



Electric rotary  
multi-revolution actuator

## MODACT MOP

Type numbers 52 039



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

# 1. APPLICATION

The **MODACT MOP, t. no. 52 039** actuators are designed for shifting control organs by reversible rotary motion (e.g. sliding valves and other devices for which they are suitable due to their parameters). Typical example of using is remote two-position or multi-position control of these organs for which tight closure in end positions is also required. The actuators fitted with current position transmitter are also suitable for automatic regulation in regime S4 – see Operating mode.

# 2. OPERATING CONDITIONS, OPERATING POSITION

## Operating conditions

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

When placed on an open area, the actuator is recommended to be fitted with a light shelter to protect it against direct action of atmospheric effects. The shelter should overhang the actuator contour by at least 10 cm at the height of 20 – 30 cm.

If the actuator is used at a location with an ambient temperature under  $-10\text{ }^{\circ}\text{C}$  and/or relative humidity above 80 %, at a sheltered location, or in the tropical atmosphere, the anti-condensation heater built in in all actuators should be always be used. One or two heater elements should be connected, as required.

Actuators can be applied in premises with inflammable and non-conductive dust unless such environment adversely influences the electric motor's function. In such case, the ČSN 34 3205 standard must be consequently adhered to. Dust should be wiped off when the dust layer thickness reaches about 1 mm.

### Notes:

*A sheltered location is considered a space where atmospheric precipitations are prevented from falling at an angle of up to  $60^{\circ}$  from the vertical.*

*The location of the electric motor should be such that cooling air has free access to the motor and no heated-up blown-out air is drawn into the motor again. For air inlet, the minimum distance from the wall is 40 mm.*

*Therefore, the space in which the motor is located should be sufficiently large, clean and ventilated.*

## Temperature

Operating temperatures for **MODACT MOP, t. no. 52 039** electric actuators ranges from  $-25\text{ }^{\circ}\text{C}$  to  $+60\text{ }^{\circ}\text{C}$ .

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

### Class:

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

## Corrosion protection

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

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

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

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

## Operating position

The actuators can be used in any operating position.

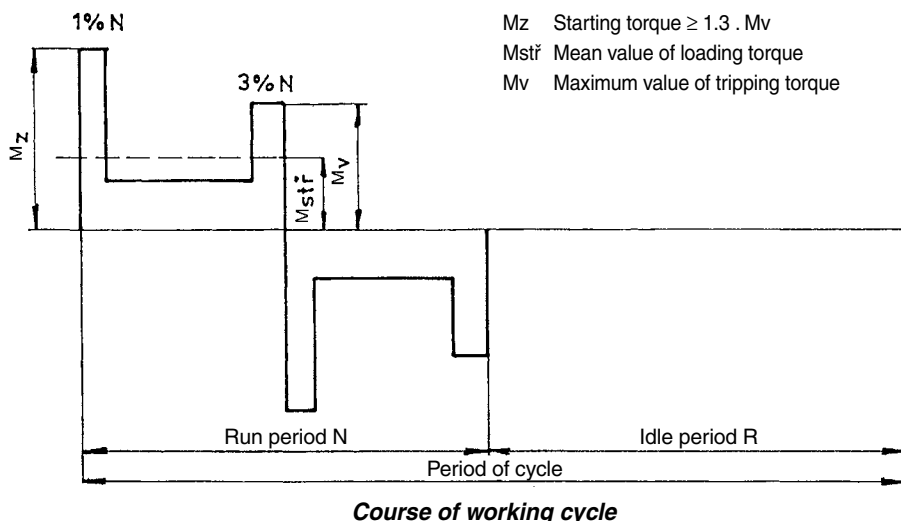
## 3. OPERATION MODE, SERVICE LIFE OF ACTUATORS

### Operation mode

The actuators can work with the type of loading S2 according to ČSN EN 60 034-1, wherein the course of loading is shown in the figure. The run period at temperature +50 °C is 10 minutes and the mean value of loading torque does not exceed 60 % of the value of maximum tripping torque.

The actuators can also work in the regime of interrupted run with start-up S4 according to ČSN EN 60 034-1 (*e.g. during gradual opening of valve etc.*). The highest number of closing in automatic regulation is 1200 cycles per hour with load factor 25 % (*the ratio of run/idle time is 1:3*). Mean value of loading torque is not higher than 40 % of maximum tripping torque. The longest working cycle ( $N+R$ ) is 10 minutes; load factor ( $N/N+R$ ) is max. 25 %.

