ZPA PEČKY, a.s.

CATALOGUE

Electric part - turn actuators

in non-explosive version, with constant velocity of changing-over the output part - coverage IP 67

MODACT MOKPED 100 Ex
MODACT MOKPED 250 Ex
MODACT MOKPED 600 Ex

Type numbers 52 320 - 52 322

www.zpa-pecky.cz

ZPA Pečky, a.s. is certified company in accordance with ISO 90001 as amended.

1. APPLICATION

The actuators are designed for shifting valves with reversing rotary motion in circuits of remote control and automatic control. They can also be used for other devices for which they are suitable with their characteristics and parameters. Special cases are to be discussed with the manufacturer.

MODACT MOKPED Ex electric actuators in non-explosive version are intended for control and operation in an environment with danger of explosion of explosive gaseous atmosphere in zone 1 and zone 2 and for areas with flammable dust in zone 21 and zone 22 according to ČSN EN 60079-10 *(332320)*. The actuators are designed in compliance with the standards ČSN EN 60079-0:2013 and ČSN EN 60079-1:2008 for explosive gaseous atmosphere and with the standard ČSN EN 60079-31:2014 for areas with flammable dust.

These are non-explosive electric appliances of the group II, category 2, in areas where occurrence of explosive atmosphere created by gases, vapours or mist – *"G"* is probable. The actuators can also be used in areas with flammable dust according to ČSN EN 50281-1-3. The actuators are labelled with a sign of protection against explosion and symbols of the group and category of appliance **Ⓔx II 2GD.**

The entire electric actuator is designed as explosion-proof enclosure "d" with marking according to the performed certification as follows:

Ⓔx II 2GD	**Ex d IIC T6 Gb**	**-25 ≤ Ta ≤ 55 °C**
	Ex d IIB T6 Gb	**-50 ≤ Ta ≤ 55 °C**
	Ex tb IIIC T80°C Db	**-50 ≤ Ta ≤ 55 °C**

The electric actuator must not be subjected to heavy charging, eg. an intense flow of a dust-air mixtures in order to prevent the occurrence of creeping electrostatic discharges.

Nomenclature

Environment with explosion danger – Environment in which an explosive atmosphere can be created.

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

Explosive dust atmosphere – mixture of flammable substances in the form of gas, vapour, mist and dust with air, under atmospheric conditions, in which, after ignition, combustion spreads to the entire unburned mixture.

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

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

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

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.

Zone 21 – An area in which the explosive atmosphere is created by a cloud of whirled flammable dust in air formed in normal operation is occasional.

Zone 22 – An area in which an explosive mixture is not likely to occur in normal operation and if it occurs it will exist only for a short time.

Applied Standards

The following basic standards apply to explosion-proof actuators:

ČSN EN 60079-14	Regulations for electrical devices in areas with a danger of explosion of flammable gasesand vapours.
ČSN IEC 60721	Types of environment for electrical devices.
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 33 0371	Non-explosive mixtures. Classification and testing methods.
ČSN 34 3205	Operation of electric rotating machines and work with them.
ČSN EN 1127-1	Explosive atmospheres – Explosion prevention and protection.
ČSN EN 60079-31	Explosion properties. Equipment protected against dust ignition with *"t"* closure.

Designation of explosion-proof properties

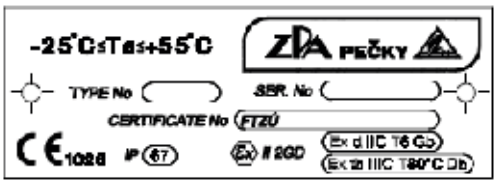
It consists of the following symbols:

Ex	Electric device complies with the standard ČSN EN 60079-0 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 60079-1.
tb	Protection by enclosure *"t"* – according to ČSN EN 60079-31.
IIC, IIB	Designation of the group of explosion-proof electric device according to ČSN EN 60079-0.
IIIC	Designation of explosion-proof electric equipment for explosive atmospheres with combustible dust, according to standard ČSN EN 60079-0.
T6	Designation of temperature class of explosion-proof electric device of the Group II according to ČSN EN 60079-0.
T80°C	Designation of explosion-proof electric equipment for explosive atmospheres with combustible dust, according to standard ČSN EN 60079-0.
Gb	Designation of explosion-proof equipment for explosive gaseous atmospheres, having a *"high"* level of protection, and not a source of ignition in normal operation or during expected malfunctions; according to ČSN EN 60079-0.
Db	Designation of explosion-proof equipment for explosive dust atmospheres, having a *"high"* level of protection, and not a source of ignition in normal operation or during expected malfunctions; according to ČSN EN 60079-0.
IP 67	Identification of the degree of protection; according to ČSN EN 60079-0 and ČSN EN 60529.

Data on actuators

The actuators are fitted with the following plates:

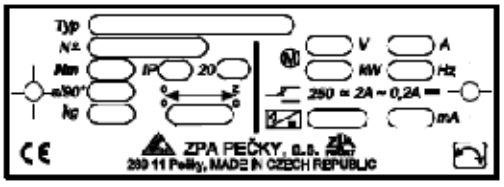
1) Plate with data of non-explosive closures:



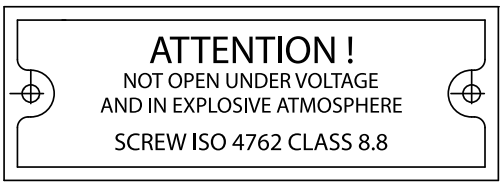
or

2) Rating and instrument plate contains:

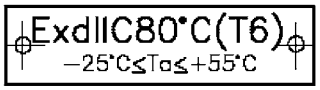
- manufacture's name and address
- type designation of product *(type number)*
- serial number
- year of production
- rated value of tripping torgue Nm
- rated speed of shifting s/90°
- rated working stroke °
- designation of protective enclosure of actuator IP
- weight of actuator kg
- mark of conformity CE
- 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 or current)*



3) Warning plate

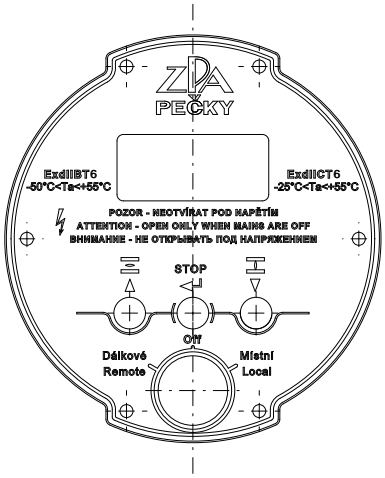


4) Plates on covers with marking of used protection against explosion



or

or front label No. 23354393 for design with local control switches and display.



2. OPERATING CONDITIONS, OPERATING POSITION

Operating conditions

The **MODACT MOKPED Ex** actuators should withstand the effect of operating conditions and external influences, Classes AC1, AD7, AE6, AF2, AG2, AH2, AK2, AL2, AM-2-2, AN2, AP3, BA4, BC3 a BE3 according to ČSN 33 2000-5-51 ed. 3.

Temperature and humidity

The operating temperature for actuators **MODACT MOKPED Ex** is -25 °C to +55 °C or -50 °C to +55 °C, relative humidity from 10% to 100% with condensation.

Classes of external effects – excerpt from ČSN 33 2000-5-51 ed. 3.

Class:

1) AC1 – elevation above sea level ≤ 2000 m
2) AD7 – water occurrence – shallow dipping
3) AE6 – strong dustiness
4) AF2 – occurrence of corrosive or polluting substances from atmosphere. Presence of corrosive substances is significant.
5) AG2 – medium mechanical stress by impacts – common industrial processes.
6) AH2 – medium mechanical stress by vibrations – common industrial processes.
7) AK2 – serious risk of growth of vegetation and moulds.
8) AL2 – serious danger of the occurrence of animals *(insects, birds, small animals).*
9) AM-2-2 – normal level of the signal voltage. No additional requirements.
10) AN2 – medium solar radiation with intensities > 500 W / m^2 and ≤ 700 W / m^2.
11) AP3 – medium seismic effects; acceleration > 300 Gal ≤ 600 Gal.
12) BA4 – personal abilities. Instructed people.
13) BC3 – frequent contact with the earth potential. Persons coming frequently into contat with *"live"* parts or standing on a conducting base.
14) BE3 – danger of explosion, production and storage of explosive substances.

Corrosion protection

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

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

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

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

MOKPED Ex electric actuators designed for an ambient temperature of -50 ° C to +55 ° C must be resistant to operating conditions characterized by an ambient temperature range from -50 ° C to +55 ° C.

The actuators are designed with three-phase motors.

The aforementioned actuators will be designated with the letter F at the last place of the supplementary type number: thus 5232x.xxxxEDF.

In all denominations of explosion-proof design of electric actuators Type No. 5232x.xxxxEDF the designation of subgroup II of explosion-proof electric device according to ČSN EN 60079-0 changes from IIC to IIB, i.e. to Ex d IIB T6 Gb.

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

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

The heating elements used are resistors TRA 25 5K1/J with a power output of 25W and resistance of 5 kOhm *(located in the Control area of the actuator)* and TRA 15 10K/J with a power of 15 W and a resistance 10 kOhm (located in the area of local control). They are switched by a switch for the heating resistor located on the source circuit board. Computer program can be used to set the switching temperature in the range of -40 to +70 °C. Permanent heating can be reliably ensured the temperature setting +70 °C. Maximum heating flow of the switch is 0.4 A / 230 V.

The present temperature range limit values for the use of the actuators *(-40 ° C and +70 ° C),* which can be changed according to customer needs. Exceeding these limits close the fault contact READY and an error signal occurs.

Note: *Sheltered areas are considered those where the fall of atmospheric precipitations under an angle up to 60° is prevented.*

Operating position

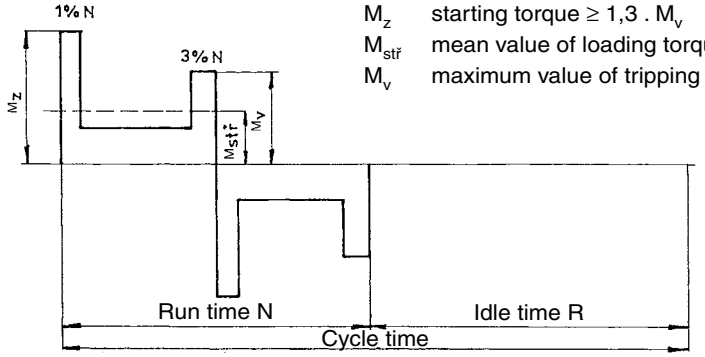
The actuators **MODACT MOKPED Ex** can operate in any operating position.

3. OPERATION MODE, SERVICE LIFE OF ACTUATORS

Operation mode

The actuators can operate at rated load torque, which is 50% of the maximum tripping torque, with S2 type load. The operation time is in this kind of load is 10 minutes at ambient environment temperature up to +55 ° C. The actuators can operate at rated load torque and intermittent operation with start-up with the S4 type of load according to ČSN EN 60034-1 *(35 0000).* The load factor is 25%, and switching frequency up to 1200 times per hour. The maximum duty

cycle is determined by the run time at a full stroke of the actuator. Maximum medium level of load torque equals to rated torque of actuator. The highest mean value of loading torque is equal to rated torque of the actuator.



