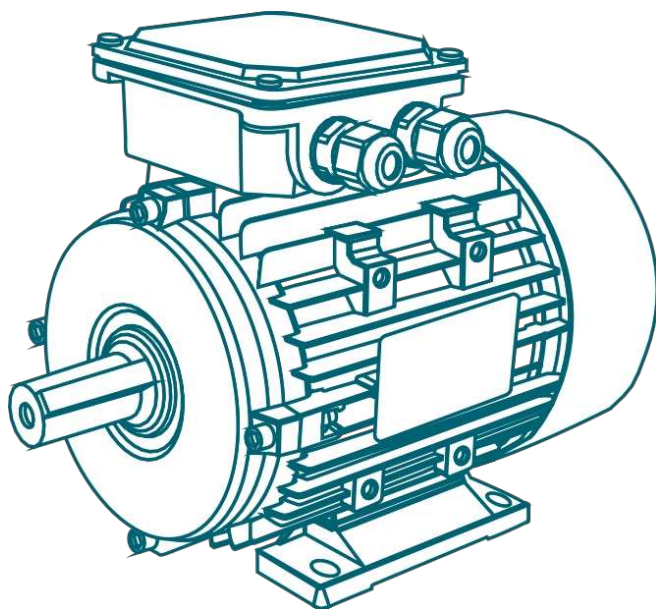


ASYNCHRONOUS THREE-PHASE
ELECTRIC MOTORS OF 5AИ, AИP,
5AИC, АДЧP AND ESQ SERIES OF
GENERAL INDUSTRIAL

OPERATING MANUAL



CONTENTS.

1. Description	2
1.1. Standart structure designation	2
1.2. Basic parameters	3
1.3. Characteristics	5
1.4. Motor design	6
2. Installation and commissioning	12
2.1. Operating limits	12
2.2. Installation and commissioning	18
2.3. Starting the motor	23
3. Operation and maintenance	24
3.1. Actions in extreme conditions	24
3.2. Bearings and bearing units	25
3.3. Maintenance	29
3.4. Preservation	32
4. Repair	32
4.1. Current repair	32
4.2. Disassembly and assembly of the motor	33
4.3. Service maintenance	34
5. Motors with brake	35
5.1. Adjusting the working air gap and braking torque	35
5.2. Adjusting the working air gap of the electromagnetic brakes	35
5.3. Adjusting the braking torque	35
5.4. Brake heating	36
5.5. Possible wiring scheme for the electromagnetic brake	37
5.6. Brake specifications	40
6. Independently cooled motors	43
7. Motor with encoder	46
8. Transportation and storage	46
8.1. Transportation	46
8.2. Storage	47
9. Possible faults and remedies	48
10. Responsibility	50
11. Disposal	51
Annex A (mandatory)	52
Annex B (mandatory)	53
Annex B (reference)	54
Annex D (reference)	55
Annex D (reference)	57

This operating manual applies to low voltage three-phase squirrel cage asynchronous motors of 5AI, AIP, 5AIC, АДЧР and ESQ series(hereinafter - motors) for general use in networks with voltage up to 690V.

Motors are manufactured in accordance with the requirements of GOST 60034-1-2014, GOST 31606-2012 and DIN EN 50347.

The manual does not apply to motors installed on land, sea and air transportation vehicles, as well as explosion-protected motors.

All transportation, storage, connection, commissioning, maintenance and repair work must be carried out by qualified personnel in accordance with the regulations and requirements of these instructions. Failure to comply with these instructions, modifications and disassembly of the motors without the approval of the manufacturer will invalidate the warranty.

Use of electric motors for operation from frequency converter with frequency below 40 Hz or above 60 Hz without independent ventilation is possible only after written agreement with Elcom specialists. Operation of electric motors of 200th size and above as part of the frequency converter without installation of a current-isolated bearing is prohibited.

1. DESCRIPTION

1.1. STANDARD STRUCTURE DESIGNATION

Pos.	1	2	3	4	5	6	7	8	9
Designation	5AI	1	1	2	M	A	6	Y	2

- 1 5AI, AIP, 5AIC, АДЧР and ESQ - designation of trademark of products manufactured by Elcom Ltd.
- 2-4 56 , 63, 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280,315, 355, 400, etc. - height of the motor rotation axis, mm;
- 5 S, M, L - setting dimension along the length of the bed;
- 6 A, B, C, D - core length (may not be available);
- 7 6 - number of poles;

- 8 У, УХЛ, ХЛ - climatic version;
9 1,2,3 - placement category.

Additional options and features not included in the standard designation structure are reported separately.

1.2. BASIC PARAMETERS

1.2.1. The power rating is indicated on the branded plate.

1.2.2. The operating mode according to GOST IEC 60034-1-2014 is indicated on the branded plate.

1.2.3. The main parameters, efficiency, $\cos \varphi$ are indicated on the branded plate.

1.2.4. Starting characteristics in accordance with GOST R IEC 60034-12-2009: M_{st}/M_N ; M_{max}/M_N ; M_{min}/M_N ; I_{st}/I_N are specified in technical specifications. Permissible deviations according to GOST IEC 60034-1-2014.

1.2.5. The motors are designed for operation on three-phase AC mains up to 690 V. The rated voltage and wiring diagram are indicated on the branded plate.

Voltage tolerance according to GOST IEC 60034-1-2014 zone "A" $\pm 5\%$. Prolonged operation in zone "B" $\pm 10\%$ (outside zone "A") is unacceptable.

1.2.6. The rated mains frequency is indicated on the branded plate. Frequency tolerance according to GOST IEC 60034-1-2014 zone "A" $\pm 2\%$. Prolonged operation in zone "B" (prolonged operation with frequency tolerance from -5% to $+3\%$) (outside zone "A") according to GOST IEC 60034-1- 2014 is unacceptable.

