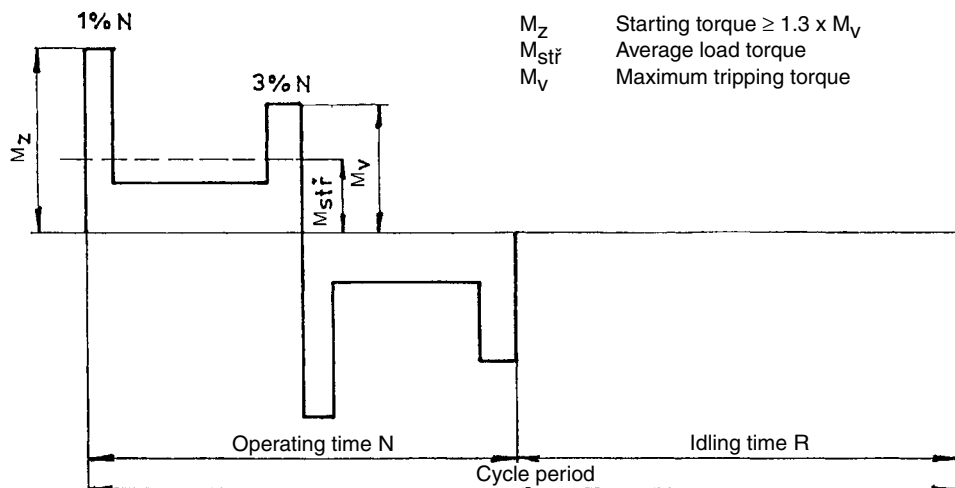
Operation mode

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 $N/N+R$ 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

4) TECHNICAL DATA

Supply voltage

The actuators have been designed to operate at supply voltage of 3 AC 400 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.

Protective enclosure

Protective enclosure of actuators **MODACT MOED EEx** – IP 55 according to ČSN EN 60 529

Noise

Level of acoustic pressure A	max. 85 dB (A)
Level of acoustic output A	max. 95 dB (A)

Tripping torque

Tripping torque is set at the manufacturer according to the customer's requirements within the range given in Table No. 1, 2. If setting of tripping torque is not required maximum tripping torque of the required type number of the electric actuator is set.

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

The actuator is self-locking provided that the load only acts in the direction against motion of the actuator output shaft. Self-locking is ensured by a roller arrest immobilizing the electric motor rotor even in the case of manual control.

In order to observe safety regulations, the actuators cannot be used for driving transportation lifting devices with possible transport of persons or for installations where persons can stand under the lifted load.

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.

Working stroke

The ranges of working stroke are given in Table No. 1 or No. 2.

Rising spindle

In the design variants with connecting dimensions, Shapes A 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.

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.

5) ACTUATOR OUTFIT

Anti-condensation heater

The actuators are fitted with an anti-condensation heater preventing condensation of water vapour. It is connected to the AC mains of voltage 230 V.

Local control

Local control serves for controlling the actuator from the site of its installation. It includes two change-over switches: one with positions "Remote control - Off - Local control", the other "Open - Stop - Close".

The former change-over switch can be built-in as two-pole or four-pole. The change-over switches are installed in a terminal-board box and the control elements on the lid of this terminal-board box.

6) ELECTRIC PARAMETERS

External electric connection

The electric actuator is equipped with a terminal board for connection to external circuits. This terminal board uses screw terminals allowing conductors with a maximum cross-section 4 mm² to be connected. Access to the terminal board is obtained after removal of the terminal box cover. All control circuits of the electric actuator are brought out to the terminal board. The terminal box is fitted with cable bushings for connecting the electric actuator. The electric motor is fitted with an independent box with a terminal board and a bushing.

Actuator internal wiring

The internal wiring diagrams of the **MODACT MOED EEx** actuators with terminal designation are shown in this Mounting and operating instructions.

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.

Isolation resistance

Isolation resistance of electric control circuits against the frame and against each other is min. 20 Mohm. After a dump test, isolation resistance of control circuits is min. 2 Mohm. Isolation resistance of the electric motor is min. 1.9 Mohm. See Technical specifications for more details.

Electric strength of electric circuits isolation

Circuits of anti-condensation heater	1 500 V, 50 Hz
Electric motor Un = 3 x 230/400 V	1 800 V, 50 Hz

Deviations of basic parameters

Tripping torque	±12 % of max. value of range
Adjusting speed	- 10 % of max. value of range
	+15 % of rated value (<i>idle run</i>)

Protection

The actuators are fitted with one internal and one external protective terminals ensuring protection against electric shock according to ČSN 33 2000-4-41. One protective terminal is also fitted to the electric motor. The protective terminals are labelled with a mark according to ČSN EN 60417-1a2 (013760).

7) DESCRIPTION

The electric actuators are designed for direct attachment on the controlled device. (*valve etc.*). 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.

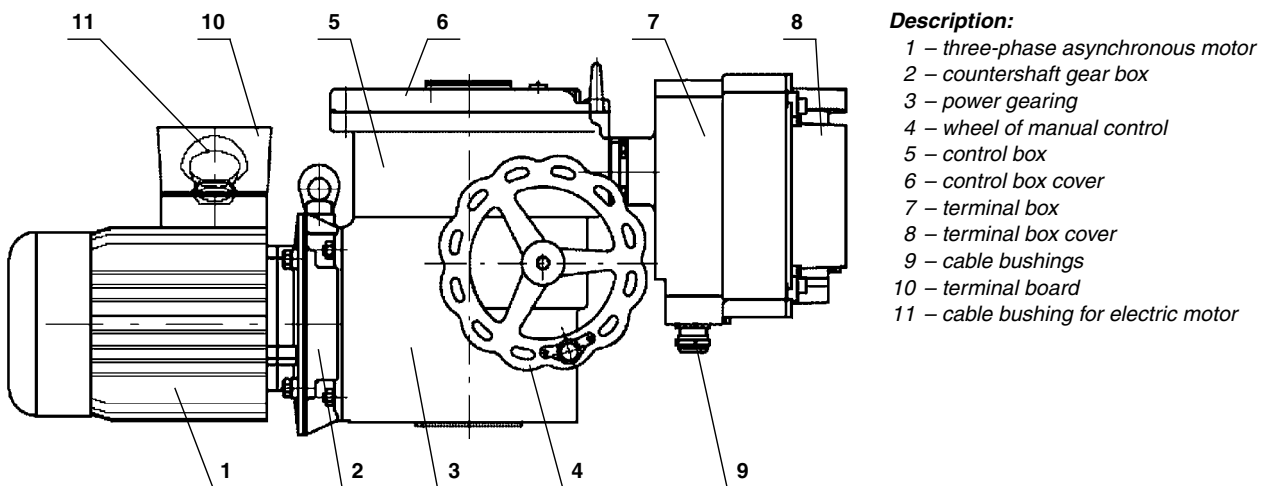
Moreover, the actuators can be delivered with connection according to Russian standards OCT (connection M, A, Б, В, Г), see the version in table no. 3.

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 fix-connected to the driver of the planet gear and passes to the control box -5- where scanning and control elements of the actuator are installed.

Operation of the torque-limit switching 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 Ex d 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 terminal board box also includes a firm closure "d" marked Ex d IIC T4. The cable inlets are secured by certified cable bushings HAWKE, type ICG 623, with a certificate; they can be used within the temperature range from -60 °C to +80 °C. The bushings of the following sizes are used in the terminal board box:



- Description:**
- 1 – three-phase asynchronous motor
 - 2 – countershaft gear box
 - 3 – power gearing
 - 4 – wheel of manual control
 - 5 – control box
 - 6 – control box cover
 - 7 – terminal box
 - 8 – terminal box cover
 - 9 – cable bushings
 - 10 – terminal board
 - 11 – cable bushing for electric motor

Fig. 1 – Actuator set-up (actuators with DMS2 ED electronic system)

cable ø				
2 pieces	ICG 623/B	M25x1,5	13,0 – 20,2 mm	Both cliental
2 pieces	ICG 623/A	M20x1,5	11,0 – 14,3 mm	One serves for interconnection with the electric motor, the other is cliental.

The cable outlet system should meet the requirement of ČSN EN 60079-14 art. 10.3.2.d for direct inlet to the firm closure of class IIC.

Therefore, in connecting the actuator, the client should provide for a non-explosive sealing (filling-in individual cable wires) by means of the enclosed two-component filling-in putty according to the instructions.

ELECTRONIC OUTFIT

Electro-mechanical control board is replaced with the electronic system **DMS2** or **DMS2 ED**. Both systems scan position of the output shaft and torque of the electric actuator by contact-free magnetic sensors. Long service life is guaranteed for the contact-free sensors that do not get mechanically worn.

The sensor of the output shaft position is absolute and does not require any backup power supply in case supply voltage is disconnected during operation of the electric actuator. Both systems can be set and monitored by a computer with controlling program (*set parameter can be backed up on a computer*) or manually without a computer (*for the electronics DMS2, parameters can be manually set and it can be checked without computer only if the system is equipped with a display and local control*). They contain diagnostic functions - error messages on the display, memory of recent failures and number of occurrences of respective failures.

The more simple system **DMS2 ED** substitutes the electro-mechanical board and/or provides for controlling the electric actuator by input analog signal as in the version Control.

The system **DMS2** enables the electric actuator to be used for two-position and three-position regulation or to be connected to the industrial bus bar Profibus.

DMS2 ED

Basic outfit:

Control unit	main part of the system DMS2.ED - includes microcomputer, position sensor, 3 signal lamps LED, 4 push-buttons for simple setting and checking the actuator, connectors for connecting the torque sensor, source board, and interface RS 232 (<i>connection of computer for setting and diagnostics</i>).
Torque unit	
Source unit	electronic power supply, user's terminal board (<i>connection of power supply and control signals</i>), 2 torque relays, 2 position relays, 2 signalling relays, 1 relay for signalling errors (<i>READY</i>), switch of resistance anti-condensation heater, connectors for connecting electronic brake, resistance heater of analog module, and connector for interconnection with the control unit.

Optional outfit:

Analog module	output of feed-back signal 4 – 20 mA, in version CONTROL input of control signal 0/4 – 20 mA
Position indicator	LED display
Local control	
Contactors or contact-less block	
Electronic brake	

Parameters:

Scanning of position	contact-less, magnetic
Scanning of torque	contact-less, magnetic
Working stroke	see Tables 1, 2, 3
Torque blocking	0 – 20 s at reversing in limit positions
Input signal	0 (4) – 20 mA with switched on regulator function Local/Remote control, Local open/close
Output signal	7 x relay 250 V AC, 3 A (<i>MO, MZ, PO, PZ, SO, SZ, READY</i>) Position signal 4 – 20 mA max. 500 ohm, active/passive, galvanic-isolated, LED display, electronic brake control
Power supply of electronic	230 V AC, 50 Hz, 4 W, over-voltage category II

Realization:

Replacement of electric-mechanical board the provided relay contacts substitute position, torque and signalling micro-switches; current feed-back signal 4 – 20 mA can also be brought out; the actuator is controlled by the superior control system with signals **“open”** and **“close”**.

CONTROL The electronics covers also function of the regulator; the output shaft position is controlled by analog input signal.

Function and setting of output relays

The output relays replace end-limit micro-switches; to some extent, function of the output relays differs according to chosen mode of electronics or it can be selected, preferably by the setting program.

Relay MO, MZ, PO, PZ

Relay	DMS2 ED	DMS2 ED Control
MO	torque open (also changes-over to errors)	motor open
MZ	torque closed (also changes-over to errors)	motor close
PO	position open	torque open (also changes-over to errors) + optional tripping in position open (parameter Tripping)
PZ	position closed	torque closed (also changes-over to errors) + optional tripping in position closed (parameter Tripping)

In the version Control, the **function of relay MO/MZ** is same as that of motor relays.

Their operation is controlled by:

- **regulation loop** (deviation of required and actual position)
- **active errors**

Any induced active error will change over both relays to a standstill position (*coils not energized*). In case of errors, the relays with a function of torque relays (*in both versions DMS2 ED and DMS2 ED Control*) are also controlled.

Relays SZ, SO, READY

<p>Relay 3/SZ - It usually signalizes position closed, it can be changed-over to any offered signalization</p> <p>Relay 4/SO - It usually signalizes position open, it can be changed-over to any offered signalization</p>	<p>Relay READY - It usually signalizes errors + warning + not remote, it can be changed-over to any offered signalization</p>
<div style="display: flex; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;"> <p>Relé 3 / SZ Relé 4 / SO</p> <p>vypnuto</p> <p>poloha O</p> <p>poloha Z</p> <p>moment O</p> <p>moment Z</p> <p>moment a poloha O</p> <p>moment a poloha Z</p> <p>otevřování</p> <p>zavírání</p> <p>pohyb</p> <p>poloha</p> <p>poloha negovaná</p> <p>ovládání-místní</p> <p>ovládání-dálkové</p> <p>ovládání-vypnuto</p> <p>moment O nebo Z</p> <p>pohyb-blikač</p> </div> <div> <p>Relay 3/SZ Relay 4/SO</p> <p>OFF</p> <p>position O</p> <p>position Z</p> <p>torque O</p> <p>torque Z</p> <p>torque + position O</p> <p>torque + position Z</p> <p>opening</p> <p>closing</p> <p>motion</p> <p>position</p> <p>negated position</p> <p>local control</p> <p>remote control</p> <p>control OFF</p> <p>torque O or Z</p> <p>motion - blinker</p> </div> </div>	<div style="display: flex; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;"> <p>Relé Ready</p> <p>vypnuto</p> <p>varování</p> <p>chyby</p> <p>varování nebo chyby</p> <p>chyby nebo není dálkové</p> <p>chyby nebo var. nebo není dál.</p> <p>moment O nebo Z</p> </div> <div> <p>Ready Relay</p> <p>OFF</p> <p>warning</p> <p>errors</p> <p>warning or errors</p> <p>errors or no remote</p> <p>errors or warning or no remote</p> <p>torque O or Z</p> </div> </div>

Setting program

The setting program is same for communication with the electronics DMS2 ED and DMS2. The users' version can be freely downloaded.

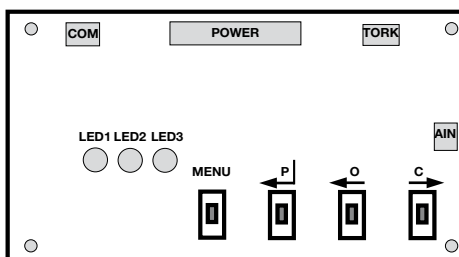
Note: In the window "Parameters" of the setting program, column "Access", the word "NO" designates parameters that cannot be changed by the user (change of these parameters is blocked).

Parametr	Změna	Chyba	Přístup	
Setrvačnost [0.1%]			NE	5
Setr. Doběh [0.1s]			NE	6
Necitlivost [%]				1

Parametr – Parameter
 Změna – Change
 Chyba – Error
 Přístup – Access
 Setrvačnost (0,1 %) – Inertia [0.1 %]
 Setr. Doběh (0,1 s) – Inertial run-out [0.1 s]
 Necitlivost (%) – Insensitivity [%]
 NE – NO

PROCEDURE OF SETTING PARAMETERS BY MEANS OF PUSH-BUTTONS

For simple programming of required operating parameters, the control unit is fitted with four push-buttons: **MENU**, **P**, **O**, **C** and three signal lamps.



Colours of diodes:
 LED1 – yellow (*menu number*)
 LED2 – red (*parameter value*)
 LED3 – green

Push-buttons and signal lamps LED on control unit DMS2.ED.S and DMS2.ED.S90

Yellow	Red	Green	State
-	-	-	System without feeding
-	-	lit on	Everything OK – working regime (<i>remote, local or switched off control</i>)
-	blinking	lit on	Error or warning – working regime (<i>remote, local or switched off control</i>)
lit on	-	lit on	Enter or exit of Setting of parameters by means of push-buttons or Setting of parameters by means of PC
blinking	-	lit on	Setting of parameters by means of push-buttons
blinking	blinking	lit on	
blinking	blinking	lit on	

In adjustment, follow the paragraphs “VERIFICATION of APPARATUS FUNCTION And its LOCATION”, “fitting on VALVE” and “ADJUSTMENT of ACTUATOR with VALVE” of these instructions.

For safety reasons, the system is delivered in the state of induced error of Calibration when the functions are limited in order to reduce the risk of damage to the actuator by wrong wiring.

Record of position CLOSED, OPEN and AUTOCALIBRATION

– The actuator must be adjusted in such a way that the recorded position would switch off the actuator before it is switched off by torque. For tight closure, the torque relay for torque Closed is only connected into the control circuit. The actuator can be shifted either manually or electrically. The actuator in version CONTROL can be started from menu MOTOR in program DMS2. In this case, the actuator does not react to the set position and can only be stopped by the torque relay. In controlling from menu MOTOR, no torque may be induced. The torque must be left manually.

If, during adjustment, the torque is reached in the end-limit position, the torque must be left by means of a hand wheel.

