

**Electric rotary multi-revolution
actuators for nuclear power plants**

- Outside containment

MODACT MOA

Type numbers 52 020 - 52 026

- Inside containment

MODACT MOA OC

Type numbers 52 070 - 52 074

CERTIFICATE **TUV NORD**

Management system as per
EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures, it is hereby certified that

ZPA Pečky, a.s.
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with sites acc. to the annex

applies a management system in line with the above standard for the following scope

**Development and production of electric actuators, switchboards,
production of Roots blowers and sheet metal treatment.**

Certificate Registration No. 04 100 950161
Audit Report No. 624 362/400

Valid until 2015-09-24
Initial certification 1995-03-01

Certification Body
at TÜV NORD CERT GmbH

Praha, 2012-09-25

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

The annex (1 page) is the integral part of the certificate.

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TGA-ZM-07-06-00

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1. USE

Rotary multirevolution electric actuators are intended for remote control of special valves installed in crewed areas of nuclear power plants (**actuators MOA**) or under the containment and/or in hermetic boxes of nuclear power plants operating reactors VVER or RBMK (**actuators MOA OC**). They are intended for safety circuits as well as for normal use; they provide for direct connection with valves or connection by means of remote control elements.

The actuators are used for controlling slide valves and valves fitted with spindle nuts. For the valves, lead angle of the spindle nut must not exceed 5°.

The actuators **MOA** fitted with a position transmitter of unified signal 4 – 20 mA can also operate in circuits of automatic regulation with regime S4.

2. OPERATING ENVIRONMENT

The actuators for nuclear power plants must operate reliably with the following parameters of surrounding environment:

Normal operating regime

	Actuators MOA	Actuators MOA OC
Operating temperature	from -20 to 55 °C	from 5 to 70 °C
Operating pressure	0.1 MPa (1 kg/cm ²)	from 0.085 to 0.1032 MPa
Relative humidity	up to 90 %	up to 95 ±3 %
Radiation level		up to 1 Gy/h

Accident regime of small leakage – reactor VVER (**actuators MOA and MOA OC**):

Temperature	up to 90 °C
Pressure	up to 0.17 MPa
Relative humidity	air-steam mixture
Radiation level	up to 1 Gy/h
Duration of accident regime (<i>accident pressure, temperature</i>)	up to 5 hours
Duration of post-accident regime (<i>post-accident pressure, temperature</i>)	up to 720 hours
Post-accident pressure	0.05 – 0.12 MPa
Post-accident temperature	from 5 to 60 °C
Frequency of regime occurrence	once in 2 years

During as well as after the end of this regime, the actuators must operate reliably and must maintain their operating ability.

Accident regime of great leakage – reactor VVER (**actuators MOA OC**):

Temperature	up to 150 °C
Pressure	up to 0.5 MPa
Relative humidity	air-steam mixture
Radiation level	up to 1x 10 ³ Gy/h
Duration of regime (<i>accident pressure, temperature</i>)	up to 10 hours
Duration of post-accident regime (<i>post-accident pressure, temperature</i>)	up to 720 hours

Post-accident pressure	0.05 – 0.12 MPa
Post-accident temperature	from 5 to 60 °C
Frequency of regime occurrence	once in 30 years

In this accident regime, the actuators must perform min. 10 cycles (*5 – during the regime, 5 – after the parameters have been reduced*).

Resistance against action of radioactive gamma radiation

The electric actuators **MOA OC** must reliably operate until they receive integral dose of gamma radiation 1×10^6 Gy ($1 \text{ Gy} = 100 \text{ rad}$). For the actuators **MOA** this integral dose is 78.8 kGy.

Resistance against seismic shock

The electric actuators **MOA** and **MOA OC** must be resistant against oscillations of acceleration 8 g in any direction, within the range of exciting frequencies from 20 to 50 Hz for the period of max. 20 s. Moreover, seismic resonance tests must be carried out in the frequency range from 5 to 20 Hz.

Resistance against deactivating agents

The actuators **MOA** and **MOA OC** are resistant against action of deactivating agents. Frequency of deactivation is once a year, duration of action max. 10 hours per year, temperature of solutions max. 60 °C. Composition of deactivating solutions is given in technical specifications.

Storage

The electric actuators for nuclear power plants should be stored in rooms protected against adverse climatic effects and other harmful effects (*acids, alkalis, etc.*) at temperatures from -50 °C to +50 °C. Maximum relative air humidity during the storage should not exceed 80 %.

3. TECHNICAL PARAMETERS

Basic technical parameters of the actuators are shown in **Tables of versions No. 1, 2, 3, 4, 5**

Supply voltage of electric motor	– 3 x 400 (380) V, 50 Hz (<i>or according to specification on the rating plate</i>)
Actuator protective enclosure	– IP 55 for actuators MOA 52 020 – 52 026 – IP 67 for actuators MOA OC 52 070 – 52 079 – IP 55 for actuators MOA OC with planetary gearboxes

Deviations of output parameters

Rated values of torques of the output shaft (*including permissible deviations*) apply to rated supply voltage with deviation -15 % +10 % and rated frequency with deviation ± 2 %; here, the deviations in voltage and frequency must not be opposite.

Actuators must be able to operate under the following conditions:

- permanent function must be ensured if voltage drops to 85 % of its rated value or increases to 110 % of its rated value, with frequency $50 \text{ Hz} \pm 2$ % (*deviations in voltage and frequency must not be opposite*);
- if voltage drops to 80 % of its rated value and, at the same time, frequency drops by 6 % of its rated value for 15 s; if voltage increases to 110 % of its rated value and, at the same time, frequency increases by 3 % of its rated value for 15 s; in both cases, the actuators must not stop and possibility of starting must be ensured for this period.

Permitted deviations of respective parameters:

– tripping torque	± 10 % of maximum value
– shifting speed	-10 % +15 % of rated value (<i>idle run</i>)
– setting of signalling switches	± 2.5 % of the highest value in the range (<i>setting ranges are given in the instructions for assembly, operation, and maintenance (Mounting Instructions)</i>).
– setting of position switches	$\pm 50^\circ$ of turning angle of the output shaft.

Operating position

The actuators can operate in any position.

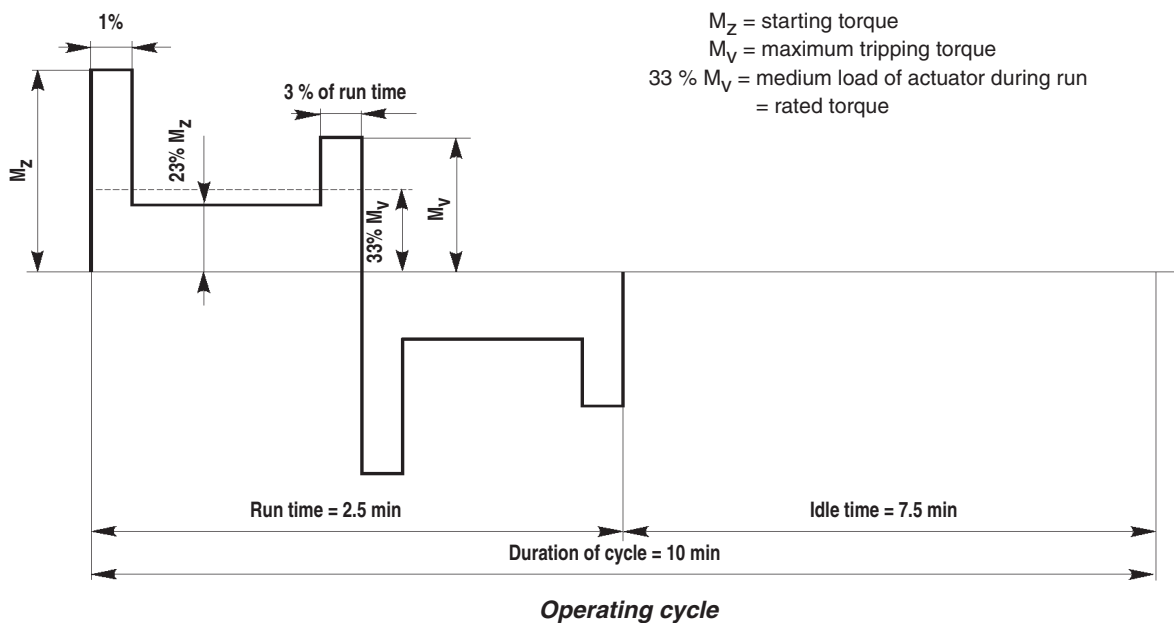
Actuators with oil charge-position limited only by slope of electric motor axis-max. 15° under the horizontal level. In this way, reducing of service life of rubber sealing of the electric motor shaft by possible fragments or impurities from the oil filling is prevented.

Switching frequency – operating cycle

The longest operating cycle (*close - open - close*) is 10 minutes with the run to idle ratio 1:3 (*load factor 25 %*). Medium load of the electric actuator during its run is 33 % of its maximum tripping torque; it is called rated torque.

Maximum number of cycles per hour is 6 (*12x switching on and off*), while maintaining the run to idle ratio 1:3.

The actuators **MOA** and **MOA OC** can also operate in the regime of interrupted run with start-up S4 according to EN 60034-1 (*e.g. in gradual opening of the valve etc.*). The highest number of closings in automatic regulation is 1200 h⁻¹, with the load factor 25 % (*ratio of run to idle time 1:3*). Medium value of loading torque is max. 33 % of the value of maximum tripping torque.



Service life and reliability

Service life of the electric actuators **MOA** and **MOA OC** is 40 years; here, in their assembly, operation, and maintenance, it is necessary to follow the manufacturer's instructions, meet the operating conditions, and replace worn or damaged parts. Service life of sealing parts is min. 10 years.

The actuators belong to the group of repaired instruments and should operate reliably for at least 4 years (*30,000 operating hours of the reactor*). Guaranteed number of operating cycles (*open - close - open*), with observed operating parameters, is 3,000 during 4 years. Probability of faultless operation of the actuators (*3,000 cycles during 4 years*) must be at least 0.98.

Insulation resistance

Insulation resistance of the electric circuits against frame and between each other must not drop below 0.3 MΩ even under the most severe operating conditions; under dry conditions (*temperature 20 °C and relative humidity from 30 to 80 %*) it must not be smaller than 20 MΩ.

Electric strength of insulation of electric circuits

	Testing voltage
Electric circuits of actuator with rated voltage up to 250 V	1 500 V, 50 Hz
Electric motor with rated three-phase voltage 400 V (<i>380 V</i>)	1 800 V, 50 Hz
Position transmitter with rated voltage up to 50 V	500 V, 50 Hz

Load capacity of micro-switches

- in AC circuits 230 V (220 V), current via closed contacts is from 20 to 500 mA, $\cos \varphi$ 0.6;
- in DC circuits 24 and 48 V, current via closed contacts is from 5 mA to 1 A, where voltage loss on closed contacts must not exceed 0.25 V. $L/R = 0.04$ s.

Operating diagram of micro-switches

Operating diagrams of the torque, position, and signalling switches are shown in respective wiring schemes.

Torque tripping

The actuators are fitted with electro-mechanical double-side tripping for torque reduction; this allows the electric motor to be switched off by means of torque switches in end-limit positions and in any other position.

The torque tripping is regulated separately, both to the close side and to the open side.

The torque switches are fitted with a blocking that prevents the motor from being restarted spontaneously and provides for ensuring initial motion of the closing organ with maximum starting torque. As a standard, the actuators are delivered with blocking time between one and two revolutions of the actuator output shaft from the change in direction of rotation. On request, versions 52 07x.xxxx1 and 52 02x.xxxS1 with the blocking time between 1/4 and 1/2 of revolution of the actuator output shaft can be delivered.

The actuators can also be ordered in versions 52 07x.xxxxM and 52 02x.xxxxSM. In this version, blocking of the torque switches is put out.

Position transmitters

Resistance (*potentiometer*) position transmitter (for MODACT MOA and MOA OC):

Total resistance 100 Ω with deviation +12 Ω . The highest load 100 mA, the highest direct voltage (*against frame*) 50 V.

Current position transmitter CPT1AA (for MODACT MOA only)

Rated output signal	4 – 20 mA or 20 – 4 mA
Rated working stroke	0° – 60° to 0° – 120° (<i>smoothly adjustable</i>)
Non-linearity incl. gearings	± 2.5 % (<i>for max. stroke 120°</i>).
Hysteresis incl. gearings	<5 % (<i>for max. stroke 120°</i>)
Non-linearity and hysteresis are related to the value of signal 20 mA.	
Loading resistance R_z	0 Ω – 500 Ω
Supply voltage	18 – 28 V DC
Maximum waviness of supply voltage	5 %
Maximum power input of transmitter	560 mW
Insulation resistance	min. 20 M Ω at 50 V DC
Electric resistance of insulation	50 V DC
Temperature of operating environment	-25 °C to +80 °C (<i>short-time up to +110 °C/ 2 h without functionality failure</i>)

Limit value of supply voltage is 30 V. Voltage between the transmitter case and signal conductors must not exceed 50 V.

The user must ensure connection of the two-wire circuit of the current transmitter to electric earth of the linked-up regulator, computer, etc. The connection must be realized at a single point in any part of the circuit outside the electric actuator.

The current transmitter can be either active (*feeding from a source built-in in the actuator*) or passive (*feeding from a source outside the actuator*).

Parameters of power supply source ZPT 01AA

Type of operation	continuous
Input voltage	230 V (220 V) +6 % -10 % , 40 – 60 Hz
Electric power input	up to 2 VA
Output voltage	18 – 28 V DC, waviness max. 5 %
Output load	one current position transmitter CPT 1AA

Galvanic separation of input and output voltage by a safety transformer	
Rated insulation voltage of input circuit	380 V AC
Rated insulation voltage of low voltage circuits	50 V DC
Temperature of surrounding environment	-25 °C to +80 °C

Mechanical connecting dimensions

The actuators are designed for direct fitting onto the valve. The connection is realized by means of a flange:

- Shape B3 according to ISO 5210 (*shape E according to DIN 3210*)
- Shape C according to DIN 3338.

Particular dimensions are given in the annex to this catalogue. Actuators with connection according to the Russian standard GOST are also available.

Electric connecting dimensions

The electric actuators for nuclear power plants are fitted with a hermetic terminal box where all circuits of micro-switches and circuits of the position transmitter are connected to screw terminals. The terminals enable connection of copper conductors of cross-section 2.5 mm² or 1.5 mm².

The terminal boxes are fitted with cable bushings the number and size of which are shown in dimensional sketches of respective types of actuators.

Example of order

In the order, the electric actuators to be installed under the hermetic containment of a nuclear power plant, made of cast iron, with a worm gearbox, maximum tripping torque 250 Nm, shifting speed of the output part (*shaft*) 40 1/min, and connecting dimensions of the shape C are specified as follows:

Electric actuator **MOA OC 250 – 40**, type number 52 072.3010

Meaning of characters of the type designation:

- MOA – rotary multirevolution electric actuator for controlling special shut-off valves in nuclear power plants;
- OC – electric actuator to be installed under the hermetic containment and in boxes in safety systems as well as in systems of normal operation;
- 250 – maximum tripping torque in Nm
- 40 – r.p.m. of the output shaft.

Meaning of the numerical characters of the type number follows from Tables No. 1, 2, 3, 4, 5

4. DESCRIPTION OF ACTUATORS

Actuators MODACT MOA (*for parameters see Tables No. 1 and No. 2*)

The electric actuators **MOA** use a planet gearbox to reduce revolutions; they are made either of cast iron or aluminium (*type number 52 02x.2xxxS or 52 02x.3xxxS*).

The actuators are fitted with a three-phase asynchronous electric motor with a short-circuit armature. The motor is naturally cooled; it is fitted with cooling ribs and its own terminal board.

The actuators can be controlled directly by a hand wheel without changing-over (*even if the electric motor is running*). The hand wheel is fitted with a sprung fixation pin; this pin should be pulled out and turned; after finishing the manual control, it should be pushed back.

Outfit of actuators MOA

- **Micro-switches** – two micro-switches for position tripping (*PO, PZ*);
 - two micro-switches for position signalling (*SO, SZ*);
 - two torque micro-switches (*MO, MZ*).

All these micro-switches have one opening and one closing contact. Two voltages of different values or phases cannot be connected to contacts of the same micro-switch.

- **Position transmitter** (*one of the following variants*):
 - Resistance transmitter 1 x 100 Ω;
 - Current transmitter CPT1 AA – signal 4 – 20 mA;
 - Current transmitter CPT1 AA with power supply source – signal 4 – 20 mA.
- **Position indicator**

Local position indicator mechanically connected to the shaft of the resistance transmitter serves for orientational determination of position of the actuator output shaft. The version with the current transmitter does not include the local indicator.
- **Anti-condensation heater** – it serves to heat the control area (*to prevent condensation of humidity*). It is connected to the power supply voltage 230 V.

