



## APPLICATION

- Servomotors are designed for adjusting control elements (e.g. mixing valves with revolving movement, ball valves, flange-less stop flanges, flanges of pneumatic equipment, etc.), for which their properties are suitable.

## DESCRIPTION

Servomotors are revolving, single-revolution, with constant control speed. The small motor and the self-locking gear mechanism are stored in a box from steel sheet. Various connecting parts and couplings required for the connection with the controlled equipment are attached to this box and the output shaft. Wires are brought in through sealing outlets.

The control can be ensured either with a three-point connection or a position control, signal 0 to 1V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA. It transfers the input analogue signal to the corresponding position of the servomotor. The position is sensed by the resistance transmitter. If the controlled equipment is stopped forcefully during the revolving movement, the drive is disconnected and failure signalling is activated. This period can be adjusted.

The input signal can be changed with interconnected pieces, limit positions can be adjusted by means of push-buttons or by means of a computer. It can also be used for adjusting the upper and the lower insensitivity zones, changing the type of operation of the actuators in case of exceeding the adjusted range by 5 % (open, close, without response, movement to the end position in the direction of the signal).

In addition to position switches and manual control, they can be equipped with:

- Two signalling switches, adjustable within the whole range of the working stroke;
- Resistance position transmitter 100 (one or two);
- Converter with signal 4 to 20 mA for two-wire connection to measuring loop (power supply directly from measured signal);
- Fuse that will ensure, in case of a forced stop of the controlled equipment during the revolving movement, disconnecting the drive and signalling failure for the period exceeding the changeover time. The initial status is switching the control signal on or off and the period for switching off is calculated from the initial status (it applies to the three-point control).

## TECHNICAL DATA

The servomotor is designed pursuant to ČSN EN 61010-1 as electrical equipment of protection class I for the application in networks with the category of overvoltage in the installation II (for AC 230 V), overvoltage in installation III (for AC 24 V) and pollution grade 2.

The servomotor has internal and external protective clamps, which are mutually interconnected.

The servomotor has no fuse of mains power supply and it shall be secured with an external fuse pursuant to ČSN EN 60127-2 ed.2.

### Electric strength

Servomotor with supply voltage AC 230 V:

- Circuit of power supply and signalling switches against protective clamp: AC 1500 V
- Circuit of power supply and signalling switches against circuit of transmitter: AC 2300 V
- Circuit of transmitter against protective clamp: AC 500 V

Servomotor with supply voltage AC 24 V:

- Circuit of power supply and signalling switches against circuit of transmitter: AC 740 V
- Circuit of power supply and signalling switches against protective clamp: AC 500 V
- Circuit of transmitter against protective clamp: AC 500 V

**Electric insulation resistance:** min. 20 M

### Power supply

Type of supply mains: 1 / N / PE AC 230 V, 50 Hz or AC 24 V, 50 Hz

Tolerance of supply voltage:  $\pm 10\%$

Tolerance of mains frequency: 48 to 52 Hz

Power input: max. 18 VA

The motor is protected against overload with a thermal fuse, which trips after the temperature of approx. 130  $^{\circ}\text{C}$  is reached

**Ingress protection** pursuant to ČSN EN 60529: IP 65

### Operation position:

Discretionary, the position with vertical axis of the outlet shaft is considered the basic one. However, positioning below the controlled equipment is not recommended.

**Weight:** approx. 5.5 kg or 7 kg pursuant to design

## OPERATION CONDITIONS

The environment is defined by the group of parameters and their severity grades IE 36 pursuant to ČSN EN 60721-3-3 and the following operation conditions.

**Ambient temperature:** -25 to 55  $^{\circ}\text{C}$

In case of operation at temperatures below  $-15^{\circ}\text{C}$  and in wet conditions, a resistor shall be connected, even if the servomotor is idle. The resistor is not a part of the equipment. The manufacturer shall be notified of such operation; it will ensure required modifications for a trouble-free operation of the machine.

### Relative ambient humidity:

10 to 100 % with condensation, with upper level of water content 29 g  $\text{H}_2\text{O}/\text{kg}$  of dry air

**Atmospheric pressure:** 70 to 106 kPa

### Vibrations:

- Frequency range [Hz] 10 to 150
- Drift amplitude [mm] 0.15
- Acceleration amplitude [ $\text{m}\cdot\text{s}^{-2}$ ] 20

## METROLOGICAL DATA

**Accuracy of nominal moment and changeover time:**

10 %

**Travel of shaft with load:** max. 0.5 $^{\circ}$

**Shaft clearance at max. 10 % load:** max. 1.5 $^{\circ}$

**Time interval for reversing:** min. 50 ms (without load)

**Load factor:** pursuant to ČSN EN 60034-1+A1+A2 ed.2

- Interrupted operation S4 - 80 %, 100 to 1200 cycles / hour

**Hysteresis of signalling switches:** max. 3 $^{\circ}$

**Rating of position switches and signalling switches:** AC 250 V / 5A resistance load

3A inductive load

**Resistance transmitter parameters** (related to max. stroke):

- Total resistance 100  $\pm 3$
- Residue resistance in position "C" max. 5
- Residue resistance in position "O" max. 5
- Non-linearity max.  $\pm 1\%$
- Hysteresis max.  $\pm 1\%$
- Rating max. 120 mA
- Power supply max. 12 V

**Resistance transmitter parameters with converter**

**4 to 20 mA** (related to max. stroke):

Power supply: DC 12 to 45 V from safe source PELV or SELV

Load resistance:  $R_z = (U-12)/0.02 [\Omega]$

Settlement period after switching power supply: 30 min.