- The actuator is set to position Closed and position Closed is stored by long pressing of push-button C (*without entering the Menu*).
- The actuator is set to position Open and position Open is stored by long pressing of push-button O.
- The calibration routine is started by means of push-button P (*in remote control*) that, in the three-position regulation, will measure actual inertial masses of the system and store them into the memory of the control unit. In the two-position regulation, pressing of push-button P only cancels the error of Calibration.
- In recording the end-limit positions, signalling relays and the position transducer are also set.
- In case the actuator stroke is to be increased and the switching off is set to “from position”, the actuator will switch off during shifting in position O or 100 %. To further change the position, press C or O, and, while keeping it depressed, the actuator can be further shifted. After required position is reached, it is stored to memory by pressing push-button C or O.

MENU 6 – Setting insensitivity in three-position regulation

- Shortly press P to select value 1 – 10 % (1 – 10x blinking of LED2) and keep pressing push-button P to store the parameter to memory.

MENU 7 – Response in case of losing control signal in three-position regulation

- Shortly press P to select value
OPEN - 1x blinking of LED2,
or CLOSE - 2x blinking of LED2,
or STOP - 3x blinking of LED2,
and keep pressing push-button P to store the parameter to memory.

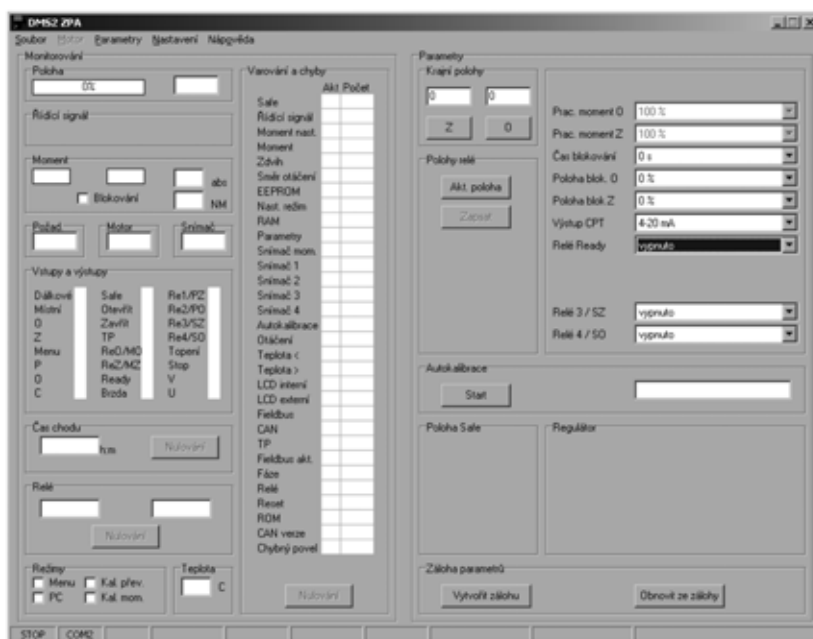
MENU 8 – Way of switching off in end-limit positions in 3P regulation

- Shortly press P to select value
TORQUE - 1x blinking of LED2,
or TORQUE + PO - 2x blinking of LED2,
or TORQUE + PZ - 3x blinking of LED2,
TORQUE + PO + PZ - 4x blinking of LED2,

And keep pressing push-button P to store the parameter to memory.

PROCEDURE OF SETTING PARAMETERS BY PROGRAM DMS2

- Before starting the actuator, it is necessary to set some parameters of the system by means of program DMS2 on PC.
- For safety reasons, the system is delivered in the state of induced error of Calibration when the functions are limited in order to reduce the risk of damaging the actuator by wrong wiring. In controlling the actuator from program DMS2, its run is stopped when any torque is induced.



Main window of setting program



Selection of electronics

Working torque

- Check and, if necessary, set the value of working torque 50 – 100 % in program DMS2.

Record of positions OPEN, CLOSED and AUTOCALIBRATION

The actuator should be adjusted so that the recorded position would stop the actuator before it is switched off by torque. The actuator is shifted manually or electrically. The actuator in version CONTROL can be started from menu MOTOR in program DMS2. In this case, the actuator does not respond to the set position and is switched off by torque. In controlling from menu MOTOR, no torque may be induced. The torque should be left manually.

Record of position CLOSED:

- In the required position, press push-button Z in the program and confirm the approved record.

Record of position OPEN:

- In the required position, press push-button O in the program and confirm the approved record.

The recorded values are confirmed by pressing push-button START in program DMS2. For the actuator in version CONTROL, change over the actuator to remote control and, by pressing push-button START, start the autocalibration. By short starting of the motor in both directions, the actuator measures inertia and changes over to the regulating regime. Information on the course of autocalibration is signalized next to push-button START. The autocalibration cannot be started in case the torque relay is switched off. The torque should be left manually.

Other parameters

Check and, if necessary, change other parameters:

Control signal	4 – 20 mA, 20 – 4 mA, 0 – 20 mA, 20 – 0 mA
Insensitivity	1 – 10 %
Function in case of error	open, close, stop, to position
Time of torque blocking in end-limit positions	0 – 20 s
Position of torque blocking in end-limit positions	1 – 10 %
Output of position signal	4 – 20 mA, 20 – 4 mA
Function READY	combined error

Note: Signal READY is brought out as contact of the relay on the terminal board. If the state ERROR or WARNING is not detected (setting can be made of what is to be evaluated as error or warning), the contact is closed; in case of error, warning, or if feeding of electronics is interrupted, the contact is opened. The state of the relay READY is indicated by the LED diode on the source board.

AUTODIAGNOSTICS

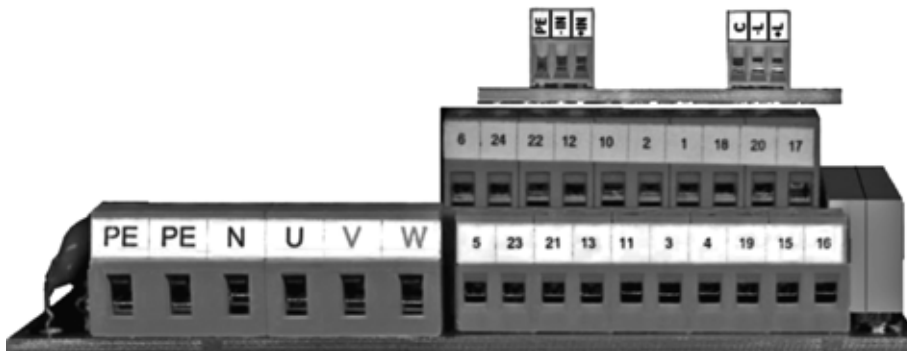
DMS2.ED performs continuously its diagnostics and, if a problem is detected, it reports warning or error. The warning or error is signalized by LED of the display and, possibly, by relay Ready. The warning has no effect on operation of the system, the error stops the actuator.

Assigning or switching off of warnings and errors is set in window “Warning and error” of the setting program (*it is opened by clicking one of parameters Warning 1 – 4 or Error 1 – 4 in window “Parameters”*).

The error or warning are reported by opening the relay READY and by blinking of the red LED diode on the control unit. Particular error is specified by program DMS2 or on the display.

RESTORING PARAMETERS FROM BACKUP

With the feeding switched off, press push-buttons O and C at the same time. Then, switch on feeding and wait until red and yellow LED diodes light on. The backup parameters are read.



Terminal board of actuator with electronics DMS2ED.

If the actuator is of the single-phase version the power supply is connected only to terminals PE, N, U. The terminals V, W remain non-connected. If the actuator is of the version “Replacement of electric-mechanical board” with three-phase electric motor without power relays, the electric motor is connected to a separate terminal board (*not shown here*).

List of warnings and errors

No.	Name	Warning ¹	Error ¹	Description
1	Safe *	X		Input Safe activated
2	Control signal	X		Value of control signal ≤ 3 mA (<i>it applies to ranges 4 – 20/20 – 4 mA</i>)
4	Torque	X		Induced torque beyond end-limit positions or disconnected torque sensor
6	Thermal protection		X	Thermal protection input activated
7	Sense of rotation		X	Reverse sense of rotation (<i>for CONTROL only</i>)
8	EEPROM	X		Wrong control sum of parameters in EEPROM
9	RAM		X	Wrong control sum of parameters in RAM
10	Parameters		X	Wrong parameters in EEPROM
11	Setting regimes	X		Setting regime from push-buttons or PC
12	Torque sensor		X	Disconnected or defective torque sensor
13	Sensor 1		X	Error of sensor of position 1 (<i>lowest stage</i>)
14	Sensor 2		X	Error of sensor of position 2
15	Sensor 3		X	Error of sensor of position 3
16	Sensor 4		X	Error of sensor of position 4 (<i>highest stage</i>)
17	Calibration	X		Autocalibration not carried out
18	Torque setting		X	Wrong setting of torques (<i>parameters Torque O/Z 50/100 %</i>)
19	Stroke		X	Wrong setting of stroke (<i>parameters Position O/Z</i>)
21	High temperature	X		Permitted max. temperature exceeded (<i>parameter Temperature max.</i>)
22	Low temperature	X		Permitted min. temperature exceeded (<i>parameter Temperature min.</i>)
23	LCD internal *	X		Display of LCD internal does not communicate or not added in parameter CAN of configuration
24	LCD external *	X		Display of LCD external does not communicate or not added in parameter CAN of configuration
25	Fieldbus *	X		Module of industrial bus does not communicate or not added in parameter CAN of configuration
26	CAN *	X		Error of bus CAN (<i>short circuit, interruption, only sensor communicates</i>)
27	Fieldbus activity*	X		Connection to industrial bus not active
28	Phase *		X	Inverse order of phases or some phase missing
29	Relay of service life	X		Service life of relay MO/MZ at CONTROL exceeded (<i>parameter Relay of service life</i>)
30	Reset	X		Non-standard Reset of unit induced (<i>watchdog etc.</i>)
31	ROM		X	Wrong control sum of program in ROM
32	CAN version *	X		Sensor, LCD display or module Fieldbus have incompatible versions of firmware
33	Wrong command *		X	Commands Open and Close entered at the same time
34	Wrong inertia	-	-	Wrong inertia measured by autocalibration (<i>for autocalibration only</i>)
35	Wrong run-down	-	-	Wrong run-down measured by autocalibration (<i>for autocalibration only</i>)
41	Wrong position		X	Servo-drive is in position 25 % behind working stroke

¹⁾ Assignment can vary depending on the version of firmware of the sensor control unit.

* Applies to DMS2 only.

Memory of number of induced warnings and errors

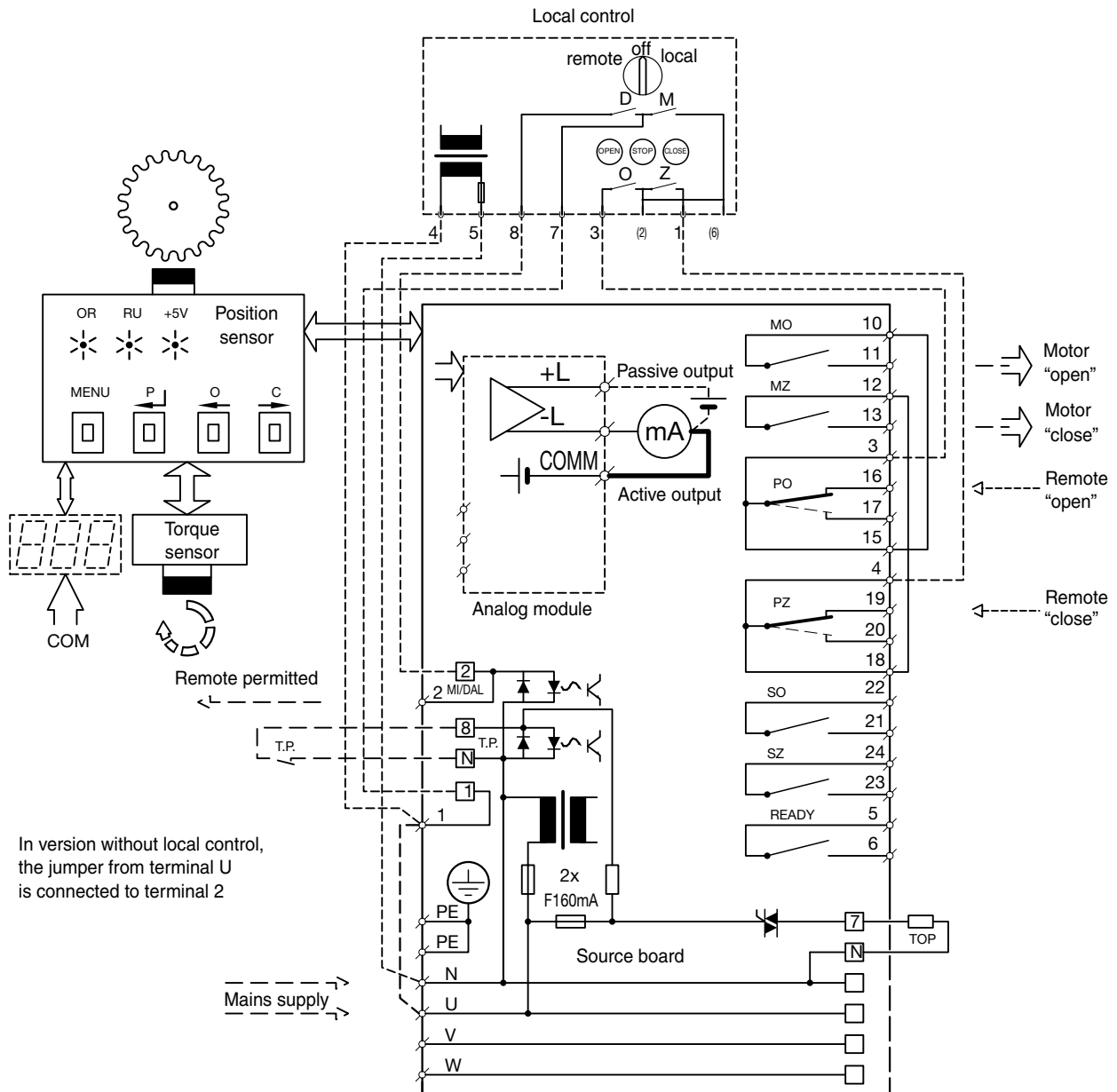
- For all ascertained warnings and errors, DMS2.ED uses counters of occurrence of these warnings and errors during operation of the system.
- Values of the counters are stored to the EEPROM memory and are preserved even in case of the power supply fall-out.
- Reading of the counters is possible by means of the program for PC
- Clearing of the counters is possible by means of the program for PC with the level of authorization “SERVICE”.

Memory of recently induced warnings and errors

- DMS2.ED stores three recently induced warnings and errors to the EEPROM memory.
- Recent warnings and errors can be displayed and erased by means of the program for PC.

Wiring diagram of electronics **DMS2 ED** in version Substitution of electro-mechanical board

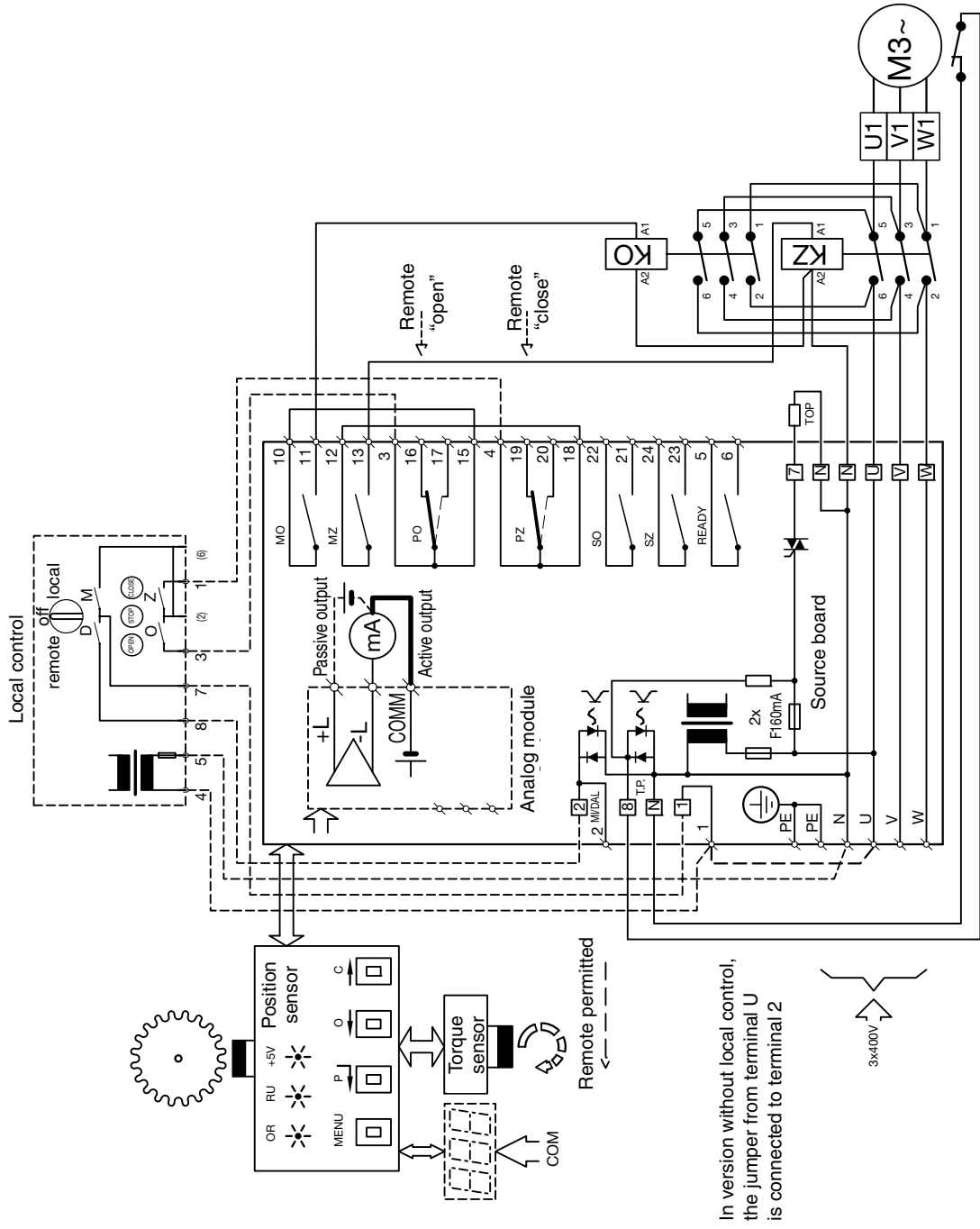
E0021



Note: Here, contacts of relays MO, MZ, SO, SZ are shown with power supply switched off; with power supply switched off contacts PO, PZ are shifted to the position drawn in dashed line.