Actuators MODACT MOA OC

- **Actuators MOA OC with worm gearbox** (*for parameters see Tables No. 3 and No. 4*)

These electric actuators **MOA OC** use a worm gearbox to reduce revolutions; they can be fitted with electric motors AJSI or 1AC and 4AC (*type number 52 07x.3xxxS or 52 07x.4xxxS*).

The actuators are only made of cast iron; they are fitted with three-phase asynchronous electric motors; these motors do not have their own terminal board and their circuits are connected to the actuator terminal board.

The actuators **MOA OC** with the worm gearbox are fitted with a change-over lever and manual control that is automatically disconnected when the motor drive is started.

Outfit of actuators MOA OC with worm gearbox

- **Micro-switches** – two micro-switches for position tripping (*PO, PZ*);
 - two micro-switches for position signalling (*SO, SZ*);
 - two torque micro-switches (*MO, MZ*).

The torque micro-switches have a change-over contact; other micro-switches have one opening and one closing contact. Two voltages of different values or phases cannot be connected to contacts of the same micro-switch.

The special micro-switches are hermetically closed and filled with gas. This guarantees their reliable function even at high temperatures; they are resistant against of radiation dose up to min. 10⁶ Gy.

These actuators are fitted neither with the transmitter or position indicator, nor with the anti-condensation heater.

- **Actuators MOA OC with planet gearbox** (*for parameters see Table No. 5*)

These electric actuators **MOA OC** use a planet gearbox to reduce revolutions; they are made either of cast iron or aluminium (*type number 52 07x.6xxx or 52 07x.7xxx*).

The actuators are fitted with three-phase asynchronous electric motors 1AC and 4AC. The motors are naturally cooled and fitted with their own terminal board.

The actuators can be controlled directly by a hand wheel without changing-over (*even if the electric motor is running*). The hand wheel is fitted with a sprung fixation pin; this fixation pin should be pulled out and turned; after finishing the manual control, it should be pushed back.

Outfit of actuators MOA OC with planet gearbox

- **Micro-switches** – two micro-switches for position tripping (*PO, PZ*);
 - two micro-switches for position signalling (*SO, SZ*);
 - two torque micro-switches (*MO, MZ*).

All these micro-switches have one opening and one closing contact. Two voltages of different values or phases cannot be connected to contacts of the same micro-switch.

Actuators **MOA OC** can be equipped with a resistive transmitter and don't have position indicator and anti-condensation heater. The actuators can be equipped with a 1x100 Ω VISHAY resistive transmitter.

Tripping moments in the actuators are set up and work only if the actuator is under voltage. If hand wheel is used and actuator is controlled mechanically torque switches doesn't work and armature can be damaged.

Blok CONTROL

This block adds the possibility of using actuators **MOA** and **MOA OC** with control armatures in automatic regulation circuits. Extends **MOA OC** equipment on regulatory CONTROL block or transmitter block 4 – 20 mA.

For actuators **MOA** and **MOA OC** is provided as a separate assembly that is electrically connected with relevant actuator and control its operation. CONTROL block contains ZP2RE6 regulator with power transformer and switching unit. Switch block can contain SSR or SSR with brake or contactors. CONTROL block may be optionally equipped with local control unit.

CONTROL block – technical data

Weight	8,1 kg	
Surrounding environment	– operational temperature	up -20 °C to +50 °C
	– relative humidity	up to 90%
	– radiation level	up to 200 Gy/life
	– maximum radiation level	2,50E-03 Gy/hour
Protective enclosure	IP 67	

Maximum cable length between CONTROL block and actuator 100 m

Specification of a cable between the CONTROL block and actuator resistance transmitter – 3 cores with 1 mm diameter, shielded and suitable for surrounding environment.

**Table 1 – Basic technical parameters and characteristics of actuator type MODACT MOA or RBMK;
Cast iron version – first position of the complementary number: 2**

Size of connecting flange	ACTUATOR													
	Type designation	Type code		Torque tripping set range [Nm]	Output shaft shifting rate [1/min]	Rychlost přestavení výstupního hřídele [1/min]	Type of lubricant CIATIM 201	Gear ratio from output shaft to motor	Gear ratio from output shaft to hand wheel	Max. force on hand wheel N 1)	Min guaranteed closing M at U = 80 % U nom [Nm] 3)	Hmotnost servomotoru s elektromotorem [kg]		
		Basic	Additional											
F10	MOA 40-5	52 020	2x42S	20-40	2 - 250	5		1:140	100 70			35		
	MOA 40-9	52 020	2x02S	20-40	2 - 250	9		1:90				35		
	MOA 40-15	52 020	2x12S	20-40	2 - 250	15		1:56				35		
	MOA 40-25	52 020	2x22S	20-40	2 - 250	25		1:56				35		
	MOA 40-40	52 020	2x32S	20-40	2 - 250	40		1:34				37		
	MOA 63-5	52 020	2xD2S	40-63	2 - 250	5		1:140				35		
	MOA 63-9	52 020	2x52S	40-63	2 - 250	9		1:90	35					
	MOA 63-15	52 020	2x62S	40-63	2 - 250	15		1:56	35					
	MOA 63-25	52 020	2x72S	40-63	2 - 250	25		1:56	100	35				
	MOA 63-40	52 020	2x82S	40-63	2 - 250	40		1:34	134	57	37			
	MOA 160-8	52 020	2x92S	100-160	2 - 250	8		1:122			35			
	MOA 180-5	52 020	2xA2S	100-180	2 - 250	5		1:140			36			
	MOA 150-15	52 020	2xB2S	100-150	2 - 250	15		1:56			36			
MOA 150-24	52 020	2xC2S	100-150	2 - 250	24		1:122			35				
F14	MOA 140-7	50 021	2x02S	63-140	2 - 250	7		1:90	1:27			59		
	MOA 160-9	52 021	2x42S	63-160	2 - 250	9		1:90				59		
	MOA 160-16	52 021	2x52S	63-160	2 - 250	16		1:56				130	61	
	MOA 160-25	52 021	2x62S	63-160	2 - 250	25		1:34				63		
	MOA 160-40	52 021	2x12S	63-160	2 - 250	40		1:34				180	65	
	MOA 160-63	52 021	2x22S	63-160	2 - 250	63	◆	1:23				120	68	
	MOA 125-100	52 021	2x32S	63-125	2 - 250	100	◆	1:14				120	120	68
	MOA 240-7	52 022	2x02S	160-240	2 - 250	7		1:90						61
	MOA 250-9	52 022	2x42S	160-250	2 - 250	9		1:90					220	61
	MOA 250-16	52 022	2x52S	160-250	2 - 250	16		1:56					220	63
	MOA 250-25	52 022	2x62S	160-250	2 - 250	25		1:34					220	65
	MOA 250-40	52 022	2x12S	160-250	2 - 250	40		1:34				190		68
	MOA 220-63	52 022	2x22S	160-220	2 - 250	63	◆	1:23				190	200	68
MOA 250-80	52 022	2x32S	160-250	2 - 250	80	◆	1:34	150		68				
F16	MOA 400-16	52 024	2x92S	250-400	2 - 240	16		1:42	1:31			121		
	MOA 400-20	52 024	2x02S	250-400	2 - 240	20		1:42				116		
	MOA 400-40	52 024	2x12S	250-400	2 - 240	40		1:23				280	129	
	MOA 400-63	52 024	2x22S	250-400	2 - 240	63	◆	1:23				280	127	
	MOA 400-100	52 024	2x42S	250-400	2 - 240	100	◆	1:14				340	385	131
	MOA 590-80	52 024	2x42S2	400-600	2 - 240	80	◆	1:18				340		97
	MOA 250-100	52 024	2x32S	160-250	2 - 240	100	◆	1:14				170		127
	MOA 630-16	52 024	2x72S	400-630	2 - 240	16		1:42					560	127
	MOA 630-20	52 024	2x82S	400-630	2 - 240	20		1:42					520	122
	MOA 630-40	52 024	2x52S	400-630	2 - 240	40		1:23				350	590	127
	MOA 630-63	52 024	2x62S	400-630	2 - 240	63	◆	1:23				350	590	129
F25	MOA 1220-33	52 025	2x12S	630-1220	2 - 240	33		1:21	1:27			210		
	MOA 1150-45	52 025	2x02S	630-1150	2 - 240	45	◆	1:23				400	1030	210
	MOA 1220-63	52 025	2x22S	630-1220	2 - 240	63	◆	1:23				400	1080	212
	MOA 800-63	52 025	2x32S	630-800	2 - 240	63	◆	1:23				400		212
F30	MOA 2000-32	52 026	2x02S	1250-2000	1 - 100	32		1:45	1:67	400		318		
	MOA 1850-42	52 026	2x12S	1000-1850	1 - 100	42	◆	1:35	1:67	400		318		

x - to be completed by the customer: 0...connection dimension, shape C } with resistance transducer
1...connection dimension, shape E }
4...connection dimension, shape C } with current transducer CPT 1A
5...connection dimension, shape E }
C...connection dimension, shape C } with resistance transmitter Vishay
E...connection dimension, shape E }

◆ – Actuator filled with oil. Other actuators are filled with plastic consistent lubricant.

for valves installed in crewed areas of nuclear power plants operating reactors VVER

ELECTRIC MOTOR										
Type designation	Power [kW]	Motor speed [1/min]	Nominal current [A]	Startup current [A]	Efficiency [%]	Power factor [cos φ]	Start up-to -nominal moment ratio	Start up-to -nominal current ratio	Start up torque [Nm]	Motor weight [kg]
1LA 7070-8AB	0.09	630	0.36	0.80	53	0.68	1.9	2.2	2.66	6.3
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-4AB	0.25	1350	0.77	2.30	60	0.78	1.9	3.0	3.42	4.8
1LA 7073-4AB	0.37	1370	1.05	3.46	65	0.78	1.9	3.3	4.75	6.0
1LA 7070-8AB	0.09	630	0.36	0.80	53	0.68	1.9	2.2	2.66	6.3
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-4AB	0.25	1350	0.77	2.30	60	0.78	1.9	3.0	3.42	4.8
1LA 7073-4AB	0.37	1370	1.05	3.46	65	0.78	1.9	3.3	4.75	6.0
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7073-8AB	0.12	645	0.51	1.20	53	0.64	2.2	2.2	3.95	6.3
1LA 7073-6AA	0.25	860	0.79	2.13	60	0.76	2.2	2.7	6.1	5.9
1LA 7070-2AA	0.37	2740	1.0	3.5	66	0.82	2.3	3.5	3.0	4.9
1LA 7073-8AB	0.12	645	0.51	1.20	53	0.64	2.2	2.2	3.95	6.3
1LA 7073-6AA	0.25	860	0.79	2.13	60	0.76	2.2	2.7	6.1	5.9
1LA 7080-6AA	0.37	920	1.2	3.72	62	0.72	1.9	3.1	7.3	8.6
1LA 7083-6AA	0.55	910	1.6	5.44	67	0.74	2.1	3.4	12.1	9.8
1LA 7090-4AA	1.1	1415	2.55	11.7	77	0.81	2.3	4.6	17.0	12.9
1LA 7096-4AA	1.5	1420	3.4	18.0	79	0.81	2.4	5.3	24.2	15.6
1LA 7096-4AA	1.5	1420	3.4	18.0	79	0.81	2.4	5.3	24.2	15.6
1LA 7083-8AB	0.25	685	1.02	2.6	55	0.64	2.0	2.6	3.95	9.5
1LA 7080-6AA	0.37	920	1.2	3.72	62	0.72	1.9	3.1	7.3	8.6
1LA 7083-6AA	0.55	910	1.6	5.44	67	0.74	2.1	3.4	12.1	9.8
1LA 7090-6AA	0.75	915	2.1	7.77	69	0.76	2.2	3.7	17.2	12.5
1LA 7096-4AA	1.5	1420	3.4	18.0	79	0.81	2.4	5.3	24.2	15.6
1LA 7096-4AA	1.5	1420	3.4	18.0	79	0.81	2.4	5.3	24.2	15.6
1LA 7096-2AA	2.2	2880	4.55	28.6	82	0.85	2.8	6.3	20.4	15.7
1LA 7107-8AB	1.1	680	2.9	9.5	72	0.76	1.8	3.3	27.8	20.5
1LA 7096-6AA	1.1	915	2.9	11.0	72	0.77	2.3	3.8	26.4	15.7
1LA 7113-6AA	2.2	940	5.2	23.9	78	0.78	2.2	4.6	48.4	27.0
1LA 7107-4AA	3.0	1420	6.4	35.8	83	0.82	2.7	5.6	54.4	24.0
1LA 7113-4AA	4.0	1440	8.2	49.2	85	0.83	2.7	6.0	73.0	31.0
1LA 7113-4AA	4.0	1440	8.2	49.2	85	0.83	2.7	6.0	73.0	31.0
1LA 7107-4AA	3.0	1420	6.4	35.8	83	0.82	2.7	5.6	54.4	24.0
1LA 7113-8AB	1.5	705	3.9	14.4	74	0.76	1.8	3.7	36.5	26.5
1LA 7106-6AA	1.5	925	3.9	16.4	74	0.75	2.2	4.2	34.0	21.5
1LA 7113-6AA	2.2	940	5.2	23.9	78	0.78	2.2	4.6	48.4	27.0
1LA 7113-4AA	4.0	1440	8.2	49.2	85	0.83	2.7	6.0	73.0	31.0
1 LA 7135-8AB	4.0	690	11.5	45.0	73	0.68	2.2	3.9	121.0	52.0
1LA 7134-6AA	5.5	950	12.8	64.0	83	0.76	2.3	5.0	126.5	54.0
1LA 7133-4AA	7.5	1455	15.2	101.0	87	0.82	2.7	6.7	132.0	50.0
1LA 7133-4AA	7.5	1455	15.2	101.0	87	0.82	2.7	6.7	132.0	50.0
1LA 7133-4AA	7.5	1455	15.2	101.0	87	0.82	2.7	6.7	132.0	50.0
1LA 7133-4AA	7.5	1455	15.2	101.0	87	0.82	2.7	6.7	132.0	50.0

- 1) The table gives one force from a pair of forces acting on diameter of the hand wheel.
Actuator size – it is determined by size of the connecting flange according to ISO 5210.
- 2) Connection of actuators – via packed bushing to the terminal board.
- 3) The value recommended by the manufacturer to be set as the maximum so that the starting torque would be 1.3x higher than the closing torque at voltage reduced by 20 %.
- 4) Possible order of version: 52 02x.xxxxS1 and 52 02x.xxxxSM
- 5) Rated and starting currents are given for voltage 400 V, 50 Hz. For U = 380 V: rated current $I_n 380 = I_n 400 \times 400/380$
starting current $I_z 380 = I_z 400 \times 400/380$
- 6) MOA actuators also can be ordered without signaling switches. These actuators will have **number 1 in fourth place on additional number.**
For example 52020.2011S.