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



## Service life of actuators

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

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

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

## 4. TECHNICAL DATA

### Feeding voltage

Feeding voltage of electric motor: – 1 x 230 V, +10 %, -15 %, 50 Hz  $\pm$ 2 %  
– 3 x 230/400V, +10 %, -15 %, 50 Hz  $\pm$ 2 %  
(or according to data on rating plate)

### Protective enclosure

Protection of the actuators – IP 67 according to ČSN EN 60 529

### Noise

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

### Tripping torque

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

### Starting torque

The starting torque of the actuator is a calculated value determined by the starting torque of the electric motor and the total gear ratio and efficiency of the actuator. After run reversion, the actuator can produce a starting torque for the duration of 1 to 2 revolutions of the output shaft when torque-limit switching is locked. This can take place in either end position or in any intermediate position.

### Self-locking

The actuator is self-locking provided that the load is applied only in the opposite direction to the output shaft motion of the actuator. Self-locking is provided by an arresting roller that stops the electric motor even in the manual control mode.

For safety reasons, it is strictly prohibited to use the actuators for driving lifting appliances that may be used for the transport of persons or equipment in cases where people might be present under the lifted load.

### Sense of rotation

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

### Working stroke

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

### 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.

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

**When using the manual control, ie. actuator is controlled mechanically, the torque-limit switches doesn't work and the valve can be damaged.**

## 5. ACTUATOR OUTFIT

### Torque-limit switches

The actuator is fitted with two torque-limit switches (*MO – OPEN, MZ – CLOSE*) each of which acts only in one direction of motion of the actuator output shaft. The torque-limit switches can be set to operate at any point of the working stroke except the region in which they are locked (*see Starting torque*).

The tripping torque can be adjusted within the range shown in Table 1. The torque-limit switches are locked if the load torque is lost after they have been brought into the OFF-position. This feature secures the actuator against the so-called “pumping”.

### Position-limit switches

The PO – OPEN and PZ – CLOSE position-limit switches limit the actuator working stroke, each being adjusted to operate in either end position.

### Position signalling

For signalling position of the actuator output shaft, two signalling switches, i.e. the SO – OPEN signalling switch and the SZ – CLOSE signalling switch, are used. Each of these switches acts only in one direction of output shaft rotation. The operating point of the microswitches can be set within the whole working stroke range except the narrow band before the operating point of the microswitch used to switch off the electric motor.

### Position transmitters

The **MODACT MOP, t. no. 52 039** electric actuators can be supplied without position transmitter or can be fitted with position transmitter:

#### a) Resistance transmitter 1 x 100 ohm

##### Technical parameters:

Position scanning	resistance
Turning angle	0° – 160°
Non-linearity	≤ 1 %
Transition resistance	max. 1.4 ohm
Permitted voltage	50 V DC
Maximum current	100 mA

**b) Type CPT 1Az passive current transmitter.** Power supply to the current loop is not a part of the actuator. Recommended feeding voltage is 18 – 28 V DC, at maximum loading resistance of the loop 500 ohm. The current loop should be earthed in one point. Feeding voltage need not be stabilized; however, it must not exceed 30 V or else the transmitter could be damaged.

Range of CPT 1Az is set by a potentiometer on the transmitter body and its starting value by corresponding partial turning of the transmitter.

##### Technical parameters of CPT 1Az:

Scanning of position	capacity
Working stroke	adjustable 0° – 40° to 0° – 120°
Non-linearity	≤ 1 %
Non-linearity, including gears	≤ 2.5 % ( <i>for a maximum stroke of 120°</i> )
Hysteresis, including gears	≤ 5 % ( <i>for a maximum stroke of 120°</i> )
<i>(The non-linearity and hysteresis are related to a signal value of 20 mA).</i>	
Loading resistance	0 – 500 ohm
Output signal	4 – 20 mA or 20 – 4 mA
Supply voltage	for $R_{load} = 0 - 100$ ohm 10 to 20 V DC
	for $R_{load} = 400 - 500$ ohm 18 to 28 V DC
Maximum supply voltage ripple	5 %
Maximum transmitter power demand	560 mW
Insulation resistance	20 Mohm at 50 V DC
Insulation strength	50 V DC
Operational environment temperature	-25 °C to +60 °C
Operational environment temperature – extended range	-25 °C to +70 °C ( <i>additional on demand</i> )
Dimensions	ø 40 x 25 mm

c) **Type DCPT active current transmitter.** Power supply to the current loop is not a part of the actuator. Maximum loading resistance of the loop is 500 ohm.