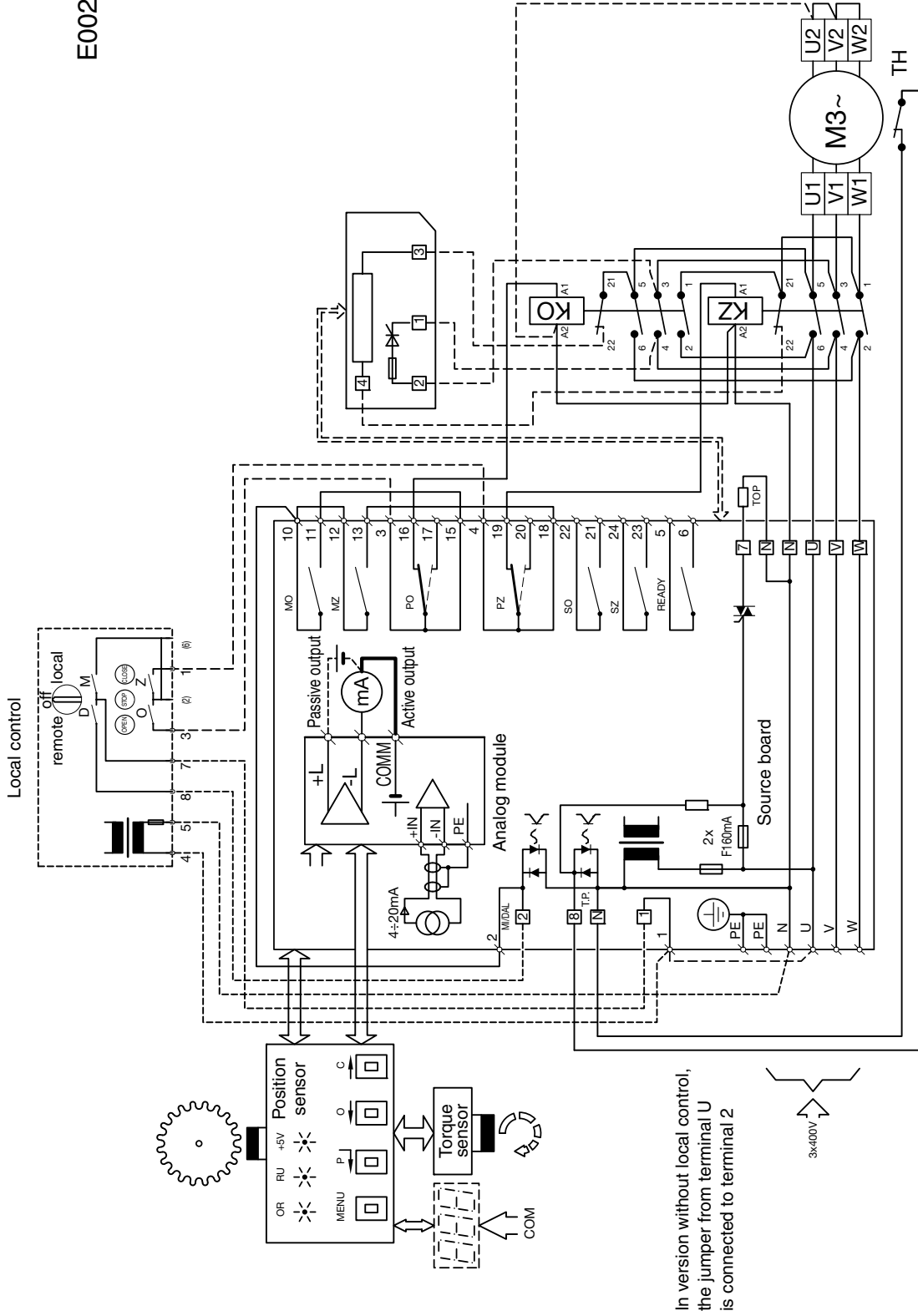
Wiring diagram of electronics **DMS2 ED** in version Substitution of electro-mechanical board with block of contactors

E0022



Wiring diagram of electronics DMS2 ED in version Control with three-phase electric motor

E0023



In version without local control, the jumper from terminal U is connected to terminal 2

Note: Here, contacts of relays MO, MZ, SO, SZ are shown with power supply switched off; with power supply switched on, PO, PZ are shifted to the position drawn in dashed line.

DMS2

Main properties of DMS2:

- Complete control of the actuator run of the two- and three-position regulation or connection to the industrial bus Profibus.
- Synoptic signalization of operation and service data on the character LCD display 2 x 12.
- Autodiagnosics of error reports on the LCD display, memory of recent failures and number of occurrences of respective failures.
- Setting of parameters by the PC program and by local control provided that the actuator is fitted with local control.

Basic outfit:

The control unit is the main part of the system DMS2; it comprises:

- Microcomputer and memory of parameters
- Position sensors
- 2 signalling LED
- Connectors for connecting the torque sensor, relay board, and two-position inputs, source board, communication adapter, LCD display, and local control

Torque unit provides for scanning torque by the contactless sensor

Source unit - two types exist:

DMS2.ZAN for the two-position or three-position control of the actuator by binary signals "Open" and "Close" or by analog signal 0 (4) – 20 mA.

DMS2.ZPR for controlling the actuator by the industrial bus Profibus.

Both units include the feeding source for electronics, two relays for controlling the power switches (*contactors or contactless switches*) of the electric motor, guarding of sequence of phases (*in case the actuator is fed by three-phase voltage*), circuits for connecting the anticondensation heater, and input terminals for connecting the thermo-contact from the electric motor. The units are fitted with the power terminal board for connecting the power supply. The units are fitted with a connector for the display and local control.

Unit DMS2ZAN also contains:

- input circuits for the two-position and three-position control of the actuator and terminals for connecting external control signals
- input of signal SAFE – information on external failure
- relay – total of five; four (*signalling*) can be set for reporting of position, torque, or other operation states of the actuator; the fifth (*Ready*) is used for reporting of errors, warnings, and other states when the actuator cannot faultlessly perform its function, and the terminals to which contacts of the relay are connected
- circuits of the feedback current signal – information on position of the actuator output shaft

Unit DMS2.ZPR also contains:

- circuits for communication with the superior control system through the industrial bus Profibus DP, input and output terminals for connecting the bus, and termination resistors with a switch.

Display unit – two-row display, 2 x 12 alpha-numeric characters

Unit of push-buttons – sensors of push-buttons "*open*", "*close*", "*stop*" and the rotary switch "*local, remote, stop*".

The actuator can be fitted with contactors or contactless switching of the electric motor; it can be fitted with an electronic brake.

PROCEDURE OF SETTING PARAMETERS BY PROGRAM DMS2

Before putting the actuator into operation, it is necessary to set some parameters of the system by means of program DMS2 on PC.

Before adjustment, check the actuator according to the paragraph ASSEMBLING And putting the ACTUATOR into operation.

Warning:

For safety reasons (reduced risk of damage to the actuator by wrong wiring), the system is delivered in the state of the induced error of CALIBRATION when the functions are limited and, during controlling the actuator from program DMS2, its run is stopped if any torque is induced.

Note:

The setting program is the same for electronics DMS2 ED. See the figure on page 14 for the main window and the window of Selection of electronics.

Working torque

- Check and, if necessary, set the value of the working torque 50 – 100 % in program DMS2.

Tripping in end-limit positions

- Check and, if necessary, set the way of tripping in the end-limit positions::
- Torque
- Torque + position O
- Torque + position Z
- Torque + position O + Z

End-limit positions - working stroke

- Position Z
 - Shift to position Closed either manually or by means of menu Motor in program DMS2.
 - The actuator can only be controlled by means of the program if no torque is induced. The torque should be left manually.
 - Press push-button Z to confirm consent with the record.
- Position O
 - Shift to position Open either manually or by means of menu Motor in program DMS2.
 - The actuator can only be controlled by means of the program if no torque is induced. The torque should be left manually.
 - Press push-button O to confirm consent with the record.

Autocalibration

- The autocalibration can only be started by means of the program if no torque is induced. The torque should be left manually.
- The autocalibration is started by push-button Start in program DMS2.
- Wait until the autocalibration is completed; information on its course is signaled next to push-button Start.

Other parameters

Check and, if necessary, change other parameters:

Control signal	4 – 20 mA	20 – 4mA	0 – 20 mA	20 – 0 mA
	2 position	Bus		
Insensitivity	1 – 10 %			
Function SAFE	Open	Close	Stop	To position
Active SAFE	0 V	230 V		
Time of blocking torque in end-limit positions	0 – 20 s			
Position of blocking torque in end-limit positions	1 – 10 %			
Output of position signal	4 – 20 mA	20 – 4 mA		
Function READY - Combined error	Switched off	Warning	Errors	Warning or error
	Errors or not remote	Errors or warning or not remote	Torque "O" or "Z"	
Relay 1 – 4	Switched off	Position O	Position Z	
	Torque O	Torque Z	Torque and position O	Torque and position Z
	Opening position N	Closing	Motion	Position
	Torque O/Z	Local control	Emote control	Control switched off
Position Relay 1 – 4	0 – 100 %			

Note: SAFE - input information on the error of an external device can be set so that the actuator would respond as to its own error.

Autodiagnostics

The table List of errors – same as for electronics DMS2 ED (page 16)

Memory of number of induced errors

- For all detected errors, DMS2 uses the counter of occurrence of these errors during operation of the system.
- Values of the counters are stored to the EEPROM memory and are preserved even in case of the power supply fall-out.
- Reading and clearing of the counters is possible by means of the program for PC.

Memory of recently induced errors

- DMS2 stores 3 recently induced errors to the memory EEPROM.
- DMS2 provides for displaying the errors by means of the PC program or the switches of the local/ remote control.
- The display in MENU 22 INFORMATION shows ERROR 1, ERROR 2, ERROR 3. ERROR 1 is the latest error.

Setting parameters by means of push-buttons of local control

Signalization of operation regimes by means of diodes LED on the position sensor board:

Red	Green	State
-	-	System without feeding
-	lit on	Everything OK – working regime (<i>remote, local, or switched off control</i>)
blinking	lit on	Error or warning – working regime (<i>remote, local, or switched off control</i>)
lit on	lit on	Setting parameters by means of push-buttons or PC

Signalization of operation regimes by means of the display:

The display shows the actuator position in %, the state of local control and/or reaching of torque. In case of an error, blinking of this state alternates with number of actual error. In case of more errors, these errors repeat cyclically.

Overview of MENU

	Name	Parameter value	Meaning
1	JAZ/LANGUAGE	CESKY	Menu LANGUAGE
		ENGLISH	
2	POLOHA O, Z	POL.OTEVR.	End-limit position Open or Closed
		POL.ZAVRENO	
3	KALIBRACE	SPUSTIT	Starting of autocalibration
4	KONCOVA POL.	MOMENT	Tripping in end-limit positions
		MOMENT+POL.O	
		MOMENT+POL.Z	
		MOMENT+P.O+Z	
5	MOMENT PR. O	50 – 100 %	Working torque Open (<i>selection 50 – 69 % depends on parameter Torque min.</i>)
6	MOMENT PR. Z	50 – 100 %	Working torque Closed (<i>selection 50 – 69 % depends on parameter Torque min.</i>)
7	CAS BLOK.MOM	0 – 20 s	Time of torque blocking
8	POLOHA BL. O	0 – 50 %	Position of torque blocking Open
9	POLOHA BL. Z	0 – 50 %	Position of torque blocking Closed
10	CPT	4 – 20 mA	Characteristics of current transducer
		20 – 4 mA	
11	RIDICI SIGN.	4 – 20 mA	Analog control signal
		20 – 4 mA	
		0 – 20 mA	
		20 – 0 mA	
12	NECITLIVOST	1 – 10 %	Range of insensitivity
13	SAFE	OTEVIRAT	Response to signal Safe and loss of control signal
		ZAVIRAT	
		ZASTAVIT	
		POLOHA	

	Name	Parameter value	Meaning
14	SAFE AKTIV.	0 V 230 V	Active signal Safe
15	TP SAFE	blokuje SAFE SAFE aktivni	Response with thermal protection activated
16	TP NULOVANI	AUTOMATICKY MISTNIM OVL.	Zeroing of thermal protection
17	RELE READY	VYPNUTO VAROVANI CHYBY VAR.+CHYBY CHYBY+NENÍ D VAR+CHYBY+ND MOMENT O/Z	Function of Relay Ready
18	RELE 1	VYPNUTO POL.OTEVRENO POL. ZAVRENO MOM.OTEVRENO MOM. ZAVRENO POL.O.+MOM.O POL.Z.+MOM.Z OTEVIRA ZAVIRA POHYB POLOHA POL. N. OVL. MISTNI OVL. DALKOVE OVL. VYPNUTO MOMENT O/Z POHYB-BLIKAC	Function of Relay 1
19	RELE 2	same as RELE 1	Function of Relay 2
20	RELE 3	same as RELE 1	Function of Relay 3
21	RELE 4	same as RELE 1	Function of Relay 4
22	INFORMACE	SNIMAC DISP I DISP E DISP ED FLDBUS CHYBA 1 CHYBA 2 CHYBA 3 MOMENT TEPLOTA	Information on the system
23	ZALOHA PAR	OBNOVIT PAR VYTVORIT ZAL	Creation of backup parameters, restoring from backup parameters
24	ADRESA	1 – 125	Address of actuator on industrial bus
25	TAKT MOD	VYPNUTO SMER O SMER Z SMĚR O+Z	Mode of cycle regime
26	TAKT BEH	1 – 250 s	Time of motor run down in cycle regime
27	TAKT PAUSA	1 – 250 s	Time of motor pause in cycle regime

Setting actuator by means of push-buttons:

- Shift the change-over switch of local control to position OFF
- Keep pressing push-button STOP to enter the MENU. Using push-buttons O or Z, browse through the MENU (*MENU1 – MENU27*). Shortly press push-button STOP in a selected menu to enter this menu and, using push-buttons O or Z, select the parameter. Keep pressing push-button STOP to store the parameter to memory. Shortly press push-button STOP to exit the setting of parameters and proceed with browsing through another menu.

Keep pressing push-button STOP to exit the set menu; or keep pressing push-button STOP in the item END after the last MENU 27 to terminate the setting regime.

Setting end-limit positions by means of push-buttons of local control

Shift the change-over switch LOCAL – REMOTE to position OFF. Keep pressing push-button STOP to enter the setting regime. Using push-button “Z”, choose MENU2. Shortly press push-button STOP to select setting of position “O”. Shift the change-over switch to position “LOCAL” and start the actuator. After the required position is reached, shift the switch to position “OFF” and keep pressing of push-button “STOP” to store the position to memory.

Shortly press push-button “Z” to select setting of position “Z”. Shift the change-over switch again to position “LOCAL” and start the actuator in direction “Z”. After the required position is reached, shift the switch to position “OFF” and keep pressing push-button “STOP” to store the position to memory.