**Table 2 – Basic technical parameters and characteristics of actuator type MODACT MOA or RBMK;
Aluminium version – first position of the complementary number: 3**

Size of connecting flange	ACTUATOR											
	Type designation	Type code		Torque tripping set range [Nm]	Scope of output volutions setting [revs]	Output shaft shifting rate [1/min]	Type of lubricant CIATIM 201	Gear ratio from output shaft to motor	Gear ratio from output shaft to hand wheel	Max. force on hand wheel N 1)	Min guaranteed M closing at U = 80 % U _{rated} [Nm] 3)	Actuator weight including electric meter [kg]
		Basic	Additional									
F 10	MOA 40-5	52 020 . 3x42S		20 – 40	2 – 250	5		1 : 140				25
	MOA 40-9	52 020 . 3x02S		20 – 40	2 – 250	9		1 : 90				25
	MOA 40-15	52 020 . 3x12S		20 – 40	2 – 250	15		1 : 56				25
	MOA 40-25	52 020 . 3x22S		20 – 40	2 – 250	25		1 : 56	100			25
	MOA 40-40	52 020 . 3x32S		20 – 40	2 – 250	40		1 : 34	70			27
	MOA 63-5	52 020 . 3xD2S		40 – 63	2 – 250	5		1 : 140				
	MOA 63-9	52 020 . 3x52S		40 – 63	2 – 250	9		1 : 90				25
	MOA 63-15	52 020 . 3x62S		40 – 63	2 – 250	15		1 : 56				25
	MOA 63-25	52 020 . 3x72S		40 – 63	2 – 250	25		1 : 56	100			25
	MOA 63-40	52 020 . 3x82S		40 – 63	2 – 250	40		1 : 34	134	57		27
	MOA 160-8	52 020 . 3x92S		100 – 160	2 – 250	8		1 : 122				25
	MOA 180-5	52 020 . 3xA2S		100 – 180	2 – 250	5		1 : 140				26
	MOA 150-15	52 020 . 3xB2S		100 – 150	2 – 250	15		1 : 56				26
MOA 150-24	52 020 . 3xC2S		100 – 150	2 – 250	24		1 : 122				25	
F 14	MOA 140-7	52 021 . 3x02S		63 – 140	2 – 250	7		1 : 90				48
	MOA 160-9	52 021 . 3x42S		63 – 160	2 – 250	9		1 : 90				48
	MOA 160-16	52 021 . 3x52S		63 – 160	2 – 250	16		1 : 56			130	51
	MOA 160-25	52 021 . 3x62S		63 – 160	2 – 250	25		1 : 34				43
	MOA 160-40	52 021 . 3x12S		63 – 160	2 – 250	40		1 : 34	180			43
	MOA 160-63	52 021 . 3x22S		63 – 160	2 – 250	63	◆	1 : 23	120			54
	MOA 125-100	52 021 . 3x32S		63 – 125	2 – 250	100	◆	1 : 14	120	120		54
	MOA 240-7	52 022 . 3x02S		160 – 240	2 – 250	7		1 : 90				
	MOA 250-9	52 022 . 3x42S		160 – 250	2 – 250	9		1 : 90			220	51
	MOA 250-16	52 022 . 3x52S		160 – 250	2 – 250	16		1 : 56			220	53
	MOA 250-25	52 022 . 3x62S		160 – 250	2 – 250	25		1 : 34			220	45
	MOA 250-40	52 022 . 3x12S		160 – 250	2 – 250	40		1 : 34	190			46
	MOA 220-63	52 022 . 3x22S		160 – 220	2 – 250	63	◆	1 : 23	190		200	54
MOA 250-80	52 022 . 3x32S		160 – 250	2 – 250	80	◆	1 : 34	150			49	
F 16	MOA 400-16	52 024 . 3x92S		250 – 400	2 – 240	16		1 : 42				96
	MOA 400-20	52 024 . 3x02S		250 – 400	2 – 240	20		1 : 42				90
	MOA 400-40	52 024 . 3x12S		250 – 400	2 – 240	40		1 : 23	280			94
	MOA 400-63	52 024 . 3x22S		250 – 400	2 – 240	63	◆	1 : 23	280			90
	MOA 400-100	52 024 . 3x42S		250 – 400	2 – 240	100	◆	1 : 14	340	385		97
	MOA 590-80	52 024 . 3x42S2		400 – 600	2 – 240	80	◆	1 : 18	340			97
	MOA 250-100	52 024 . 3x32S		160 – 250	2 – 240	100	◆	1 : 14	170			90
	MOA 630-16	52 024 . 3x72S		400 – 630	2 – 240	16		1 : 42			560	102
	MOA 630-20	52 024 . 3x82S		400 – 630	2 – 240	20		1 : 42			520	97
	MOA 630-40	52 024 . 3x52S		400 – 630	2 – 240	40		1 : 23	350		590	97
MOA 630-63	52 024 . 3x62S		400 – 630	2 – 240	63	◆	1 : 23	350		590	97	
F 25	MOA 1220-33	52 025 . 3x12S		630 – 1220	2 – 240	33		1 : 21	400		970	158
	MOA 1150-45	52 025 . 3x02S		630 – 1150	2 – 240	45	◆	1 : 23	400		1030	158
	MOA 1220-63	52 025 . 3x22S		630 – 1220	2 – 240	63	◆	1 : 23	400		1080	158
	MOA 800-63	52 025 . 3x32S		630 – 800	2 – 240	63	◆	1 : 23	400			158
F 30	MOA 2000-32	52 026 . 3x02S		1250 – 2000	1 – 100	32		1 : 45	1 : 67	400		241
	MOA 1850-42	52 026 . 3x12S		1000 – 1850	1 – 100	42	◆	1 : 35	1 : 67	400		241

x - to be completed by the customer:

- 0...connection dimension, shape C } with resistance transmitter
- 1...connection dimension, shape E } with resistance transmitter
- 4...connection dimension, shape C } with current transmitter CPT1AA
- 5...connection dimension, shape E } with current transmitter CPT1AA
- 6...connection dimension, shape C } with current transmitter CPT1AA with supply source
- 7...connection dimension, shape E } with current transmitter CPT1AA with supply source
- 8...connection dimension, shape C } without transmitter with position indicator
- 9...connection dimension, shape E } without transmitter with position indicator
- C...connection dimension, shape C } with resistance transmitter Vishay
- E...connection dimension, shape E } with resistance transmitter Vishay

for valves installed in crewed areas of nuclear power plants operating reactors VVER

ELECTRIC MOTOR										
Type designation	Power [kW]	Motor speed [1/min]	Nominal current [A]	Startup current [A]	Efficiency [%]	Power factor [cos φ]	Start up-to-nominal moment ratio	Start up-to-nominal current ratio	Start up torque [Nm]	Motor weight [kg]
1LA 7070-8AB	0.09	630	0.36	0.80	53	0.68	1.9	2.2	2.66	6.3
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-4AB	0.25	1350	0.77	2.3	60	0.78	1.9	3.0	3.42	4.8
1LA 7073-4AB	0.37	1370	1.05	3.46	65	0.78	1.9	3.3	4.75	6.0
1LA 7070-8AB	0.09	630	0.36	0.80	53	0.68	1.9	2.2	2.66	6.3
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7070-4AB	0.25	1350	0.77	2.3	60	0.78	1.9	3.0	3.42	4.8
1LA 7073-4AB	0.37	1370	1.05	3.46	65	0.78	1.9	3.3	4.75	6.0
1LA 7070-6AA	0.18	850	0.74	1.70	50	0.70	2.1	2.3	4.25	4.9
1LA 7073-8AB	0.12	645	0.51	1.20	53	0.64	2.2	2.2	3.95	6.3
1LA 7073-6AA	0.25	860	0.79	2.13	60	0.76	2.2	2.7	6.1	5.9
1LA 7070-2AA	0.37	2740	1.0	3.5	66	0.82	2.3	3.5	3.0	4.9
1LA 7073-8AB	0.12	645	0.51	1.20	53	0.64	2.2	2.2	3.95	6.3
1LA 7073-6AA	0.25	860	0.79	2.13	60	0.76	2.2	2.7	6.1	5.9
1LA 7080-6AA	0.37	920	1.2	3.72	62	0.72	1.9	3.1	7.3	8.6
1LA 7083-6AA	0.55	910	1.6	5.44	67	0.74	2.1	3.4	12.1	9.8
1LA 7090-4AA	1.1	1415	2.55	11.7	77	0.81	2.3	4.6	17	12.9
1LA 7096-4AA	1.5	1420	3.4	18	79	0.81	2.4	5.3	24.2	15.6
1LA 7096-4AA	1.5	1420	3.4	18	79	0.81	2.4	5.3	24.2	15.6
1LA 7083-8AB	0.25	685	1.02	2.6	55	0.64	2.0	2.6	3.95	9.5
1LA 7080-6AA	0.37	920	1.2	3.72	62	0.72	1.9	3.1	7.3	8.6
1LA 7083-6AA	0.55	910	1.6	5.44	67	0.74	2.1	3.4	12.1	9.8
1LA 7090-6AA	0.75	915	2.1	7.77	69	0.76	2.2	3.7	17.2	12.5
1LA 7096-4AA	1.5	1420	3.4	18	79	0.81	2.4	5.3	24.2	15.6
1LA 7096-4AA	1.5	1420	3.4	18	79	0.81	2.4	5.3	24.2	15.6
1LA 7096-2AA	2.2	2880	4.55	28.6	82	0.85	2.8	6.3	20.4	15.7
1LA 7107-8AB	1.1	680	2.9	9.5	72	0.76	1.8	3.3	27.8	20.5
1LA 7096-6AA	1.1	915	2.9	11	72	0.77	2.3	3.8	26.4	15.7
1LA 7113-6AA	2.2	940	5.2	23.9	78	0.78	2.2	4.6	48.4	27
1LA 7107-4AA	3.0	1420	6.4	35.8	83	0.82	2.7	5.6	54.4	24
1LA 7113-4AA	4.0	1440	8.2	49.2	85	0.83	2.7	6.0	73	31
1LA 7113-4AA	4.0	1440	8.2	49.2	85	0.83	2.7	6.0	73	31
1LA 7107-4AA	3.0	1420	6.4	35.8	83	0.82	2.7	5.6	54.4	24
1LA 7113-8AB	1.5	705	3.9	14.4	74	0.76	1.8	3.7	36.5	26.5
1LA 7106-6AA	1.5	925	3.9	16.4	74	0.75	2.2	4.2	34	21.5
1LA 7113-6AA	2.2	940	5.2	23.9	78	0.78	2.2	4.6	48.4	27
1LA 7113-4AA	4.0	1440	8.2	49.2	85	0.83	2.7	6.0	73	31
1LA 7135-8AB	4.0	690	11.5	45	73	0.68	2.2	3.9	121	52.0
1LA 7134-6AA	5.5	950	12.8	64	83	0.76	2.3	5.0	126.5	54.0
1LA 7133-4AA	7.5	1455	15.2	101	87	0.82	2.7	6.7	132	50.0
1LA 7133-4AA	7.5	1455	15.2	101	87	0.82	2.7	6.7	132	50.0
1LA 7133-4AA	7.5	1455	15.2	101	87	0.82	2.7	6.7	132	50.0
1LA 7133-4AA	7.5	1455	15.2	101	87	0.82	2.7	6.7	132	50.0

1) The table gives one force from a pair of forces acting on diameter of the hand wheel.

Actuator size – it is determined by size of the connecting flange according to ISO 5210.

2) Connection of actuators – via packed bushing to the terminal board.

3) The value recommended by the manufacturer to be set as the maximum so that the starting torque would be 1.3x higher than the closing torque at voltage reduced by 20 %.

4) Possible order of version: 52 02x.xxxxS1 and 52 02x.xxxxSM

5) Rated and starting currents are given for voltage 400 V, 50 Hz. For U = 380 V: rated current $I_n 380 = I_n 400 \times 400/380$
starting current $I_z 380 = I_z 400 \times 400/380$

6) MOA actuators also can be ordered without signaling switches. These actuators will have **number 1 in fourth place on additional number.**
For example 52020.2011S.

Table 3 – Basic technical parameters and characteristics of actuators MODACT MOA OC operating reactors VVER or RBMK; cast iron version, worm gearbox, electric

Size of connecting flange	ACTUATOR										
	Type designation	Type code		Torque tripping set range [Nm]	Scope of output volutions setting [revs]	Gear ratio from output shaft to motor	Gear ratio from output shaft to hand wheel	Max. force on hand wheel N ¹⁾	Start up torque [Nm]	Actuator weight including electric meter [kg]	
		Basic	Additional								
F 10	MOA OC 40-10	52 070.3xA0		20 – 40	10.3	1:89.7	1:1	160	90	44.7	
	MOA OC 40-16	52 070.3x40			16				1:89.7	106	44.7
	MOA OC 40-25	52 070.3x00			25				1:57.3	66	44.7
	MOA OC 32-40	52 070.3x10		20 – 32	40	1:36.1			43	44.7	
	MOA OC 40-63	52 070.3x20		20 – 40	63	1:22.5			67	54.5	
	MOA OC 40-100 ⁺)	52 070.3x30			100	1:14.5		55	54.5		
	MOA OC 50-25	52 070.3x50		25 – 50	25	1:57.3		250	106	44.7	
	MOA OC 63-12	52 070.3x90		25 – 63	12.5	1:57.3			130	54.5	
	MOA OC 63-25	52 070.3x60			25	1:57.3			169	54.5	
	MOA OC 63-40	52 070.3x70			40	1:36.1			106	54.5	
MOA OC 160-12	52 071.3x50		63 – 160		12.5	1:56.1	222		225	75	
MOA OC 160-25	52 071.3x00		63 – 160	25	1:56.1	265		75			
MOA OC 130-40	52 071.3x40		63 – 130	40	1:36.1	170		75			
MOA OC 160-40	52 071.3x10		63 – 160	40	1:36.1	340		94			
MOA OC 160-63	52 071.3x20			63	1:23.2	210		94			
MOA OC 160-100 ⁺)	52 071.3x30			100	1:14.9	220		94			
MOA OC 250-40	52 072.3x10			125 – 250	40	1:36.1		347	330	94	
MOA OC 250-63	52 072.3x20		63		1:23.2	420			108		
MOA OC 250-100 ⁺)	52 072.3x30		100		1:13.8	340			108		
MOA OC 500-40	52 074.3x00		250 – 500		40	1:36.5			1:1	650	152
MOA OC 630-40	52 074.3x10		250 – 630	40	1:36.5	1100	212				
MOA OC 630-63	52 074.3x20			63	1:23.7	823	212				
MOA OC 500-100 ⁺)	52 074.3x40		250 – 500	100	1:14.5	650	212				
MOA OC 360-120 ⁺)	52 074.3x50		250 – 360	120	1:11.9	470	212				

x - to be added by the customer:

- 0...connecting dimension, shape C
- 1...connecting dimension, shape E
- 2...connection dimension, shape C with resistance transmitter, without signaling switches
- 3...connection dimension, shape E with resistance transmitter, without signaling switches
- 4...connection dimension, shape C with resistance transmitter, with signaling switches
- 5...connection dimension, shape E with resistance transmitter, with signaling switches

+) non-self-locking worm

**for shut-off valves installed under the hermetic containment of nuclear power plants
motors AJSI, voltage 400 V, 50 Hz**

ELECTRIC MOTOR									
Type designation	Power	Motor speed	Efficiency	Power factor	Start up-to-nominal moment ratio	Start up-to-nominal current ratio	Nominal current	Motor weight	Start up torque
	[kW]	[1/min]	[%]	[cos φ]			[A]	[kg]	[Nm]
AJSI 89B-6Z	0.07	940	21.8	0.36	7.2	1.8	1.3	9.5	3.6
AJSI 89B-4Z	0.12	1425	48.6	0.36	8.4	3.6	1.0	9.5	4.0
AJSI 89B-4Z	0.12	1425	48.6	0.36	8.4	3.6	1.0	9.5	4.0
AJSI 89B-4Z	0.12	1425	48.6	0.36	8.4	3.6	1.0	9.5	4.0
AJSI 116B-4Z	0.3	1455	64	0.36	7.8	4.8	1.9	19.5	10
AJSI 116B-4Z	0.3	1455	64	0.36	7.8	4.8	1.9	19.5	10
AJSI 89B-4Z	0.12	1425	48.6	0.36	8.4	3.6	1.0	9.5	4.0
AJSI 116B-8Z	0.11	701	23	0.30	7.5	1.8	2.3	19.5	7.5
AJSI 116B-4Z	0.3	1455	64	0.36	7.8	4.8	1.9	19.5	10
AJSI 116B-4Z	0.3	1455	64	0.36	7.8	4.8	1.9	19.5	10
AJSI 116C-8Z	0.18	710	30	0.29	7.9	1.83	3.5	21	12
AJSI 116C-4Z	0.55	1403	66	0.43	6.2	4.5	2.8	21	16
AJSI 116C-4Z	0.55	1403	66	0.43	6.2	4.5	2.8	21	16
AJSI 145B-4Z	1.2	1425	76.3	0.51	6.7	6.2	4.4	40	32
AJSI 145B-4Z	1.2	1425	76.3	0.51	6.7	6.2	4.4	40	32
AJSI 145B-4Z	1.2	1425	76.3	0.51	6.7	6.2	4.4	40	32
AJSI 145B-4Z	1.2	1425	76.3	0.51	6.7	6.2	4.4	40	32
AJSI 180B-4Z	2.2	1386	80.5	0.59	6.5	5.7	6.5	54	63
AJSI 180B-4Z	2.2	1386	80.5	0.59	6.5	5.7	6.5	54	63
AJSI 180B-4Z	2.2	1386	80.5	0.59	6.5	5.7	6.5	54	63
AJSI 215B-4Z	3.7	1432	85.8	0.64	6.2	8.0	9.8	93	120
AJSI 215B-4Z	3.7	1432	85.8	0.64	6.2	8.0	9.8	93	120
AJSI 215B-4Z	3.7	1432	85.8	0.64	6.2	8.0	9.8	93	120
AJSI 215B-4Z	3.7	1432	85.8	0.64	6.2	8.0	9.8	93	120

Notes:

- 1) The table gives one force from a pair of forces acting on circumference of the hand wheel.
Actuator size – it is determined by size of the connecting flange according to ISO 5210.
- 2) Range of setting the working stroke for all actuators is 2 – 250 rev.
- 3) Connection of actuators – via packed bushing to the terminal board.
- 4) Rated current is given for supply voltage 400 V. For supply voltage 380 V: $I_n 380 = I_n 400 \times 400/380$.
- 5) Actuators MOA OC 5207x.3xxx equipped with microswitch D3031 (one NC and one NO contact) will have on the last place in additional number letter R, Type No. 5207x.3xxxR.