M_z starting torque ≥ 1,3 . M_v
$M_{stř}$ mean value of loading torque
M_v maximum value of tripping torque

Course of working cycle

Service life of actuators

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	1000	2000	4000
Number of starts [1/h]	Max. number of starts 1200	1000	500	250

4. TECHNICAL DATA

Basic technical parameters are given in Table 1.

Power supply

– nominal value of the AC voltage is 1 x 230 V or 3 x 400 V *(according to version)*
– permitted power supply voltage tolerance is -10 % to +6 % of the nominal value
– rated frequency of supply voltage is 50 Hz
– permitted power supply voltage frequency tolerance is 2% of the nominal 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 the **MODACT MOKPED Ex** actuators is IP 67 according to ČSN EN 60529 *(33 0330).*

Noise

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

Tripping torque

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

Self-locking

Actuator self-locking capacity is provided by mechanical electric motor brake, at actuator type no. 52 320 by mechanic gearbox brake.

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 working stroke of **MODACT MOKPED Ex** actuator is 90° *(after agreement with the manufacturer actuators can be supplied with working stroke 60°, 120° or 160°).*

Manual control

The actuators are controlled by a hand wheel directly *(without a clutch)* and control is possible even during operation of the electric motor. When rotating the hand wheel in clockwise direction, the actuator's output shaft also rotates in clockwise direction *(looking at the local position indicator).* Handwheel direction of rotation is also indicated on the label of the handwheel.

Torque-limit switches in the actuator are set and work when the actuator is under voltage.

When using the manual control, ie. actuator is controlled mechanically, the torque-limit switches doesn´t work and the valve can be damaged.

5. ACTUATOR OUTFIT

Position indicator

The actuator can be fitted with a display as an option for **DMS2 ED** electronic system. Actuator with **DMS2** electronic system is equipped with two-line display.

Heating element

Actuators are equipped with a heating element to prevent water vapour condensation. As a heating element they apply resistors TRA 25 10 K/J with an output of 25 W and resistance of 10 kΩ. They are switched by a switch for the heating resistor located on the source circuit board. It is possible to use a computer to set the switching temperature in the range of -40 to +70 °C. Permanent heating can reliably be ensured by the temperature setting +70 °C. Maximum heating current of the switch is 0.4 A/230 V.

The preset temperature range limit values of the actuators *(-40 °C and +70 °C)* can be changed according to customer needs. Exceeding these limits close the fault contact READY and an error signal occurs.

Local control

Local control serves for controlling the actuator from the site of its installation. For DMS2 ED electronic system includes two change-over switches: one with positions *"Remote control – Off - Local control",* the other *"Open – Stop – Close".*

The first 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.

If the actuator is equipped with DMS electronic system local control consists of 3 buttons – *"Open", "Stop", "Close"* and rotary switch *"Local, Remote, Off".*

6. ELECTRIC PARAMETERS

Terminal board of the actuator

Electrical equipment consists of electronics power supply circuit and motor control circuit. Connection of the distribution network is performed by means of the terminal board located on the control module. The terminal block is designed that the total connection does not need any other terminals.

This terminal board uses screw terminals allowing to connect conductors with a maximum cross-section of 2,5 mm^2.

Actuator internal wiring

The internal wiring diagrams of the **MODACT MOKPED Ex** 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 actuator. 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 MΩ. Isolation resistance of the electric motor is min. 1,9 MΩ. After a dump test, isolation resistance of control circuits is min. 2 MΩ.

Electric strength of electric circuits isolation

MOKPED Ex actuator with electronic system are tested:

circuits of anti-condensation heater	1500 V 50 Hz
circuits of electric motor	1000 V +2.Ujm 50 Hz, at least 1500 V
circuits of outgoing and control signal circuits	50 V DC

Deviations of basic parameters

Tripping torque	±15 % of max. value of range
Adjusting time	+10 % till -15 % of rated value *(idle run)*

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 entire actuator is designed as explosion-proof closure *"d"* marked **Ex d IICT6 Gb or Ex d IIB T6 Gb** for explosive gaseous atmosphere and **Ex tb IIIC T80°C Db IP67** for areas with flammable dust.

If the actuator is equipped with local control unit, the local control unit makes another explosion-proof closure *"d"*. Both explosion-proof closures are in such case separated by a bushing.

The motors consist of two parts:

a) **Power part** – is used to draw the necessary torque to the valve and is composed of a single- or three-phase asynchronous electric motor, countershaft gear box, planet gear box with output shaft, device for manual control with a hand wheel and floating screw.

b) **Control *(electronic)* part** onsisting of **DMS2** or **DMS2 ED** electronic system is used to control the actuator. The individual modules of both electronic systems and their functions are described in Chapter **ELECTRONIC OUTFIT.**

Operation of the position-limit is derived from rotation of the output shaft via special mechanisms. Operation of the torque-limit switches is derived from axial displacement of the *"floating worm"* of the manual control unit which is scanned and transferred to the control box.

The tripping torque can be adjusted within the range specified in the table 1. Torque switches may be blocked when actuator needs to produce a starting torque.

Showing position of the output shaft of the actuator can be either on site using mechanical indicators or display that can be installed in the actuator or remotely via an analog output signal and the corresponding indicator. Indicator is not included in the delivery.

Connecting and wiring

To enter into explosion-proof closure the actuators are equipped with following threaded holes:

a) **Actuator** – has 3 threaded entries M20x1.5 or M25x1.5 *(see dimensional drawings of actuator)*

b) **Local control unit** – has 2 threaded entries M20x1,5.

Threaded holes for cable glands are marked M20x1,5 respectively M25x1,5 in accordance with article. 13 ČSN EN 60079-1.

These inputs are standardly closed by a blanking plug appropriate size.

Customer must set up electrical connection *(actuator inputs must be fitted with certified cable glands),* which according to inclusion are in accordance with ČSN EN 60079-14 and the protective enclosure is min. IP 67.

At the customer's request, the manufacturer may supply the actuator with cable gland system that meets requirement of EN 60079-14 Article. 10.4.2.d for direct entry into explosion-proof closure group IIC. To enter into explosion-proof closure of the actuator can be used Peppers glands *(type CR-U)* or HAWKE glands *(type 623 ICG)* according to the following table:

Gland type	Threaded hole	Cable diameter
CR-U/25	M25x1,5	11,7 – 20,0 mm
ICG 623/B	M25x1,5	13,0 – 20,2 mm
CR-U/20	M20x1,5	9,5 – 14,0 mm
ICG 623/A	M20x1,5	11,0 – 14,3 mm

When connecting the actuator with these glands customer is obliged to follow the instructions of sealing individual cable cores.

8. ELECTRONIC OUTFIT

The actuator is controlled 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 SYSTEM

Basic outfit of the DMS2 ED electronics:

Position 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 *(connection of computer for setting and diagnostics).*
Source unit	– electronic power supply, user's terminal board *(connection of power supply and control signals),* 2 torque relays, 2 position relays, 2 signalling relays, 1 relay for signalling errors *(READY),* switch of resistance anti- condensation heater and its thermostatic control, connectors for connecting the control unit and analog CPT module.
Torque sensor	– provides contactless torque sensing

Optional outfit of the DMS2 ED electronics:

Analog module	– output of feed-back signal 4 – 20 mA, in version CONTROL input of control signal 0/4 – 20 mA
LCD display	– communication, position indicator
Local control	
Reversing relays	– for three-phase motors

Technical parameters of the DMS2 ED electronics:

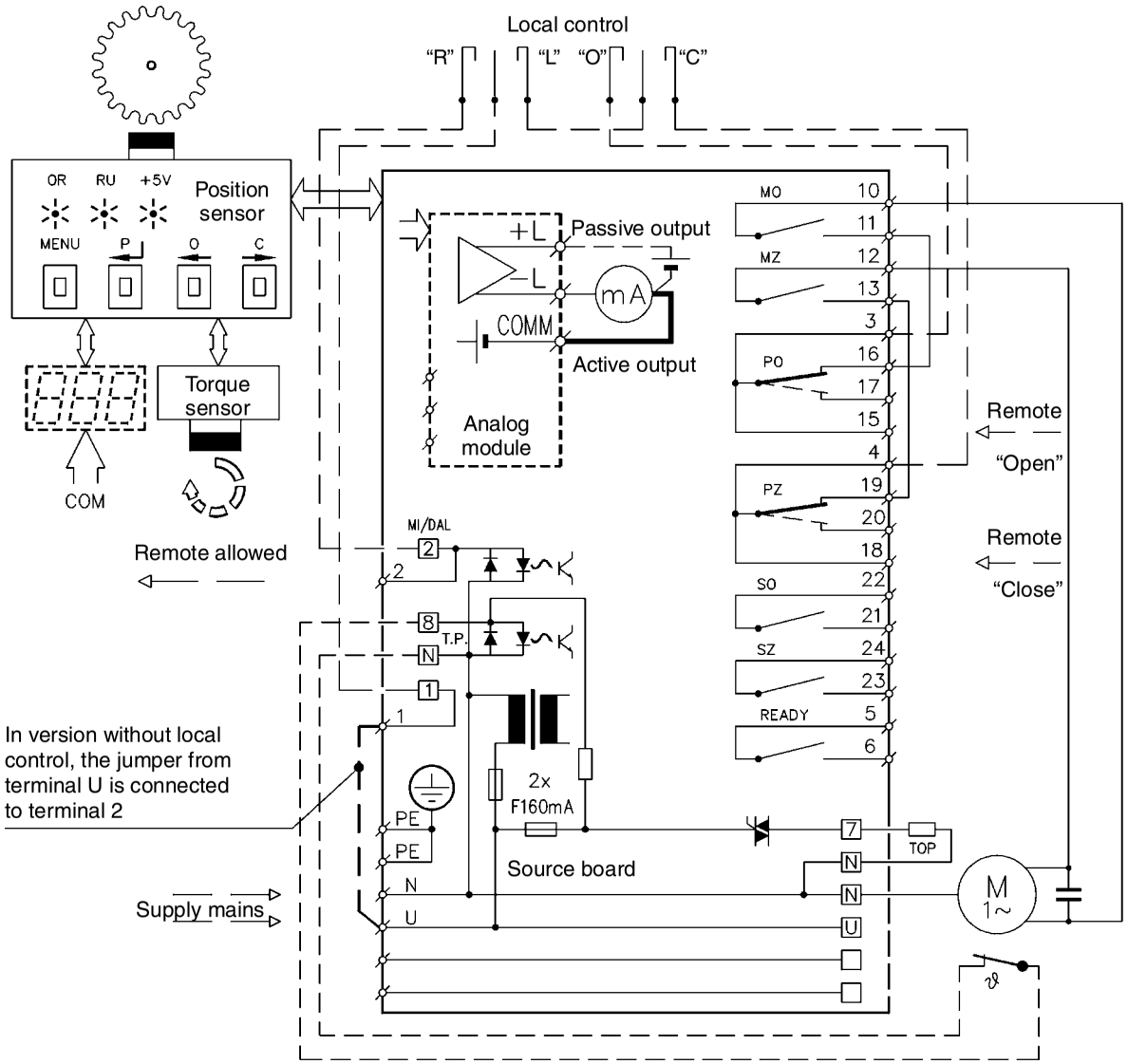
Scanning of position	contact-less, magnetic
Scanning of torque	contact-less, magnetic
Working stroke see	90°
Torque blocking	0 – 20 s at reversing in limit positions
Input signal	0*(4)* – 20 mA, 20 – 0*(4)* mA with switched on regulator function Local/Remote control, Local open/close
Output signal	7 x relay 250 V AC, 3 A *(MO, MZ, PO, PZ, SO, SZ, READY)* Position signal 4 – 20 mA, max. 500 Ω, active/passive, galvanic-isolated, 2x12 character LED display
Power supply of electronic	230 V AC, 50 Hz, 4 W, over-voltage category II

Design of DMS2 ED electronics:

Replacement of electromechanical 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.

