



**Electric linear thrust
(pull-rod) actuators**

MODACT MTPED

Type number 52 441



www.zpa-pecky.cz

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

APPLICATION

The electric actuators **MODACT MTPED** t. no. 2 441 are designed for shifting valves by a reversible linear motion in circuits of remote control as well as automatic regulation. They can also be used for other devices for which they are suitable with their properties and parameters. Use in special cases should be discussed with the manufacturer.

WORK ENVIRONMENT, WORKING POSITION

Work environment

The actuators **MODACT MTPED** are resistant against influence of operating conditions and external effects of classes AC1, AD7, AE6, AF2, AG2, AH2, AK2, AL2, AM-2-2, AN2, AP3, BA4 and BC3 according to ČSN 33 2000-5-51 ed. 3.

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

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

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

Notes:

The area under a shelter means the one where falling of atmospheric precipitations under and angle up to 60° from the vertical is prevented.

The electric actuator must be installed in a place where cooling air has a free access. Minimum distance from a wall for access of air is 40 mm. Therefore, the area where the electric actuator is installed must be sufficiently large, clean and ventilated.

Temperature

Operating temperatures for **MODACT MTPED** electric actuators ranges from -25 °C to +60 °C. Relative humidity from 10 % to 100 % with condensation.

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

- 1) AC1 – Altitude $\leq 2\,000$ m a.s.l.
- 2) AD7 – occurrence of water – shallow dipping – short-time
- 3) AE6 – intense dust content.
- 4) AF2 – Occurrence of corrosive or polluting substances is atmospheric. Presence of corrosive polluting substances is significant.
- 5) AG2 – Medium mechanical stress. In common industrial processes.
- 6) AH2 – Medium vibrations. In common industrial processes.
- 7) AK2 – Serious danger of growth of plants or moulds.
- 8) AL2 – Serious danger of occurrence of animals (insects, birds, small animals).
- 9) AM-2-2 – normal level of signal voltage. No additional requirements.
- 10) AN2 – Medium solar radiation. Intensity > 500 and 700 W/m².
- 13) AP3 – Medium seismic effects. Acceleration > 300 Gal ≤ 600 Gal.
- 14) BA4 – Personal qualification. Instructed staff.
- 15) BC3 – Frequent contact of persons with earth potential. Persons are in frequent contact with foreign conductive parts or stand on and conductive support.

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 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.

Operating position

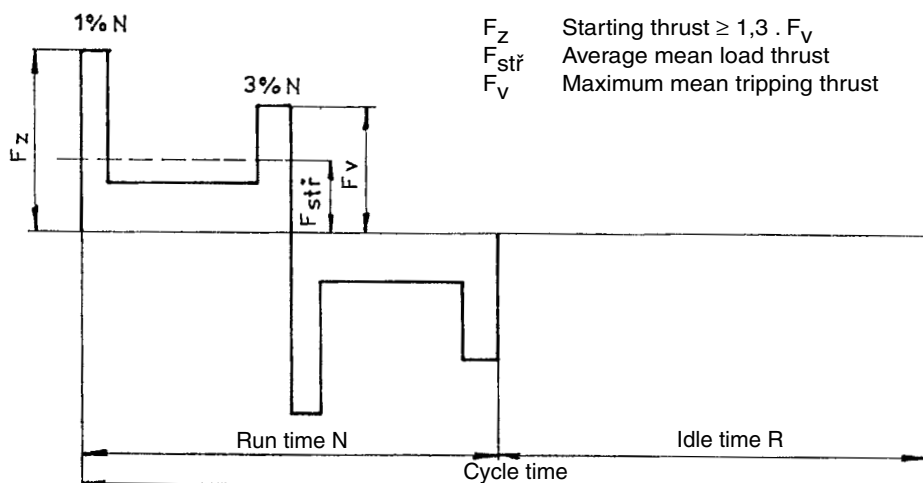
The actuators can be operated in any operating position.

3. WORKING MODE, SERVICE LIFE OF ACTUATORS

Working 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.

The maximum duty cycle is determined by the run time at a full stroke of the actuator.



Course of working cycle

Service life of actuators

The actuator designed for shut-off valves must be able to perform at least 10,000 working cycles (*Close-Open-Close*). The actuator designed for regulation purposes must be able to perform at least 1 million cycles with running time (*when the output shaft is moving*) at least 250 hours. Service life in operating hours (h) depends on loading and number of switching actions. High frequency of switching is not always beneficial for precision of regulation. For reaching the longest possible

faultless period and service life, it is recommended to set frequency of switching to the lowest possible number of switching actions necessary for the given process. Indicative data of service life derived from the set regulation parameters are shown in the following table.

Service life of electric 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

Supply voltage

- 1 x 230 V, +10 % -15 %, 50 Hz \pm 2 %
- 3 x 230/400 V, +10 % -15 %, 50 Hz \pm 2 % (or as shown on the motor rating plate).

Protection

Degree of protection of actuator – IP 67

Noise

Sound pressure level A max. 85 dB (A)
 Sound power level A max. 95 dB (A)

Tripping thrust

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

Breakaway force

Breakaway force is a calculated value, determined by electric motor's breakaway torque, actuator's total ratio and by its effectiveness. Actuator can produce breakaway force after run reversing operation for 1 to 2 revolutions of the output shaft, while torque tripping is interlocked. Torque tripping is blocked only in the end positions. Blocking time is adjustable in the range from 0 to 20 s.

Self-locking

According to these technical conditions the actuator is self-locking provided that load acts only in the direction against the motion of the actuator's output shaft. Self-locking function is provided by a roller lock, which immobilizes actuator's rotor even in case of manual operation.

With respect to safety regulations, it is unacceptable to apply actuators for operating transport lifting equipment with possible transport of persons, or for equipment where persons may be present below the lifted load.

Working stroke

Working stroke is specified in Table 1.

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. By turning the hand wheel clockwise, the output pull rod of the actuator rod extends (*closes*).

Torque values in actuators are set up and work if the actuator is energized.

If manual operation is used i.e. if actuator is operated mechanically, the torque set up will not work and valve may be damaged.

5. ACTUATOR FEATURES

Position indicator

The actuator can be equipped with a display as an option of the DMS2 ED electronics. In DMS2 electronics the actuator is equipped with a multi-line display.

Heating element

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

6. ELECTRIC PARAMETERS

External electrical connection

The actuator is fitted with a terminal board providing connection to external circuits. Terminal board is provided with bolt terminals for connection of supply conductors of the electric motors with a maximum section of 4 mm². Connecting of signal conductors to the terminals of control circuits uses conductors with a cross section fo 1.5 mm². Terminal board is accessible upon removal of terminal box cover. All electrical control circuits of actuator are led to the terminal board. Terminal box is provided with cable bushings for electric connection of actuator. Electric motor is equipped with a separate terminal box. Alternatively, actuators with connector can be supplied with a connector.

Internal electrical connection of actuators

Internal electrical wiring diagrams of **MODACT MTPED** actuators including identification of terminals are included in the present Installation Manual.

In the actuator, the internal wiring diagram is depicted on the inner side of the electric actuator. The terminals are marked with labels on a self-adhesive sticker.

Isolation resistance

Isolation resistance of electric control circuits against the frame and against each other at normal conditions is min. 20 Mohm, after a dump test, isolation resistance of control circuits is min. 2 Mohm. Detailed data are in the technical conditions.

Electric strength of electric circuit isolation

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

Deviations of basic parameters

Tripping thrust	±12 % of max. tripping thrust
Shifting speed	-10 % to +15 % of rated value
Output part clearance	max. 1 mm

Protection

The electric actuators are fitted with external and internal protecting terminal for securing protection against dangerous shock voltage.

The protecting terminals are marked according to ČSN IEC 417 (34 5550).

7. DESCRIPTION AND FUNCTION

Design of the actuators **MODACT MTNED, t. no. 52 441** is based on a kit series of the actuators **MODACT MONED, t. no. 52 039**. In addition, they are fitted with a linear-thrust device converting rotation to linear motion.

The asynchronous electric motor drives, via a drive gearing, the central wheel of the differential gear located in the load-bearing box of the electric actuator (*force gear*). In motor control, the crown wheel of the epicyclic differential is held in constant position by a self-locking screw gear. The hand wheel connected with the screw provides for alternative manual control even when the electric motor is running, without any danger to the operator.

