MULTI-TURN ELECTRIC ACTUATOR BF-9034, BF-9035 AND BF-9036

TECHNICAL DESCRIPTION AND OPERATION MANUAL

27.1-44796480-003-009KE

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ATTENTION: This marks actions or operations significantly affecting the correct operation of the actuator.
Failure to follow these instructions may lead to subsequent malfunctions under certain circumstances.

This document contains information on the installation, commissioning, control, and maintenance of the multi-turn electric actuators of BF-903 series for general industrial purposes of BF-9034, BF-9035 and BF-9036 standard size (hereinafter referred to as the electric actuators). The information provided here is intended to assist the personnel responsible for performing this work.

The current edition of this manual should be found, downloaded and printed from manufactures web site www.BFactuator.com under "Documentation" link and may not be included in the delivery package of the electric actuator. A printed version of the manual should be kept by user for the entire period of the product operating.

The design of the electric actuator may be changed slightly and these changes may be not reflected in this manual!

1. SAFETY PRECAUTIONS

The electric actuators meet the requirements of technical regulations of ТУ У 27.1-44796480-003:2022, and of Directive 2006/95/EC of the European Parliament and of the Council on “Machinery”, Directive 2014/30/EU of the European Parliament and of the Council on “Electromagnetic compatibility”.

The manufacturer is not responsible for any damage caused by unauthorized use, commissioning, field tests as well as service and maintenance.

The conditions for proper operating also include compliance with the requirements of this manual.

Any changes to the product design are allowed only with the writing manufactures consent.

1.1. General safety instructions

When performing installation, electric connection, commissioning, and control, the service personnel shall ensure compliance with all requirements in accordance with the officially recognised rules regarding occupational health and safety.

The personnel should know and follow safety rules of working with the electric actuator.

Only qualified specialists who have permission to the relevant work are allowed to conduct the installation, work with electric equipment, commissioning, control, and maintenance.

Personnel shall review the contents of this manual before starting the work.

Commissioning

Check that all settings and requirements are met before starting.

The incorrect settings may cause the valve and the electric actuator damage and operation failure. The manufacturer is not responsible for any possible damage caused by incorrect settings of the electric actuators. All responsibility, in this case, shall be borne by the operator.

Operation

Safe and reliable operation conditions:

- proper transportation, storage, installation, and qualified commissioning;
- the electric actuator is allowed to be operated only in good condition, taking into account the instructions in this manual;
- in case of failure respond appropriately and fix the problem immediately;
- observe rules of labour safety;
- observe local safety regulations;
- the electric actuator heats up during operation and its surface temperature can reach more than 60 °C. It is recommended to check the surface temperature with a thermometer before starting the work to protect against burns. Wear the protective gloves.

Protection measures

The operator shall be responsible for the availability of appropriate safety equipment, such as enclosures, covers, and personal protective equipment.

Care

Follow the instructions in this operation manual, as otherwise the reliable operation of the equipment is not guaranteed.

1.2. Application

Purpose

Electric actuators are designed for controlling shut-off and control industrial pipeline valves (for example: gate valves) in remote and automatic operation mode, including cases when tight closing in end positions is required.

The use of the electric actuators for other purposes is allowed only with written permission from the manufacturer.

The electric actuators shall not be used for:

- operating modes that exceed those specified in this manual (see operation modes);
- long-time water submersion (see protection level);
- explosive environment;
- environment containing aggressive vapours and gases.

Installation

Electric actuators may be installed indoors or outdoors. It is recommended to protect the electric actuator with a light canopy when installed outdoors.

The height of the installation site must not exceed 1000 meters above sea level.

Consult the manufacturer for installation at an altitude of more than 1000 meters above sea level.

Electric actuators operation in environment with non-flammable and non-conductive dust is possible. It is recommended to remove dust when the layer is approximately 1 mm thick.

Operation position

The electric actuators shall be installed directly on the valve and can operate in any mounting position, without restrictions.

Operation ambient

Operation ambient temperature values:

• standard execution	from minus 45 °C to plus 60 °C
• optionally	from minus 60 °C to plus 60 °C
• optionally	from minus 10 °C to plus 60 °C

Operation relative humidity values:

• average annual value	75 % at 15 °C, 100 % at 25 °C.
• upper value	75 % at 27 °C, 98 % at 25 °C,

See the actuator nameplate for the actual version.

Protection level in accordance with EN 60529 (IEC 529)

Standard execution — IP 65.

Optional executions:

IP 67	protection against water penetration at a depth of 1 meter for 30 min
IP 68	protection against water penetration at a depth of 3 meters for 48 hours.

Notes:

- up to 10 actuations are allowed during the submersion;
- when submersed in water the control mode is not foreseen;
- an inspection must be conducted each time after submersion.

See the actuator nameplate for the actual version.

Vibration resistance

The electric actuators remain operational during and after exposure to external mechanical factors (sinusoidal vibration) in the frequency range of 0.5 – 100 Hz, maximum acceleration amplitude of 10 m/s2 (g).

Seismic factors impact

The electric actuators remain functional during and after seismic impact up to 9 points by MSK-64 scale inclusive.

Corrosion protection

The electric actuators are suitable for installation in industrial applications like power and water stations with a low concentration of pollutants, as well as in aggressive environments with a moderate concentration of pollutants (wastewater treatment plants, chemical industry, etc.).

Coating type and characteristics

Paint coating — electrostatic powder coating, color — silk gray (similar to RAL 7030), thickness not less than 80 μm.

2. TECHNICAL DATA AND CHARACTERISTICS

Power supply voltage

Type of current, voltage and frequency of the network:

- three-phase network AC 400 V, 50 Hz.

AC-powered electric actuators remain operational and ensure the valve switching off when the frequency deviation is ±2 %, the supply voltage deviation is from plus 10 % to minus 15 %, and the voltage and frequency deviations must not be opposite.

See the actuator nameplate for the actual version.

Operating mode IEC 60034-1-2017

The electric actuators are equipped with electric motors providing operation in modes in accordance with IEC 60034-1-2017:

- S2 – 15 min (short-term operating mode);
- S4 – 25 % (intermittent periodic mode).

The permissible operating characteristics for these modes at rated voltage, ambient temperature of 40 °C are shown in Table 1.

Table 1 – Operating characteristics of electric actuators

Max torque, Nm	S2 – 15 min		S4 – 25 %
	Max operating time per hour, min*	Starts per hour **	Starts per hour ***
up to 600	15	20	600
over 600 and up to 2500		15	300
over 2500 and up to 5000		10	60

Notes:

* At an average load no more than 35 % of the maximum torque with the ability to transfer 100 % of the maximum torque for 10 % of the time.

** One start consists of a stroke of at least one revolution in any direction with a load of not more than 35 % of the maximum torque. Cyclic duration ratio is 25 %.

*** One start consists of a stroke of at least 1/4 turn with a load not exceeding 35 % of the maximum torque. Cyclic duration ratio is 25 %.

Maximum torque refers to the upper value of the range of each specific electric actuator indicated in Table 2.

See the actuator nameplate for the actual version.

ATTENTION: It is forbidden to exceed the performance characteristics!

Basic specifications

Table 2 — Basic specifications of electric actuators.

Actuator type	Actuator model	Torque adjustment limits, Nm[1]		Output shaft speed, rpm	Electric motor				
		min	max		Rated power, kW	Rotation speed, rpm	Rated current, A[2]	Maximum current consumption, A[3]	Starting current, A
BF-9034	BF-9034.450	230	450	12	0,55	1420 / 1420	2,4 / 2,0	4,8 / 4,0	14,0 / 14,7
				18	0,75		2,7 / 2,6	5,4 / 5,2	17,5 / 19,3
				24	1.1		4,1 / 3,3	8,1 / 6,6	19,8 / 17,6
				36	1,5		5,7 / 4,4	11,4 / 8,8	33,0 / 30,8
		230	400	48					
		230	380	72	2,2		7,5 / 4,6	15,2 / 9,2	39,3 / 37,1
	BF-9034.600	300	600	24	1,5	1420 / 1420	5,7 / 4,4	11,4 / 8,8	33,0 / 30,8
				36	2,2	1420 / —	7,5 / —	15,2 / —	39,3 / —
				48					
				72	3,0		12,1 / —	28,8 / —	66,0 / —
	BF-9034.900	450	900	12	1.1	1420 / 1420	4,1 / 3,3	8,1 / 6,6	19,8 / 17,6
				18	1,5		5,7 / 4,4	11,4 / 8,8	33,0 / 30,8
				24	2,2		7,5 / 4,6	15,2 / 9,2	39,3 / 37,1
				36	3.0	1420 / —	12,1 / —	28,8 / —	66,0 / —
				48					
		450	800	72	4,0		13,2 / —	26,4 / —	77,0 / —
	BF-9034.1200	600	1200	12	1,5	1420 / 1420	5,7 / 4,4	11,4 / 8,8	33,0 / 30,8
				18	2,2		7,5 / 4,6	15,2 / 9,2	39,3 / 37,1
				24	3,0		12,1 / 6,1	28,8 / 12,1	66,0 / 49,0
				36	4,0	1420 / —	13,2 / —	26,4 / —	77,0 / —
		600	1100	48					

Table 2 (continued)