DCPT can be easily set by two push-buttons with LED diode on the transmitter body.

**Technical parameters of DCPT:**

Scanning of position	contact-less magneto-resistant
Working stroke	adjustable 60° – 340°
Non-linearity	max. ±1 %
Loading resistance	0 – 500 ohm
Output signal	4 – 20 mA or 20 – 4 mA
Power supply	15 – 28 V DC, < 42 mA
Working temperature	-25 °C to +70 °C
Dimensions	ø 40 x 25 mm

For the transmitters CPT 1A as well as DCPT, a two-wire connection is used, i.e., the transmitter, the power supply and the load are connected in series. The user should secure that the two-wire circuit of the current transmitter is connected to the electric earth of the associated regulator, computer, etc. This connection should only be made at a single point in any section of the circuit, outside the actuator.

**Position indicator**

The actuator is 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.

**6. ELECTRIC PARAMETERS**

**External electric connection**

The electric actuator is equipped with a terminal board for connection to external circuits. This terminal board uses screw terminals allowing conductors with a maximum cross-section 4 mm<sup>2</sup> to be connected. Access to the terminal board is obtained after removal of the actuator cover. All control circuits of the electric actuator are brought out to the terminal board. The actuator is fitted with cable bushings for connecting the electric actuator.

Connecting of actuators with connector – on special request.

**Actuator internal wiring**

The internal wiring diagrams of the **MODACT MOP, t. no. 52 039** 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.

**Current rating and maximum voltage of microswitches**

Maximum voltage of mikroswitches is 250 V AC as well as DC, at these maximum levels of currents.

MO, MZ	250 V AC / 2 A; 250 V DC / 0,2 A
SO, SZ	250 V AC / 2 A; 250 V DC / 0,2 A
PO, PZ	250 V AC / 2 A; 250 V DC / 0,2 A

The microswitches can only be used as single-circuit devices. Two voltages of different values and phases cannot be connected to the terminals of the same microswitch.

**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.



## Electric strength of electric circuits isolation

Circuit of resistance transmitter		500 V, 50 Hz
Circuit of current transmitter		50 V DC
Circuits of microswitches and 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	±10 % of the maximum range value
Adjusting speed	-10 % of the maximum range value
	+15 % of the rated value ( <i>in no-load operation</i> )
Setting of signalling switches	± 2.5 % of the maximum range value
	( <i>for the ranges, refer to the Mounting instructions</i> ).
Hysteresis of signalling switches	max. 4 % of the maximum range value
Setting of position-limit switches	±2,5 % of the maximum range value
Hysteresis of position-limit switches	max. 4 % of the maximum range value

## 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

The actuators are designed for direct assembly on the control organ (*valve, etc.*). They are connected by means of a flange and a clutch according to ČSN 186314 (*ST SEV 5448-85*) or according to ISO DIN 5210 and DIN 3338.

Three-phase asynchronous motor drives, via a countershaft gear, the sun wheel of differential gearing installed on the supporting box of the actuator (*power gearing*). During the motor control, the crown wheel of the epicyclic differential is held in constant position by a self-locking worm gearing. The hand wheel connected with the worm provides for alternative manual control even when the electric motor is running, without any danger to the operator.

The output shaft is firmly connected with the carrier of the epicyclic gearing. The output shaft passes to the control box where all control elements of the actuator are installed (*torque-limit switching unit, position-limit and signalling unit, heating resistance, and/or position transmitter*).



