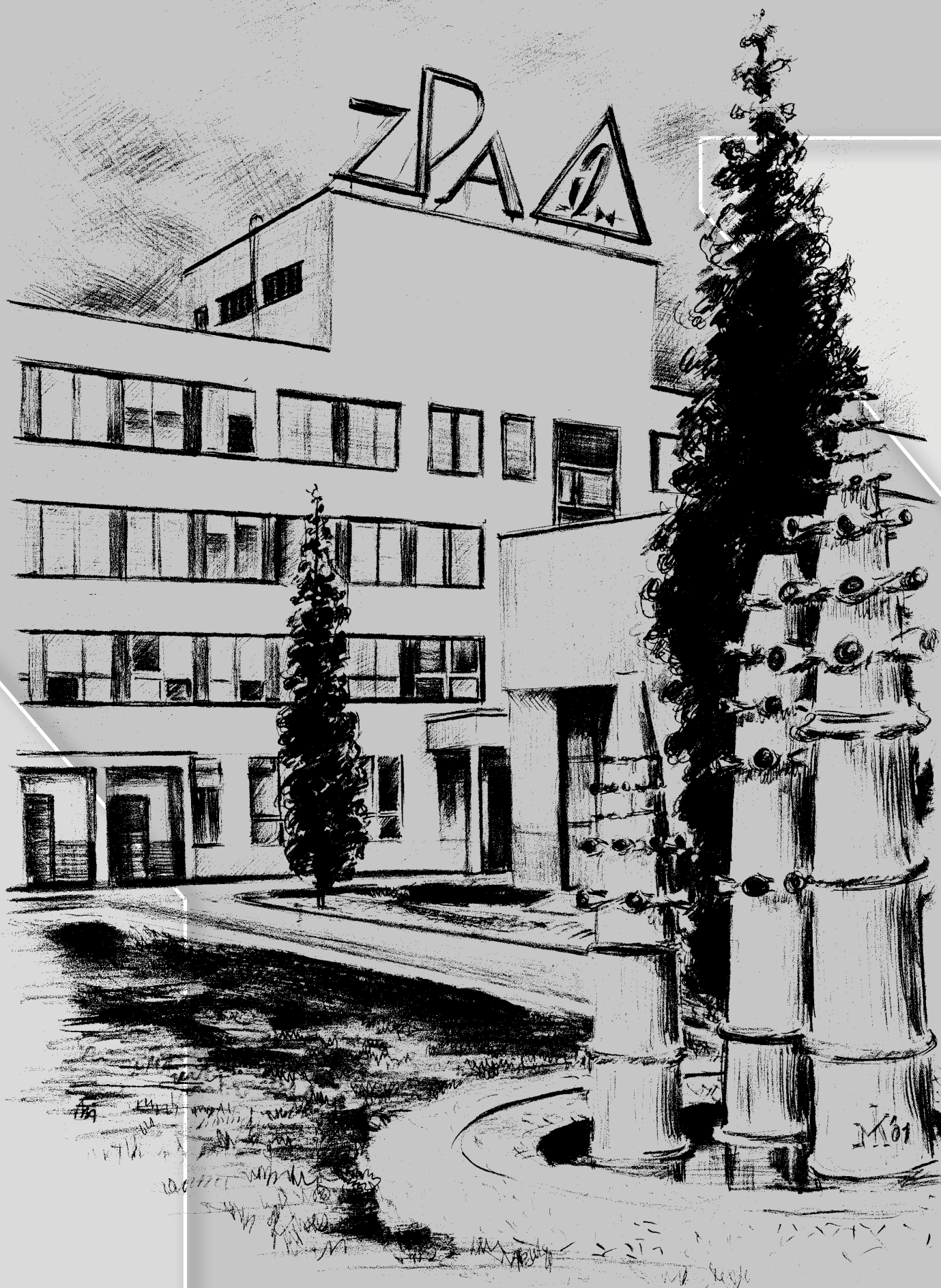


**Electric Linear (Pull-rod)
actuators**

MODACT MTNED, MTPED

Type numbers 52 442, 52 443



ZPA Pečky, a.s. is certified company in accordance with ISO 9001 as amended.

CONTENS

1. Application	3
2. Operating conditions, Operating position	3
3. Operating mode, Service life of actuators	4
4. Technical data	5
5. Actuator outfit	6
6. Electric parameters	7
7. Description	7
8. Elektronic outfit	8
Tables – basic parameters	35–36
Dimensional sketch MODACT MTNED, MTPED	37–39
9. Packing and storing	40
10. Checking of the instrument function and its location	40
11. Attachment to a valve	40
12. Adjustment of the actuator with a valve	40
13. Operation and maintenance	40
14. Failures and their removal	41
Spare parts list	42

1. APPLICATION

The actuators **MODACT MTNED, MTPED** are used for remote two-position or three-position control of valves by reciprocating linear motion. The actuators can also be used for other devices for which they are appropriate due to their performance and parameters. Using in special cases should be discussed with the manufacturer.

2. OPERATING CONDITIONS, OPERATING POSITION

Operating conditions

The **MODACT MTNED, MTPED** actuators should withstand the effect of operating conditions and external influences, Classes AC1, AD5, AD7, AE4, AE6, AF2, AG2, AH2, AK2, AL2, AM2-2, AN2, AP3, BA4 and BC3, according to ČSN Standard 33 2000-5-51 ed. 3.

When installed on a free area the actuator should be fitted with a light shelter against direct action of atmospheric effects. The shelter should overhang the actuator contour by at least 10 cm at the height of 20 – 30 cm.

Installation of the actuators at a location with incombustible and non-conducting dust is possible only if this has no adverse effect on their function. At the same time, it is necessary to strictly observe the ČSN Standard 34 3205. It is advisable to remove dust whenever the layer of dust becomes as thick as about 1 mm.

Notes:

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

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

Temperature

Operating temperatures for **MODACT MTNED** electric actuators ranges from -25 °C to +70 °C and -40 °C to +60 °C.

Operating temperatures for **MODACT MTPED** electric actuators ranges from -25 °C to +60 °C and -40 °C to +60 °C.

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

Class

- 1) AC1 – above-sea level \leq 2000 m
- 2) AD5 – spouting water; water may spout in all directions
AD7 – shallow immersion, possible sporadic partial or full coverage (only MTPED)
- 3) AE4 – slight dust formation
AE6 – strong dust formation (only MTPED)

- 4) AF2 – occurrence of corrosive or polluting agents is atmospheric; presence of corrosive pollutants is significant
- 5) AG2 – mean mechanical strain; in normal industrial operations
- 6) AH2 – mean vibrations; in normal industrial operations
- 7) AK2 – serious risk of plant and moulds growth
- 8) AL2 – serious risk of occurrence of animals (*insects, birds, small animals*)
- 9) AM-2-2 – normal level of signal voltage. No additional requirements.
- 10) AN2 – mean solar radiation. Intensity > 500 and ≤ 700 W / m²
- 11) AP3 – mean seismic impacts; acceleration > 300 Gal ≤ 600 Gal
- 12) BA4 – capability of persons; instructed persons
- 13) BC3 – frequent contact of persons with ground potential; persons often touch foreign conductive parts or stand on conductive substrate

Corrosion protection

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

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

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

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

Operating position

The actuators can be used in any operating position. It is not recommended to position actuator vertically downwards by motor in case of it is filled by oil.

3. OPERATION MODE, SERVICE LIFE OF ACTUATORS

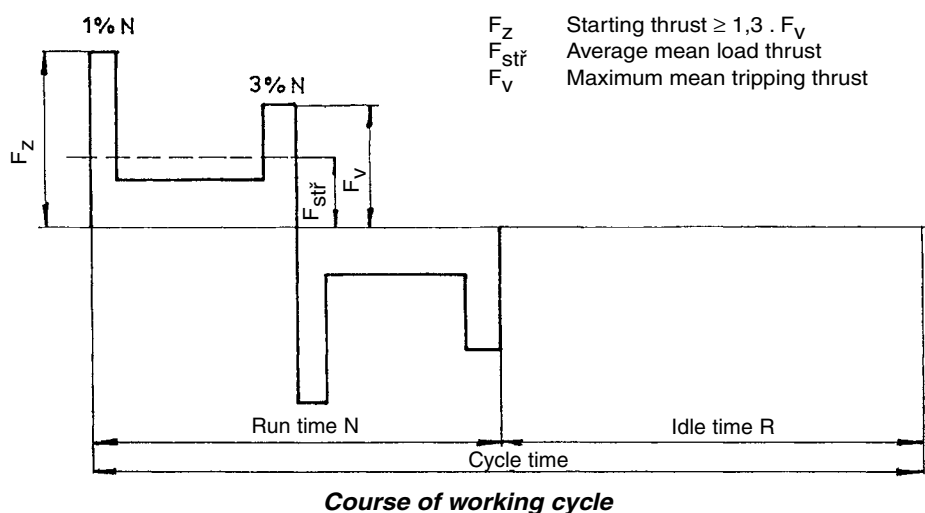
Operation mode

According to ČSN EN 60 034-1, actuators can be operated in S2 load category (*the course of load is shown in the picture*). The operation time at +50 °C shall be 10 minutes, the average mean load thrust value shall be below or equal to 60 per cent of the maximum tripping thrust F_V .

According to ČSN EN 60 034-1, the actuators can also be operated in the S4 mode (*interrupted operation with acceleration intervals*).

The load factor N/N+R shall be maximum 25 per cent, the longest operation cycle N + R is 10 minutes. The maximum number of switching actions in automatic control mode is 1200 actions per hour. The average mean load thrust at load factor of 25 per cent and 50 °C shall not exceed 40 per cent of the maximum tripping thrust F_V .

The maximum average mean of the load thrust equals the rated thrust of the actuator.



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.

When using reversing contactor unit the service life of actuator is 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

When using reversing contactless unit the service life of actuator is 3 million starts

Service life [h]	2490	3000	6000	12000
Number of starts [1/h]	3600	3000	1500	750

4. TECHNICAL DATA

Supply voltage

Supply voltage of electric motor: **MODACT MTNED, MTPED:** 3 x 230/400 V, +10 %, -15 %, 50 Hz ± 2 %
3 x 220/380 V, +10 %, -15 %, 50 Hz +3 % - 5 %

Actuators designed to operate at another voltage and frequency than those given above are available upon special request. For more details, refer to the Technical conditions.

Protective enclosure

Protective enclosure of actuators: **MODACT MTNED – IP 55**
MODACT MTPED – IP 67

Noise

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

Tripping thrust

At the factory, the tripping thrust has been adjusted within the min./max. range giving in Table 1, according to the customer's requirements. If no tripping thrust adjustment is required the actuator is adjusted to its maximum tripping thrust.

Starting thrust

The starting thrust 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 thrust 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. Blocking time is adjustable in range 0 – 20 s.

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.

Working stroke

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

Manual control

The actuators are controlled by the hand wheel directly (*without a clutch*) and they can be controlled even with the electric motor running. By rotating the hand wheel in the clockwise direction, the actuator output tie rod is shifted out (*closes*). During turning of handwheel, it is necessary to use it gently, because actuator is not equipped by overload protection due safety aspects. Moment and position switches are not working in this moment.

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 electronic system **DMS2 ED**. Actuator with electronic system DMS2 is equipped with two-line display.

Anti-condensation heater

Anti-condensation heater is connected to DMS and DMS ED electronic circuit. Switching of the anti-condensation heater is controlled by a thermostat. From the factory is the switching temperature set to 10°C. The temperature is adjustable by adjusting software DMS2. Input power of the anti-condensation heater is 10W / 230V.

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 at a terminal-board box. If the actuator is equipped with **DMS2** electronic system local control consists of 3 buttons – "Open", "Stop", "Close" and rotary switch "Local, Remote, Off".

Dynamic brake

The brake is an optional accessory to the actuators fitted with electronics **DMS2** and **DMS2 ED Control**. As switching elements are used contactors (*mechanical contacts*) or SSR (*modern contactless switching elements*). After opening the switching element (*contactor or SSR*), it induces dynamic braking moment in the motor for several tenths of second. When the actuator is in a standstill no braking moment is exerted. The brake reduces dramatically time of the actuator run-down and regulation is thus more precise. The used brakes BR2 are controlled, impulse for action comes from the control unit. Corresponding variant of the brake is chosen according to the electric motor output and the type of switching elements.

Corresponding variant is chosen according to the electric motor power:

contactors	BR2 550	output up to 550 W
	BR 2,2	output up to 2.2 kW
SSR	BR2 BK 550	output up to 550 W
	BR BK 2,2	output up to 2.2 kW

Switching of electric motor, contactor unit

The actuators in variants Control are fitted with built-in reversing contactor combinations or SSR switches. First variant is assembled from two contactors and second variant from contactless switches.

The combination also includes mechanical blocking that prevents both contactors from being closed at the same time. This could, for instance, happen in case of wrong connection of jumpers on the terminal board. The blocking is not dimensioned for long-term action. The over-current relays protects the electric motor against over-loading and is dimensioned with respect to its output. According to the actuator version, the contactors are controlled by the regulator, change-over switch of local control or external input. Control voltage is 230 V / 50 Hz as a standard; it is supplied via contacts of position and/or moment micro-switches. Thus, these micro-switches need not be led out of the actuator. Contactors have defined service life at least 1 million cycles.

To extend the service life we recommend using contactless reversing unit with a minimum service life of 3 million cycles. The standard control voltage is 24V DC. It is used for output into 4 kW or 7.5 kW. The unit consists of semiconductor elements - thyristors.

6. ELECTRIC PARAMETERS

External electric connection

a) Actuator terminal board

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 sqmm to be connected. For connecting of signalling conductors to control circuits terminals it is used by conductors of maximal midship 1,5 sqmm. 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. Alternatively it is possible to deliver actuators with connector.

b) Connector

According to the customer's requirements the **MODACT MTNED, MTPED** actuators can be fitted with the connector to provide for connection of control circuits. This connector uses screw terminals allowing conductors with a maximum cross-section 4 sqmm to be connected. For connecting of signalling conductors into the crimp terminals of control circuits it is used by conductors of maximal midship 1,5 sqmm. ZPA Pečky, a.s. also supplies a counterpart for the cable. In order to connect the cable to this counterpart it is necessary to use special crimping pliers. After an agreement it is possible to rent or buy crimp pliers in ZPA Pečky, a.s. based under certain conditions.

Actuator internal wiring

The internal wiring diagrams of the **MODACT MTNED, MTPED** 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. Terminals are marked by numbers on source board. Carrying strap and self-adhesive label with numbers is at electromechanical board.

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

Circuits of anti-condensation heater	1 500 V, 50 Hz
Electric motor $U_n = 3 \times 230/400 \text{ V}$	1 800 V, 50 Hz

Deviations of basic parameters

Tripping thrust	$\pm 12 \%$ of max. value of range
Adjusting speed	- 10 % of max. value of range
	+15 % of rated value (<i>idle run</i>)
Clearance of output part	max. 1 mm

Protection

The actuators are fitted with one internal and one external protection terminal for ensuring protection against electric shock injury according to ČSN 33 2000-4-41 ed. 2. One protection terminal is also installed on the electric motor. The protection terminals are marked according to ČSN EN 60 417-1 and 2 (013760).

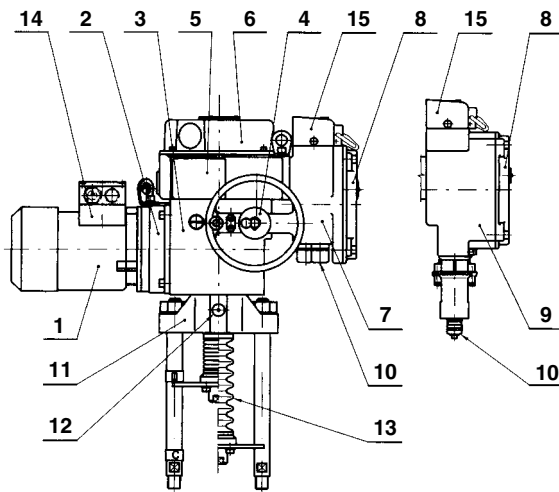
7. DESCRIPTION

In respect of their basic connecting dimensions, the actuators have been engineered for direct mounting to the valve. The connection of the actuator to the valve is provided by means of columns according to ČSN 18 6314, Art. 1.3, or by means of columns and a flange (*in non-standard design MTNED, MTPED 40 only*).

To transfer movement of output actuator rod to valve are actuators equipped with a clutch according to ČSN 18 6314, type A, article 1.3 (*with internal screw-thread*) or type B, article 1.3 (*with external screw-thread*) - see dimensional sketches and Table no. 2.

