

APPLICATION

The actuators **MODACT MOKED** are designed for shifting control elements by a reversible rotary motion with the turning angle of the output part 90°, including cases when tight closure in end positions is required. Typical example of using is control of ball and flap valves in similar installations in the regime of remote control as well as automatic regulation. The electric actuators **MODACT MOKED** are mounted directly on the controlled element.

OPERATING CONDITIONS, OPERATING POSITION

Operating conditions

The actuators **MODACT MOKED** are resistant against effect of operating conditions and external effects of classes AA7, AB7, AC1, AD5, AE5, AF2, AG2, AH2, AK2, AL2, AM2, AN2 AP3, BA4 and BC3 according to ČSN 33 2000-3 (mod. IEC 364-3:1993).

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 %, it is always necessary to use an anti-condensation heater fitted to the actuator.

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

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.

Classes of external effects

Basic characteristics – excerpt from ČSN 33 2000-3 (mod. IEC 364-3:1993)

- 1) AA7 – Combined effect of surrounding temperature from -25 °C to +55 °C (and relative humidity from 10 %).
- 2) AB7 – Surrounding temperature identical with point 1. The lowest relative humidity 10 %; the highest relative humidity 100 % with condensation.
- 3) AC1 – Altitude $\leq 2\,000$ m a.s.l.
- 4) AD5 – Spouting water; water can spout in any direction.
- 5) AE5 – Medium dustiness. Medium-thick layers of dust. Fall-out of dust higher than 35 and not more than 350 mg/m² daily.
- 6) AF2 – Occurrence of corrosive or polluting substances is atmospheric. Presence of corrosive polluting substances is significant.
- 7) AG2 – Medium mechanical stress. In common industrial processes.
- 8) AH2 – Medium vibrations. In common industrial processes.
- 9) AK2 – Serious danger of growth of plants or moulds.
- 10) AL2 – Serious danger of occurrence of animals (*insects, birds, small animals*).
- 11) AM2 – Harmful effects of released stray currents
- 12) 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.

Operating position

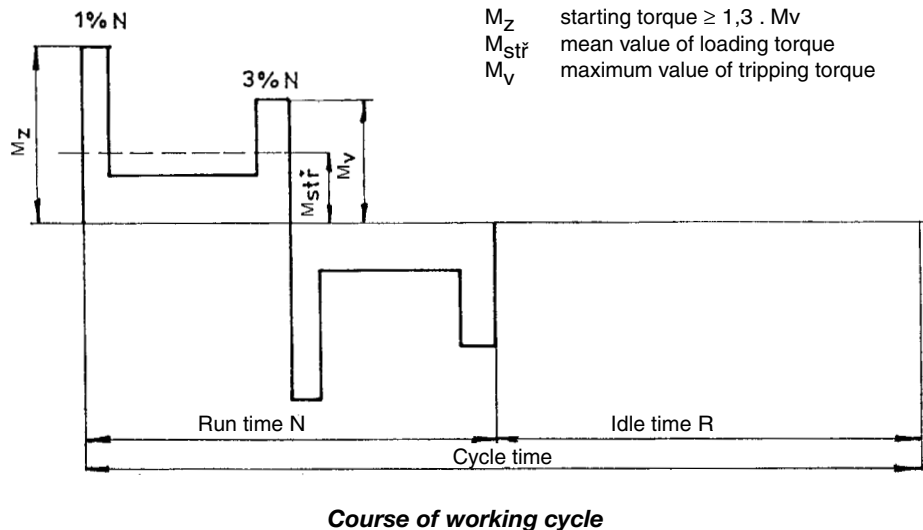
The actuators can be operated in any operating position.

OPERATION MODE, SERVICE LIFE OF ACTUATORS

Operation mode

The actuators can be operated with the type of loading S2 according to ČSN EN 60 034-1. The run period at temperature +50 °C is 10 minutes; the mean value of loading torque should not exceed 60 % of the value of maximum tripping torque M_V . The actuators can also work in the regime S4 (*interrupted run with start-up*) according to ČSN EN 60 034-1. Load factor $N/N+R$ is max. 25 %; the longest working cycle ($N+R$) is 10 minutes (*course of working cycle is shown in the figure*). The highest number of closing operations in automatic regulation is 1200 cycles per hour. Mean value of loading torque with load factor 25 % and surrounding temperature +50 °C is not higher than 40 % of maximum tripping torque M_V .

The highest mean value of loading torque is equal to rated torque of the actuator.



Service life of actuators

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

The actuator intended for shut-off valves must be able to perform at least 10,000 operating cycles (C - O - C).

The actuator intended for regulating purposes must be able to perform at least 1 million cycles with operation time (*during which the output shaft is moving*) at least 250 hours. Service life in operating hours (h) depends on load and number of switching. Not always, high frequency of switching influences positively accuracy of regulation. For attaining the longest possible faultless period and service life, frequency of switching is recommended to be set to the lowest number of switching necessary for the given process. Orientation data of service life derived from the set regulation parameters are shown in the following table.

Service life of actuators for 1 million starts

Service life [h]	830	1 000	2 000	4 000
Number of starts [1/h]	Max. number of starts 1200	1 000	500	250

TECHNICAL DATA

Supply voltage

Supply voltage of electric motor:

- 1 x 230 V, +10 %, -15 %, 50 Hz ± 2 %
- 3 x 230/400V, +10 %, -15 %, 50 Hz ± 2 %
- 1 x 220 V, +10 %, -15 %, 50 Hz +3 % -5 %
- 3 x 220/380 V, +10 %, -15 %, 50 Hz +3 % -5 %

(or as shown on the motor rating plate)

Other supply voltage for electric actuators should be discussed with the manufacturer.

Protective enclosure

Protective enclosure of actuators: **MODACT MOKED** – IP 65 or IP 67 according to ČSN EN 60529.

Noise

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

Tripping torque

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

Self-locking

The actuators are self-locking. Self-locking of the electric actuators is ensured by a mechanical or electromagnetic brake of the electric motor.

Sense of rotation

When looking at the output shaft in the direction towards the control box, the CLOSE direction of rotation is identical with the clockwise sense.

Working stroke

Rated working stroke of electric actuator is 90°.

Manual control

Manual control is performed directly by a handwheel (*without clutch*). It can be used even when the electric motor is running (*the resulting motion of the output shaft is determined by the function of the differential gear*). When the handwheel is rotated clockwise the output shaft of the actuator also rotates clockwise (*when looking at the shaft towards the control box*). On condition that the valve nut is provided with left-hand thread, the actuator closes the valve.

ACTUATOR OUTFIT

Position indicator

The actuator can be fitted with a local position indicator.

Anti-condensation heater

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

Local control

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

ELECTRIC PARAMETERS

External electric connection

The terminal board of the actuator is fitted with terminals allowing one copper or aluminium conductor with a maximum cross-section of 2.5 mm² or two conductors with the same cross-sectional area up to 1 mm² to be connected.