Table 4 – Basic technical parameters and characteristics of actuators MODACT MOA OC operating reactors VVER or RBMK; cast iron version, worm gearbox, electric

Size of connecting flange	ACTUATOR									
	Type designation	Type code		Torque tripping set range [Nm]	Scope of output volutions setting [revs]	Gear ratio from output shaft to motor	Gear ratio from output shaft to hand wheel	Max. force on hand wheel N ¹⁾	Start up torque [Nm]	Actuator weight including electric meter [kg]
		Basic	Additional							
F 10	MOA OC 40-16	52 070.7x40		20 – 40	16	1:90	1:27	100	139	30
	MOA OC 40-25	52 070.7x00			25	1:56			86	
	MOA OC 32-40	52 070.7x10		20 – 32	40	1:34		70	42	
	MOA OC 63-25	52 070.7x60		40 – 63	25	1:56		100	86	
	MOA OC 45-40	52 070.7x70		25 – 45	40	1:34		134	73	34
F 14	MOA OC 160-25	52 071.7x00		63 – 160	25	1:56	1:27	120	400	64
	MOA OC 160-40	52 071.7x10			40	1:36			350	
	MOA OC 160-70	52 071.7x20			70	1:20			250	
	MOA OC 160-100	52 071.7x30			100	1:14			630	
	MOA OC 250-25	52 072.7x00		160 – 250	25	1:56		150	600	64
	MOA OC 250-40	52 072.7x10			40	1:36			400	
	MOA OC 250-70	52 072.7x20			70	1:20				
F 16	MOA OC 400-33	52 074.7x00		250 – 400	33	1:42	1:31	280	750	93
	MOA OC 400-63	52 074.7x10			63	1:23			700	106
	MOA OC 400-95	52 074.7x20			95	1:15			780	111
	MOA OC 630-33	52 074.7x40		400 – 630	33	1:42		350	1200	106
	MOA OC 630-63	52 074.7x50			63	1:23			1000	111

x - to be added by the customer: 0...connecting dimension, shape C
1...connecting dimension, shape E

**for shut-off valves installed under the hermetic containment of nuclear power plants
motors 1AC, 4AC**

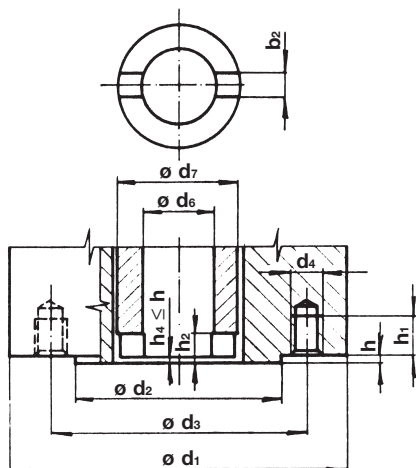
ELECTRIC MOTOR										
Type designation	Power [kW]	Motor speed [1/min]	Efficiency [%]	Power factor [cos φ]	Start up-to-nominal moment ratio	Start up-to-nominal current ratio	Nominal current [A]	Motor weight [kg]	Start up torque [Nm]	
1AC-56A4A5B3	0.18	1371	48	0.60	2.2	5	0.95	10.3	2.54	
1AC-63B4A5B3	0.25	1350	50	0.57			1.2	13.8	3.72	
4AC80A4A5	1.3	1380	62	0.70	2.2		24	20.5		
4AC80B4A5	1.7	1400	64	0.65	2.5		6.2	22.5	30	
4AC80A4A5	1.3	1380	62	0.70	2.2		24	20.5		
4AC80B4A5	1.7	1400	64	0.65	2.5		6.2	22.5	30	
4AC100S4A5	3.2	1410	75	0.76	2.3		6	7.9	39.5	49
4AC100L4A5	4.25		77		2.6			10.2	45	76.5
4AC100S4A5	3.2		75		2.3			7.9	39.5	49
4AC100L4A5	4.25		77		2.6			10.2	45	76.5

Notes:

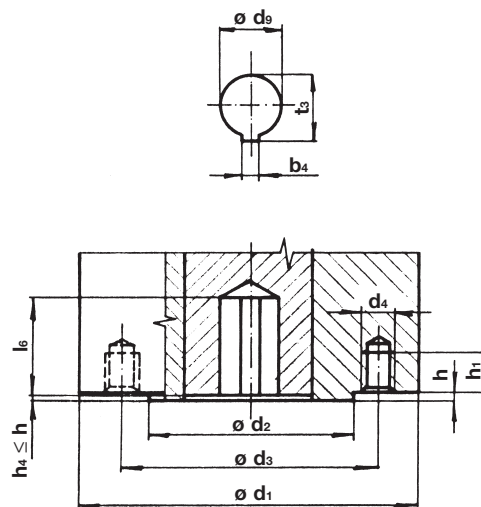
- 1) The table gives one force from a pair of forces acting on circumference of the hand wheel.
Actuator size – it is determined by size of the connecting flange according to ISO 5210.
- 2) Range of setting the working stroke for all actuators is 2 – 250 rev.
- 3) Connection of actuators – via packed bushing to the terminal board.
- 4) Rated current is given for supply voltage 400 V. For supply voltage 380 V: $I_n 380 = I_n 400 \times 400/380$.

Connecting dimensions of electric actuators **MODACT MOA** and **MOA OC**

Shape C (according DIN 3338)

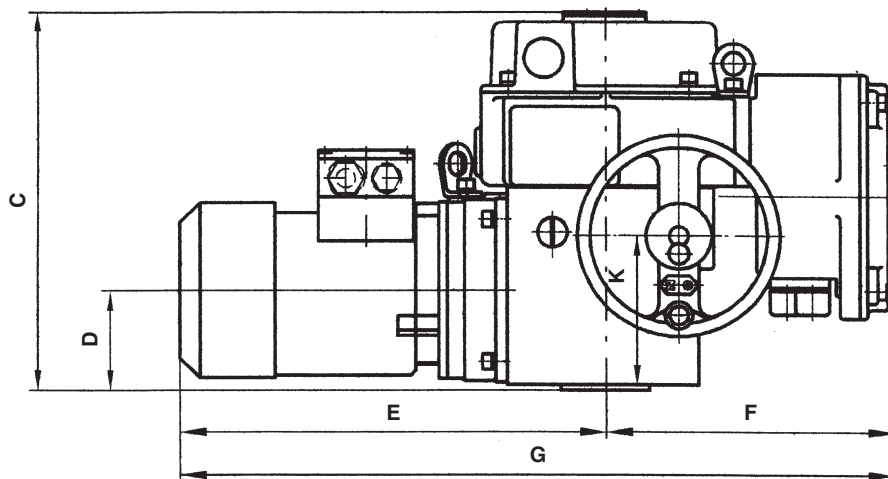
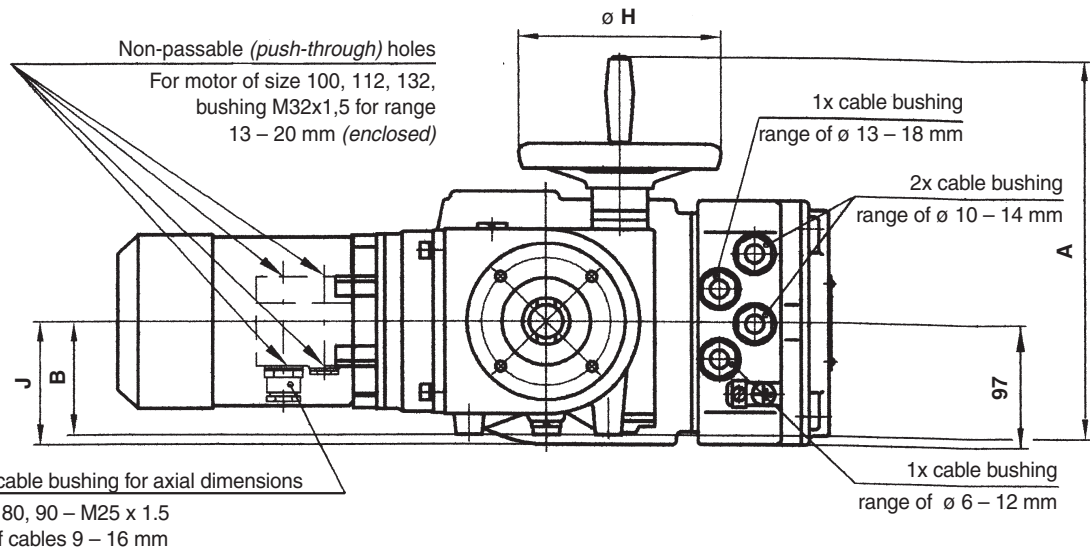


Shape B3 (according ISO 5210)
shape E (according DIN 3210)



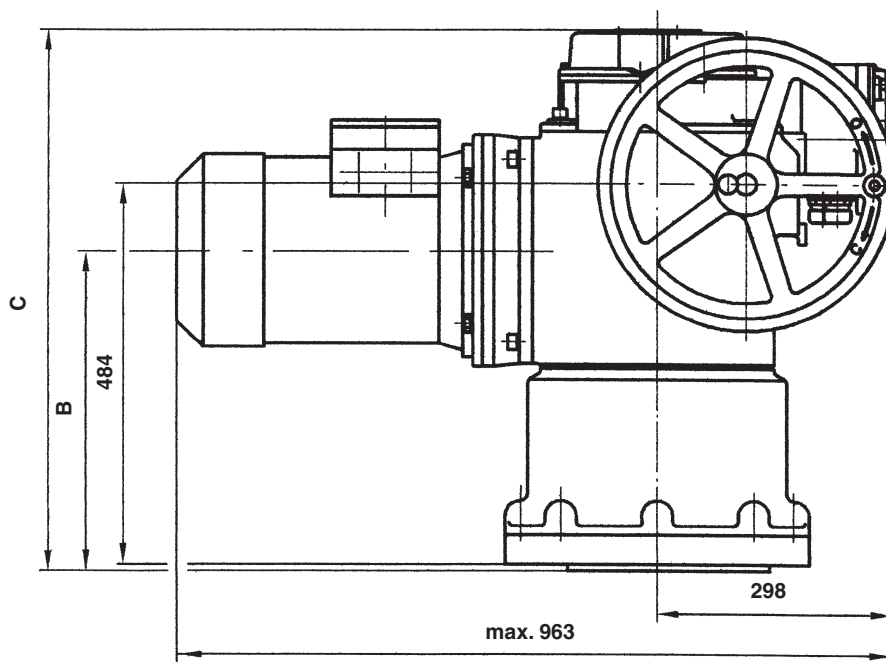
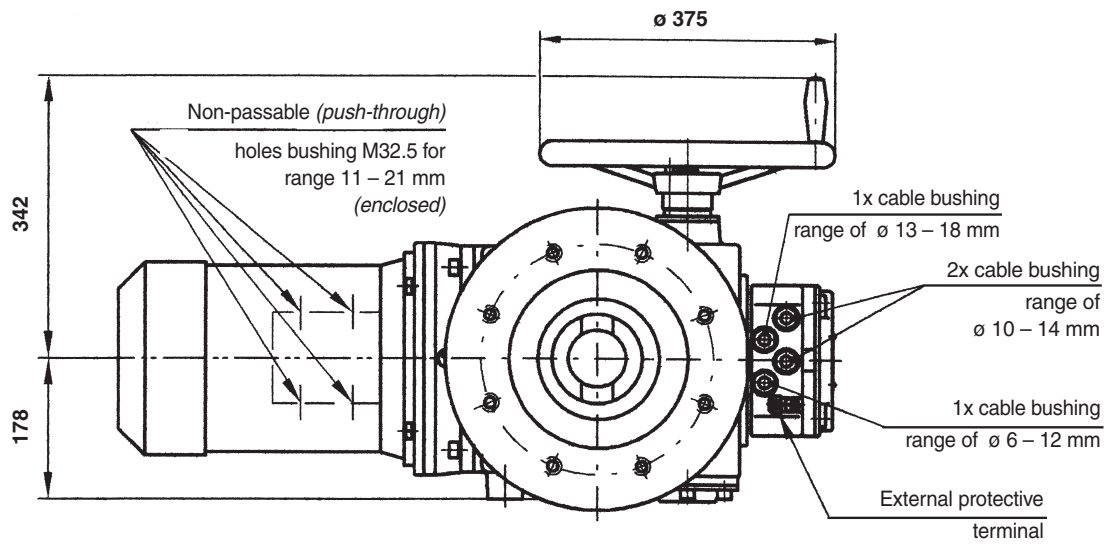
Shape	Dimension	Type number				
		52 020 52 070	52 021, 52 071 52 022, 52 072	52 024 52 074	52 025	52 026
Common values for both shapes C, B3 (E)	$\varnothing d_1$ orientation values	125	175	210	300	350
	$\varnothing d_2$ f8	70	100	130	200	230
	$\varnothing d_3$	102	140	165	254	298
	$\varnothing d_4$	M 10	M 16	M 20	M 16	M 20
	number of threaded holes	4	4	4	8	8
	h1 min. 1,25 d_4	12,5	20	25	20	25
	h max.	3	4	5	5	5
Values for shape C	$\varnothing d_7$	42	60	80	100	120
	h_2	10	12	15	16	18
	b_2 H11	14	20	24	30	40
	$\varnothing d_6$	28	41,5	53	72	72
Valuaes for shape B3 (E)	$\varnothing d_9$ H8	20	30	40	50	60
	l_6 min.	55	76	97	117	127
	t_3	22,8	33,3	43,3	53,8	64,4
	b_4 Js9	6	8	12	14	18
The dimensions $\varnothing d_6$ and l_6 must not be smaller than stated in the table. The dimensions are given in mm.						