<table>
<tr><th rowspan="3">Actuator type</th><th rowspan="3">Actuator model</th><th colspan="2" rowspan="2">Torque adjustment limits, Nm[1]</th><th rowspan="3">Output shaft speed, rpm</th><th colspan="5">Electric motor</th></tr>
<tr><th rowspan="2">Rated power, kW</th><th rowspan="2">Rotation speed, rpm</th><th rowspan="2">Rated current, A[2]</th><th rowspan="2">Maximum current consumption, A[3]</th><th rowspan="2">Starting current, A</th></tr>
<tr><th>min</th><th>max</th></tr>
<tr><td rowspan="11">BF-9035</td><td rowspan="6">BF-9035.1800</td><td rowspan="4">900</td><td rowspan="4">1800</td><td>12</td><td>2,2</td><td rowspan="2">1420/1420</td><td>6,6/6,6</td><td>14,5/14,5</td><td>48,4/33,0</td></tr>
<tr><td>18</td><td>3,0</td><td>8,9/8,3</td><td>19,6/18,2</td><td>72,6/47,3</td></tr>
<tr><td>24</td><td>4,0</td><td rowspan="9">1420/–</td><td>11,2/–</td><td>24,6/–</td><td>88,0/–</td></tr>
<tr><td>36</td><td rowspan="2">5,5</td><td rowspan="2">15,7/–</td><td rowspan="2">49,9/–</td><td rowspan="2">128,0/–</td></tr>
<tr><td>900</td><td>1500</td><td>48</td></tr>
<tr><td>900</td><td>1400</td><td>72</td><td>7,5</td><td>21,6/–</td><td>56,4/–</td><td>173,0/–</td></tr>
<tr><td rowspan="5">BF-9035.2500</td><td rowspan="5">1300</td><td rowspan="4">2600</td><td>12</td><td>3,0</td><td>8,9/8,3</td><td>19,6/18,2</td><td>72,6/47,3</td></tr>
<tr><td>18</td><td>4,0</td><td>11,2/–</td><td>33,7/–</td><td>88,0/–</td></tr>
<tr><td>24</td><td>5,5</td><td>15,7/–</td><td>49,9/–</td><td>128,0/–</td></tr>
<tr><td>36</td><td rowspan="2">7,5</td><td rowspan="2">21,6/–</td><td>76,9/–</td><td rowspan="2">173,0/–</td></tr>
<tr><td>2000</td><td>48</td><td>56,4/–</td></tr>
<tr><td rowspan="7">BF-9036</td><td rowspan="4">BF-9036.3500</td><td rowspan="4">1800</td><td rowspan="4">3500</td><td>12</td><td>4,0</td><td>1430/1420</td><td>12,7/9,9</td><td>44,3/34,7</td><td>99,0/69,3</td></tr>
<tr><td>18</td><td>5,5</td><td rowspan="6">1430/–</td><td>15,4/–</td><td>63,1/–</td><td>122,0/–</td></tr>
<tr><td>24</td><td>7,5</td><td>19,8/–</td><td>69,3/–</td><td>149,0/–</td></tr>
<tr><td>36</td><td>11,0</td><td>28,6/–</td><td>113,0/–</td><td>215,0/–</td></tr>
<tr><td rowspan="3">BF-9036.5000</td><td rowspan="3">2500</td><td rowspan="3">5000</td><td>12</td><td>5,5</td><td>15,4/–</td><td>63,1/–</td><td>122,0/–</td></tr>
<tr><td>18</td><td>7,5</td><td>19,8/–</td><td>69,3/–</td><td>149,0/–</td></tr>
<tr><td>24</td><td>11,0</td><td>28,6/–</td><td>113,0/–</td><td>215,0/–</td></tr>
</table>

Notes:

[1] – Switch-off torque is adjustable in both directions;

[2] – The rated current corresponds to the maximum permissible average load;

[3] – The maximum consumption current corresponds to the load at the maximum switch-off torque;

The numerator indicates the data of the electric motors for S2 15 min mode, the denominator indicates the data for the S4 mode 25 %.

Switching off torque

The Switching off torque shall be set at the customer's request in accordance with Table 2. If the switching off torque is not specified in the agreement, then the switching off torque shall be set to the maximum.

The actual switching off torque is indicated in the technical certificate.

Rotation direction

Electric actuators are used for valves that are closed clockwise.

Working stroke

The working stroke of the electric actuator is:

- standard is from 20 to 400 revolutions;
- optional is from 1 to 20 revolutions;
- optional is from 300 to 1200 revolutions.

See the actuator nameplate for the actual version.

Factory settings:

- a working stroke of 40 turns is preset;
- the output shaft of the electric actuator is in the middle position.

Self-braking

The electric actuator with an output shaft speed of 12,18, 24 and 36 rpm is self-braking if the load acts in the direction opposite to the movement of the output shaft of the electric actuator. Self-braking is ensured by the actuator design.

The exclusion of self-movement of the locking element of the valve when using electric drives with a speed of rotation of the output shaft 48 and 72 must be ensured by the design of the valve.

Manual operation

Manual operation is performed using a handwheel. Manual operation is used for actuator setup as well as when operating in an emergency. When the handwheel is rotated clockwise, the actuator closes the valve, and when it is rotated counter clockwise, it opens the valve.

Connecting the electric actuator to the valve

Flange connection according to ДСТУ ISO 5210 (ISO 5210) or ОСТ 26-07-763-73 is used as a standard. Non-standard connection is possible on request.

Connection and general dimensions in accordance with Appendix A.

Noise

The noise level during idle operation of the electric actuator should not exceed 85 dB.

Electric actuators lifetime

The designated lifetime is 20 years.

The time to failure and the designated resource in table 3

Table 3

Max torque, Nm	The time to failure is not less		The designated resource is at least	
	cycles open – close (S2 15 min) [1]	Starts (S4 25%) [2]	cycles open – close (S2 15 min) [1]	Starts (S4 25%) [3]
up to 600	10000	$1{,}2 \times 10^6$	40000	3×10^6
over 600 and up to 2500	5000	5×10^5	20000	$1{,}2 \times 10^6$
over 2500 and up to 5000	2500	$2{,}5 \times 10^5$	10000	$0{,}6 \times 10^6$

1 – One cycle consists of 25 turns in both directions (i.e. 25 turns to open + 25 turns to close) with an average load of no more than 35% of the maximum torque with the ability to transfer 100% of the maximum torque for 10% of the time.

2 – One start consists of a stroke of at least one revolution in any direction with a load not exceeding 35% of the maximum torque. Cyclic duration factor 25%.

3 – One start consists of a stroke of at least 1/4 turn with a load not exceeding 35% of the maximum torque. The coefficient of cyclic duration is 25%.

The designated storage period is 10 years.

3. STRUCTURE, OPERATIONAL PRINCIPLE AND OPERATION OF THE ELECTRIC ACTUATOR

3.1. Electric actuator operational principle

The structure and operational principle of the electric actuator in accordance with Figure 1 and 2.

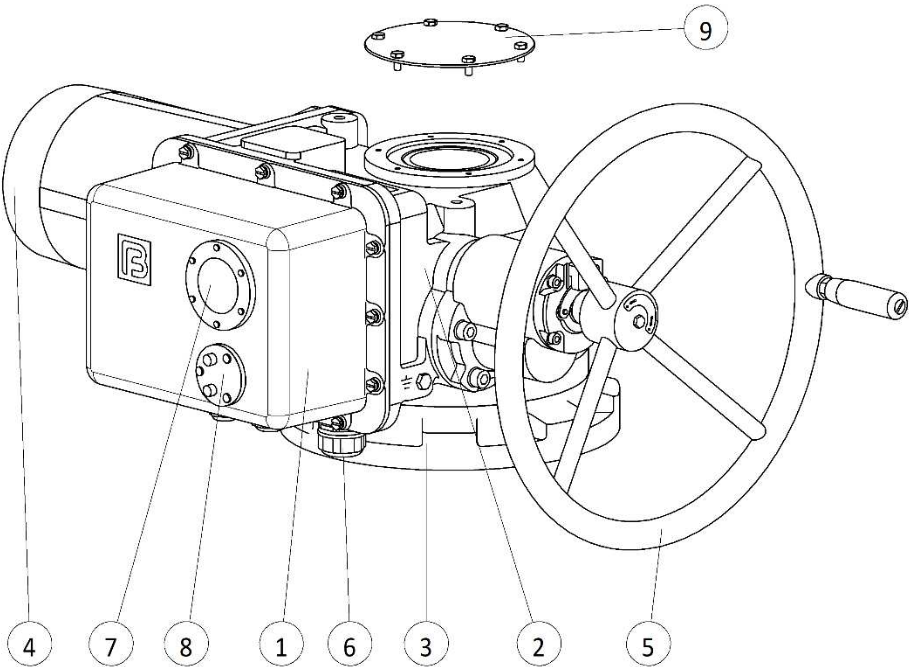


Figure 1 — Electric actuator general view

1 – cover, 2 – housing, 3 – connection flange, 4 – electric motor,
5 – handwheel, 6 – cable glands, 7 – position indication window, 8 – local control buttons “OPEN” and “CLOSED”, 9 – plug.

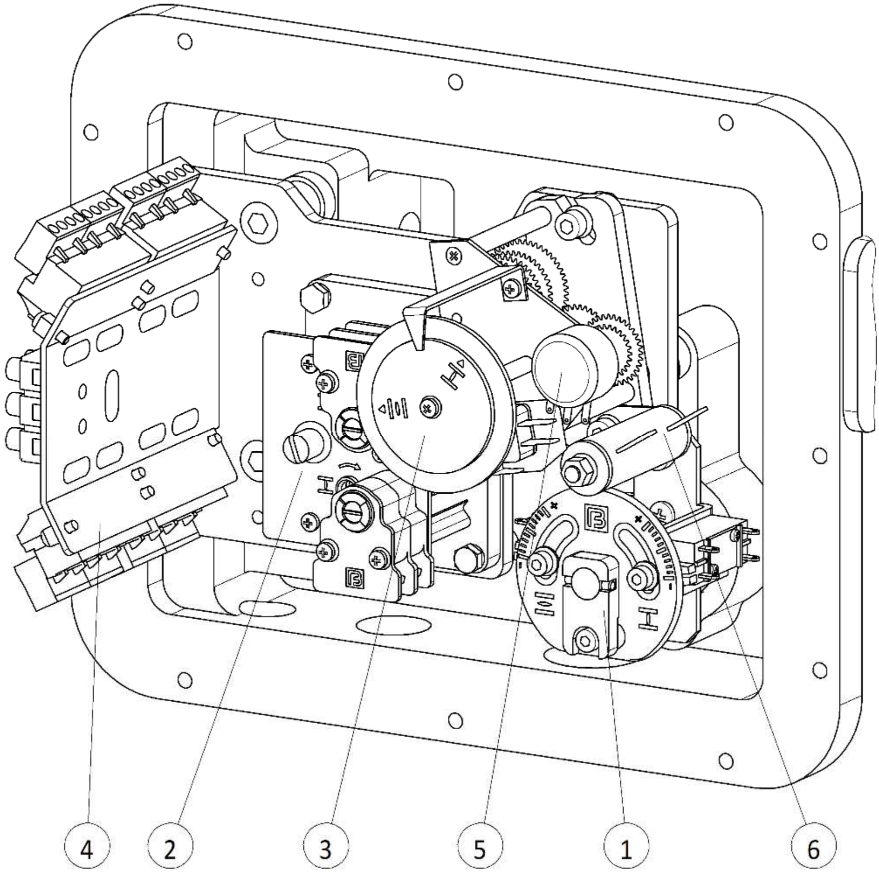


Figure 2 — Control panel

1 – torque limiting clutch, 2 – stroke limiter with position switches, 3 – position indicator, 4 – terminal blocks, 5 – ohmic position transmitter (optional), 6 – heating element.