The output shaft is fix-connected with the epicyclic gear catch driver and passes on to the control box where the control unit with the position sensor, torque sensor, and heating resistor are installed.

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. 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 programme or manually without a computer.

The more simple system **DMS2 ED** substitutes electromechanical parts 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	It also contains the sensor of position of the output shaft, 4 push-buttons and 3 signal LEDs for setting and checking the actuator.
Torque-limit unit	
Source unit	Contacts of seven relays (<i>MO, MZ, PO, PZ, SO, SZ, READY</i>) are connected to the terminal board; state of each relay is signalized by LED. The unit enables the heating resistor to be connected and controlled by the thermostat.

Optional outfit:

Feedback signal 4 – 20 mA	
Analog regulator	
Position Indicator – LED display	
Local control	
Power relays	for three-phase electric motor

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
Blocking of torque	0 – 20 sec. at reversing in limit positions
Input signal	0 (4) – 20 mA with switched on regulator function Local/Remote control, Local open/close
Output signal	7x 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
Power supply of electronic	230 V AC, 50 Hz, 4 W, over-voltage category II

DMS2

Basic outfit:

Control unit	It also includes a sensor of the output shaft position, 2 signals LED
Torque-limit unit	
Source unit	It includes: 2 relays for electric motor control; Relay Ready with change-over contact connected to the terminal board; Signalling relays 1 – 4 with one pole of the switching contact connected to the terminal board; Second poles of the switching contacts of relays 1 – 4 are interconnected and brought out to the terminal COM. Heating resistor switched by a thermostat is connected to the unit. The unit controls power switches of the electric motor (<i>reversing relay</i>). Two-row display, 2 x 12 alpha-numeric characters.
Unit of display	Two-row display, 2 x 12 alpha-numeric characters.
Unit of push-buttons	Push-buttons " Open ", " Close ", " Stop ", Selector switch " Local ", " Remote ", " Stop ".
Power relays	For three-phase electric motor (<i>according design</i>)

Optional outfit (the electric actuator must be fitted with one of these units):

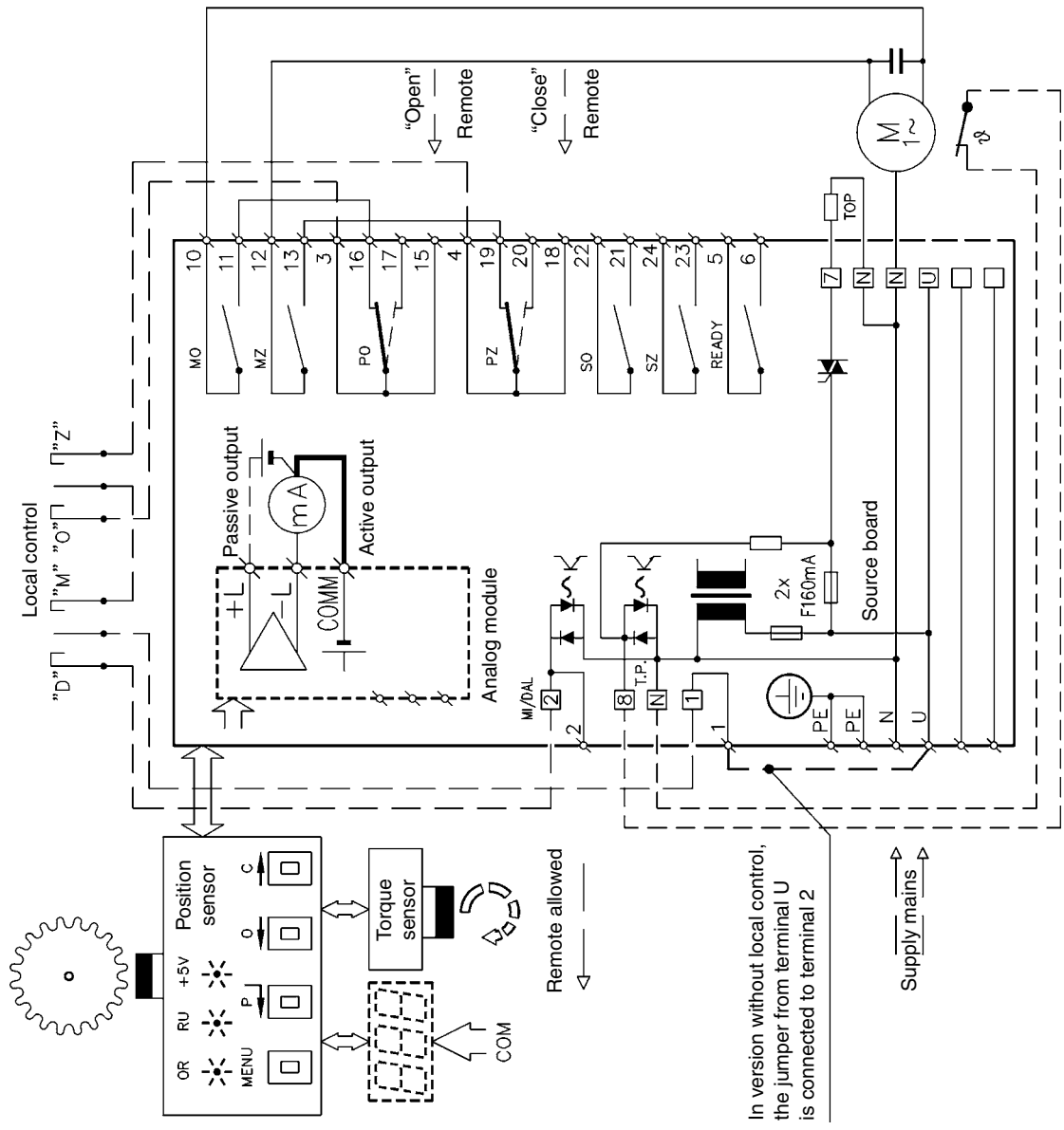
Unit of two- and three-position control – control of the electric actuator by shifting to position "Open" and "Close" or by analog signal 0 (4) – 20 mA.

Unit of connection Profibus – control of the electric actuator by industrial bus bar Profibus.

The electronic control DMS2 checks, within its function, sequence and fall-out of phases of supply voltage.

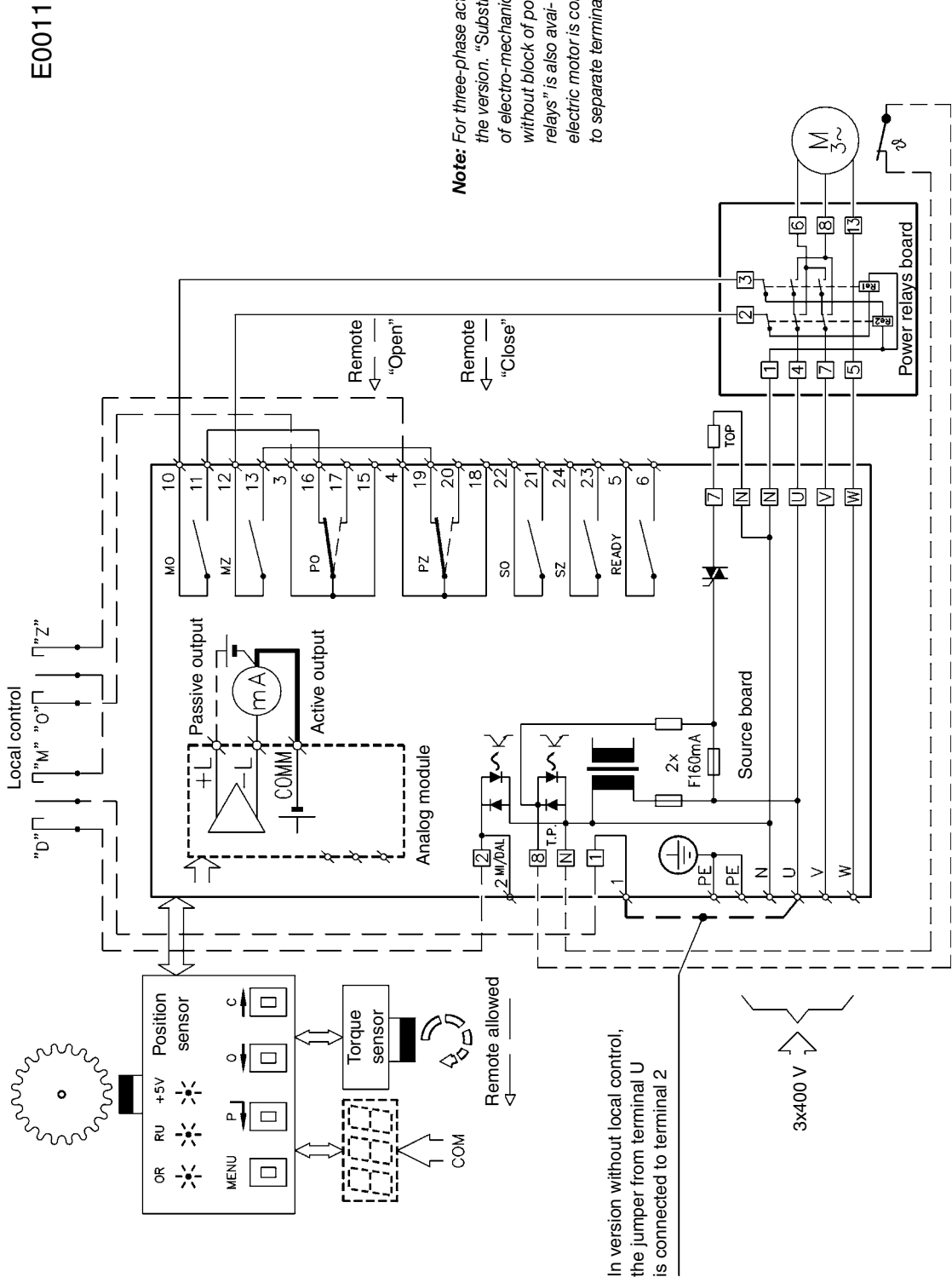
Example of wiring diagram of electronics **DMS2 ED** in version **Replacement of electro-mechanical board**
with single-phase electric motor