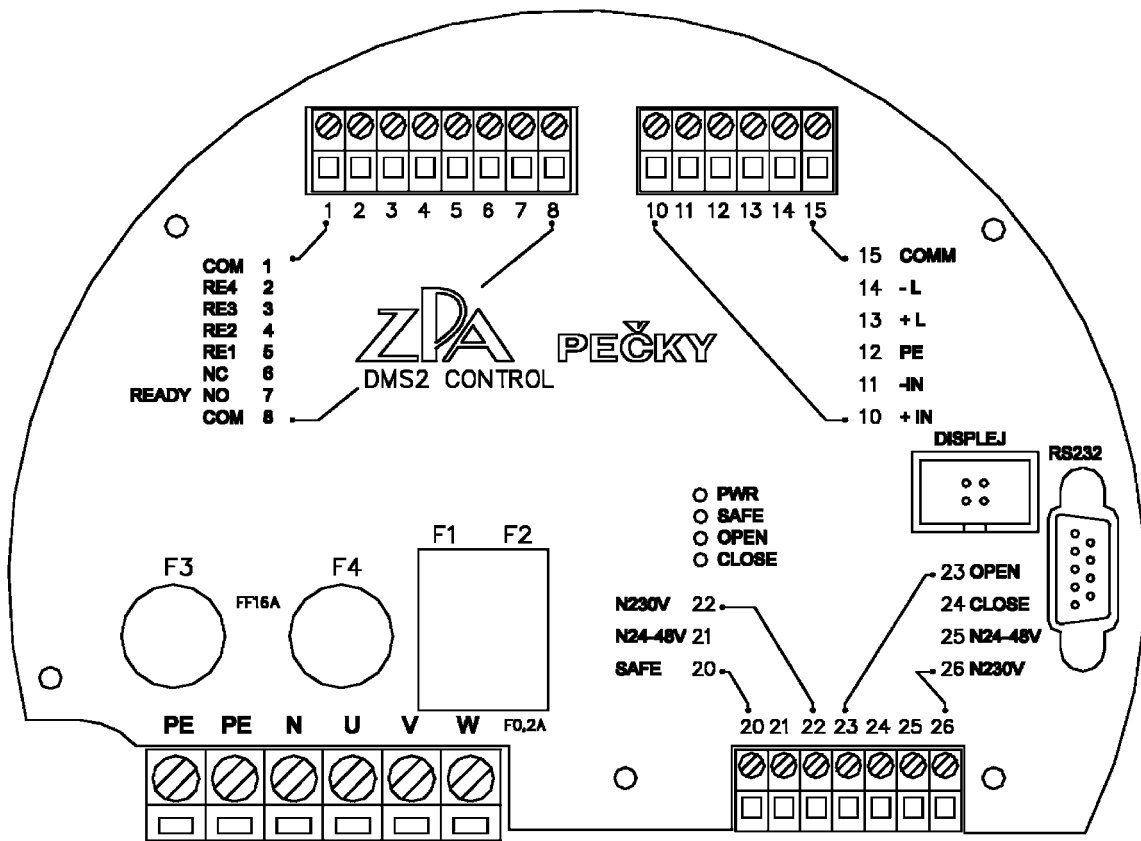
Shortly press push-button “STOP” to exit MENU 2. Keep pressing push-button “STOP” to exit the setting regime.

Change over the local control to position OFF, enter the menu (*by long pressing of push-button STOP*), and change over to position “LOCAL”; the actuator can now be shifted by means of push-buttons “O” and “Z” beyond the set end-limit positions. In this case, the actuator will trip after the set tripping torque is reached.

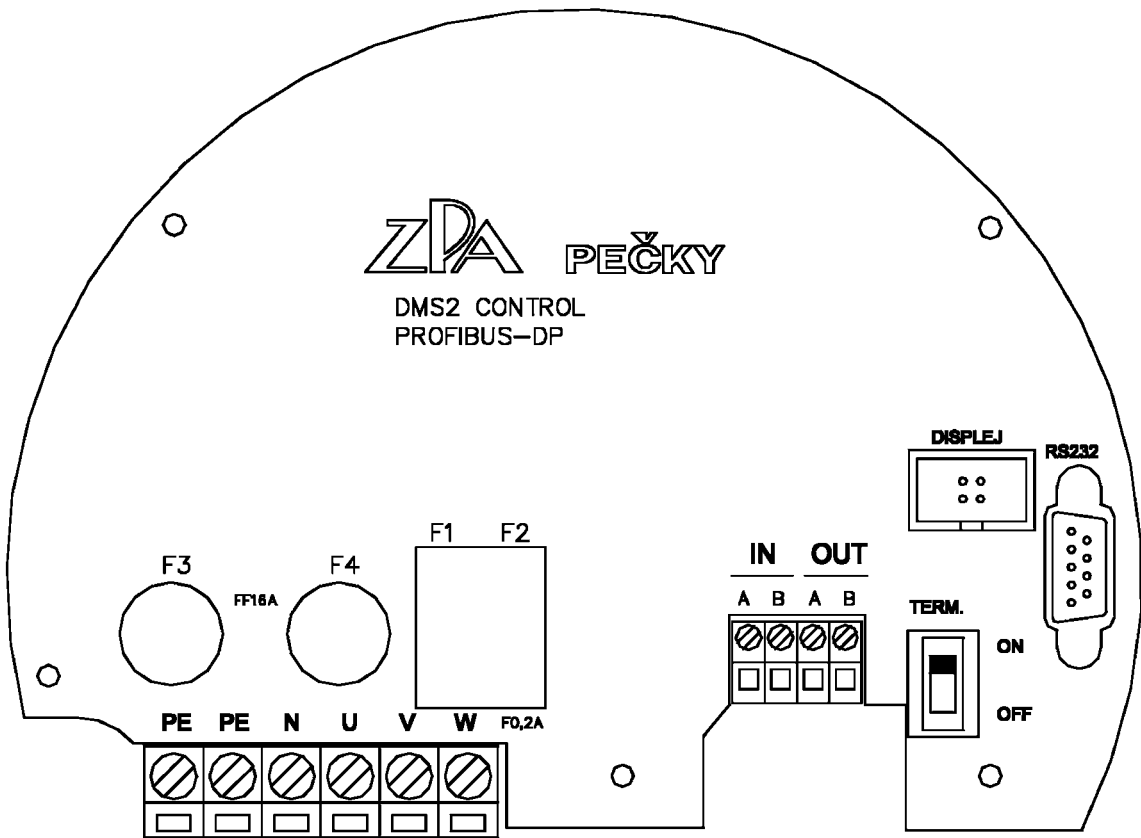
Autocalibration

In the setting regime choose MENU 3. Shortly press push-button “STOP” to enter MENU 3 and keep pressing push-button “STOP” to start autocalibration. By short starting of the motor in both directions, the actuator will measure inertia. Completion of the autocalibration is announced by the message AUTOCALIBRATION OK.

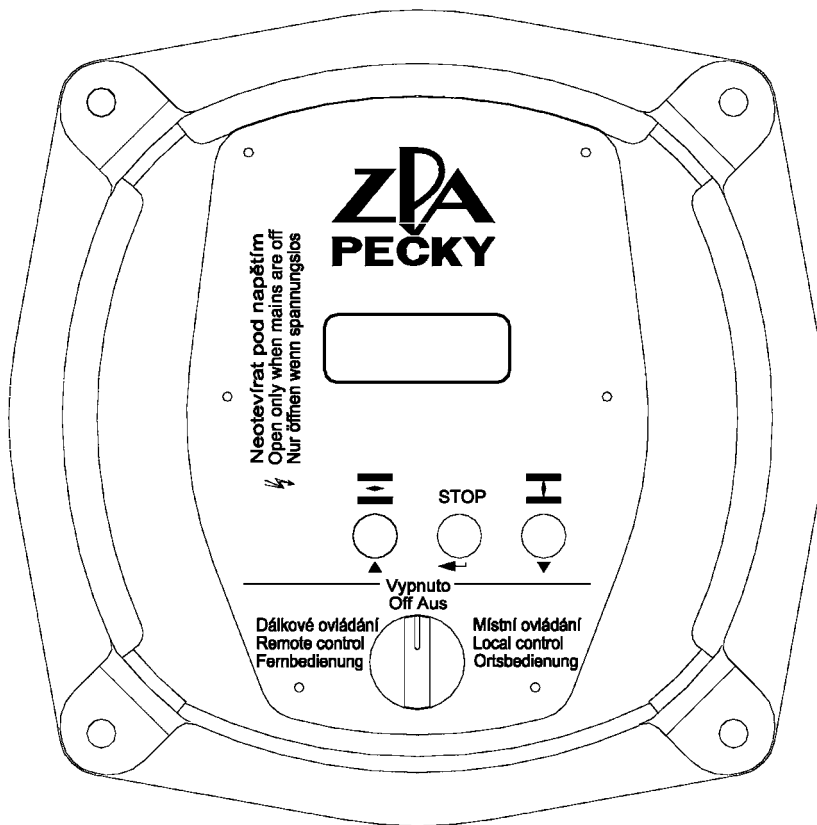
Shortly press push-button “STOP” to return to MENU 3 and keep pressing of push-button “STOP” to exit the setting regime.



Terminal board of DMS2 Analog



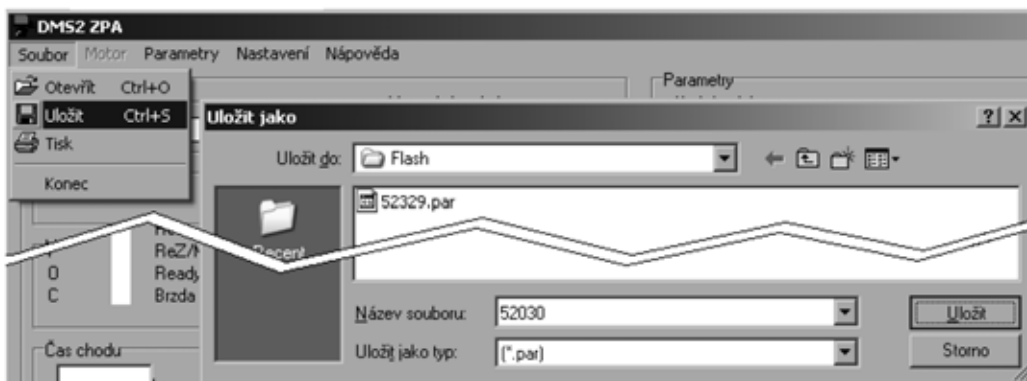
Terminal board of DMS2 Profibus



DMS2 - local control and display

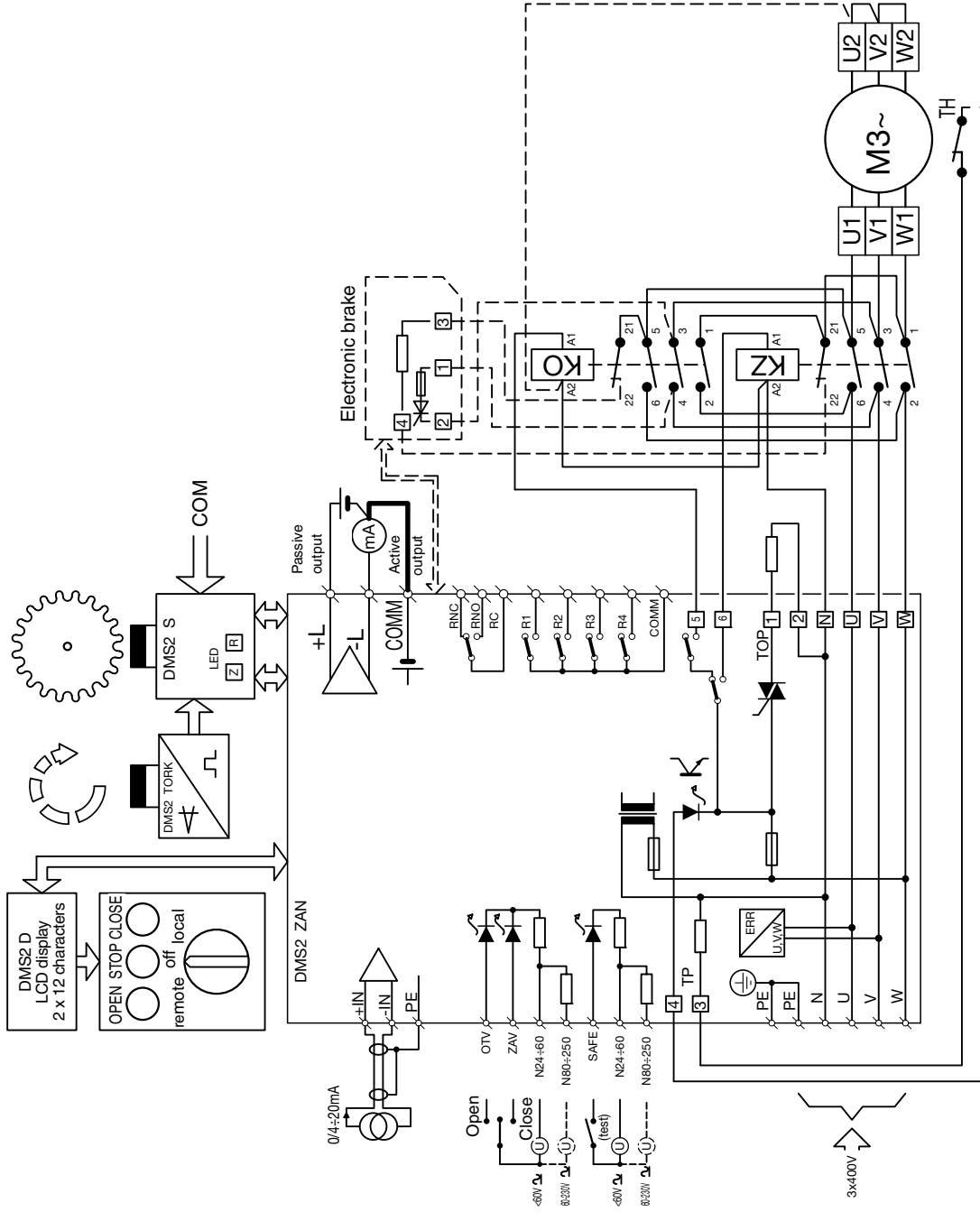
Note:

The setting program enables data to be copied from the memory of parameters of the electronics DMS2 and DMS2 ED into the computer as a file with suffix "par" (in the example in the figure the file 52 030.par is created in the directory Flash). The file can serve as a back-up for the case that it will be necessary to replace the position sensor in the given actuator and to set it in the same way as the replaced one; or it can be sent as an enclosure to e-mail to the manufacturing or service firm in solving possible problems..



Wiring diagram of electronics **DMS2 Analog** in version (for 2P or 3P regulation) with three-phase electric motor

E0006



Wiring diagram of electronics **DMS2 Profibus** with three-phase electric motor

E0008

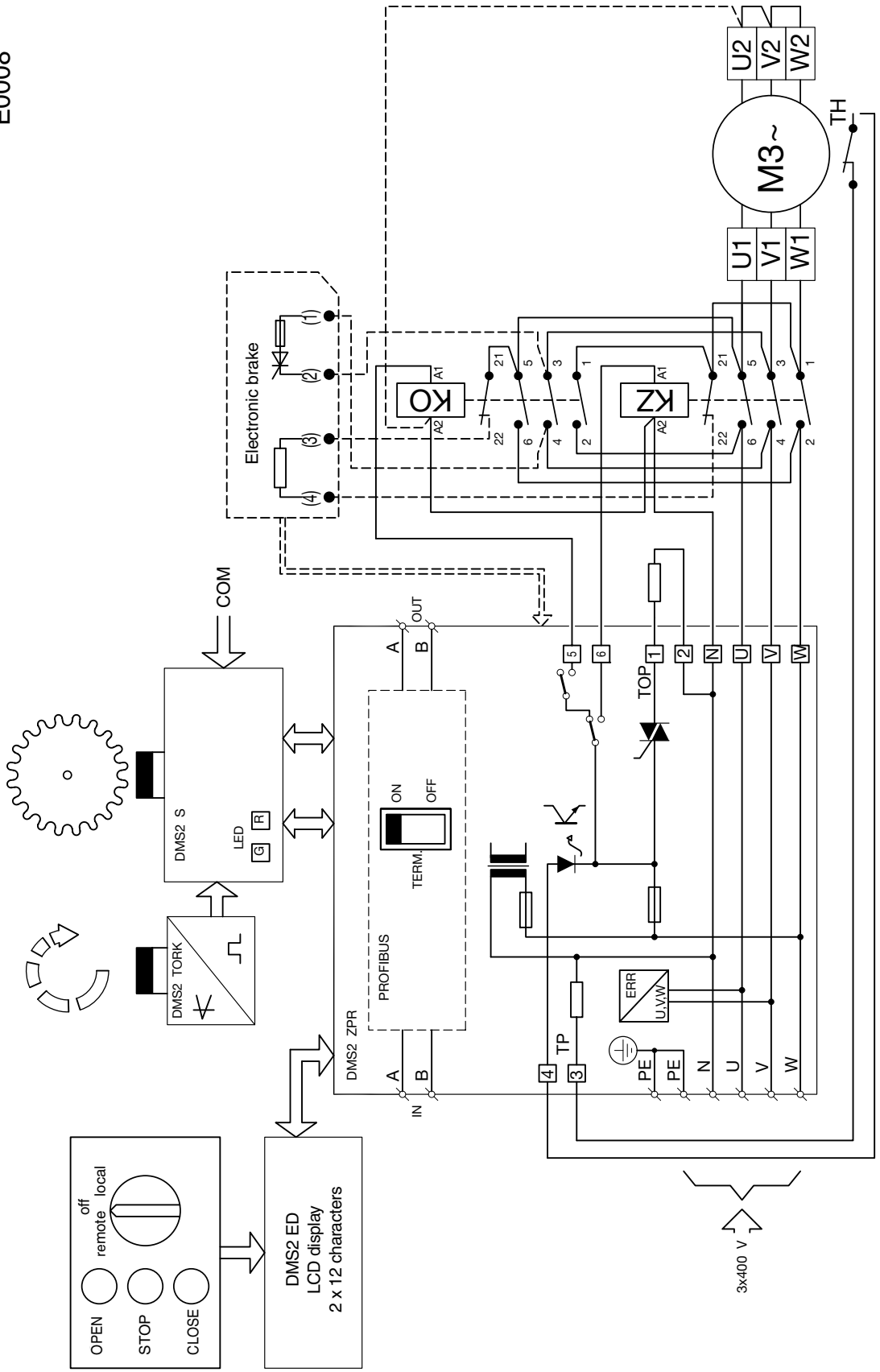


Table 1 – MODACT MOED EEx with AVM electric motors
– basic technical parameters and designs