3.2. Electric actuator operation

Remote operation

Rotation of the output shaft of the electric actuator is transmitted to the valve shaft through the connecting sleeve and ensures the movement of the shut-off valve body in the direction of opening or closing. The electric actuator shall be stopped in any intermediate position by a command from the control panel, and if the shut-off valve reaches one of the end positions, the electric motor is automatically switched off by the previously adjusted position switches of the stroke limiting device (2) or if the torque is exceeded – by the torque switches (1).

The position indicator (3) allows to control the position of the valve visually.

Manual operation

It is necessary to switch on manual operation mode. When rotating the hand heel (5), the actuator output shaft shall turn. When the hand heel is rotated clockwise, the actuator closes the valve, and when it is rotated counter clockwise, it opens the valve.

Local control

Local control is carried out using "OPEN" and "CLOSED" buttons (9) that are located on the cover (1) of the electric actuator. Please see Figure 1.

4. ELECTRIC ACTUATOR EQUIPMENT

Torque switches

The electric actuators are equipped with two torque switches SQ1 (TO) – for opening, SQ3 (TC) – for closing, each of them is designed for one direction of the electric actuator output shaft movement. The actuator switching off torque value may be set within the limits specified in Table 2.

The electric drives are equipped with two light indication of torque switch actuation SQ2 (STO) - for the opening position, SQ4 (STC) - for the closing position.

The maximum load current and the rated voltage of the switches

Maximum voltage:

• AC	250 V
• DC	60 V

Maximum current:

• alternating voltage	5 A
• direct voltage	0.2 A

Position switches

Two position switches limit the stroke of the output shaft of the electric actuator and provide light indication on the control panel of the end positions of the valve trim SQ5(PO) – for opening, SQ7(PC) – for closing, each of them for one output shaft movement direction.

Electric actuators can be additionally equipped with two position switches for intermediate positions optionally. One intermediate position can be set for each movement direction.

The maximum load current and the rated voltage of the position switches with resistive load

Maximum current:

• alternating voltage	10 A
• direct voltage 250V	0.8 A
• direct voltage 24V	5 A

The maximum load current and the rated voltage of the position switches with inductive load

Maximum current:

• alternating voltage	6 A
• direct voltage 250V	0.5 A
• direct voltage 24V	3 A

Position transmitter

The electric actuators are supplied without the position transmitter, but can be equipped with a position transmitter on request (option):

Resistive transducer – potentiometer

Technical specifications:

• resistance	1.0 kΩ ± 5 %
• non-linearity	no more than ±0.4 %
• transient resistance	max. 2.0 Ω
• rated power	1 W
• maximum working voltage	50 V DC

Current position transmitter CPT-2, the "passive" current loop is formed at the output of the Transmitter.
Technical specifications:

• output signal	4 to 20 mA
• basic error	no more than 1 %
• rated load resistance	0.5 kΩ
• the length of the communication line (current loop)	no more than 200 m
• power supply voltage	230 V AC

Current position transmitter CPT-3, the "passive" current loop is formed at the output of the Transmitter. The transmitter requires an external power supply to operate.
Technical specifications:

• output signal	4 to 20 mA
• basic error	no more than 1 %
• rated load resistance	0.5 kΩ
• the length of the communication line (current loop)	no more than 200 m
• power supply voltage	22 to 26 V DC

Position indicator
The electric actuator is equipped with a local position indicator. The indicator displays information about valve position.
 - indicates valve position is OPEN - indicates valve position is CLOSED.

Blinker
The electric actuator is equipped with a blinker. The blinker signals the movement of the electric actuator output shaft in the opening or closing direction.

Heating element
The electric actuators are equipped with a heating element to prevent moisture condensation and maintain the optimal temperature of the control system elements at a low ambient temperature. The heating resistance of 6.8 kΩ with a power of 10 W is used as an element. It is connected to the AC network with a voltage of 230 V.

5. ELECTRIC PARAMETERS

External electric circuits
The electric actuator is equipped with:

- terminal block (orange) for connecting the power supply circuits of the electric motor, which clamps allow connecting conductors with a cross section of up to 8 mm^2;
- terminal blocks (green) for connecting control and signalling circuits, with clamps for connecting one conductor with a cross section of up to 2.5 mm^2 or two conductors with a cross section of up to 1 mm^2.

Internal electric circuits
The electric circuit diagram of the electric actuator connections is located on the inside of the electric actuator cover or in the present manual that must be downloaded from manufactures web site www.BFUkraine.com under "Documentation" link.
The terminals are indicated by numbers on the terminal block.
Recommended wiring diagrams for electric actuators are given in Appendix B to this manual.

Protection of electric motors from overheating
The thermal cut-off is installed at the motor winding and protects it from the heating.
Technical parameters of the thermal cut-off:

• shut-off temperature	plus 135 ±5 °C
• reconnection temperature	from plus 105 to plus 110 °C
• maximum permissible load	2 A at a voltage of 250 V AC

The thermal cut-off of electric motors has independent outputs, so that it can be connected to the control circuit.

ATTENTION: If the thermal cut-off is not connected, the motor may fail. In this case, the warranty on the electric motor shall be canceled.

Insulation resistance
The insulation resistance of the electric control circuits relative to the housing and between them must be at least 20 MΩ. More information is available on request.

Electric insulation strength of electric circuits
Test voltage:

• ohmic position transmitter circuit	500 V, 50 Hz;
• switches and heating element circuits	1500 V, 50 Hz;
• three-phase motor circuit	1800 V, 50 Hz;

Deviations of the main parameters
Torque switching off is ±10 % of the maximum switching off value.
The output shaft changeover time is from minus 25 % to plus 25 % of the rated value.
Hysteresis of the position switches is not more than 5°.

Protection
The electric actuators are equipped with an external and internal ground clamp for protection against electric shock. The ground terminals are marked with

6. MARKING

The factory nameplate is installed on all electric actuators.
The electric actuator factory nameplate contains information in accordance with Figure 3.

Figure 3 — Electric actuator factory nameplate (example)

1 – Manufacturer's name,

2 – Manufacturer's trademark,

3 – Electric actuator model,

4 – Commercial number,

5 – Serial number,

6 – Year and week of manufacture,

7 – Output shaft rotation speed,

8- Torque rating on the output shaft for closed direction,

9- Torque rating on the output shaft for open direction, 10 – Range of ambient temperatures, 11 – Current type, 12 – Electric motor rated power, 13 – Electric motor rated current, 14 - thermal class according to IEC 60085,

15 - Operation mode according to EN 60529 (IEC 529),

16 – Insulation class of the electric motor according to IEC 60085, 17 – weight, 18 - CE mark, 19 - manufacturer's website, 20 - actuator working stroke, 21 - type of electric actuator.

All electric actuators have a model number and commercial number corresponding to the order. More detailed information related to the specific electric actuator is available on request.

7. TRANSPORTATION, STORAGE AND PACKAGING

7.1. Packing

Wrapped in plastic wrap electric actuators are packed in a wooden box for safe transportation and storage. Each electric actuator is protected from mechanical damage by special wood inserts.

7.2. Transportation

Transportation to the installation site shall be carried out by tented truck, sea or air freight container or any other analogue way in the factory packaging at a temperature from minus 40 to plus 60 °C in accordance with the storage conditions class 3.5 according to IEC 60721.
The slinging during installation of the electric actuators should be performed at actuator housing. When actuator is installed on the valves, slinging shall be performed at the valves, and not at the electric actuator.

7.3. Storage

The electric actuators shall be stored in their original packaging.
The electric actuators shall be stored in the well-ventilated, dry rooms, with air temperature from minus 40 to plus 50 °C in storage conditions 3.5 according to IEC 60721. To protect from soil humidity store on a rack or wooden pallet. Cover to protect from dust and dirt.
Shelf life is 3 years.
In case of long-term storage for more than three years: check the storage conditions, the integrity of the package, the absence of damage to the paint coating and violations of conservation of unpainted surfaces. After eliminating violations and damages, make a note in actuator technical certificate.
Such checks shall be made every 12 months in the future with a note in the technical certificate.

ATTENTION: Improper storage leads to corrosion!

ATTENTION: Condensation and damage to the paint coating lead to corrosion!

8. INSTALLATION

Inspect the actuator after unpacking and make sure it has no visible damage occurred during transportation and storage.
Check the ease of movement of the output shaft when operating in manual operation mode before installing the electric actuator.

8.1. Mounting position

The electric actuators can operate in any mounting position without restrictions.
Space must be provided for removing the actuator cover when installing it (see Appendix A, dimensional drawing).

8.2. Installing the electric actuator on the valve

The electric actuator installation procedure.