Actuator configuration (Fig.1)

The three-phase asynchronous motor 1 drives via countershaft gearing 2 the sun gear of a differential gear unit enclosed in the supporting actuator box (*power gear transmission*) 3. In the mechanical power control mode, the



- Legend:**
- 1 – Three-phase asynchronous motor
 - 2 – Countershaft gear box
 - 3 – Power transmission gear
 - 4 – Handwheel
 - 5 – Control box
 - 6 – Control box cover
 - 7 – Terminal box
– design with terminal box
 - 8 – Terminal box cover
 - 9 – Terminal box
– design with connector
 - 10 – Cable bushings for control
 - 11 – Rectilinear mechanism
 - 12 – Grease cup
 - 13 – Dust seal
 - 14 – Terminal board of electric motor
 - 15 – Local controller

Fig.1 - **Configuration of the actuator (with electronic system DMS2 ED)**

crown gear of the planet differential unit is held in a steady position by a self-locking worm gear drive. The handwheel 4, which is connected with the worm, allows manual control to be accomplished even during motor operation.

The output hollow shaft is fixably coupled to the planet-gear carrier. The output shaft of the actuator is extended to the rectilinear mechanism 11 which converts the rotary shaft motion to the rectilinear motion of a pull-rod. The output shaft goes into the control box 5 in which all control devices of the actuator have been concentrated, including position-limit, signalling and torque-limit switches, a position transmitter and the anti-condensation heater.

The operation of the torque-limit sensor is derived from the axial displacement of a “floating worm” of the manual control unit which is sensed and transferred to the control box by means of a lever. All controls are accessible after removal of cover 6 of the control box. Access to the terminal box 7 (9) is obtained after removal of cover 8. Cable inlets are secured by cable bushings 10.

The electric motor has its own terminal board 14 with a cable leadthrough. In addition, the pull rod position can be read from the display that can be fitted to the actuator.

8. 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:

Feed-back signal	4 – 20 mA,
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 block of contact-less control	
Electronic brake	

Main merits:

Absolute scanning of position independent of backup power supply.
 Simple setting by 4 push-buttons, computer PC or PDA.
 Possibility of back-up making of set parameters on PC.
 Intended for direct substitution of electromechanical components of the electric actuator.

Parameters:

Scanning of position	Contact-less, magnetic
Scanning of torque	Contact-less, magnetic
Working stroke	see Table 1
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 (<i>optional</i>)
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.

Relays 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 (<i>parameter Tripping</i>)
PZ	position closed	torque closed (also changes-over to errors) + optional tripping in position closed (<i>parameter Tripping</i>)

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.

Relay SZ, SO, READY

<p>Relay 3/SZ - <i>It usually signalizes position closed</i>, it can be changed-over to any offered signalization</p> <p>Relay 4/SO - <i>It usually signalizes position open</i>, it can be changed-over to any offered signalization</p>	<p>Relay READY - <i>It usually signalizes errors + warning + not remote</i>, it can be changed-over to any offered signalization</p>
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;"> <p>Relé 3 / SZ Relé 4 / SO</p> <p>vypnuto poloha O poloha Z moment O moment Z moment a poloha O moment a poloha Z otevírání zavírání pohyb poloha poloha negovaná ovládání-místní ovládání-dálkové ovládání-vypnuto moment O nebo Z pohyb-blikač</p> </div> <div> <p>Relay 3/SZ Relay 4/SO</p> <p>OFF position O position Z torque O torque Z torque + position O torque + position Z opening closing motion position negated position local control remote control control OFF torgue O or Z motion - blinker</p> </div> </div>	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;"> <p>Relé Ready</p> <p>vypnuto varování chyby varování nebo chyby chyby nebo není dálkové chyby nebo var. nebo není dál. moment O nebo Z</p> </div> <div> <p>Ready Relay</p> <p>OFF warning errors warning or errors errors or no remote errors or warning or no remote torgue 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.

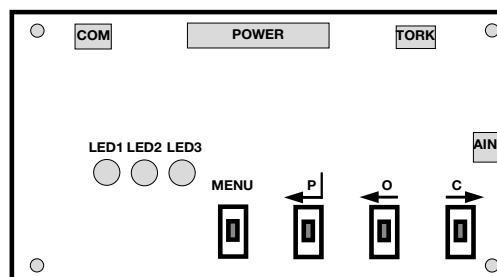
Note: In the window "Parameters" of the setting program, column "Access", the word "NO" designates parameters that cannot be changed by the user (change of these parameters is blocked).

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: **LED1**, **LED2**, **LED3**.



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.

Parameters that can be changed by user are set by manufacturer as follows:

1. Tripping torques: 100 % or required value (*it is not recommended to change the value without consulting the supplier of the valve, etc.*).
2. Relay 3 and relay 4: signalization SZ 1 % and SO 99 % of stroke
3. Time of blocking: 2 – 8 s according to rate of actuator shifting
4. Position of blocking: 5 % of stroke from end-limit positions (*it is not recommend to change the value by more than 10 %*)
5. Characteristics of position transducer: closed 4 mA, open 20 mA
6. Relay READY: errors + warning + not remote

In version CONTROL:

1. Setting of control signal: closed 4 mA, open 20 mA
2. Insensitivity of actuator in regulation: 1 % (*it is not recommended to set insensitivity higher than 3 %*)
3. Response in case of loss of control signal: stop
4. Way of switch off in end-limit positions: torque + PO + PZ

Overview of MENU

BROWSING THROUGH MENU

- The setting regime is entered by pressing and keeping depressed push-button **MENU** for at least 2 s; LED1 is then lit on.
- Shortly press **MENU** to select the basic MENU – menu M1 to M8 (*LED1 signalizes the menu number*); by short pressing of P, O, C they are entered (*LED2 signalizes particular parameter*).
- Shortly press P to select required value of the parameter. In case the parameter can be set to several values, they are changed by short pressing of P (*number of blinking of LED2 indicates its value*). Keep pressing of P to record the chosen parameter; the record is confirmed by lighting on of LED2.
- Shortly press **MENU** to gradually set the required menu and parameters.
- After setting all required parameters, exit the setting menu by pressing and keeping depressed push-button **MENU** for at least 2 s. The setting menu will also be left in case that no push-button is pressed within 1 minute.

MENU 1 – Setting of tripping torques

- After entering the menu by means of push-button C or O, select required torque.
- Shortly press P to select the set value of the parameter 50 – 100 % (*5 – 10 blinking of LED2*) and keep pressing push-button P to store the parameter to memory.

MENU 2 – Setting function of signalling relays

- Basic setting of the signalling relays is SZ 1 % and SO 99 % of stroke.
- In case different setting is required, it can be changed after shifting the actuator to required position by means of push-button C or O.
- Using push-button P, perform basic setting SZ 1 % and SO 99 % of stroke.

MENU 3 – Setting of blocking of torque in end-limit positions

- Shortly press P to select the set value of blocking time 0 – 20 s (*0 – 20 blinking of LED2*) and keep pressing push-button P to store the parameter to memory.
- Keep pressing push-button C to store actual position for blocking torque on the side Closed to memory.
- Keep pressing push-button O to store actual position for blocking torque on the side Open to memory.

MENU 4 – Setting transducer characteristics

- Shortly press P to select the value 4 – 20 mA – 1x blinking of LED2 or 20 – 4 mA – 2x blinking of LED2, and keep pressing push-button P to store the parameter to memory.

Other menus only serve for board setting in version Control

MENU 5 – Setting control signal in 3P regulation

- Shortly press P to select value
4 – 20 mA - 1x blinking of LED2,
or 20 – 4 mA - 2x blinking of LED2,
or 0 – 20 mA - 3x blinking of LED2,
or 20 – 0 mA - 4x blinking of LED2
- and keep pressing push-button P to store the parameter to memory.

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.

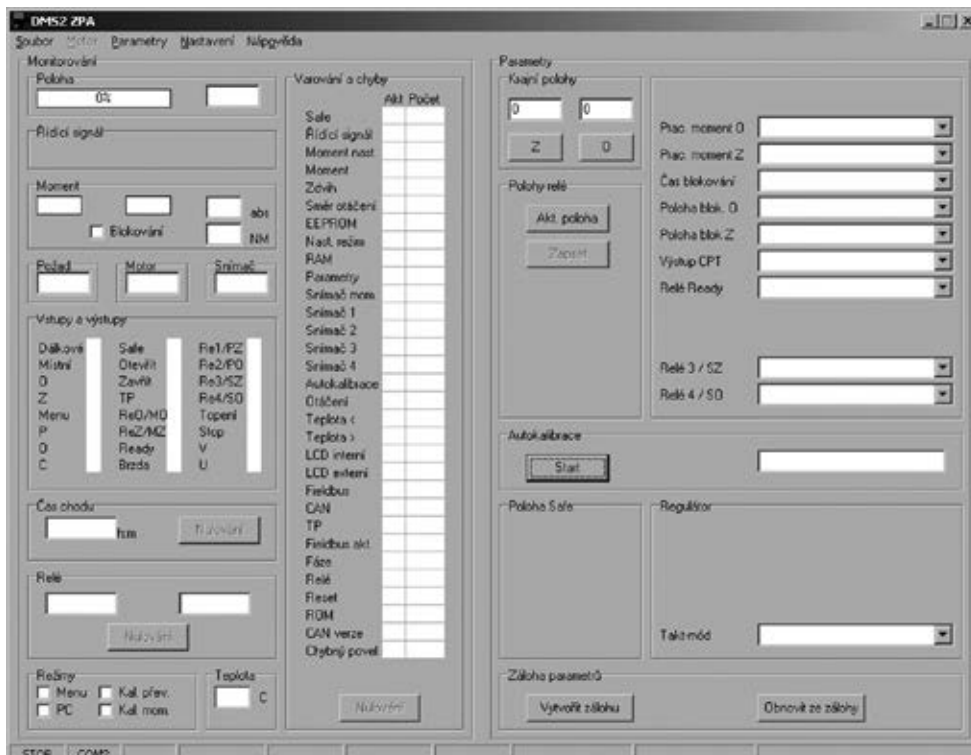
MENU 8 – Way of switching off in end-limit positions in 3P regulation

- 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

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 signaled 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 signaled 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.

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>)
20	Rotation error		X	The actuator does not rotate
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

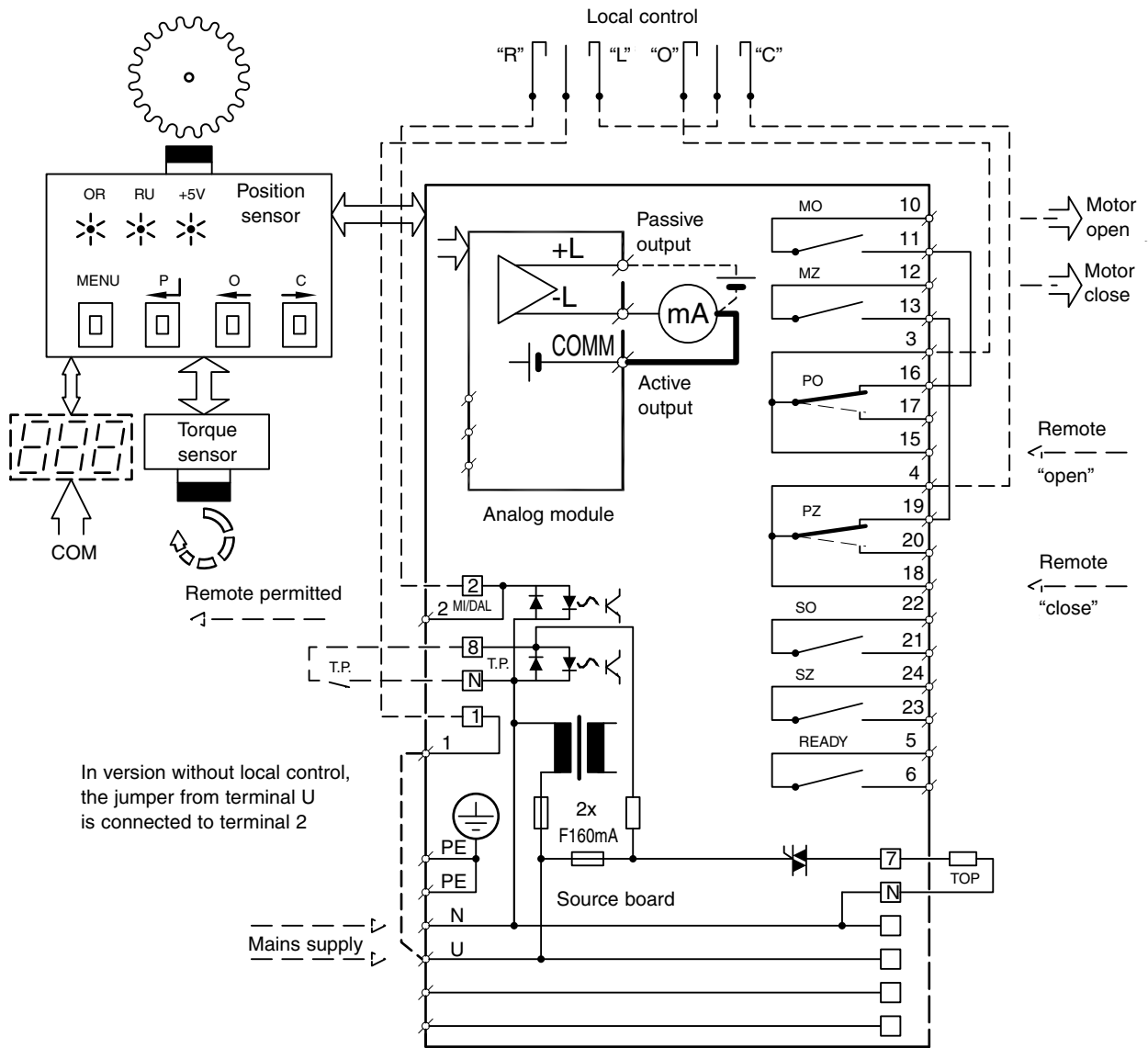
- For all ascertained warnings and errors, DMS2.ED uses counters of occurrence of these warnings and errors during operation of the system.
- Values of the counters are stored to the EEPROM memory and are preserved even in case of the power supply fall-out.
- Reading of the counters is possible by means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

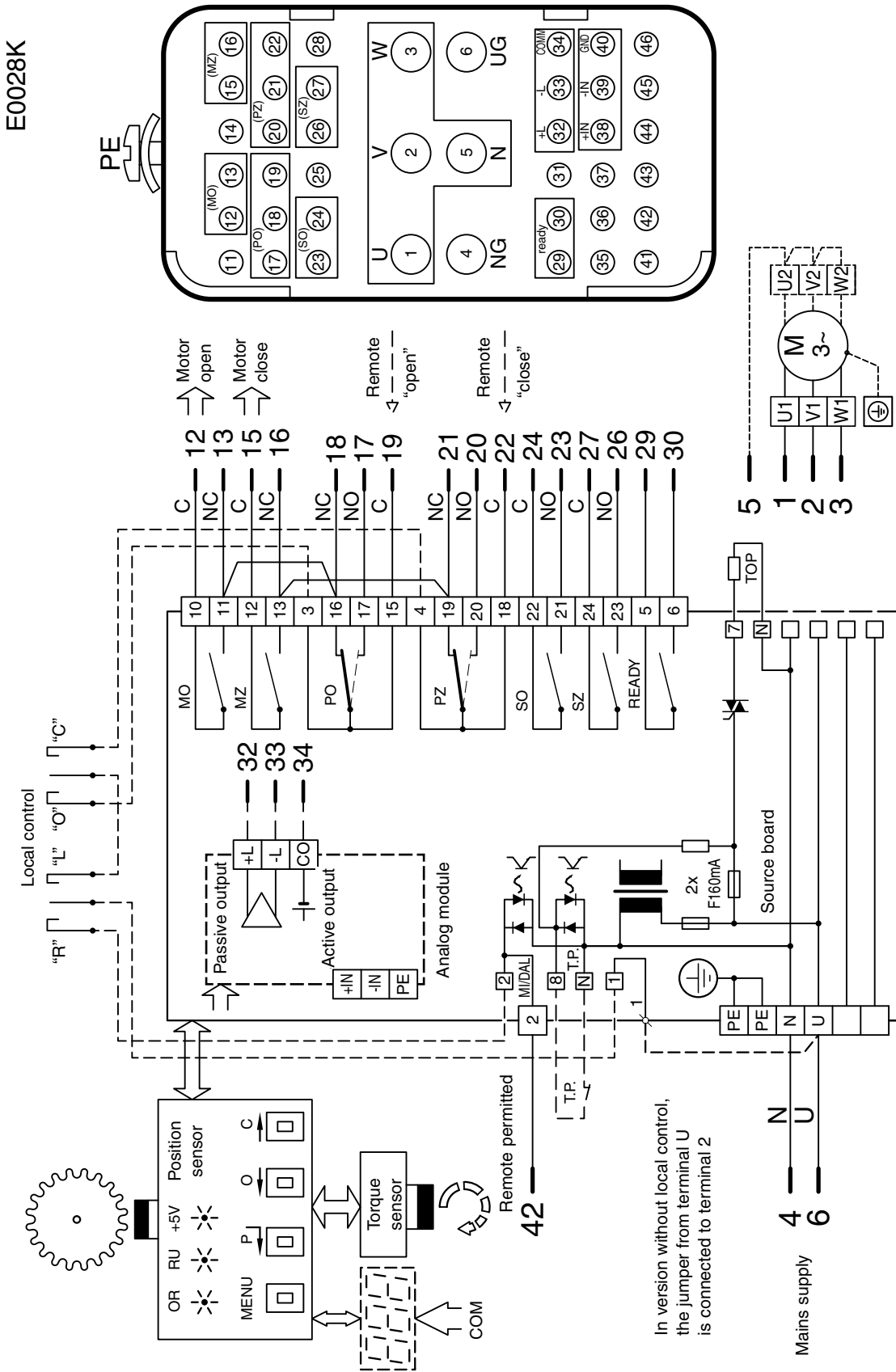
Example of wiring diagram of electronics **DMS2 ED** in version
Substitution of electro-mechanical board
(actuators MODACT MTNED, MTPED)