Dimensional sketch of actuators **MODACT MOA** and **MOA OC**,
 aluminium version – Type Nos. 52 020.3xxxS – 52 025.3xxxS
 Type Nos. 52 070.7xxx – 52 074.7xxx (*planet gearbox*)
 cast iron version – Type Nos. 52 070.6xxx – 52 074.6xxx (*planet gearbox*)



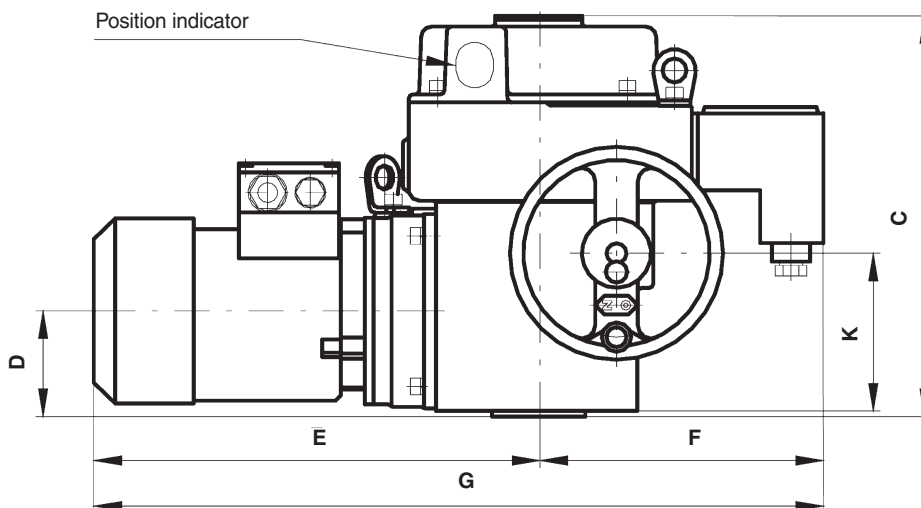
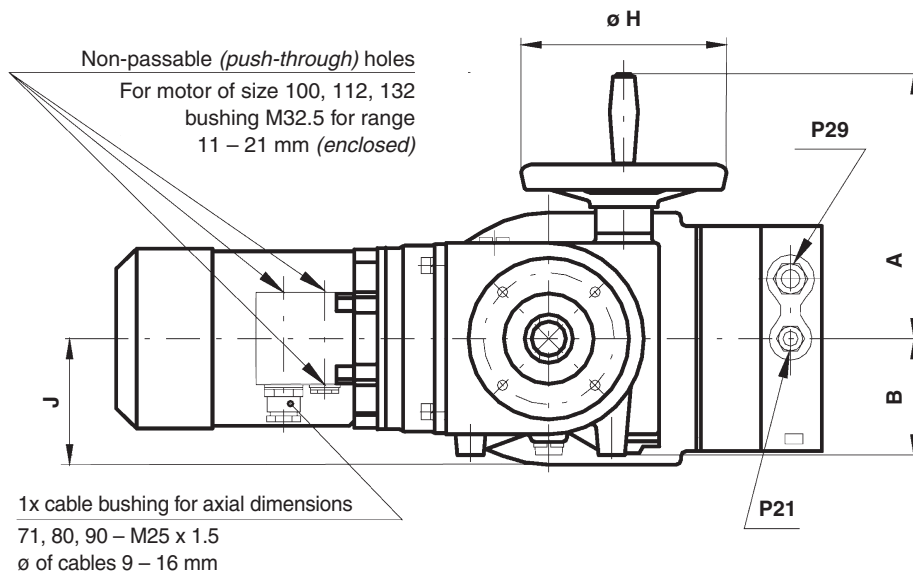
Type designation	A	B	C	D	E	F	G	\varnothing H	J	K
52 020.3xxxS 52 070.6xxx , 52 070.7xxx	305	90	300	78	334	228	562	160	99	120
52 021.3xxxS, 52 022.3xxxS 52 071.6xxx, 52 072.6xxx 52 071.7xxx, 52 072.7xxx	376	120	328	92	436	228	664	200	-	144
52 024.3xxxS 52 074.6xxx , 52 074.7xxx	455	145	382	123	519	258	777	250	-	190
52 025.3xxxS	540	178	442	153	598	298	896	375	-	234

Dimensional sketch of electric actuators **MODACT MOA**
aluminium version – Type No. 52 026.3xxxS



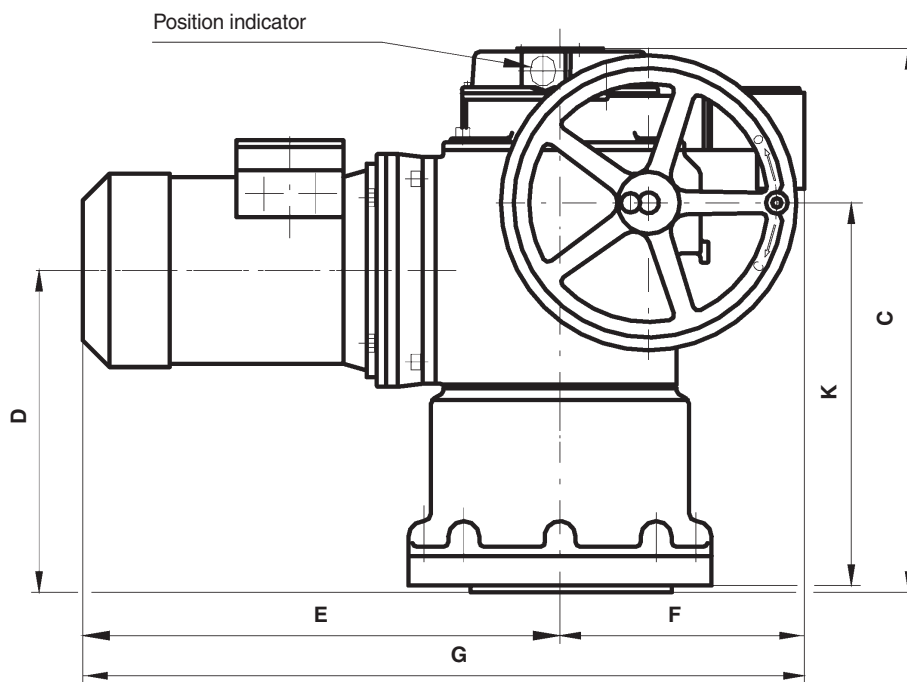
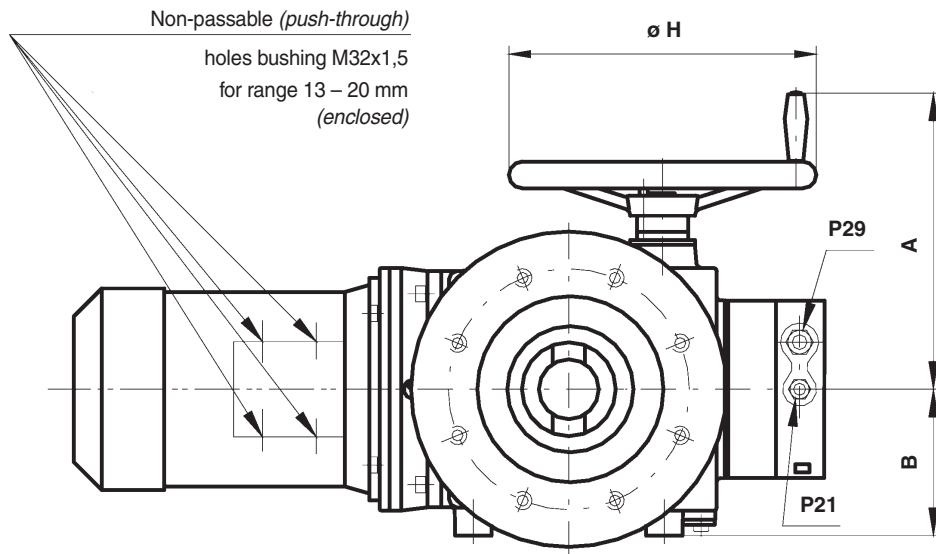
Type designation	B	C
52 026.3xxxS shape of connecting A	463	750
52 026.3xxxS shape of connecting B, C, D, E	418	705

Dimensional sketch of electric actuators **MODACT MOA**
cast iron version – Type Nos. 52 020.2xxxS – 52 025.2xxxS



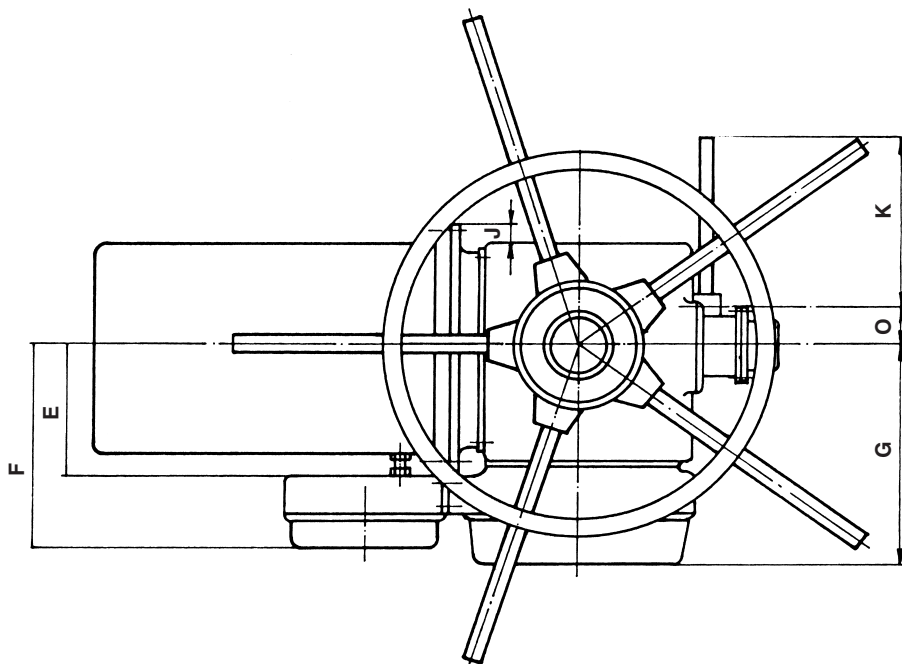
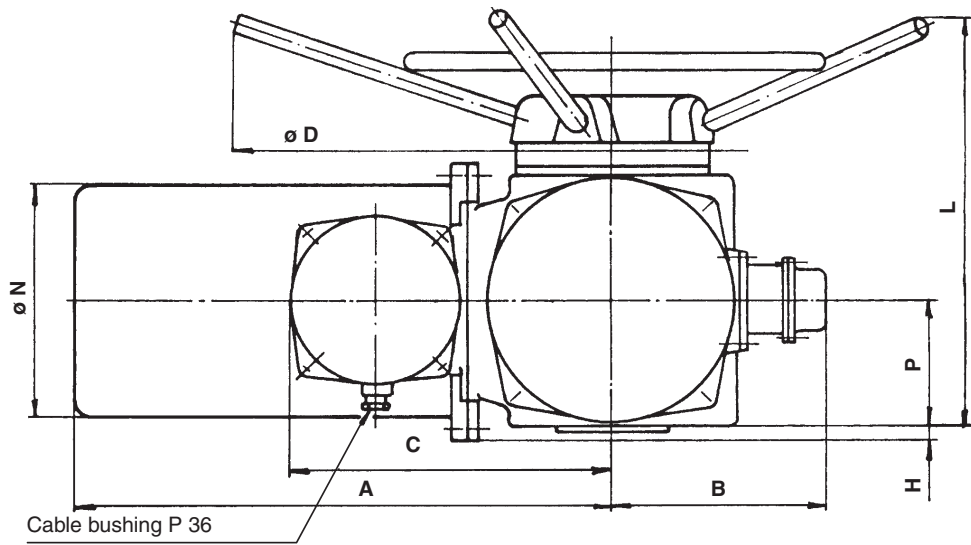
Type designation	Dimension [mm]									
	A	B	C	D	E	F	G	øH	J	K
52 020.2xxxS	200	90	310	80	310	165	475	160	99	120
52 021.2xxxS 52 022.2xxxS	240	120	320	92	408	230	638	224	–	144
52 024.2xxxS	290	145	380	123	553	256	809	300	–	190
52 025.2xxxS	345	178	440	153	665	290	955	375	–	234

Dimensional sketch of electric actuators **MODACT MOA**
cast iron version – Type No. 52 026.2xxxS



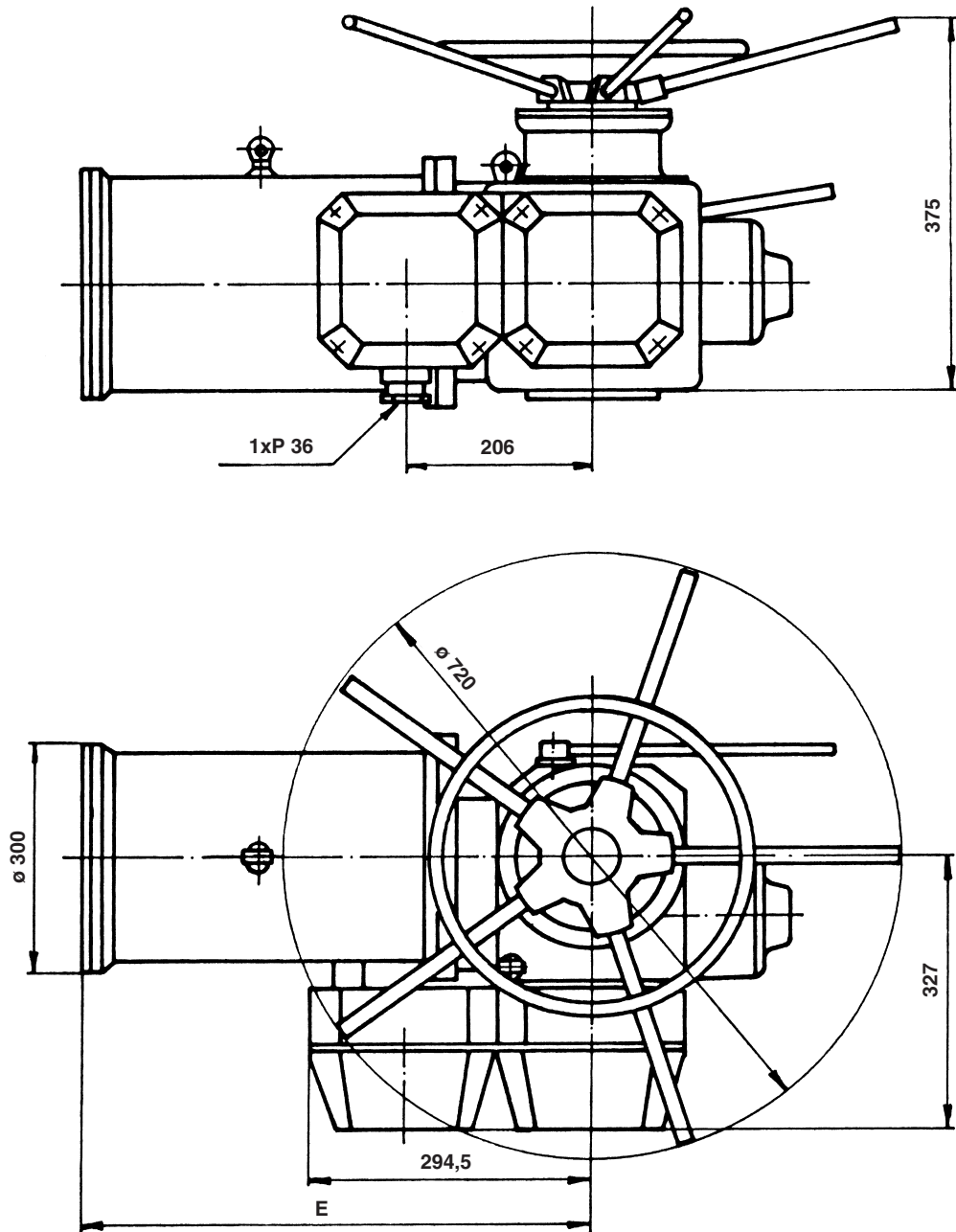
Type designation	Dimension [mm]								
	A	B	C	D	E	F	G	$\varnothing H$	K
52 026.2xxxS	345	178	690	415	665	290	955	375	450

Dimensional sketch of electric actuators **MODACT MOA OC**
 Type No. 52 070.3xxx, 52 071.3xxx, 52 072.3xxx – (worm gearbox, cast iron version)



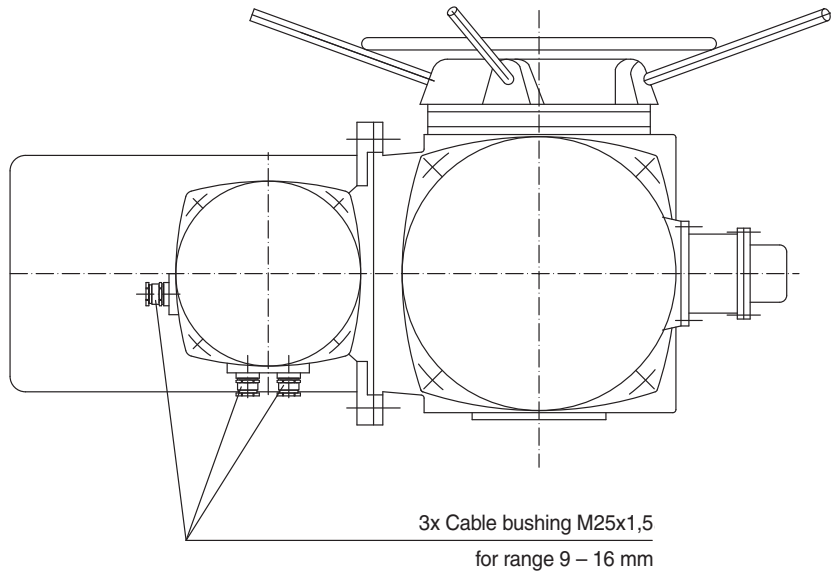
Type number	Dimension [mm]													
	A	B	C	D	E	F	G	H	J	K	L	N	O	P
52 070	365	185	290	250	100	250	240	-	-	150	255	153	85	90
52 071 52 072	488	206	290	720	128	295	252	21	23	240	300	225	100	105

Dimensional sketch of electric actuators **MODACT MOA OC**
 Type Nos. 52 074.3xxx – (worm gearbox, cast iron version)