Basic outfit: 1 electric motor type AVM 1 anti-condensation heater														
Type designation	Torque [Nm]		Adjusting speed [RPM]	Working stroke [rev.]	Type of lubricant	Electric motor					Weight [kg]		Type number	
	tripping	starting				Type AVM	Power [kW]	Speed [1/min]	In (400 V)	Iz In	Design		basic 1 2 3 4 5	supplementary 6 7 8 9 10 11
			cast-iron	alumin.										
MOED EEx 40/90 - 25	20 - 40	90	25	2 - 1980		71MK04	0,25	1360	0,75	3,4	–	47	52120	xx1xxxx
MOED EEx 40/80 - 40	20 - 40	80	40			71M04	0,37	1360	1,05	3,1	–	49		xx2xxxx
MOED EEx 63/90 - 25	40 - 63	90	25			71MK04	0,25	1360	0,75	3,4	–	43		xx3xxxx
MOED EEx 63/80 - 40	40 - 63	80	40			71M04	0,37	1360	1,05	3,1	–	49		xx4xxxx
MOED EEx 100/130 - 25	63 - 100	130	25			71M04	0,37	1360	1,05	3,1	–	49		xx5xxxx
MOED EEx 125/160 - 11	80 - 125	160	11			71MK04	0,25	1360	0,75	3,4	–	47		xx6xxxx
MOED EEx 100/130 - 25	63 - 100	130	25	2 - 1400		80MK06	0,37	910	1,1	3,3	70	57	52121	xx1xxxx
MOED EEx 100/130 - 40	63 - 100	130	40			80MK04	0,55	1390	1,45	4,2	71	58		xx2xxxx
MOED EEx 85/110 - 63	63 - 85	110	63		♣	80M04	0,75	1380	1,9	3,9	71	58		xx3xxxx
MOED EEx 85/110 - 100	63 - 85	110	100		♣	90LK04	1,1	1410	2,7	4,6	78	65		xx4xxxx
MOED EEx 160/210 - 16	100 - 160	210	16			80MK06	0,37	910	1,1	3,3	70	57		xx5xxxx
MOED EEx 160/210 - 25	100 - 160	210	25			80M06	0,55	910	1,6	3,4	70	57		xx6xxxx
MOED EEx 130/170 - 40	100 - 130	170	40			80M04	0,75	1380	1,9	3,9	71	58		xx7xxxx
MOED EEx 130/170 - 65	100 - 130	170	65		♣	90LK04	1,1	1410	2,7	4,6	78	65		xx8xxxx
MOED EEx 130/170 - 100	100 - 130	170	100		♣	90L04	1,5	1410	3,4	4,8	79	66		xx9xxxx
MOED EEx 160/210 - 125	100 - 160	210	125		♣	90L02	2,2	2865	4,5	6,0	80	67		xxAxxxx
MOED EEx 250/325 - 10	160 - 250	325	10	52122		80MK06	0,37	910	1,1	3,3	70	57	xx0xxxx	
MOED EEx 250/325 - 16	160 - 250	325	16			80M06	0,55	910	1,6	3,4	71	58	xx1xxxx	
MOED EEx 210/280 - 25	160 - 210	280	25			90LK06	0,75	940	2,1	3,9	81	68	xx2xxxx	
MOED EEx 210/280 - 40	160 - 210	280	40			90LK04	1,1	1410	2,7	4,6	78	65	xx3xxxx	
MOED EEx 210/280 - 65	160 - 210	280	65		♣	90L04	1,5	1410	3,4	4,8	79	66	xx4xxxx	
MOED EEx 250/330 - 80	160 - 250	330	80		♣	90L02	2,2	2865	4,5	6,0	80	67	xx5xxxx	
MOED EEx 400/520 - 16	250 - 400	520	16	2 - 1080		90L08	0,75	695	2,6	3,3	126	113	52123	xx0xxxx
MOED EEx 400/520 - 25	250 - 400	520	25			90L06	1,1	935	2,9	4,1	125	112		xx1xxxx
MOED EEx 500/650 - 40	250 - 500	650	40			112M06	2,2	945	5,4	5,0	146	126		xx2xxxx
MOED EEx 400/520 - 63	250 - 400	520	63		♣	100L04	3,0	1435	6,5	5,9	132	112		xx3xxxx
MOED EEx 400/520 - 100	250 - 400	520	100		♣	112M04+	4,0	1430	8,5	6,5	150	130		xx4xxxx
MOED EEx 630/820 - 16	320 - 630	820	16			100L08+	1,1	690	3,1	3,6	128	108		xx0xxxx
MOED EEx 550/715 - 25	320 - 550	715	25	52124		100L06+	1,5	940	3,9	4,9	128	108	xx1xxxx	
MOED EEx 630/820 - 63	320 - 630	820	63		♣	112M04+	4,0	1430	8,5	6,5	150	135	xx2xxxx	
MOED EEx 960/1250 - 32	630 - 960	1250	32		♣	132M08+	3,0	725	7,3	5,5	239		xx1xxxx	
MOED EEx 1100/1400 - 45	630 - 1100	1400	45	2 - 1080	♣	132MK06+	4,0	975	9,2	7,0	240		52125	xx2xxxx
MOED EEx 1100/1400 - 63	630 - 1100	1400	63		♣	132M06+	5,5	970	12,5	6,5	248			xx3xxxx
MOED EEx 920/1200 - 100	630 - 920	1200	100		♣	132M04+	7,5	1455	15,5	6,8	243			xx4xxxx

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 – 11th places of the type number should be completed with respective digit or letter from Tables 3 – 6.
– Rated currents for different feeding voltages than those given in the table are available on request at the manufacturer.
♣ – Mark of actuators filled with oil. Other actuators are filled with plastic lubricant.

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

Basic outfit: 1 electric motor type 4KTC 1 anti-condensation heater																	
Type designation	Torque [Nm]		Adjusting speed [RPM]	Working stroke [rev.]	Type of lubricant	Electric motor					Weight [kg]		Type number				
	tripping	starting				Type 4KTC	Power [kW]	Speed [1/min]	In (400 V)	Iz In	Design		basic 1 2 3 4 5	supplementary 6 7 8 9 10 11			
			cast-iron	alumin.													
MOED EEx 40/90 - 25	20 - 40	90	25	2 - 1980		71A - 4	0,25	1355	0,75	3,8	–	49	52120	x x A x x x			
MOED EEx 40/80 - 40	20 - 40	80	40			71B - 4	0,37	1350	1,05	3,8	–	50		x x B x x x			
MOED EEx 63/90 - 25	40 - 63	90	25			71A - 4	0,25	1355	0,75	3,8	–	49		x x C x x x			
MOED EEx 63/80 - 40	40 - 63	80	40			71B - 4	0,37	1350	1,05	3,8	–	50		x x D x x x			
MOED EEx 100/130 - 25	63 - 100	130	25			71B - 4	0,37	1350	1,05	3,8	–	50		x x E x x x			
MOED EEx 125/160 - 11	80 - 125	160	11			71A - 4	0,25	1355	0,75	3,8	–	49		x x F x x x			
MOED EEx 100/130 - 25	63 - 100	130	25	2 - 1400		80A - 6	0,37	925	1,1	3,6	76	63	52121	x x B x x x			
MOED EEx 100/130 - 40	63 - 100	130	40			80A - 4	0,55	1410	1,38	4,6	76	63		x x C x x x			
MOED EEx 100/130 - 63	63 - 100	130	63			♣ 80B - 4	0,75	1400	1,8	5,0	77	64		x x D x x x			
MOED EEx 100/130 - 100	63 - 100	130	100			♣ 90S - 4	1,1	1410	2,4	5,4	83	70		x x E x x x			
MOED EEx 160/210 - 16	100 - 160	210	16			80A - 6	0,37	925	1,1	3,6	76	63		x x F x x x			
MOED EEx 160/210 - 25	100 - 160	210	25			80B - 6	0,55	915	1,5	4,1	76	63		x x H x x x			
MOED EEx 160/210 - 40	100 - 160	210	40			80B - 4	0,75	1400	1,8	5,0	77	64		x x I x x x			
MOED EEx 160/210 - 65	100 - 160	210	65			♣ 90S - 4	1,1	1410	2,4	5,4	83	70		x x J x x x			
MOED EEx 160/210 - 100	100 - 160	210	100			♣ 90L - 4	1,5	1405	3,25	5,8	86	73		x x K x x x			
MOED EEx 160/210 - 125	100 - 160	210	125			♣ 90L - 2	2,2	2845	4,4	6,9	86	73		x x L x x x			
MOED EEx 250/325 - 10	160 - 250	325	10	2 - 1400		80A - 6	0,37	925	1,1	3,3	76	63	52122	x x A x x x			
MOED EEx 250/325 - 16	160 - 250	325	16			80B - 6	0,55	915	1,5	3,4	77	64		x x B x x x			
MOED EEx 250/325 - 25	160 - 250	325	25			90L - 6	1,1	915	3,0	4,1	87	74		x x C x x x			
MOED EEx 250/325 - 40	160 - 250	325	40			90S - 4	1,1	1410	2,4	5,4	83	73		x x D x x x			
MOED EEx 210/280 - 65	160 - 210	280	65			♣ 90L - 4	1,5	1405	3,25	5,8	86	73		x x E x x x			
MOED EEx 250/325 - 80	160 - 250	325	80			♣ 90L - 2	2,2	2845	4,4	6,9	86	73		x x F x x x			
MOED EEx 500/650 - 16	250 - 500	650	16	2 - 1080		100LB - 8	1,1	695	3,25	3,8	135	122	52123	x x A x x x			
MOED EEx 500/650 - 25	250 - 500	650	25			100L - 6	1,5	930	3,7	4,7	134	121		x x B x x x			
MOED EEx 500/650 - 40	250 - 500	650	40			112M - 6	2,2	960	5,0	6,1	153	133		x x C x x x			
MOED EEx 400/520 - 63	250 - 400	520	63			♣ 100LB - 4	3,0	1400	6,4	5,3	137	117		x x D x x x			
MOED EEx 400/520 - 100	250 - 400	520	100			♣ 112M - 4	4,0	1430	8,2	6,6	151	131		x x E x x x			
MOED EEx 550/715 - 16	320 - 550	715	16			100LB - 8	1,1	695	3,25	3,8	137	117		x x A x x x			
MOED EEx 630/820 - 25	320 - 630	820	25			100L - 6	1,5	930	3,7	4,7	137	117		x x B x x x			
MOED EEx 630/820 - 63	320 - 630	820	63			♣ 112M - 4	4,0	1430	8,2	6,6	151	131		x x C x x x			
MOED EEx 950/1235 - 32	630 - 950	1235	32	2 - 1080		♣ 132M - 8	3,0	710	7,2	4,8	237		52125	x x A x x x			
MOED EEx 950/1235 - 45	630 - 950	1235	45			♣ 132MA - 6	4,0	960	8,8	6,3	240			x x B x x x			
MOED EEx 950/1235 - 63	630 - 950	1235	63			♣ 132MB - 6	5,5	955	11,8	6,1	247			x x C x x x			
MOED EEx 950/1235 - 100	630 - 950	1235	100			♣ 132M - 4	7,5	1445	14,8	6,5	245			x x D x x 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 – 11th places of the type number should be completed with respective digit or letter from Tables 3 – 6.
 – Rated currents for different feeding voltages than those given in the table are available on request at the manufacturer.
 ♣ – Mark of actuators filled with oil. Other actuators are filled with plastic lubricant.

Explosion – proof electric rotary multi-turn actuators MODACT MOED EEx

Place in the type number	1	2	3	4	5		6	7	8	9	10	11
Type number	5	2	1	2	x	.	x	x	x	x	ED	x

6th place of type number:

Table 3 – Connecting dimensions

Connecting dimensions according ISO and DIN	Shape A	5
	Shape B	6
	Shape C	7
	Shape D	8
	Shape E	9
Connecting dimensions according OST (Russia)	Connection M	M
	Connection A	A
	Connection Б	B
	Connection B	V
	Connection Г	G

According to the actuators size, the connection OST (Russia) is as follows:

Type number 52 120	Connection M, A, Б
Type number 52 121 and 52 122	Connection A, Б, B
Type number 52 123 and 52 124	Connection Б, B
Type number 52 125	Connection B, Г

7th place of type number:

If one of numerals 1, 3, 5, 7 or 9 is on the 9th place of the type number the character from Table 4 is on the 7th place.

If one of numerals 2, 4, 6 or 8 is on the 9th place of the type number the character from Table 5 is on the 7th place.

Table 4 – Actuator fitted with electronics DMS2 ED

Outfit	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	M	N	V	W	
Local control		x		x		x		x		x		x		x		x		x		x	
Display			x	x			x	x			x	x			x	x				x	x
Contactors or contact-less switching					x	x	x	x					x	x	x	x	x	x	x	x	
Analog module																					
transmitter									x	x	x	x	x	x	x	x	x	x	x	x	
regulator																	x	x	x	x	

Table 5 – Actuator fitted with electronics DMS2

Two-position or three-position control *)	R
Profibus	P

*) Two- or three-position regulation of the actuator is set at the manufacturer. Unless otherwise specified in the order, the actuator will be set for three-position regulation (control by signal 4 – 20 mA).

8th place of type number:

Tripping torque, adjusting speed – Table 1 or 2

9th place of type number:

Table 6 – Type of electronics, power switches, brake

Electronics DMS2 ED – without contactors	1
Electronics DMS2 – with contactors	2
Electronics DMS2 ED – with contact-less switches	3
Electronics DMS2 – with contact-less switches	4
Electronics DMS2 ED – with contactors and brake	5
Electronics DMS2 – with contactors and brake	6
Electronics DMS2 ED – with contact-less switches and brake	7
Electronics DMS2 – with contact-less switches and brake	8
Electronics DMS2 ED – with contactors	9

10th place of type number:

ED – actuators with electronics DMS2 or DMS2 ED

11th place of type number:

Table 7 – Ambient temperatures

For ambient temperature of -25 °C to +55 °C	without designation
For ambient temperature of -50 °C to +55 °C *)	F

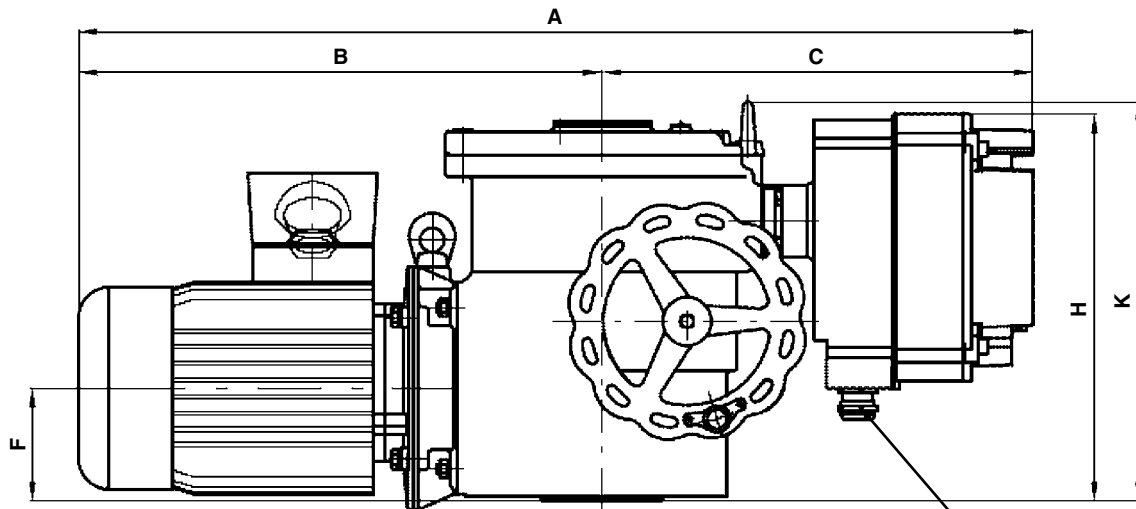
*) The electronic outfit should be discussed with the manufacturer.