E0001



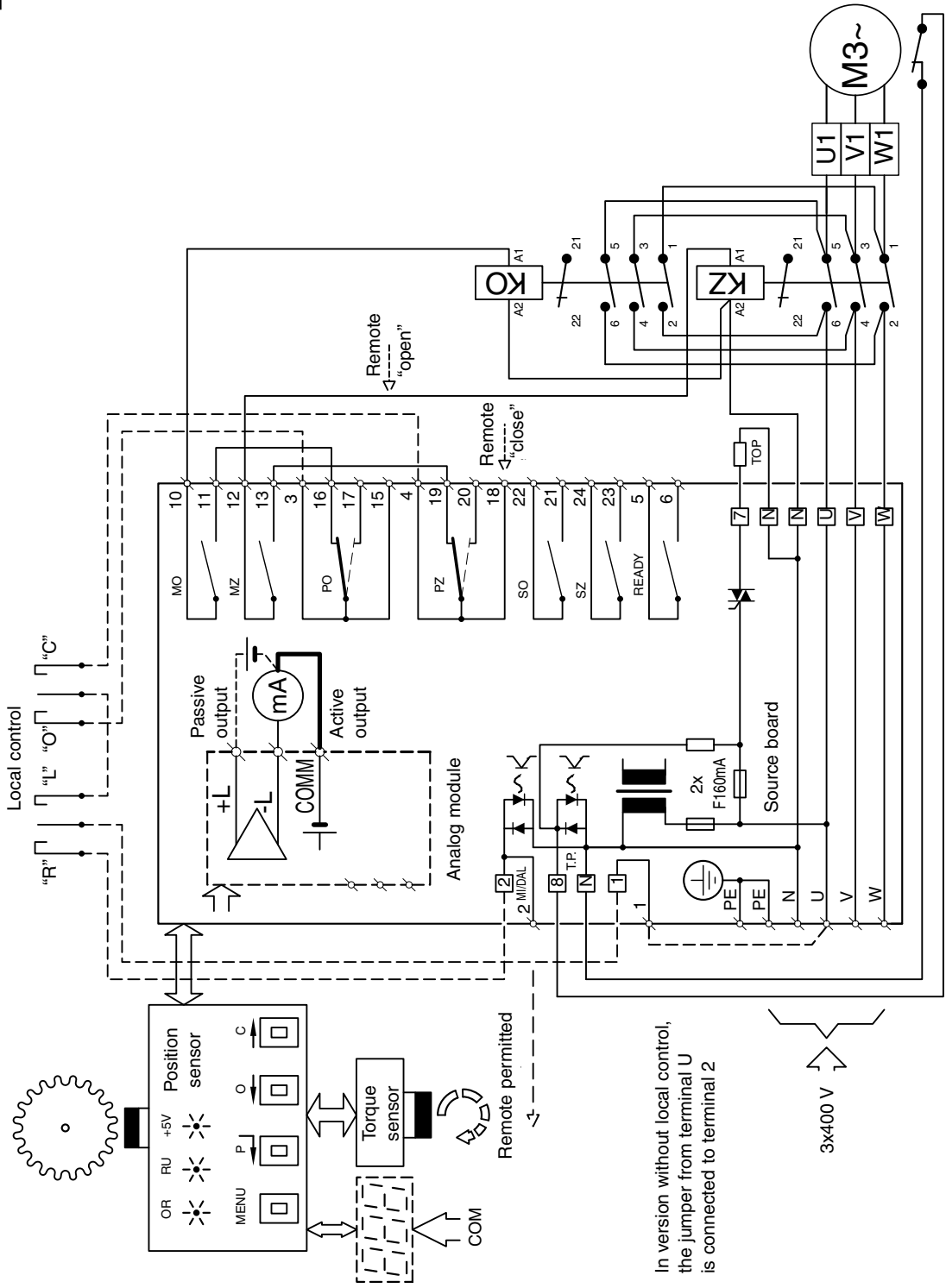
Note: Here, contacts of relays MO, MZ, SO, SZ are shown with power supply switched off; with power supply switched off contacts PO, PZ are shifted to the position drawn in dashed line.

Example of wiring diagram of electronics **DMS2 ED** in version **Substitution of electro-mechanical board with connector connection**
(actuators MODACT MTNED, MTPED)



Example of wiring diagram Substitution of electro-mechanical board with contactors and thermal relay
 (actuators MODACT MTNED, MTPED)

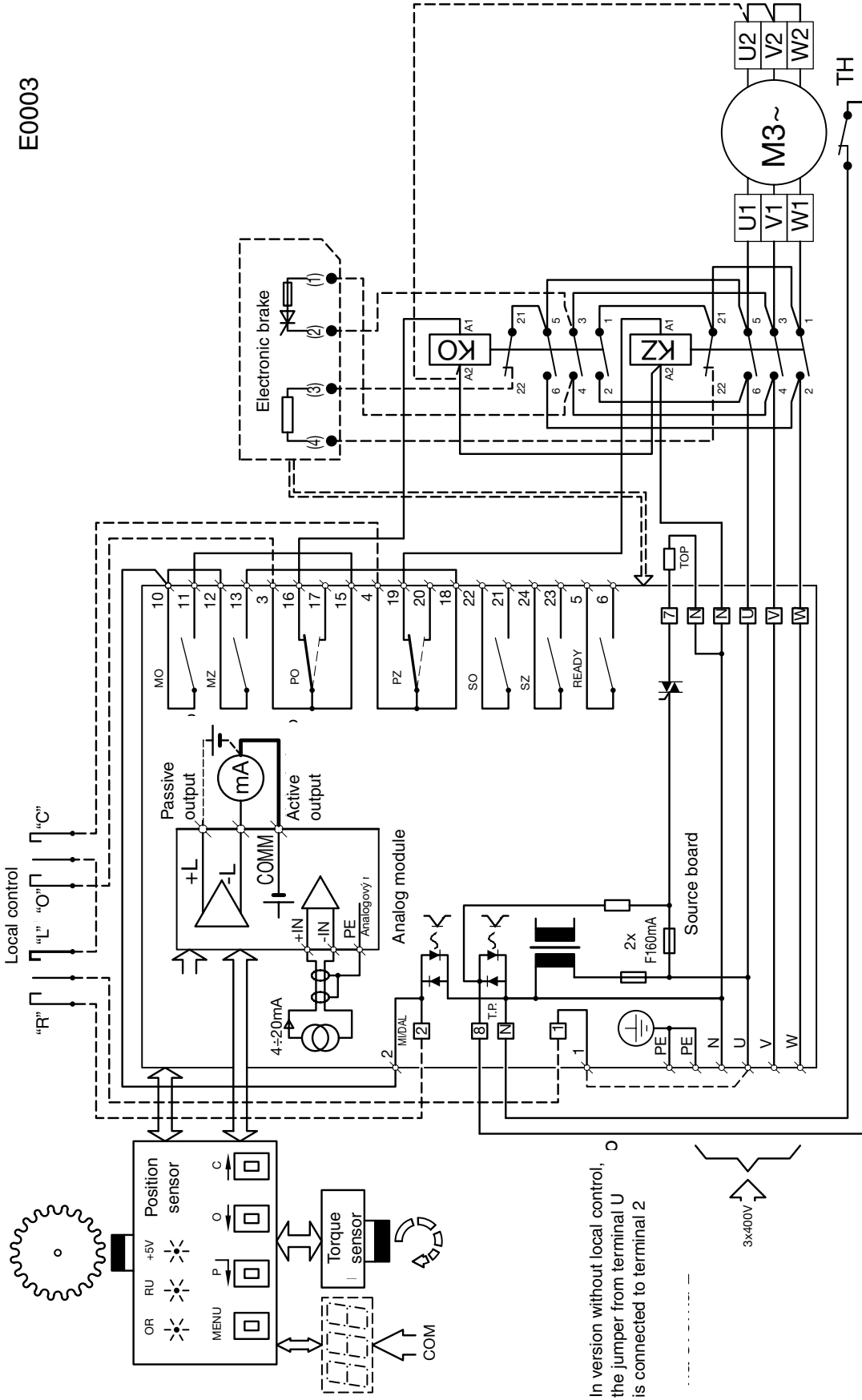
E0002



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

3x400 V

Example of wiring diagram of electronics DMS2 ED in version Control (actuators MODACT MTNED, MTPED)

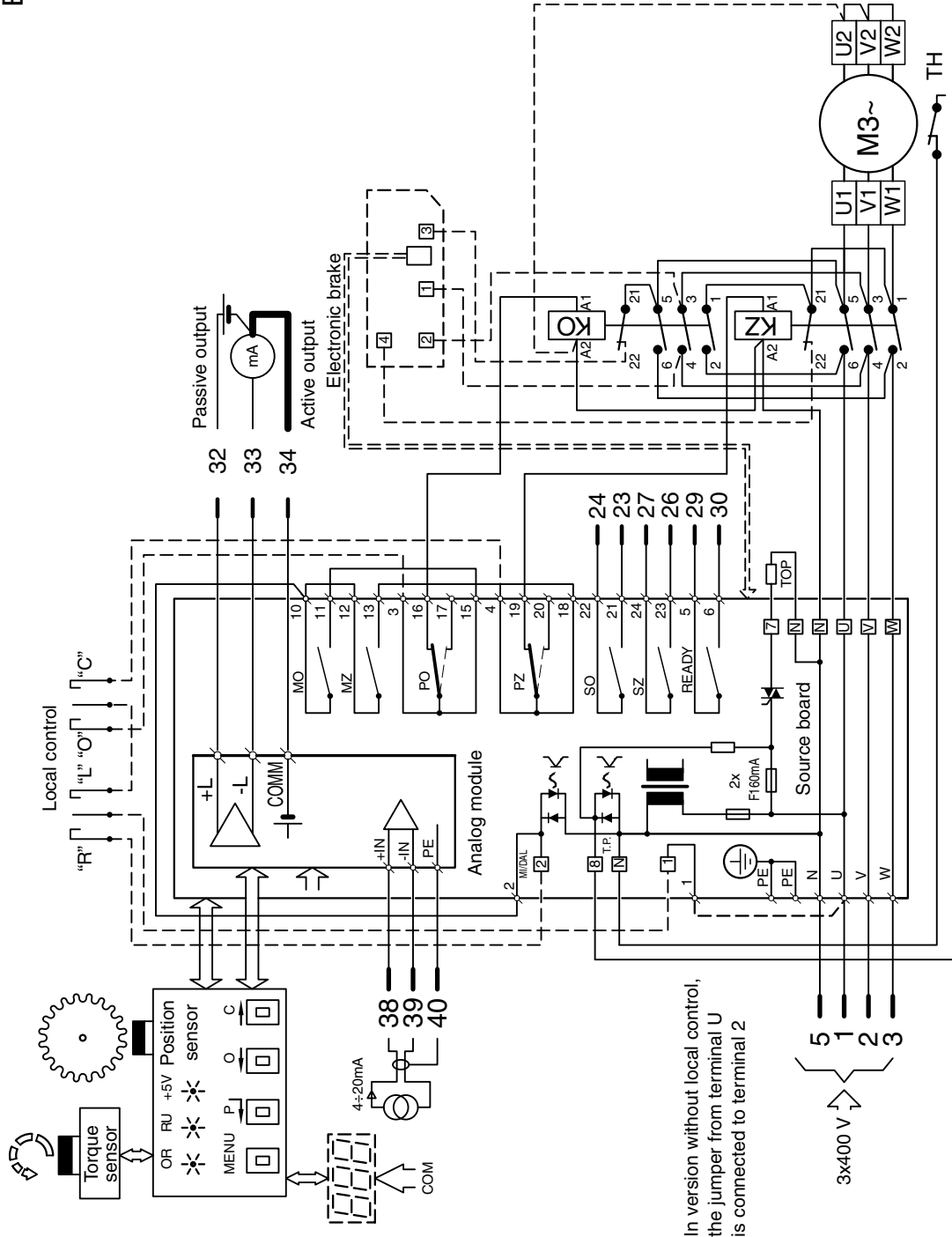


In version without local control, the jumper from terminal U is connected to terminal 2

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.

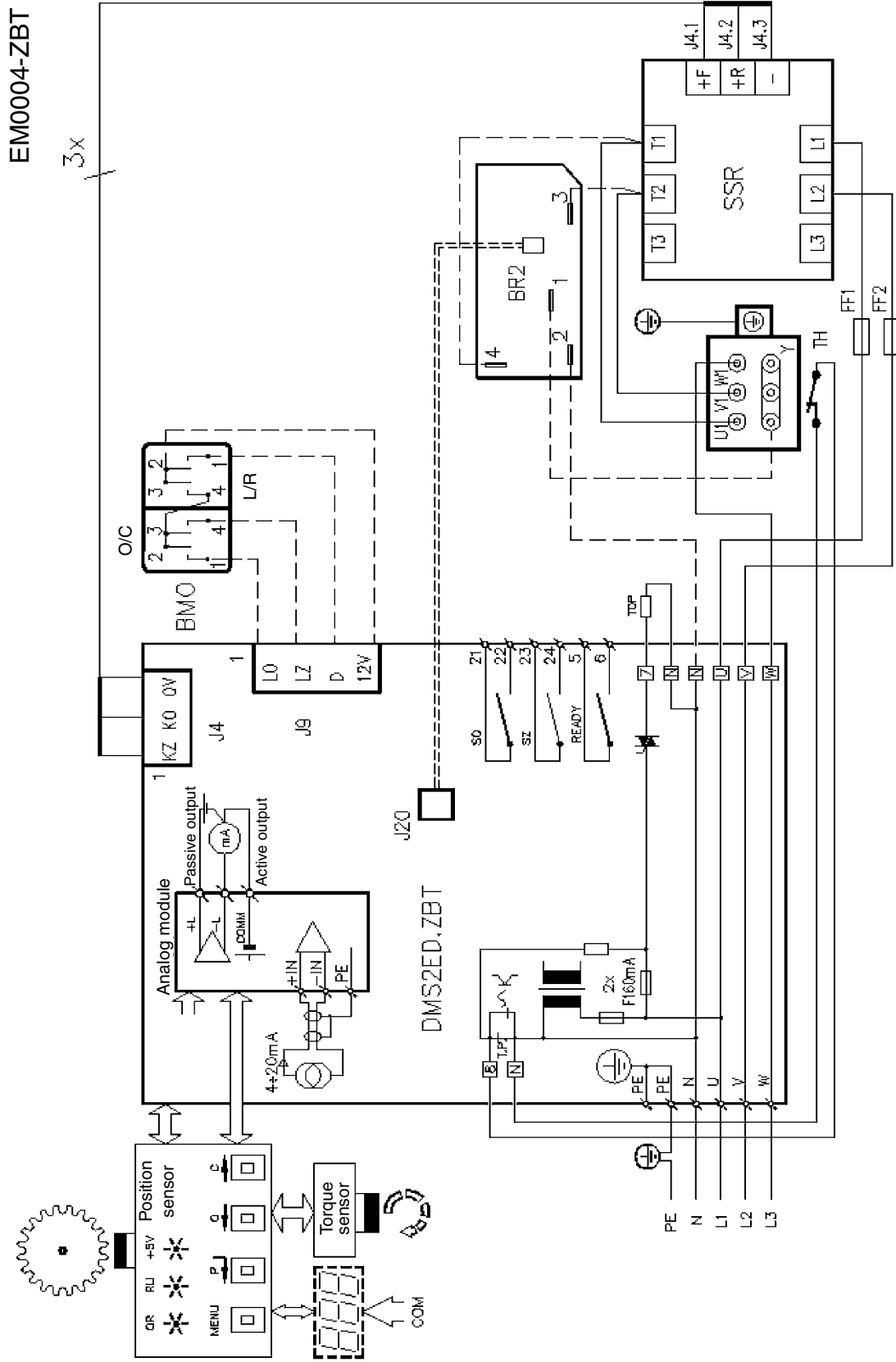
Example of wiring diagram of electronics DMS2 ED in version Control with connector connection
 (actuators MODACT MTNED, MTPED)