1. Bring the valve to the middle position.
2. For valves with rising spindle make sure that the outer diameter of the spindle does not exceed the d_{max} dimension given in Table A.2 of Appendix A. If the spindle extension in the open position exceeds dimension H1 (see Figure A2 and Table A2) remove the plug 10, in accordance with Figure 1. It is recommended to install a protective cylindrical cover for the rising spindle instead of the plug. The protective cover is not included in the delivery.
3. Thoroughly clean the valve and electric actuator flange surfaces.
4. Install the actuator on the valve. Use actuator manual operation mode to align the output shaft, valve spindle couplings and the mounting holes in the flanges. Pay attention to the correct centering and complete fit of the flanges.
5. Secure the actuator using fasteners (bolts or studs and nuts, depending on the valve flange design). Tighten the fasteners evenly crosswise with a tightening torque according to Table 3. Use fasteners with a strength class of at least 8.8 according ISO 898.

Table 3 – Bolt tightening torques

Thread diameter	Tightening torque, Nm
M16	215
M20	431
M30	1440

6. Check the ease of rotation for the output shaft using the actuator manual operation handwheel.

Check the paintwork at the end of the work and repair the damaged areas, if necessary.

9. ELECTRIC CONNECTION

ATTENTION: Failure to comply with the requirements for connecting the electric actuator may result in equipment failure, serious injury, or death.

9.1. General instructions

Only qualified personnel is allowed to connect electric equipment.
Read the instructions in this chapter before starting the work. Read the chapters "Commissioning" and "Field test" after connecting the electric equipment before applying voltage.

Electric circuit. Connection scheme

Recommended wiring diagrams for electric actuators are given in Appendix B to this manual. The electric wiring diagram for a specific version of the electric actuator is attached on the inside of the actuator cover. If there is no electric scheme, it can be downloaded and printed from manufactures web site www.BFUkraine.com under "Documentation" link or requested according to the model number (see the factory nameplate).

Connecting the electric actuator

The operation of electric actuators requires an external control unit. Do not connect the electric motor of the actuator directly to the electric network, as this may cause damage to the valve.
Use the electrical diagram in accordance with the type of valve control prescribed by the valve manufacturer.

Protection of the electric actuator during operation

Use the automatic switches to protect the electric actuator from short circuits and to disconnect the electric actuator from the network. The selection of automatic switches shall be calculated from the maximum current consumption of the electric motor (see Table 2). In this case, the selected automatic switch must be designed for operation in circuits with the inductive load.
Connect the motor's thermal cut-off to the external control unit to protect the motor from overheating. Failure to connect the thermal cut-off will void the actuator warranty.
To protect the operator during manual operation, it is necessary to provide connection to the control circuits of the switch for blocking the start of the electric motor SQ10.

Type of current, voltage and network frequency

The current, voltage and network frequency must meet the technical requirements of the electric motor (see the actuator nameplate).

Connection cables

Use the appropriate, high-voltage-resistant cables to ensure that the device is insulated. The cables must be designed for the maximum rated voltage.
The connecting cables must be designed for minimum operating temperature.
Use cables resistant to UV rays when connecting actuators exposed to UV radiation (located outdoors, etc.).

9.2. Connecting the cables

ATTENTION: Incorrect connection: Dangerous voltage when the grounding conductor is not connected!
Do not use the product without grounding.

Ground wire connection

Connect all ground wires.

Connect the external ground wire to the ground contact. Carefully clean the connection point of the ground conductor, connect the conductor and tighten the screw. Use a copper wire with a cross-section of at least 4 mm^2 as the ground conductor. Check the resistance of the grounding device, it should be no more than 10 Ohms.

Upon completion of the connection, check the contact resistance between the ground wire and any metal, non-current-carrying part of the actuator accessible to touch, it should not exceed 0.1 Ω. Protect the connection point of the conductor from corrosion by applying the consistent grease.

The actuator must be connected to the network immediately after installation. Always use the heating element, that all electric actuators are equipped with, if the ambient temperature is below plus 10 °C and the relative humidity is more than 80 %, or when installing outdoors, in order to prevent the formation of condensation.

ATTENTION: Condensation leads to corrosion.

Connecting power and control circuits

The order of connection is as follows:

1. Unscrew the four screws and remove the cover 1 (see Figure 1);
2. Remove the transport seals (if any) and install the threaded cable glands (can be included in the delivery set optionally). Use an unarmoured circular cable, the outer diameter of the cable must correspond to the dimensions of the cable glands specified in Appendix A. Replace the cable glands with the appropriate ones if using a different type of cable.
   The ingress protection level indicated on the factory nameplate (IP...) is only guaranteed when the appropriate cable glands are used;
3. Insert the cables into the cable glands;
4. Cover the unused cable entries with plugs;
5. Remove the insulation from the wire and clean the wire;
6. Connect the wires according to the electric scheme, according to the order. Connect the flexible cables using end sleeves (DIN 46228).
7. Tighten the clamping nut to ensure that the cable is sealed and secured.

10. CONTROL

10.1. Manual operation mode

The actuator can be controlled manually during the setup and commissioning, as well as in the event of motor failure and power loss.

ATTENTION: Incorrect control may cause damage to the electric actuator and valve!

ATTENTION: Switch to manual mode only when the motor is turned off.

ATTENTION: When operating manually, the torque switch does not function. Do not apply excessive force to the handwheel. Do not use additional tools to increase the effort.

Switch the electric drive to manual control mode in accordance with Figure 4, for which, releasing the locking screw 1, remove the latch 2 from the shaft groove, release the shaft 3. Pull, slightly turning, the handwheel 4 towards you until it stops, so that the latch enters the next groove on the shaft. Tighten the lock screw.

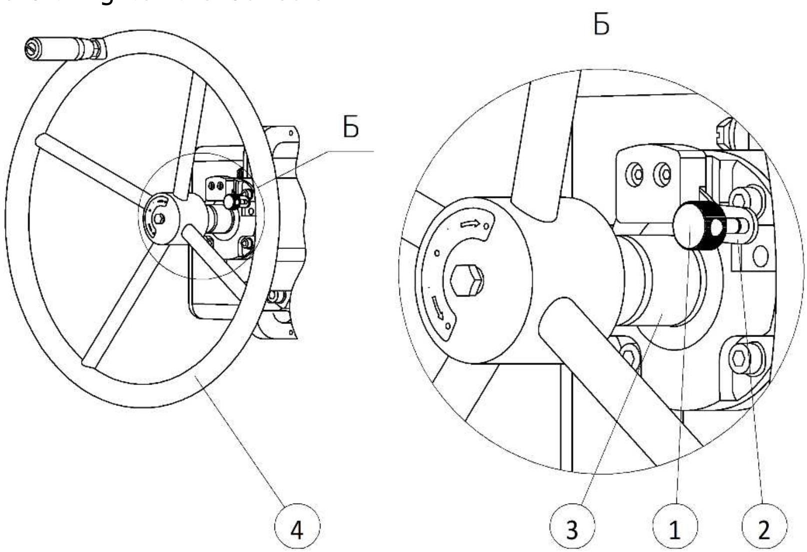


Figure 4 — Switching to manual operation mode
1 - Locking screw, 2 - Retainer, 3 - Shaft, 4 - Handwheel

Rotate the handwheel in the desired direction. Rotate the hand wheel clockwise to close the valve; the drive shaft (valve spindle) turns clockwise in the direction of closing. Rotate the hand wheel counterclockwise to open it.
Release the shaft to exit manual mode. Push the steering wheel away from you until it stops, while the latch should enter the groove on the shaft. Tighten the lock screw.

10.2. Remote operation mode

ATTENTION: Incorrect electric actuator setting may cause damage to the valve!

ATTENTION: Complete all the actuator commissioning steps, including field test, before switching on the remote operation mode.

The control unit of the electric actuator is required to operate in remote operation mode.
Turn on the power and start the actuator in the any rotation direction. When the actuator switched on in the "Closed" direction, the valve shaft will turn clockwise in the closing direction. The operator should turn on the power and start the actuator from the control panel. Turning off is carried out by the operator from the control panel, or automatically when the end positions are reached.
If in the end position of the valve it is required to ensure tight closing and create the required torque on the valve trim, then the electric actuator is turned off using torque switches. Install required jumpers between terminals 9-10 and (or) 13-14 for this. Please check the diagram in Appendix B.

10.3. Local operation mode

Local control is carried out using the "OPEN" and "CLOSED" buttons located on the cover of the electric actuator.
Press and hold the "OPEN" or "CLOSED" button to start the electric actuator in a given direction.
Release the pressed button to stop the actuator.

11. INDICATION

Mechanical position indicator/stroke indication:

- indicates whether the actuator is in motion (stroke indication);
- indicates reaching the end positions ("Open" and "Closed" tags).

12. SIGNALS

In the standard execution, the electric actuator transmits the light alarm signal to the control panel when:

- the valve shut-off element reaches the end positions;
- torque switch actuation;
- rotation of the electric actuator shaft (blinker).

Optionally the electric actuator can be equipped with potentiometer BQ1, current position transmitter CPT-2 (4-wire "active" system of 4-20mA) or current position transmitter CPT-3 (2-wire "passive" system of 4-20mA). Last two transmits 4-20mA signal corresponding to the valve shut-off element position.

13. COMISSIONING

ATTENTION: Beware of open valves moving parts (butterfly valves, ball valves, etc.)!

13.1. Setting the torque switches

ATTENTION: Electric actuator switch-off torque must correspond to the value specified in the valves data sheet.

Torque switch is shown in Figure 5.

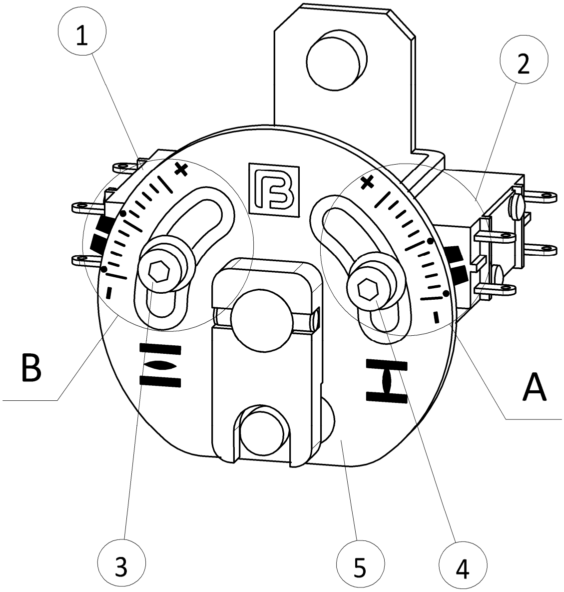


Figure 5 – Torque switch

1 – Torque switch SQ1(TO) – opening, 2 – torque switch SQ2(TC) – closing, 3,4 – Adjustment screw, 5 – Disc.