E0010



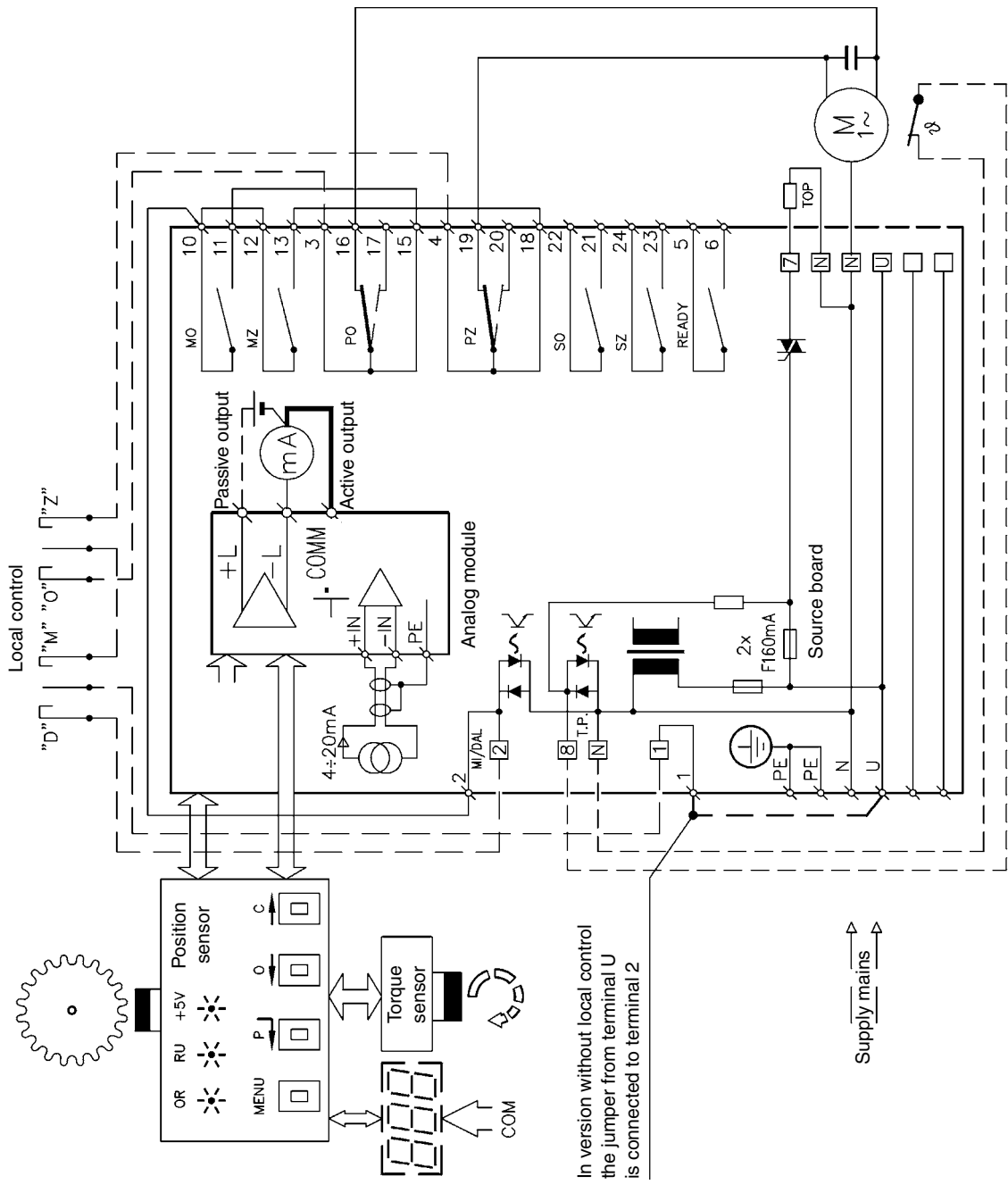
Note: Here, contacts of relays MO, MZ, SO, SZ are shown with power supply switched off; with power supply switched on contacts PO, PZ are shifted to the position drawn in dashed line.

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



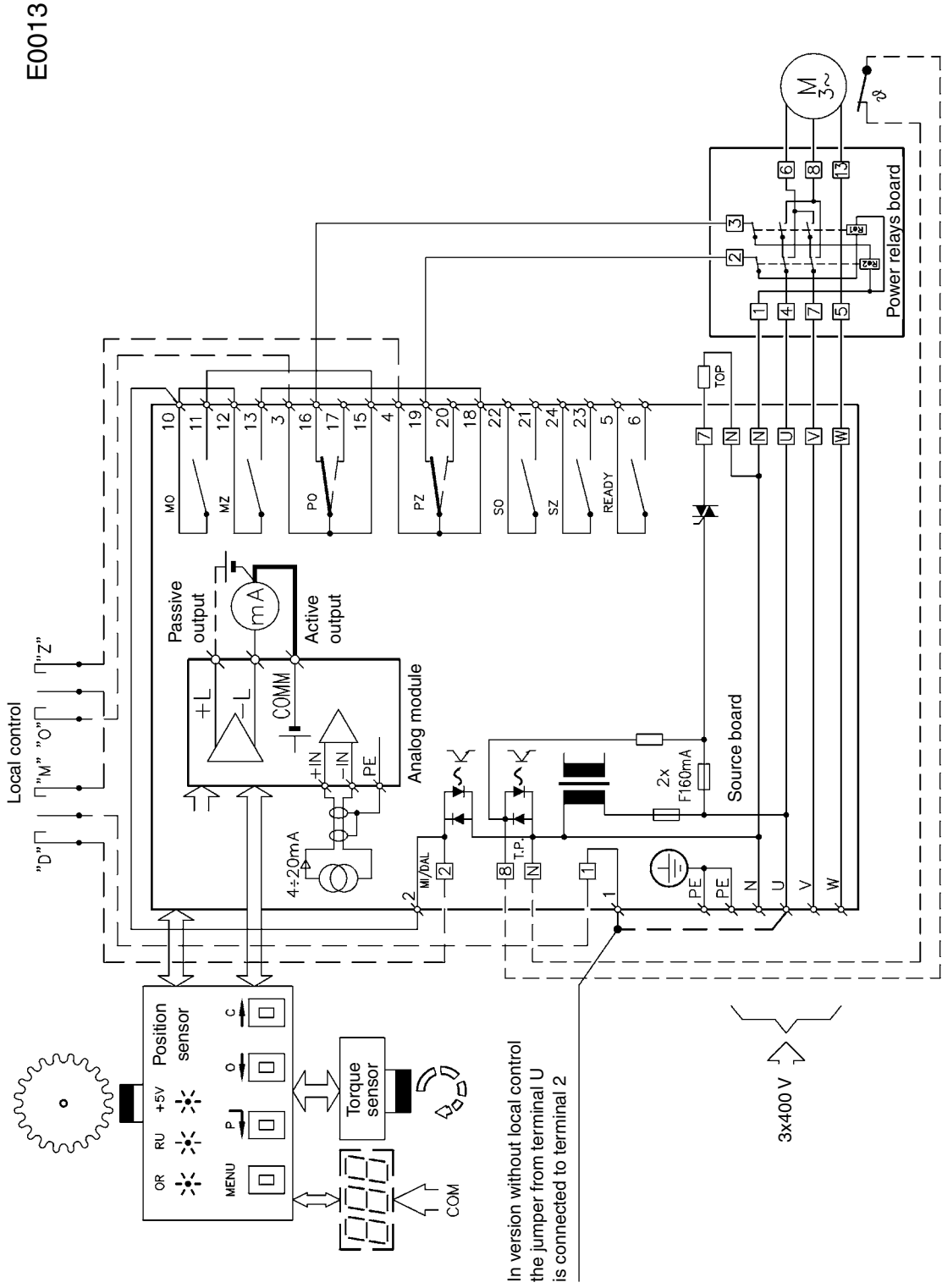
Example of wiring diagram of electronics **DMS2 ED** in version **Control** with single-phase electric motor