Connecting of actuators with connector – on special request.

Actuator internal wiring

The internal wiring diagrams of the **MODACT MOKED** actuators with terminal designation are shown in this catalogue.

Each actuator is provided with its internal wiring diagram on the inner side of the actuator cover. The terminals are marked on a self-adhesive label attached to a carrying strip under the terminal block.

Isolation resistance

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

Overheating protection of electric motor

All electric motors have thermal fuses in their winding. They serve as an additional protection; they do not substitute the overcurrent protection or circuit breaking.

The fuses of single-phase electric motors are internally interconnected with the winding and, in case of overheating, they cut out the electric motor; after cooling down, they cut it in automatically.

The fuses of three-phase electric motors are separately led out and they can be connected into control or signalling circuits. They are connected to the actuator terminal board as a standard for MOKED 63 (*type no. 52 325*) only.

Load-bearing capacity is 250 V AC / 2.5 A.

Electric strength of electric circuits isolation

Circuits 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 torque		±15 % of max. tripping torque
Shifting time of output shaft		+10 % of rated value - 15 %
Setting of working stroke		±1°
Clearance at output part	type no. 52 325, 52 326, 52 328	max. 1,5°
	type no. 52 327, 52 329	max. 2,5°

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*).

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	input and output analog signals

Small LED display	on request
Local control	
Reversing relay	for version Control

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	90°
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	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, GO (<i>optional</i>), LED display (<i>optional</i>) Dynamic brake (<i>optional</i>)
Power supply	230 V AC, 50 Hz, 4 W, over-voltage category II

DMS2

Basic outfit:

Control unit	It is installed in the area of electro-mechanical board. It also includes a sensor of the output shaft position, 2 signal LED.
Torque-limit unit	It is installed in the area of electro-mechanical board.
Source unit	It is installed in the terminal board box. It contains: 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>contactor or contact-less switching</i>). Dynamic brake can be connected to the unit.
Unit of display	Two-row display, 2 x 12 alpha-numeric characters.
Unit of push-buttons	Sensors of push-buttons “Open”, “Close”, “Stop” and selector switch “Local”, “Remote”, “Stop” .

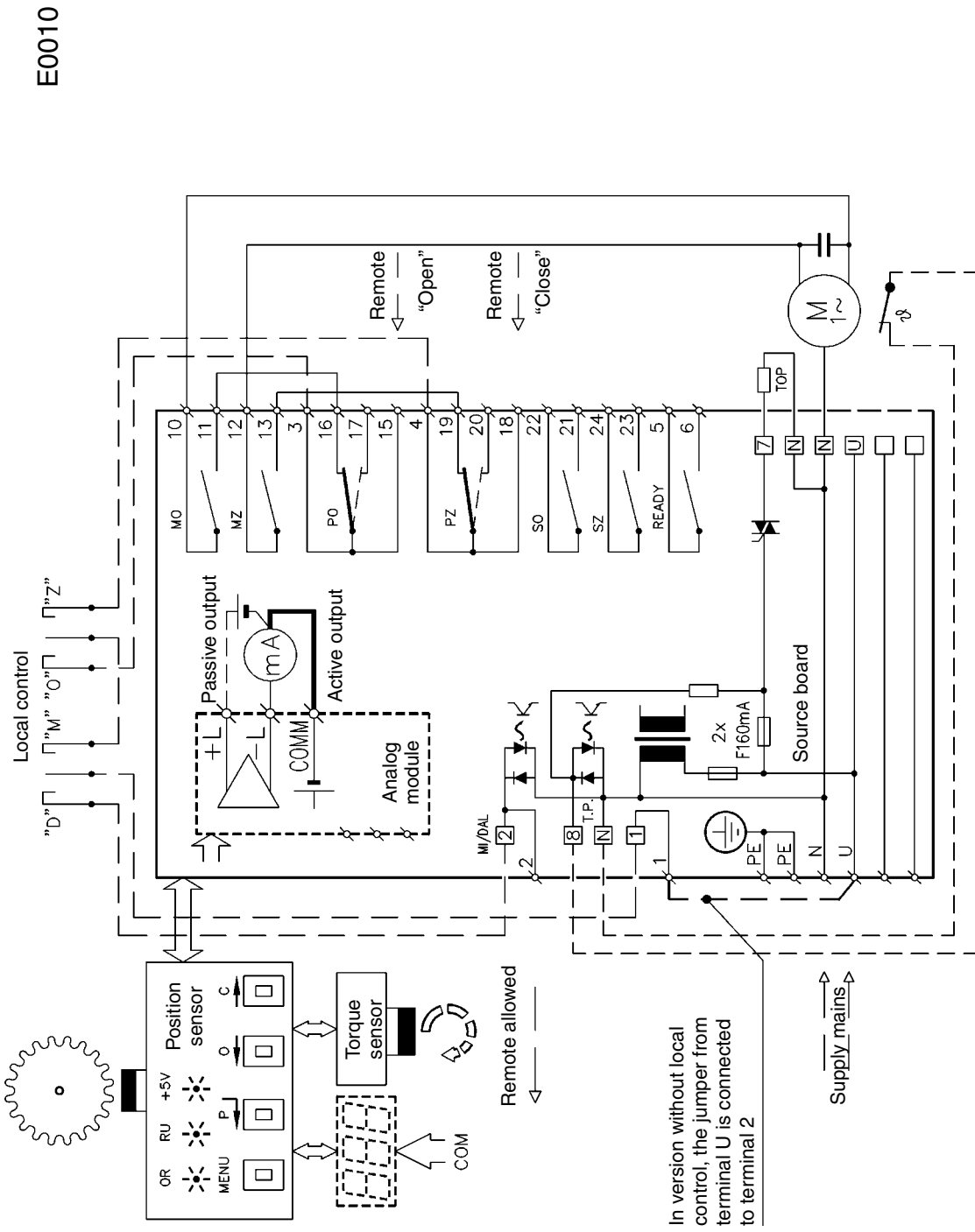
Optional outfit (*the electric actuator must be fitted with one of these units*):

Unit of two-position 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.

Electronic control DMS2 – within its function, it checks sequence and fall-out of phases of supply voltage.