E0027K

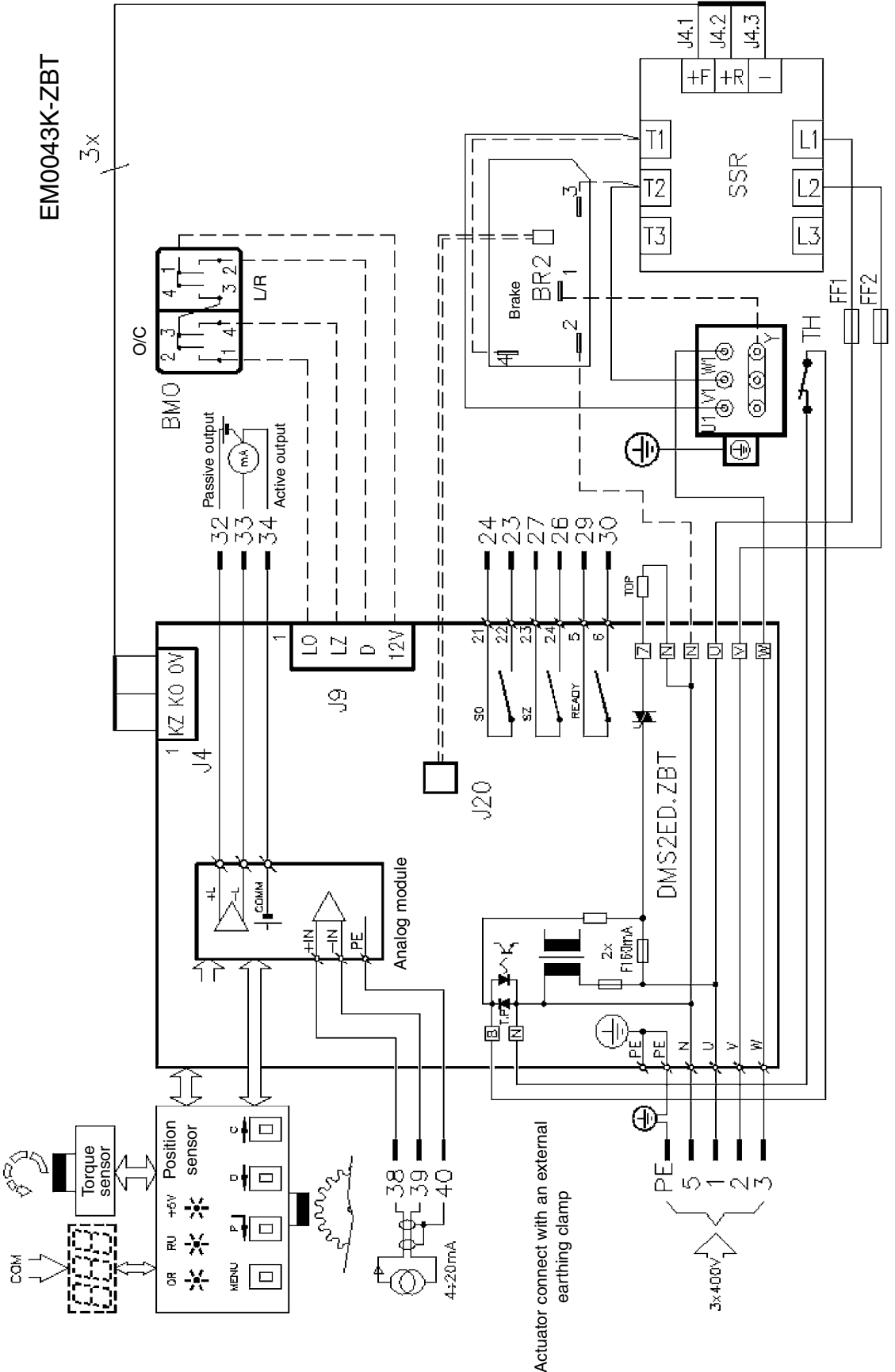


In version without local control, the jumper from terminal U is connected to terminal 2

Example of wiring diagram of electronics **DMS2 ED** in version **Control** with contact-less switching of electric motor



Example of wiring diagram of electronics **DMS2 ED** in version **Control** with contact-less switching of electric motor with connector connection



Note: Here, contacts of relays MO, MZ, SO, SZ are shown with power supply switched off; with power supply switched on, 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 12 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, which you change only after consultation with the armature manufacturer.

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 signalized 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	Closing	Motion	Position
	position N	Local control	Emote control	Control switched off
	Torque O/Z	Motion - blinker		
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.

Autodiagnosics

The table List of errors – same as for electronics DMS2 ED (page 15)

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	Active signal Safe
		230 V	
15	TP SAFE	blokuje SAFE	Response with thermal protection activated
		SAFE aktivni	
16	TP NULOVANI	AUTOMATICKY	Zeroing of thermal protection
		MISTNIM OVL.	
17	RELE READY	VYPNUTO	Function of Relay Ready
		VAROVANI	
		CHYBY	
		VAR.+CHYBY	
		CHYBY+NENÍ D	
		VAR+CHYBY+ND	
		MOMENT O/Z	
18	RELE 1	VYPNUTO	Function of Relay 1
		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	
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	Information on the system
		DISP I	
		DISP E	
		DISP ED	
		FLDBUS	
		CHYBA 1	
		CHYBA 2	
		CHYBA 3	
		MOMENT	
		TEPLOTA	
23	ZALOHA PAR	OBNOVIT PAR	Creation of backup parameters, restoring from backup parameters
		VYTVORIT ZAL	
24	ADRESA	1 – 125	Address of actuator on industrial bus
25	TAKT MOD	VYPNUTO	Mode of cycle regime
		SMER O	
		SMER Z	
		SMĚR O+Z	
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.

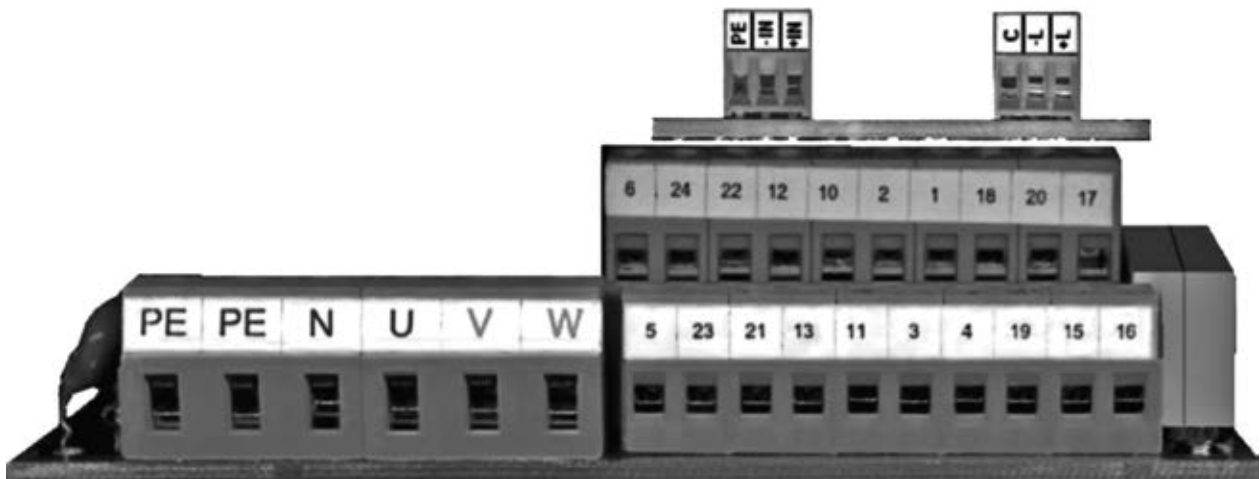
Shortly press push-button “STOP” to exit MENU 2. Keep pressing push-button “STOP” to exit the setting regime.

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

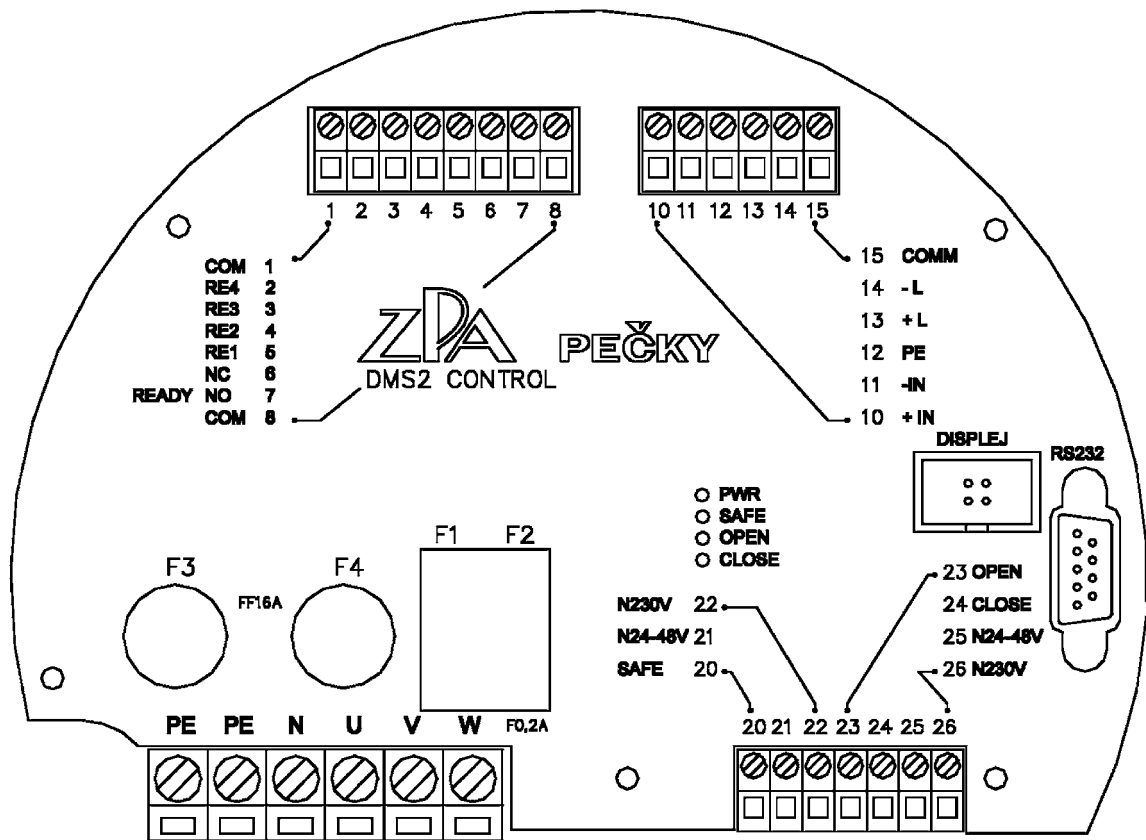
In the setting regime choose MENU 3. Shortly press push-button “STOP” to enter MENU 3 and keep pressing push-button “STOP” to start autocalibration. By short starting of the motor in both directions, the actuator will measure inertia. Completion of the autocalibration is announced by the message AUTOCALIBRATION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

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

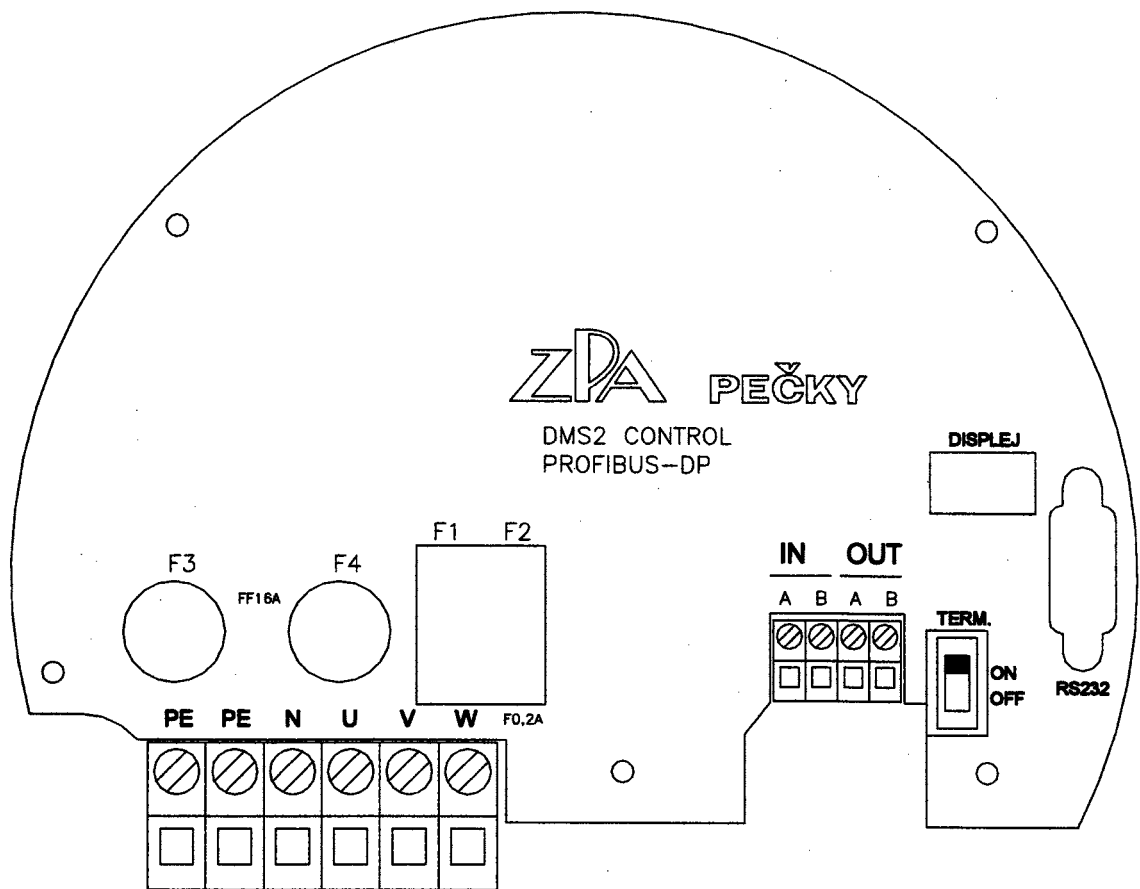


Terminal board of the actuator with electronics DMS2ED

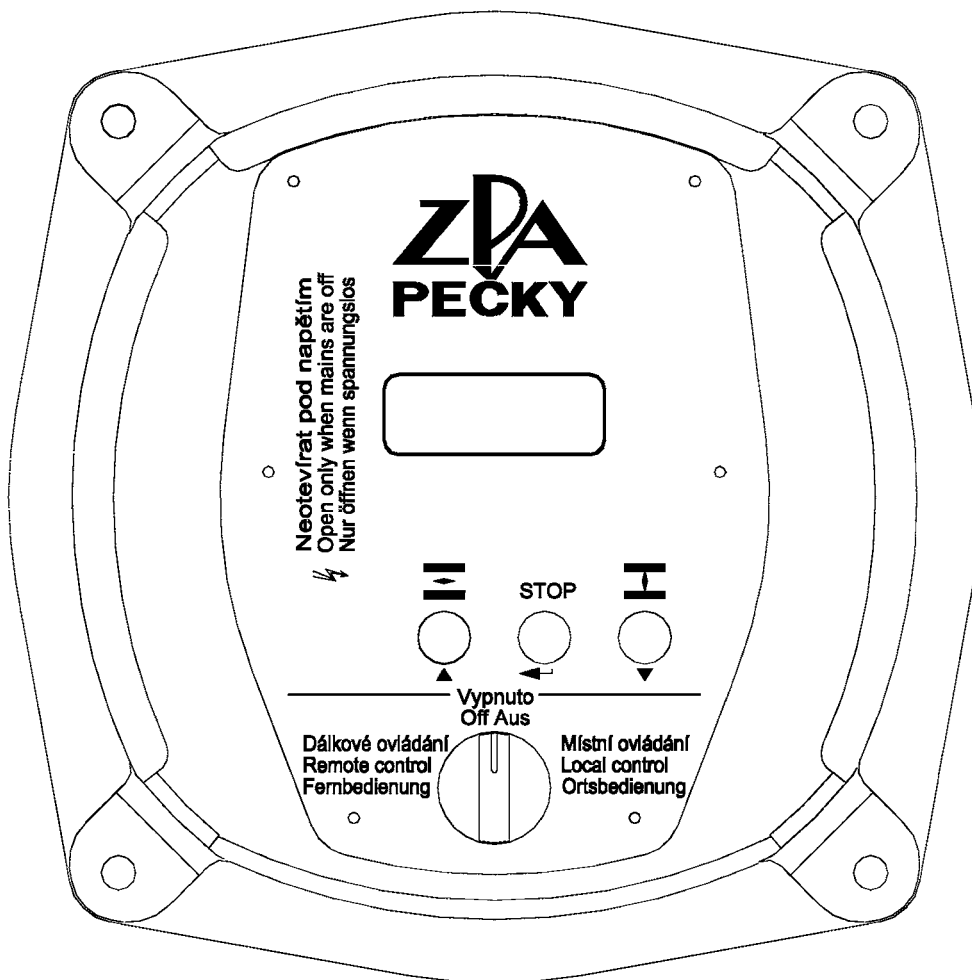
If the actuator is of the single-phase version the power supply is connected only to terminals **PE, N, U**. The terminals **V, W** remain non-connected. If the actuator is of the version “Replacement of electric-mechanical board” with three-phase electric motor without power relays, the electric motor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