Example of wiring diagram of electronics **DMS2 ED** in version **Substitution of electro-mechanical board** with single-phase electric motor

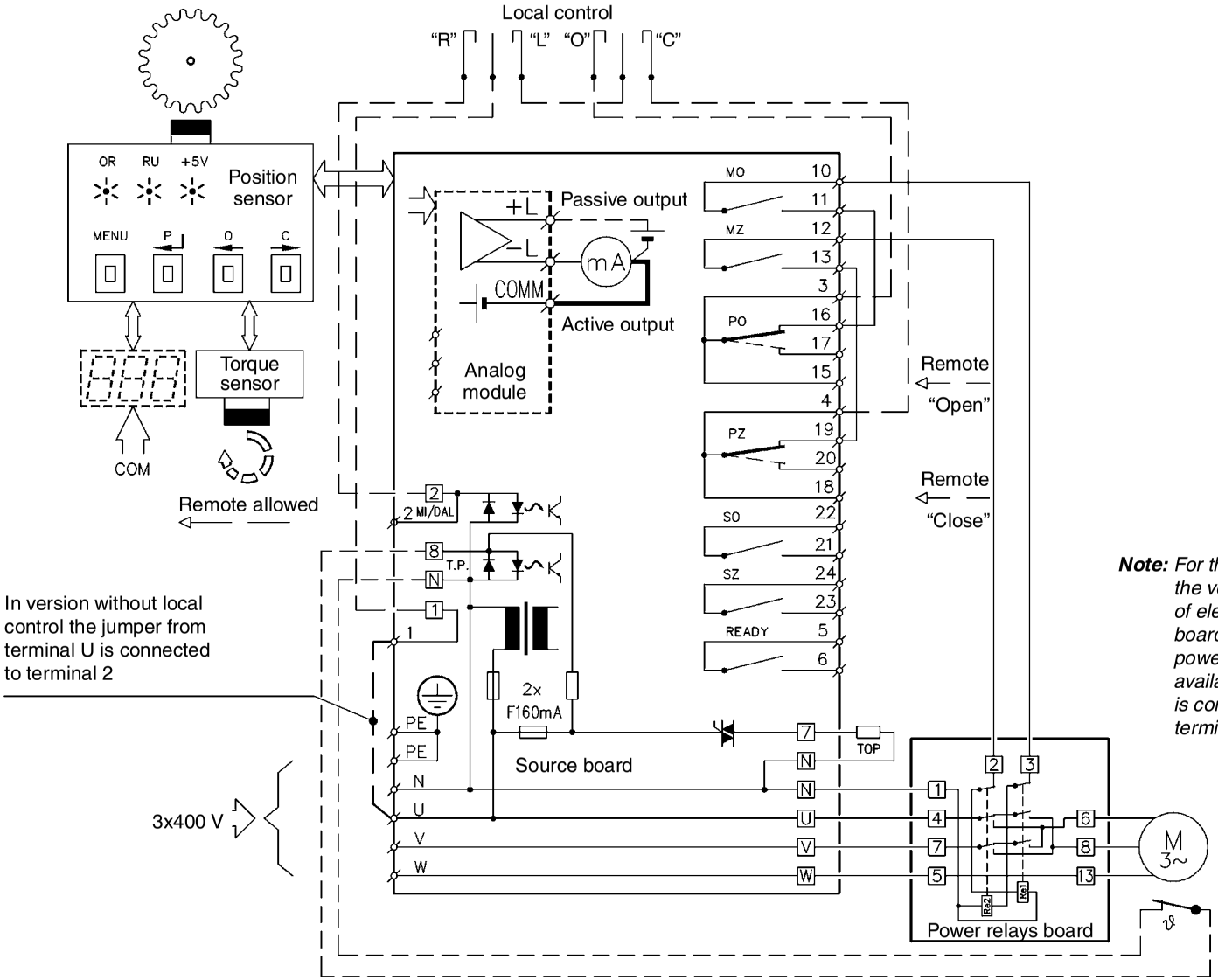
E0010



Note: *Here, contacts of relay 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.*

Example of wiring diagram of electronics **DMS2 ED** in version **Substitution of electro-mechanical board** with three-phase electric motor

E0011

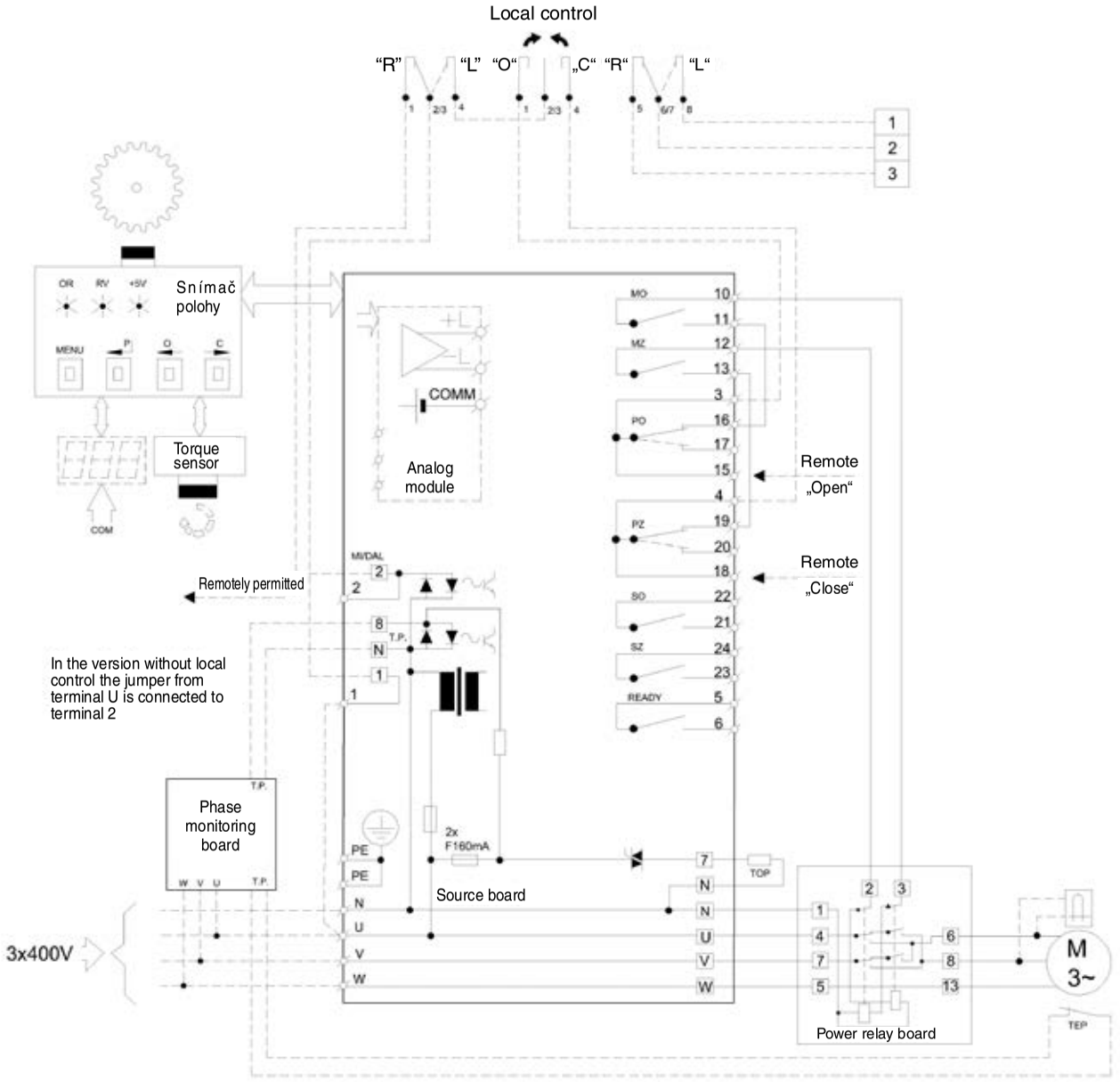


Note: *For three-phase actuator, the version. "Substitution of electro-mechanical board without block of power relays" is also available; electric motor is connected to separate terminal board.*

