



**Electric linear thrust actuators
with constant output speed**

MODACT MTP

Type number 52 441



www.zpa-pecky.cz

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

APPLICATION

The **MODACT MTP, t. n. 52 441** actuators are designed for shifting of valves by reversible linear motion in circuits of remote control and automatic regulation. They can also be used for other devices for which they are suitable due to their parameters. Their using in special cases should be discussed with the manufacturer.

OPERATING CONDITIONS, OPERATING POSITION

Operating conditions

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

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

When actuators are to be installed in the working environment with temperature below -10 °C and in the environment with relative humidity above 80 %, it is always necessary to use an anti-condensation heater fitted to the actuator.

Installation of the actuators at a location with incombustible and non-conducting dust is possible only if this has no adverse effect on their function. It is advisable to remove dust whenever the layer of dust becomes as thick as about 1 mm.

Notes:

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

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

Temperature

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

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

Class:

- 1) AC1 – altitude ≤ 2 000 m a.s.l.
- 2) AD7 – occurrence of water - shallow immersion - short-term
- 3) AE6 – occurrence of foreign solid particles - strong dustiness. Thick layers of dust. Fall-out of dust higher than 350 and not more than 1000 mg/m² daily.
- 4) AF2 – occurrence of corrosive or polluting substances is atmospheric. Presence of corrosive polluting substances is significant.
- 5) AG2 – medium mechanical stress. In common industrial processes.
- 6) AH2 – medium vibrations. In common industrial processes.
- 7) AK2 – serious danger of growth of plants or moulds.
- 8) AL2 – serious danger of occurrence of animals (*insects, birds, small animals*)
- 9) AM-2-2 – harmful effects of released stray currents
- 10) AN2 – medium solar radiation. Intensity > 500 and ≤ 700 W/m².
- 11) AP3 – medium seismic effects. Acceleration > 300 Gal ≤ 600 Gal
- 12) BA4 – personal qualification. Instructed staff.
- 13) BC3 – frequent contact of persons with earth potential. Persons are in frequent contact with foreign conductive parts or stand on and conductive support.

Corrosion protection

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

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

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

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

Operating position

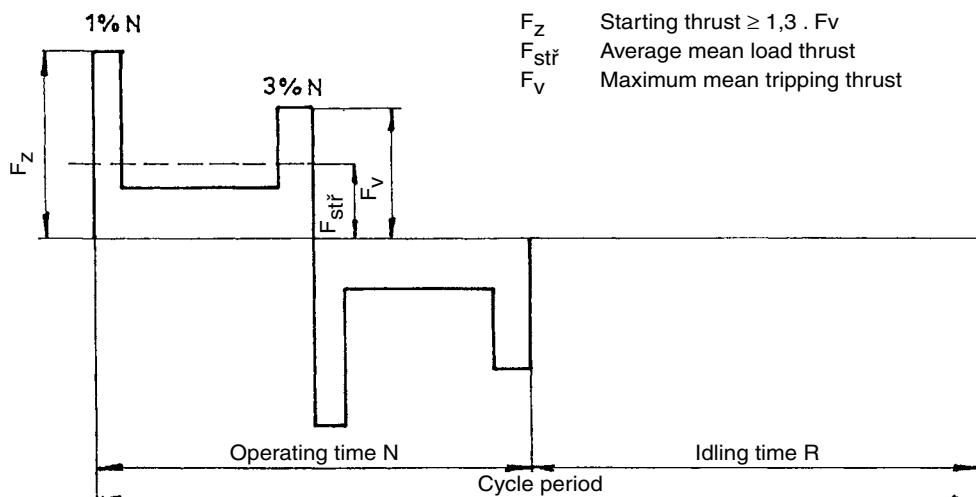
The actuators can be operated in any operating position.

OPERATION MODE, SERVICE LIFE OF ACTUATORS

Operation mode

According to ČSN EN 60 034-1, actuators can be operated in S2 load category (*the course of load is shown in the picture*). The operation time at +50 °C shall be 10 minutes, the average mean load thrust value shall be below or equal to 60 per cent of the maximum tripping thrust F_V . According to ČSN EN 60 034-1, the actuators can also be operated in the S4 mode (*interrupted operation with acceleration intervals*). The load factor $N/N+R$ shall be maximum 25 per cent, the longest operation cycle $N+R$ is 10 minutes. The maximum number of switching actions in automatic control mode is 1200 actions per hour. The average mean load thrust at load factor of 25 per cent and 50 °C shall not exceed 40 per cent of the maximum tripping thrust F_V .