E0012



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

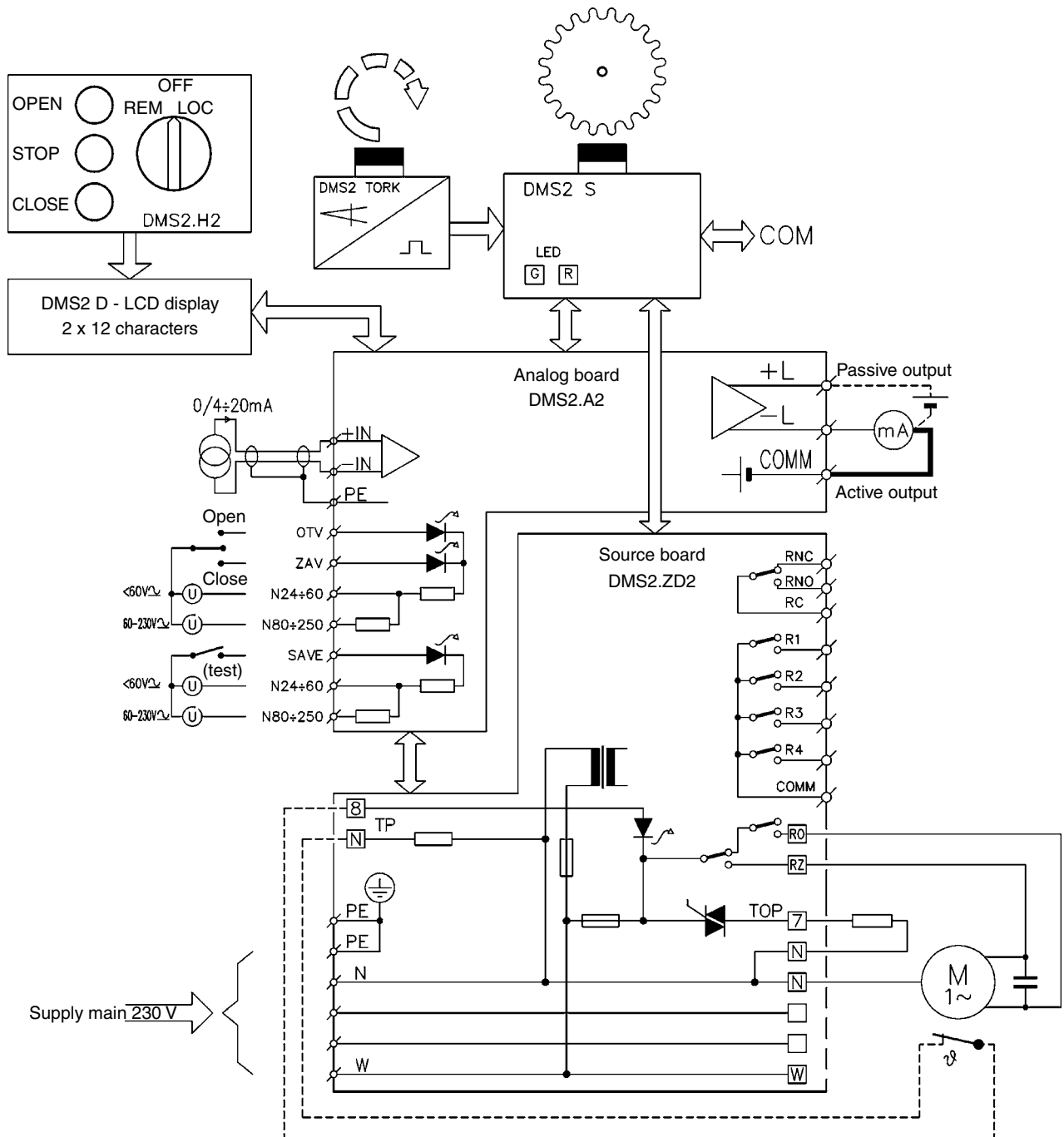
Example of wiring diagram of electronics **DMS2 ED** in version **Control** with three-phase electric motor



Note: Here, contacts of 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.

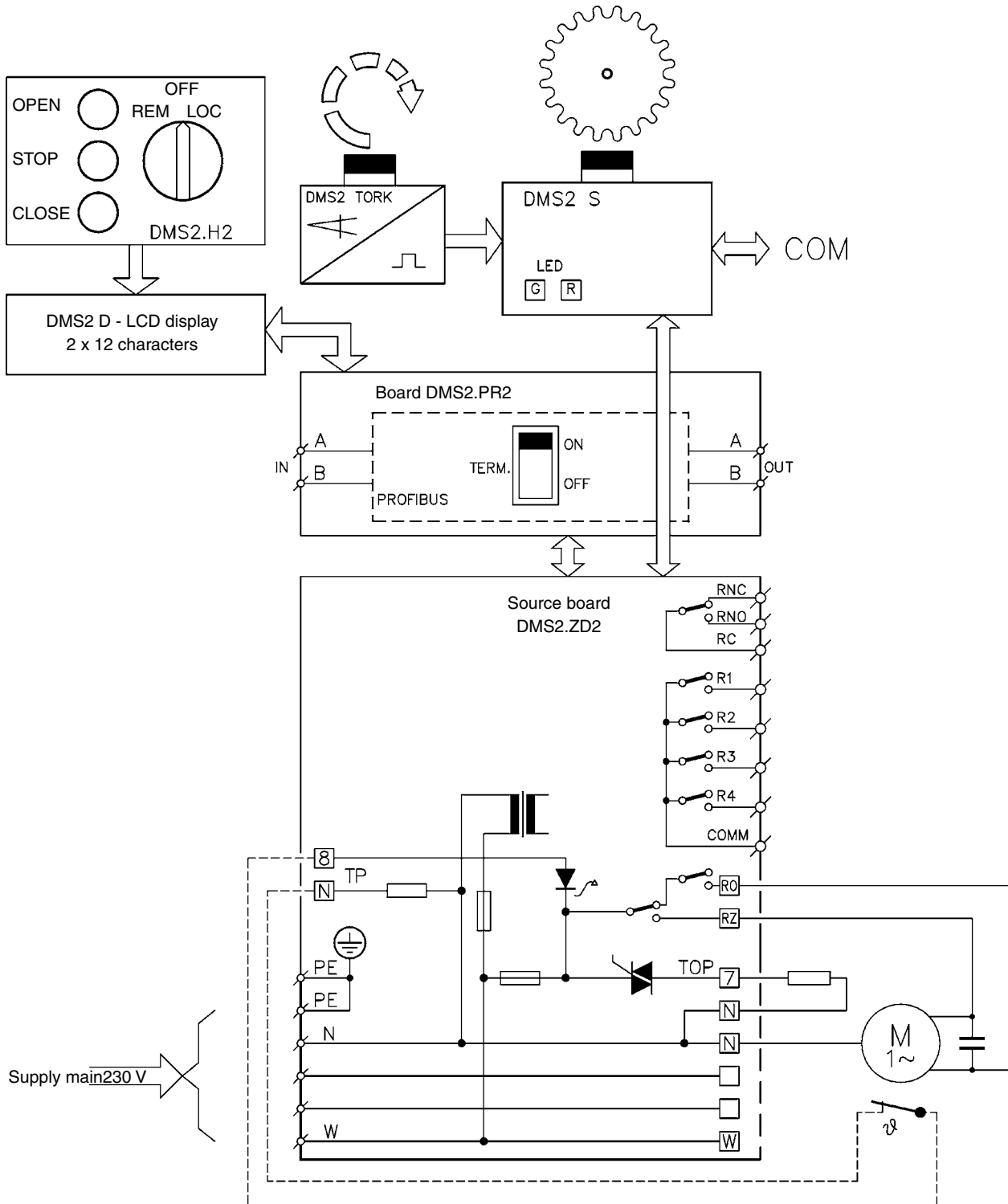
Example of wiring diagram of system **DMS2** in version for control with signals “open” and “close” or in version for control with analog current signal with single-phase electric motor