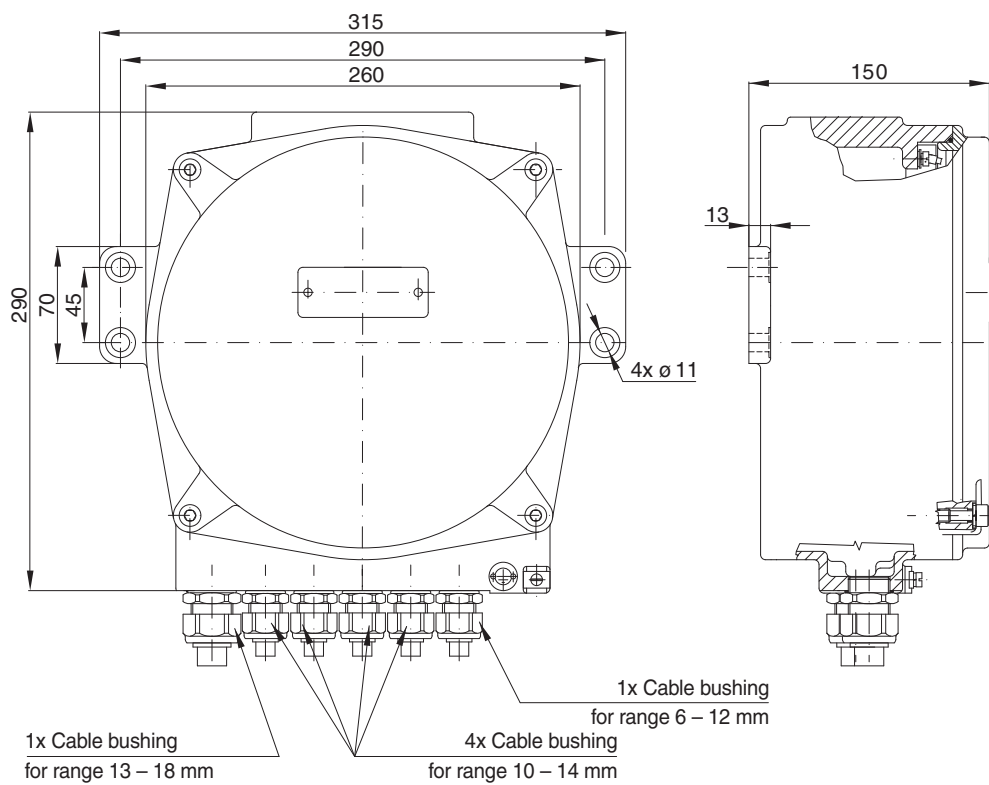


Type number	E
52 074.3x00	573
52 074.3x10, 52 074.3x20, 52 074.3x40, 52 074.3x50	620

Dimensional sketch of cable inputs for actuators **MOA OC**
*(It's supplied in version with position transmitter.
 For other version you have to specify cable entries.)*



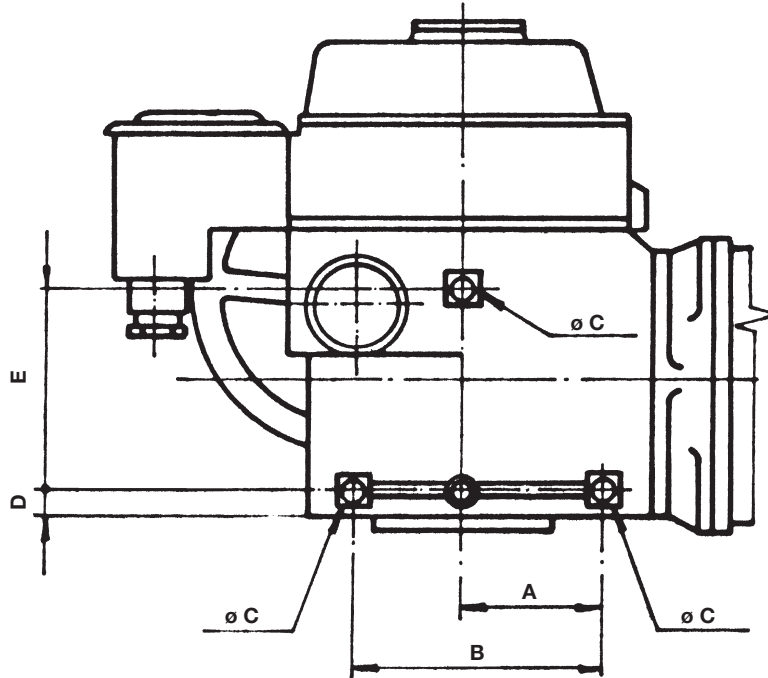
Dimensional sketch of CONTROL block



Holes for fixing actuators to structure

Actuators **MODACT MOA** Type No. 52 020.xxxxS – 52 026.xxxxS

Actuators **MODACT MOA OC** with planet gearbox and electric motors 1AC a 4 AC
(Type No. 52 070.7xxx – 52 074.7xxx and Type No. 52 070.6xxx – 52 074.6xxx)



	Type number				
	52 020.xxxxS 52 070.7xxx	52 021.xxxxS, 52 071.7xxx 52 022.xxxxS, 52 072.7xxx	52024.xxxxS 52 074.7xxx	52 025.xxxxS	52 026.xxxxS
Maximum force for accessory fixing of actuator	1000 N	2000 N	4000 N	6000 N	6000 N

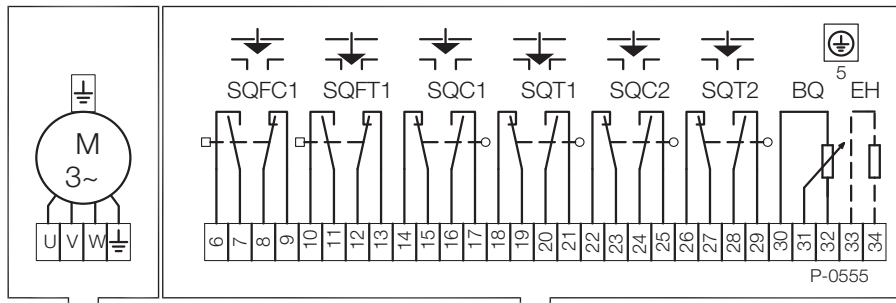
Type number	Dimension [mm]				
	A	B	ø C	D	E
52 020, 52 070.6xxx, 52 070.7xxx	61	110	M 10	16	120
52 021, 52 022, 52 071.6xxx, 52 072.6xxx 52 071.7xxx, 52 072.7xxx	90	160	M 12	21	140
52 024, 52 074.6xxx, 52 074.7xxx	110	210	M 16	23	200
52 025	120	240	M 20	47	220
52 026	120	240	M 20	47	220

Note:

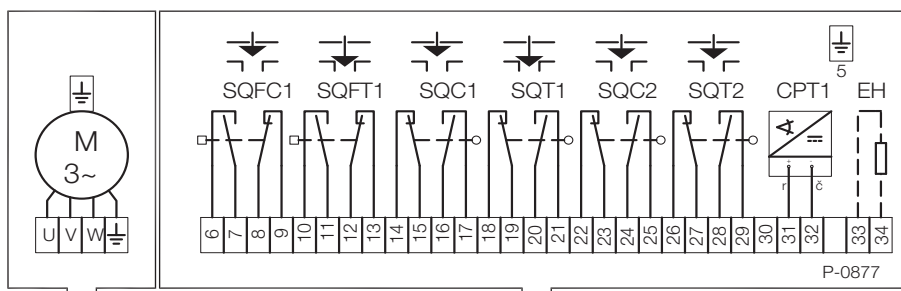
Total force higher than stated in the table must not act on the fixing elements of the actuator ø C.

Diagram of internal electric wiring of actuators **MODACT MOA**

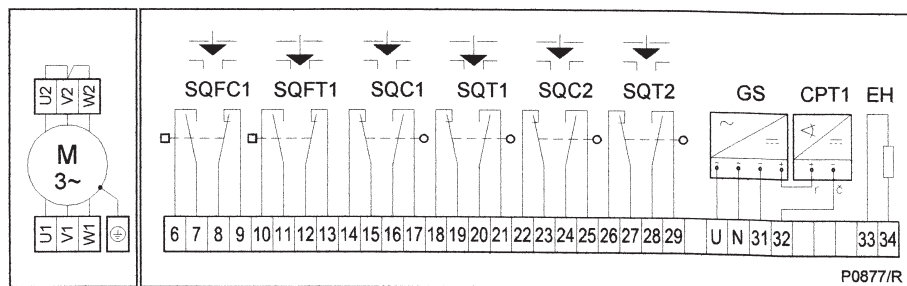
Position transmitter: resistance 100Ω



Position transmitter: current $4 - 20\text{ mA}$



Position transmitter: current $4 - 20\text{ mA}$ with feeding source (aluminium version only)

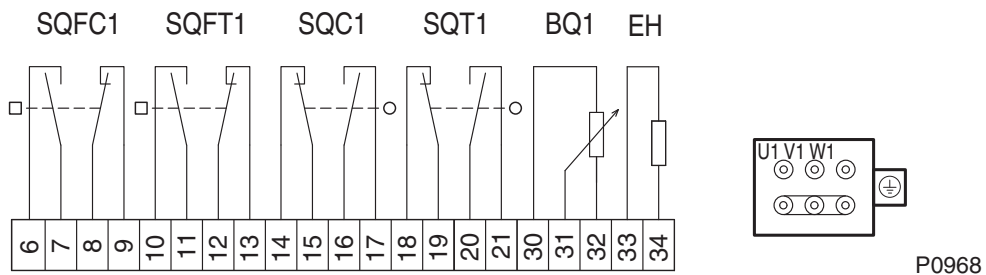


LEGEND:

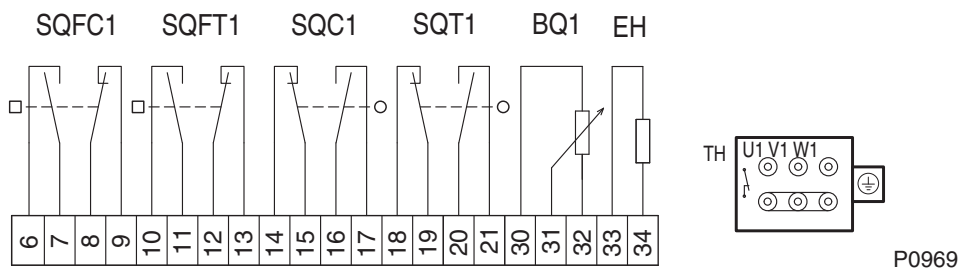
- | | |
|--|--|
| SQFC1 (MO) – torque-limit switch “open” | BQ – remote transmitter (<i>potentiometer</i>) |
| SQFT1 (MZ) – torque-limit switch “close” | M – three-phase asynchronous motor |
| SQC1 (PO) – position-limit switch “open” | EH – heating resistance |
| SQT1 (PZ) – position-limit switch “close” | CPT1 – current transmitter |
| SQC2 (SO) – position signalling switch “open” | GS – feeding source |
| SQT2 (SZ) – position signalling switch “close” | |

Diagram of electric wiring of actuators **MOA** without signaling switch, with resistance transmitter.

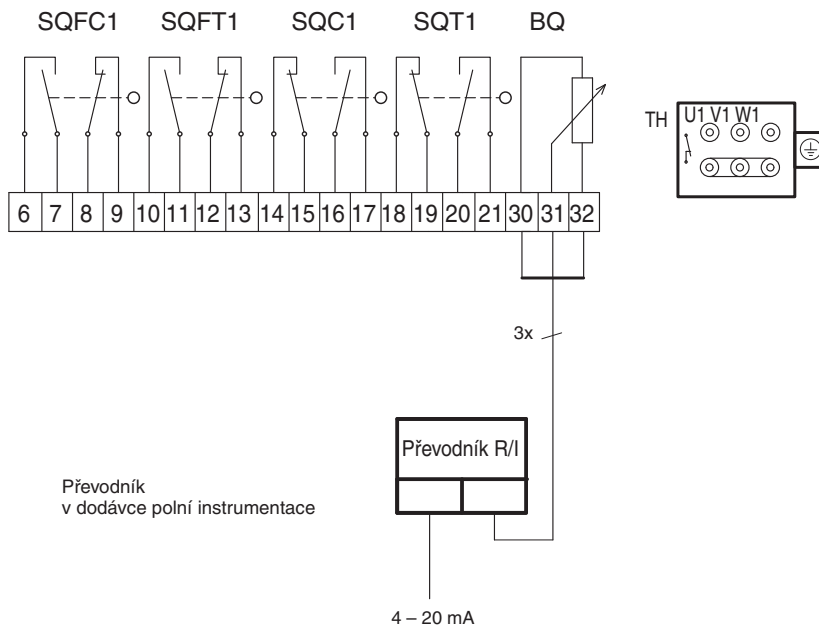
Actuator MOA with resistance transmitter



Actuator MOA with resistance transmitter and thermocontact in electric motor



Actuator MOA with resistance transmitter – example R/I converter connection



Note:

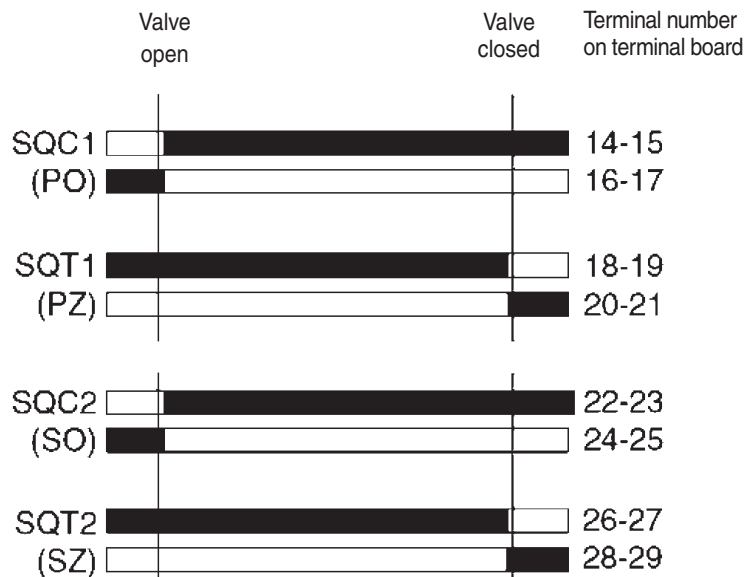
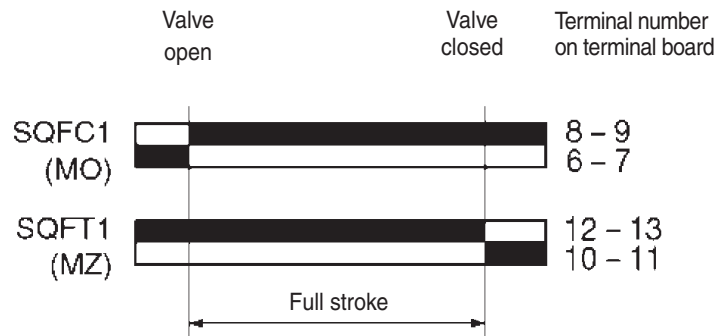
The diagram P 0968 and P 0969 are for actuators MOA without signaling switches. These actuators are in fourth place in additional number identifies with number 1. For example 52020.2011S.

For models with signaling switches are valid standard diagrams P 0555 and P 0877.

Transmitter 4 – 20 mA

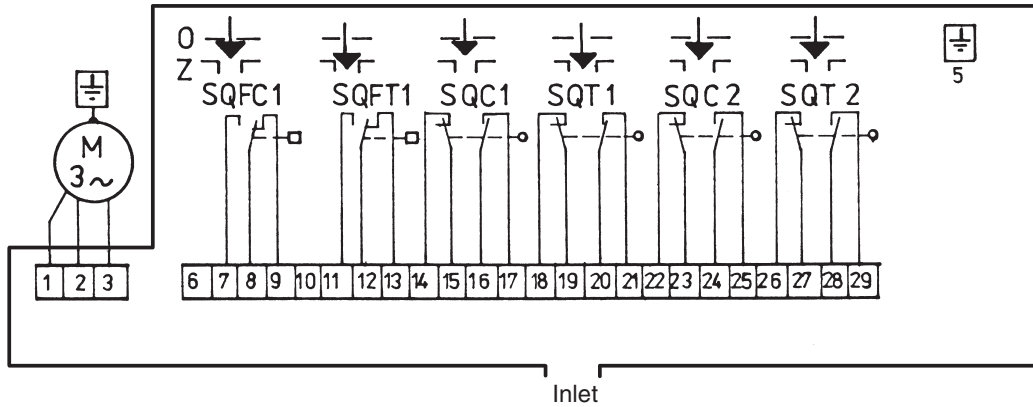
Converter is available as a separate mounting block for actuators MOA OC and MOA with resistance transmitter. Resistance transmitter signal 100 Ω is transform to standard signal 4 – 20 mA. Converters Treston 222-224 Ripa/SO/BT III/ZOV are supplied. They have enlarged scope of adjustability, output signal of 4 – 20 mA can be convert to 30 % of resistance transmitter travel.