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



Course of working cycle

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

TECHNICAL DATA

Basic technical parameters

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

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

Tripping thrust

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

Starting thrust

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

Self-locking

The actuator is self-locking.

Working stroke

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

Manual control

Manual control is performed by a hand wheel directly (*without a clutch*) and it is also possible when the electric motor is running. By rotating the hand wheel in the clock-wise direction the actuator output pull rod is thrown out (*closes*).

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.

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 thrust*).

The tripping torque can be adjusted within the range shown in Table No. 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 MTP** electric actuators can be supplied without position transmitter 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 % (for a maximum stroke of 120°)
Hysteresis, including gears	≤ 5 % (for a maximum stroke of 120°)
<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 (additional on demand)
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 1Az 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.

ELECTRIC PARAMETERS

External electric connection

The terminal board of the actuator is fitted with terminals allowing one 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.

Actuator internal wiring

The internal wiring diagrams of the **MODACT MTP** 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 the resistance transmitter	500 V, 50 Hz
Circuit of the 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 thrust	±12 % of the maximum value of the range
Adjusting speed	+10 % of the rated value
	-15 % of the rated value (<i>in no-load operation</i>)
Hysteresis of position-limit and signalling switches	max. 1 mm of the output pull-rod displacement
Setting of position-limit and signalling switches	±0.2 mm of the output pull-rod displacement (<i>without the influence of running-down</i>)
Clearance of output part	max. 1 mm

Protection

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

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

If isn't the actuator equipment with overcurrent protection when purchased is needed to ensure that the protection is added externally.

DESCRIPTION

The **MODACT MTP, t. n. 52 441** actuators are based on MODACT MON, t. n. 52 039 actuator series. Moreover, they are desigPED with linear transmission unit for converting rotary motion into linear motion.

An asynchronous motor drives, via a geared countershaft, the sun gear of a epicyclic gear unit enclosed in the supporting actuator box (*power transmission*). In the mechanical power control mode, the crown gear of a planet epicyclic gear unit is held in steady position by a self-locking worm gear drive. Alternatively, the handwheel, connected with the worm allows manual control to be accomplished even during motor operation without any risk of operator's injury.

The output shaft is fixedly coupled to the planet-gear carrier. It is extended to the control box in which all controls of the actuator are concentrated.

The operation of the position-limit switches, the signalling switches and the position transmitter is derived from the rotary motion of the output shaft via drive mechanisms. The operation of the torque-limit switches is derived from the axial displacement of the "floating" worm of the manual control unit, which is sensed and transferred to the control box by means of a lever.

All controls are accessible after removal of the cover of the actuator.