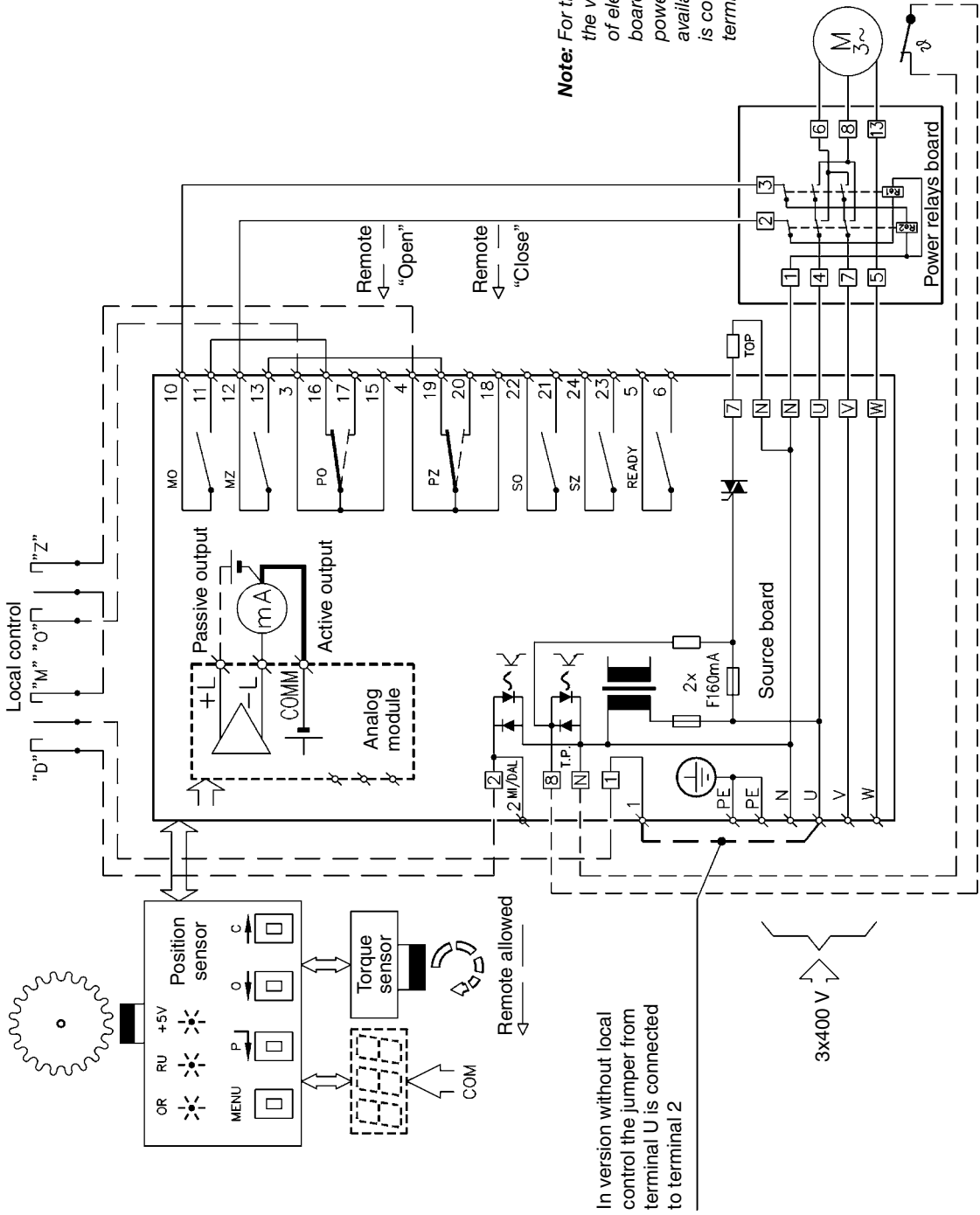
Example of wiring diagram of electronics **DMS2 ED** in version **Substitution of electro-mechanical board** with single-phase electric motor



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

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

E0011

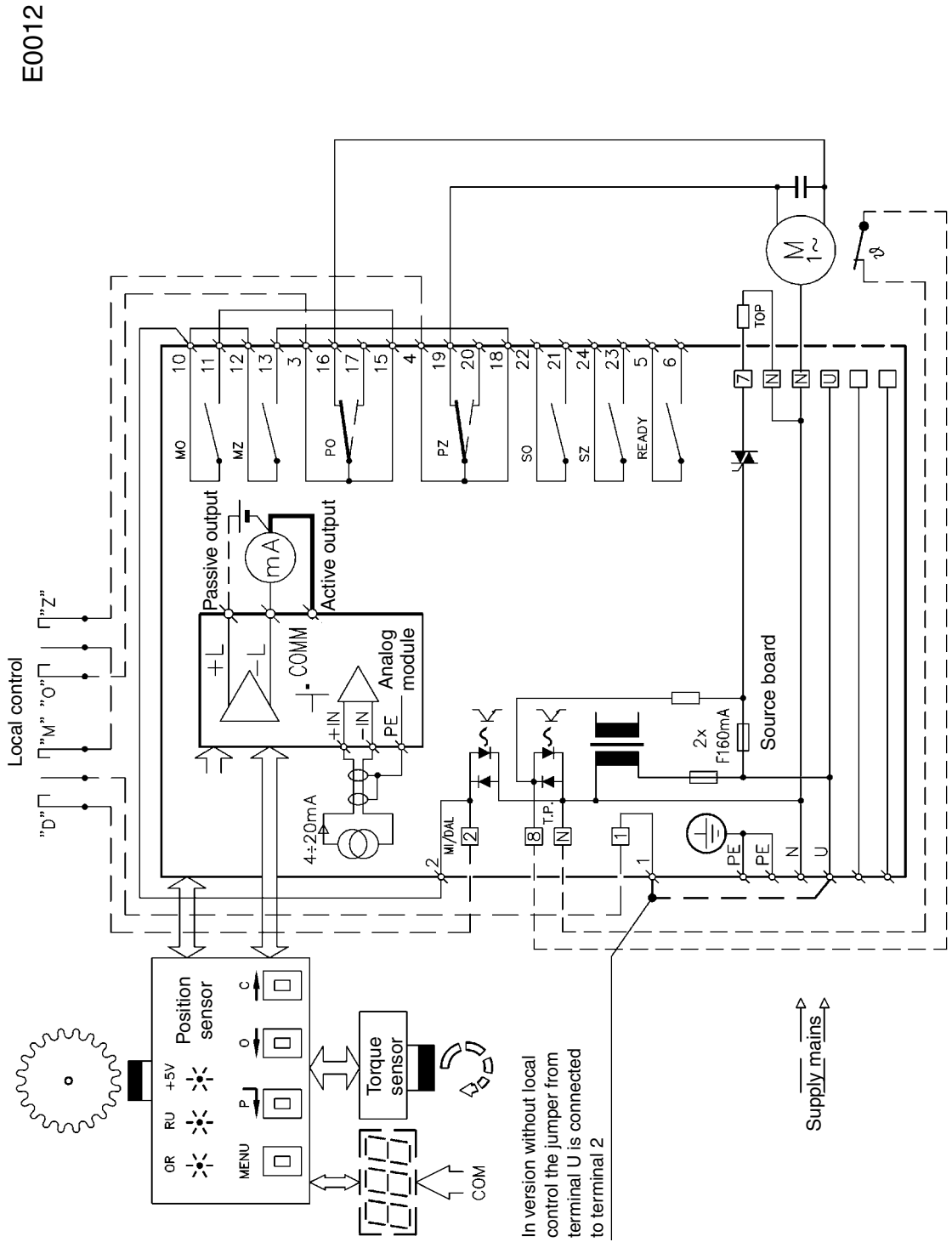


Note: For three-phase actuator, the version. "Substitution of electro-mechanical board without block of power relays" is also available; electric motor is connected to separate terminal board.