1.2.7. Depending on the mounting method, electric motors are manufactured in the following forms of versions: IM1011, IM1001, IM2001, IM3001, IM1081, IM2081, IM3081, IM2011, IM3011, IM1031, IM2031, IM3031, IM1082, IM2082, IM3082, IM1002, IM2002, IM3002, etc. according to GOST R IEC 60034-7-2012. The design is specified in the motor data sheet.

Installation and connection dimensions according to GOST 31606-2012 and DIN EN 50347.

Dimensions and mounting and connection dimensions are given in the manufacturer's documentation and are available on request.

1.2.8. Protection degree of motors from external influences IP54, IP55, IP56, IP65, IP66 according to GOST IEC 60034-5-2011.

The degree of protection of the motor is indicated on the branded plate.

The customer must ensure that the motor shaft is not exposed to direct precipitation when operated outdoors and in shelters to prevent icing in cold weather.

1.2.9. Cooling method according to GOST R IEC 60034-6-2012:

IC411 - surface cooling by its own fan (self-cooling).

IC416 - forced ventilation from an attached fan with separate power supply.

1.2.10. The maximum permissible value of the average sound level at idle speed at 50 Hz power supply complies with GOST IEC 60034-9-2014.

1.2.11. Maximum permissible RMS vibration value of the motor in idle mode without drive mechanism on the shaft according to GOST IEC 60034-14-2014 is given in the table.

Balancing the rotor with a half key on the output end of the shaft. Table of vibration values.

Machine category	Method of attachment	Height of the axis of rotation								
		56 ≤ H ≤ 132			132 < H ≤ 280			H > 280		
		Vibration displacement	Vibration speed, mm/s	Vibration acceleration	Vibration displacement	Vibration speed, mm/s	Vibration acceleration	Vibration displacement	Vibration speed, mm/s	Vibration acceleration
A	Elastic	25	1,6	2,5	35	2,2	3,5	45	2,8	4,4
	Hard	21	1,3	2,0	29	1,8	2,8	37	2,3	3,6
<p><i>Category "A" - motors without special vibration requirements. Standard version. The limit frequencies for the transition from vibration velocity to vibration displacement and from vibration velocity to vibration acceleration are 10 Hz and 250 Hz respectively.</i></p>										

1.2.12. Heat resistance class F according to GOST 8865-93.

1.3. CHARACTERISTICS

1.3.1. Labeling

The rated technical data of the motor can be found on the branded plate:

- power, kW;
- voltage, V;
- the symbol for the type of current;
- mains frequency, Hz;
- current, A;
- rotational speed, rpm;
- power factor ($\cos\phi$);
- EFFICIENCY, %;
- winding phase connection diagram;
- degree of protection;
- temperature class of insulation;
- operation mode;
- weight, kg.

1.3.2. Operating conditions are determined by climatic factors of the environment. Type of climatic execution Y1, Y2, Y3, УХЛ1, УХЛ2, УХЛ3, УХЛ4, ХЛ1, ХЛ2, ХЛ3 according to GOST 15150-69. Information on the climatic version of the motor is shown on the information plate on the motor housing.

Table of ambient temperature and air humidity values depending on the climatic version.

Climatic version	Category	Ambient operating temperature		Max humidity
		max temperature	min temperature	
Y	1,2	+40°C	-45°C	100% at 25°C
Y	3	+40°C	-45°C	98% at 25°C
ХЛ, УХЛ	1,2	+40°C	-60°C	100% at 25°C
ХЛ, УХЛ	3	+40°C	-60°C	98% at 25°C
УХЛ	4	+35°C	+1°C	80% at 25°C

The climatic version is indicated on the motor nameplate.

Accommodation Category:

1. outdoors;
2. under shelter in the absence of direct exposure to solar radiation and precipitation;
3. in enclosed areas without artificial climate control;
4. in enclosed rooms with artificially regulated climate conditions.

1.4. MOTOR DESIGN

1.4.1. Motor housing

The stator housing (frame) and bearing plates are made of gray cast iron or aluminum alloy, depending on the motor type. The frame has cooling fins. The fan casing is made of thin sheet steel.

More precise information on a specific motor type is available on request.

1.4.2. Stator and rotor core

The stator and rotor cores are made of insulated electrical steel sheets.

1.4.3. Stator winding

The stator winding has the temperature class of insulation on the branded plate. The winding is made of round enameled copper wire. The stator winding has been vacuum impregnated twice with electrical coating.

1.4.4. Rotor

The rotor winding is short-circuited (squirrel cage type), made of die-cast aluminum or aluminum alloy (depending on the type of motor).

The motor shaft is made of 45 grade structural steel.

1.4.5. Terminal box

Terminal box housing and cover depending on motor type are made of aluminum alloy, gray cast iron or mild steel.

In the terminal box there is a terminal board with power contacts for connection of power supply cable and additional contacts for connection of cables of control and protection systems (for details see paragraph 1.4.8.).

The motor wiring diagrams are located on the terminal box cover.

Power and control cables are fed through cable glands.

1.4.6. Bearings and bearing arrangements

Bearings are used as standard for motors with rotational axis heights:

- \leq H132 sealed bearings with seals on both sides and bearing lubrication by the manufacturer for the entire service life;
- H160 and above - open bearings with a nipple for replenishing grease during operation.

The bearing sizes for specific standard motors can be found on the branded plate.

The type of bearings used may differ for special motors. For exact information on the installed bearings, refer to the motor nameplate or the motor data sheet.