Table 1 – Electric actuators MODACT MTP
 – basic technical parameters, version

Basic electric outfit: 2 torque-limit switches MO, MZ 2 position-limit switches PO, PZ 2 signalling switches SO, SZ 1 anti-condensation heaters 1 three-phase asynchronous electric motor Auxiliary electric outfit: (according to customer's wish) 1 resistance transmitter 1 x 100 ohm 1 current transmitter CPT 1Az 1 current transmitter DCPT with supply source 1 block of local control																
BASIC TECHNICAL PARAMETERS:																
Type	Range of tripping torque [kN]	Engage-ment force [kN]	Shifting speed [mm/min]	Stroke [mm]	Electric motor						Weight [kg]	Type number				
					Type	Output [W]	Speed [1/min]	I _n (400 V) [A]	I _z /I _n	Voltage [V]		basic 12 345	additional 6 7 8 9			
MTP 15	5 – 15	19	45	10 – 100	T42RL477	50	1350	0,24	2	3x400	22	52	441	x x 0 x P		
			75		T42RR478	90	1300	0,34	2,5	3x400				x x 1 x P		
			125		T42RX479	150	1270	0,53	2,2	3x400				x x 2 x P		
			200		T42RX479	150	1270	0,53	2,2	3x400				x x 3 x P		
	5 – 10	13	45		J42RT502	100	1370	0,8	1,7	1x230		x x 5 x P				
			75		J42RT502	100	1370	0,8	1,7	1x230		x x 6 x P				
			125		J42RT502	100	1370	0,8	1,7	1x230		x x 7 x P				
			45		T42RR478	90	1300	0,34	2,5	3x400		x x 8 x P				
MTP 25	15 – 25	33	75	T42RR478	90	1300	0,34	2,5	3x400	x x 9 x P						
			45	J42RT502	100	1370	0,8	1,7	1x230	x x A x P						
			Mechanical connection – with terminal board for the pillar pitch A = 160 mm or B = 150 mm (+ designation at 7 th place acc. Table 2)											6 x x x P		
			Mechanical connection – with terminal board for the pillar pitch A = 132 mm or B = 100 mm (+ designation at 7 th place acc. Table 2)											1 x x x P		
Mechanical connection – with connector for the pillar pitch A = 160 mm or B = 150 mm (+ designation at 7 th place acc. Table 2)											7 x x x P					
Mechanical connection – with connector for the pillar pitch A = 132 mm or B = 100 mm (+ designation at 7 th place acc. Table 2)											2 x x x P					
CONNECTING DIMENSIONS																
T. No. 52 441.xxxxP (Table No. 2)																
Position transmitter (without block of local control and position regulator)		current transmitter CPT 1Az									x x x 0 P					
		current transmitter DCPT with source									x x x 1 P					
		resistance transmitter 1 x 100 ohm									x x x 2 P					
		without position transmitter									x x x 3 P					
Block of local control											Transmitter 1 x 100 Ω	Current transmitter				
		with block of local control									x x x 4 P	x x x A P				
		with block of local control with DCPT + source										x x x D P				
		with block of local control without transmitter									x x x 5 P					
Note::																
1) In case the customer requires version without torque blocking the last position of the type number shall contain the letter M, e.g. 52 441.6211M (actuators in design with convertor are not at disposal).																

Table 2 – Connecting dimensions

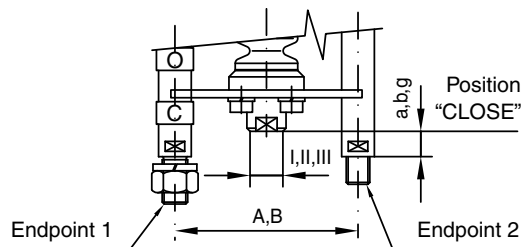
– specification of the 7th place of the Type No. 52 441.xxxx

Design spacing of columns A (160 or 132 mm)	Character on 7th place
Aa1I	0
Aa1II	1
Aa1III	2
Aa2I	3
Aa2II	4
Aa2III	5
Ab1I	6
Ab1II	7
Ab1III	8
Ab2I	9
Ab2II	A
Ab2III	B

Design spacing of columns B (150 or 100 mm)	Character on 7th place
Ba1I	C
Ba1II	D
Ba1III	E
Ba2I	F
Ba2II	G
Ba2III	H
Bb1I	I
Bb1II	J
Bb1III	K
Bb2I	L
Bb2II	M
Bb2III	P
Bg2I	R

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

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



Spacing of columns	A	160 or 132 mm		
	B	150 or 100 mm		
Position "Closed"	a	30 mm	Long columns c	see table "Design variants" Fig. 1 and 2
	b	74 mm	Long columns d	
	g	130 mm	Long columns h	
Thread of coupling	I	M20 x 1,5		
	II	M16 x 1,5		
	III	M10 x 1		

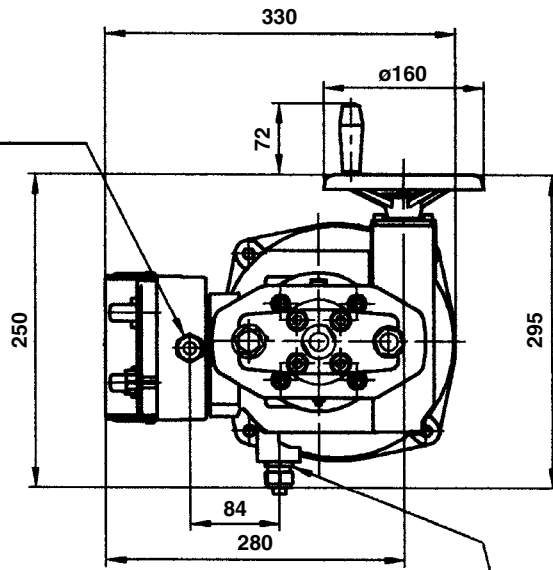
Dimensional sketch of **MODACT MTP 15** electric actuator,
Type No. 52 441 (the pillar pitch 132 and 100 mm)