Terminal board of DMS2 Analog

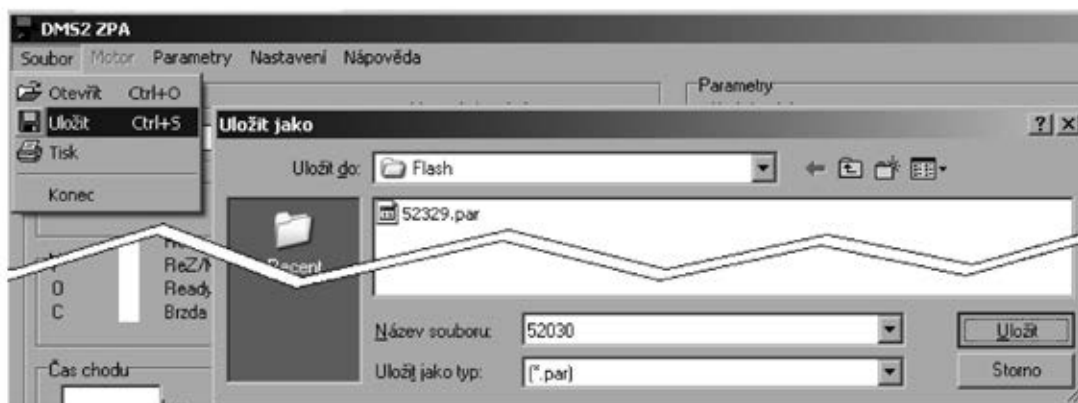


Terminal board of DMS2 Profibus



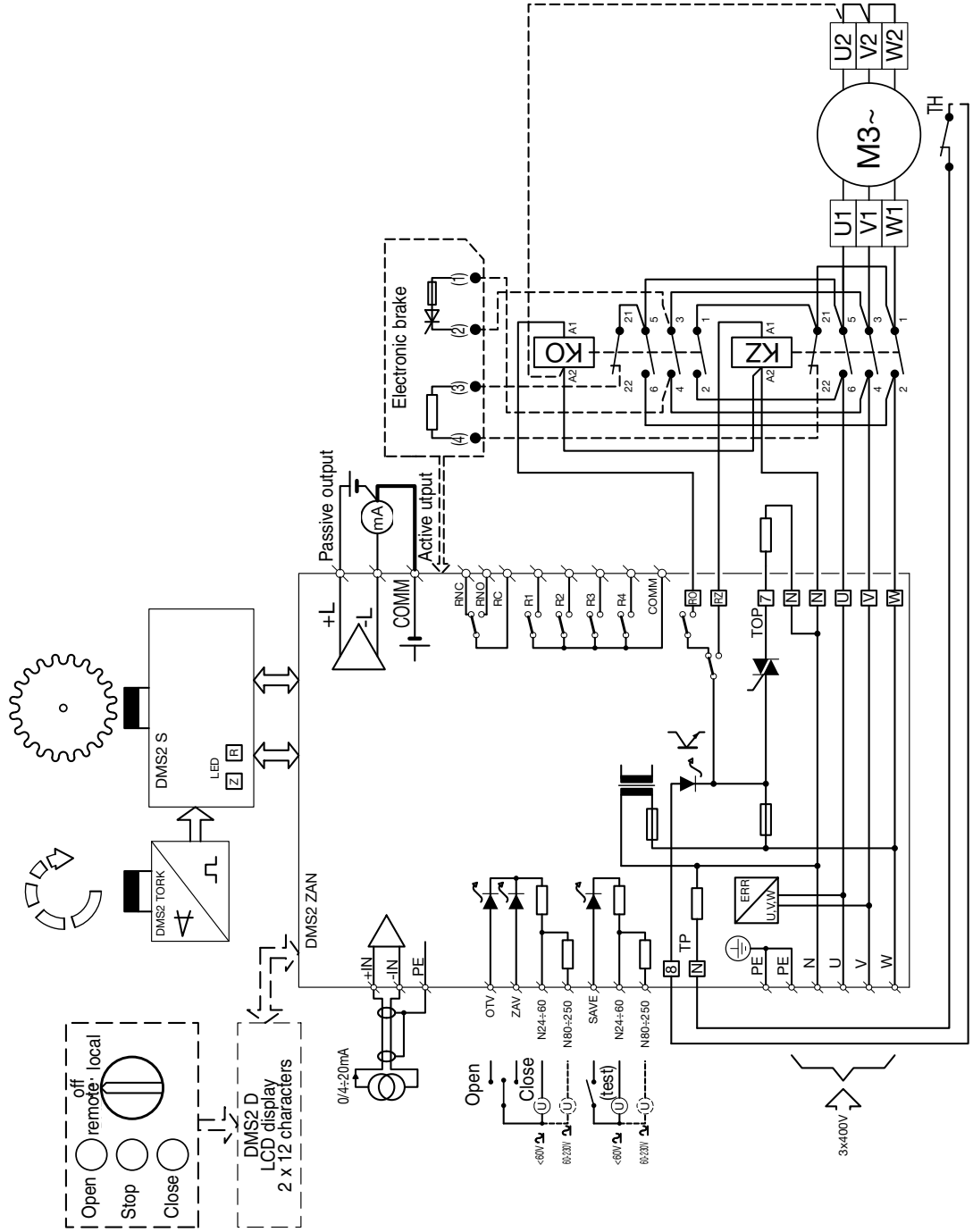
DMS2 - local control and display

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..



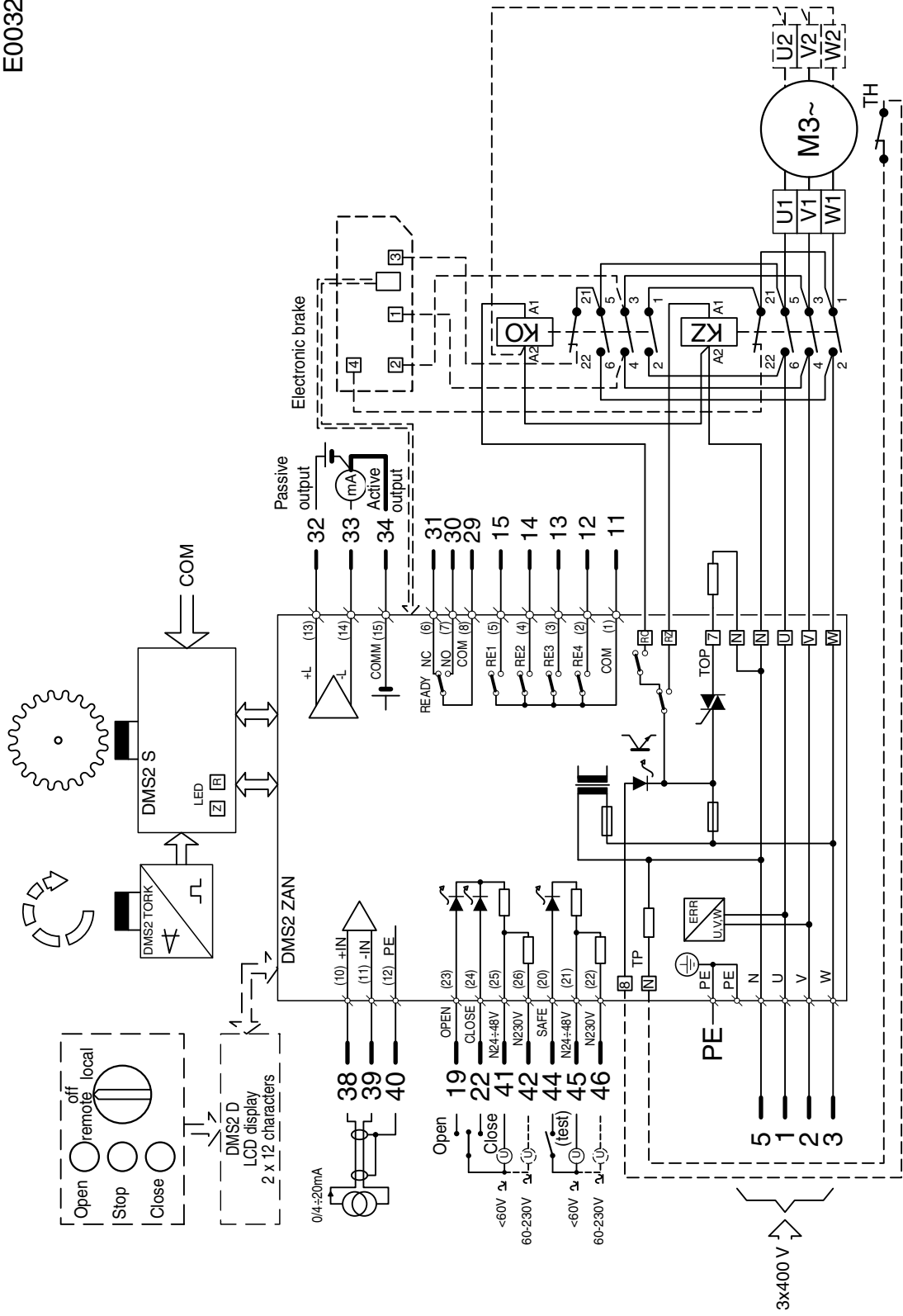
Example of wiring diagram of electronics **DMS2 Analog** in version **Control (actuators MODACT MTNED, MTPED)**

E0006



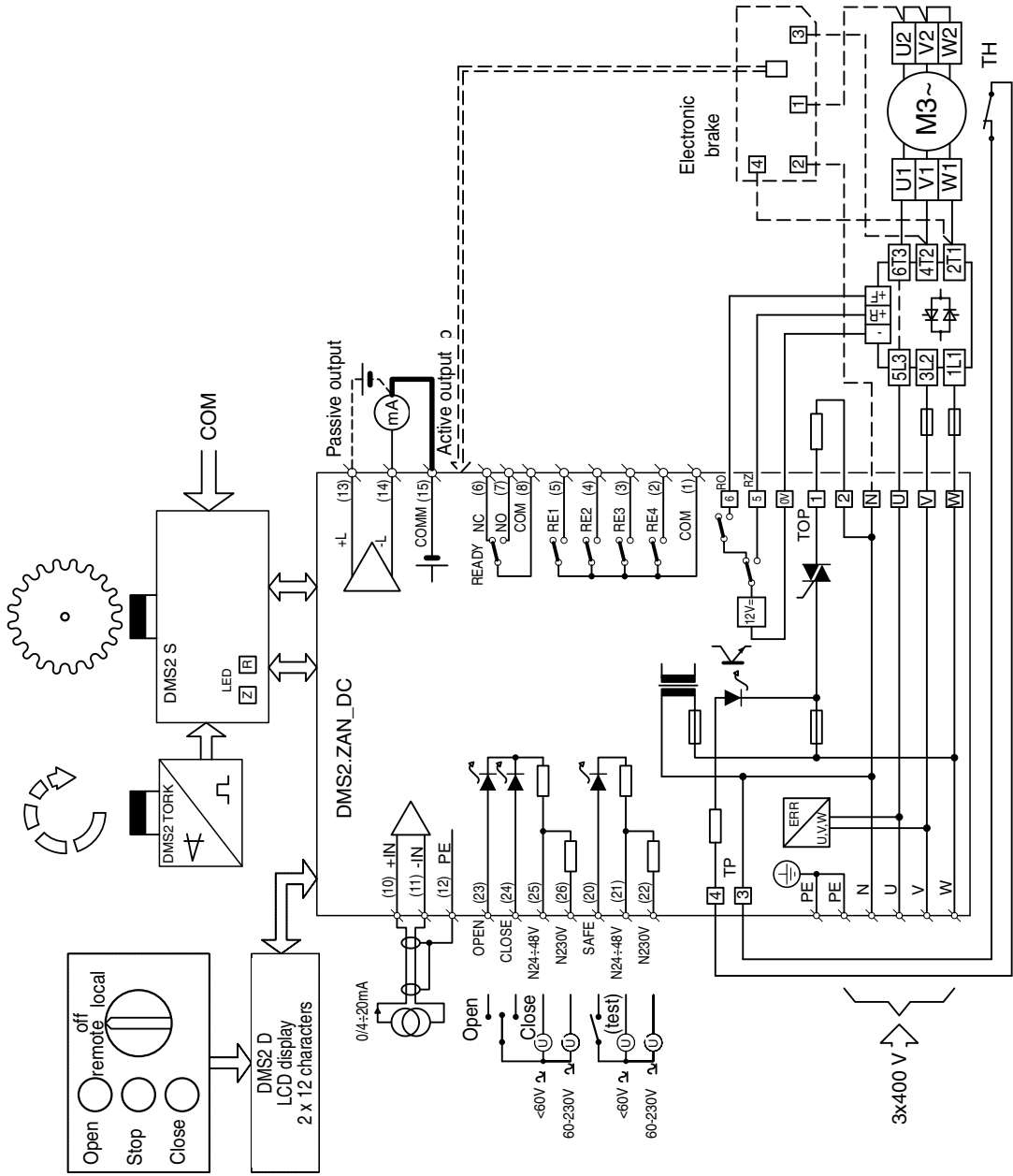
Example of wiring diagram of electronics **DMS2 Analog** in version **Control** with connector connection
(actuators MODACT MTNED, MTPED)

E0032K



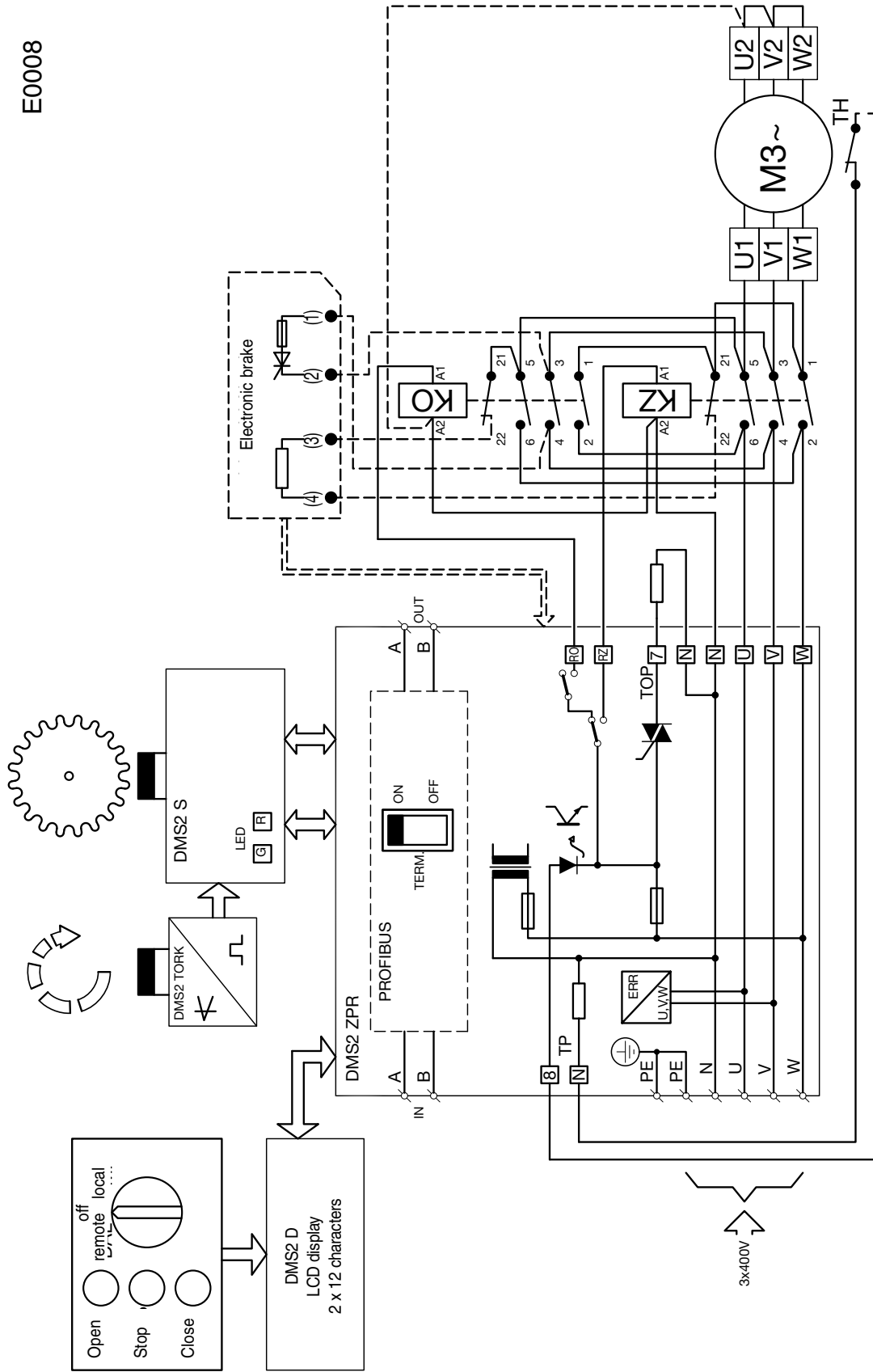
Example of wiring diagram of electronics **DMS2 Analog** with contact-less switching of electric motor
(actuators MODACT MTNED, MTPED)