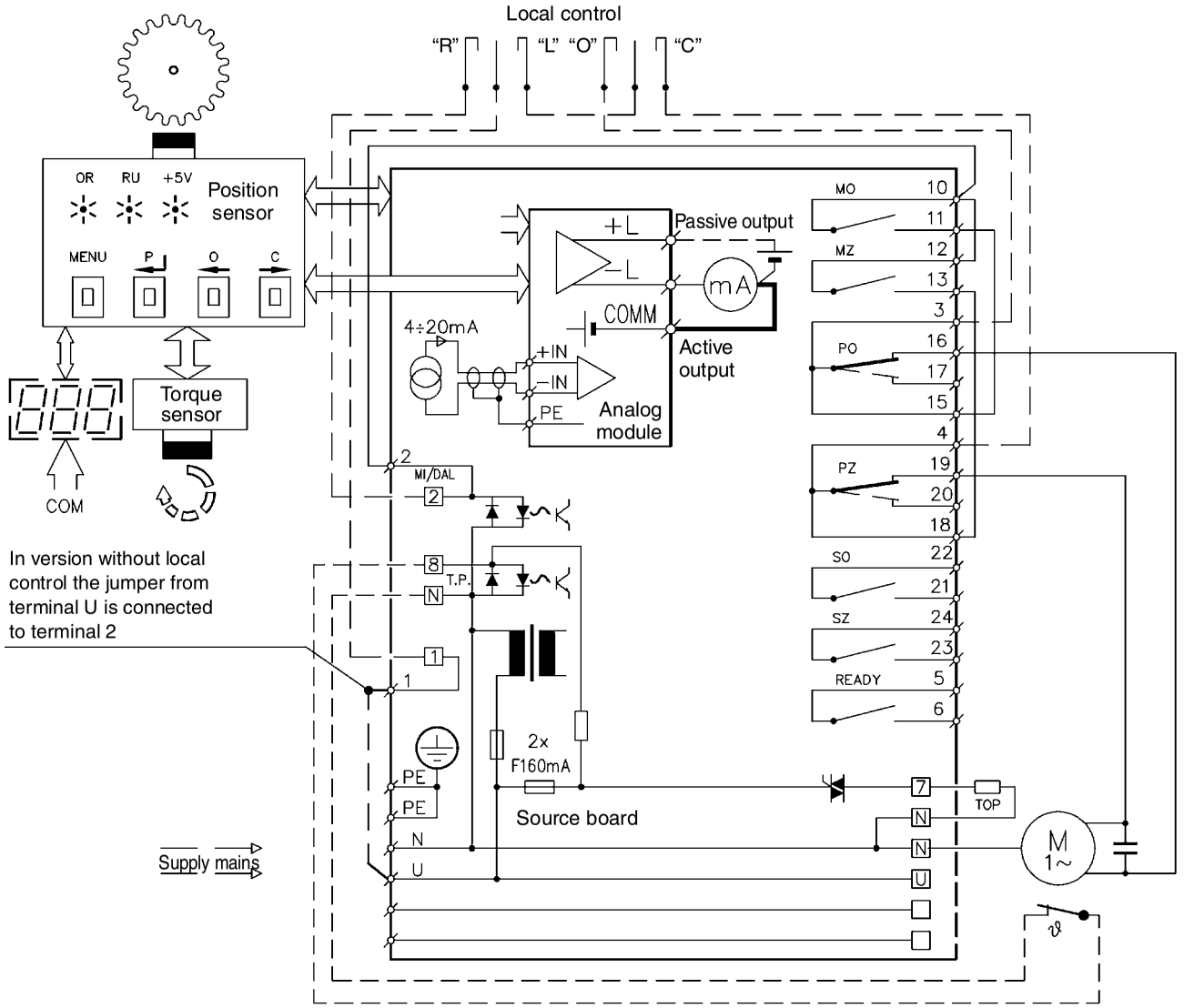
Note: *Here, contacts of relay MO, MZ, SO, SZ are shown with power supply switched off; with power supply switched off contacts PO, PZ are shifted to the position drawn in dashed line.*

Example of connection of **DMS2ED electronics with phase tripping monitoring** module dual local control switch

E0102

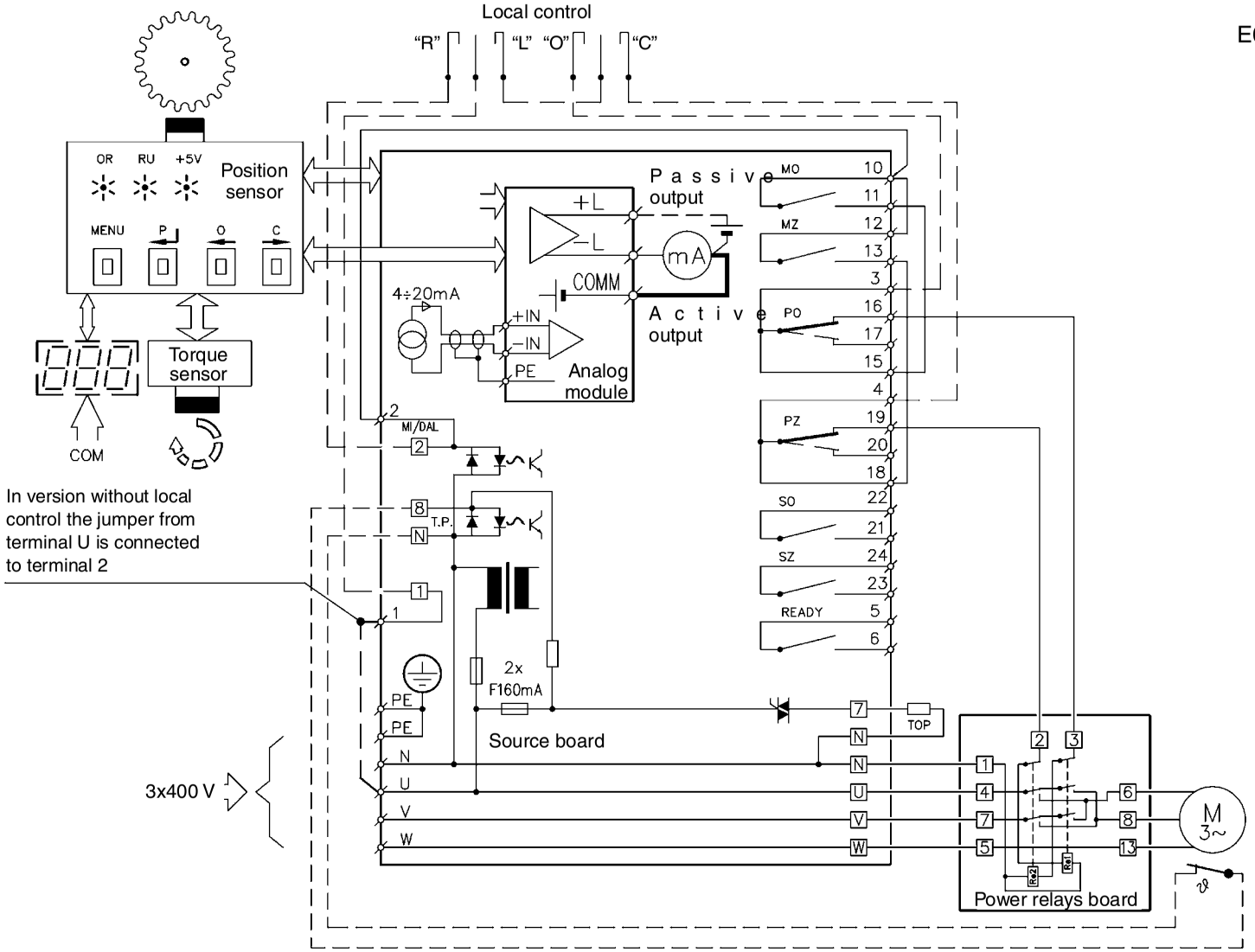


Example of wiring diagram of electronics **DMS2 ED** in version **Control** with single-phase electric motor



Note: *Here, contacts of relay 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.*

Example of wiring diagram of electronics **DMS2 ED** in version **Control** with three-phase electric motor



Note: *Here, contacts of relay 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.*

DMS2 SYSTEM

Main properties of DMS2 electronics:

– 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.
– Autodiagnostics 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 of DMS2:

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.

The **source unit** consists of:
– Power supply for electronics.
– 2 relays for electric motor control,
– Ready relay with change-over contact separately led on a terminal board
– 1 – 4 signalling relays with one pole of contact switch led on terminal board. Second poles of relay contacts 1 – 4 are connected to COM terminal.
– User terminal for supply voltage and output relays connection.

The unit allows connection of the heating resistor and its control with thermostat.

The unit controls power switches of the electric motor *(reversing relay)* and can directly control a low power single phase electric motor.

Display unit – dual line display, 2 x 12 alphanumeric characters
Button unit – buttons sensor ***"open", "close", "stop"*** and rotary switches ***"local, remote, stop."***
Power relays – for three-phase electric motor *(according to design).*

Note:

DMS2 electronics – in 2P or 3P control design are motor relays for controlling of the actuator (associate torque and position function) connected directly to the contactors and not to the terminal board. Four relay contacts R1 to R4, led to the terminal board, have only a secondary function and are used like a signalling switches to indicate the status of the actuator.

DMS2 electronic system as DMS2ED electronic system designed for 2P or 3P regulation has **contact Ready** led to the terminal board for error and non-standard states signalling according to the following list:

OFF	warnings + errors	torque O or Z
warning	errors + not remote	
error	errors + warnings + not remote	

Electronics DMS2 in version Profibus communicates with the master control system exclusively via industrial bus, no other signals are brought out.

Optional DMS2 electronics outfit *(in the actuator must be one of these units):*

The two- and three-position control unit – allows controlling the actuator by moving to the *"open"* and *"closed"* positions or by analog signal 0 *(4)* – 20 mA.

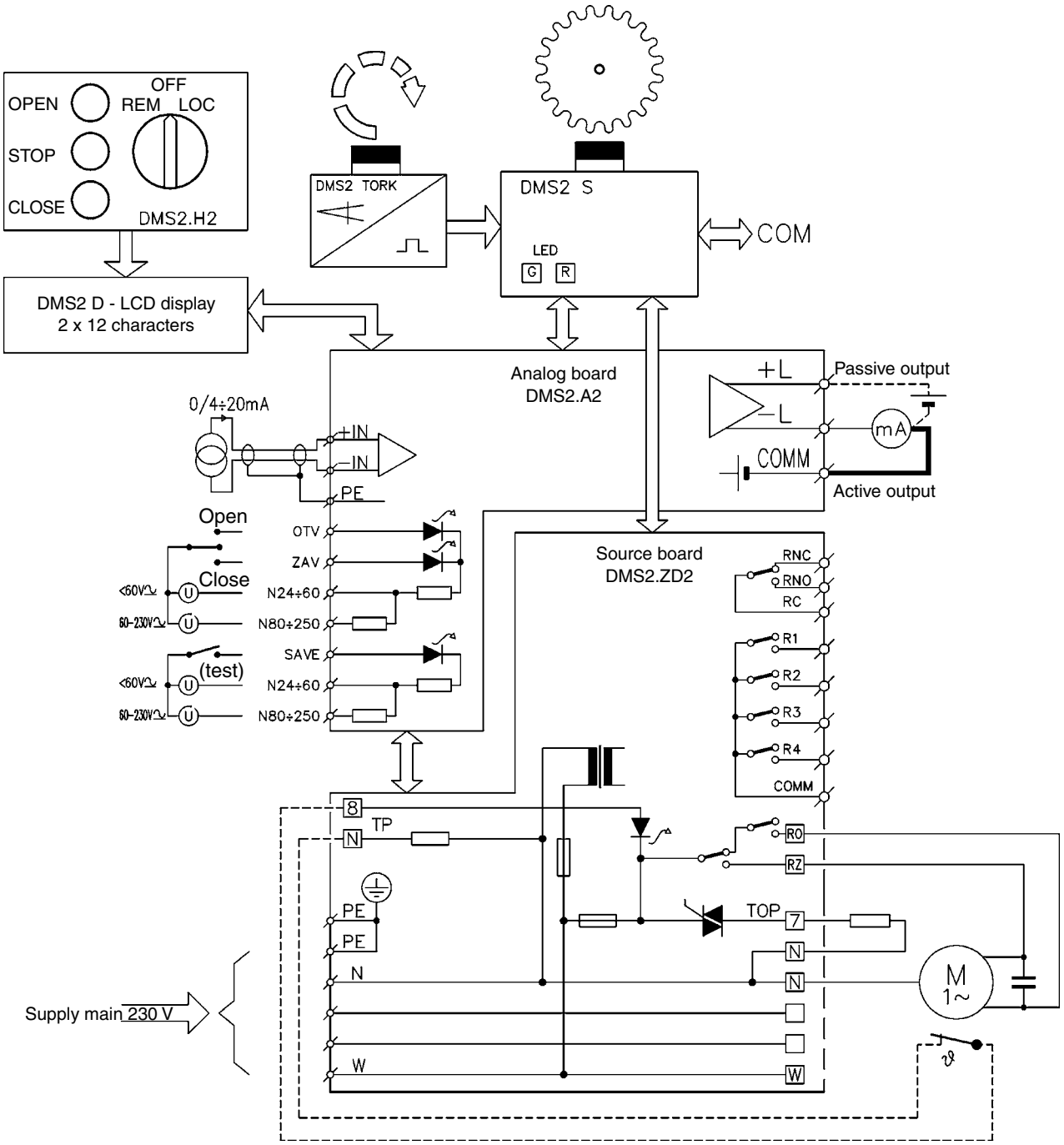
Profibus connection unit – allows you to control actuator by PROFIBUS.