Additional information is provided in the following paragraphs:

- 2.2.1 Inspection before installation - **Bearing lock**;
- 2.2.4 Test run;
- 3.2 Bearings and bearing units.

1.4.7. Cooling

The IC411 motor uses a shaft mounted fan for external cooling. The fan is made of plastic.

Cooling is achieved by air being drawn in through the openings in the fan guard and passing through the cooling fins on the motor housing. For this method of cooling, the rotation of the motor shaft can be reversed.

The IC416 motor uses axial cooling fan, the axis of rotation of which coincides with the axis of rotation of the shaft. The fan is made of metal. Cooling is achieved by air being suction in through the openings in the fan casing and passing through the cooling fins on the motor housing. The fan is connected directly from the mains supply, independent of the motor supply. The fan impeller rotates at a constant speed.

1.4.8. Motor protection

1.4.8.1 Monitoring of stator winding temperature

Starting from 160 frame dimension, to protect the motors against stator winding overheating, bimetallic sensors, one in each phase of the stator winding, are built into the frontal parts of the stator winding and connected in series. Other stator winding temperature protection can be installed upon customer request, information on which is provided below. The type of temperature protection installed is specified in the motor data sheet.

PTC thermistors with positive temperature coefficient

In order to protect the motors against stator winding overheating in emergency modes, PTC thermistors with DIN 44082 characteristics can be integrated in the frontal parts of the winding, one in each phase and connected in series.

Characteristics of a single sensor for motor monitoring	Winding insulation class F
nominal sensor temperature, °C	145
cold resistance, Ohm	≤ 400
resistance of PTC-thermistors circuit when the nominal temperature of sensors is exceeded (command to disconnect the motor power circuit), Ohm	≥ 4000
measuring voltage, V	≤ 2,5

The number of sensors connected in series is indicated in the circuit diagram located in the terminal box. The typical diagram is shown in Figure A.2. of Annex A.

To connect the thermistor circuits, the output ends are led into the terminal box and connected to the terminals. Marking of lead ends according to IEC 60034-8:

- "1TR1 and 1TR2."

PT100 resistance thermistors

To protect motors in emergency modes from stator winding overheating, PT100 resistance thermistors with a three-wire circuit can be built into the frontal parts of the winding. The number of installed sensors is specified in the motor passport.

A typical diagram is shown in Figure A.3. of Annex A.

For connection of thermal converter circuits, the lead ends are brought into the terminal box and connected to the terminals.

Marking of lead ends according to IEC 60034-8:

-"1R1-(1R2:1R2)", "2R1-(2R2:2R2)", "3R1-(3R2:3R2)" for 3-wire this circuit, there are 3 sensors in 3 phases;

-"1R1-(1R2:1R2)" - for 3-wire circuit one sensor per stator winding.

Recommended temperature setpoints for the stator winding protection controller.

Characteristics of a single sensor for motor monitoring	Insulation class F
warning temperature, alarm temperature, °C	135
cut-off temperature, °C	150

Resistance measurement of thermal converters is carried out with measuring current $\leq 1\text{mA}$

Bimetallic thermal switches

To protect motors in emergency modes against stator winding overheating, normally closed bimetallic thermal switches type KSD-9700-145 H3 can be built into the frontal parts of the winding, one in each phase and connected in series.

Characteristics of a single sensor for motor monitoring	Insulation class F
sensor operation temperature, °C	145
current at AC $\leq 250\text{V}$ ($\cos f = 1$), A	≤ 2.5
current at AC $\leq 250\text{V}$ ($\cos f = 0.6$), A	≤ 1.6

Note. Sensor current limitation in the control circuit is necessary to reduce self-heating.

The number of sensors connected in series is indicated in the scheme located in the terminal box. The typical scheme is shown in Figure A.4. of Annex A.

Marking of lead ends according to IEC 60034-8:

-"1TB1 and 1TB2."

For connection of thermal switch circuits, the lead ends are led into the terminal box and connected to terminals.

1.4.8.2 Winding heating

The motors can be equipped with a band anti-condensation heater, which is fixed on the frontal part of the statorwinding. The heater is designed for power supply from AC mains with voltage 210-250 V, frequency 50 Hz and power:

Frame, mm	Anti-condensation heating power, W
132	68
160	88
180	96
200	104
225	120
250	128
280	144
315	168
355	184

The wiring scheme is located in the terminal box. Typical wiring scheme is shown in Figure A.5 of Annex A.

Lead end labeling:

-"HE1 and HE2."

The lead ends for the anti-condensation heater are led into the terminal box and connected to the terminals. The heater must be energized when the motor is not running in humid conditions and at temperatures less than -20°C it is mandatory, at temperatures less than 0°C it is recommended.

WARNING: DO NOT USE SPACE HEATERS WHILE THE MOTOR IS RUNNING!

1.4.8.3 Bearing temperature monitoring

To monitor bearing temperatures, motors can be equipped with sensors.

PTC is thermistors with positive temperature coefficient.

Marking of lead ends according to IEC 60034-8:

"7TR1 to 7TR2" - D-end side;

"8TR1 to 8TR2" - N-end side.

Pt100 resistance thermistors.

Marking of lead ends according to IEC 60034-8:

"7R1 - (7R2:7R2)" - D-end side;

"8R1 - (8R2:8R2)" - N-end side.

Bimetallic thermal switches.

Marking of lead ends according to IEC 60034-8:

"7TB1 to 7TB2" - D-end side;

"8TB1 to 8TB2" - N-end side.

The monitoring circuits are connected in the drive equipment box or in the sensor's own box. The choice of sensor installation option is determined when ordering.

Measurement of resistance of thermal converters is carried out with measuring current $\leq 1\text{mA}$.