PILLAR VERSION 1
PILLAR VERSION 2
Type No. 52441 xxxx

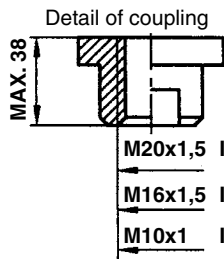
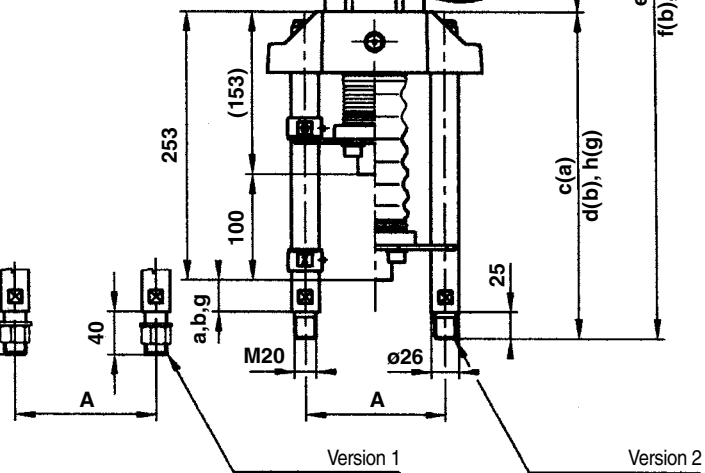
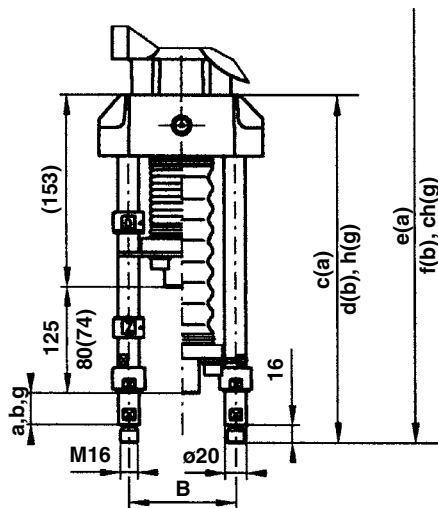
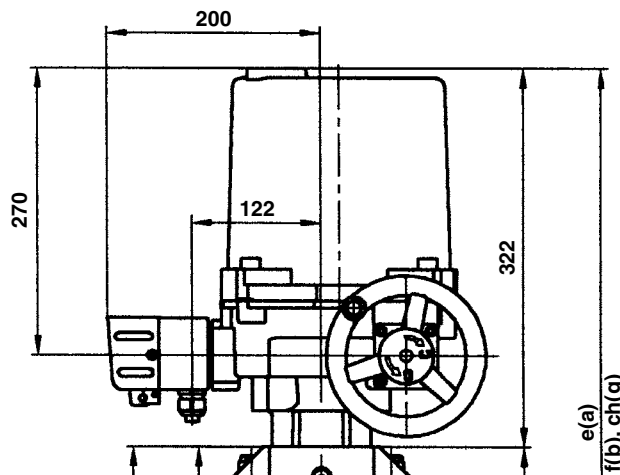
Version 1	
A	132
a	30
b	74
g	130
c (a)	323
d (b)	367
h (g)	423
e (a)	645
f (b)	689
ch (g)	745

Version 2		
A	132	
B		100
a	30	30
b	74	74
g	130	
c (a)	308	327
d (b)	352	327
h (g)	408	
e (a)	630	649
f (b)	674	649
ch (g)	730	