Technical parameters of DMS2 electronics:

Scanning of position	contact-less, magnetic
Scanning of torque	contact-less, magnetic
Working stroke see	90°
Torque blocking	0 – 20 s at reversing in limit positions
Input signal	0*(4)* – 20 mA with switched on 3P regulator function
	Open, Close 15 – 60 V AC/DC with switched on 2P regulator function
	Safe 15 – 60 V AC/DC
	Local/remote control, local open, stop, local close
Output signals	5 x relay 250 V AC 3A *(R1, R2, R3, R4, READY)*
	Position signal 4 – 20 mA, max. 500 Ω, active/passive, galvanic-isolated
	LCD display 2 x 12 alpha-numeric characters
Power supply	230 V AC, 50 Hz, 4 W, over-voltage category II
	Monitoring the presence and sequence of a phase

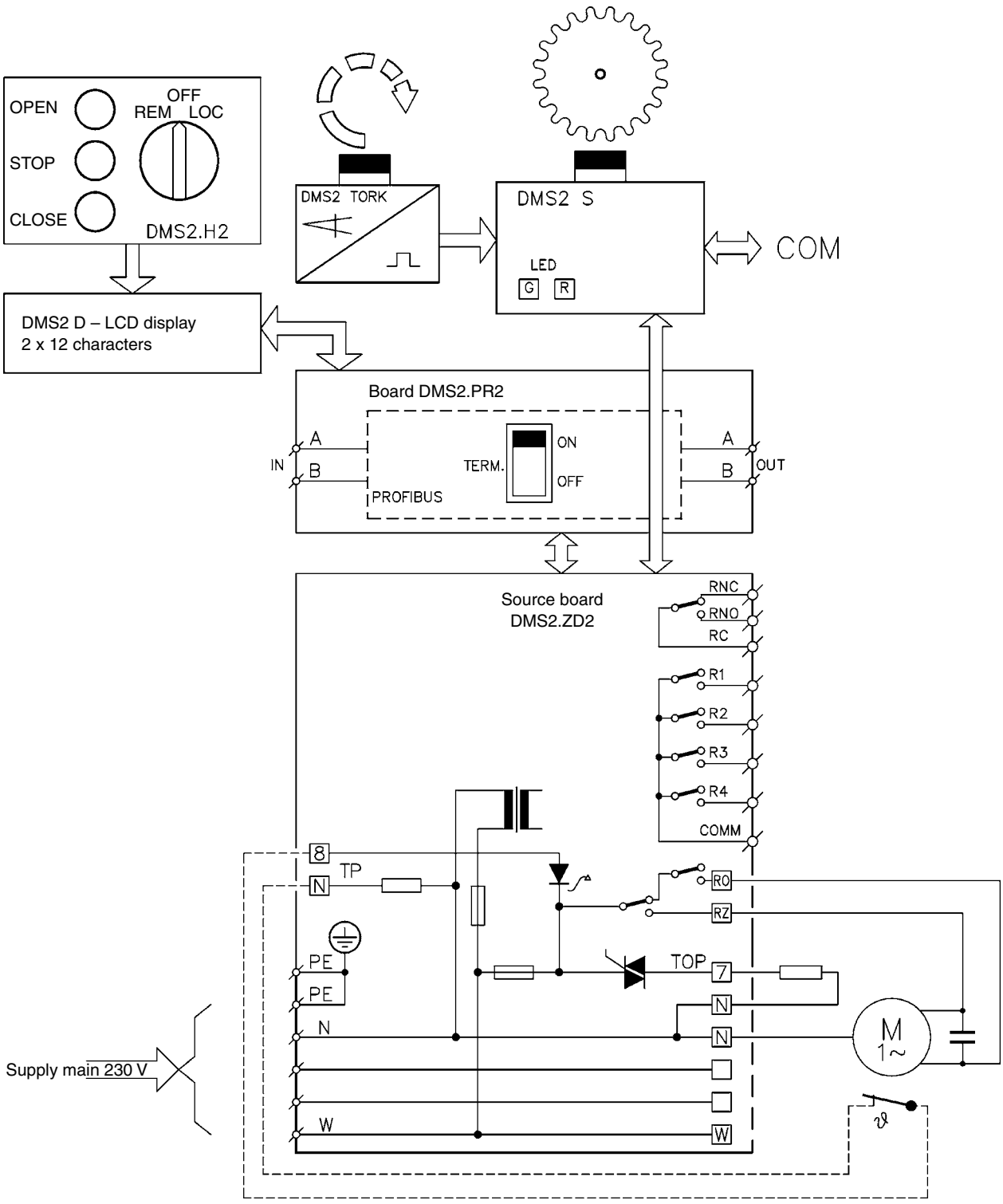
Example of wiring diagram of system **DMS2** in version for control with signals *“open”* and “close” or in version for control with analog current signal with single-phase electric motor

E0014



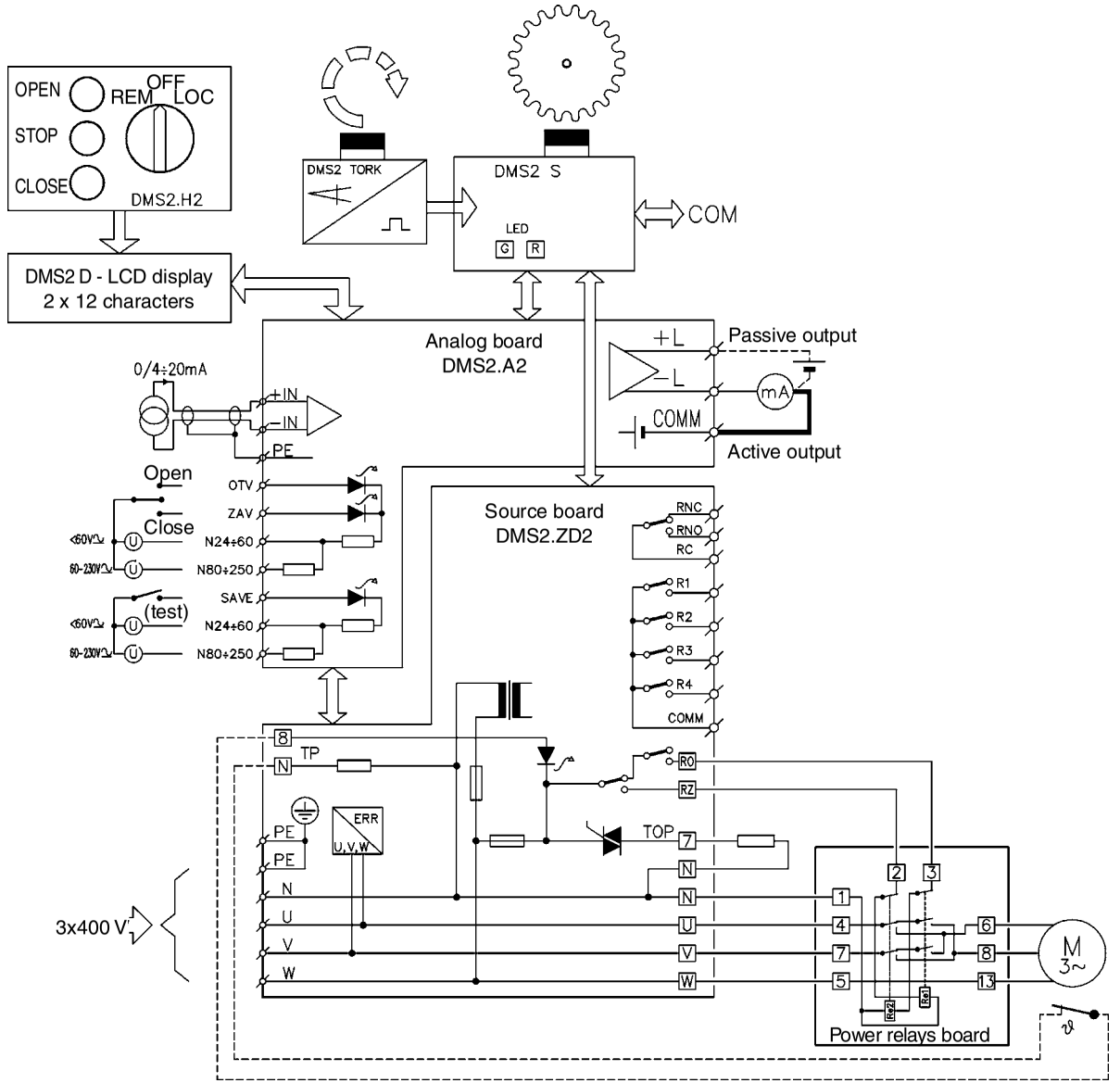
Example of wiring diagram of system **DMS2** in version Profibus
with single-phase electric motor