E0014

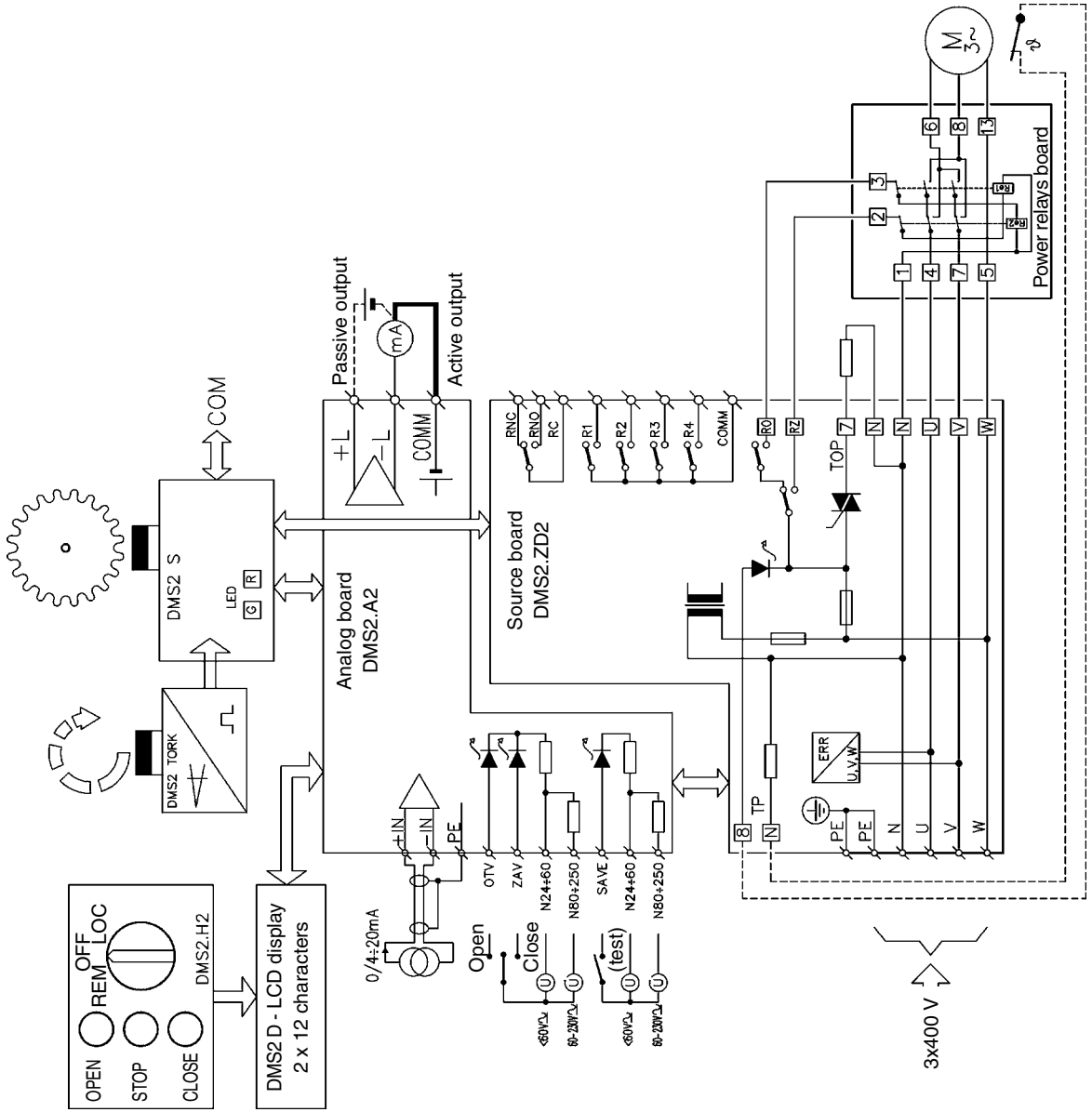


Example of wiring diagram of system **DMS2** in version Profibus
with single-phase electric motor

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

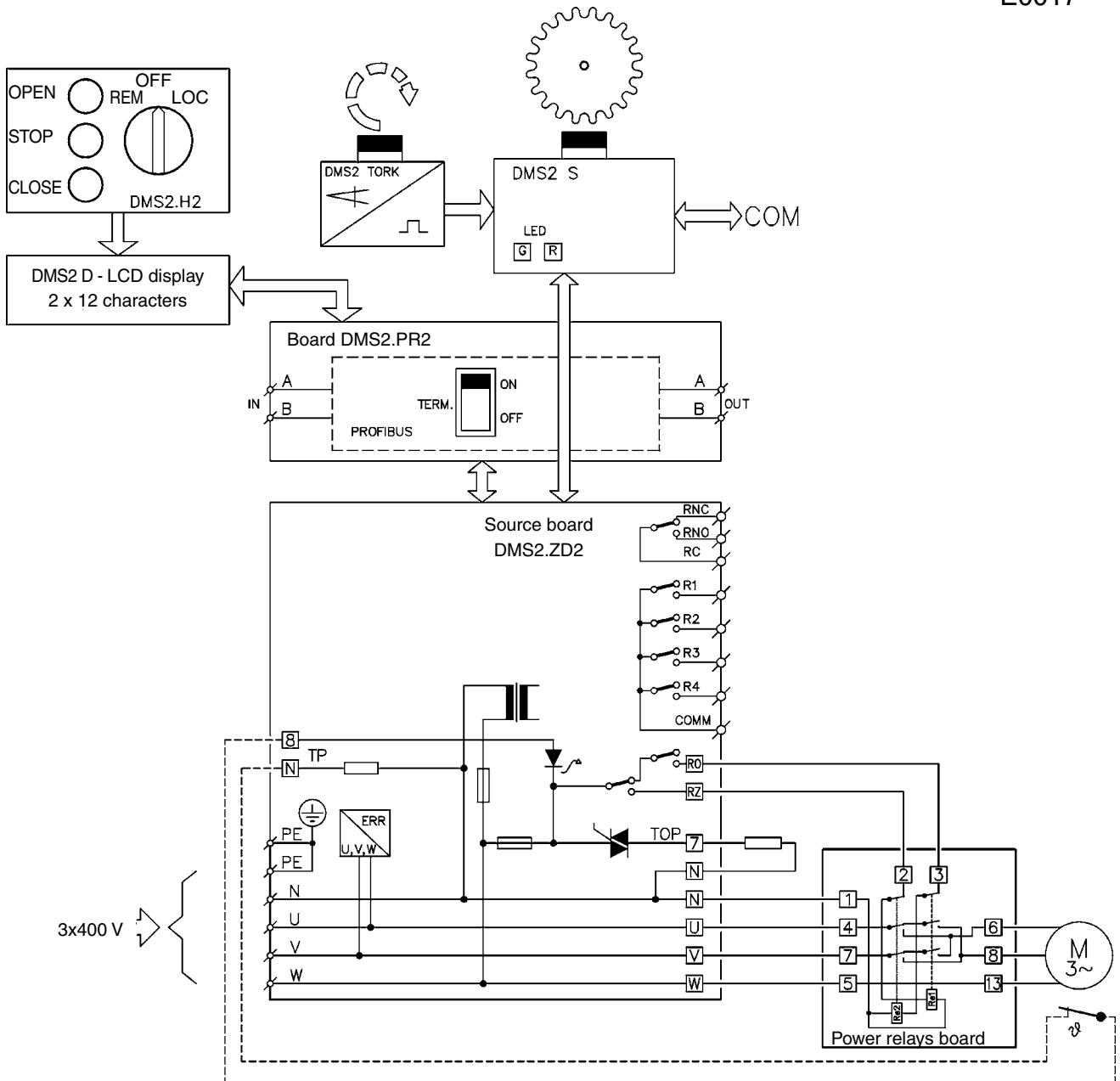


Table 1 – Electric actuators MODACT MTPED, Type No. 52 441
– basic technical parameters