2x cable bushing M20 x 1,5
 Cable ø 10 – 14 mm



2x cable bushing M25 x 1,5 Cable ø 6 – 16 mm



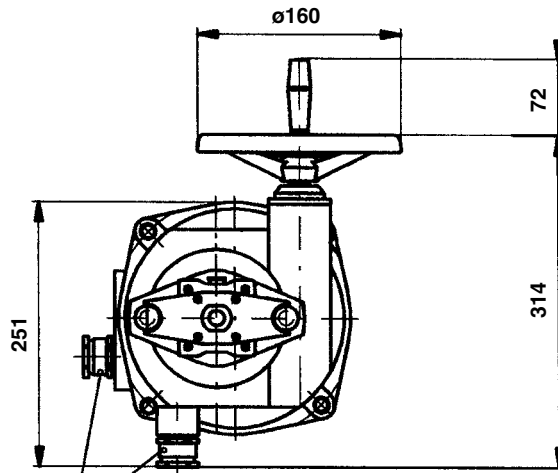
After agreement with the manufacturer

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

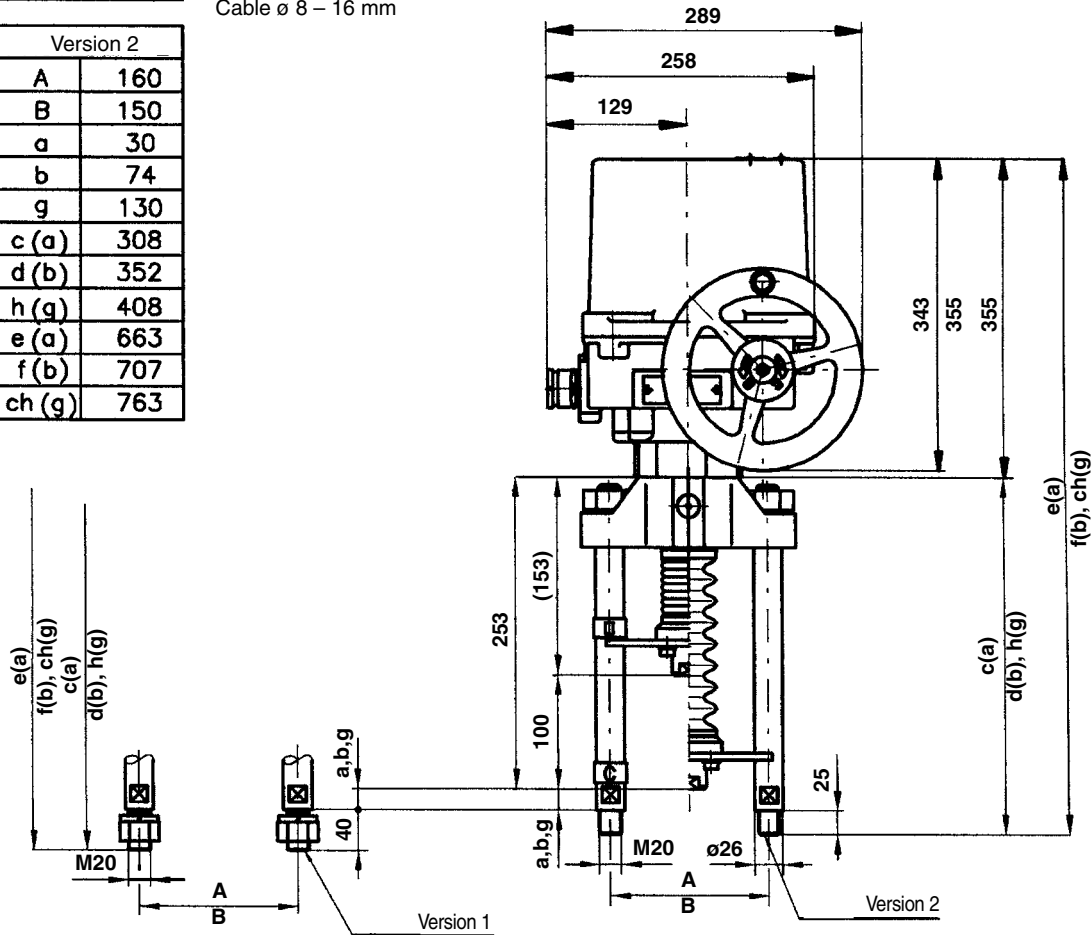
PILLAR VERSION 1
PILLAR VERSION 2
Type No. 52441 xxxx

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

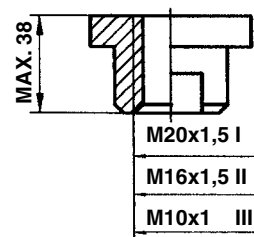
Version 2	
A	160
B	150
a	30
b	74
g	130
c (a)	308
d (b)	352
h (g)	408
e (a)	663
f (b)	707
ch (g)	763