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

Note: Here, contacts of relay 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 single-phase electric motor



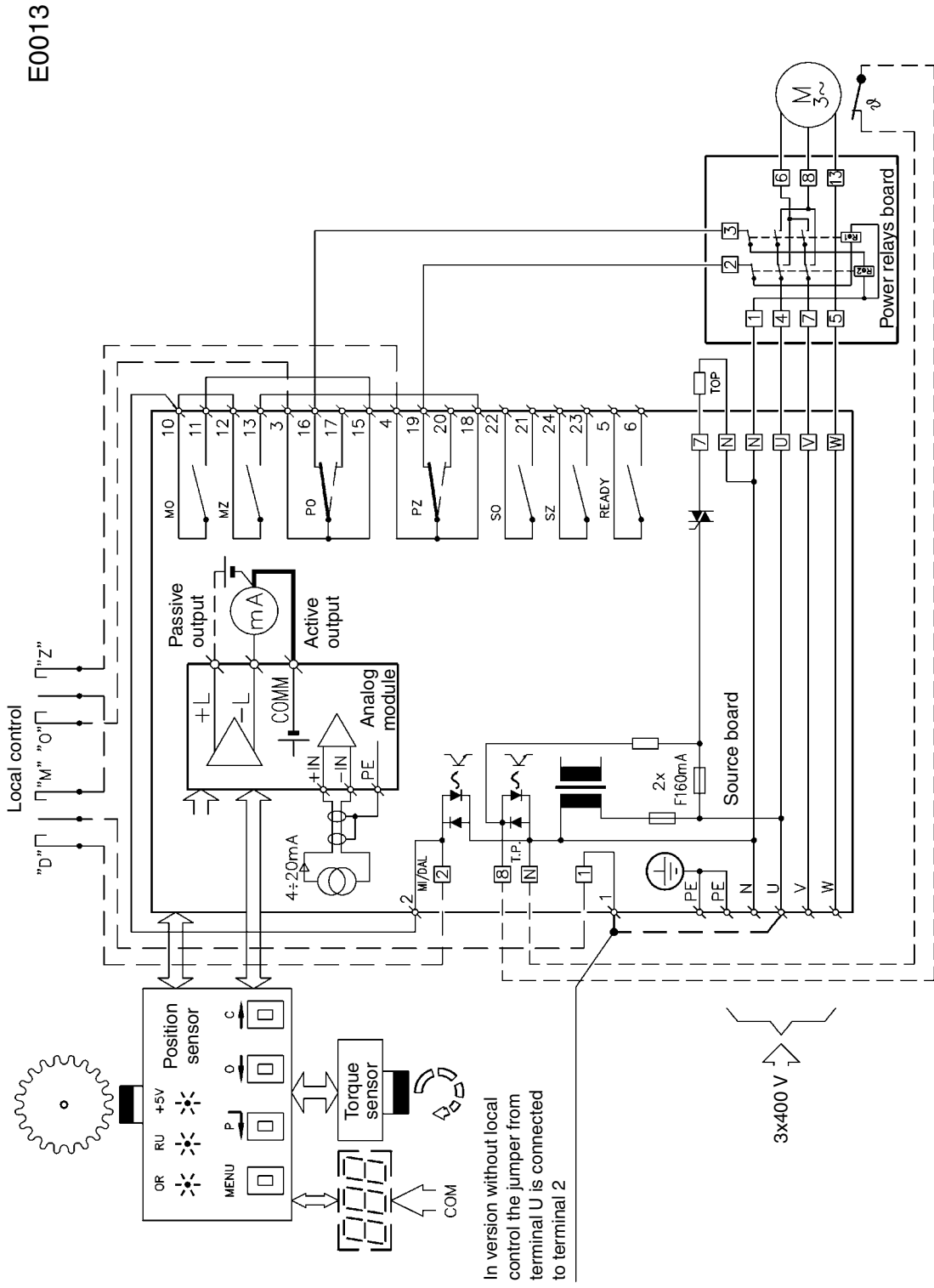
E0012

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

Supply mains →

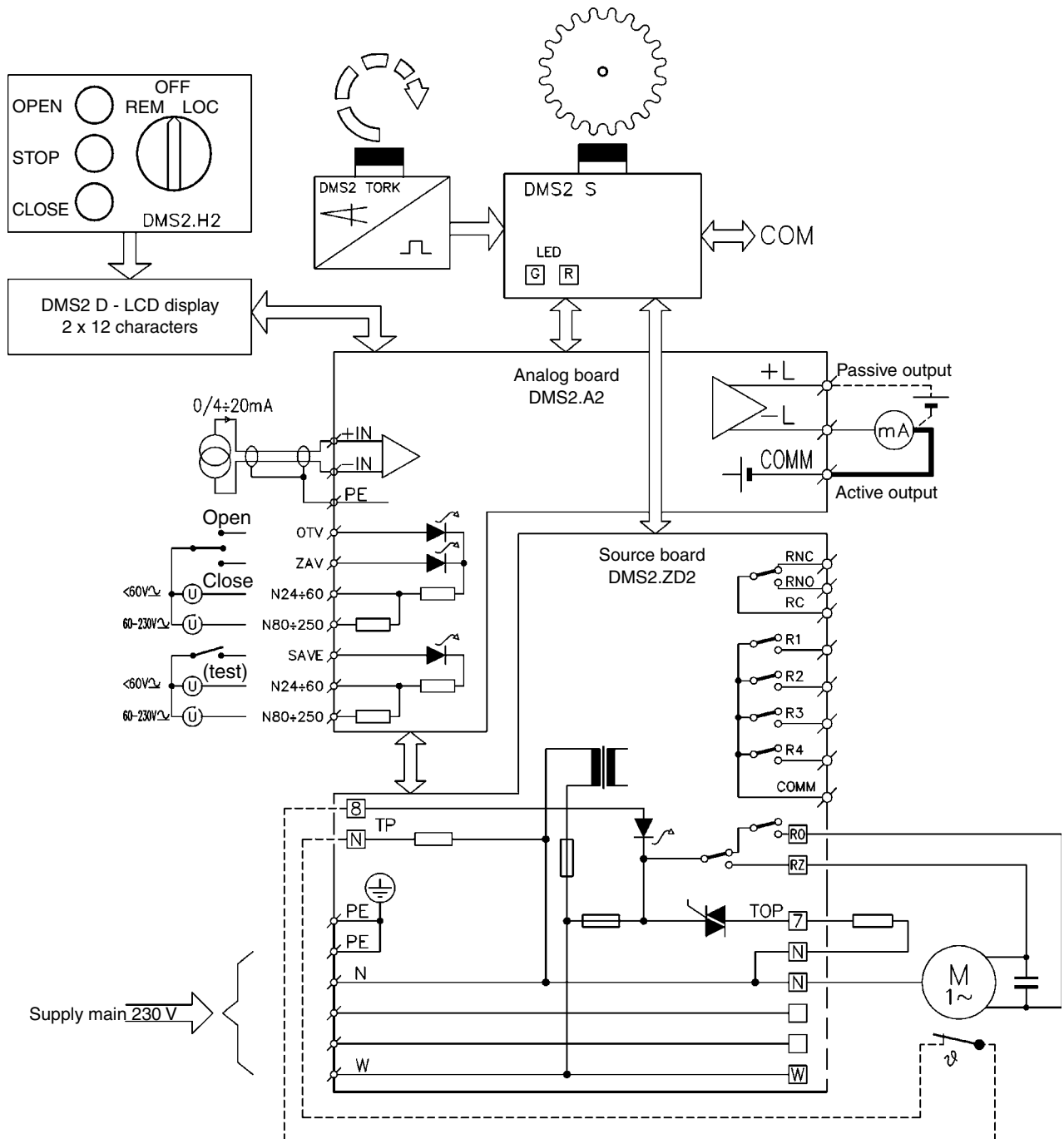
Note: Here, contacts of relay MO, MZ, SO, SZ are shown with power supply switched off; with power supply switched off contacts PO, PZ are shifted to the position drawn in dashed line.