1.4.8.4 Vibration control

The motors can be provided with holes in the bearing shields for mounting the VK-310C vibration measurement sensor in the radial direction along the X-axis.

Marking of the vibration sensor connection cable:

"VS1" - the vibration sensor is mounted on the X-axis on the electric motor frame on the DE bearing unit;

"VS2" - the vibration sensor is mounted along the X axis on the motor frame on the NDE bearing unit;

"VS3" - the vibration sensor is installed along the X-axis in the center of the electric motor frame;

"VS4" - vibration sensor according to customer's specifications.

2. INSTALLATION AND COMMISSIONING

Attention! Installation and initial commissioning of the motor must be carried out in the presence of a representative of the manufacturer (if there is a separate contract for supervision and commissioning), or upon written agreement with Elcom Ltd., without a representative of the manufacturer, with the subsequent sending of the commissioning certificate to the manufacturer within 20 calendar days after commissioning.

Disassembly of the motor, including bearing assemblies and removal of the fan casing (except for cases when behind the casing is packed spare parts, temperature control device or other motor equipment) during the warranty period without the presence of a representative or written authorization of the manufacturer is prohibited!

The technical commissioning report must be drawn up in accordance with the manufacturer's prescribed form (the commissioning report form can be downloaded from https://www.elcomspb.ru/downloads/?cat_id=145 or by scan on the QR code below.

The manufacturer's warranty for the period of use of the engine is only validated by sending a technical report within the above-mentioned time limits.



2.1. OPERATIONAL LIMITATIONS

2.1.1. Operating limits

The motors must be used in the operating mode according to IEC 60034-1-2014 as specified on the branded plate.

Use of electric motors for frequency converter operation below 40 Hz or above 60 Hz without independent ventilation possible, only after a written agreement with specialists of Elcom Ltd.

Operation of electric motors larger than 200th frame with frequency converter without installation insulated end shield or insulated bearing is prohibited.

Soft start (time to reach rated speed not more than 1 min.) by means of a soft-starter or frequency converter is acceptable.

2.1.2. Mains voltage and frequency

The mains voltage and frequency limits are specified in paragraph 1.2.5. and 1.2.6.

2.1.3. Mounting

Install the motor only in accordance with the mounting which are specified in paragraph 1.2.7.

2.1.4. External factors: water and dust

Install and operate the motors according to the degree of protection specified on the type plate (see paragraph 1.2.8).

2.1.5. Cooling

Cooling method is specified in paragraph 1.2.9.

There must be no devices or surfaces around the motor that can cause additional heating. The maximum and minimum ambient temperature must be within the limits of the climatic version of the motor (see paragraph 1.3.2).

The distance from the end face of the fan casing to the nearest obstacle must be $\geq d/2$, where d is the diameter of the casing.

Do not operate motors without fan and fan casing.

2.1.6. Ambient temperature and climatic factors

The motors may only be operated in accordance with the climatic version of the motor (see paragraph 1.3.2).

Regardless of the climatic version specified in the motor type, the rated power of the motors indicated on the branded plate is specified for operation at altitudes up to 1000m above sea level and at ambient temperatures $\leq +40^{\circ}\text{C}$.

When operating the engine at altitudes above 1000m and at ambient temperatures above +40°C, the motor load must be reduced in accordance with the data given in the tables.

Table of power reduction depending on ambient temperature.

Upper ambient temperature value	+40°C	+45°C	+50°C	+55°C	+60°C
Coefficient of variation of permissible power depending on temperature, % (K) _T	1,00	0,95	0,90	0,85	0,80

Table of power reduction as a function of altitude.

Altitude above sea level, m	1000	1500	2000	2400	3000	3500	4000	4300
Coefficient of variation of permissible power depending on the height above the sea level, % (K) _{sl}	1,00	0,98	0,95	0,93	0,88	0,84	0,80	0,74

For simultaneous exposure to ambient temperature at altitudes above 1000m, the permissible load is calculated using the formula:

$$P_p^D = P_r \times K_T \times K_{sl}, \text{ where:}$$

P_p^D - permissible power;

P_r - rated power;

K_T - coefficient of power change depending on temperature;

K_{sl} - coefficient of variation of allowable power depending on the altitude above sea level.

The value of the load power at the motor shaft can be determined from the measured motor current. A change in load power within $\pm 20\%$ of the rated power (indicated on the nameplate) is directly proportional to the change in current (disregarding nonlinearities in motor characteristics).

$$P_{load} = (I_{measured} / I_{rated}) \times P_{2rated}$$

2.1.7. Overload

Overloaded operation is unacceptable and will result in motor failure.

2.1.8. Bearings

The axial and radial load on the bearings from the drive train must not exceed the values given in the table below.

It is not permissible to disassemble the electric motor without authorization from Elcom Ltd. Exceeding the values specified below leads to shortened bearing life, electric motor failure and is a violation of the operating rules.

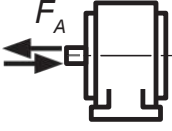

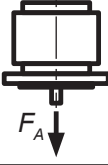
Maximum permissible radial load.