E0031



Example of wiring diagram of electronics **DMS2 Profibus** in version **Control (actuators MODACT MTNED, MTPED)**

E0008



Example of wiring diagram of electronics **DMS2 Profibus** with contact-less switching of electric motor
(actuators MODACT MTNED, MTPED)

E0033

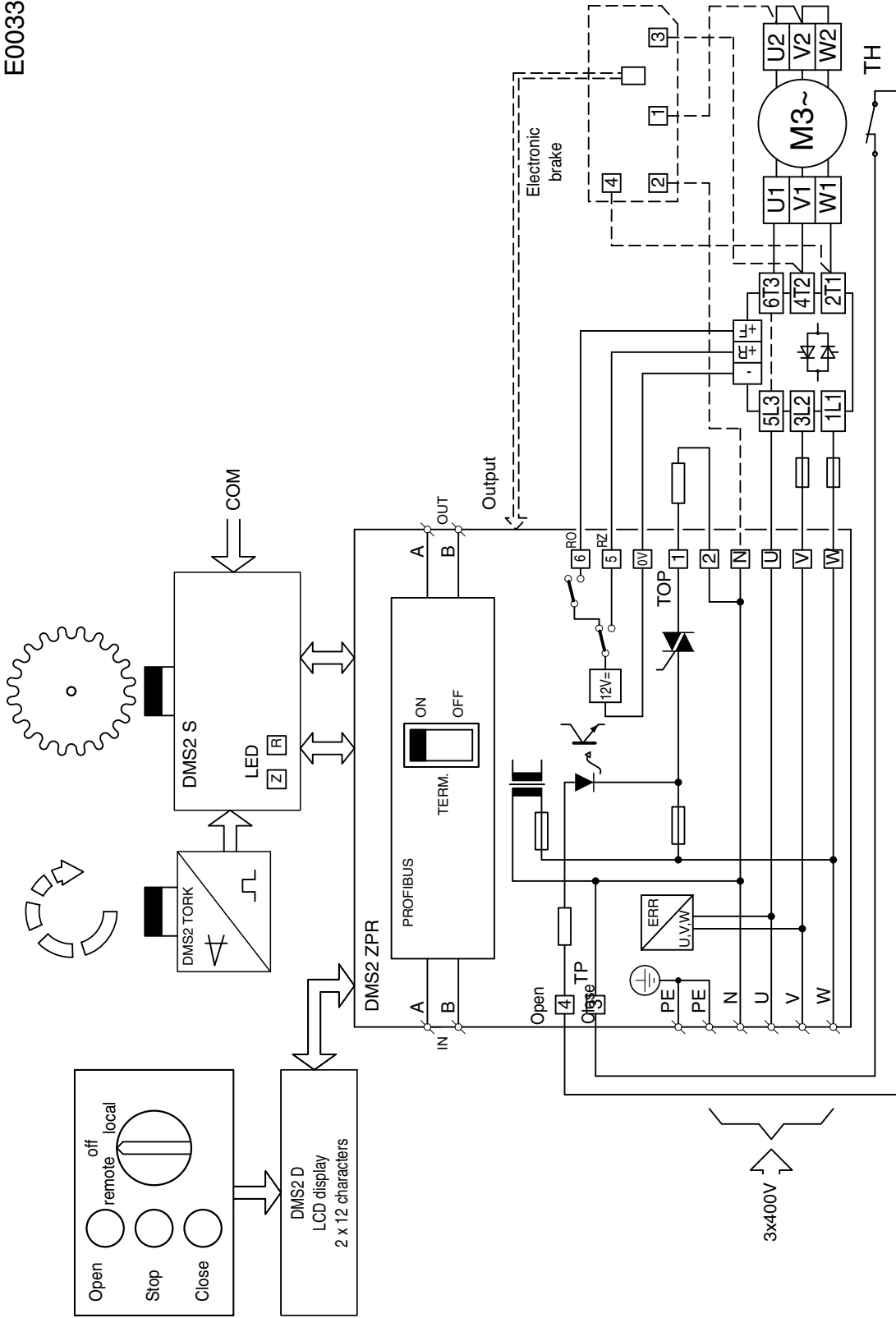


Table 1 – MODACT MTNED, MTPED electric actuators
– basic technical parameters

Basic technical parameters (8 th place of Type No.)																						
Type	Adjustment range of tripping thrust [kN]	Starting thrust [kN]	Speed [mm/min]	Stroke [mm]	Electric motor					Weight [kg]	Type Number											
					Type	Power [W]	Revolutions per minute [1/min]	I _n (400 V) [A]	I _z /I _n		basic		additional									
											12	345	6	7	8	9	10					
MTNED 15 MTPED 15	11,5 – 15	17	50	10 – 100	1TZ9002-0CC2	180	875	0,85	2	33	52 442	x	x	0	x	x						
			80		1TZ9002-0CC2	180	875	0,85	2			x	x	1	x	x						
			125		1TZ9002-0CB2	250	1365	0,8	3			x	x	3	x	x						
			36		1TZ9002-0CD3	120	625	0,82	2			x	x	2	x	x						
			27		1TZ9002-0CD3	120	625	0,82	2			x	x	A	x	x						
MTNED 25 MTPED 25	15 – 25	32,5	50		10 – 100	1TZ9002-0CC2	180	875	0,85			2	33	52 442	x	x	4	x	x			
			80			1TZ9002-0CC2	180	875	0,85			2			x	x	5	x	x			
			125			1TZ9002-0CB2	250	1365	0,8			3			x	x	6	x	x			
			36			1TZ9002-0CD3	120	625	0,82			2			x	x	7	x	x			
			27			1TZ9002-0CD3	120	625	0,82			2			x	x	8	x	x			
MTNED 40 MTPED 40 1)	25 – 40	52	80	20 – 120		1TZ9002-0DC3	550	900	1,68	2,7	60	52 443			x	x	1	x	x			
			125			1TZ9002-0DB2	550	1385	1,44	3,7					x	x	2	x	x			
MTNED 63 MTPED 63	40 – 63	82	80			20 – 120	1TZ9002-0EC0	750	940	2,3					3,8	63	52 443	x	x	4	x	x
			125				1TZ9002-0EB0	1,1	1405	2,5					4,5			x	x	5	x	x

Notes: 1) Design with clutch internal threads and a flange (non-standard) is available only in the design variants, Type No. 52 443.x21xNED and 52 443.x22xNED (Type MTNED, MTPED 40).

Electric actuators MODACT MTNED, MTPED
– Specification of meaning of the 6th to 11th place of the type number

Table 2 – Specification of respective positions in the type number

6 th place	Connection (terminal board/connector), electronics type		Table No. 3	
7 th place	Connecting dimensions	for type 52 442	Table No. 4	
		for type 52 443	according to Fig. 3, 4	1
			according to Fig. 5	2
8 th place	Force, speed		Table No. 1	
9 th place	Type of electronic see table 3 (letter on 6 th place)	DMS2	R – Analog, P – Profibus	
		DMS2 ED	Table No. 5	
10 th place	Protective enclosure	IP 55	MTNED	
		IP 67	MTPED	
11 th place	Surrounding temperatures		Table No. 6	

6th place of Type No.

Table 3 – Version, electric connection, electric outfit

Electronics	Terminal board	Connector	Terminal board, brake	Connector, brake
DMS2 ED (version see Table No. 4)	E	F	H	K
DMS2 ED, contact-less switches	A	B	C	D
DMS2, Profibus, contactors	P	T	U	Y
DMS2, Profibus, contact-less switches	I	J	L	M
DMS2 two- or three-position control*), contactors	R	V	W	1
DMS2 two- or three-position control*), contact-less switches	N	S	2	Z

*) The two or three-position control of the actuator will be installed at the manufacturers plant. Unless otherwise specified in the purchasing order, the **three-position control** will be installed (4 – 20 mA signal control)

7th place of Type No.

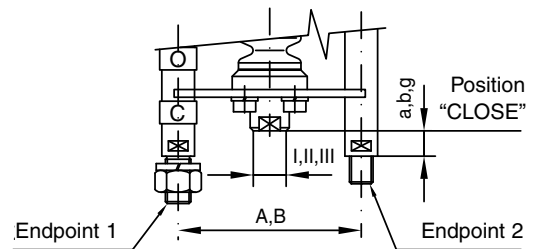
Table 4 – Connecting dimensions (Type No. 52 442)

Design spacing of columns A (160 mm)	Character on 7th place	Design spacing of columns B (160 mm)	Character on 7th place
Aa1I	0	Ba1I	C
Aa1II	1	Ba1II	D
Aa1III	2	Ba1III	E
Aa2I	3	Ba2I	F
Aa2II	4	Ba2II	G
Aa2III	5	Ba2III	H
Ab1I	6	Bb1I	I
Ab1II	7	Bb1II	J
Ab1III	8	Bb1III	K
Ab2I	9	Bb2I	L
Ab2II	A	Bb2II	M
Ab2III	B	Bb2III	P
		Bg2I	R

Spacing of columns
Thread of coupling
Ending of columns
Position "Closed"

Deliveries in design III with coupling M 10 x 1 upon special request only.

Spacing of columns	A	160 mm		
	B	150 mm		
Position "Closed"	a	30 mm	Long columns c	see table "Design variants" Fig. 1 and 2
	b	74 mm	Long columns d	
	g	130 mm	Long columns h	
Thread of coupling	I	M20 x 1,5		
	II	M16 x 1,5		
	III	M10 x 1		



9th place of Type No.

Table 5 – Outfit of electronics DMS2 ED

Outfit DMS2 ED	Character on 9th place																							
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	H	J	K	L	M	N	V	W
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
Contactors or contact-less switch					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
	Regulator																	x	x	x	x	x	x	x

Note: If the electric motor used is not fitted with a built-in temperature sensor the contactors include a thermal relay. If the actuator has DMS2 ED electronic system in configuration Electromechanics board replacement, the electronic brake will not be delivered.

11th place of Type No.

Table 6 – Surrounding temperatures

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

Dimensional sketch of **MODACT MTNED, MTPED 15,**
MTNED, MTPED 25 electric actuators,
 Type No. 52 442.xxxxNED, Type No. 52 442.xxxxPED

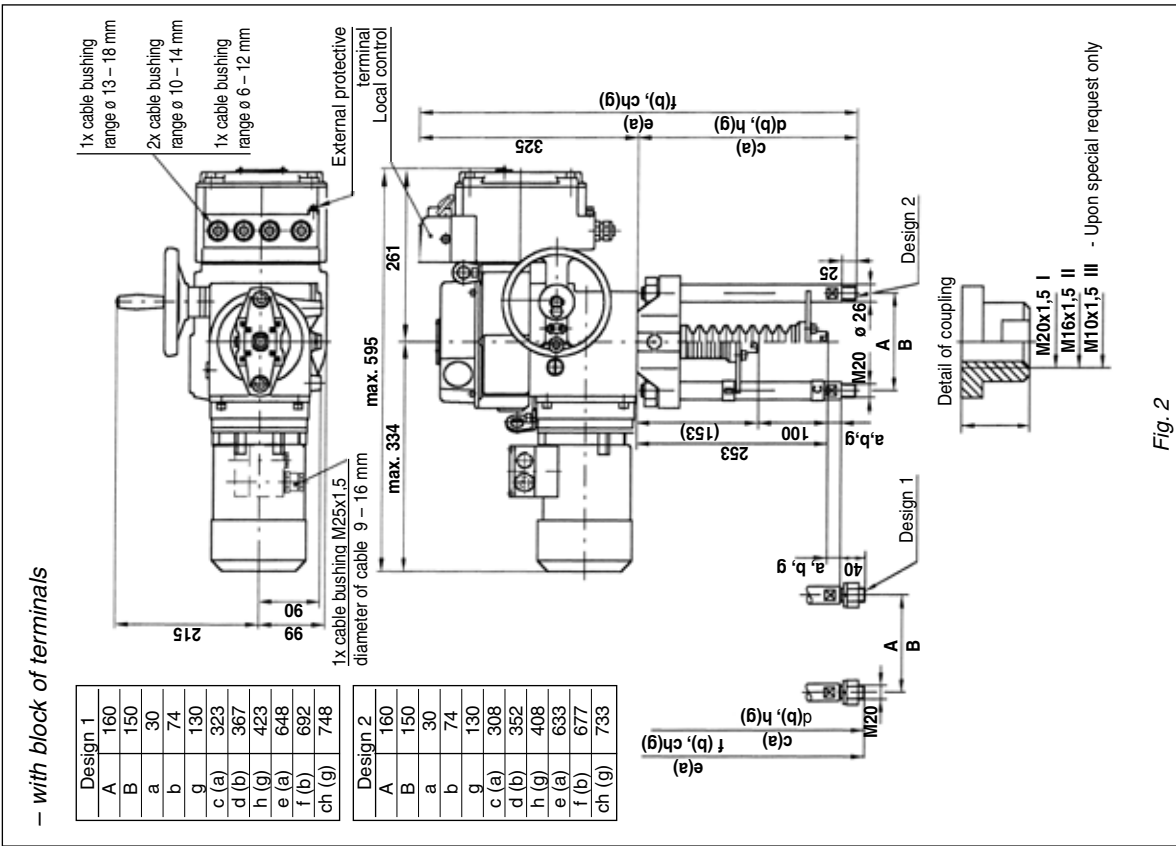


Fig. 2

Dimensional sketch of **MODACT MTNED, MTPED 15,**
MTNED, MTPED 25, electric actuators,
 Type No. 52 442.xxxxNED, 52 442.xxxxPED

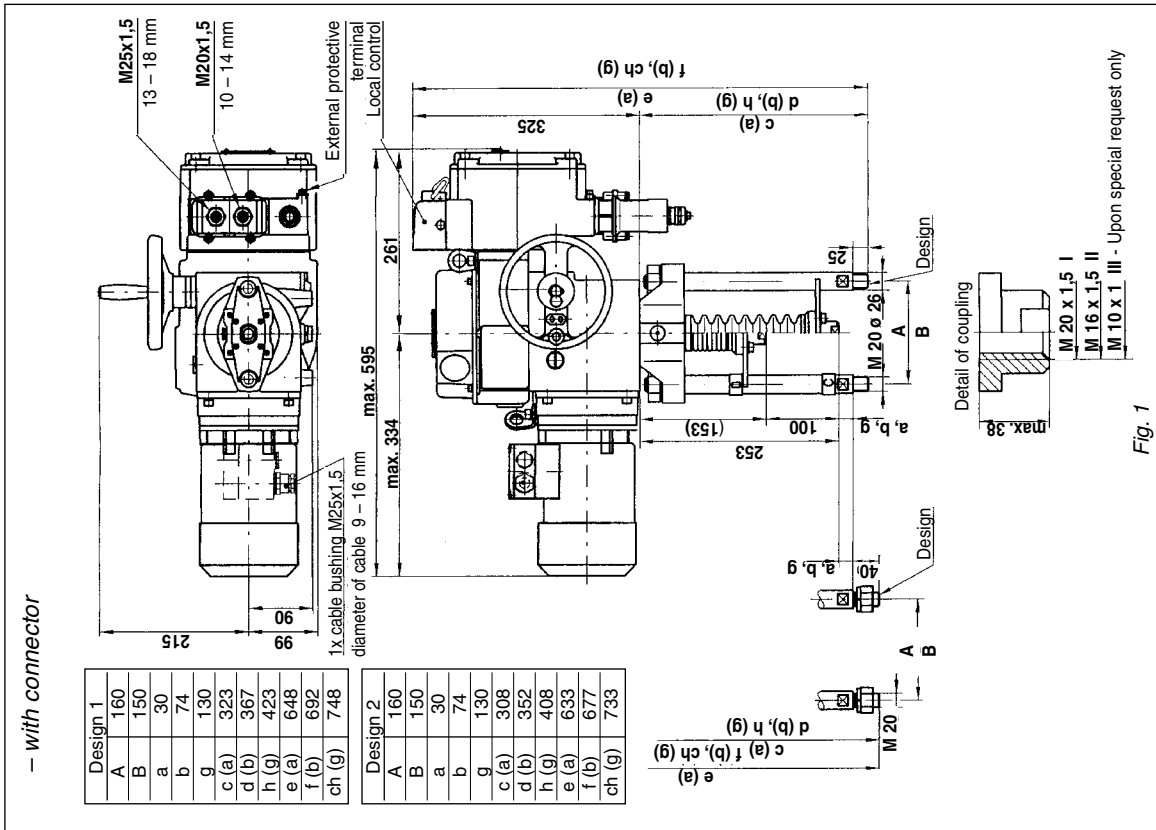


Fig. 1

Note: For actuators MODACT MTNED, the switchboard box has threads for bushings: 3 x M20 x 1.5; 1 x M25 x 1.5. For actuators MODACT MTPED, the switchboard box has bushings: 1 x M25 x 1.5, range of \varnothing 13 – 18 mm; 2 x M20 x 15 range of \varnothing 10 – 14 mm; 1 x M20 x 1.5 range of \varnothing 6 – 12 mm.