2x Cable bushing M25 x 1,5
Cable \varnothing 8 – 16 mm



Detail of coupling

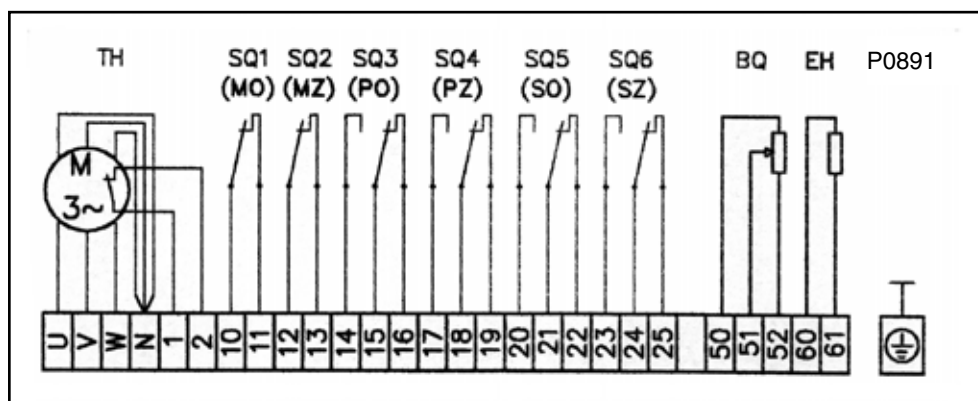


Diagrams of internal electric wiring of actuators **MODACT MTP, Type No. 52 441**

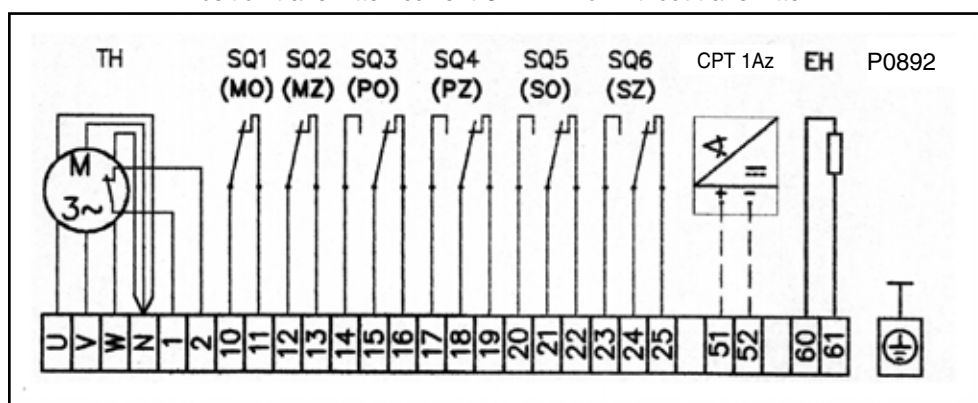
Legend:

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

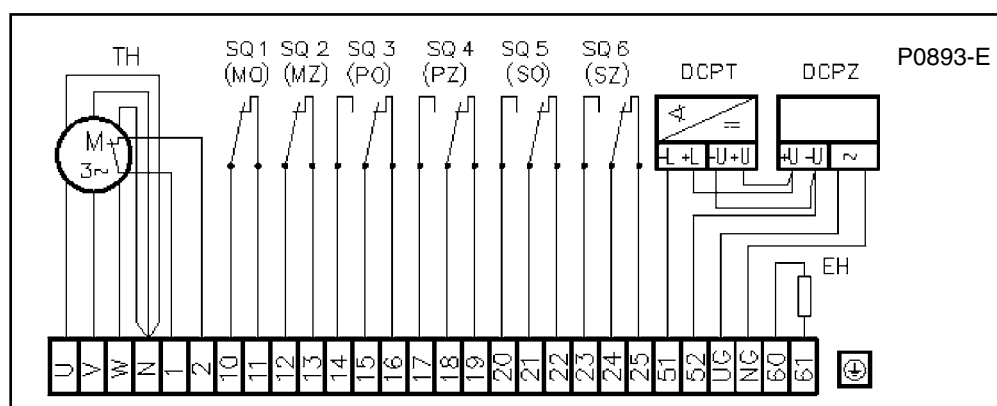
Position transmitter: potentiometer 100 ohm