Operation diagram of torque, position-limit and signalling units
 (actuator **MODACT MOA**)



The micro-switches can be used as single-circuit only. Two voltages of different magnitudes or phases must not be connected to contacts of the same micro-switch. The contacts of micro-switches are drawn in the intermediate position.

Diagram of internal electric wiring of actuators MODACT MOA OC
 cast iron version, worm gearbox, with electric motors AJSI or 1AC, 4AC
 Type Nos. 52 070.3xxx – 52 074.3xxx or Type Nos. 52 070.4xxx – 52 074.4xxx



Contacts are drawn in intermediate position of the actuator output shaft

LEGEND:

- SQFC1 (MO) – torque-limit switch “open”
- SQFT1 (MZ) – torque-limit switch “close”
- SQC1 (PO) – position-limit switch “open”
- SQT1 (PZ) – position-limit switch “close”
- SQC2 (SO) – position signalling switch “open”
- SQT2 (SZ) – position signalling switch “close”
- M – three-phase asynchronous motor

Operation diagram of torque, position-limit and signalling units

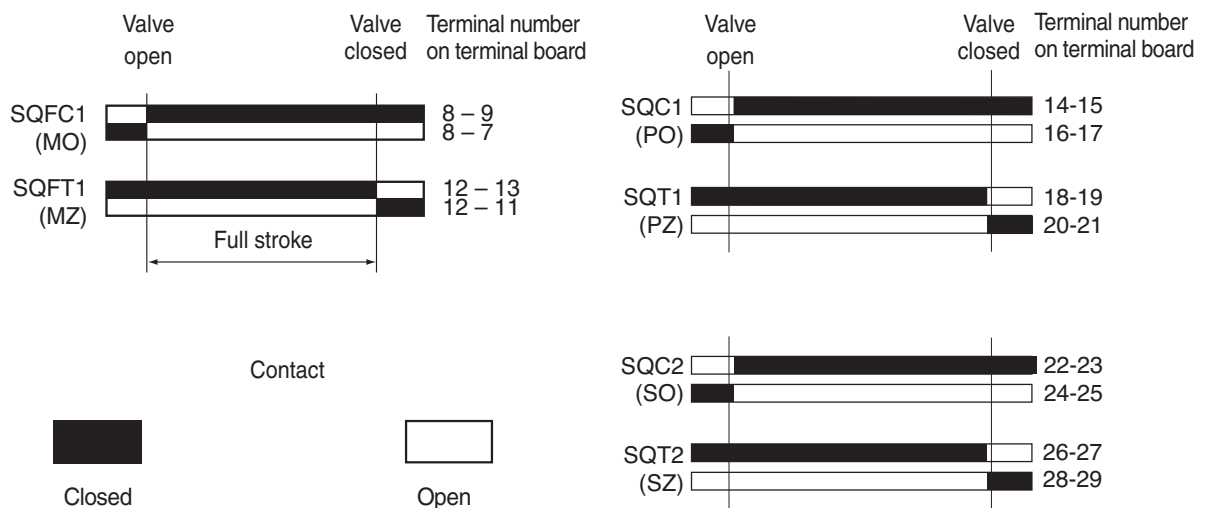
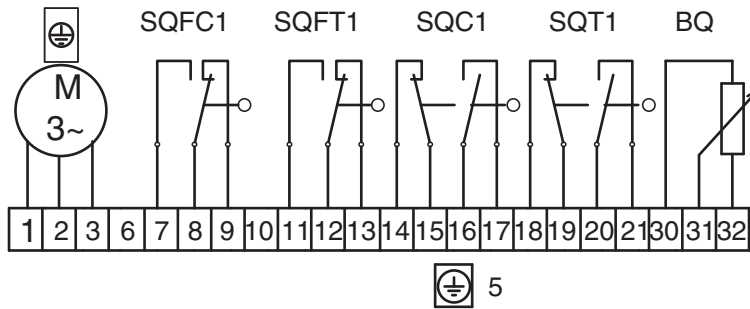
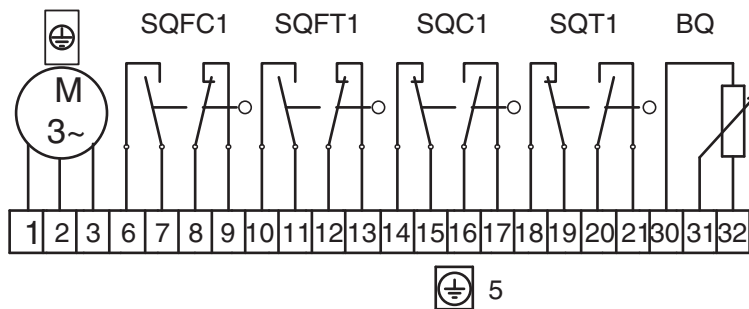


Diagram of electric wiring of actuator **MODACT MOA OC**
without signaling switches, with resistive transmitter

Actuator MOA OC with resistive transmitter

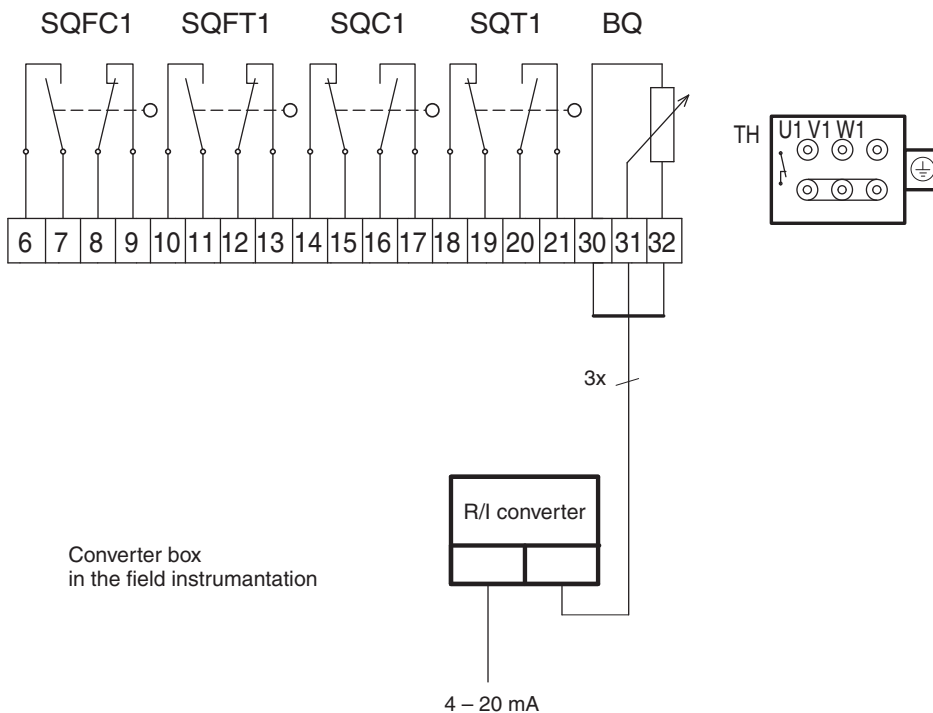


P0973



P0974

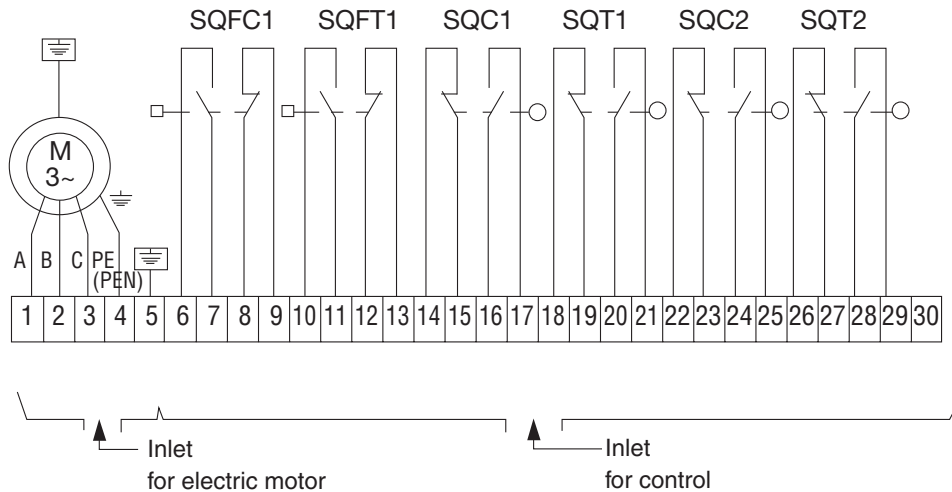
Example – R/I converter connection



Actuators MOA OC with resistive transmitter are supplied as standart without signaling switches (*diagram P0973 or P0974*).

If customer requires a signaling switches, due to lack of space the torque-limit switches will be not wired to the terminal board – this option must be specify in the order (*both variants are in diagram shown by dashed lines*).

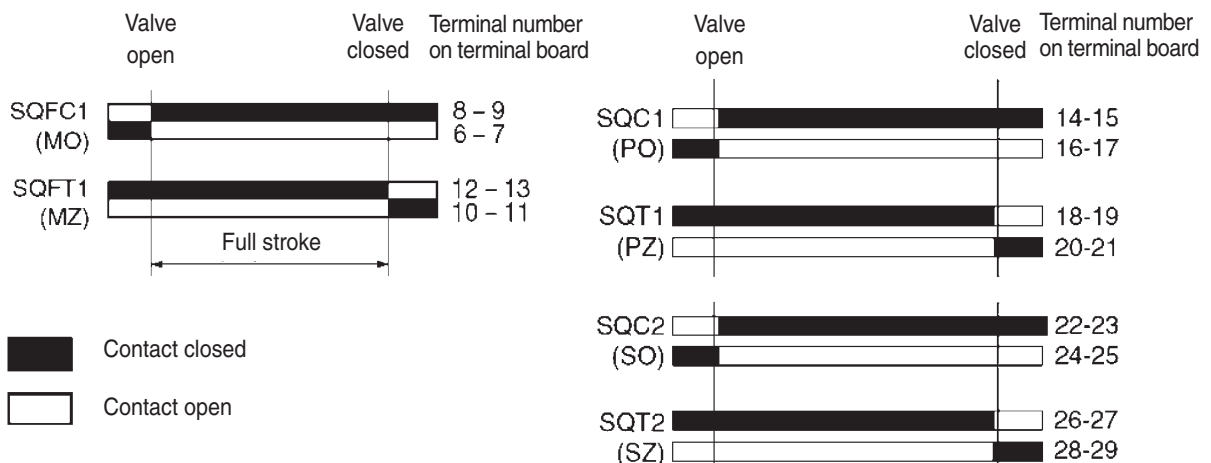
Diagram of internal electric wiring of actuators MODACT MOA OC
 cast iron version and aluminium version, planet gearbox, with electric motors 1AC, 4AC
 Type Nos. 52 070.6xxx – 52 074.6xxx and 52 070.7xxx – 52 074.7xxx



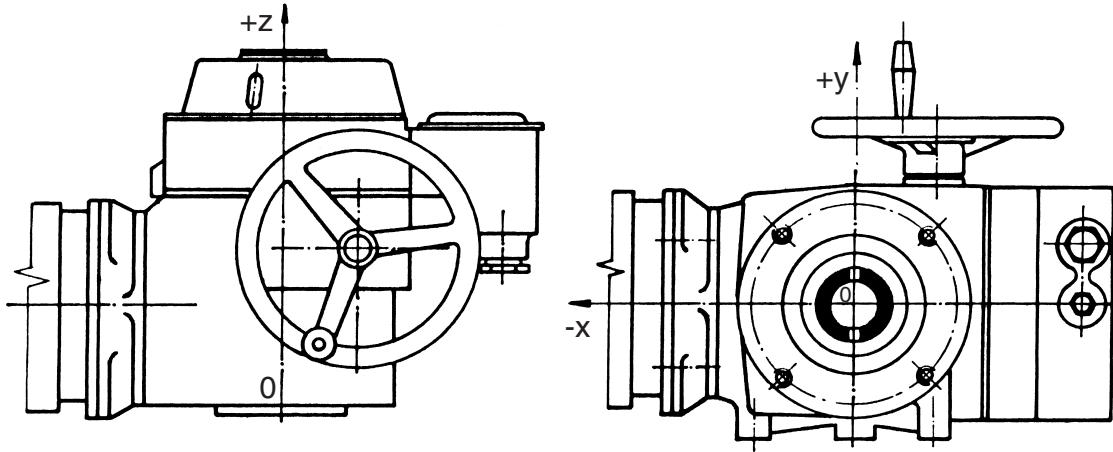
LEGEND:

- SQFC1 (MO) – torque-limit switch “open”
- SQFT1 (MZ) – torque-limit switch “close”
- SQC1 (PO) – position-limit switch “open”
- SQT1 (PZ) – position-limit switch “close”
- SQC2 (SO) – position signalling switch “open”
- SQT2 (SZ) – position signalling switch “close”
- M – three-phase asynchronous motor

Operation diagram of torque, position-limit and signalling units

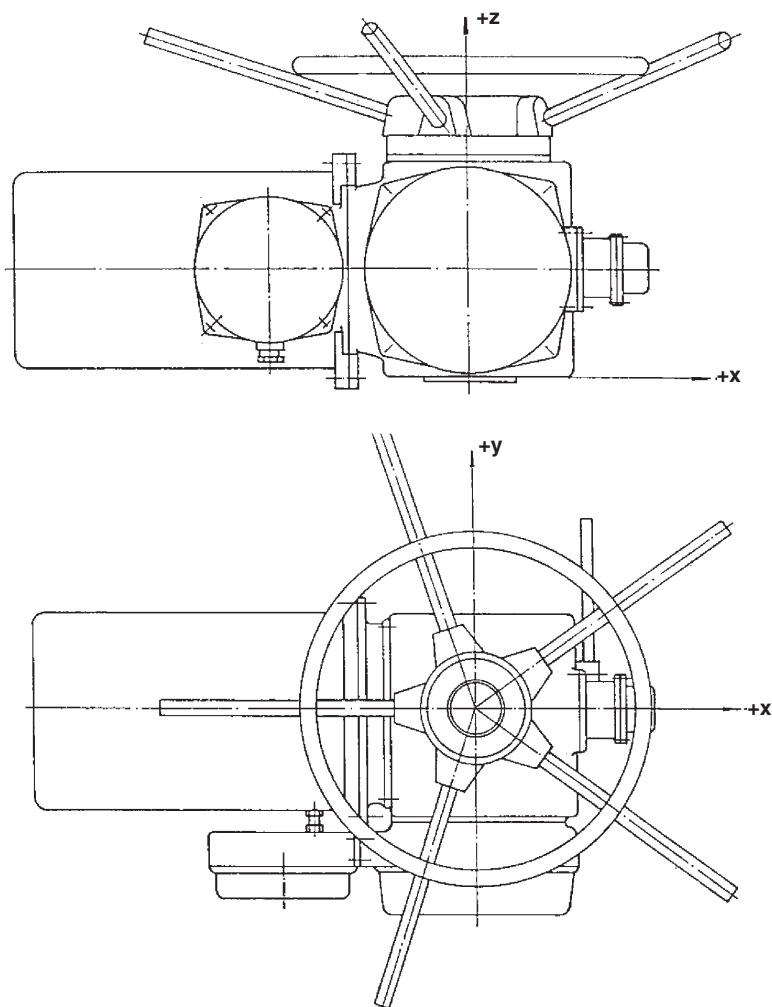


Centre of mass of actuators **MODACT MOA**
cast iron version – Type Nos. 52 020.2xxxS – 52 025.2xxxS