Output signal: 4 to 20 mA DC

20 to 4 mA DC

Ripple: max. 5 %

Non-linearity: max.  $\pm 1\%$

Hysteresis: max.  $\pm 1\%$

**Position actuator parameters:**

- Power supply AC 230 V  
AC 24 V
- Input signal with maximum tolerance  $\pm 5\%$   
It can be changed by means of interconnecting pieces
  - 0 to 1 V / 10 k
  - 0 to 10 V / 100 k
  - 0 to 20 mA / 100
  - 4 to 20 mA / 100
- Output contact relay – 250 V, 1 A, it signals exceeding moment, signal failure
- Action in case of failure It goes to the end position in the direction of the signal (other possibilities: open, close, without response)
- Switch-off time 150 s  $\pm 10\%$  (2.5 min.) - possible adjustment 5 to 250 s
- Operation restart after switching the device on and off
- Upper insensitivity zone 2 % (possible adjustment 2 to 5 %)
- Lower insensitivity zone 2 % (possible adjustment 2 to 5 %)
- Course of movement linear

Possible modifications of parameters – refer to Adjustment of position control (pages 4 and 5)

**Moment fuse parameters (for three-point control):**

- Input signal for open or closed AC 230 V or AC 24 V
- Output relay for failure signalling  $I_{max}$  1 A
- Response time delay of switch on/off max. 65 ms
- Failure time time without signal, when motor is not switched off, max. 65 ms
- Switch-off time 150 s  $\pm 10\%$  (2.5 min.)
- Operation restart change of status of input signal for period exceeding 65 ms

**ELECTROMAGNETIC COMPATIBILITY (EMC)**

Pursuant to ČSN EN 61326-1

- Values of interfering voltage, pursuant to ČSN EN 55011: class A, group 1
- Electrostatic discharges, pursuant to ČSN EN 61000-4-2: 4 kV contact, 8 kV by air, functional criterion 2
- External electro-magnetic field, pursuant to ČSN EN 61000-4-3 ed.2: 10 V/m 80-1000 MHz, 80% AM 1kHz, functional criterion 1
- Fast transient phenomena, pursuant to ČSN EN 61000-4-4: 2 kV power supply, 1 kV Sig. I/O, functional criterion 2
- Surge impulse pursuant to ČSN EN 61000-4-5: 1 kV power supply symmetrical and signal I/O, functional criterion 2  
2 kV power supply non-symmetrical, functional criterion 2
- Induced high-frequency field pursuant to ČSN EN 61000-4-6: 3 V, 0.15 – 80 MHz, functional criterion 1
- Magnetic field of mains frequency, pursuant to ČSN EN 61000-4-8: 30 A/m, functional criterion 1
- Voltage drop of power supply pursuant to ČSN EN 61000-4-11: 30 %, operating period 10 ms functional criterion 1  
60 %, operating period 100 ms functional criterion 3  
60 %, operating period 1000 ms functional criterion 3  
>95 %, operating period 5000 ms functional criterion 3

**DESIGNATION****Data servomotor label:**

- Trade mark of the manufacturer
- Made in Czech Republic
- Product number
- Manufacturing number
- Nominal voltage, frequency and power input
- Changeover speed
- Nominal moment Nm
- Nominal voltage and current of switches
- Ingress protection grade
- Weight
- CE mark

A connecting scheme is in the cover of the servomotor.

**CERTIFICATION**

- Declaration of Conformity ES - 676000

**DELIVERY**

The servomotors are delivered with installed lever in the interim position. The position switches are adjusted to 90° or 120° pursuant to the working stroke with limit positions O and C pursuant to Figure 1.

Signalling switches are adjusted to approx. 5° before limit positions.

The design for ball cocks GIACOMINI and flange-less stop flaps with coupling in position "O".

Every delivery includes, unless agreed otherwise with the customer:

- Delivery note
- Products pursuant to the purchase order
- Accessories pursuant to ordering table
- The following accompanying technical documentation in Czech:
  - Product quality and completeness certificate (it declares compliance with Technical conditions and it also serves as the warranty certificate)
  - Test report
  - Installation, operation and maintenance manual

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product:

- EC Declaration of Conformity
- Other documents

**RELIABILITY**

The medium service life is 6 years, however 3,000 operation cycles as a maximum for servomotors for remote control and 250,000 cycles of servomotors for automatic control with service time specified in technical documentation for any specific product.