**Table 8 – Cable entries of electric motors used in multi-revolution actuators
MODACT MOED EEx**

Type of electric motor	Axial height of motor	Number of entries x range of cable Ø (thread size)
AVM	71, 80, 90, 100	1 x ø 13 to 16 mm
	112, 132	2 x ø 17 to 20 mm
4KTC	71	2 x ø 6 to 12 mm (M20 x 1,5)
	80, 90, 100	1 x ø 6 to 12 mm (M20 x 1,5)
		1 x ø 13 to 18 mm (M25 x 1,5)
	112	1 x ø 6 to 12 mm (M20 x 1,5)
		1 x ø 13 to 18 mm (M32 x 1,5)
	132	1 x ø 6 to 12 mm (M20 x 1,5)
2 x ø 13 to 18 mm (M32 x 1,5)		

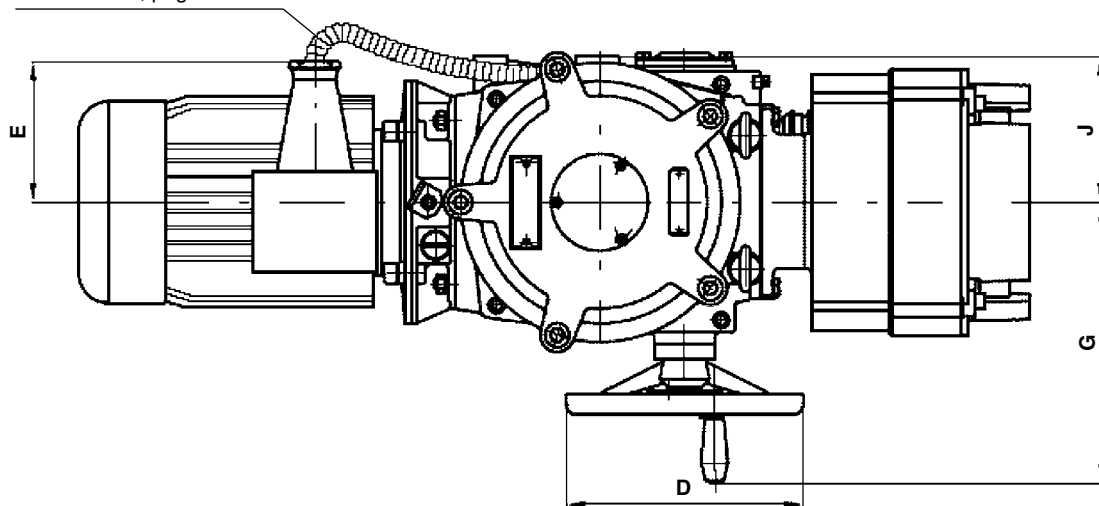
The above listed cable entries of electric motors (see the table) and the actuator (see the dimensional sketch on page 33) are available as a standard. Requirement for other diameters of connecting cables should be specified in the order.

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



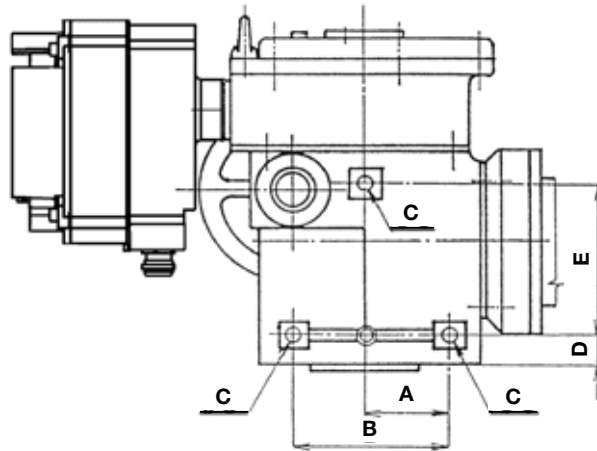
Dimensions of cable entries of electric motors are shown in Table no. 8, page 32

2 x M25 x 1,5, cable \varnothing 13 – 18
1 x M20 x 1,5, cable \varnothing 10 – 14



Dimension	Type number			
	52 120	52 121, 2	52 123, 4	52 125
A max.	662	791	915	1049
B max.	340	462	573	684
C	322	329	342	365
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.	336	348	412	468
J	90	120	145	178
K	315	335	400	442

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

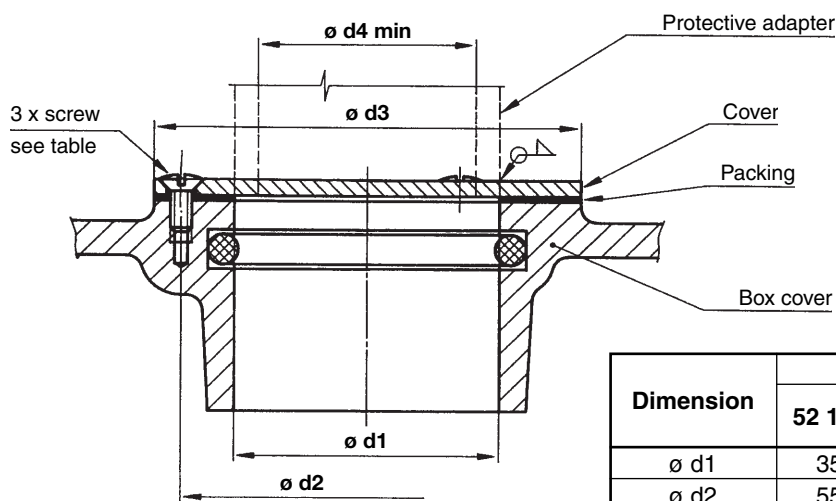


Dimension	Type number			
	52 120	52 121, 2	52 123, 4	52 125
A	61	90	110	120
B	110	160	210	240
C	M 10	M 12	M 16	M 20
D	16	21	23	47
E	120	140	200	220

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
ø d1	35	50	75	80
ø d2	55	70	100	100
ø d3	65	80	112	112
ø d4	28	41.5	53	72

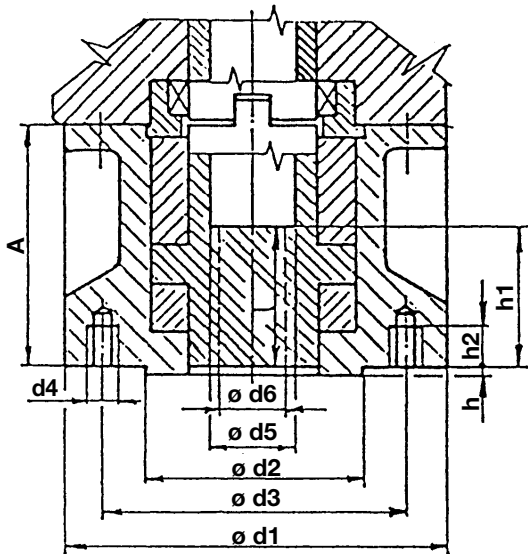
Screw ISO 2010 (ČSN 021155)	M4x10	M4x10	M5x10	M5x10
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Table of connecting dimensions of the **MODACT MOED EEx** electric actuators
(without adapters)

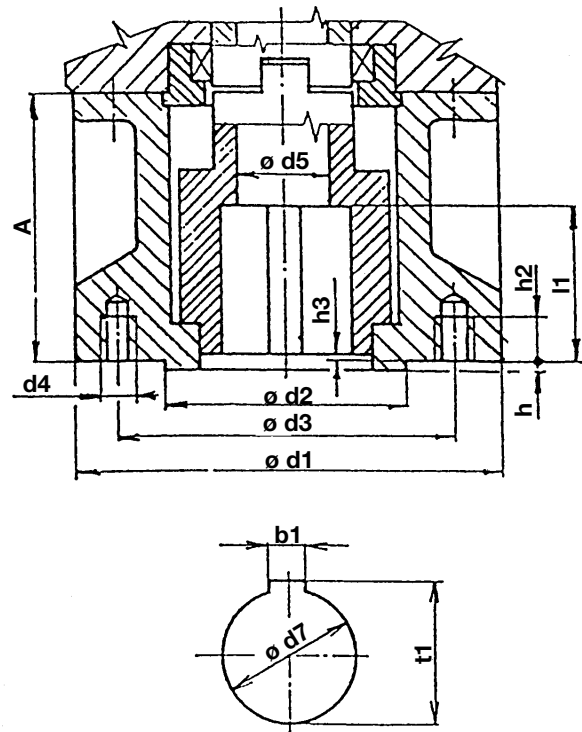
Shape	Dimension	Type number / Flange			
		52 120	52 121, 2	52 123, 4	52 125
C, D, B3	\varnothing d1 (orientation value)	125	175	210	300
	\varnothing d2 f8	70	100	130	200
	\varnothing d3	102	140	165	254
	d4	M 10	M 16	M 20	M 16
	Number of tapped holes	4	4	4	8
	$h \begin{matrix} 0 \\ -0,2 \end{matrix}$	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 MOED 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
A	h2 min.	12,5	20	25	20
	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
B1	l min.	45	55	70	90
	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	

8) ASSEMBLING AND PUTTING THE ELECTRIC ACTUATOR INTO OPERATION

Upon receipt of the actuator from the factory, it is essential to check that no damage was caused during transport and to compare the data on the actuator rating plates with those contained in the order and accompanying documentation. Any discrepancy, defect or damage should be immediately reported to the supplier. Putting into operation is excluded in this case. Upon receipt of the actuator from the factory, it is essential to check that no damage was caused during transport and to compare the data on the actuator rating plates with those contained in the order and accompanying documentation. Any discrepancy, defect or damage should be immediately reported to the supplier. Any discrepancy, defect or damage should be immediately reported to the supplier. If the actuator is to be stored for a longer period than 3 years then, prior to commissioning, oil refilling should be made. Any manipulation of the equipment at a temperature below - 25°C is forbidden. Storing the actuator out of doors or at a location that is not protected against the effects of rain, snow or ice accretion should be avoided. Before putting the actuator into operation, slush should be removed. When unpacked actuators are to be stored longer than 3 months it is advisable to place a bag with silica gel or another suitable desiccant in the terminal box.

The user can only put into operation electric installations with compliance documented by a report of the initial revision. Before fitting in place, the actuator should be carefully inspected, particularly in case that it has been stored for a prolonged period; the following should be checked:

- condition of parts and connections forming explosion-proof closure;
- insulation resistance of the motor winding;
- possible damage during storage;

It should also be checked that location corresponds to provisions of the par. "Working conditions". If different way of assembly is required by local conditions the manufacturer should be contacted.

The protective conductor must be connected to a protective terminal marked according to ČSN IEC 417. On the actuator, the protective terminals are located on the body and inside the actuator, on the control board at the terminal board.

Note: Before connecting and adjusting the actuators MODACT MOED EEx in an environment with danger of explosion of an explosive gaseous atmosphere, the space where the actuator is to be installed should be ventilated.

Connection

The actuator should be connected according to the wiring diagram placed inside the cover in such a way that power supply wires have permanent good contact with the connecting terminals. The supply voltage must correspond to the voltage stated on the rating plate of the actuator. Internal space of the cover should be clean and dry. No free wires may stick out of the connected conductors.

Insulation resistance

Before putting the actuator into operation or restarting it after a longer idle time, it is necessary to check that insulation conditions have not been worsened and that there is no danger of the winding damage or electric shock. Insulation conditions should also be checked during inspections in compliance with provisions of ČSN 34 3205 and standards valid for non-explosive electric installations. Insulation resistance of electric control circuits against the frame and against each other should be min. 20 Mohm. Insulation resistance of the electric motor should be min 1.9 Mohm. Insulation resistance of the current transducer is 20 Mohm at 50 V DC.

The actuators with a lower insulation resistance must not be put into operation. The cause can lie in a damaged winding or excess humidity. Damp motors with insulation resistance lower than the stated value must be carefully dried before being put into operation. By drying the winding, moisture is removed from the insulation and insulation resistance is thus increased to the prescribed value. Drying can be carried out in different ways. Drying directives are given by the standard ČSN 35 0010 or local recommended methods can be applied.

Inlet and connection

Before the assembly, check completeness and functionality of the bushings. A qualified technician using proper tools can only carry out the installation. The bushing should be fitted without any modifications in the state it was delivered. Use safety nuts or a glue to prevent incidental loosening. In any case, tightening moments depending on cables used are at the full user's responsibility. Both parts – the sealing connection and the nut – should be properly tightened. Insufficient or excess tightening can influence protection type, tightness or power properties of the bushing.

Direct input to explosion-proof closure (*imbedding of individual cable conductors*)

The cable bushing system should meet requirements of ČSN EN 60079-14 art. 10.3.2.d for direct input to the explosion-proof closure of group IIC. Therefore, in connecting the actuator, the client should create a non-explosive sealing according to the following procedure.

Instruction for Use no. N740052 – issue no.1

Non-explosive cable bushings, type leG 623

Assembly Instructions for cable gland: ICG 623 Exd IIC/Exe II

Certificate BASEEFA No. BAS 01 ATEX 2079X (Ex) II 2 GD IP66 CE 623 EExd I/EEExe I

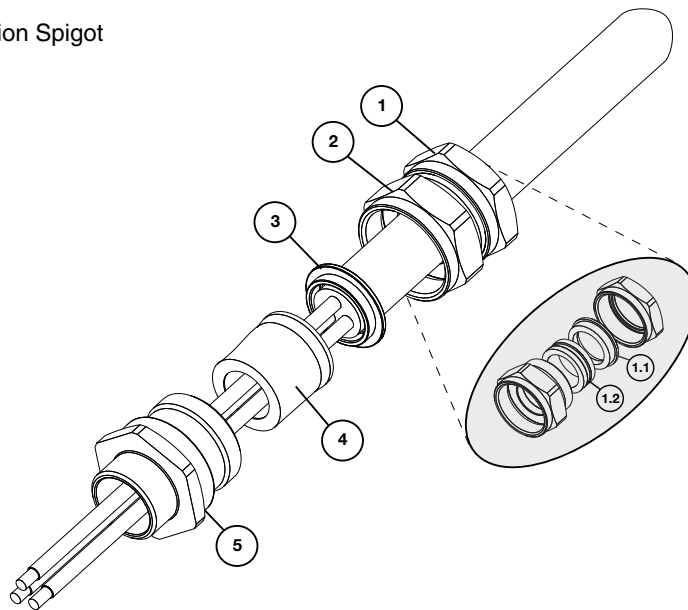
Certificate BASEEFxA No. BAS 02 ATEX 0177X (Ex) IM 2 IP66 CE

Operating temperature range -60 °C +80 °C

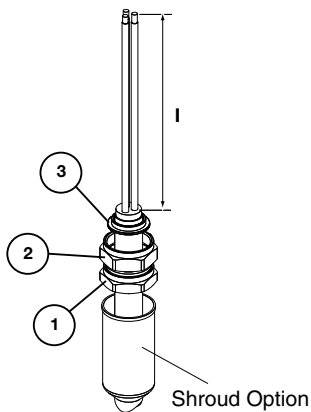
Assembly Instructions
AI 305 / Issue L - 08/06

HAWKE International

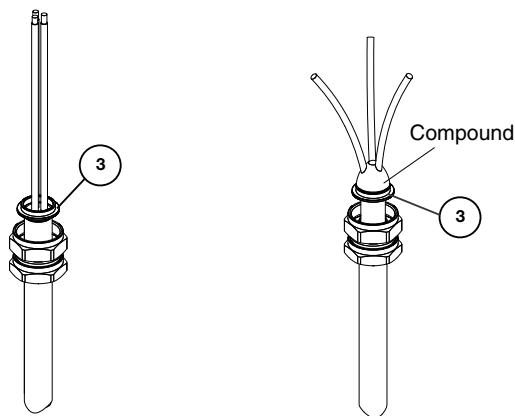
1. Backnut
 - 1.1 Rear Compression Spigot
 - 1.2 Rear Seal
2. Middle Nut
3. Pot Cap
4. Rubber Pot
5. Entry



Cable Preparation



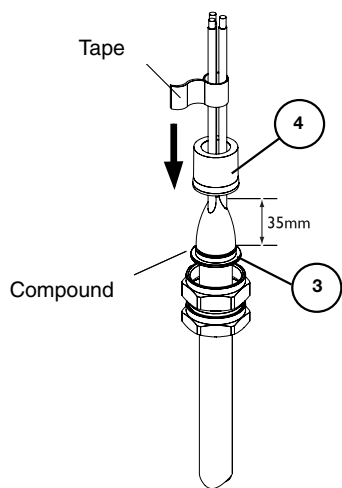
Gland Preparation



A
Strip Cable to suit equipment as shown above, removing all cable fillers. Length *l* to suit equipment. If required, fit shroud. See Notes re. Drain Wires.

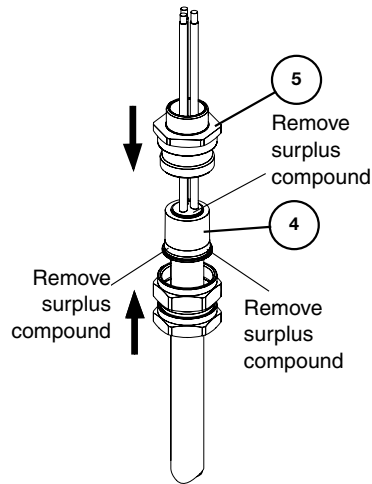
B
Position rear of pot cap (3) level with prepared face of cable insulation, ensuring that the cap remains concentric to cable at all times.

C
Spread the cable cores out for the compound packing. Pack the compound between the cores as shown. See notes overleaf and Fig. 7 for compound preparation.



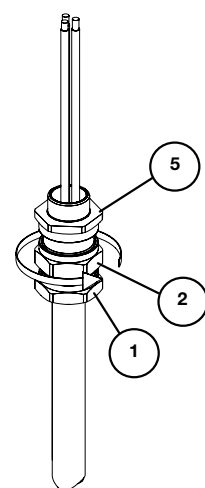
D

With all gaps and voids filled, bring the conductors back together and pack more compound around the outside of the conductors. Tape the conductors together to prevent disturbance of the compound seal. Pass the rubber pot (4) over pot cap (3) and remove any surplus compound from the top of rubber pot (4) and joint faces as indicated.