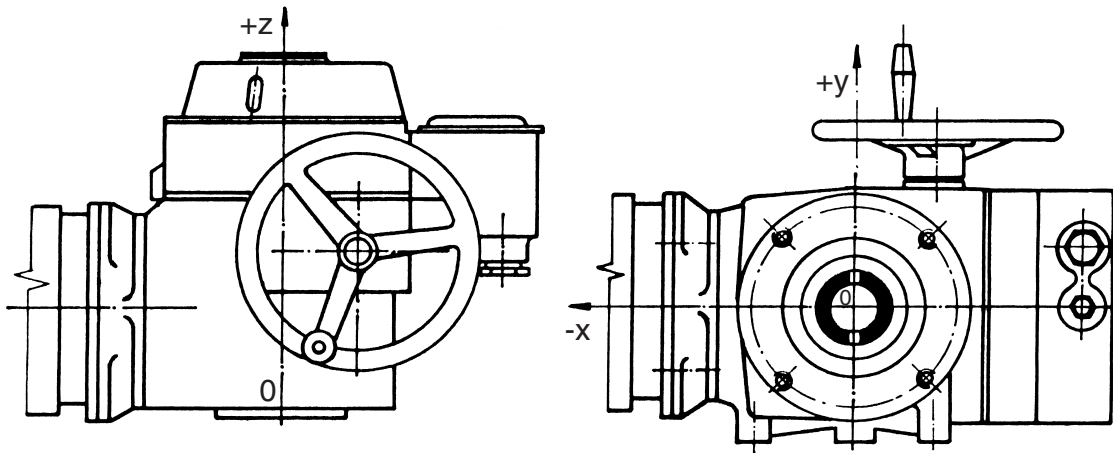
Type number of actuator	Coordinates of centre of mass			Actuator weight [kg]
	x [mm]	y [mm]	z [mm]	
52 020.2022S	-17	2	122	35
52 022.2012S	-56	0	135	68
52 024.2042S	-82	5	155	131
52 025.2022S	-153	6,5	161	236
52 026.2002S	-97	0	331	340

Centre of mass of actuators **MODACT MOA OC**
 cast iron version, worm gearbox, with electric motor AJSI
 Type Nos. 52 070.3xxx – 52 074.3xxx



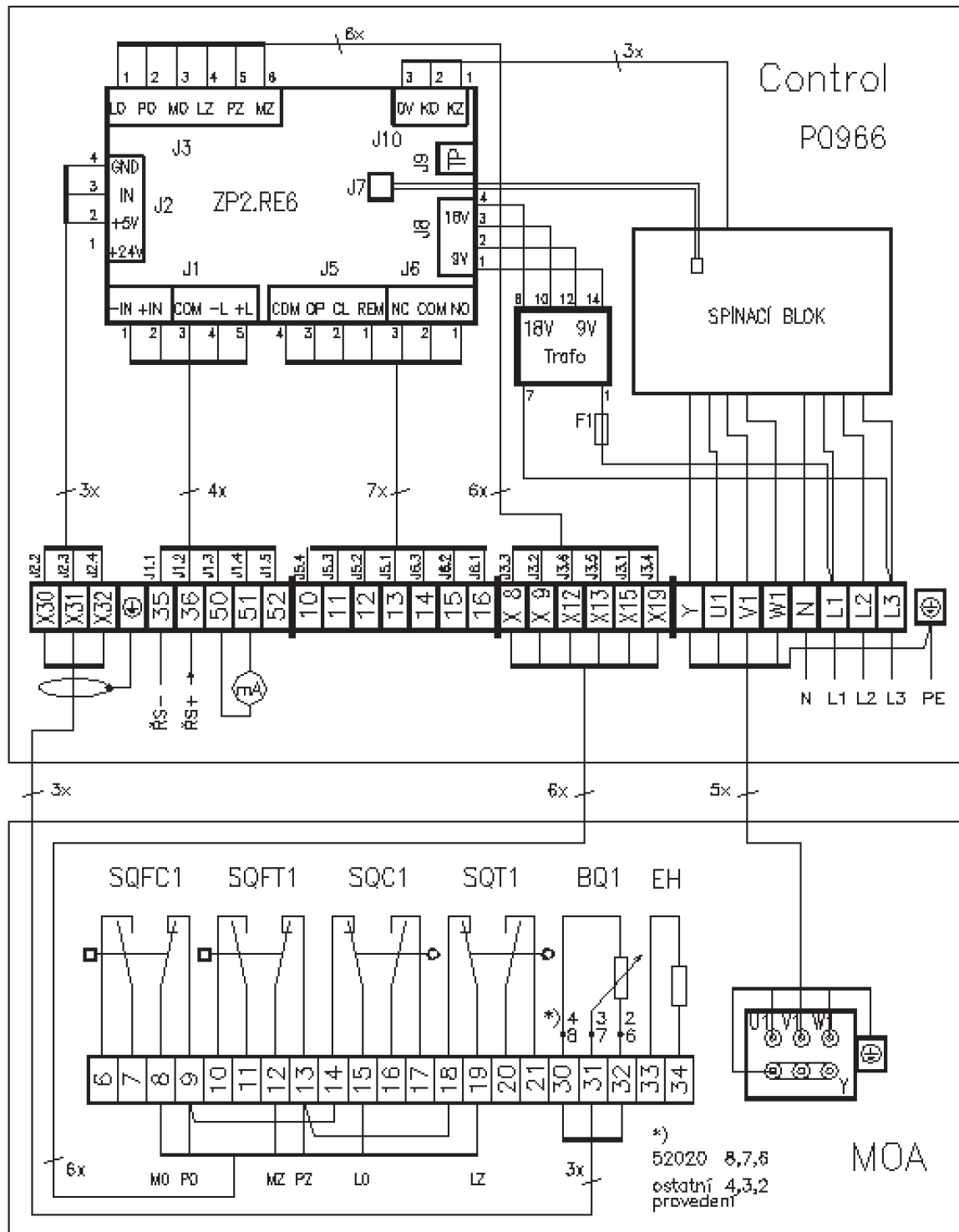
Type number of actuator	Coordinates of centre of mass			Actuator weight [kg]
	x [mm]	y [mm]	z [mm]	
52 070.3x20, .3x30; 52 070.3x60, .3x70	-104	-50	+93	54,5
52 070.3x00, .3x10; 52 070.3x40, .3x50	-63	-72	+88	44,7
52 072.3x20, .3x30	-167	-20	+113	108
52 074.3x00	-150	-54	+129	152
52 074.3x10, 20, 40 50	-215	-50	+134	212

Centre of mass of actuators MODACT MOA OC
aluminium version – Type Nos. 52 070.7xxx – 52 074.7xxx



Type number of actuator	Electric motor signification	Electric motor weight [kg]	Coordinates of centre of mass			Actuator weight [kg]
			x [mm]	y [mm]	z [mm]	
52 070.7x00	1AC56A4A5B3	10,3	-52	+5	+135	30
52 070.7x10	1AC56A4A5B3	10,3	-52	+5	+135	30
52 070.7x40	1AC56A4A5B3	10,3	-52	+5	+135	29
52 070.7x60	1AC56A4A5B3	10,3	-52	+5	+135	30
52 071.7.x00	4AC80A4A5	24	-120	+6	+150	57
52 071.7x10	4AC80A4A5	24	-120	+6	+150	57
52 071.7x20	4AC80B4A5	25,5	-115	+6	+152	57
52 071.7x30	4AC80B4A5	25,5	-115	+6	+152	57
52 072.7x00	4AC80A4A5	24	-120	+6	+150	56
52 072.7x10	4AC80B4A5	25,5	-115	+6	+152	58
52 072.7x20	4AC80B4A5	25,5	-115	+6	+152	57
52 074.7x10	4AC100S4A5	39,5	-130	+5	+162	96
52 074.7x20	4AC100L4A5	45	-150	+5	+162	102
52 074.7x40	4AC100S4A5	39,5	-130	+5	+162	98
52 074.7x50	4AC100L4A5	45	-150	+5	+162	102

Diagram of electric wiring of actuators **MOA** and **MOA OC** with Control block
 – example of electric wiring to the actuator MOA



EXPLANATORY NOTES TO THE DIAGRAMS

BQ 1	resistance transmitter
SQFC1	OPEN torque-limit switch (<i>MO</i>)
SQFT1	CLOSED torque-limit switch (<i>MZ</i>)
SQC1	OPEN position switch (<i>PO</i>)
SQT1	CLOSED position switch (<i>PZ</i>)
TH	thermal protection

Regulator ZP2RE6 – Connectors signals

Connector J1 control signal 4 – 20 mA location 4-20 mA

J1.1 (<i>-IN</i>)	terminal 35 control signal -
J1.2 (<i>+IN</i>)	terminal 36 control signal +
J1.3 (<i>COM</i>)	terminal 50 output position active 4 – 20 mA
J1.4 (<i>-L</i>)	terminal 51 outlet common position
J1.5 (<i>+L</i>)	terminal 52 outlet position passive 4 – 20 mA

Connector J2 Resistance or current position sensor inlet

J2.1 (<i>+24V</i>)	-
J2.2 (<i>+5V</i>)	R sensor
J2.3 (<i>IN</i>)	R sensor
J2.4 (<i>GND</i>)	R sensor

Connector J3 Torque and position switches inlet for position indicator

J3.1 (<i>LO</i>)	position OPEN (<i>PO</i>)
J3.2 (<i>PO</i>)	common PO - MO
J3.3 (<i>MO</i>)	torque OPEN (<i>MO</i>)
J3.4 (<i>LZ</i>)	position CLOSED (<i>PZ</i>)
J3.5 (<i>PZ</i>)	common PZ - MZ
J3.6 (<i>MO</i>)	torque OPEN (<i>MO</i>)

Connector J4 Local control unit

J4.1 (<i>+24 V</i>)	control signal
J4.2 (<i>D</i>)	signal for remote (<i>regulator function</i>)
J4.3 (<i>LZ</i>)	signal for local-closed
J4.4 (<i>LO</i>)	signal for local-open

Connector J5 Software configurable signal relay

J5.1 (<i>REM</i>)	terminal 13 outlet relay 1, example remote control
J5.2 (<i>CL</i>)	terminal 12 outlet relay 2, example CLOSED
J5.3 (<i>OP</i>)	terminal 11 outlet relay 3, example OPEN
J5.4 (<i>COM</i>)	terminal 10 connected to relay 1, 2, 3

Connector J6 Relay – central failure

J6.1 (<i>NO</i>)	terminal 16 NO contact
J6.2 (<i>COM</i>)	terminal 15 common contact
J6.3 (<i>NC</i>)	terminal 14 NC contact

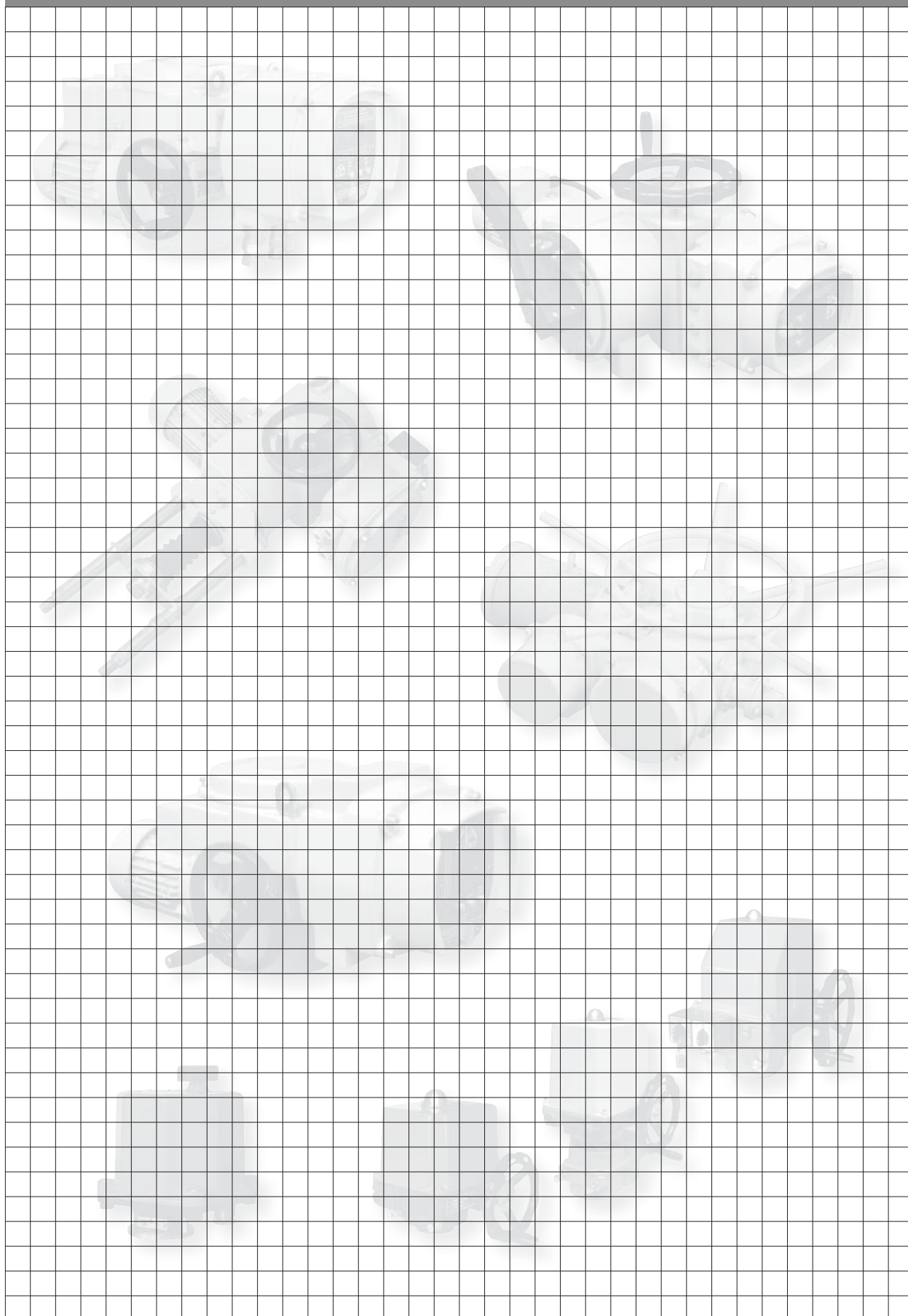
Connector J7 Brake control

Connector J8 Power connector

J8.1 (<i>9 V</i>)	power supply 9 V
J8.2 (<i>9 V</i>)	power supply 9 V
J8.3 (<i>18 V</i>)	power supply 18 V
J8.4 (<i>18 V</i>)	power supply 18 V

Connector J9 Thermal protection

J9.1 (<i>TP230</i>)	inlet 230 V
J9.2 (<i>TP 24</i>)	inlet 24 V
J9.3 (<i>TP 0</i>)	common inlet





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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

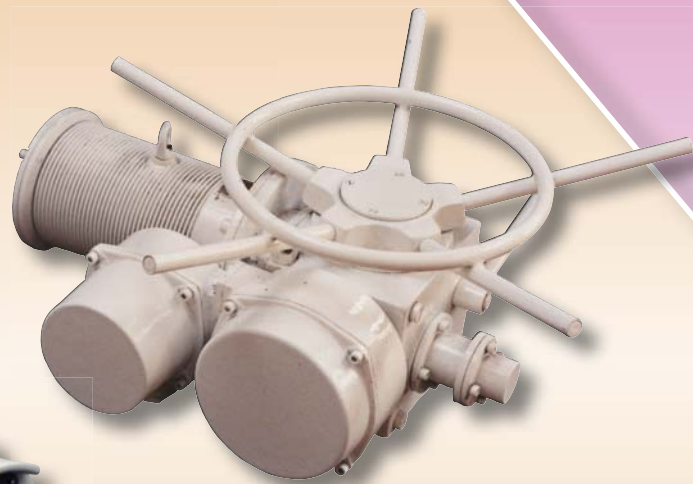
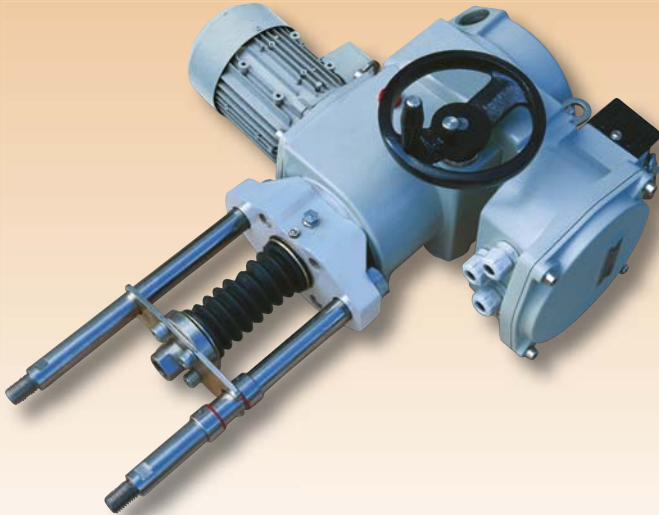
MODACT MPS, MPSP, MPSED, MPSPED

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MODACT MTN, MTP, MTNED, MTPED

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