**Table 1 – MODACT MOP, Type No. 52 039, electric actuators**  
 – basic technical parameters (electric motors ATAS Náchod are used)

Type designation	Torque		Adjusting speed [min <sup>-1</sup> ]	Working stroke [rev.]	Electric motor						Weight [kg]	Type number			
	Tripping [Nm]	Engage- ment [Nm]			Type	Voltage [V]	Output [kW]	Speed [1/min]	In (400 V) [A]	Iz / In		Basic		Comple- mentary	
												1	2	3	4
MOP 30/65-9	10-30	65	9	1,5-38	T42RL477	3x400	0,05	1350	0,24	2	17	52 039	x x 1 x P		
MOP 30/83-15		83	15		T42RR478	3x400	0,09	1300	0,34	2,5	17		x x 2 x P		
MOP 30/58-25		58	25		T42RX479	3x400	0,15	1270	0,53	2,2	17		x x 3 x P		
MOP 30/39-40		39	40		T42RX479	3x400	0,15	1270	0,53	2,2	17		x x 4 x P		
MOP 30/84-9	10-20	84	9		J42RT502	1x230	0,100	1370	0,8	1,7	17		x x 5 x P		
MOP 30/56-15		56	15		J42RT502	1x230	0,100	1370	0,8	1,7	17		x x 6 x P		
MOP 20/27-25		27	25		J42RT502	1x230	0,100	1370	0,8	1,7	17		x x 7 x P		
MOP 60/84-9		30-60	84		9	J42RT502	1x230	0,100	1370	0,8	1,7		17	x x D x P	
MOP 60/140-9			140		9	T42RR478	3x400	0,09	1300	0,34	2,5		17	x x A x P	
MOP 60/83-15	83		15	T42RR478	3x400	0,09	1300	0,34	2,5	17	x x B x P				
MOP 45/58-25	10-45		58	25	T42RX479	3x400	0,15	1270	0,53	2,2	17	x x C x P			

**Meaning of complementary numbers in the actuator type number:**

6<sup>th</sup> position – the way of mechanical and electrical connection:

Electrical and mechanical connection	terminal board	connector
connection F07, shape C	1 x x x P	C x x x P
connection F07, shape D	2 x x x P	D x x x P
connection F07, shape E	3 x x x P	E x x x P
connection F10, shape C	4 x x x P	J x x x P
connection F10, shape D	5 x x x P	K x x x P
connection F10, shape E	6 x x x P	L x x x P
connection F10, shape A	7 x x x P	F x x x P
connection F10, shape B1	8 x x x P	H x x x P
connection F07, shape B1	9 x x x P	B x x x P
connection F07, shape A	0 x x x P	A x x x P

7<sup>th</sup> position – the required time of torque blocking:

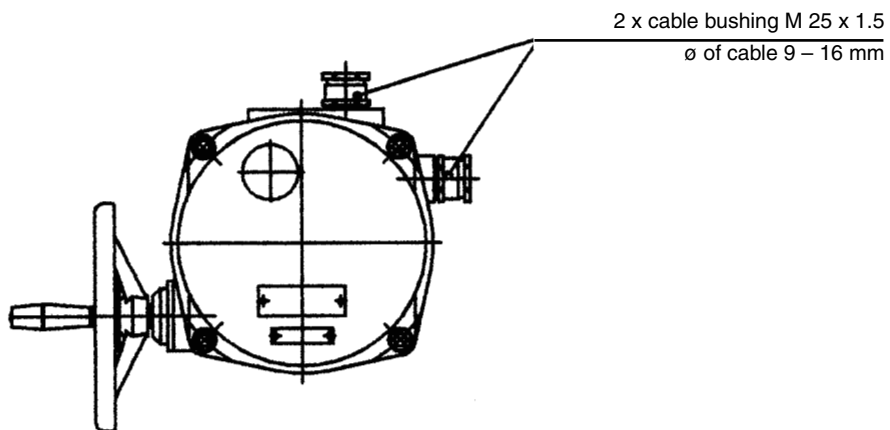
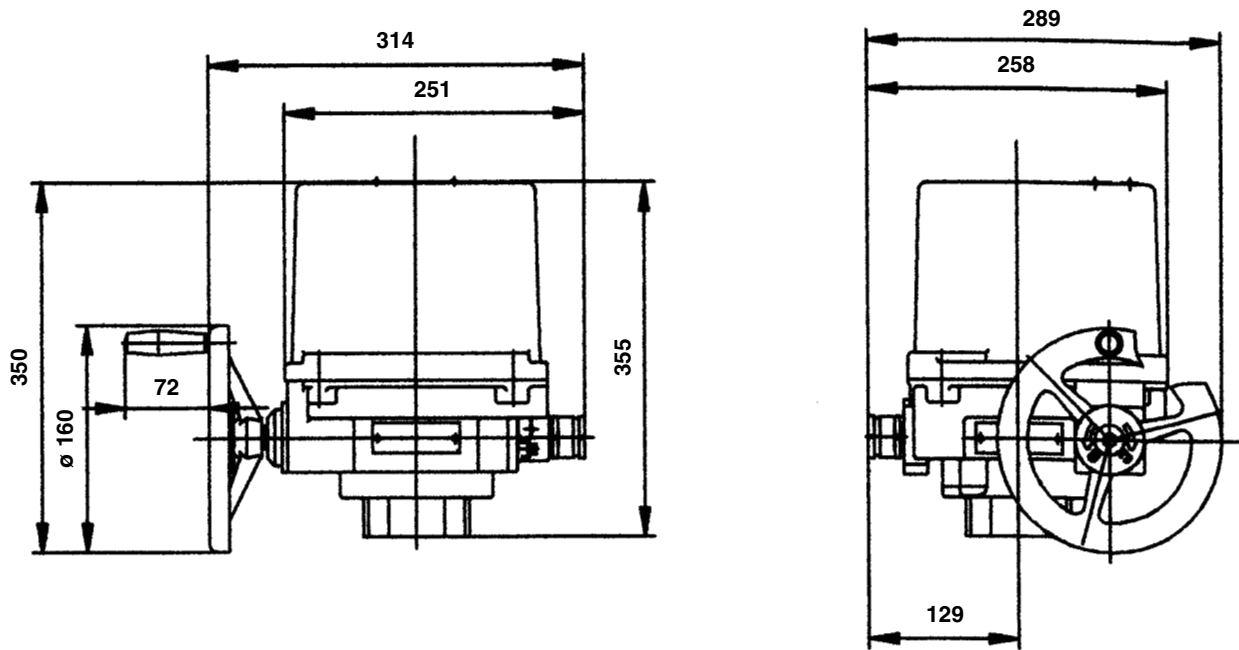
x 0 x x	time of blocking between 1.5 and 3 revolutions of output shaft after reversing
x 1 x x	time of blocking between 0.75 and 1.5 revolutions of output shaft after reversing
x 2 x x	time of blocking between 0.4 and 0.75 revolutions of output shaft after reversing

8<sup>th</sup> position – adjusting speed – see Table 1.

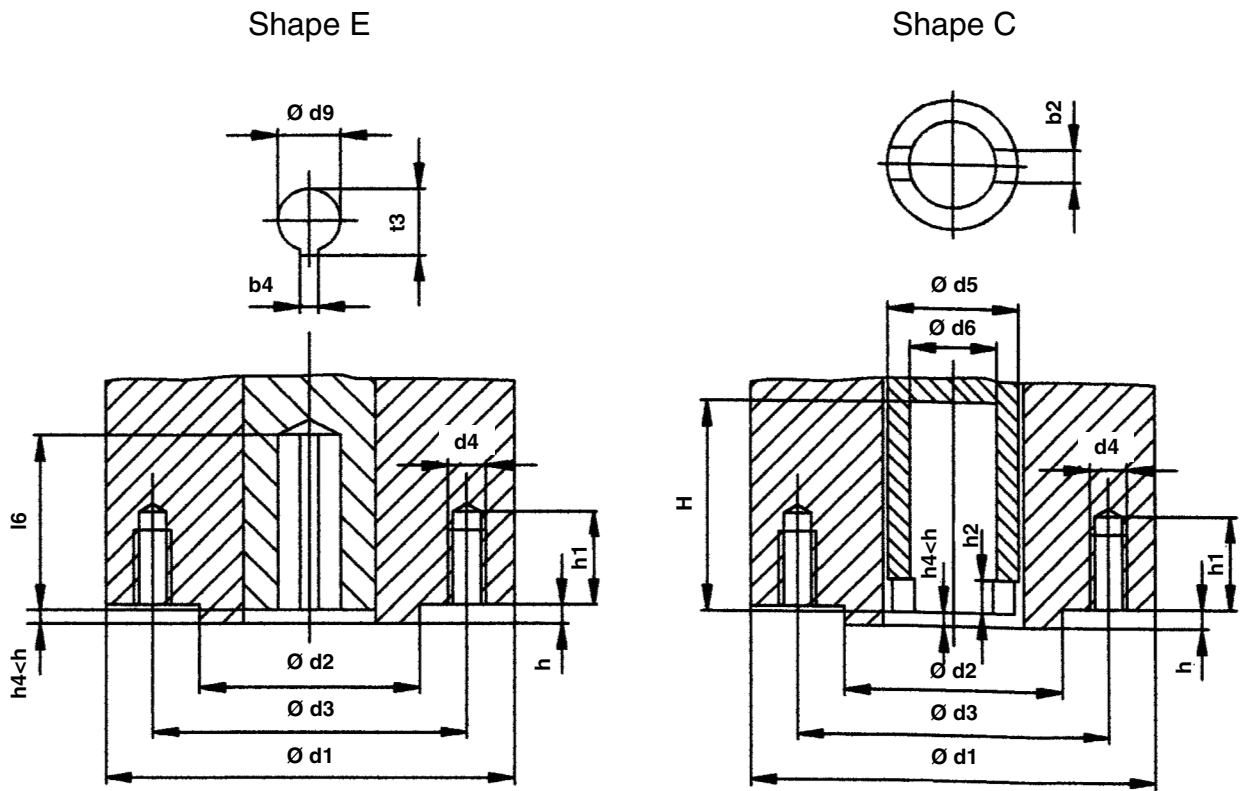
9<sup>th</sup> position – possible use of position transmitter:

	without BMO	with BMO
without position transmitter	x x x 0 P	x x x 4 P
resistance transmitter 1x 100 Ω	x x x 1 P	x x x 5 P
current transmitter CPT 1A	x x x 2 P	x x x 6 P
current transmitter DCPT with feeding source	x x x 3 P	x x x 7 P

Dimensional sketch of actuator **MODACT MOP, Type No. 52 039**



Mechanical connecting dimensions of actuator **MODACT MOP, Type No. 52 039**

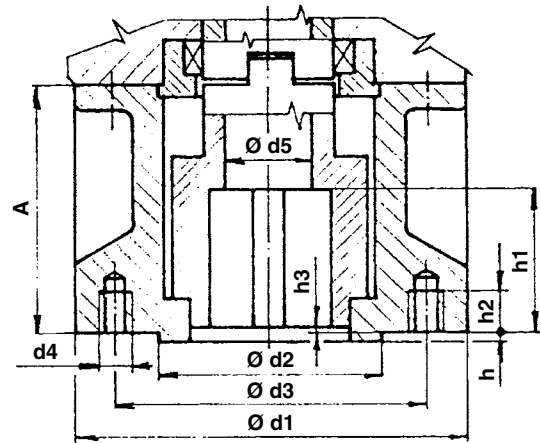
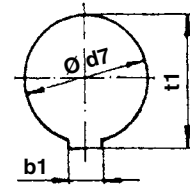
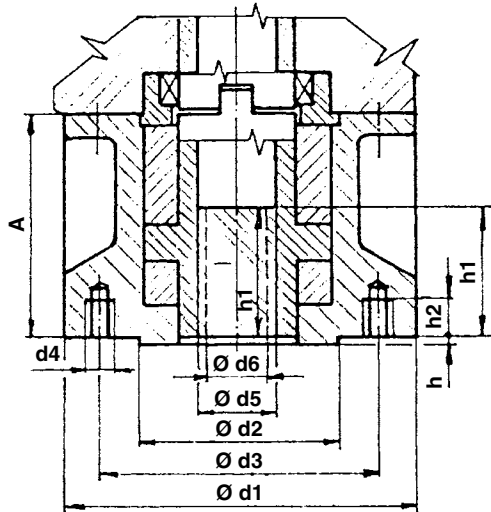


Flange size	ComMOP data for both shapes							Data for shape C					Data for shape E			
	Ø d1	Ø d2f8	Ø d3	d4	Number of threaded holes	h1	h	Ø d5	h2	H	b2H11	Ø d8	Ø d9H8	l6 min	t3	b4Js9
F 07	125	55	70	M8	4	16	3	40	10	125	14	28	16	40	18.1	5
F 10	125	70	102	M10	4	20	3	40	10	125	14	28	20	55	22.5	6