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



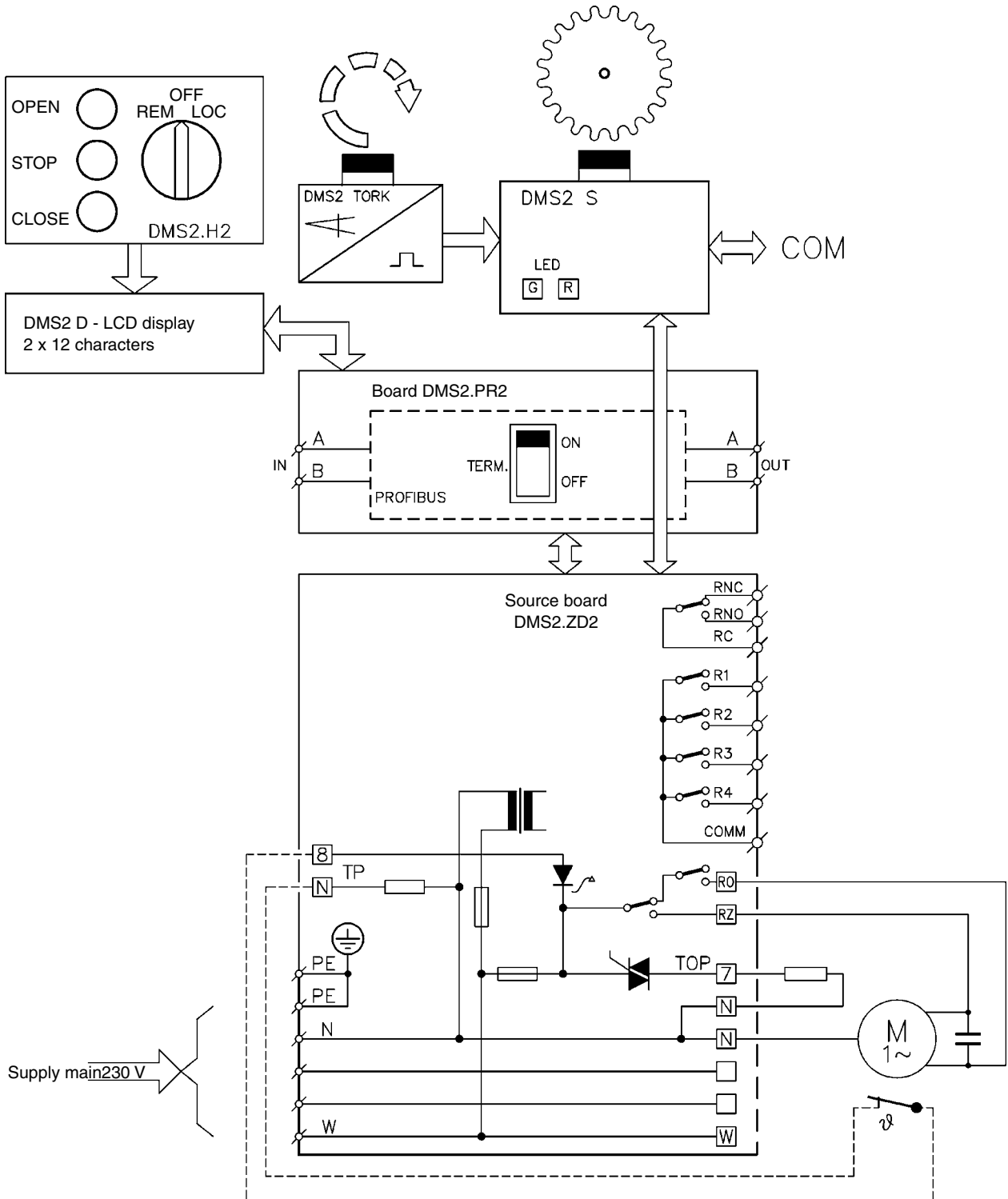
Example of wiring diagram of system **DMS2** in version for control with signals “open” and “close” or in version for control with analog current signal with single-phase electric motor