**PACKING**

The products are packed pursuant to controlled packing regulations identified by a technological procedure for the relevant product. The servomotors are delivered in the packing ensuring resistance against the impacts of temperature effects pursuant to ČSN EN 60654-1 and mechanical effects pursuant to ČSN IEC 654-3.

**TRANSPORT**

The servomotors may be transported on conditions corresponding to the set of combinations of the classes IE 21 pursuant to ČSN EN 60721-3-2. The servomotors may be transported by rail or vehicles. In case of air transport, transport in heated and hermetically closed parts of the airplane shall only be considered.

**STORAGE**

The servomotors may be stored in the transport package on conditions corresponding to the set of combinations of classes IE 11 pursuant to ČSN EN 60721-3-1. The products may be stored for max. 12 months. After this period, control piece tests shall be realized pursuant to TP.

**PLACING AN ORDER**

The purchase order shall specify

- Name
- Product ordering number
- Specifications (if any)
- Special design after an agreement with the manufacturer
- Number of pieces

**PURCHASE ORDER EXAMPLE**

Electric tie-rod servomotor ZEPAROT 2  
676 14 / OP1, S1, R1  
5 pcs

**DESIGN OF SERVOMOTOR**

SPECIFICATIONS			ORDERING NUMBER	
Supply voltage	Nominal moment Nm	Changeover time s/90°	676	xx
AC 230V 50/60Hz	25	15		11
	60	30		12
	100	60		13
	125	90		14
AC 24V 50/60Hz	25	15		21
	60	30		22
	100	60		23
	125	90		24

Basic design: three-point position control, manual control, end position switches KPO and KPZ, working angle 90 ° without transmitter and connecting elements (on the basis of an agreement, the working angle may be up to 300°).

**ADDITIONAL EQUIPMENT**

CODE	NAME	Connection pursuant to Figure
MP1	Moment fuse - without OP1	
OP1	Position control 0 to 1 V, 0 to 10 V, 0(4) to 20 mA - without R2	
ANP1	Adapter with adjustment programme for servomotors with OP1	
S1	Signalling switches SO and SZ	
U12	Working angle 120 °	
R1	1 resistance transmitter 100	
R2	2 resistance transmitters 100 - without OP1 and I1	
I1	Converter 4 to 20 mA	
P2	Angle bar with lever	Figure1
P31	Stop flaps ABO 14x16	Figure2
P32	Stop flaps ABO 17x22	Figure2
P33	Stop flaps FL 12 (square)	Figure2
P34	Stop flaps EBRO 12 (square)	Figure2
P35	Stop flaps FL,EBRO,IBC 16 (square)	Figure2
P36	Stop flaps SČA 14 (square)	Figure2
P37	Stop flaps SČA 17 (square)	Figure2
P38	Stop flaps 14 (square)	Figure2
RK2	Manual control wrench on cover	

The specification code shall be identified behind the ordering number.

**SERVOMOTOR ACCESSORIES**

FOR DESIGN pursuant to Figure	NAME	Number of pieces
All	Manual control wrench, drawing number 241131	1 pc
Pursuant to Figure 2	Label, drawing number 152053	1 pc
	Screw ČSN EN ISO 4762 – M8 x 25 – 8.8	4 pcs
	Nut ČSN EN ISO 4034 – M8 – 5	4 pcs
	Washer 8 ČSN 02 1740	4 pcs
	Label, drawing number 152064	1 pc
	Screw ČSN EN ISO 4762 – M6 x 25 – 8.8	4 pcs
	Nut ČSN EN ISO 4034 – M6 - 5	4 pcs
	Washer 6 ČSN 02 1740	4 pcs

**INSTALLATION AND CONNECTION**

The servomotor shall be connected to the controlled equipment by means of an angle bar or a support. The type of connection is evident from the dimensional drawing in figures 1 to 2.

**Connection of servomotor to the controlled equipment  
Design P2 pursuant to Figure 1:**

Connect the servomotor by means of the angle bar to the controlled flap with two screws.

Now adjust the lever of the servomotor and the flap to the same position C (closed).

**Design P31 to P38 pursuant to Figure 2:**

The servomotor is adjusted by the manufacturer to the position OPEN. Put it on the open flap so that the square of the spindle falls into the recess in the coupling. With the use of four screws with nuts and washers, connect the label marking the position, together with the drive, to the flap (screws, nuts, washers and label form a part of accessories).

The cover of the servomotor is removed after releasing two nuts. After the removal of the cover, the terminal board for the connection of supply voltage, signalling switches and resistance position transmitter or converter 4 to 20 mA is accessible.

Connect the servomotor with a cable with max. 12 mm to supply voltage after mechanical connection to the controlled equipment and after adjustment. Realize the connection with insulated Cu wires with max. cross section of 1.5 mm<sup>2</sup> with total insulation resistance of min. 10 MΩ. The installation at the servomotor shall include a switch or a circuit-breaker enabling the disconnection of the device from supply mains. After the connection of wires of the outlet, seal it duly with a suitable material (e.g. Colorplast). The connection scheme is illustrated in Figure 3, 4 and 5.