Type	Range of tripping force setting [kN]	Control	Tripping force [kN]	Shifting speed [mm/min]	Stroke [mm]	Electric motor						Weight [kg]	Type number											
						Type	Output [W]	Speed [1/min]	I _n (400 V) [A]	I _z I _n	Voltage [V]		Basic 1 2 3 4 5	Complementary 6 7 8 9 10 11										
MTPED 15	5 - 15	C	19	45	10 - 100	T42RL477	50	1350	0,24	2	3x400	22	5 2 4 4 1	x x 0 x PED										
		C		75		T42RR478	90	1300	0,34	2,5	3x400			x x 1 x PED										
		C		125		T42RX479	150	1270	0,53	2,2	3x400			x x 2 x PED										
		C		200		T42RX479	150	1270	0,53	2,2	3x400			x x 3 x PED										
		C		45		J42RT502	100	1370	0,8	1,7	1x230			x x 5 x PED										
		C		75		J42RT502	100	1370	0,8	1,7	1x230			x x 6 x PED										
	C	13	125	J42RT502		100	1370	0,8	1,7	1x230	x x 7 x PED													
MTPED 25	15 - 25	C	33	45	T42RR478	90	1300	0,34	2,5	3x400	x x 8 x PED													
		C		75	T42RR478	90	1300	0,34	2,5	3x400	x x 9 x PED													
		C		45	J42RT502	100	1370	0,8	1,7	1x230	x x A x PED													
		Mechanical connection – pitch A = 160 mm or B = 150 mm (+ designation at 7 th place acc. Table 3)												6 x x x PED										
Mechanical connection – pitch A = 132 mm or B = 100 mm (+ designation at 7 th place acc. Table 3)												1 x x x PED												
With connector for the pitches A = 160 mm or B = 150 mm (+ designation at 7 th place acc. Table 3)												7 x x x PED												
With connector for the pitches A = 132 mm nebo B = 100 mm (+ designation at 7 th place acc. Table 3)												2 x x x PED												

Meaning of respective places of type number:

6th place – specifies pitch of pillars (Table 1)

7th place – specifies parameters of mechanical connection (Table 3)

8th place – specifies range of setting of tripping force and shifting speed (Table 1)

9th place – specifies control electronics outfit

the letter “U”, if the letter **C, P, R** or **S** is on the 10th place (electric actuator is fitted with electronics DMS2)
character from Table 2, if the letter **E** is on the 10th place

Table 2 – Outfit of control electronics DMS2 ED

Outfit	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
	controller																x	x	x	x	x	x	x	x

Note: The actuators with three-phase electric motor and electronics DMS2 or with three-phase electric motor and electronics DMS2ED and regulator must also be fitted with a block of power relays. The actuators with single-phase electric motors are not available with power relays.

10th place – specifies type of electronics:

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

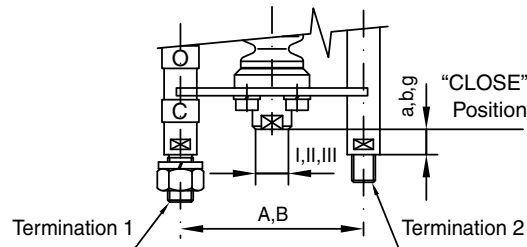
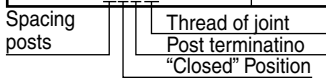
*) Two- or three-position regulation of the actuator is set at the manufacturer. Unless otherwise specified in the order, the actuator will be set for three-position regulation (control by signal 4 – 20 mA).

Table 3 – Connecting dimensions

– specification of the 7th place of t. no. 52 441.xxxx

Column A spacing (160 or 132 mm)	Sign on 7th place	Column B spacing (150 or 100 mm)	Sign 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

Supplies of design III
with M joint 10x1 only
upon agreement with
the manufacturer

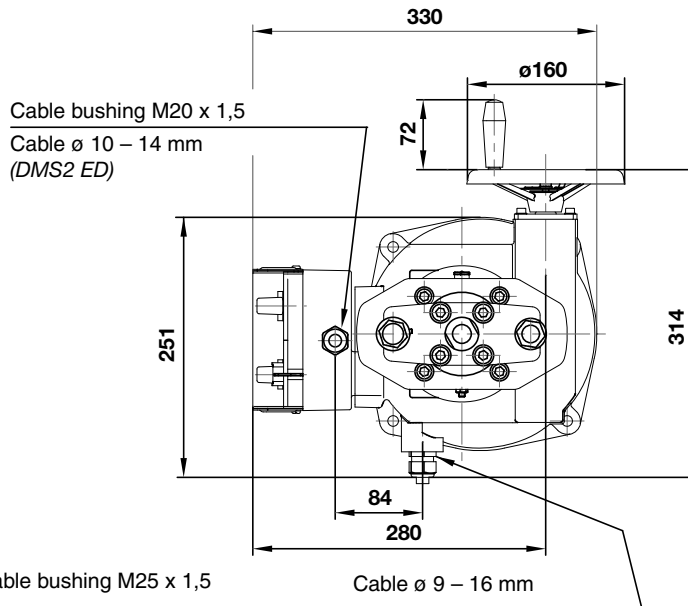


Column spacing	A	160 or 132 mm		
	B	150 or 100 mm		
"Closed" Position	a	30 mm	c post length	by „Design“ tables – fig. 1 a 2
	b	74 mm	d post length	
	g	130 mm	h post length	
Thread in link	I	M20 x 1,5		
	II	M16 x 1,5		
	III	M10 x 1		

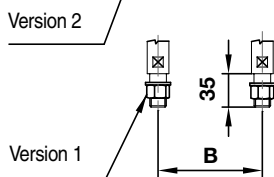
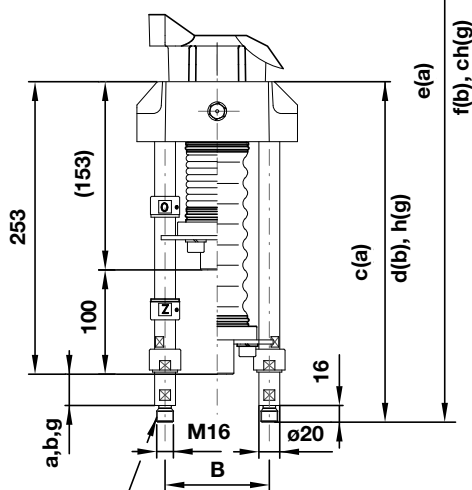
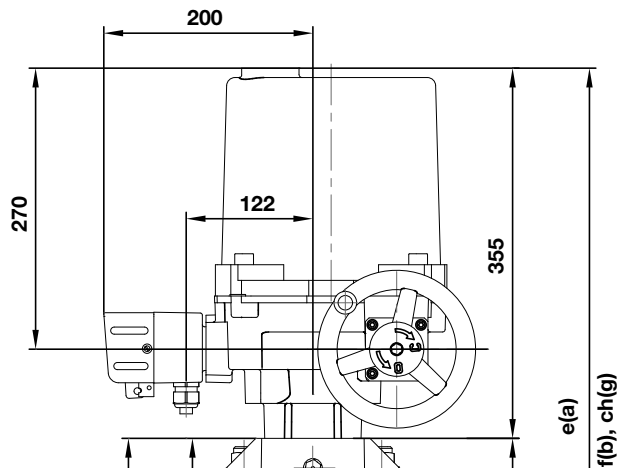
Dimensional sketch of **MODACT MTPED 15** electric actuator,
Type No. 52 441 (the pillar pitch 132 and 100 mm)
 (actuator in version with local control unit)