E0014

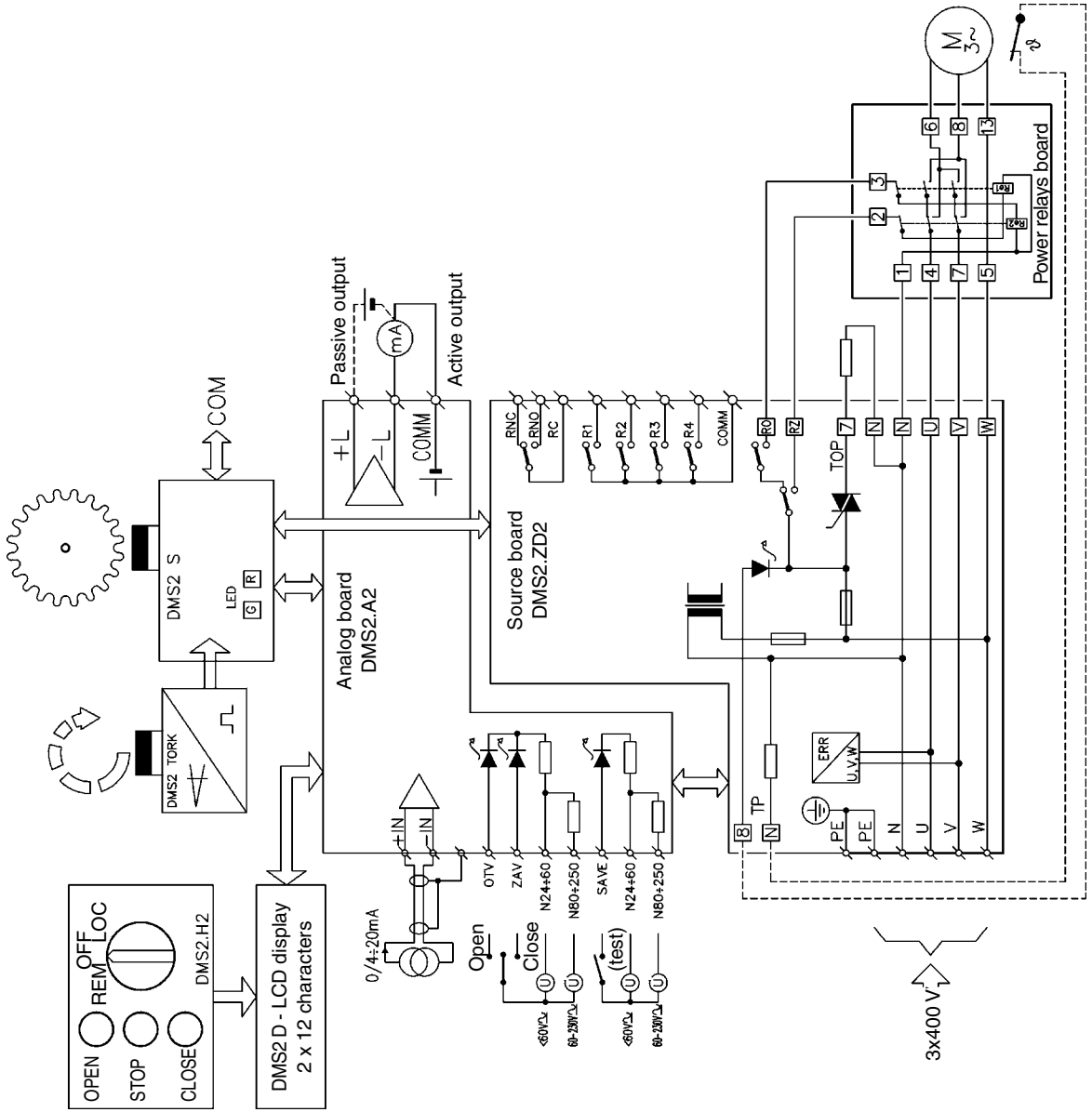


Example of wiring diagram of system **DMS2** in version Profibus
with single-phase electric motor