**The output shaft is adjusted as follows:**

By means of manual control, after removing the cover or tilting the cap on the cover as follows:

- On the shaft with a pin apply the wrench of manual control from the accessories and push in the direction into the cover, which results in disconnecting the gear from the motor. During the adjustment, the toothed wheel shall be pressed. After the start of operation of the machine, the wheel returns into gear automatically.

We deliver a manual control wrench with index RK2 that is connected in a special holder directly on the cover. By turning by 90°, you can remove the holder, apply the wrench on the shaft with the pin and press in the direction into the cover. It results in disconnecting the gear from the motor. During the adjustment, the toothed wheel shall be pressed. After the start of operation of the machine, the wheel returns into gear automatically.

To turn the output shaft by 90°, approx. 1 full turn of manual control is required.

**Adjustment of end switches:**

When changing the position "CLOSED" and "OPEN", the cams controlling these switches shall be adjusted as follows:

- Release the nut M8 and the screws securing the position of the cams
- Now adjust the cams controlling these switches so as the switches switch in the required position "CLOSED" a "OPEN" (working angle 90° or 120°)
- Tighten the nut and the screws again

**Adjustment of signalling switches**

The servomotor is adjusted gradually to the positions to be signalled. Release the nut M8 and the screws securing the position of the cams, adjust the cams controlling these switches so as the switches switch in the required position. Tighten the nut and the screws again.

**Adjustment of transmitter**

The transmitter is adjusted by the manufacturer to the working angle 90° or 120° pursuant to the purchase order, including values of residue resistance in end limits positions. When changing the positions "CLOSED" and "OPEN", the transmitter shall be adjusted as follows:

- Adjust the servomotor to the required position e.g. "CLOSED" and check the value of residue resistance in this position. It shall comply with the parameters of the resistance transmitter.

- Then adjust the servomotor by 90° or 120° to the position "OPEN" and check the value of residue resistance again. It shall comply with the parameters.

**Adjustment of resistance transmitter with converter 4 to 20 mA**

The converter is adjusted by the manufacturer to the working angle pursuant to the purchase order. When changing the positions "C" and "O", the procedure described below shall be followed:

- Connect milliammeter with accuracy 0.2 to the outlet from the sensor. After connecting supply voltage, you need to allow temperature settlement of the sensor. After the settlement, the outlet current shall be 4 mA ± 80µA at the beginning of the shaft position and 20 mA ± 80µA at the end. Otherwise, adjust the initial and end positions of the shaft gradually and the corresponding currents 4 and 20 mA with the use of trimmers; it is necessary to consider the fact that values influence each other.
- Repeat the adjustment until current at the beginning of the shaft position is 4 mA ± 80 µA and 20 mA ± 80 µA at the end or measure the current value at initial (I<sub>L0</sub>) and end (I<sub>H0</sub>) rotations of the shaft and calculate the new value I<sub>H1</sub> for the end adjustment with the use of the formula (\*).
- After the adjustment of this value with a trimmer "20 mA", turn the shaft to the initial position and adjust the value 4 mA with a trimmer "4 mA". Check the adjustment afterwards. Unless the current is 4 mA ± 80µA at the beginning of the shaft position and 20 mA ± 80µA at the end, repeat the adjustment.

$$*) I_{H1} = 16x I_{H0} / (I_{H0} - I_{L0})$$

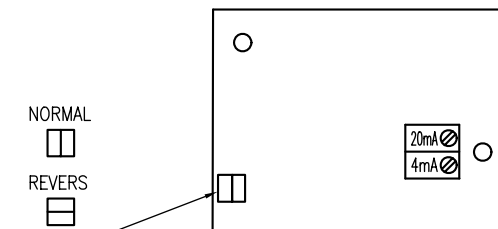
I<sub>L0</sub>.. Value of current at the initial rotation of shaft

I<sub>H0</sub>.. Value of current at the end rotation of shaft

I<sub>H1</sub>.. Calculated value of current for end rotation of shaft

**Adjustment of reversing**

Normal direction of travel is set-up at the factory, i.e. that current is decreased with revolving clockwise when the device is viewed from the side of electronics. When adjusting the opposite direction, remove the interconnecting pieces, turn them by 90° and insert them back, refer to the figure. Then inspect or, as the case may be, adjust output current in both positions.