Maximum permissible radial load Fr, H												
Frame	3000 rpm			1500 rpm			1000 rpm			750 rpm		
	Radial load application point											
	IM design: 1001, 1081, 2001, 2081, 3001, 3081*											
	X= 0	X= 0,5	X= 1	X= 0	X= 0,5	X= 1	X= 0	X= 0,5	X= 1	X= 0	X= 0,5	X= 1
71	500	450	400	700	630	530	-	690	-	-	-	-
80	550	530	420	750	710	570	860	820	640	950	800	680
90	610	580	520	840	760	700	980	860	770	1100	1030	930
100	910	820	740	1080	990	880	1010	950	790	1350	1310	1060
112	1060	980	870	1270	1150	970	1720	1590	1350	1630	1480	1290
132	1530	1340	1160	1890	1650	1420	2120	1860	1590	2430	2070	1720
IM design: 1001, 2001, 3001*												
160	2310	1980	1640	3060	2720	2270	3420	2940	2520	3800	3220	2770
180	2920	2550	2240	3970	3460	3050	4590	3960	3500	5090	4470	3860
200	3420	2960	2700	4460	2900	3360	5130	4530	3900	5660	4930	4220
225	3880	3440	3080	5160	4480	3910	5900	5150	4360	6440	5560	4730
250	4230	3960	3580	6260	5510	4810	7260	6470	5640	7820	6970	6160
280	4700	4110	3730	6520	5570	4840	7380	6870	5970	8080	7665	6410
315	4980	4380	3880	7360	6390	5390	8510	7270	6300	8340	8360	6660
355	7800	7500	6800	12600	11600	10800	14200	13000	12000	16000	14600	13600

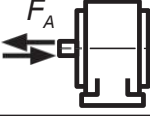
**maximum permissible value of loads in case of other constructional design is available upon request to specialists of Elcom Ltd.*

Note: Radial load application points: X = 0 - at the shoulder of the shaft; X = 0.5 - middle of the shaft; X = 1 - end of the shaft.

Maximum permissible axial load.

		Maximum permissible axial load $F_{A,H}$					
		IM design: 1001, 1081, 2001, 2081, 3001, 3081*					
Frame	Number of poles	Direction of action of axial load F_A					
							
		When $F_r = 0$	At F_r max	When $F_r = 0$	At F_r max	When $F_r = 0$	At F_r max
80 90 100	2	380	215	430	340	390	150
	4	440	265	570	400	520	150
	6	480	360	690	450	630	190
	8	560	455	780	620	720	270
112	2	850	590	930	730	820	310
	4	1050	760	1250	950	1140	370
	6	1350	950	1520	1200	1370	480
	8	1550	1150	1720	1400	1570	690
132	2	1450	835	1550	1300	1400	380
	4	1750	1015	2050	1600	1850	470
	6	2200	1275	2450	1850	2200	540
	8	2550	1435	2800	2150	2550	670

*maximum permissible value of loads in case of other constructional design is available upon request to specialists of Elcom Ltd.
 Note: The value of the maximum radial load F_r max is from Table1 for the application point $X = 0.5$ - middle of the shaft.

		Maximum permissible axial load $F_{A,H}$	
		IM designs: 1001, 2001, 3001*	
Frame	Number of poles	Direction of action of axial load F_A	
			
		When $F_r = 0$	At F_r max
160	2	1640	660
	4	2200	1000
	6	2060	1080
	8	2100	1200
180	2	2030	780
	4	2480	1080
	6	2990	1300
	8	3500	1450

Maximum permissible axial load $F_{A,H}$			
IM designs: 1001, 2001, 3001*			
Frame	Number of poles	Direction of action of axial load F_A	
		When $F_r = 0$	At $F_r \text{ max}$
200	2	1340	940
	4	1670	1070
	6	2080	1360
	8	2320	1640
225	2	1500	1020
	4	1860	1220
	6	2240	1370
	8	2530	1600
250	2	3210	2760
	4	4280	3590
	6	5000	4180
	8	6530	5550
280	2	3050	2550
	4	3850	3150
	6	4600	3750
	8	4900	4000
	10	6050	4900
315	2	3400	2700
	4	4300	3600
	6	5100	4150
	8	5800	4700
	10	6900	5850

* - the maximum permissible value of loads in case of other design is available upon request to Elcom Ltd. specialists.

Note: The value of the maximum radial load $F_{r,max}$ from Table 1 for the application point $X = 0.5$ - middle of the shaft.

The maximum permissible bearing temperature, temperature dependent service life and bearing maintenance are specified in paragraph **3.2. Bearings and bearing units.**

2.1.9. Maximum number of starts

The motors can be started in two consecutive direct starts (with a stop between starts) from cold, with an interval between starts of 3 to 5 minutes or one hot start 1 hour after the machine has been left stationary.

2.1.10. Reliability indicators

- not less than 20,000 h. - average motor life before overhaul.
- not less than 30 000 h. - average motor MTBF.

2.1.11. The warranty is specified in the product data sheet.

2.2. INSTALLATION AND COMMISSIONING

The electric motor may be installed and operated by personnel who are authorized to work with electrical installations, who have studied the operation manual and safety instructions (including GOST12.2.007.075, GOST12.2.007.175), the Rules of Technical Operation of Electrical Installations of Consumers and the Rules of Electrical Installations (ПУЭ).

The authorization of personnel to carry out installation and commissioning of the electric motor is to be considered as confirmation that the personnel is familiar with the above documents. During the warranty period, the manufacturer shall not be liable for damage caused by the user if the installation, wiring and operating instructions are not non-compliance.

Elcom Ltd. renders services on supervision of installation and start-up and commissioning works for commissioning of equipment in accordance with the manufacturer's requirements on the territory of Russia and CIS countries.

After installation, before connecting the motor to the mains, check that the voltage and frequency of the mains correspond to the voltage and frequency specified on the motor nameplate and that the stator winding leads are correctly connected to the mains wires. Check the correct selection of the circuit breaker and the setting of the thermal relay. Starting the motor without circuit breakers is not allowed!

2.2.1. Pre-installation inspection

Check the integrity of the original packaging for damage. If any damage is detected, take photographs and contact the retailer or the manufacturer.

Check the engine for mechanical damage and paintwork damage. If there is damage, contact your dealer or the manufacturer.