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

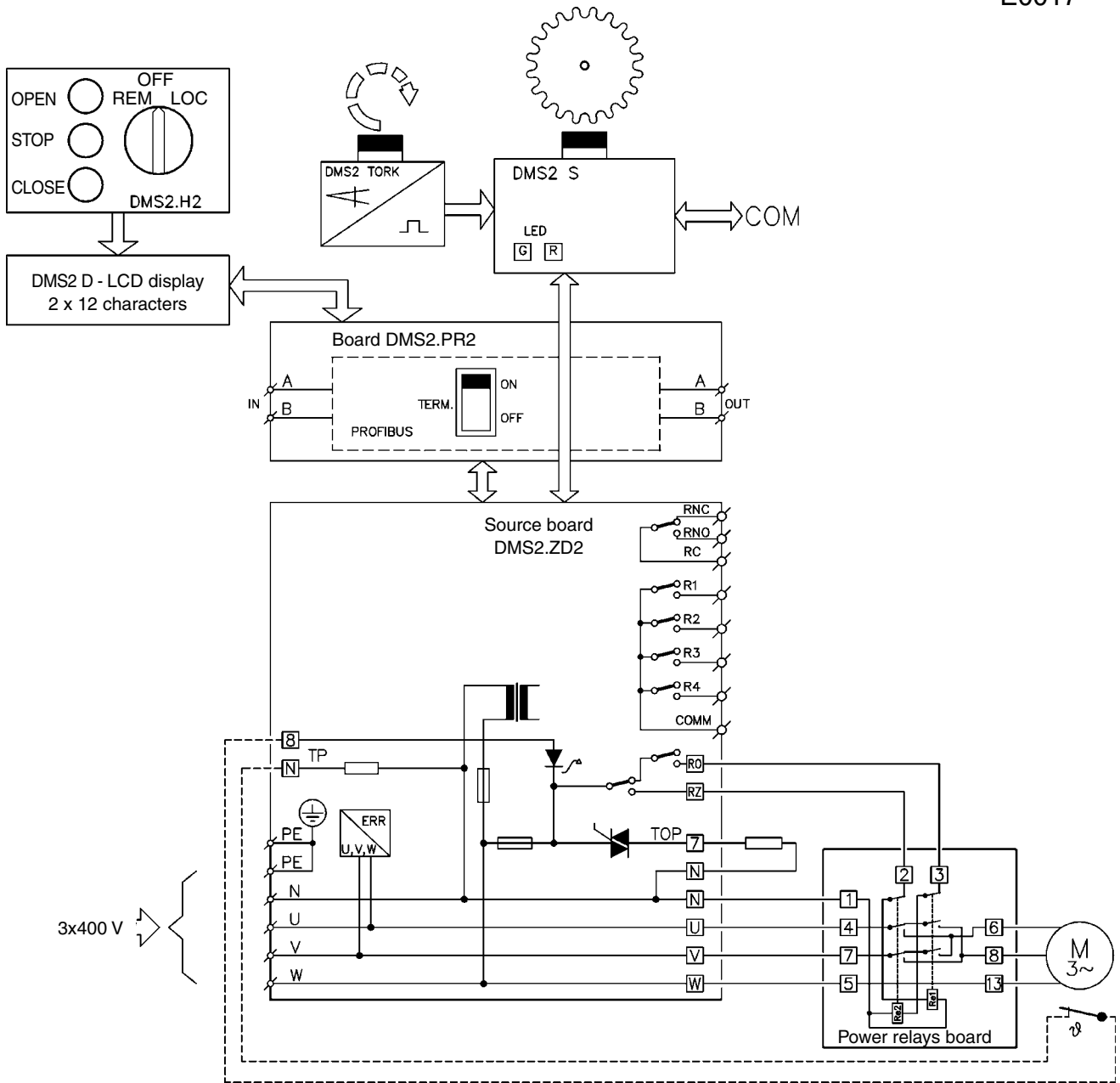


Table 1 – Electric actuators MODACT MOKED - basic technical parameters

Type	Type number		Shifting time [s/90°]	Tripping torque [Nm]	Electric motor					Weight [kg]
	basic	supplem			Type	Output [W]	Speed [min ⁻¹]	Voltage [V]	Current [A]	
	1 2 3 4 5	6 7 8 9 10								
MOKED 63	52 325	xx1xED	10	16 – 32	FCJ2B52D	15	2780	1 x 230	0,37	7,4
		xx2xED	20			15	2780	1 x 230	0,37	7,4
		xx3xED	40			15	2780	1 x 230	0,37	7,4
		xx4xED	80	25 – 45	FCT2B54D	4	1270	1 x 230	0,25	7,4
		xx5xED	10		FT2B52D	15	2680	3 x 400	0,10	7,4
		xx6xED	20			15	2680	3 x 400	0,10	7,4
		xx7xED	40			15	2680	3 x 400	0,10	7,4
MOKED 125	52 326	xx1xED	10	63 – 125	FCJ4C52N	60	2770	1 x 230	0,53	12,7
		xx2xED	20			60	2770	1 x 230	0,53	12,7
		xx3xED	40		FCT4C54N	20	1350	1 x 230	0,4	12,3
		xx4xED	80			20	1350	1 x 230	0,4	12,3
		xx5xED	10		FT4C52NA	90	2770	3 x 400	0,34	12,7
		xx6xED	20			90	2770	3 x 400	0,34	12,7
		xx7xED	40		EAMR56N04A	20	1440	3 x 400	0,20	12,7
		xx8xED	80			20	1440	3 x 400	0,20	12,7
MOKED 250	52 327	xx2xED	20	125 – 250	FCJ4C52N	60	2770	1 x 230	0,53	21
		xx3xED	40			60	2770	1 x 230	0,53	21
		xx4xED	80		FCT4C54N	20	1350	1 x 230	0,4	20,5
		xx5xED	160			20	1350	1 x 230	0,4	20,5
		xx6xED	20		FT4C52NA	90	2770	3 x 400	0,34	21
		xx7xED	40			90	2770	3 x 400	0,34	21
		xx8xED	80		EAMR56N04A	20	1440	3 x 400	0,20	21
		xx9xED	160			20	1440	3 x 400	0,20	21
		MOKED 500	52 328		xx2xED	20	250 – 500	1 PK 7060-4AB	120	1350
xx3xED	40			120	1350	3 x 400			0,42	26
xx4xED	80			120	1350	3 x 400			0,42	26,3
xxCxED	40			EAMRB63L02	90	2780		1 x 230	0,90	27
MOKED 1000	52 329	xx3xED	40	500 – 1000	1 PK 7060-4AB	120	1350	3 x 400	0,42	45
		xx4xED	80			120	1350	3 x 400	0,42	43
		xx5xED	160			120	1350	3 x 400	0,42	43,3
		xxCxED	80		EAMRB63L02	90	2780	1 x 230	0,90	45

*) The version with higher tripping torque up to 80 Nm can be used in an environment from -20 °C to +55 °C.

The type number shall include:

6th place: the letter “U”, if there is letter P or R on the 7th place (electric actuator is fitted with electronics DMS2)
character from Table 2, if there is letter E on the 7th place (electronics DMS2 ED)

Table 2	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
	regulator																x	x	x	x	x	x	x	x

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

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

9th place: the numeral or letter according to Table no. 3 is written.

Notes: The actuators with three-phase electric motor and electronics DMS2 or with electronics DMS2 ED and the regulator can also be fitted with a block of power relays.

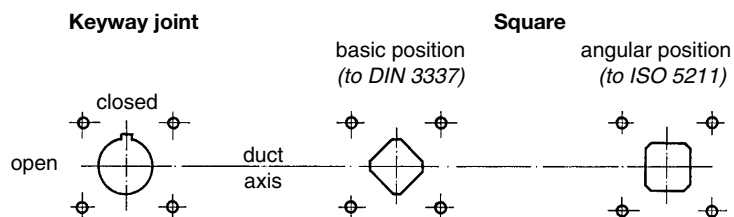
Table 3 – Connection of electric actuators MODACT MOKED
 – designation of the 9th place of the type number

Flange size	Connection	Square sizes [mm]	Square position	Marking of the 9th position in the type number
Type Number 52 325				
F05	keyway			0
F05	square	14	basic	1
F04	keyway			2
F04	square	11	basic	3
F05		14	positioned at a 45°	4
F04		11	positioned at a 45°	5
F04		12	basic	6
F04		12	positioned at a 45°	7
F05		16	basic	8
F05		16	positioned at a 45°	9
Type Number 52 326				
F07	keyway			0
F07	square	17	basic	1
F05	keyway			2
F05	square	14	basic	3
F07		17	positioned at a 45°	4
F05		14	positioned at a 45°	5
F05		16	basic	6
F05		16	positioned at a 45°	7
F07		19	basic	8
F07		19	positioned at a 45°	9
Type Number 52 327				
F10	keyway			0
F10	square	22	basic	1
F07	keyway			2
F07	square	17	basic	3
F10		22	positioned at a 45°	4
F07		17	positioned at a 45°	5
F07		19	basic	6
F07		19	positioned at a 45°	7
F10		24	basic	8
F10		24	positioned at a 45°	9
F10		27	basic	A
F10		27	positioned at a 45°	B
Type Number 52 328				
F12	keyway			0
F12	square	27	basic	1
F10	keyway			2
F10	square	22	basic	3
F12		27	positioned at a 45°	4
F10		22	positioned at a 45°	5
F10		24	basic	6
F10		24	positioned at a 45°	7
F10		27	basic	8
F10		27	positioned at a 45°	9
F12		32	basic	A
F12		32	positioned at a 45°	B
Type Number 52 329				
F12	keyway			0
F12	square	27	basic	1
F12		27	positioned at a 45°	4
F12		32	basic	5
F12		32	positioned at a 45°	6