The electric actuator torque switch is set up by manufacture or manufactures' authorised representative using special torque adjustment stand according to the order. If the torque is not specified in the order, the maximum value according to Table 2 is set.

The actuator switch-off torque is specified in its technical certificate which is supplied together with the actuator.

If during commissioning it is necessary to change the settings of the torque limiting switch, proceed as follows.

13.2. Setting torque switch – close

Torque switch for closing direction is set in accordance with Figure 6.

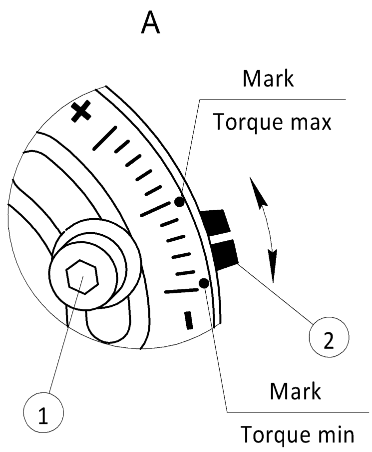


Figure 6 — Torque switch for close direction
1 – Adjustment screw, 2 – Indicator.

1. Determine the point on the scale corresponding to the required switching off torque. The point is determined by interpolation. To do this, calculate the scale division value – divide the difference between the values of the maximum and minimum torque at closing in Nm, indicated in the actuator technical certificate, by the number of divisions between the maximum and minimum torque marks on the scale. After calculating the scale interval, and knowing the difference between the values of the required and the previously configured switching off torque specified in the certificate, determine the required position of the indicator.
2. Loosen the adjusting screw 1.
3. Turn the adjusting screw 1 in the desired direction, aligning the corresponding point on the disc scale with the groove in indicator 2. When setting, it is not allowed for the indicator to go out of the sector limited by marks on the scale.
4. Tighten the adjusting screw 1.

13.3. Setting torque switch – open

Torque switch for opening direction is set in accordance with Figure 7.

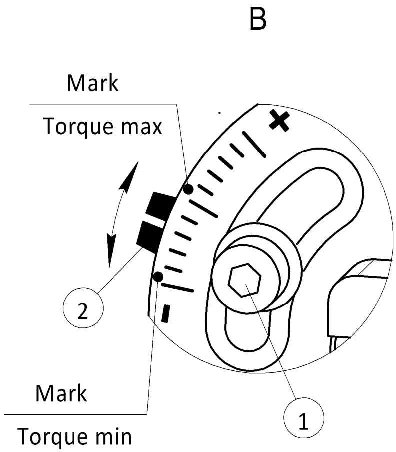


Figure 7 — Torque switch for open direction
1 – Adjustment screw, 2 – Indicator.

Setting of the torque switch for opening direction is carried out in a similar way as for closing direction. The value of the maximum and minimum switching off torque when opening, as well as the value of the factory setting torque are indicated in the actuator technical certificate. Setting is made within the limits limited by marks on the scale. After making the setting, tighten the adjusting screw 1.

It should be borne in mind that with self-setting, the cutoff torque value may differ from the required one by more than ± 10 %.

13.4. Setting the position and position indication switches

The position and position indication switches shall be adjusted after the actuator is installed on the valve in order to achieve precise operation of the position and position indication switch contacts when the desired position of the valve is reached.

The order of the position and position indication switches in accordance with Figure 8.

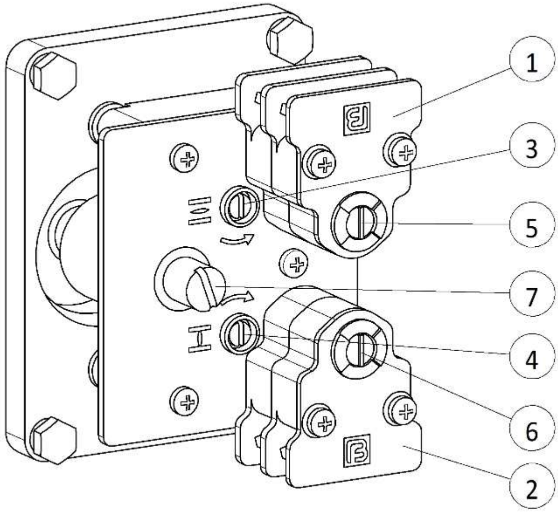


Figure 8 — Stroke limiter with position switches

1 – "Open" position and position indication switch SQ3(PO),

2 – "Closed" position and position indication switch SQ5(PC),

3 – "Open" position setting screw, 4 – "Closed" position setting screw, 5 – "Open" switch position indication, 6 – "Closed" switch position indication, 7 – Screw.

13.5. Setting the "Closed" position and position indication switches

SQ7(PC) position and position indication switch:

1. Switch to the manual operation mode;
2. Turn the handwheel clockwise until the valve is completely closed;

If, before reaching the “Closed” position, the SQ7 (PC) switch has activated, in accordance with Figure 9, then proceed in the following order:

- using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
- turn the adjusting screw 4 counterclockwise. The number of screw revolutions is approximately calculated at the rate of 2.5 screw revolutions per the number of valve shaft revolutions required until it is completely closed;
- turn the screw 7 counterclockwise, returning it to its original position;
- turn the handwheel clockwise until the valve is completely closed;

a) b)

Figure 9 –Switch indicator

a) switch in the intermediate position; b) the switch was activated.

3. Turn the handwheel back 1/4 of a turn (overrun value);
4. Using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
5. Turn the adjusting screw 4 in the direction of the arrow (clockwise), as shown in Figure 8, until the SQ7 (PC) switch is activated in accordance with Figure 9.
6. Turn the screw 7 counterclockwise, returning it to its original position.
7. Make sure that screw 7 is fixed, the adjusting screw 4 must not turn.

If in the closed position, switching off is performed by the torque switch SQ3 (TC) – closing, then when setting switch, take into account that the SQ7 (PC) switch must be activated before the torque switch SQ3 (TC).
The "Closed" position and position indication switch SQ7(PC) is now set.

13.6. Setting the "Open" position and position indication switches

SQ5(PO) position and position switch:

1. Switch to the manual operation mode;
2. Turn the handwheel counterclockwise until the valve is fully open;
   If, before reaching the "Open" position, the SQ5 (PO) switch has activated, in accordance with Figure 9, then proceed in the following order:
   - using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
   - turn the adjusting screw 3 clockwise. The number of screw revolutions is approximately calculated at the rate of 2.5 screw revolutions per the number of valve shaft revolutions required until it is completely open;
   - turn the screw 7 counterclockwise, returning it to its original

position;
- turn the handwheel counterclockwise until the valve is completely open;

3. Turn the handwheel back 1/4 of a turn (overrun value);
4. Using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
5. Turn the adjusting screw 3 in the direction of the arrow (counterclockwise), as shown in Figure 8, until the SQ5 (PO) switch is activated in accordance with Figure 9.
6. Turn the screw 7 counterclockwise, returning it to its original position.
7. Make sure that screw 7 is fixed, the adjusting screw 3 must not turn.

If in the open position, switching off is performed by the torque switch SQ1(TO) – open, then when setting it, take into account that the SQ5(PO) switch must be activated before the torque switch SQ1(TO).

The "Open" position and position indication switch SQ5(PO) is now set.

13.7. Setting mechanical position indicator

The valve position indicator should be adjusted after the setting of position switches is completed. The setting procedure is as follows.

1. Depending on the required number of revolutions of the output shaft, engage gear 1 with a toothed wheel, in accordance with Figure 10 and Table 5, and fix it. The step number is indicated on the side rack.

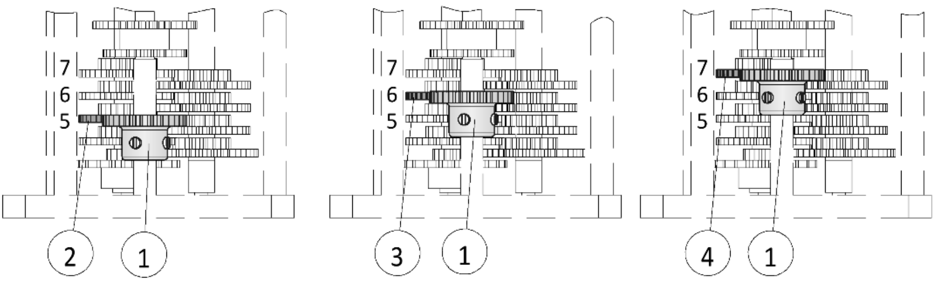


Figure 10 – Setting the range of the position indicator working stroke
1 – Gear, 2 – Toothed wheel of the 5th stage, 3 – Toothed wheel of the 6th stage, 4 – Toothed wheel of the 7th stage.

Table 5 – Setting ranges of the indicator working stroke

Output shaft revolutions	Indicator drive stage	Potentiometer gear combination – ohmic position transmitter (Figure 12)
from 20 to 28	5	A – B
from 29 to 49		C – D
from 50 to 84	6	A – B
from 85 to 143		C – D
from 144 to 246	7	A – B
from 247 to 418		C – D

2. Set the valve to the “Closed” position in manual operation mode.
3. In accordance with Fig. 11, loosen the screw 3 and by turning the “Closed” position dial 1 align the mark with the indicator 4 located on the cover of the electric actuator, tighten the screw.
4. Set the valve to the “Open” position in manual operation mode.
5. In accordance with Fig. 11, loosen the screw 3, while holding the “Closed” position dial 1, align the mark of the “Open” position dial 2 with the indicator 4 by turning, tighten the screw.