Version 1		
A	132	
B		100
a	30	30
b	74	74
g	130	130
c (a)	323	318
d (b)	367	362
h (g)	423	418
e (a)	678	673
f (b)	722	717
ch (g)	778	773

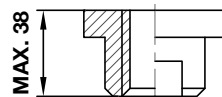
Version 2		
A	132	
B		100
a	30	30
b	74	74
g	130	130
c (a)	308	299
d (b)	352	343
h (g)	408	399
e (a)	663	654
f (b)	707	698
ch (g)	763	754



Cable bushing M25 x 1,5
 Cable \varnothing 9 – 16 mm



Detail of coupling



M20x1,5 I

M16x1,5 II

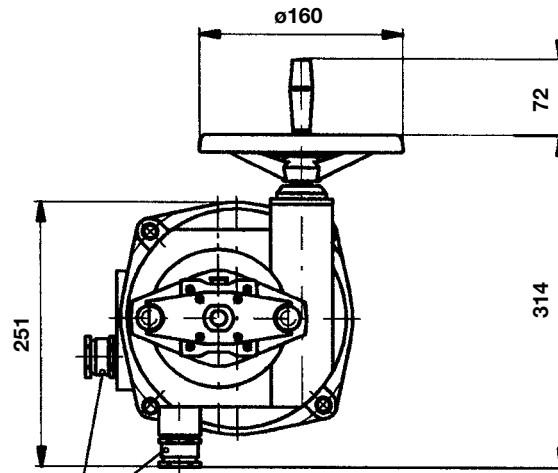
M10x1 III

After agreement with the manufacturer

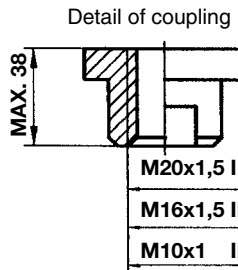
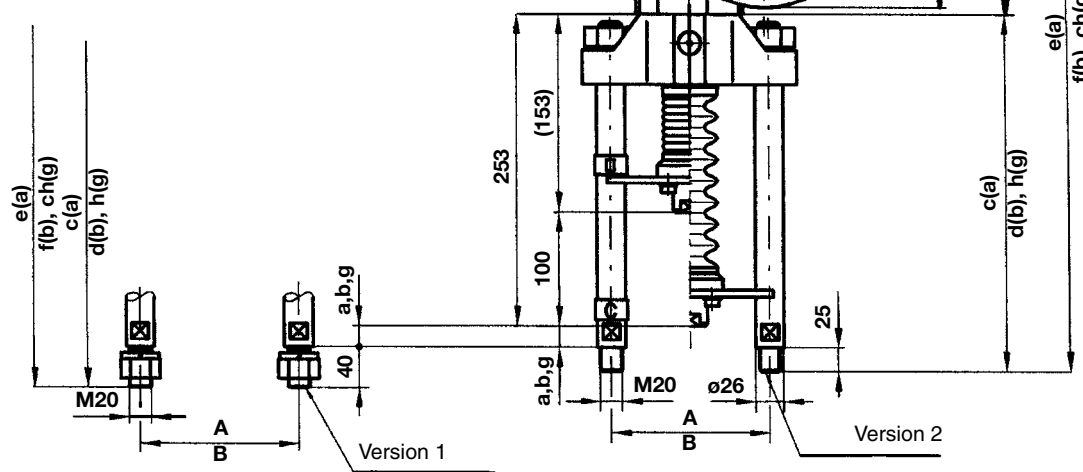
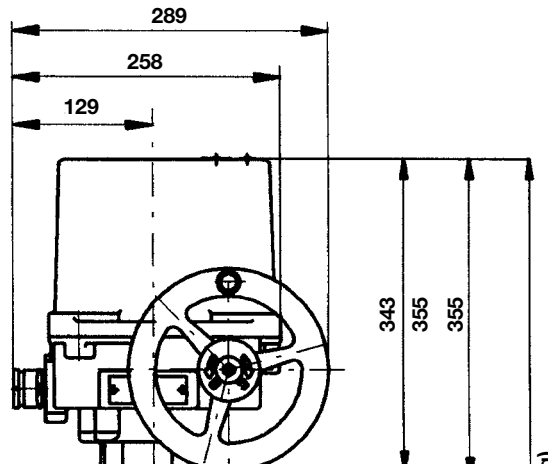
Dimensional sketch of **MODACT MTPED 15** electric actuator,
Type No. 52 441 (the pillar pitch 160 and 150 mm)

Version 1	
A	160
B	150
a	30
b	74
g	130
c (a)	323
d (b)	367
h (g)	423
e (a)	678
f (b)	722
ch (g)	778

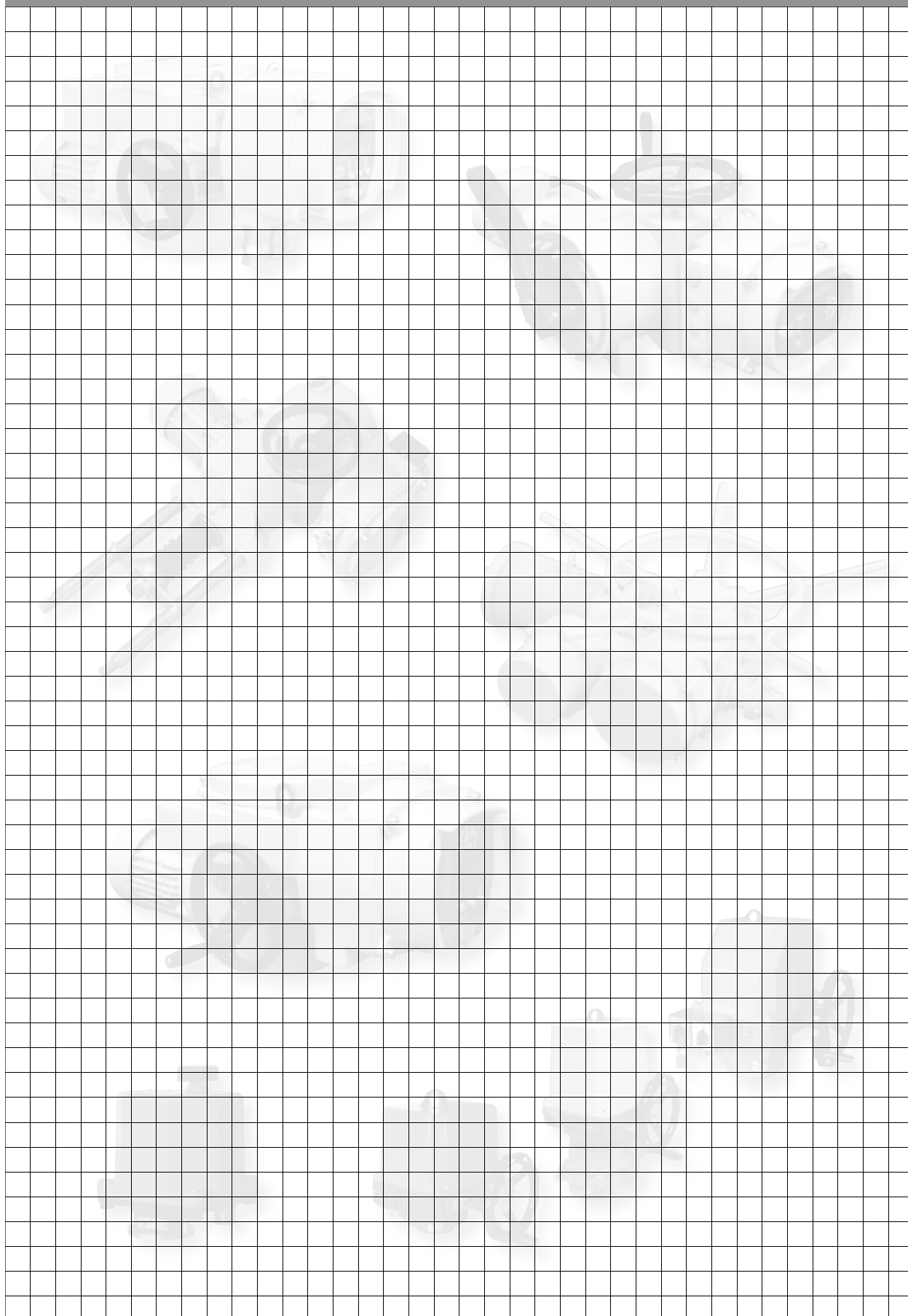
Version 2	
A	160
B	150
a	30
b	74
g	130
c (a)	308
d (b)	352
h (g)	408
e (a)	663
f (b)	707
ch (g)	763