**Adjustment of position control**

The control is adjusted by the manufacturer to the working angle and input signal pursuant to the purchase order, switch-off time 150 s and movement to the end position in the direction of the signal in case of its loss. In case of changes of these parameters, proceed as follows:

A change of the input signal for ranges starting with zero shall be realized by changing the location of interconnecting pieces pursuant to the table:

**INSTALLATION OF INTERCONNECTING PIECES:**

0 to 1 V	J1, J2
0 to 10 V	J2
0 to 20 mA	J1, J3
4 to 20 mA	J1, J3



Figure 1 Dimensional drawing – connection P2 (with angle bar)

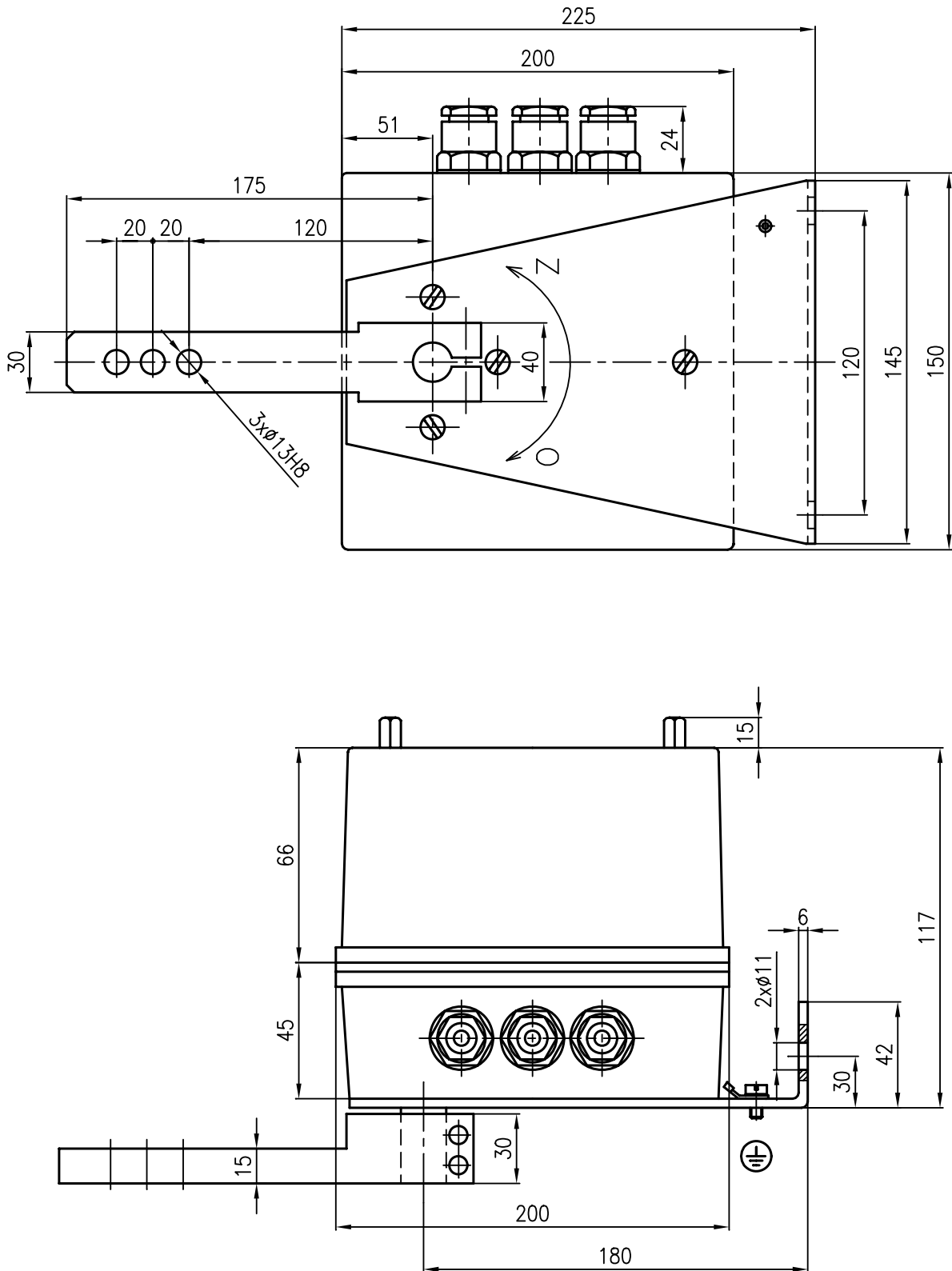
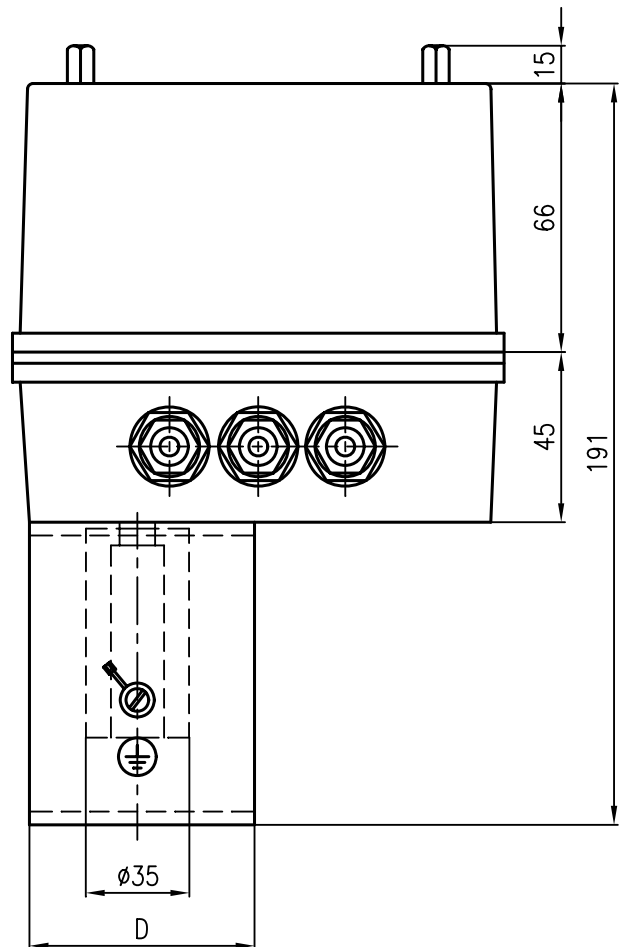
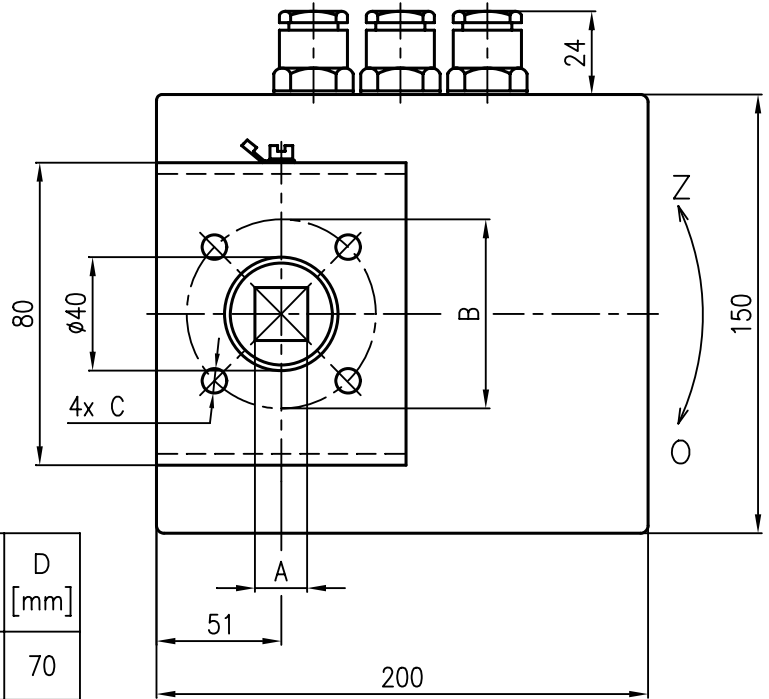