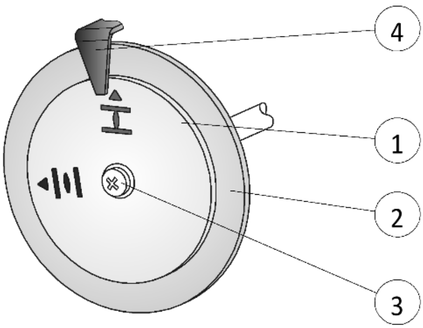


Figure 11 – Setting mechanic position indicator
1– "Closed" position dial, 2 – "Open" position dial,
3 – Screw, 4 – Indicator.

Position indicator setting is completed.

14. FIELD TEST

Perform a field test only after all the above settings have been completed.

ATTENTION: Incorrect actuator rotation direction causes damage to the valve! Turn off the actuator immediately if the rotation direction is incorrect. Fix the phase connection and repeat the field test.

14.1. Actuator rotation direction test

The verification procedure is as following:

1. Set the valve to the middle position in the manual operation mode.
2. Briefly start the electric actuator in the "Closed" direction and follow the mechanical position indicator rotation direction. Turn off the actuator before the end position is reached.

The direction of rotation is correct if the valve shaft is moving in the "Closed" direction and the mechanical position indicator is rotating clockwise.

If the direction of rotation of the valves shaft is incorrect:

- for electric actuators with a single-phase electric motor – switch positions U and V on terminal block;

- for electric actuators with a three-phase electric motor - switch positions of the two conductors on terminals U, V, W of the electric actuator terminal block;

Then check the rotation direction again.

14.2. Position switches test

Bring the electric actuator into both end positions of the valve one by one in manual operation mode.

The position switches are set correctly if:

- switch SQ5(PO) is activated in the end position "Open";

- switch SQ7(PC) is activated in the end position "Closed";

- the switch will unlock the contacts again after you turn the hand wheel back.

If the end position is set incorrectly, adjust the position switches again.

15. ADDITIONAL EQUIPMENT

15.1. Ohmic position transmitter setup

Ohmic position transmitter is supplied optionally.
The ohmic position transmitter is a potentiometer that indicates the valves position.
The full range of the potentiometer is not used due to the electric actuator design, so it is necessary to provide an external adjustment (trimming potentiometer).
The procedure for setting the potentiometer in accordance with Figure 12.

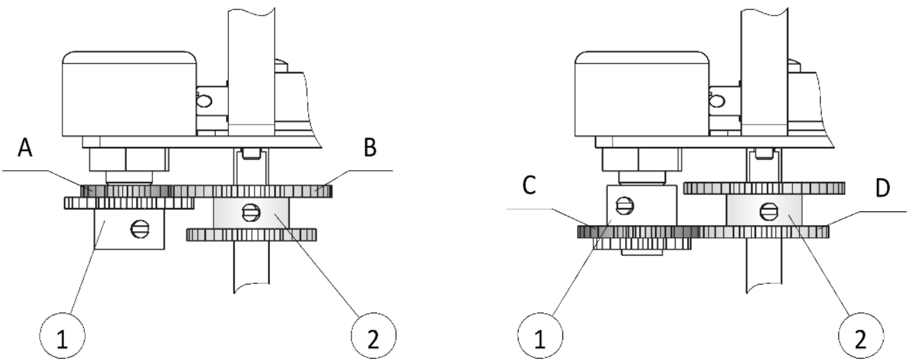


Figure 12 — Setting of the ohmic position transmitter
1 – Potentiometer gear block, 2 – Position indicator gear block

1. Bring the valve to the "Closed" position in manual operation mode.
2. Depending on the required number of revolutions of the output shaft, install the gear unit of the potentiometer 1, in accordance with Figure 12 and Table 5 and fix it.
3. Turn the potentiometer gear block 1 counterclockwise (when viewed from the mechanical position indictor side) until it end position, then turn the potentiometer shaft in the opposite direction (clockwise) by the angle of approximately 15° degrees.
4. Without changing the position of the potentiometer gear block, engage the indicator gear block 2 with the potentiometer gear block 1 and fix it.
5. Adjust the external potentiometer (for remote position indication).

The ohmic position transmitter is set.

15.2. Current position transmitter

Current position transmitter is supplied optionally.

The current position transmitter is used to determine the position of the valve. It sends a 4-20 mA signal based on the actual value position, which is received from the potentiometer (ohmic position transmitter).

15.3. Setting up CPT-2 current position transmitter

The transmitter is set up in accordance with Figure 13.

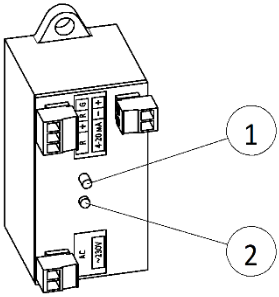


Figure 13 – CPT-2 current position transmitter
1 – Button, 2 – LED indicator.

1. Close the valve in manual operation mode using handwheel.
2. Setup the potentiometer in accordance with paragraph 15.1.
3. To control the output signal value, connect external power supply and a milliampere meter with an accuracy class of at least 0.5 % to the terminals 1 and 2 of the electric actuator terminal block. The connection scheme in accordance with Figure B.3 of Appendix B.
4. Supply the power to terminals 3, 30 of the actuator terminal blocks. The transmitter will switch to operation mode when powered up. The LED indicator 2 is turned off.
5. Switch the transmitter to setup mode by pressing and holding button 1 until LED indicator 2 flashes, then release the button. The indicator blinks to indicate that the setting mode is switched on.
6. Press and hold button 1 until the LED indicator lights up continuously after making sure that the electric actuator is in the "Closed" position. Release the button.
7. Turn the electric actuator to the "Open" position in manual operation mode and the LED indicator will remain lit during this. Press the button. When the LED indicator went out, it indicates that the

transmitter set up is finished and it switched to the operating mode. Release the button.

8. Check the current values by alternately setting the actuator output shaft to the extreme positions. In the “Closed” position, the current is approximately 4 mA, and 20 mA in the “Open” position.

15.4. Setting up CPT-3 current position transmitter

The transmitter is set up in accordance with Figure 14.

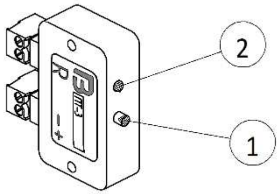


Figure 14 — CPT-3 Current position transmitter
1 – Button, 2 – LED indicator.

1. Close the valve in manual operation mode.
2. Setup the potentiometer in accordance with paragraph 15.1.
3. To control the output signal value, connect external power supply and a milliampere meter with an accuracy class of at least 0.5 % to the terminals 1, 2 of the electric actuator terminal blocks. The connection scheme in accordance with Figure B.3 of Appendix B. The power supply must checked before connecting; its voltage must not exceed the maximum permissible value of 30 V DC. The recommended voltage value is 18-28 V DC. The transmitter will switch to operating mode when powered. The LED indicator 2 is turned off.
4. Switch the transmitter to setup mode by pressing and holding button 1 until LED indicator 2 flashes, then release the button. The indicator blinks to indicate that the setting mode is set.
5. Press and hold button 1 until the indicator lights up continuously after making sure that the electric actuator is in the "Closed" position. Release the button.
6. Turn the electric actuator to the "Open" position and the LED indicator will remain lit. Press the button. When the indicator stops glowing, it indicates that the transmitter setup is has finished setting and has switched to the operating mode. Release the button.

7. Check the current values by placing the electric actuator in the end positions one at a time. The current value is approximately 4 mA in the "Closed" position and 20 mA in the "Open" position.

The transmitter setup is complete.

The settings shall be stored in the independent memory of the transmitter when the power is turned off, and when the power is restored, the transmitter will switch to operating mode with these settings.

The transmitter settings may be changed, if necessary.

15.5. Additional position and position indication switches

Additional position switches are supplied optionally.

Electric actuators can be additionally equipped with two position switches, which provide indication when the shut-off element has reached a predetermined intermediate position. For each direction of travel, one intermediate position can be set at any point in the stroke.

Location of position switches for intermediate positions in accordance with Figure 15.

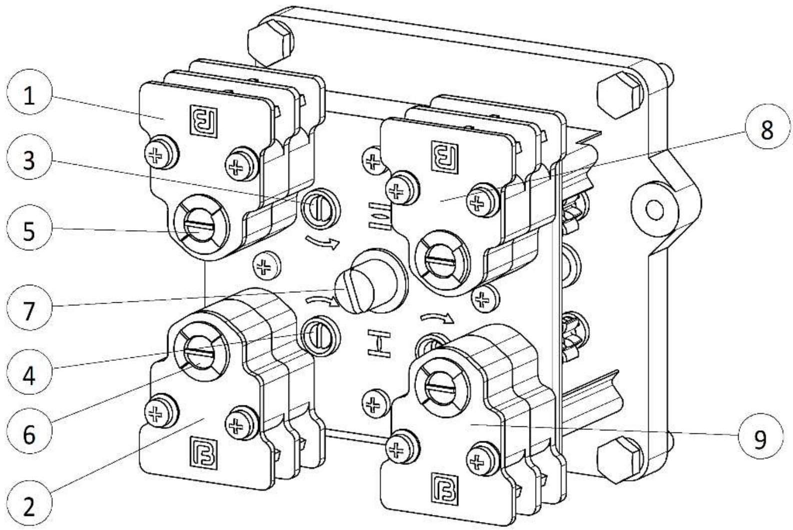


Figure 15 – Stroke limiter with position switches

1 – Opening direction switch, 2 – Closing direction switch, 3 – Opening direction setting screw, 4 – Closing direction setting screw, 5 – Position

indicator of the Opening direction switch; 6 – Position indicator of the switch for the Closing direction; 7 – Screw, 8 – "Open" position and position indication switch, 9 – "Closed" position and position indication switch.

15.6. Setting the "Closed" switch

The position and position indication switch setting procedure is as following.