The electric motor (except for the actuator version with the motor interconnected with the switchboard box) is always delivered with cable bushing. Connector Harting is always fitted with cable bushings.

Dimensional sketch of **MODACT MTNED, MTPED 40,**
MTNED, MTPED 63 electric actuators,
 Type No. 52 443.x1xxNED, 52 443.x1xxPED

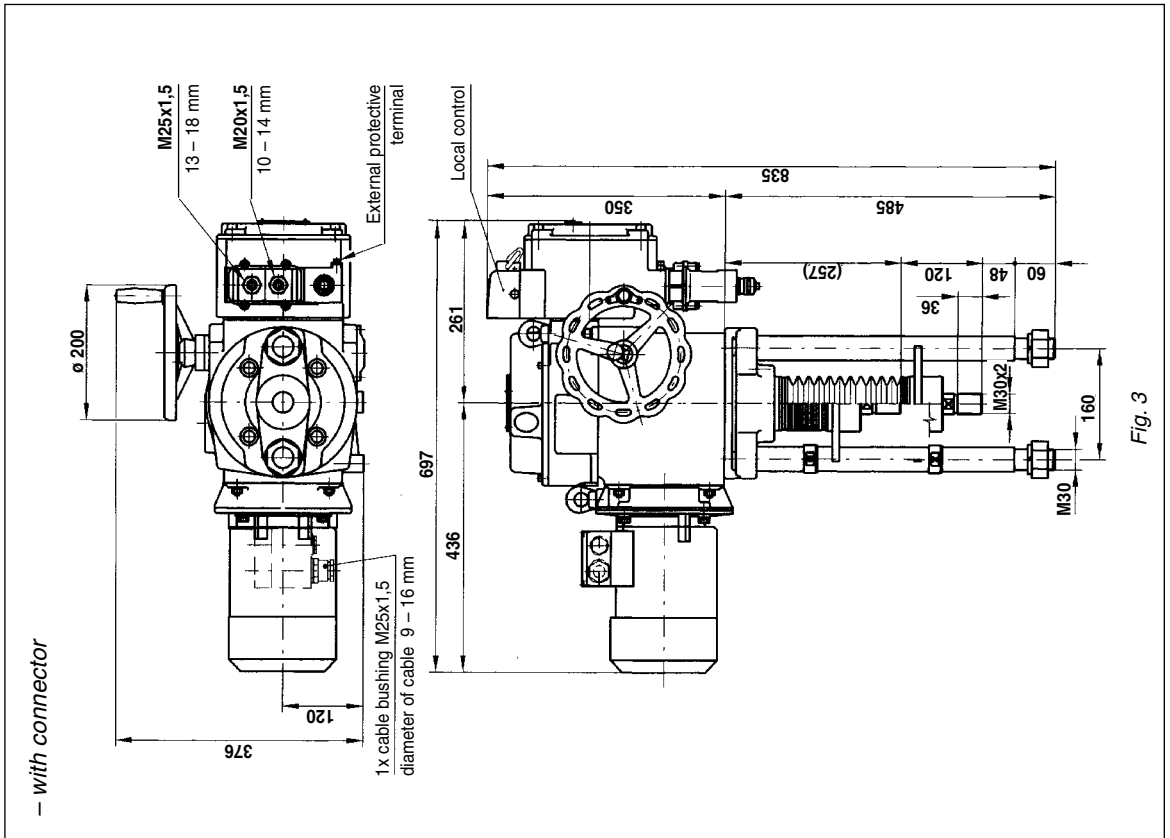


Fig. 3

Dimensional sketch of **MODACT MTNED, MTPED 40,**
MTNED, MTPED 63 electric actuators,
 Type No. 52 443.x1xxNED, 52 443.x1xxPED

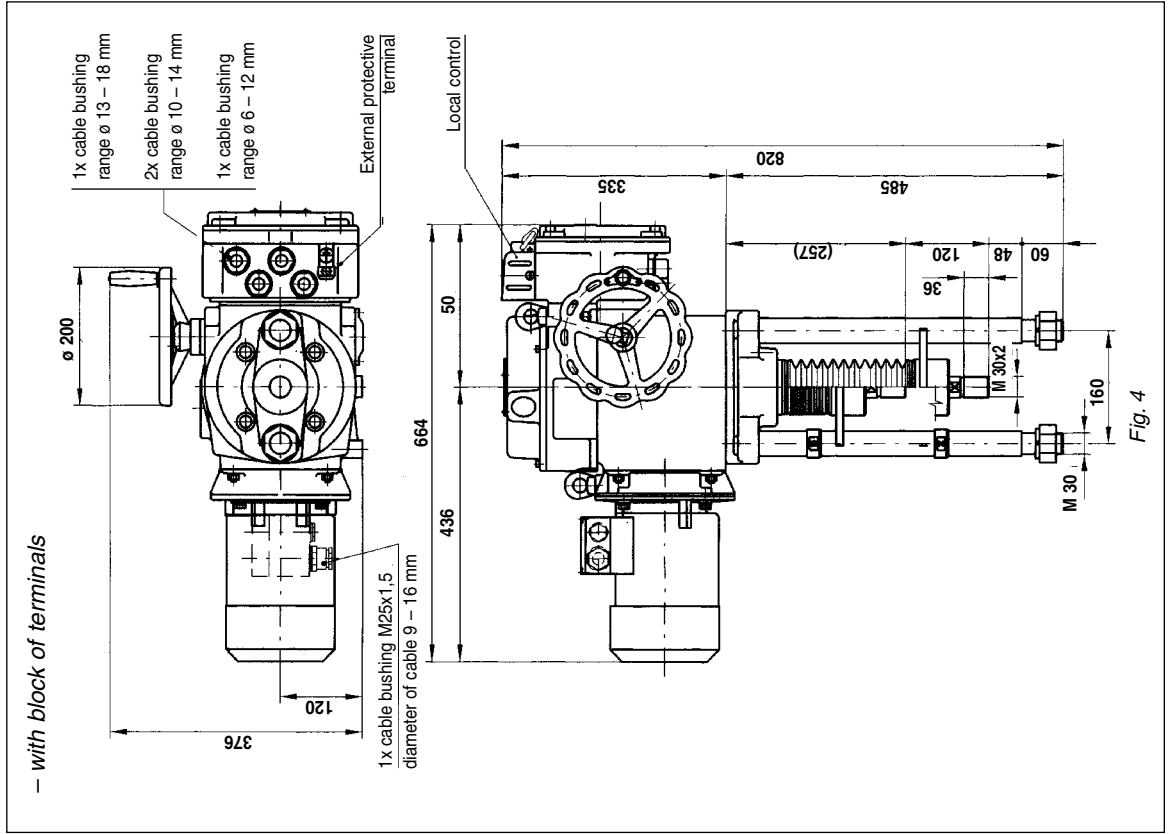
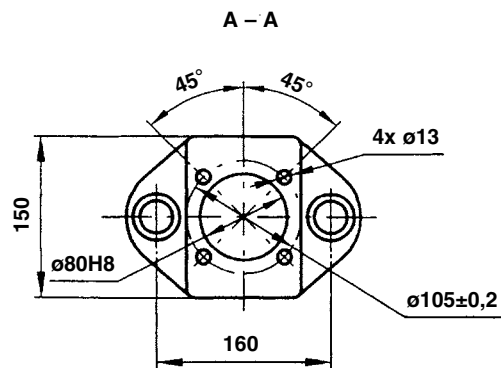
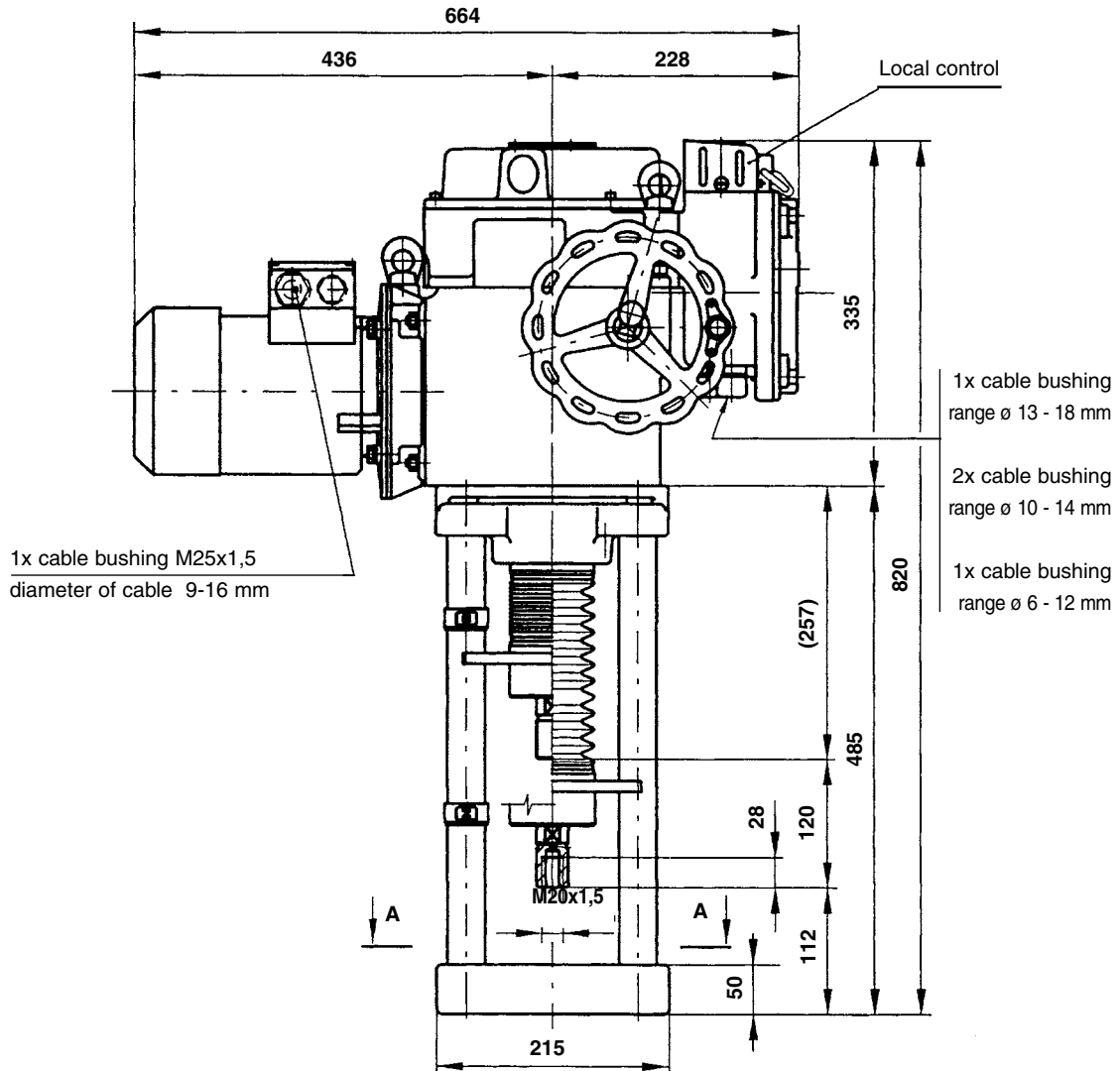


Fig. 4

Dimensional sketch of **MODACT MTNED 40, MTPED 40** electric actuators,
 Type No. 52 443.x2xxNED, 52 443.x2xxPED
 – design with flange – non standard

– with block of terminals



9. PACKING AND STORING

For inland freight, the actuators are unpacked. However, they should be transported by covered conveyances or in transport containers.

For delivery abroad, the actuators should be packed, the type and design of package being adapted to the transport conditions and the distance of the place of destination.

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.

When the unpacked actuator is not immediately installed it should be stored at a dust-free location with a temperature within the range of -25 °C to +50 °C and relative humidity up to 80 % where there are neither aggressive gases nor vapours and which is secured against the harmful effects of climatic conditions.

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, excessive 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.

10. CHECKING OF THE INSTRUMENT FUNCTION AND ITS LOCATION

Prior to installation, be sure that the actuator was not damaged during storing. A functional check of the electric-motor can be made so that it is connected to the AC mains via a circuit breaker and started for short-time operation. In this case, it is sufficient to check that the electric motor starts and turns the output shaft.

The actuator should be installed so that easy access to the handwheel, the terminal box and the control box is provided. It is also imperative to check that the installation complies with the Clause "Operating Conditions". If another method of installation is required due to local conditions, please consult the manufacturer.

11. ATTACHMENT TO A VALVE

Place the actuator on the valve so that its output pull-rod can be connected to the output pull-rod of the valve. Attach the actuator to the valve and check the attachment by rotating the handwheel. Remove the terminal box cover and wire the actuator, according to the internal and external circuit layouts.

12. ADJUSTMENT OF THE ACTUATOR WITH A VALVE

After fitting the actuator on the valve and checking mechanical connection, the assembly is set up and adjusted.

Setting-up and adjustment can only be carried out by a person with prescribed qualification. These works may not be carried out without properly studying these assembly instructions. Adjustment is accomplished according to instructions for the given type of electronics (*DMS2, DMS2 ED*) and outfit (*manual, program*).

13. OPERATION AND MAINTENANCE

Operation

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".

Within half a year at the latest from putting the actuator into operation and then at least once a year, it is necessary to properly tighten the bolts connecting the valve with the actuator. The bolts are to be tightened in a cross-wise manner.

Lubrication

Types and quantities of lubricants are specified in table below.

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

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

Actuator serial number	Quantity of lubricant (kg)	Type of lubricant for specific climatic conditions and temperature	
		T1 (-25 – +70 °C)	U1 (-40 – +60 °C)
52 442	0,30	CIATIM – 201 GOST 6267-74	
52 443	0,50	CIATIM – 221 GOST 9433-80	

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 52 442 (for locations of friction between the shaft and other surfaces).

Maintenance

Moreover, the rectilinear mechanism 11 (Fig. 1) should be greased yearly. For this purpose, force about 50 g of grease MOGUL LV 2-EP into grease box 12 of the rectilinear mechanism (Fig. 1). The threads of the nut and the spindle are also greased with MOGUL LV 2-EP so that the upper tightening strip or ring of dust seal 13 (Fig. 1) is released. After removal of the dust seal, the threads should be greased through the gap that has been thereby disclosed. This procedure should be made with the pull-rod in the CLOSED position.

In case the actuator is operated in a dusty environment its surface should be regularly cleaned from dust in order to prevent deterioration of its cooling.

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.

14. FAILURES AND THEIR REMOVAL

The actuator is in its limit position and does not start; the motor hums. Make a check for possible interrupted phase.

If the valve is wedged and cannot be moved using the hand wheel or motor, dismount the actuator and release the closure mechanically.

Cleaning – general inspection

The electric actuators should be kept clean and attention should be paid to prevent their clogging with dirt and dust. Cleaning should be carried out regularly and as often as required by operation conditions. Occasionally, it is necessary to make sure that all connecting and earthing terminals are properly tightened in order to prevent their heating during operation. The general inspection of the actuator is recommended once in 4 operating years unless otherwise specified in the revision regulations of electric devices.