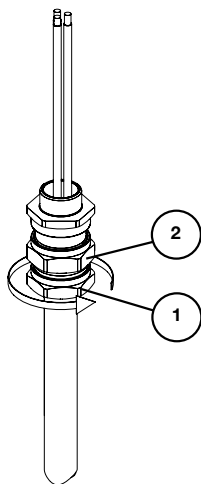
E

Replace the entry (5) over the rubber pot (4) ensuring that compound does not cover end of rubber pot (4).



F

Locate and hand tighten the sub-assembly (1) and (2) to the entry (5).

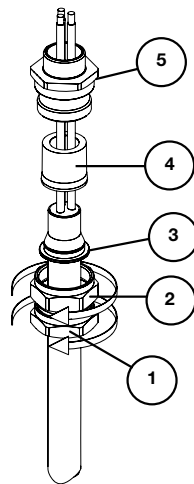


G

To further locate and support the compound and rubber pot assembly, while holding the middle nut (2) with a spanner/wrench, tighten the backnut (1) until the seal grips the cable to prevent movement of the cable gland.

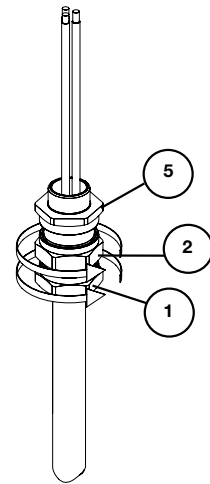
Important note:

The conductors must not be moved for a minimum of four hours.



H

Allow the compound to cure. (See Fig. 7 for Curing Times). Untighten firstly the backnut (1) from (2) and secondly the middle nut (2) from the entry (5). The rubber pot (4) may be removed for inspection to ensure that the packing is satisfactory. Add further compound if necessary.



I

Re-assemble rubber pot (4) and the entry (5). Hand tighten the sub-assembly (1) and (2) to the entry (5) and add half a turn to (2) with a spanner/wrench. Tighten the backnut (1) to form a seal around the cable, then tighten a further half to full turn using a spanner/wrench. Ensure that the middle nut (2) does not rotate when tightening the backnut (1). Locate the shroud over the cable gland if applicable.

EPOXY COMPOUND PREPARATION

When handling this material, the gloves supplied must be worn. The epoxy compound is supplied in the form of a two part package. These should be mixed into the ratio of 1:1 until both colours have blended into one, without any streaks. Rolling and folding is the most satisfactory method of obtaining an even blend. Once mixed, the compound must be used within 30 minutes. After this time it will begin to stiffen. The compound should be kept at an ambient temperature of no less than 20 °C prior to using. At lower temperatures it becomes difficult to mix. Should any compound come into contact with the skin it should be cleaned off with skin cleaner and not allowed to dry on the skin. Only compound for immediate terminations should be mixed.

The mixing and installation of the compound at an ambient temperature below 4 °C is not recommended due to extended curing period.

The following instructions are the various BASEEFA approved methods of passing drain wires etc. through the compound barrier and should be followed if permitted by cable installation specifications.

Drain wire preparation

1.0. Insulating drain wires with heat shrink or cold shrink tubing

- 1.1. Fold back the armour I braid and bend it to right angles from the inner sheath.
- 1.2. Remove foils and tape level with the outer sheath. exposing the drain wires and insulated conductors. Cut back a further 10 mm of inner sheath.
- 1.3. Pass 100 mm length of heat shrink or cold shrink tubing over the drain wire until it comes into contact with the foils, then shrink the tubing evenly down onto the drain wire so that no air pockets occur.
- 1.4. To insulate the joint between the foils and the tubing a suitable piece of 10 mm long shrink tubing or neoprene stretch tubing or a 10 mm wide lap of PVC tape may be used.
- 1.5. After completing 1.1 to 1.4 on each drain wire, lay the armour I braid parallel to the cable, if applicable, then carry out instruction B.

2.0. Insulating drain wires i screens with separate insulated crimped conductors or soldered connection

- 2.1. Fold back the armour I braid and bend to right angles from the inner sheath.
 - 2.2. Remove a further I 5mm of inner sheath (See Fig. 1).
 - 2.3. Unravel one or two groups of wires from the screen wires, then remove the remainder of the screen wires (See Fig. 2).
 - 2.4. Twist the group of screen wires into a pigtail and cut to 15 mm long.
 - 2.5. Crimp an insulated conductor to the pigtail with a suitable insulated butt ferrule (or soldered connection), leaving enough length of the insulated conductor to enable the remote end to be connected to the earth terminal in the equipment. (See Fig. 3).
- Note:** There shall be a minimum of 10mm of compound on both ends of the crimped I soldered joint.
- 2.6. To insulate the joint between the screen wires and the insulated conductor, place one lap of PVC insulating tape over the exposed metallic joint.
 - 2.7. After completing 2.1 to 2.6 on each drain wire. lay the armour I braid parallel to the cable. Then carry out instruction B.

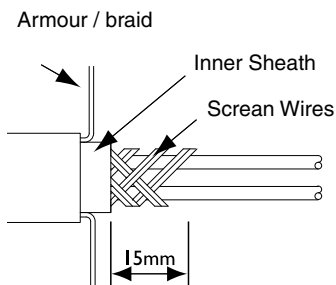


Fig. 1

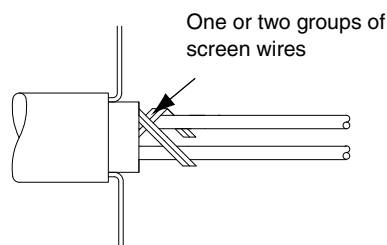


Fig. 2

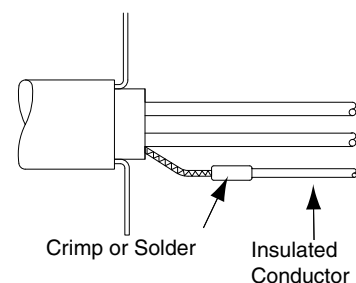


Fig. 3

3.0. Insulating drainwires with insulating varnish or paint

- 3.1. Fold back the armour I braid and bend it at right angles from the inner sheath.
- 3.2. Remove the foil and tape level with the inner sheath exposing the drain wires and conductor pairs.
- 3.3. Cut back a further 10 mm of inner sheath (See Fig. 4).
- 3.4. Spray or paint the drain wires with insulating varnish or paint, then leave to dry (See Fig. 5)
- 3.5. To insulate the foil ends a suitable piece of 10 mm long shrink tubing or neoprene stretch tubing or a 10 mm wide lap of PVC tape may be used (See Fig. 6).
- 3.6. After completing 3.1 to 3.5 on each drain wire, lay the armour I braid parallel to the cable. Then carry out instruction B.

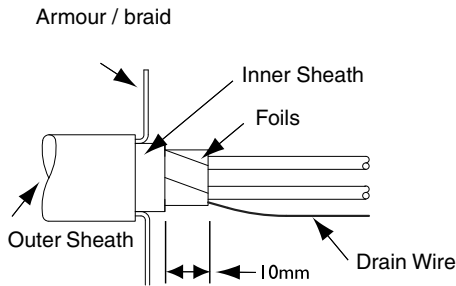


Fig. 4

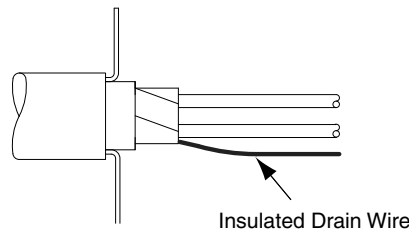


Fig. 5

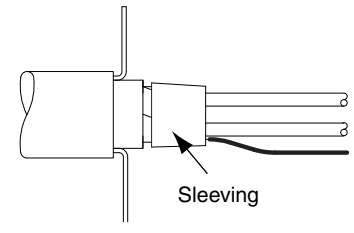


Fig. 6

Epoxy Compound Cure Time Vs. Temperature

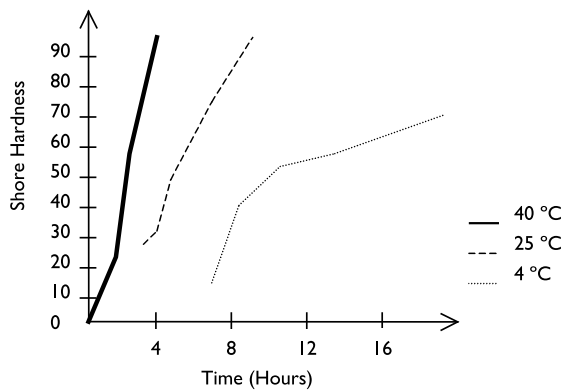


Fig. 7

- The compound may be adversely affected by some solvent vapours. If such vapours are likely to be present in the vicinity of the cable gland in service, suitable precautions may be necessary. (Contact Hawke's Technical Dept).

- The compound cures at a Shore D hardness of 85, when it can be handled. The compound when fully cured is suitable for use at a temperature range of -60 °C to +80 °C.

CABLE GLAND SELECTION TABLE												
Size Ref.	Entry Thread Size		Cable Acceptance Details							Max. Length	Hexagon Dimensions	
			Inner Sheath/Cores			Outer Sheath						
	Metric	NPT	Max. Over Cores	Max. Inner Sheath	Max. No. of Cores	Standard Seal		Alternative Seal (5)				
						Min.	Max.	Min.	Max.			
Os	M20	½"	8.0	8.0	6	3.0	8.0	-	-	66	24.0	27.7
O	M20	½"	8.9	10.0	6	7.5	11.9	-	-	66	24.0	27.7
A	M20	½" - ¾"	11.0	12.5	10	11.0	14.3	8.5	13.4	63	30.0	34.6
B	M25	¾" - 1"	16.2	18.4	21	13.0	20.2	9.5	15.4	68	36.0	41.6
C	M32	1" - 1¼"	21.9	24.7	42	19.0	26.5	15.5	21.2	70	46.0	53.1
C2	M40	1¼" - 1½"	26.3	29.7	60	25.0	32.5	22.0	28.0	72	55.0	63.5
D	M50	1½" - 2"	37.1	41.7	80	31.5	44.4	27.5	34.8	87	65.0	75.1
E	M63	2" - 2½"	48.8	53.5	100	42.5	56.3	39.0	46.5	90	80.0	92.4
F	M75	2½" - 3"	59.0	65,3/66,2	120	54.5	68.2	48.5	58.3	92	95.0	109.6

Limiting conditions:

1. Cable bushings OS and O can only be used for braided cables and firm instruments; the cable should be properly fixed to prevent its possible pulling out or twisting.
2. Operating temperature of the cable bushing is -60 °C to +80 °C.
3. The space between the equipment and the cable bushing should be sealed in order to preserve particular degree of protection against penetration of dust, solid particles, and water.

Accessories:

Before assembling or dismounting the cable bushing, become familiar with accessories of the cable bushing which include, for instance:

- coat providing additional protection against corrosion;
- safety nut securing position of the cable bushing;
- sealing washer under the additional protection of the cover of the cable bushing front part against penetration;
- knurled washer damping vibrations that could loosen the safety nut or the cable bushing assembly

The inlet to the actuator and connection to its switching, protection and securing instruments can only be installed by technicians with particular qualification who must follow pertaining standards and wiring diagrams as provided in these Instructions for Use. After connecting the inlet cables, all screws of the connecting terminals should be checked for tightness so that they do not get warm during operation due to increased transition resistance. The connecting terminals must not be under tension or bending stress from the connected conductors. In case of connection with aluminium conductors the following measures are recommended. One-step before connecting the conductor, the oxidized layer should be removed from the conductor and new oxidation should be prevented by smearing the connection with a neutral vaseline.

After the connection, make sure, by short starting of the actuator in the intermediate position of the working stroke, that the output shaft of the actuator rotates in a proper direction. If this is not the case, reconnect any two conductors on the terminals U, V, W of the motor (*actuator*) terminal board. Then, repeat the functional check. After verifying correct electric connection, the actuator is fitted to the valve and adjusted according to the paragraph Actuator Setting. The adjustment is best carried out using the manual control regime.

Important warning!

1) *During adjusting, repair, and maintenance, secure the actuator in the prescribed way in order to rule out its connection to the power supply and thus to prevent possibility of an injury due to electric shock or the actuator rotation.*

After adjusting the actuator, check its function using the control circuit. In particular, make a check that the actuator is correctly starting and that there is no voltage on the electric motor after particular relays has been switched off. If this is not the case, switch the actuator power supply immediately so that damage to the electric motor is prevented, and seek for the failure.

9) OPERATION AND MAINTENANCE

Depending on the operating conditions, the operation of rotary actuators usually involves only the transmission of pulses, as required for the individual functions. In the event of a power supply failure, readjust the controlled device by the handwheel. If the actuator has been connected in the circuit of automatic equipment (*which does not imply the control mode*) it is advisable that manual remote control units are connected in the circuit so that the actuator can be controlled even if a failure of the automatic equipment occurs.

It is the operator's duty to ensure that the actuator is given the prescribed maintenance attention and is protected against the harmful effects of ambient and climatic conditions not included in the Clause "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.

Lubrication

The actuators are lubricated with plastic consistent lubricants or gearbox oil PP 80 (*Table 1 or 2*).

Lubricants

Type number of actuator	Adjusting speed of output shaft [min ⁻¹]	Surrounding temperature [°C]						
		-25 +60	-40 +60	-50 +60	-60 +60	-25 +80	-40 +80	-50 +80
52 120, 52 121, 52 122	up to 40	M	M	M	M	M	M	M
52 123, 52 124	above 40	O	O	–	–	O	O	–
52 125	up to 70	M	M	M	M	M	M	M
	above 70	O	O	–	–	O	O	–

Note: M – plastic lubricant, O – gearbox oil

Actuators with plastic lubricant

The types of lubricant and amounts are listed in the table.

For lubrication of drive units use plastic consistent lubricants.

Lubricants in the drive units supplied are designed to last the entire useful life of the unit.

During the time when the drive units are in use, it is not necessary to change or monitor the amount of the lubricant.

The actuators with plastic lubricant are labelled “Filled: solid grease” on the power box at the side of the hand-wheel.

Type number of drive unit	Amount of lubricant (kg)	Type of lubricant for specific climatic conditions and temperature		
		T1 (-25 – +70 °C)	U1 (-40 – +55 °C)	UCL1 (-50 – +55 °C)
52 120	0,30	CIATIM – 201 GOST 6267-74 CIATIM – 221 GOST 9433-80		
52 121, 52 122	0,50			
52 123, 52 124	0,70			
52 125	0,90			

Note: The Ciatim 221 lubricant is designed for the friction points of rubber bushings against metal surfaces, roller brake, the hub of an outer cogged wheel of a planetary-gear differential of actuators 52 120 (for locations of friction between the shaft and other surfaces).

Actuators with oil charge

Check the level of oil at least yearly and refill, if required. Oil change should be made after 500 operating hours of the actuator, but not later than after 2 years of operation. The level of oil should be as high as the filling hole. For the actuator, Grade PP 80 motor-car gearbox oil or an equivalent oil with the same properties (viscosity class 80 W, according to SAE/J306a) should be used.

The quantity of oil required is tabulated below:

Type No.	Quantity of oil (in l)
52 120	1,8
52 121, 52 122	3
52 123, 52 124	6,1
52 125	13

Once in two years, it is recommended to lightly smear the driving wheel gearing on the output shaft and the gear wheel of the position sensor in the control box. Use the lubricant CIATIM 201 or PM MOGUL LU 2-3.

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.

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 recommended that the electric actuator Ex 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 60079-0:2004 and ČSN EN 60079-1:2004.