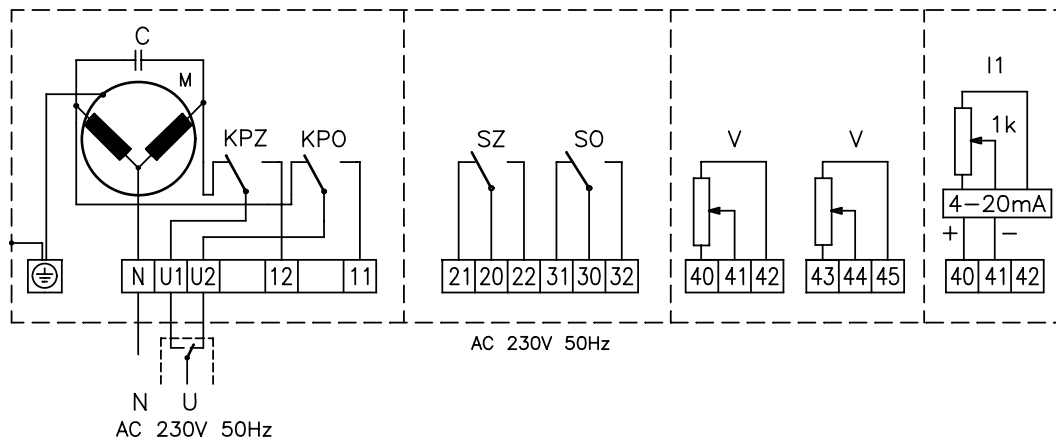
Figure 2 Dimensional drawing – connection P31 to P38 (flange-less stop flaps)

Code	A [mm]	Orientation A	B [mm]	C [mm]	D [mm]
P31	14x16		50	6.5	70
P32	17x22		70	9	90
P33	12		70	9	90
P34	12		50	6.5	70
P35	16		70	9	90
P36	14		50	6.5	70
P37	17		70	9	90
P38	14		70	9	90