1. Switch to the manual control mode.
2. Turn the handwheel clockwise to the desired valve position.
   If, before reaching the required position, the position switch has activated, in accordance with Figure 9, then in the following order:
   - using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
   - turn the adjusting screw 4 counterclockwise. The number of screw revolutions is approximately calculated at the rate of 2.5 screw revolutions per the number of valve shaft revolutions required to move to the desired position;
   - turn the screw 7 counterclockwise, returning it to its original position;
   - turn the handwheel clockwise until the valve is in the desired position;
3. Turn the handwheel back 1/4 of a turn (overrun value).
4. Using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
5. Turn the adjusting screw 4 in the direction of the arrow (clockwise), as shown in Figure 15, until the position switch is activated in accordance with Figure 9.
6. Turn the screw 7 counterclockwise, returning it to its original position.
7. Make sure that screw 7 is fixed, the adjusting screw 4 must not turn.

The "Closed" position and position indication switch is now set.

15.7. Setting the "Open" switch

The position and position indication switch setting procedure is as following.

1. Switch to the manual control mode.
2. Turn the handwheel counterclockwise to the desired valve position.
   If, before reaching the required position, the position switch has activated, in accordance with Figure 9, then in the following order:

- using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
- turn the adjusting screw 3 clockwise. The number of screw revolutions is approximately calculated at the rate of 2.5 screw revolutions per the number of valve shaft revolutions required to move to the desired position;
- turn the screw 7 counterclockwise, returning it to its original position;
- turn the handwheel clockwise until the valve is in the desired position;

3. Turn the handwheel back 1/4 of a turn (overrun value).
4. Using a slot screwdriver press the screw 7 until it stops and turn it clockwise to fix it in pressed position;
5. Turn the adjusting screw 3 in the direction of the arrow (clockwise), as shown in Figure 15, until the position switch is activated in accordance with Figure 9.
6. Turn the screw 7 counterclockwise, returning it to its original position.
7. Make sure that screw 7 is fixed, the adjusting screw 3 must not turn.

The "Open" position and position indication switch is now set.
After setting the switches, check that they operate in local or remote control mode properly.

Adjust for the actual overturn if necessary.

16. SETUP COMPLETION

Install the actuator cover back after completing all the necessary settings provided in this manual.

The procedure for installing the cover as following:

- clean the sealing surfaces on the cover and housing;
- check the O-ring, replace if damaged;
- oil the ring lightly, for example, with vaseline and install it back;
- install the cover in place (avoid any ring skewing and/or biting) until the flanges come into close contact;
- evenly tighten the mounting screws crosswise.

Inspect the paint after all work doe and repair damaged areas, if any.

ATTENTION: Paint coating damage lead to corrosion!

17. CARE AND MAITENANCE

ATTENTION: Improper maintenance leads to equipment failure!

ATTENTION: Maintenance and care shall be performed by qualified personnel authorized to perform such work.

ATTENTION: Perform maintenance works only when the electric actuator is switched off.

17.1. Preventive measures for care and safe operation

The following measures are necessary for safe and reliable operation once every six months after commissioning, then annually:

- check the reliability and tightness of cable entries, plugs, etc. visually;
- inspect the paintwork, repair the damage, if necessary;
- check the tightening of the bolts between the electric actuator and the valve. Tighten with force according to Table 4, if necessary;
- perform the field test, if the actuator was running rarely;

For electric actuators with IP 67, 68 protection degree, after immersion in water:

- clean the internal cavities from dirt;
- dry the electric actuator properly;
- fill the gearbox compartment with new grease;
- check readiness for operation by performing a field test.

17.2. Care

The gearbox compartment is filled with lubricant at the factory.

The type of lubricant, depending on the operating conditions (climatic version):

- from minus 30 °C to plus 70 °C – ISO-L-XDCBB00;
- from minus 50 °C to plus 70 °C – ISO -L-XECBB00;
- from minus 10 °C to plus 70 °C – ISO -L-XBEBB00.

The lubrication shall be replaced during maintenance:

- in normal operation after 4-6 years;
- in intensive operation after 6-8 years;
- in little operation intensity after 10-12 years.

It is also recommended to replace the rubber O-rings when replacing the lubricant.

The additional lubrication of the gearbox is not required.

18. POSSIBLE MALFUNCTIONS AND REMEDIES

18.1. Malfunctions during commissioning

Possible malfunctions during the commissioning of the electric actuator are shown in Table 6.

Table – 6. Malfunctions during commissioning

Description of malfunction	Possible cause	Elimination
The switch does not turn off the electric motor, the electric actuator reaches the stop end.	1.Overrun was not taken in consideration when setting up the switch. Overrun occurs due to the moment of inertia of the rotating parts of the electric actuator and valve, as well as the delay when disconnecting. 2. The direction of rotation of the electric drive is not correct.	1.Reset the switch. 2. Adjust the direction of movement
The switch does not work.	The switch is configured incorrectly or faulty.	Check the settings. Configure the switch again, if necessary. Check the switch and replace it, if necessary.

18.2. Electric motor protection

A thermal cut-off is built into the motor winding to protect the motor from overheating and exceeding the permissible surface temperatures. The motor protection is activated when the maximum permissible winding temperature is exceeded, and the electric actuator stops. Further operation is possible only after the motor has cooled down.

Possible causes of overheating: overloading, exceeding the number of runs, too high ambient temperature.

The reason of the thermal cut-off activation must be determined and eliminated.

18.3. Malfunctions during operation

Possible malfunctions during the operation of the electric actuator are shown in Table 7

Table – 7. Malfunctions during operation

Description of malfunction	Possible cause	Elimination
The electric actuator does not work when the start buttons are pressed.	1. There is no power supply. 2. The power circuit or electromagnetic starter of the three-phase electric actuator is faulty. 3. The electric motor failed.	1. Power up. 2. Check the power circuit and the electromagnetic starter. 3. Check the motor and replace, if necessary.
The electric motor does not switch off when the "Closed"/"Open" position is reached	1. The setting of the closing/opening position switch cams has been disrupted. 2. The closing/opening position switch failed.	1. Setup the closing/opening position switch cams taking into account the actual overrun. 2. Replace the position switch.
The electric actuator stopped during the closing/opening stroke.	Jamming of the valve or moving parts of the electric actuator.	Turn the output shaft in the opposite direction in manual operation mode, then repeat the start of the electric actuator in the direction in which the jam occurred. Identify the reason and fix the problem if the electric actuator will stop during restart.
The "Closed" or "Open" indication on the control panel in the end positions of the valve trim do not work.	1. The indicator is blown. 2. There is no power supply to the indication circuit of the electric actuator.	1. Replace the indicator. 2. Check the indication circuit of the electric actuator, correct the faults and supply power to the indication circuit.

The "Closed" and "Open" light indicators are lit on the control panel simultaneously.	Short circuit between the wires of the position switches.	Find the fault and fix the problem.
Incomplete closing/opening of the valve trim.	The position switch is not set accurately.	Reset the position switch.
Loose closing/opening of valve trim.	Torque switch is incorrectly set.	Adjust the torque switch.
While the electric actuator is running, the position indicator disc does not rotate.	The screw that secures the position indicator disc is loosened.	Set the valve trim position indicator disc and secure the disc with a screw.

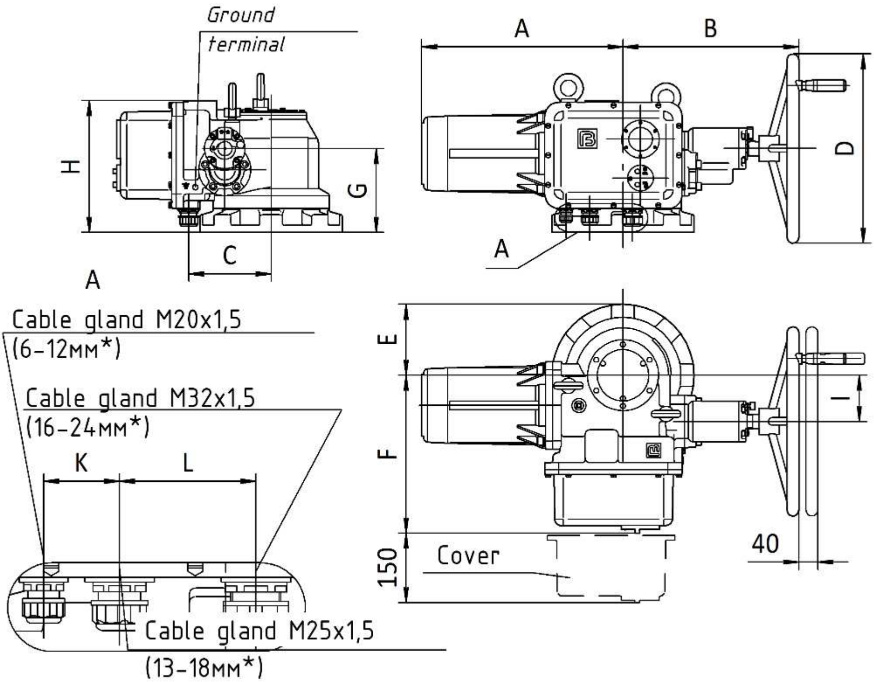
19. DISMANTLING AND DISPOSAL

Electric actuators are designed for long service life. However, they still need to be replaced over time.
The electric actuator does not pose danger to life, human health or the environment and must be disposed after the end of its service life according to the technology adopted by the company operating the electric actuator.
The electric actuator can be disassembled after dismantling and sorted by various materials at the end of its service life:
- various metals;
- plastic;
- lubrications.

Please follow the general disposal rules:
- grease and oils pollute the soil and water, so these should not get into the environment;
- the disassembled materials shall be disposed in accordance with local regulations, or processed by substance separately;
- observe the local regulations for environmental protection.

20. APPENDEXES

Appendix A (mandatory)
Electric actuator dimensional drawings



1. * — Diameter of cable sheath for cable glands included in the delivery set.
2. There is no handle on the handwheel of size 9036 actuators.