Use special load securing devices (eyebolt) to suspend the motor.

Check that they are securely fastened. Suspension from other places is not allowed. For motors of dimension $H \leq 100$ there are no load devices. The load securing devices are only designed for the motor's own weight.

Check the data sheet, instructions, data on the type plate for compliance with the order requirements and operating conditions.

When transporting the motor to the installation place, whether packed or unpacked, no sudden jolts, knocks or damage to the paintwork by any tools are permitted.

Bearing lock

Before checking shaft rotation, unlock the motor shaft by removing the shaft transport locks (if any).

Check free rotation of the motor shaft by hand. There must be no knocking, catching, cracking or bearing noise during rotation.

For protection class IP55 and higher, check that the sealing collars on the motor shaft are in the right place, intact and correctly fitted. The design of the seals for the respective operating conditions is determined by the manufacturer.

For subsequent transports, the shaft must be locked again with the transport locks (if originally supplied with the motor).

2.2.2. Deconservation

Clean all connecting surfaces of the motor: output end of the shaft, connecting surfaces of the flange plate and support surface of the feet from conservation grease and wash with white spirit or gasoline. Clean the outer surface of the motor from dust (if any).

The drive end of the shaft may have damage to an area not exceeding 1% of the total working area of the shaft: jams, scuffs, scratches. The electric motor is recognized as serviceable with such damage.

2.2.3. Insulation resistance and circuit integrity

Check insulation resistance of windings, elements built into the stator winding and continuity of circuits before:

- any first connection of the motor to the supply voltage at idle speed without drive train in order to check operation and defects;
- installation with drive mechanism.

Insulation resistance

The insulation resistance of the stator windings, winding thermal protection against the housing, between winding phases and between the winding and its built-in components at ambient temperature +20°C must be at least 1 megohm. If the resistance is lower, the motor must be dried.

Refer to Annex B for **motor drying**.

If silica gel is presence in the terminal box, it must be removed.

Measure insulation resistance with a 500-1000V mega-ohmmeter.

Integrity of schemes

Measure winding resistance with an ohmmeter with DC measurement accuracy class ≤ 0.5 , measuring range from 1 mOhm to 100 ohms. The resistance value is regulated by the manufacturer and, if necessary, is available on request.

Measure the circuit resistance of bimetallic sensors with an ohmmeter at a DC voltage of not more than 2.5 V per sensor.

WARNING: It is not allowed to measure the resistance with a megohmmeter.

2.2.4. Test run

In order to check the performance of the motor, it is permissible to perform a test run at idle speed without mounting on the foundation, frame, drive unit or without the coupling half attached to the motor shaft. The motor connection is described in paragraph 2.2.5.3.

After installation, before carrying out a test run, check that the mains voltage and frequency correspond to the voltage and frequency specified on the motor nameplate and that the stator winding leads and power supply wires are correctly connected.

Check correct selection of the automatic protection circuit breaker and setting of the thermal relay.

In order to avoid bearing damage on motors with roller bearings, continuous idling without bearing load is not permissible.

2.2.5. Mounting

2.2.5.1. Inserting belt pulleys, toothed pulleys or coupling halves onto the shaft end

The shaft end must be cleaned and greased before using. It is advisable to use special anti-friction greases for this purpose.

The parts to be fitted must be balanced with the half key.

Insert parts onto the motor shaft without mechanical shocks, by heating the parts, using special tools (if a threaded hole in the shaft is present).

2.2.5.2. Alignment

When installing motors, ensure that the foundation, frame or drive unit is in good condition.

To ensure alignment of the motor shaft with the drive train, U-shaped shims can be used between the motor feet and the foundation directly under the mounting bolt.

Do not install the gasket away from the bolt to avoid stresses in the motor foot and damage to the motor foot.

Alignment tolerance of the motor shaft with the drive train ≤ 0.04 mm and angular misalignment ≤ 0.03 mm over a length of 100 mm.

The masses of parts attached to the motor shaft and the tensioning of belts in the case of V-belt drives must not create radial and axial loads on the motor shaft greater than the values specified in paragraph 2.1.8.

2.2.5.3. Connection

Grounding

The motor must be grounded before connection.

In the standard version there is a special bolt in the terminal box for grounding, motors from frame 160 have an additional grounding bolt on the housing.

The contact points of the grounding points must be clean, dry and free of rust.

Connection of supply voltage

Use the cable glands in the terminal box to insert the power supply cable.

Use the terminal screws to connect the supply cable. Connect according to the diagrams in the terminal box and observe the voltage data on the branded plate. Typical wiring diagrams are given in Annex A.

Contact bolts and contact points must be clean, dry and rust-free. The minimum air gaps between uninsulated conductive elements and the grounding system must not be smaller than the following values: 8 mm at $U_r \leq 550$ V; 10 mm at $U_r \leq 725$ V; 14 mm at $U_r \leq 1000$ V. Make sure that no foreign objects are in the terminal box during installation and that no fasteners get inside the motor.

Direction of rotation

To change the direction of rotation, swap the two power wires on the contact bolts.

Connection of independent ventilation unit

The independent ventilation unit is connected by a separate supply line.

The independent ventilation unit must not be connected to the motor power contacts. The wiring diagrams for independent ventilation are specified in paragraph 6. of these operating instructions.

Connection of control circuits and embedded elements, if any.

Use the cable glands in the terminal box to insert the control cable. Use the special contact plates in the terminal box to connect the control cable.

Monitoring of stator winding temperature

Connection of PTC thermistors should be connected in accordance with the requirements of paragraph 1.4.8.1.

Connection of PT100 resistance thermistors should be connected in accordance with the requirements of paragraph 1.4.8.1.