E0015



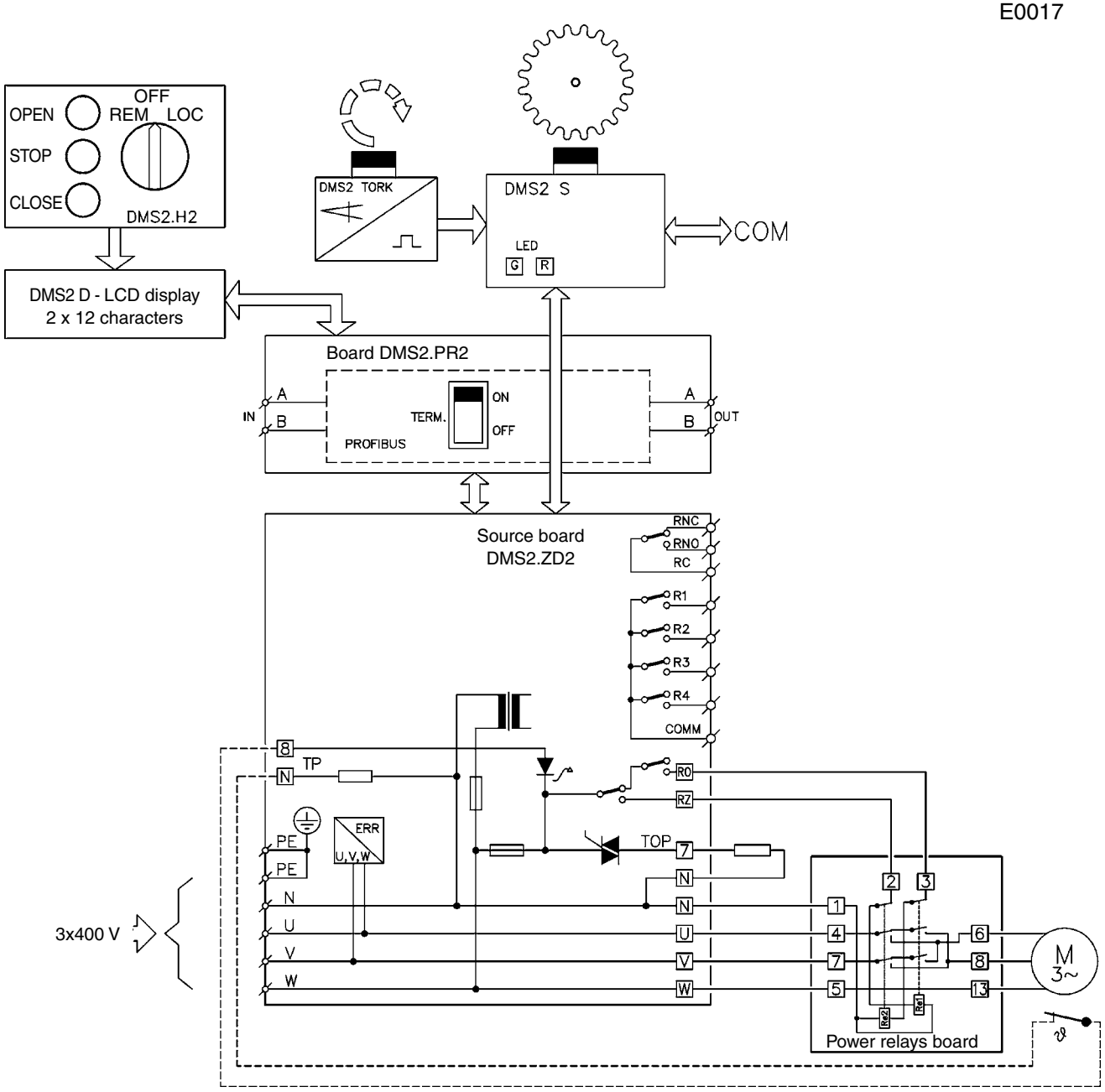
Example of wiring diagram of system **DMS2** in version for control with signals “open” and “close” or in version for control with analog current signal with three-phase electric motor

E0016

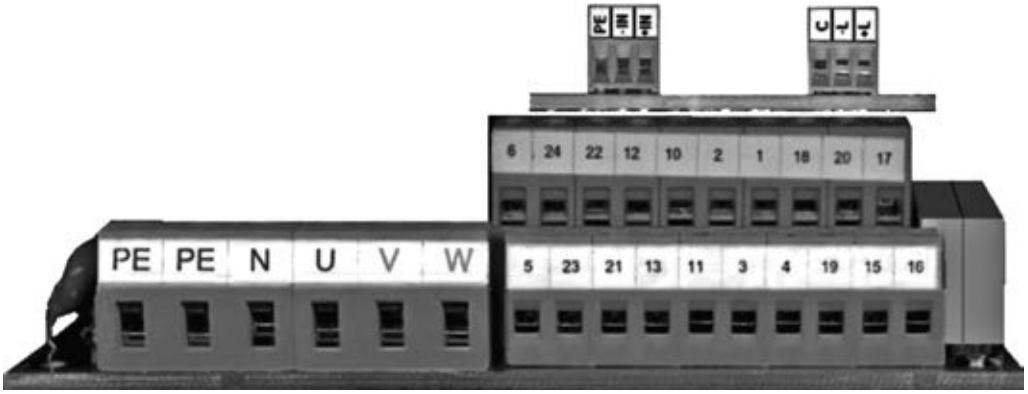


Example of wiring diagram of system **DMS2** in version Profibus
with tree-phase electric motor

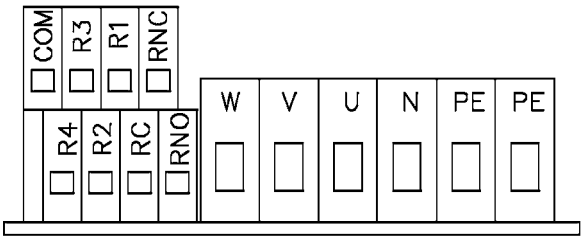
E0017



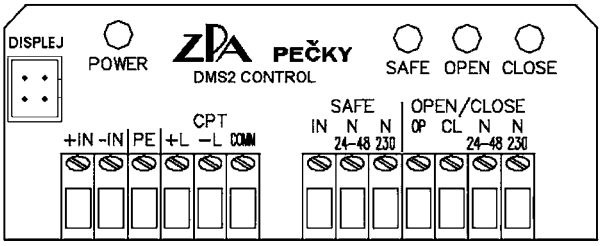
The terminal board of the actuator with electronics DMS2 ED.



The terminal board of the actuator with electronics DMS2.



Terminals on source board



Terminals in local control box

If the actuator is of one-phase version the supply mains inlet is only connected to the terminals ***PE, N, U.***

The terminals ***V, W*** *will remain unconnected. If the actuator is of the version "Replacement of electric-mechanical board" with threephase electric motor without power relays, the electric motor is connected to a separate terminal board (not shown here).*

Table 1 – Electric actuators MODACT MOKPED Ex

– basic technical parameters

Type	Type number	Shifting time [s/90°]	Tripping torque [Nm]	Electric motor						Weight [kg]
				Power [W]	Type	RPM [1/min]	Voltage [V]	Current [A]	Capacity µF	
MOKPED 100 Ex	52320.x=1+ED	10	25 – 100	74	ES 7150-2AL	2750	1 x 230	0,67	7	9,7
	52320.x=2+ ED	20		74	ES 7150-2AL	2750	1 x 230	0,67	7	
	52320.x=3+ ED	40	25 – 85	15	FCJ2B52D	2780	1 x 230	0,37	3,5	
	52320.x=4+ ED	80	25 – 100	17	ES 7130-4AY	1300	1 x 230	0,27	3,5	
	52320.x=5+ ED	10	16 – 32	15	FT2B52C	2680	3 x 400	0,10	-	
	52320.x=6+ ED	20	25 – 90	15	FT2B52C	2680	3 x 400	0,10	-	
	52320.x=7+ ED	40	25 – 100	15	FT2B52C	2680	3 x 400	0,10	-	
MOKPED 250 Ex	52321.x=1+ ED	10	63 – 125	90	EAMRB56N02	2780	1 x 230	0,9	8	18,5
	52321.x=2+ ED	20	100 – 250	90	EAMRB56N02	2780	1 x 230	0,9	8	
	52321.x=3+ ED	40		40	EAMRB56N04A	1380	1 x 230	0,55	5	
	52321.x=4+ ED	80		40	EAMRB56N04A	1380	1 x 230	0,55	5	
	52321.x=5+ ED	10	63 – 200	90	EAMR56N02L	2790	3 x 400	0,25	-	
	52321.x=6+ ED	20	100 – 250	90	EAMR56N02L	2790	3 x 400	0,25	-	
	52321.x=7+ ED	40		60	EAMR56N02A	2790	3 x 400	0,20	-	
	52321.x=8+ ED	80		20	EAMR56N04A	1440	3 x 400	0,20	-	
MOKPED 600 Ex	52322.x=1+ ED	10	250 – 510	180	EAMR63N04	1370	3 x 400	0,6	-	31
	52322.x=2+ ED	20	250 – 600	120	EAMR63N04L	1390	3 x 400	0,45	-	
	52322.x=3+ ED	40		60	EAMR63L02A	2790	3 x 400	0,20	-	
	52322.x=4+ ED	80		20	EAMR63L04A	1440	3 x 400	0,20	-	
	52322.x=5+ ED	160		20	EAMR63L04A	1440	3 x 400	0,20	-	
	52322.x=6+ ED	20	250 – 450	180	EAMRB63N04	1320	1 x 230	1,35	10	
	52322.x=7+ ED	40	250 – 550	90	EAMRB63L02	2780	1 x 230	0,90	8	
	52322.x=8+ ED	80	250 – 600	40	EAMRB63L04A	1380	1 x 230	0,55	5	
	52322.x=9+ ED	160		40	EAMRB63L04A	1380	1 x 230	0,55	5	

The type number shall include:

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

6th place: – **the letter "U",** if there is letter **C, P, R** or **S** on the 7th place *(electric actuator is fitted with electronics DMS2),*
– **the letter "T"** if there is letter **C** or **R** 7th place – the actuator is not equiped with display and block of local control
– **character from Table 2,** if there is letter **E** on the 7th place *(electronics DMS2 ED)*

Table 2 – actuator with electronics DMS2 ED

Character		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**A**	**B**	**C**	**D**	**E**	**F**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**
Local control			x		x		x		x		x		x		x		x		x		x		x		x
Display				x	x			x	x			x	x			x	x			x	x			x	x
Power relays						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	x	x	x	x
	regulator																	x	x	x	x	x	x	x	x

7th place: **E** – electric actuator is fitted with electronics DMS2 ED
P – electric actuator is fitted with electronics DMS2 for connection to Profibus, power relays
S – electric actuator is fitted with electronics DMS2 for connection to Profibus
R – electric actuator is fitted with electronics DMS2 for two- or three-position control **), power relays
C – electric actuator is fitted with electronics DMS2 for two- or three-position control **)

**) 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 – adjusting time, tripping torque - according to Table 1

9th place – mechanical connection – the numeber or letter according to Table 3

10th place – **ED** – actuators with DMS2 or DMS2 ED electronic system

11th place – surrounding temperature

For surrounding temperature from -25 °C till +55 °C	no designation
For surrounding temperature from -50 °C till +55 °C	F

In all markings of explosion-proofness of actuators type no. 52 32x.xxxxF, the marking of sub-groups of group II of an explosion-proof electric device according to standard ČSN EN 60079-0 will be changed from IIC to IIB, namely Ex d IIB T6.

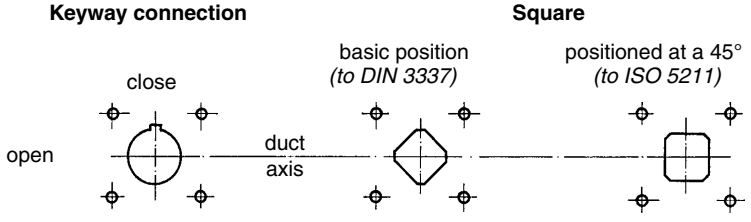
The version 52 32x.xxxxF is only available with three-phase electric motors.