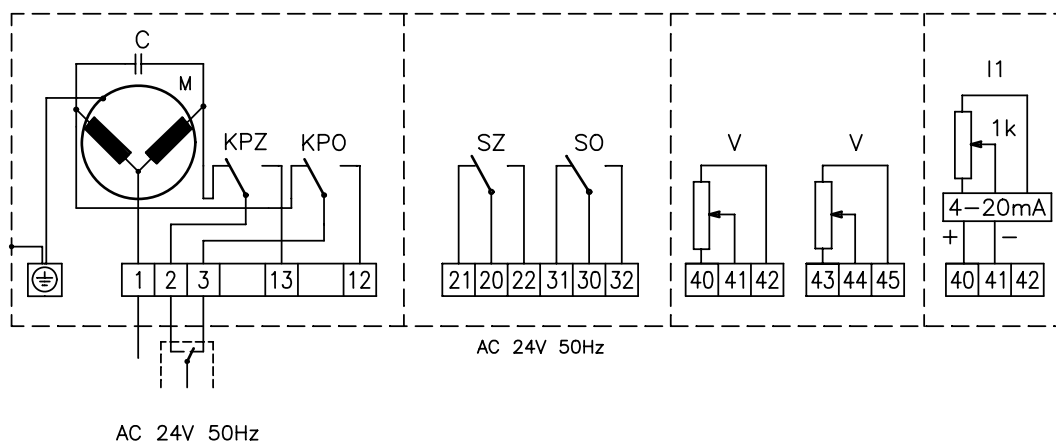


**Figure 3 Connection scheme and drawing of terminal board - three-point control**

Connection scheme 230V 50Hz



Connection scheme 24V 50Hz

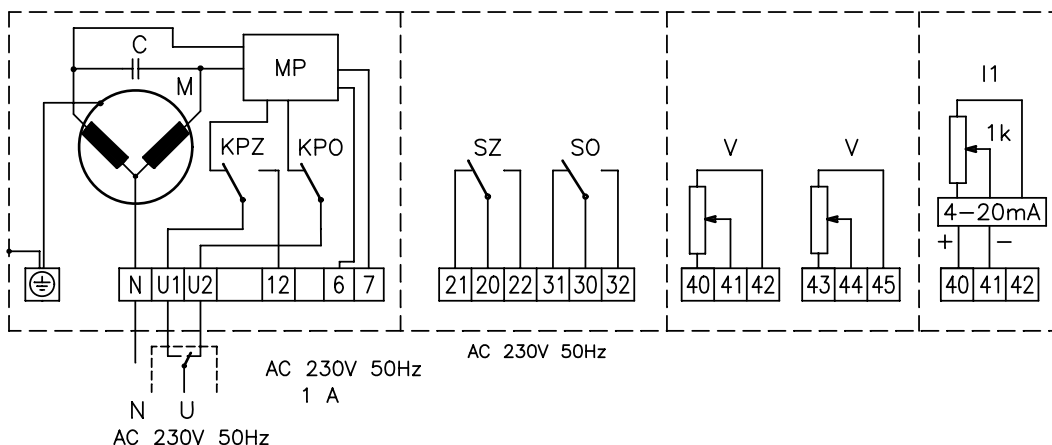


- KPO - End position switch for servomotor position O
- KPZ - End position switch for servomotor position C
- SO - Signalling switch for servomotor position O
- SZ - Signalling switch for servomotor position C
- M - Small motor
- C - Condenser
- V - Transmitter 100
- I1 - Converter 4-20mA for two-wire connection to measuring loop (power supply directly from measured signal)