Position transmitter: current CPT 1Az or without transmitter

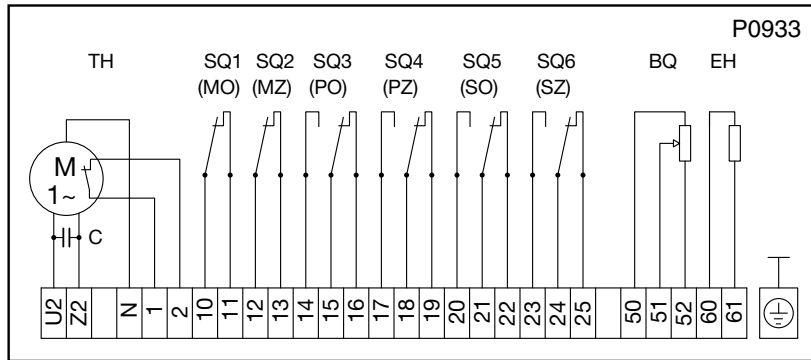


Position transmitter: current DCPT with feeding source

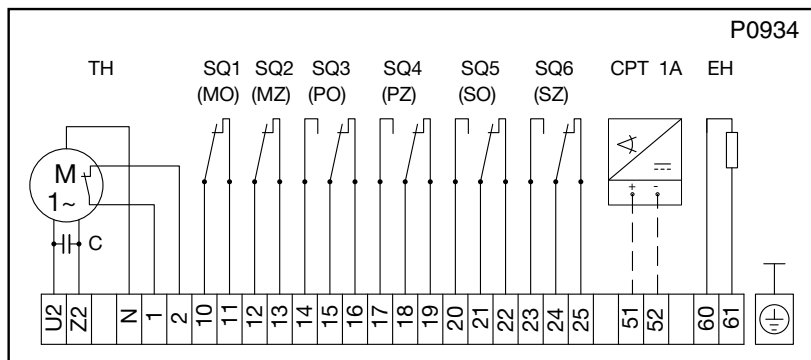


The micro-switches can only be used as single-circuit. Two voltages of different magnitudes or phases must not be connected to contacts of the same micro-switch. The contacts of micro-switches are drawn in the intermediate position. In the version with current transmitter, the user should ensure connection 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.

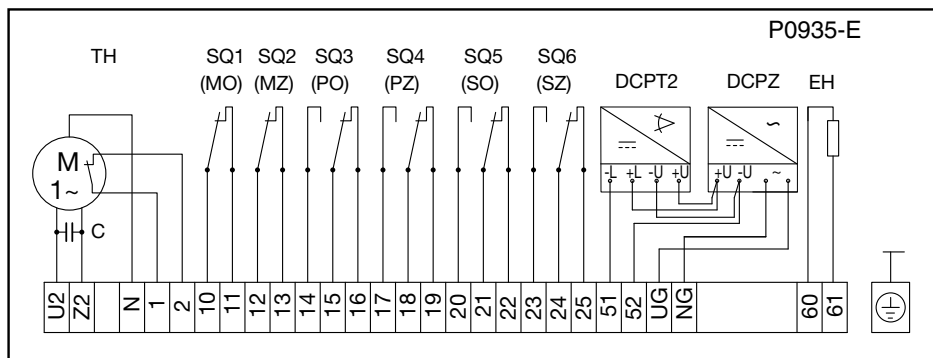
Position transmitter: potentiometer 100 ohm



Position transmitter: current CPT 1Az or without transmitter



Position transmitter: current DCPT with feeding source



The micro-switches can only be used as single-circuit. 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.



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

SURVEY OF PRODUCED ACTUATORS

KP MINI, KP MIDI

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

MODACT MOK, MOKED, MOKP Ex, MOKPED Ex

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

MODACT MOKA

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

MODACT MON, MOP, MONJ, MONED, MOPED, MONEDJ

Electric rotary multi-turn actuators

MODACT MO EEX, MOED EEX

Explosion proof electric multi-turn actuators

MODACT MOA

Electric multi-turn actuators for nuclear power stations application outside containment

MODACT MOA OC

Electric multi-turn actuators for nuclear power stations application inside containment

MODACT MPR VARIANT

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

MODACT MPS, MPSP, MPSED, MPSPED

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

MODACT MTN, MTP, MTNED, MTPED

Electric linear thrust actuators with a constant output speed

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



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