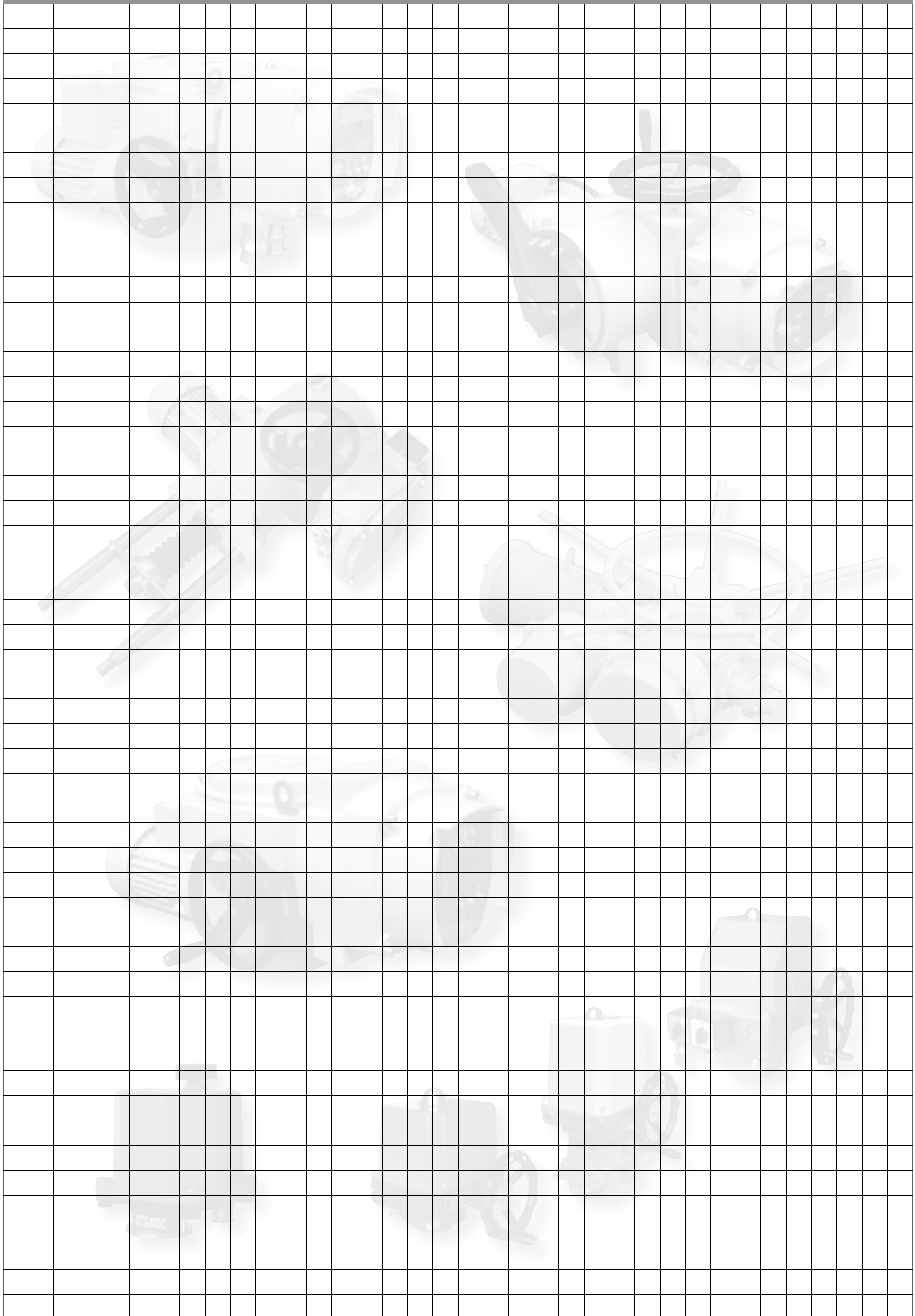


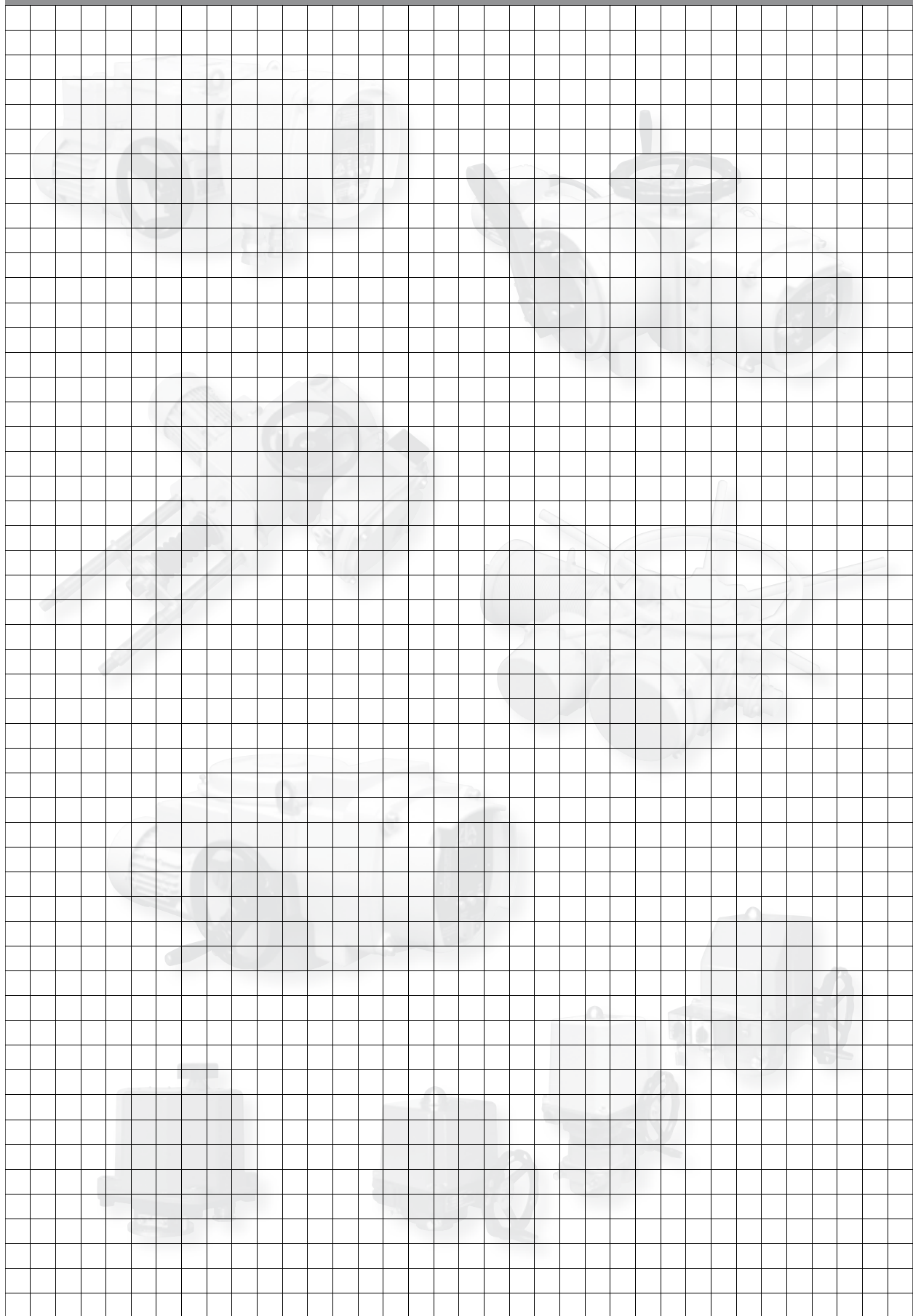
2x Cable bushing M25 x 1,5
 Cable \varnothing 9 – 16 mm



After agreement with the manufacturer









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

SURVEY OF PRODUCED ACTUATORS

KP MINI, KP MIDI

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

MODACT MOK, MOKED, MOKP Ex

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

MODACT MOKA

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

MODACT 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 KONSTANT, MPSED

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

MODACT MTN, MTP, MTNED, MTPED

Electric linear thrust actuators with a constant output speed

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



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