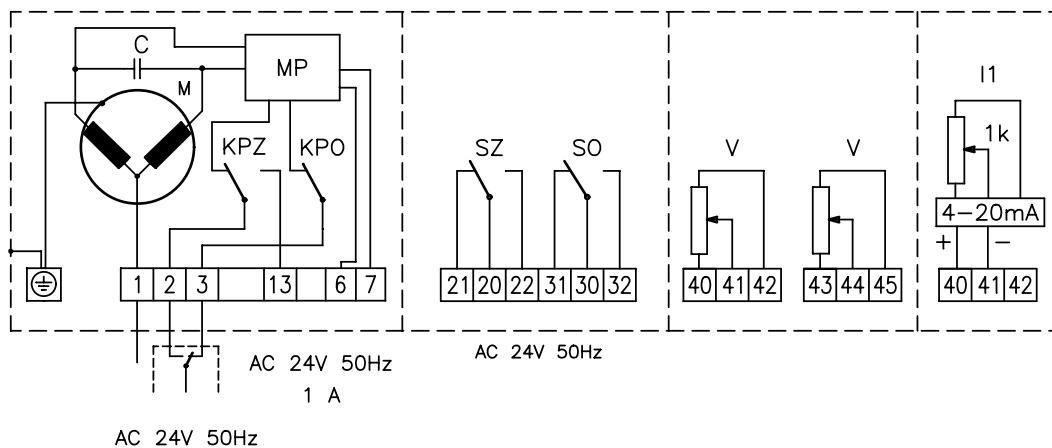


**Figure 4 Connection scheme and drawing of terminal board - three-point control with moment fuse**

Connection scheme 230V 50Hz



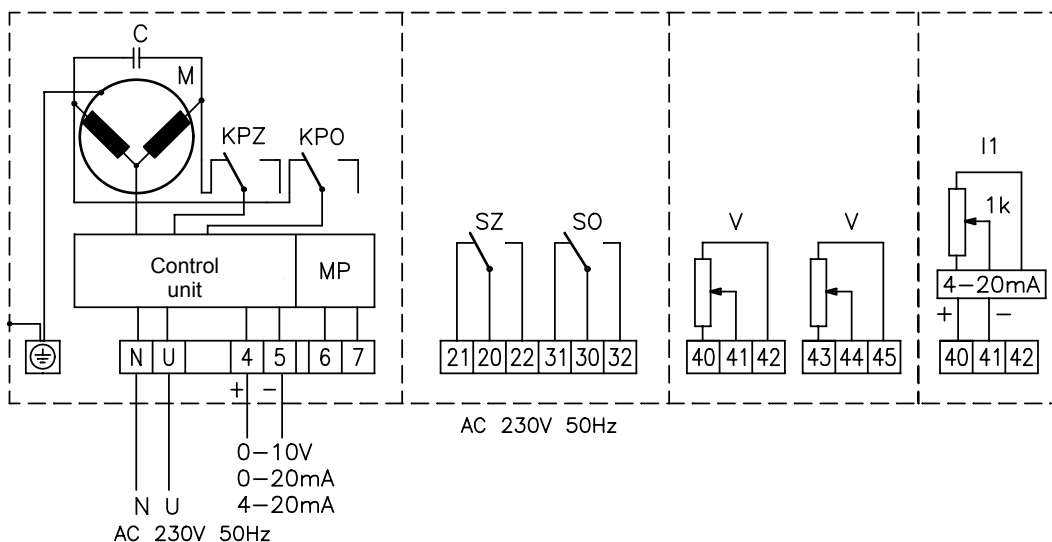
Connection scheme 24V 50Hz



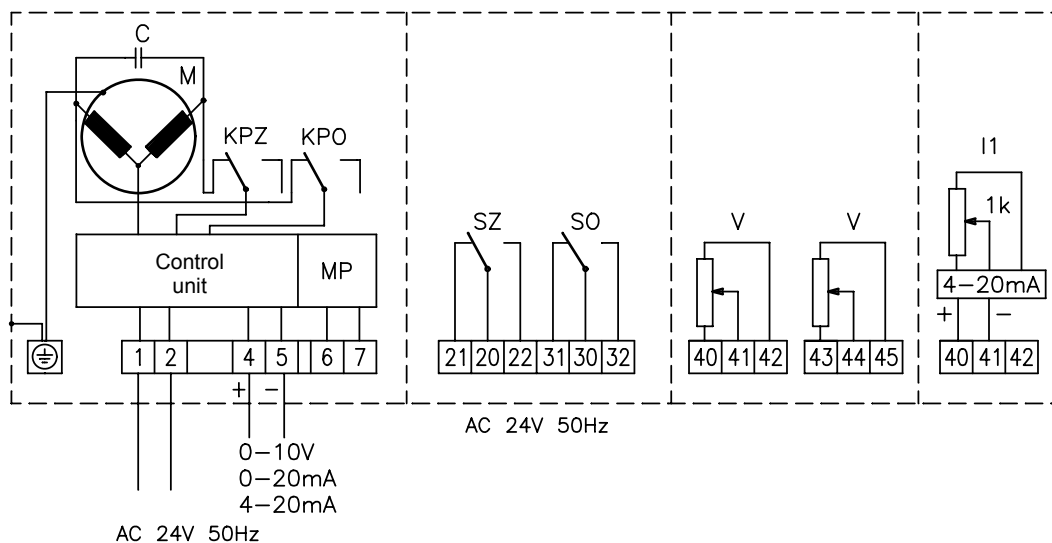
- KPO - End position switch for servomotor position O
- KPZ - End position switch for servomotor position C
- SO - Signalling switch for servomotor position O
- SZ - Signalling switch for servomotor position C
- M - Small motor
- C - Condenser
- V - Transmitter 100
- I1 - Converter 4-20mA for two-wire connection to measuring loop (power supply directly from measured signal)
- MP - Moment fuse

**Figure 5 Connection scheme and drawing of terminal board - control 0to 1V, 0 to 10V, 0 to 20mA, 4 to 20mA**

Connection scheme 230V 50Hz



Connection scheme 24V 50Hz



- KPO - End position switch for servomotor position O
- KPZ - End position switch for servomotor position C
- SO - Signalling switch for servomotor position O
- SZ - Signalling switch for servomotor position C
- M - Small motor
- C - Condenser
- V - Transmitter 100
- I1 - Converter 4-20 mA for two-wire connection to measuring loop (power supply directly from measured signal)
- MP - Output with galvanic separation – contact relay 250V, 1A



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