Bimetallic thermal switches should be connected in accordance with the requirements of paragraph 1.4.8.1.

Winding heating

Connection of the space heater should be connected in accordance with the requirements of paragraph 1.4.8.2.

Bearing temperature monitoring

When monitoring the bearing temperature, the temperature protection should be connected in accordance with the requirements of paragraph 1.4.8.3.

After connecting all circuits, check tightness of connection points, cable glands, impermeability of cable entry (if necessary, wrap an additional layer of insulating material around the cable).

Close the terminal box cover and tighten the mounting bolts securely. Refer to Annex B of this manual for the torque of the contact bolt connections.

2.3. STARTING THE MOTOR

2.3.1. No-load test run without motor installation

Trial idling without mounting the motor on the frame and to the drive unit to check its condition and operability should be carried out with regard to paragraph 2.2.4.

2.3.2. Start-up and normal operation with drive mechanism

When starting directly from the mains, a transient process must be taken into account, whereby the motor current is initially equal to the starting current and decreases to the nominal or lower value during acceleration, depending on the static load. The motor acceleration time (reduction of the current downward from the starting value) depends on the system moment of inertia and the starting characteristics of the motor (starting, minimum and maximum torque values).

Direct start-up from the mains at 80% of the standard voltage is permitted.

After a test run and elimination of any deficiencies noted, perform a second run under load. The motor is started by switching on the mains voltage from manual, remote or automatic control devices.

When operating the motor at full (rated) load, make sure that the current drawn by the motor from the mains does not exceed the value indicated on the branded plate. The motor must not be operated without automatic protection devices. Overcurrent operation is not permissible and will lead to motor failure.

For star-delta starting, the mains voltage must correspond to the motor voltage in delta connection. During this start-up, the transient process described above for direct start-up must be taken into account with the following condition: at the initial start-up moment on the star, the starting current of the motor is 3 times lower than the regulated value; the starting, minimum and maximum motor torques are 3 times lower than the regulated values.

Before commissioning, check that all motor screw connections, including the nuts of the entire motor terminal block contact group, are tight. Also check the correct positioning of the contact group components (no misalignment of washers, jumpers, shims and supply cable lugs).

3. OPERATION AND MAINTENANCE

The operating conditions must be suitable for the intended use of the product and its characteristics.

3.1. ACTIONS IN EXTREME CONDITIONS

Disconnect the motor from the mains immediately (emergency) in the following cases:

- smoke or fire in the motor or its control gear;
- vibration in excess of the permissible limits, jeopardizing the integrity of the motor;
- failure of the drive mechanism;
- heating of the bearing beyond the permissible temperature.

In the event of a motor in fire, only carbon dioxide fire extinguishers should be used to extinguish it.

Do not use foam extinguishers!

3.2. BEARINGS AND BEARING UNITS

Information on bearing types depending on motor dimension is given in paragraph 1.4.6.

3.2.1. Maintenance of sealed bearings

For motors equipped with permanently lubricated sealed bearings (bearings marked 2RS), it is recommended to replace them when operating at ambient temperatures +40°C approximately after 10,000 operating hours for 2-pole motors or 20,000 operating hours for motors with 4 or more poles, but at least once every 3-4 years.

When operating at ambient temperatures of +25°C, service life is twice as long.

Operation of the electric motor with closed bearings at ambient temperatures above +40°C is unacceptable.

Regardless of the ambient temperature, the temperature in the bearing area on the drive end side may be increased due to impaired heat dissipation caused by the installation of enclosure structures in the drive end shaft. Considering this factor, it is necessary to measure the air temperature in the bearing area, monitor the temperature of the bearing shield or cover, and make ventilation windows in the enclosure structures.

Maximum permissible bearing temperature:

When commissioning an electric motor with protection class IP55 or higher, the rotor shaft and bearing shields may be heated up to +100°C (+90°C when measured on the bearing shield or bearing cover outside the motor in the bearing contact area).

To reduce the run-in time of the gland seals and to reduce the heating temperature of the bearing shields, we recommend additional lubrication of the contact point between the gland seals and the motor shaft.

3.2.2. Maintenance of open bearings with grease replenishment via the nipple

Electric motors equipped with bearing grease replenishment devices must undergo regulated maintenance, including partial replenishment of bearing grease.

The amount of grease to be replenished and the periodicity of grease replenishment for roller bearings are shown in the table below:

Table of lubrication intervals and lubricant quantities for roller hoppers.

Frame	Amount of grease, gr.	Time interval of grease replenishment, hr						
		3600 rpm	3000 rpm	1800 rpm	1500 rpm	1200 rpm	1000 rpm	500-900 rpm
180-225	25	900	1500	4300	5000	5800	6500	7000
250-280	35	400	1000	3300	4500	5500	6300	6800

The amount of grease to be replenished and the periodicity of grease replenishment for ball-bearings are shown in the table below:

Table of lubrication intervals and quantity of grease for ball studs.

Frame	Amount of grease, gr.	Time interval of grease replenishment, hr						
		3600 rpm	3000 rpm	1800 rpm	1500 rpm	1200 rpm	1000 rpm	500-900 rpm
180-225	25	1800	3100	5500	6500	7500	8500	9500
250-280	35	800	2000	5000	6000	7000	8000	9000

Lubrication replenishment devices provide for replenishment of the bearing grease without disassembly of the electric motor, the grease is replenished through grease nipples by injecting the grease with a syringe and turning the electric motor shaft.

Sinopec BME based on mineral oils with lithium thickeners is used as a bearing grease; Litol-24 may be used as a grease replenishment analogue.

Upon agreement with the customer, the motors can be equipped with grease of other types and manufacturers.