Adapters to actuators **MODACT MOP, Type No. 52 039**

Shape A

Shape B1



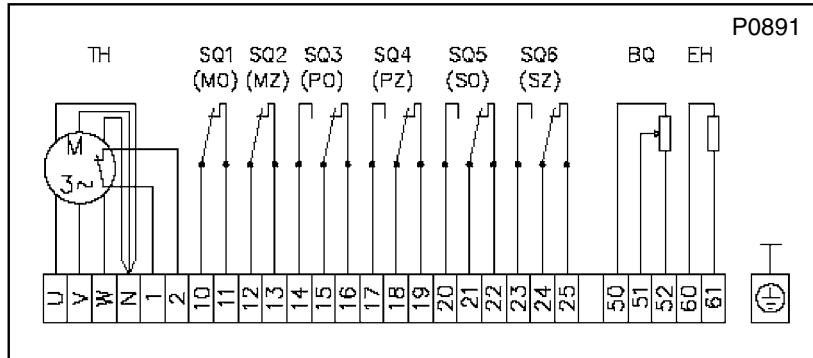
	Dimension	52 039
A, B1 (identical dimensions)	ød1	125
	ød2 f8	70
	ød3	102
	d4	M10
	number of holes d4	4
	h	3
	h2 min	12,5
A	A	63,5
	ød5	30
	ød6 max	26
	h1 max	43,5
	l min	45
B1	A	63,5
	ød5	30
	l1 min	45
	h3 max	3
	b1	12
	ød7 H9	42
	t1	45,3

## Wiring diagrams of **MODACT MOP** electric actuators, **Type No. 52 039**

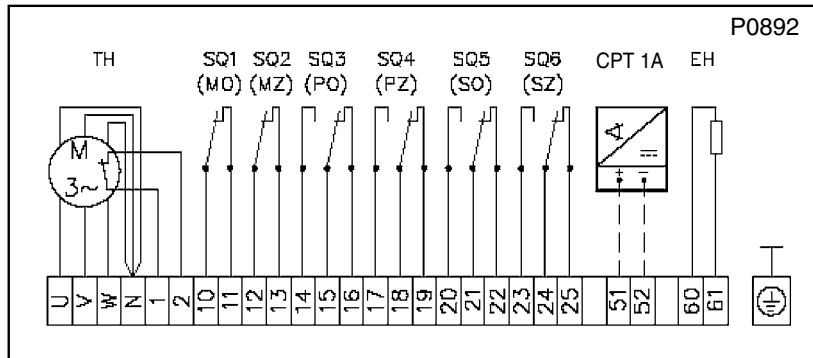
**Legend:**

- |   |                                       |
|---|---------------------------------------|
| SQ1 (MO) – torque-limit switch “open”         | CPT 1Az – current transmitter CPT 1Az |
| SQ2 (MZ) – torque-limit switch “close”        | DCPT – current transmitter DCPT       |
| SQ3 (PO) – position-limit switch “open”       | DCPZ – feeding source for DCPT        |
| SQ4 (PZ) – position-limit switch “close”      | M1~ – one-phase asynchronous motor    |
| SQ5 (SO) – position signalling switch “open”  | M3~ – three-phase asynchronous motor  |
| SQ6 (SZ) – position signalling switch “close” | TH – thermo-contact                   |
| BQ – resistance transmitter 100 ohm           | EH – heating resistance               |

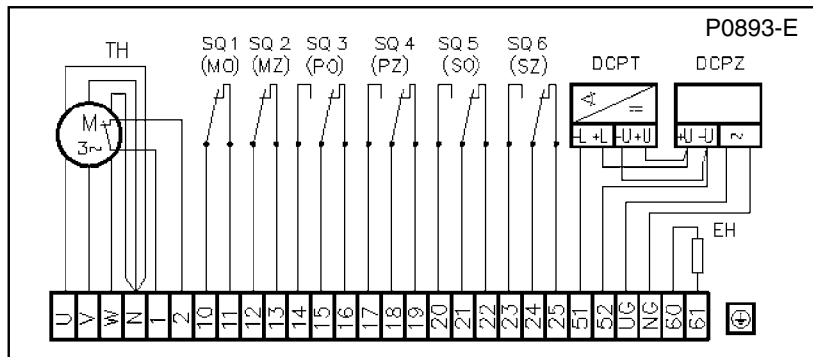
*Position transmitter: resistance 100 ohm*