Table 3 – Way of connecting MODACT MOKPED Ex electric actuators

– specifying of the 9th place in type number

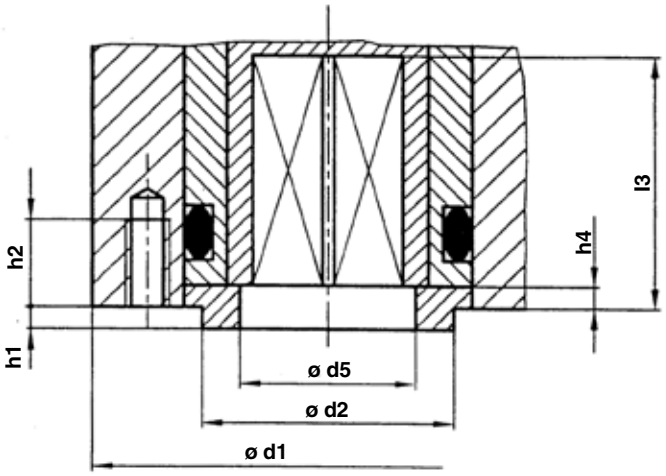
Flange size	Connection	Square size s [mm]	Square position	Marking of the 9th position in the type number	Structural design of output
Type number **52 320**					
F05	keyway	Ø 22		0	collar
F05	square	14	basic	1	exchangeable inserts
F04	keyway	Ø 18		2	
F04	square	11	basic	3	
F05		14	positioned at a 45°	4	
F04		11	positioned at a 45°	5	
F04		12	basic	6	
F04		12	positioned at a 45°	7	
F05		16	basic	8	
F05		16	positioned at a 45°	9	
Type number **52 321**					
F10	square	22	basic	1	exchangeable inserts
F07	keyway	Ø 28		2	
F07	square	17	basic	3	
F10		22	positioned at a 45°	4	
F07		17	positioned at a 45°	5	
F07		19	basic	6	
F07		19	positioned at a 45°	7	
F10		24	basic	8	
F10		24	positioned at a 45°	9	
F10		27	basic	A	
F10		27	positioned at a 45°	B	
Type number **52 322**					
F12	keyway	Ø 50		0	collar
F12	square	27	basic	1	exchangeable inserts
F10	keyway	Ø 42		2	
F10	square	22	basic	3	
F12		27	positioned at a 45°	4	
F10		22	positioned at a 45°	5	
F10		24	basic	6	
F10		24	positioned at a 45°	7	
F10		27	basic	8	
F10		27	positioned at a 45°	9	
F12		32	basic	A	
F12		32	positioned at a 45°	B	

Actuator output shaft position
(when viewing towards the local position indicator).
The handwheel tallies with the CLOSED position

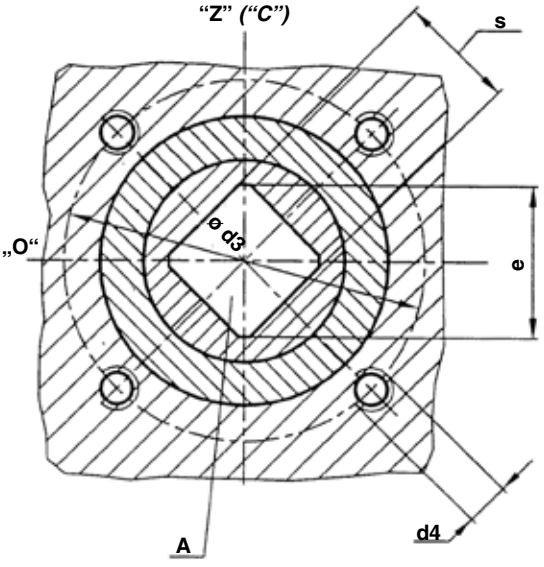


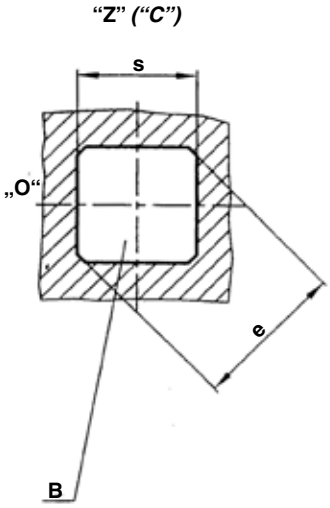
Another connection of electric actuators on demand.

Connecting dimensions of **MODACT MOKPED Ex** electric actuators
for valves and control devices - connecting with square



The position of the square hole in end position of electric actuator.
The position "Opened" is to the left of the position "Closed" when viewing in the direction to the local indicator of position.
The square hole is according to DIN 79:2013-02.
Connecting dimensions are according to DIN 3337 or ISO 5211.
The position "Z" *("C")* of the square hole for spindle is identical with the position "Z" *("C")* on the local indicator of position.

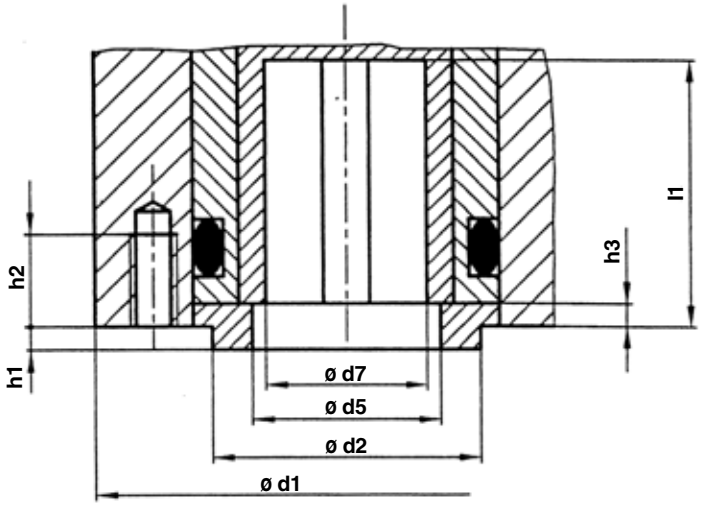




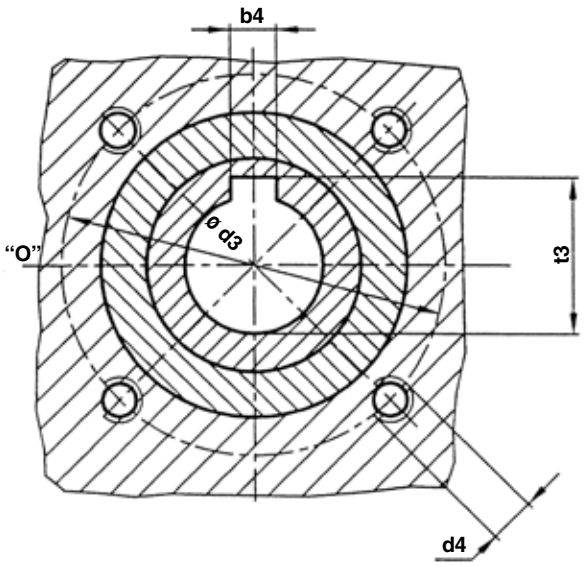
A – connection by square in basic position
B – connection by square turned by 45 °

Flange	ø d1	ø d2 f8	ø d3	d4	h4		h2 min.	h1 max.	l 3 min.	s H 11	e min.	ø d5
					min.	max.						
F04	65	30	42	M6	1,5	0,5	12	3	15,1	11	14,1	25
									16,1	12	16,1	
F05	65	35	50	M6	3	0,5	12	3	19,1	14	18,1	28
									22,1	16	21,2	
F07	90	55	70	M8	3	0,5	13	3	23,1	17	22,2	40
									26,1	19	25,2	
F10	125	70	102	M10	3	1	16	3	30,1	22	28,2	50
									33,1	24	32,2	
									37,1	27	36,2	
F12	150	85	125	M12	3	1	20	3	37,1	27	36,2	70
									44,1	32	42,2	

Connecting dimensions of **MODACT MOKPED Ex** electric actuators
for valves and control devices – connecting with keyway



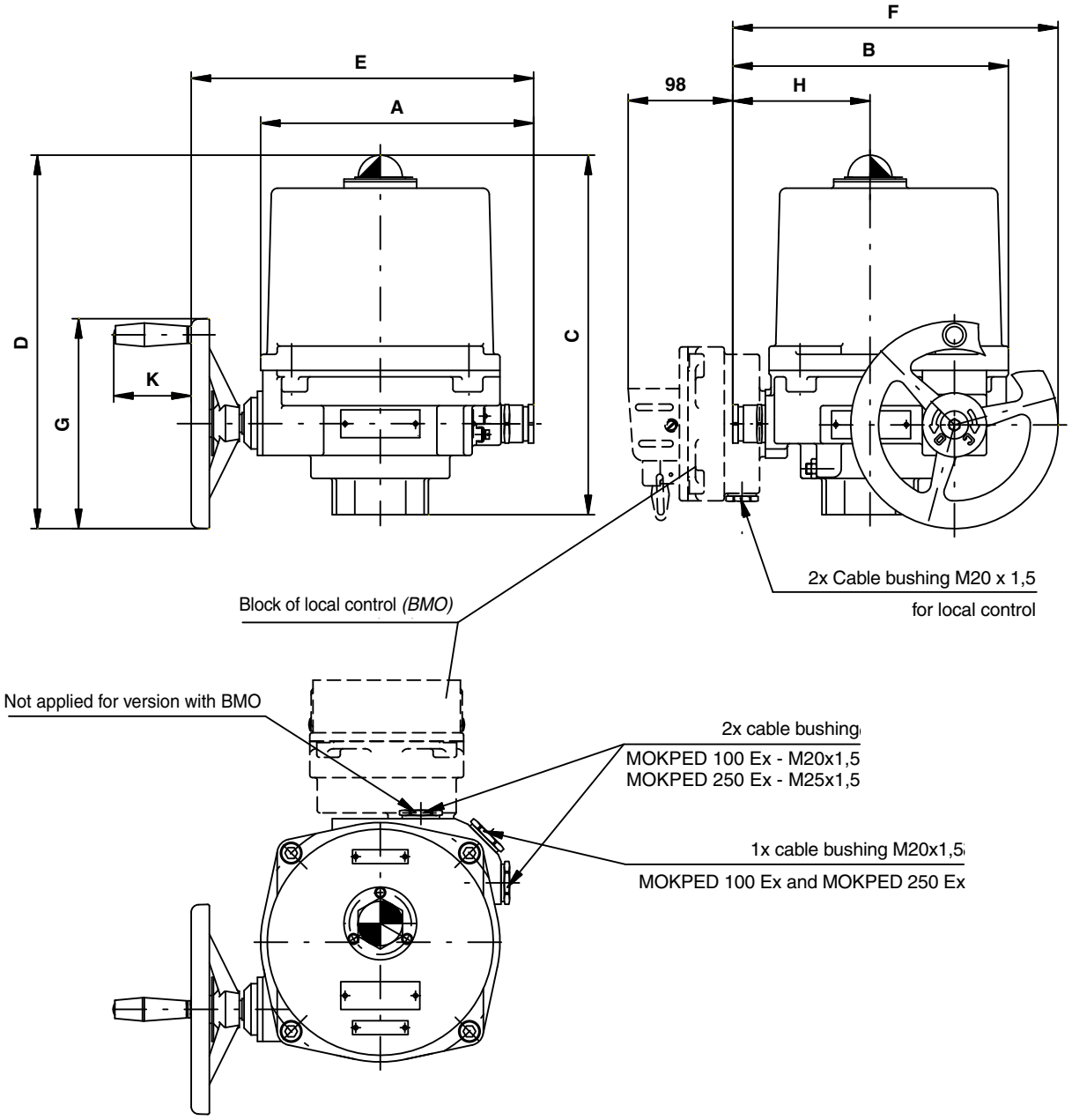
"Z" ("C")



The position of groove for keyway according to ISO 5211 and DIN 3337 is in the position "Closed". The position "Opened" is to the left of the position "Closed" when viewing in the direction to the local indicator of position. The position "Z" *("C")* of the groove for keyway is identical with the position "Z" *("C")* on the local indicator of position.