Figure A. 1 — General electric actuator drawing

Table A. 1 – Electric actuator dimensions

Model	Dimensions, mm											Weight, no more than, kg
	A	B	C	D	E	F	G	H	I	K	L	
BF-9034	485**	372	174	400	150	334	178	280	98	50	90	138
BF-9035	610	460	200	500	185	360	245	330	128	46	90	203
BF-9036	597	480	242	600	180	402	255	335	156	46	74	268

Note - **The size and weight of a particular electric drive, depending on the version of the electric motor, may differ from those indicated, the table shows the maximum values.

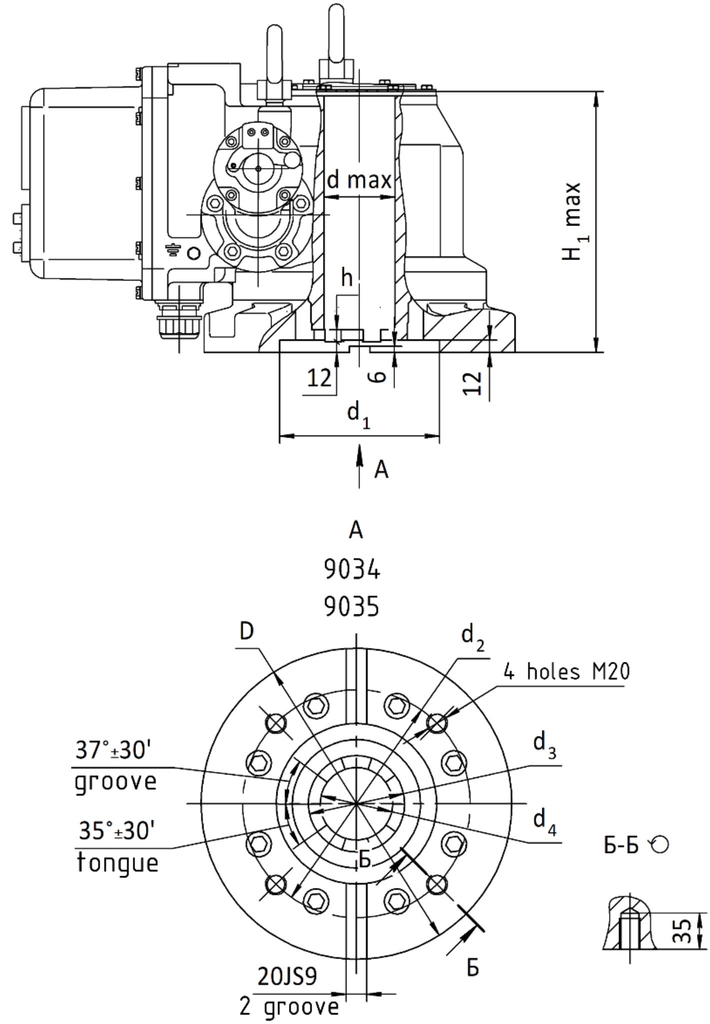
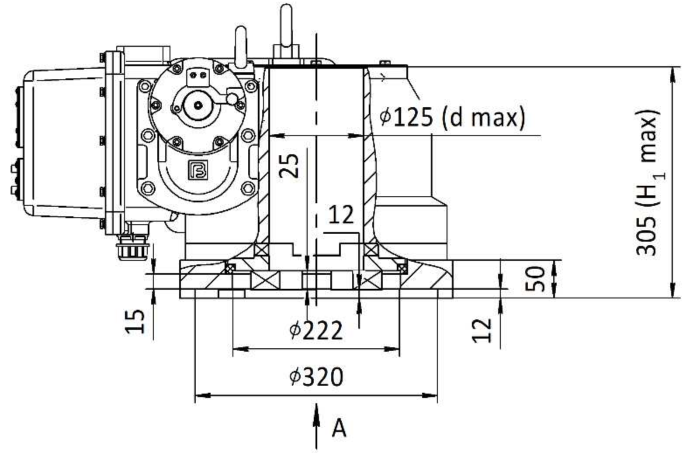


Figure A. 2 — Electric actuator connection dimensions model 9034 and 9035

Table A.2 – Connecting dimensions of the electric actuator

Model	Dimensions, mm							
	D	d	d_1	d_2	d_3	d_4	h	H_1 max
BF-9034	300	70	155	220	84	70	10	245
BF-9035	370	110	240	330	148	120	12	300



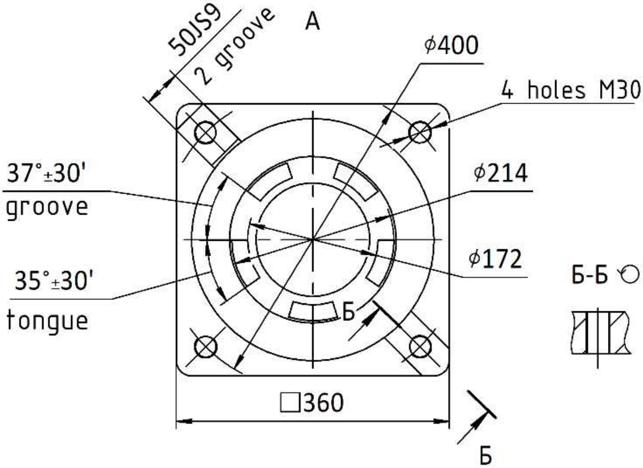


Figure A.3 — Electric actuator connection dimensions for model 9036

Any non-standard connections are available on request.

Appendix B (recommended)
Electric actuators connection schemes

Symbols on schemes:
SQ1 (TO) – torque switch for "Open" direction
SQ4 (STO) – switch for "Open" torque switch actuation
SQ3 (TC) – torque switch for "Close" direction
SQ4 (STC) – switch for "Closed" torque switch actuation
SQ5 (PO) - switch for "Open" position
SQ6 (SO) - switch for "Open" position indication
SQ7 (PC) - switch for "Closed" position
SQ8 (SC) - switch for "Closed" position indication
R1 – heating element
R2 – trimmer resistor
SK – adjustable thermal switch
BQ1 (V1) – ohmic position transmitter 1.0 kΩ

CPT2 – 4-20 mA current position transmitter with active current loop
CPT3 – 4-20 mA current position transmitter with passive current loop
GB – power supply for the current position transmitter
M – electric motor
QF1 – automatic switch for three phase power network
KM1 – contactor for "Opening" direction (for three phase power network)
KM2 – contactor for "Closing" direction (for three phase power network)
HL1 – "Network" light indication
HL2 – light indication of torque switch actuation
HL3 – "Open" light indication
HL4 – "Closed" light indication
F – fuse
SB1 – "Stop" button, SB2 – "Open" button, SB3 – "Closed" button
SA1 – "Open" local control button
SA2 – "Close" local control button
SQ9 – output shaft movement indicator
SQ10 - motor start interlock switch
SAK – Electric actuator control switch "Local"/"Remote"
HL5 – light indication of the move output shaft for " Open " direction
HL6 – light indication of the move output shaft for "Close" direction

Note. Dotted lines indicate the jumpers installed in case of operation of the electrical actuator by torque switches.
The position switches are shown in the schemes in the state corresponding to the valve middle position and the torque switches are in the state when there is no torque overload.

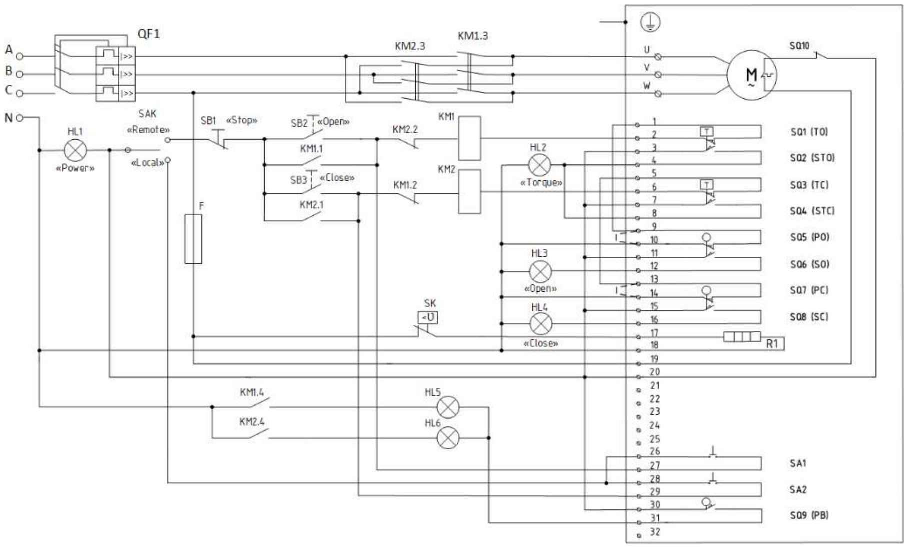


Figure B.1 — Connection diagram DrE611 of an electric actuator with a three-phase electric motor

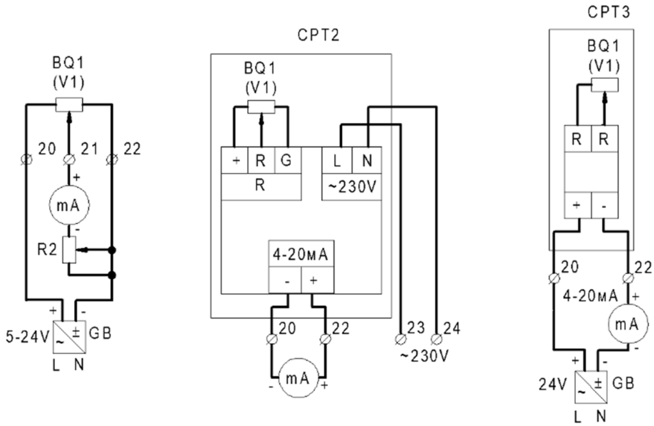


Figure B. 2 – Connection diagram of the actuator additional equipment (optional)

21. NOTES

22. CONTACTS

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