*Position transmitter: current 4 – 20 mA or without transmitter*



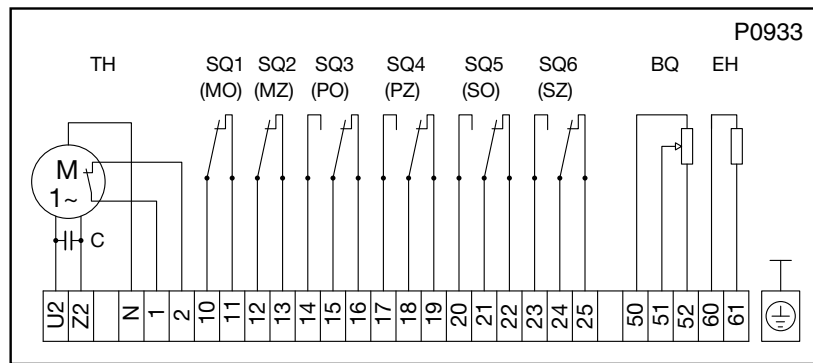
*Position transmitter: current 4 – 20 mA with feeding source*



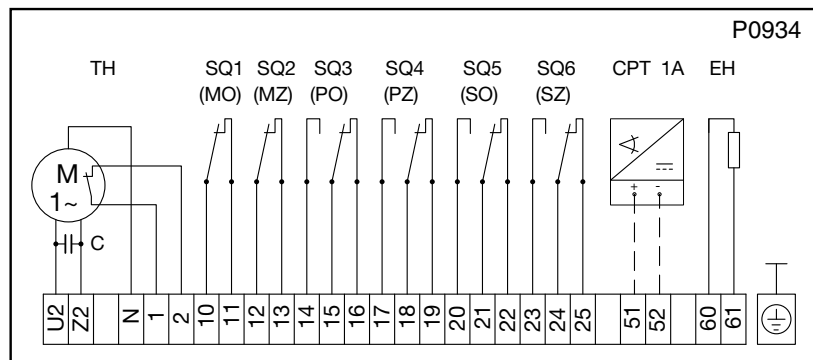
*The micro-switches can be used as single-circuit only. Two voltages of different magnitudes or phases must not be connected to contacts of the same micro-switch. The contacts of micro-switches are drawn in the intermediate position.*

*In the version with current transmitter, the user should ensure connection of two-wire circuit of the current transmitter to electric earth of the linked-up regulator, computer, etc. Connection must be realized just in one point in any part of the circuit outside the electric actuator.*

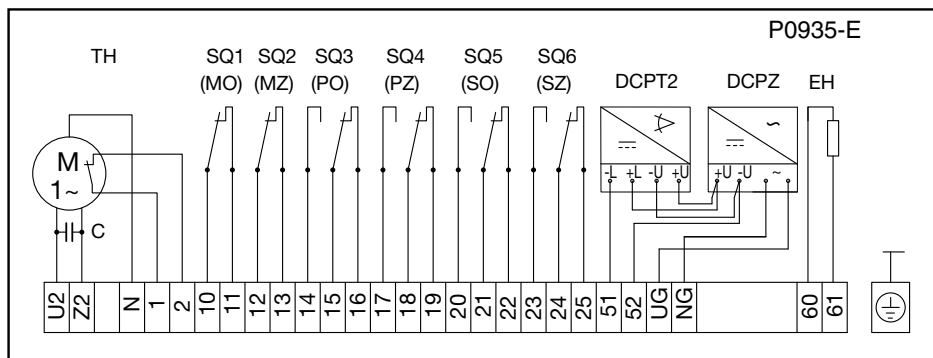
Position transmitter: resistance 100 ohm



Position transmitter: current 4 – 20 mA or without transmitter



Position transmitter: current 4 – 20 mA with feeding source



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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 MOP, MOP, MOPJ, MOPED, MOPED, MOPEDJ**

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





ZPA Pečky, a.s.  
tř. 5. května 166  
289 11 PEČKY, Czech Republic  
[www.zpa-pecky.cz](http://www.zpa-pecky.cz)

tel.: +420 321 785 141-9  
fax: +420 321 785 165  
+420 321 785 167  
e-mail: [zpa@zpa-pecky.cz](mailto:zpa@zpa-pecky.cz)