Actuator output shaft

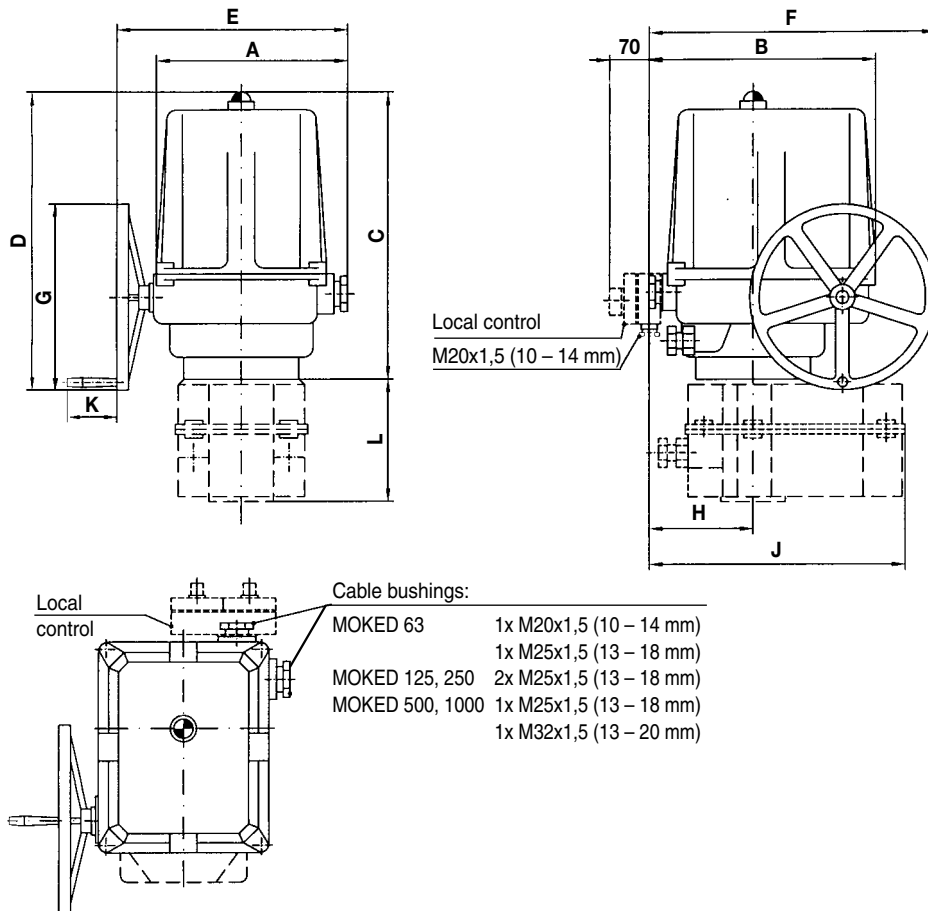
(when viewing towards the local position indicator).

The handwheel tallies with the CLOSED position



Other connection of the actuator upon special request.

Dimensional sketch of **MODACT MOKED** electric actuators



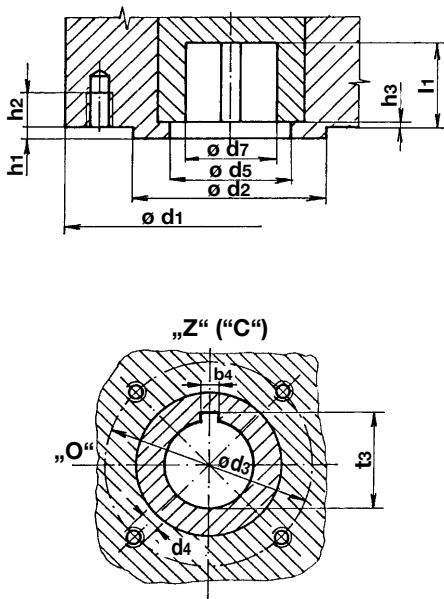
Typ	A	B	C	D	E	F	G	H	J	K	L	Flange
MOKED 63	173	203	247	244	213	245	160	98	-	73	-	F 05, F 04, F 07*
MOKED 125	204	237	325	347	252	290	200	111	-	73	-	F 07, F 05, F 10*
MOKED 250	204	237	325	347	252	290	200	111	263	73	128	F 10, F 07
MOKED 500	250	290	386	398	325	362	250	128	-	73	-	F 12, F 10
MOKED 1000	250	290	386	398	325	362	250	128	323	73	155	F 12

*) on request

Note: Connecting of actuators with connector – on special request.

Connection dimensions of MODACT MOKED actuators

– for valves and control devices with spindles that are provided with a tight-fit keyway



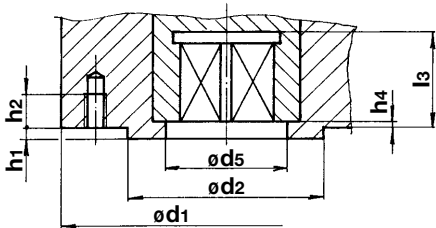
Position of the keyway, according to ISO 5211 and DIN 3337
(The groove is in the CLOSE position whereas the OPEN position is on the left side when viewing the local position indicator)

Flange	$\varnothing d_1$	$\varnothing d_2$ f8	$\varnothing d_3$	d_4	$\varnothing d_7$ H9	h_{3max}	h_{2min}	h_{1max}	l_{1min}	b_4 Js9	$t_3^{+0,4}$ $+0,2$	$\varnothing d_5$
F04	65	30	42	M6	18	3	12	3	26	6	20,5	25
F05	65	35	50	M6	22	3	12	3	30	6	24,5	28
F07	90	55	70	M8	28	3	13	3	35	8	30,9	40
F10	125	70	102	M10	42	3	16	3	45	12	45,1	50
F12	150	85	125	M12	50	3	20	3	53	14	53,5	70

Note: The CLOSE position "Z" ("C") of the keyway is identical to the "Z" "C" position on the local position indicator.
Dimension d_1 is determined by a larger flange used by the actuator.

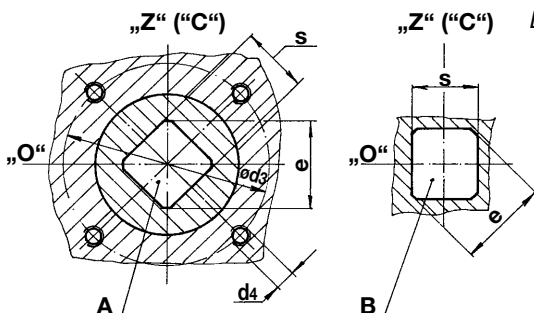
– for valves and control devices with spindles that are provided with a square hole

Position of the square hole in the end position of the actuator. The OPEN position is on the left of the CLOSE position, when viewing the local position indicator. The square hole corresponds to DIN 79. The connecting dimensions comply with DIN 3337 or ISO 5211



Flange	$\varnothing d_1$	$\varnothing d_2$ f8	$\varnothing d_3$	d_4	h_4		h_{2min}	h_{1max}	l_{3min}	s H11	e_{min}	$\varnothing d_5$
					max	min						
F04	55	30	42	M6	1,5	0,5	12	3	15,1 16,1	11 12	14,1 16,1	25
F05	65	35	50	M6	3	0,5	12	3	19,1 22,1	14 16	18,1 21,2	28
F07	90	55	70	M8	3	0,5	13	3	23,1 26,1	17 19	22,2 25,2	40
F10	125	70	102	M10	3	1	16	3	30,1 33,1 37,1	22 24 27	28,2 32,2 36,2	50
F12	150	85	125	M12	3	1	20	3	37,1 44,1	27 32	36,2 42,2	70

Note: The CLOSE position "Z" ("C") of the square hole for the spindle is identical to the "Z" "C" position on the local position indicator.
Dimension d_1 is determined by a larger flange used by the actuator.



A – Square-end joint in the basic position

B – Square-end joint positioned at an angle of 45°