List of spare parts of MODACT MTNED, MTPED actuators
(for 5 years of operation)

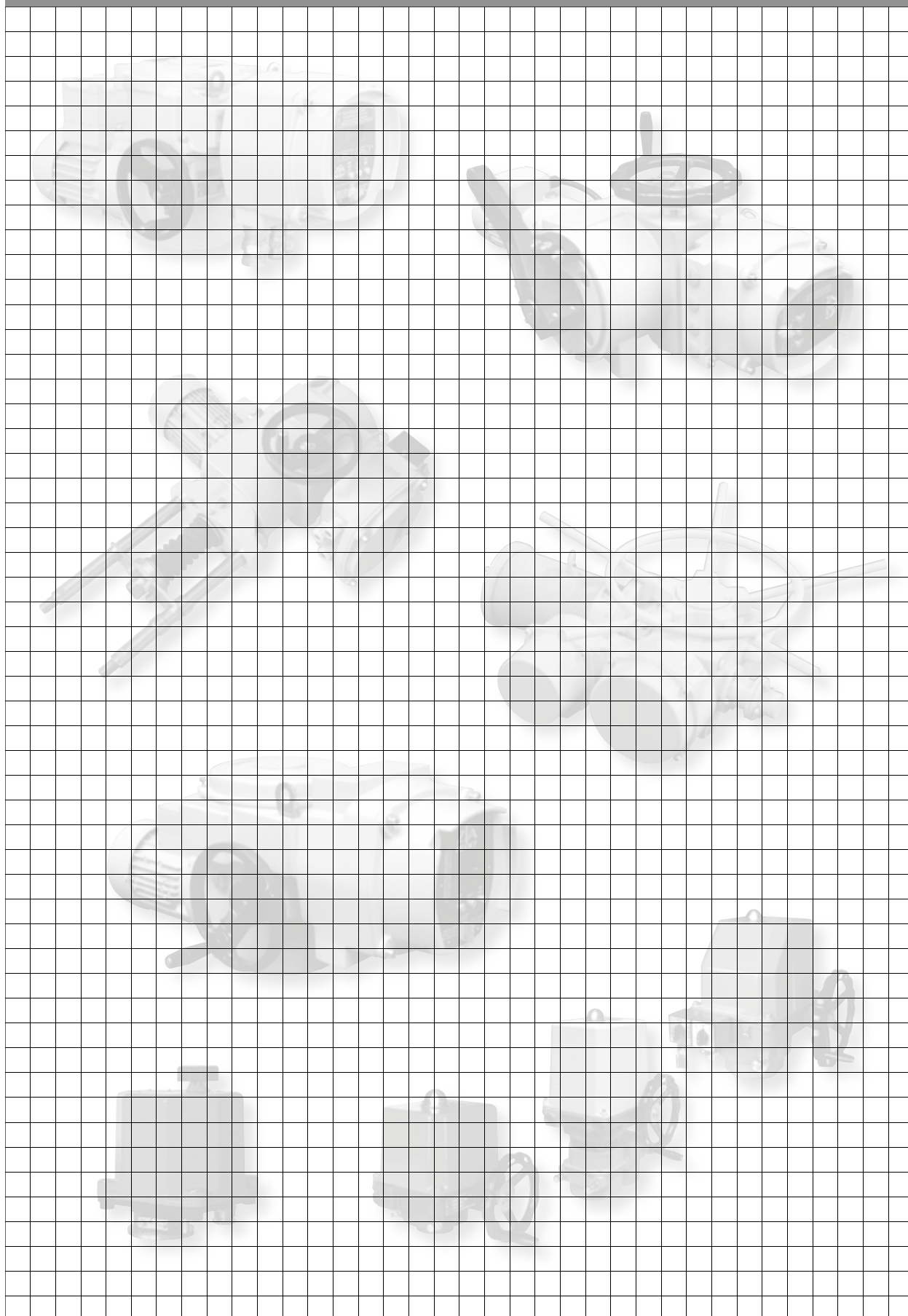
	Designation	Drawing or ČSN Standard No.		Application
52442	Sealing ring 125x3	PN 02 9281.2	1	Packing between power gear box and flange with gears
	Sealing ring 130x3	PN 02 9281.2	1	Packing between control box and power gear box
	Sealing ring 43x35	PN 02 9280.2	1	Sealing of output shaft in the control box
	Sealing ring 170x3	PN 02 9280.2	1	Sealing of control box cover
	Rotary shaft seal 40x52x7	ČSN 02 9401.0	1	Sealing of output shaft in the control box
	Rotary shaft seal 40x52x7	ČSN 02 9401.0	2	Sealing of output shaft in the power gear box
	Rotary shaft seal 16x28x7	ČSN 02 9401.2	1	Sealing of handwheel shaft
52 443	Sealing ring 160x3	PN 02 9281.2	1	Packing between power gear box and flange with gears
	Rotary shaft seal 20x32x7	ČSN 02 9401.0	1	Sealing of handwheel shaft
	Sealing ring 95x85	PN 02 9280.2	1	Packing of the rubber-copper sealing ring in the power box
	Sealing ring 50x2	PN 02 9281.0	1	Sealing of torque-limit switching spring cover
	Rotary shaft seal 60x75x8	ČSN 02 9401.0	2	Sealing of output shaft in the power gear box
	Sealing ring 190x3	PN 02 9280.2	1	Packing between control box and power gear box
	Rotary shaft seal 55x70x8	ČSN 02 9401.2	1	Sealing of output shaft in the control box
	Sealing ring 60x50	PN 02 9280.2	1	Sealing of output shaft in the control box cover
	Sealing ring 190x3	PN 02 9281.0		Sealing of control box cover
52 442 + 52 443	Packing 16x22	224580840	2	Packing of threaded plug (<i>for oil filling</i>)
	Sealing ring 125x5	P 02 9281.2	1	Packing between control box and terminal box
	Packing	52 442 - 224591870	1	Packing between electric motor and flange with gears
		52 443 - 224642240	1	
	Microswitch CHERRY D - 433 - B8LD		1	CLOSE signalling switch (<i>SZ</i>)
			1	OPEN signalling switch (<i>SO</i>)
	Microswitch CHERRY D - 433 - B8LD		1	CLOSE position-limit switch (<i>PZ</i>)
			1	OPEN position-limit switch (<i>PO</i>)
	Microswitch SAIA XGK 12-88-J21		1	CLOSE torque-limit switch (<i>MZ</i>)
			1	OPEN torque-limit switch (<i>MO</i>)
	Sealing ring 180x3	PN 02 9281.2	1	Packing of terminal box cover
	Sealing ring 32x2	PN 02 9281.2	1	Packing of inspection hole of local position indicator
	Inspection hole	4 - 62847	1	Local position indicator cover
Sealing ring 10x6	PN 02 9280.2	2	Packing of torque-limit switching shaft	

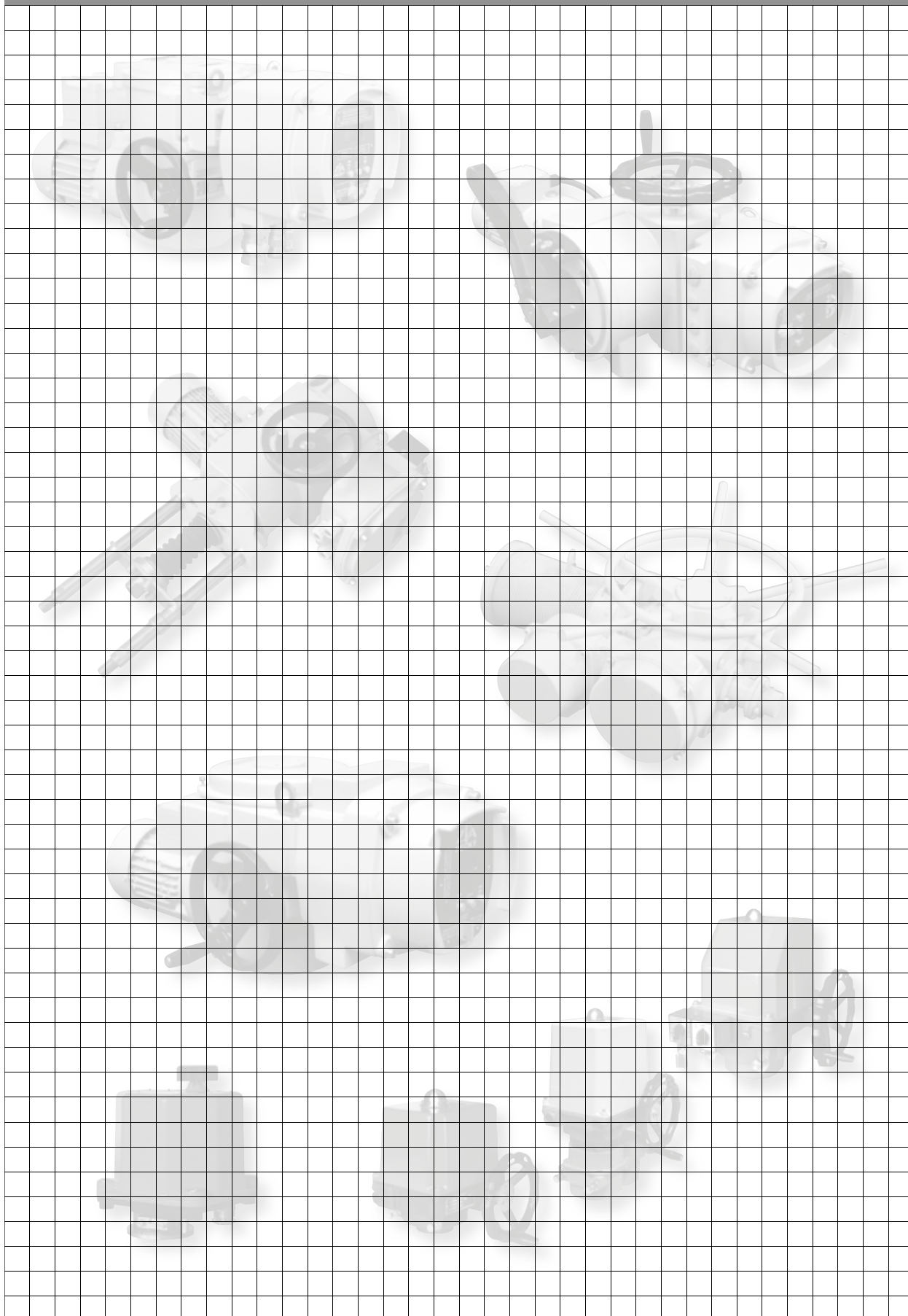
Actuators fitted with electronics DMS2 ED			
Part name	Part designation	Stock item	Note
Source board	DMS2.ED.Z	39620000	
Position sensor multi-revolution	DMS2.ED.S	39620001	
Torque sensor	DMS2.TORK	39620003	common for DMS2.ED and DMS2
Analog module	DMS.ED.CPT	39620004	back signal 4 – 20 mA and software 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	

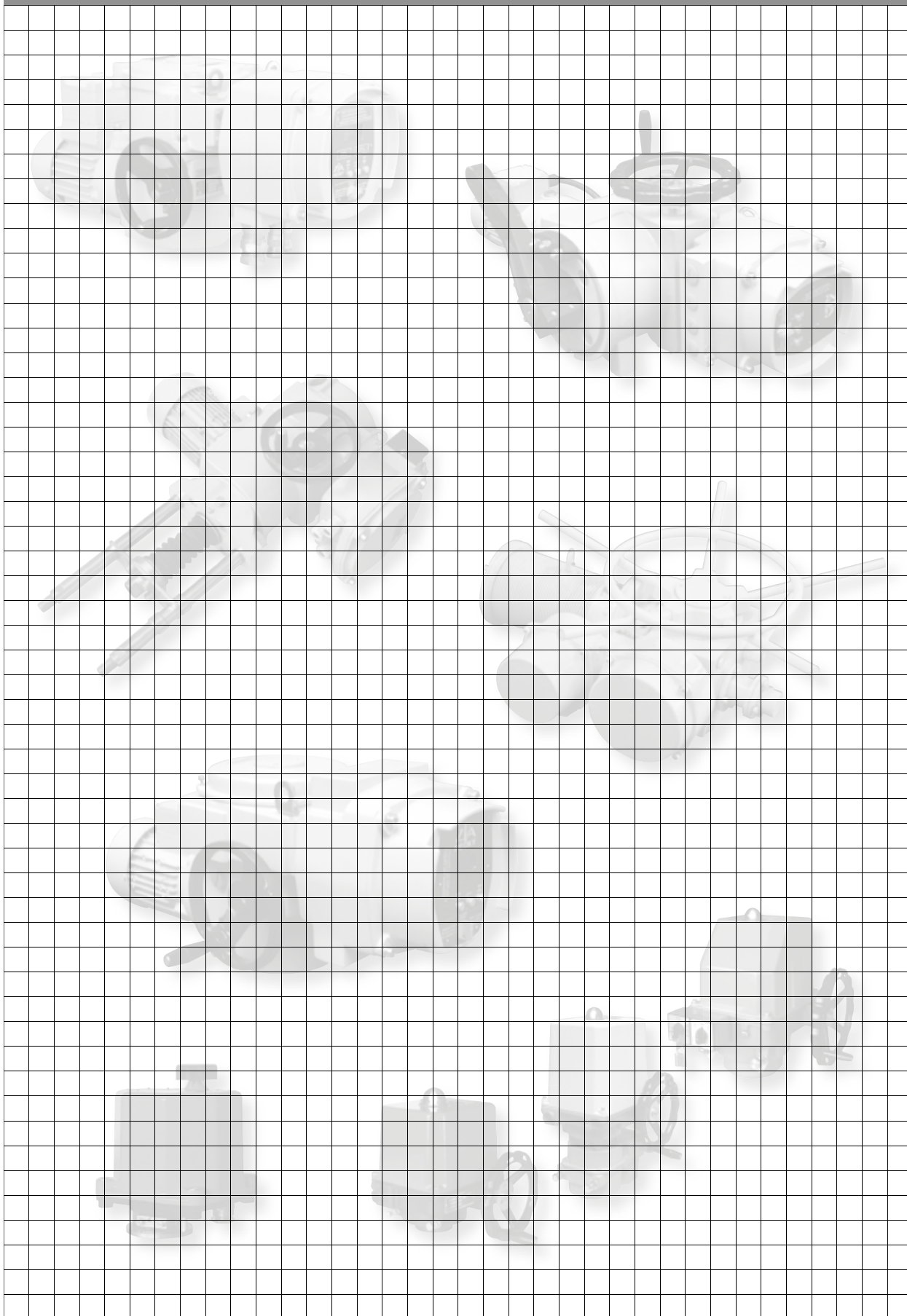
A setting program is available for the actuators (it is described in these Assembly Instructions); it enables the parameters of the electronic outfit of the actuators to be set and checked by a computer.

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

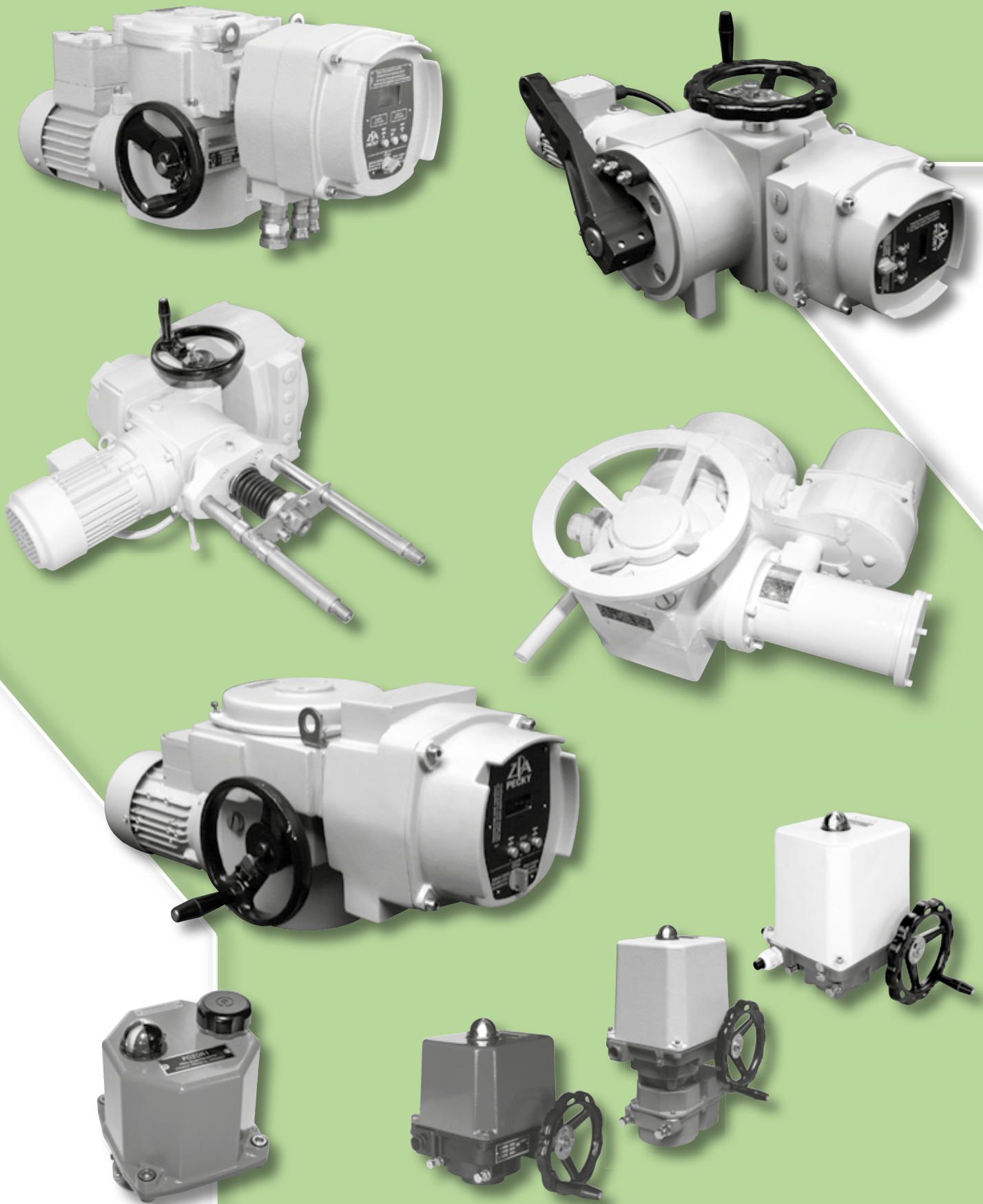
MODACT MPS, MPSP, MPSED, MPSPED

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

MODACT MTN, MTP, MTNED, MTPED

Electric linear thrust actuators with a constant output speed

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



ZPA Pečky, a.s.
tř. 5. května 166
289 11 PEČKY, Czech Republic
www.zpa-pecky.cz

tel.: +420 321 785 141-9
fax: +420 321 785 165
+420 321 785 167
e-mail: zpa@zpa-pecky.cz