LIST OF SPARE PARTS

(for 5 years of operation)

Type No. 1	Designation 2	Drawing or Standard No. 3	Pcs. 4	Application 5
52 120	Sealing ring 125x3 2327311049	PN 029281.2	2	Packing between the power gear box and the flange with gears
	Sealing ring 170x3 2327311054	PN 029281.2	1	Gasket of terminal box cover
	Sealing ring 130x3 2327311041	PN 029281.2	2	Packing between the control box and flange Packing between the control box and the power gear box
	Sealing ring 43x35 2327311008	PN 029280.2	1	Sealing of output shaft in the control box
	Sealing ring 10x6 2327311001	PN 029280.2	2	Sealing of torque - tripping shaft
	Sealing ring 180x3 2327311043	PN 029281.2	1	Sealing of control box cover
	Rubber-copper 40x52x7 2327352066	ČSN 029401.0	1	Sealing of output shaft in the control box
	Sealing ring 16x12 2327311025	PN 029280.2	1	Sealing of handwheel shaft
	Packing	224612280	1	Hole cover gasket for the rising spindle of the fitting
	Rubber-copper 40x52x7 2327352066	ČSN 029401.0	2	Sealing of output shaft in the power gear box
	Rubber-copper 16x28x7 2327352022	ČSN 029401.0	1	Sealing of handwheel shaft
	Packing 16x22	224580840	2	Gasket of threaded oil filling plug
	Packing	224635220	1	Packing between the control box and the terminal box
Packing	23459187	1	Packing between the electric motor and the flange with gears	
52 121 + 52 122	Rubber-copper 2327352090 60x75x8	ČSN 029401.0	2	Sealing of output shaft of the power gear box
	Rubber-copper 2327352027 20x32x7	ČSN 029401.0	1	Sealing of handwheel shaft
	Sealing ring 95x85 2327311029	PN 029280.2	1	Packing piece with "rubber-copper" rings in the power gear box
	Sealing ring 50x2 2327311028	PN 029281.2	1	Packing of the torque spring cover
	Sealing ring 16x22	224580840	2	Sealing of threaded oil filling plug
	Packing	23354394	1	Packing between the electric motor and the flange with gears

1	2	3	4	5
	Sealing ring 160x3 2327311048	PN 029281.2	1	Packaging between the power gear box and the flange with gears
	Sealing ring 170x3 2327311054	PN 029281.2	1	Gasket of terminal box cover
	Sealing ring 190x3 2327311056	PN 029281.2	1	Packing between the control box and the power gear box
	Rubber-copper 55x70x8 2327352083	ČSN 029401.0	1	Sealing of output shaft in the power gear box
	Sealing ring 10x6 2327311001	PN 029280.2	2	Sealing of torque-tripping shaft
	Sealing ring 200x3 2327311044	PN 029281.2	2	Packing of control box cover
	Packing, size 3	224610741	1	Hole cover gasket for the rising spindle of fitting
	Sealing ring 60x50 2327311090	PN 029280.2	1	Sealing of output shaft in the control box cover
52 123 +	Sealing ring 220x3 2327311045	PN 029281.2	1	Packing of control box cover
52 124	Rubber-copper 80x100x10 2327352096	ČSN 029401.0	1	Sealing of output shaft in the power gear box
	Sealing ring 10x6 2327311001	PN 029280.2	2	Sealing of torque-tripping shaft
	Sealing ring 85x75 2327311087	PN 029280.2	1	Sealing of output shaft in the control box cover
	Sealing ring 25x21 2327310999	PN 029280.2	1	Sealing of handwheel shaft
	Packing	224637080	1	Hole cover gasket for the rising spindle of fitting
	Rubber-copper 80x100x10 2327352096	ČSN 029401.0	1	Sealing of output shaft in the power gear box
	Rubber-copper 27x40x10 2327352044	ČSN 029401.0	1	Sealing of handwheel shaft
	Sealing ring 70x2 2327311058	PN 029281.2	1	Sealing of torque spring cover
	Sealing ring 200x3 2327311044	PN 029281.2	1	Packing between the power gear box and the flange with gears
	Packing 16x22	224580840	2	Gasket of threaded oil filling plug
	Packing	224635220	1	Packing between the control box and the terminal box
	Packing	23354395	1	Packing between the electric motor and the flange with gears

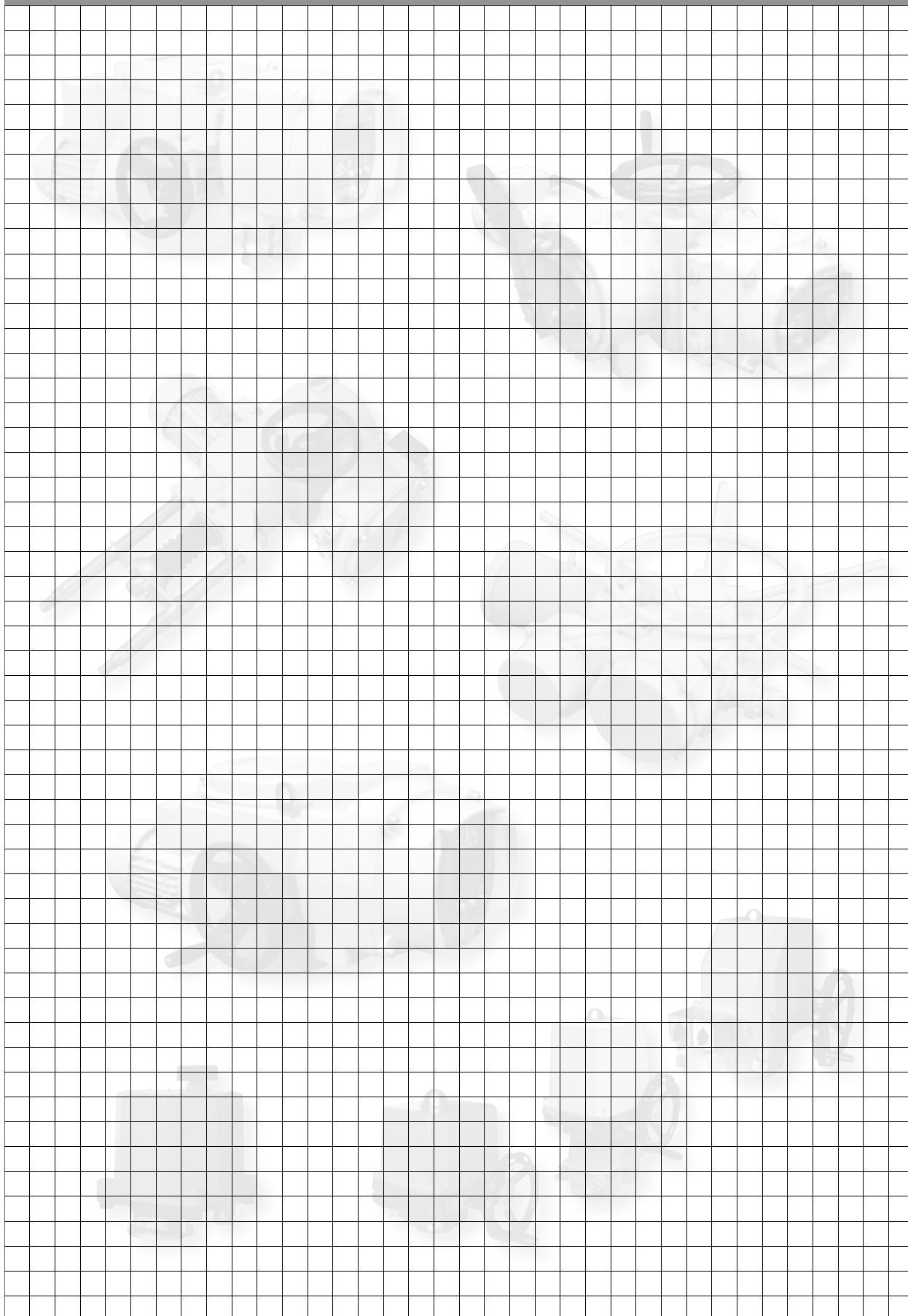
1	2	3	4	5
	Sealing ring 200x3 2327311044	PN 029281.2	1	Packing between the power gear box and the control box
	Sealing ring 170x3 2327311054	PN 029281.2	1	Sealing of output shaft in the power gear box
52 125	Sealing ring 16x22	224580840	2	Gasket of threaded oil filling plug
	Packing	22459337	1	Packing between the electric motor and the flange with gears
	Sealing ring 280x3 2327311078	PN 029281.2	1	Packing between the power gear box and the flange with gears
	Rubber-copper 105x130x13 2327352109	ČSN 029401.0	2	Sealing of output shaft in the power gear box
	Rubber-copper 30x50x12 2327352054	ČSN 029401.0	1	Sealing of handwheel shaft
	Sealing ring 30x22 2327311026	PN 029280.2	1	Sealing of handwheel shaft
	Sealing ring 90x2 2327311081	PN 029281.2	1	Packing of the torque spring cover
	Rubber-copper 85x110x12 2327352099	ČSN 029401.0	1	Sealing of output shaft in the control box
	Sealing ring 260x5 2327311046	PN 029281.2	1	Packing between the power gear box and the control box
	Sealing ring 220x3 2327311045	PN 029281.2	1	Sealing of control box cover
	Sealing ring 10x6 2327311001	PN 029280.2	2	Sealing of torque-tripping shaft
	Sealing ring 90x80 2327311011	PN 029280.2	1	Sealing of output shaft in the control box cover
	Packing	224637080	1	Hole cover gasket for the rising spindle of fitting
	Packing	224635220	1	Packing between the control box and the terminal box
	Sealing ring 170x3 2327311054	PN 029281.2	1	Gasket of terminal box cover

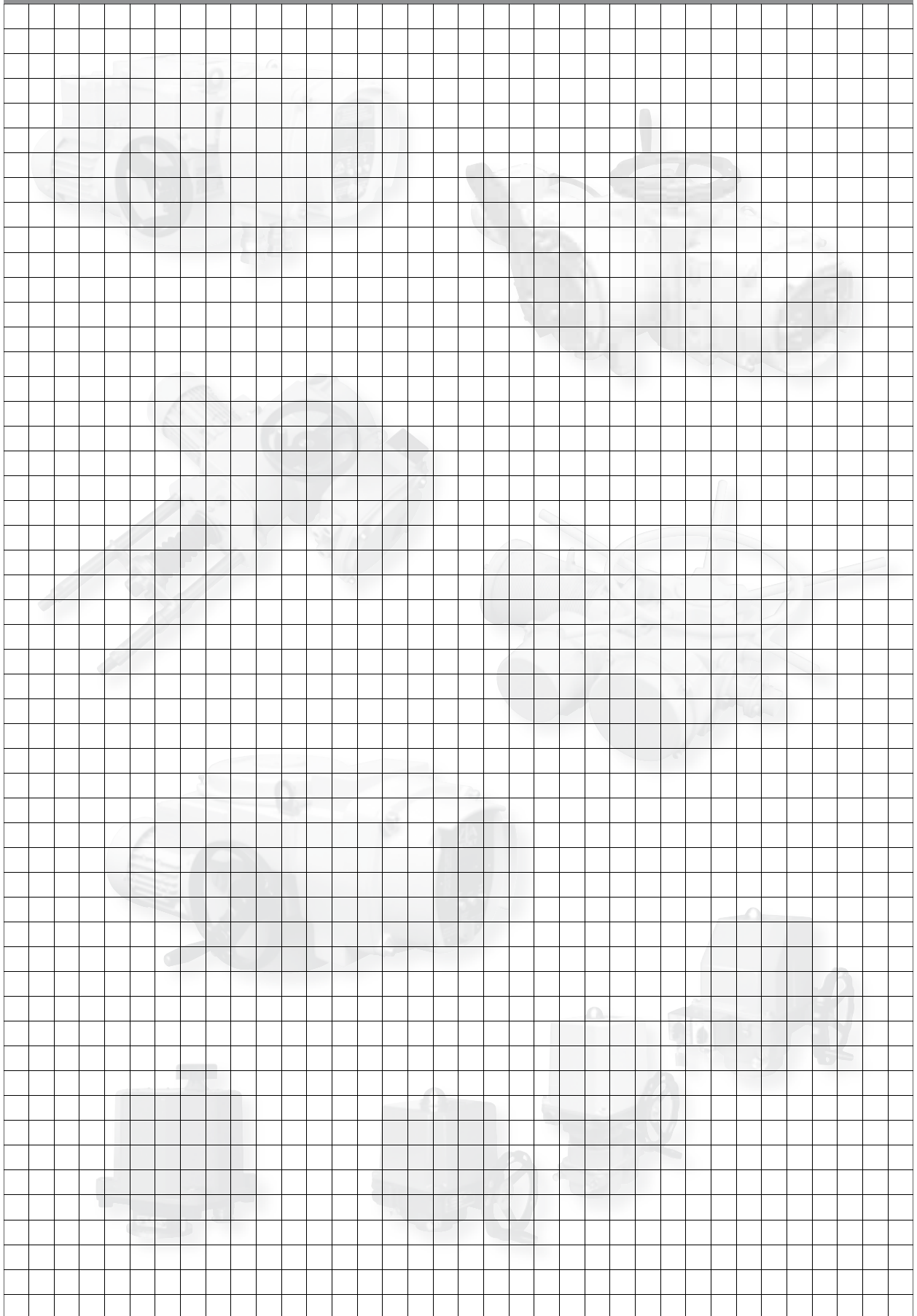
Actuators fitted with electronics DMS2 ED			
Part name	Part designation	Stock item	Note
Source board	DMS2.ED.Z	39620000	
Position sensor multi-revolution	DMS2.ED.S	39620001	
Torque sensor	DMS2.TORK	39620003	common for DMS2.ED and DMS2
Analog module	DMS.ED.CPT	39620004	back signal 4 – 20 mA and software blocked regulator
Display	DMS2.ED.D	39620005	
Actuators fitted with electronics DMS2			
Source board analog	DMS2.ZAN	39620014	only for analog
Source board Profibus	DMS2.ZPR	39620015	only for Profibus version
Position sensor multi-revolution	DMS2.S	39620016	
Torque sensor	DMS2.TORK	39620003	common for DMS2.ED and DMS2
Display	DMS2.DP	39620018	
Board of local control block	DMS2.H1	39620019	
Dynamic brakes (for actuators with electronics DMS2 ED a DMS2)			
Brake	BR2 550	2339610124	
Brake	BR2 BK 550	2339610128	
Brake	BR 2,2	2339610142	
Brake	BR BK 2,2	2339610141	
Braking resistance	TR342 68R	2337110355	

A setting program is available for the actuators (it is described in these Mounting and operating Instructions); it enables the parameters of the electronic outfit of the actuators to be set and checked by a computer.

The electronics is connected to the serial port of the computer by a cable (it is available e.g. under the name "Extending cable for mouse 9F-9M").

In case the computer is not fitted with a serial port the converter USB-RS 232, can be ordered.







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

SURVEY OF PRODUCED ACTUATORS

KP MINI, KP MIDI

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

MODACT MOK, MOKED, MOKP Ex, MOKPED Ex

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

MODACT MOKA

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

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

Electric rotary multi-turn actuators

MODACT MO EEx, MOED EEx

Explosion proof electric multi-turn actuators

MODACT MOA

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

MODACT MOA OC

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

MODACT MPR Variant

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

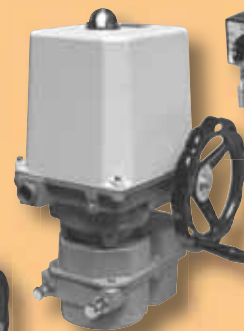
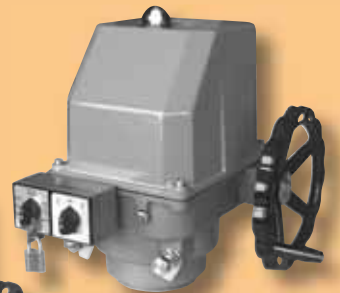
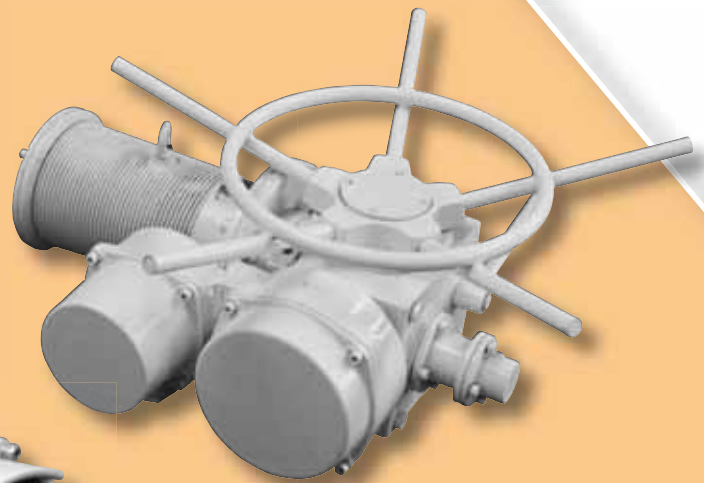
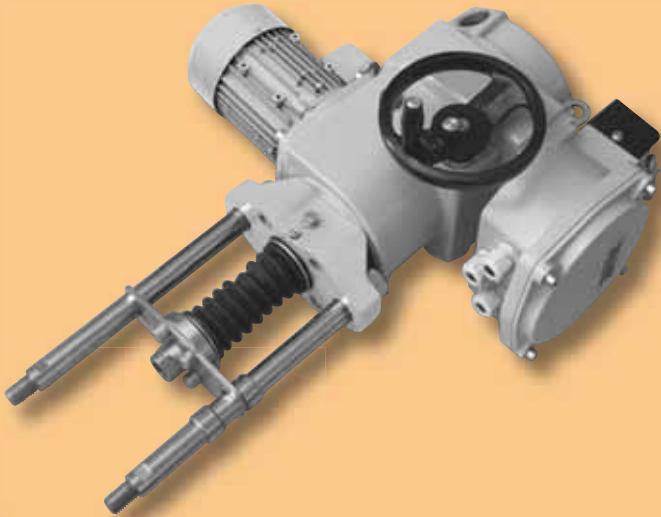
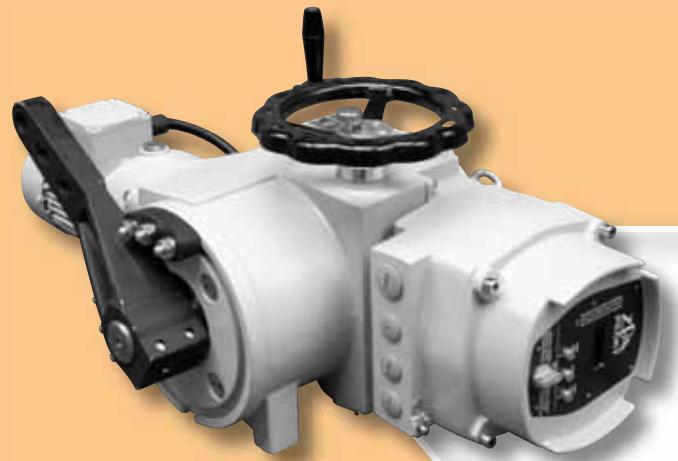
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