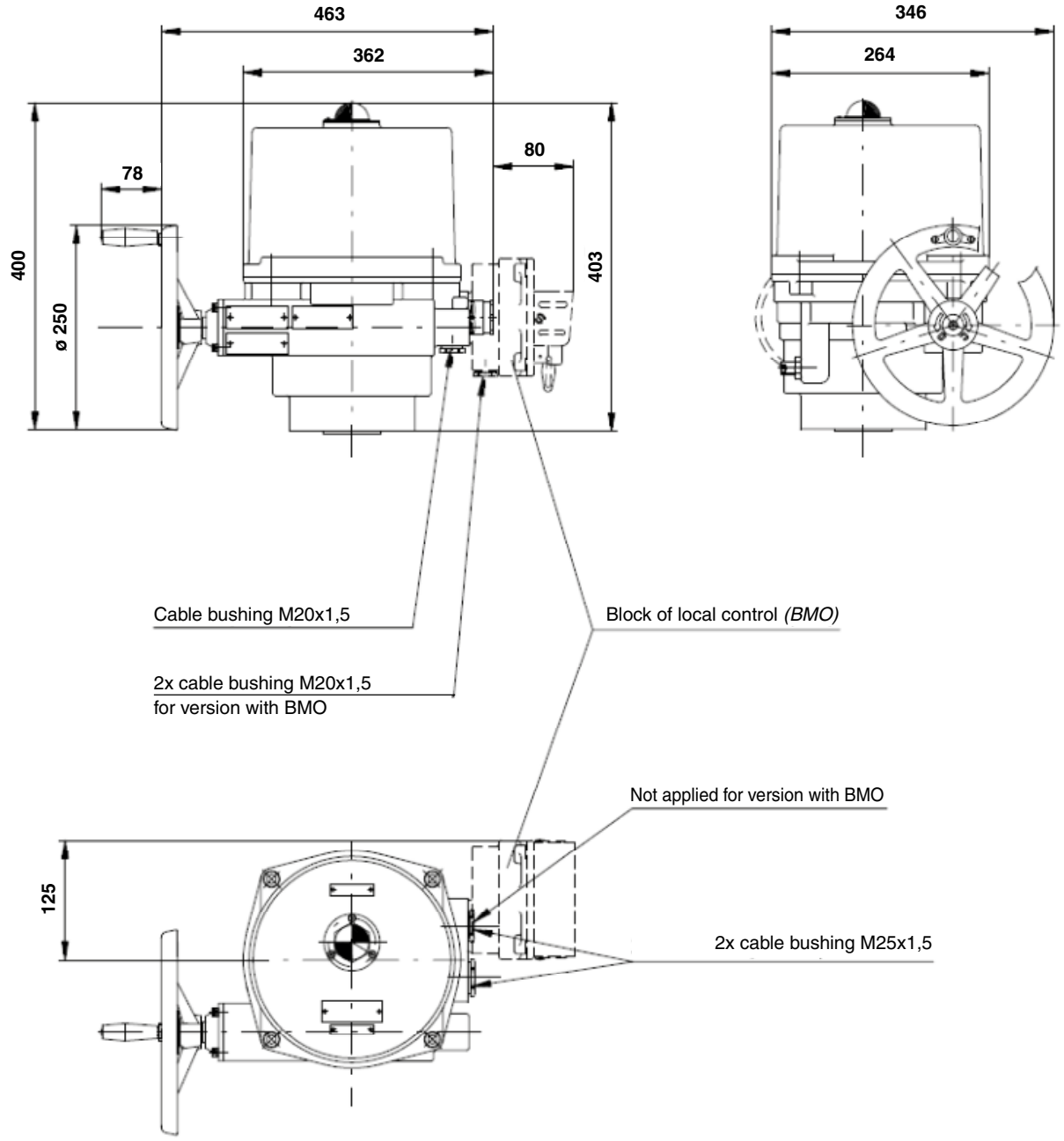
Flange	ø d1	ø d2 f8	ø d3	d4	d7 H9	h3 max.	h2 min.	h1 max.	l1 min.	b4 Js 9	$t3^{+0,4}_{+0,2}$	ø d5
F04	65	30	42	M6	18	3	12	3	26	6	20,5	25
F05	65	35	50	M6	22	3	12	3	30	6	24,5	28
F07	90	55	70	M8	28	3	13	3	35	8	30,9	40
F10	125	70	102	M10	42	3	16	3	45	12	45,1	50
F12	150	85	125	M12	50	3	20	3	55	14	53,5	70

Dimensional sketch of **MODACT MOKPED 100 Ex** and **250 Ex** electric actuators



Type	A	B	C	D	E	F	G	H	K
MOKPED 100 Ex	253	276	297	308	311	316	160	170	72
MOKPED 250 Ex	306	312	368	385	376	363	200	183	72

Dimensional sketch of **MODACT MOKPED 600 Ex** electric actuators



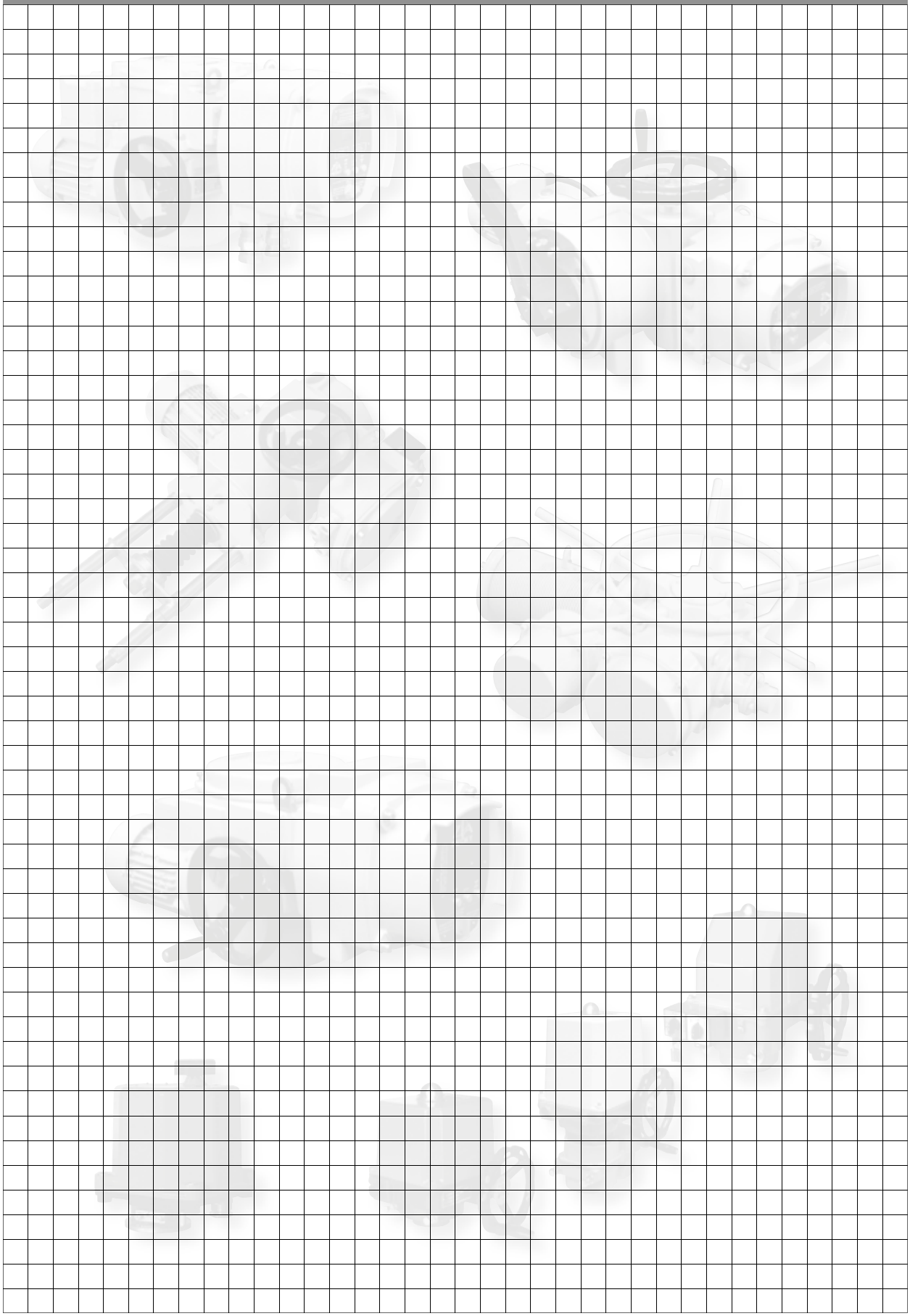
Threaded holes for cable entries are marked M20x1,5 or M25x1,5 in accordance with article 13 of ČSN EN 60079-1. These entries are sealed by plugs M20x1,5 or M25x1,5.

The customer is obliged to establish electrical connection for direct entry to the flameproof enclosure, that corresponds to the requirements of ČSN EN 60079-14 and the protective enclosure is at least IP 67.

At the customer's request, the manufacturer can supply motors with cable bushing system that meets the requirements of ČSN EN 60079-14 Article 10.4.2.d for direct entry into flameproof enclosure of group IIC. For entry into actuators flameproof enclosure are used certified sealed bushings appropriate sizes.

They can be used Peppers *(type CR-U)* or HAWKE (type 623 ICG) glands according to the following table:

Gland	Threaded hole	Cable diameter
CR-U/25	M25x1,5	11,7 – 20,0 mm
ICG 623/B	M25x1,5	13,0 – 20,2 mm
CR-U/20	M20x1,5	9,5 – 14,0 mm
ICG 623/A	M20x1,5	11,0 – 14,3 mm



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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

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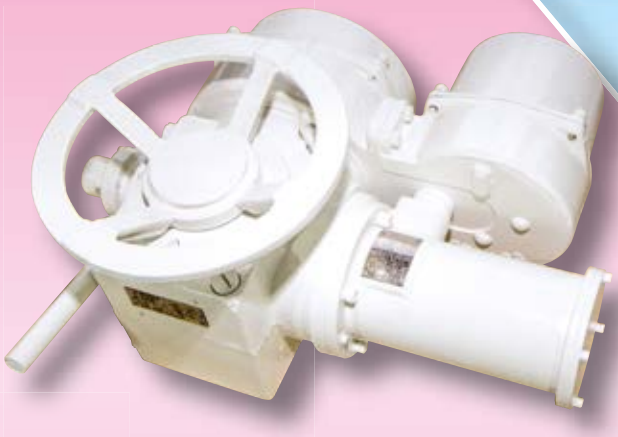

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