Grease may be replaced by the user with other types of grease only after the factory grease has been completely removed.

To avoid bearing damage, mixing greases of different types is strictly prohibited.

It is recommended to perform scheduled grease on a warmed up motor.

(1 to 2 hours of idling or at normal load). Before refilling, remove the sealing plugs of the grease drain holes.

Evaluate the condition of used grease, which came out through drain holes, if necessary fill bearings with new grease, referring to paragraphs 3.2.2.1., 3.2.2.2.2. of this Manual.

For every 15°C increase in ambient temperature or bearing temperature, the time interval between replenishments is reduced by a factor of 2. The maximum permissible increase in ambient temperature is up to +40°C.

In favorable conditions, the time intervals can be increased by a maximum of two times if the bearing temperature is below +70°C.

For motors equipped with roller bearings, the interval between replenishments grease are reduced by a factor of 2.

Operation of the motor with open bearings at ambient temperatures above +40°C is not permissible.

Regardless of the ambient temperature, the temperature in the bearing area on the drive end may be increased due to impaired heat dissipation caused by the installation of enclosure structures in the drive end shaft area. Considering this factor, it is necessary to measure the air temperature in the bearing area, monitor the temperature of the bearing shield or cover, and make ventilation windows in the enclosure structures.

Maximum permissible bearing temperature during operation:

When commissioning an electric motor with protection class IP55 or higher, the rotor shaft and bearing shields may be heated up to +100°C (+90°C when measured on the bearing shield or bearing cover outside the motor in the bearing contact area) during the running-in process of the sealing glands.

To reduce the run-in time of the gland seals and to reduce the heating temperature of the bearing shields, we recommend additional lubrication of the contact area between the gland seals and the motor shaft.

For lubrication of electric motor bearings in climatic conditions N1, N2, N3, NF4 it is recommended to use greases based on mineral oils with lithium thickener, for example Litol24.

For lubrication of electric motor bearings in climatic conditions F1, F2, F3, N F1, NF2, NF3 it is recommended to use heat-resistant greases, for example, TSIATIM-221.

A high temperature grease, such as Mobil Unirex No. 2, should be used to lubricate the bearings of electric motors labeled "HTG SBU" and coupled to dome compressors.

Bearings which use grease based on another saponified grease, for example sodium-based grease, can lead to grease degradation and loss of lubrication properties when contaminated, which can lead to bearing destruction.

WARNING: Mixing of greases of different brands is not allowed!

3.2.2.1. Grease replenishment process when the motor is rotating

- remove the sealing plugs from the grease drain holes, if installed, during refilling;
- when greasing open bearings, the motor shaft must be rotated by hand to ensure even distribution of grease in the bearing. The bearing is considered to be filled with fresh grease if the grease itself starts to come out of the outlet opening when shaft rotated by hand;
- allow the motor to rotate for 1-2 hours to ensure that excess grease is removed;
- close the outlet holes with a plug.

3.2.2.2. Grease replenishment process with motor at inactive

- remove the sealing plugs from the grease outlet drain holes, if installed, during refilling;
- add new grease (half of the recommended amount) into the bearings and then run the motor for 5-10 min;
- after stopping the motor, add grease until the old grease is completely gone;
- allow the engine to rotate for 1-2 hours to ensure that excess grease is removed;
- close the outlet holes with a plug.

After long periods of storage or downtime, including new motors, it is advisable to change the lubricant before commissioning, especially if the bearing separator noises are audible due to thickening of the lubricant in the bearing.

During start-up it may happen that strong bearing noises can be heard for some time. Bearing noises are not dangerous if the operating temperature has not been reached and the noises are caused by the increased density and dynamic viscosity of the bearing grease. In the event that extraneous noise from bearing units does not stop, it is recommended to perform manipulations according to paragraph 3.2.2.1. or paragraph 3.2.2.2.

3.3. MAINTENANCE

The procedure for technical inspection (hereinafter referred to as TM) and its periodicity are shown in the table below.

After 3 years of operation the periodicity of TM is repeated.

Once a week a complete inspection of the motor appearance should be carried out. If traces of dirt are detected on the motor housing, remove them; if oil leaks from the bearing, check the tension of drive belts, measure axial and radial loads; check the condition of rubber seals, reinforced sleeves and cable glands; check the places where the motor is attached to the equipment; check the tightness of all threaded connections, etc.

Elcom Ltd. provides a full range of services on technical maintenance and service support of equipment operation on the territory of Russia and CIS countries.

Table - Order and frequency of maintenance operations

№ TM	Motor maintenance procedures	Periodicity	Note
TM1	check that there is no long-term overcurrent (power) overload of the motor	upon expiration 500 hours of operation; or after one year of operation	
	check for excessive vibration (correct mating, alignment of motor and drive unit)		
	check that there is no excessive bearing noise, increased heating in bearing units		
	check places of motor attachment to the equipment (tightness of threaded connections of feet and motor flange to the equipment, absence of mechanical damage of feet, flange plate and corresponding places of drive equipment attachment)		
	check winding insulation resistance		
	check tightness of the cable gland connector, no turning or pulling of the cable out of the cable gland (by hand)		
	check drain holes and condition of water drain plugs (if any) in motors with protection degree IP55 and higher, if necessary - clean the holes		
	make sure that there is no dirt, water or snow in the drain holes of the flanged motor - shaft up;		
	in cold season, when the motor is placed on an open area, under a shed, in an unheated room, make sure that there is no icing on the shaft, rotating parts, if ice is detected, remove it.		
TM2	under unfavorable operating conditions (heavy pollution, high external vibration, wet, sharp temperature difference of air, unheated rooms), if necessary, repeat the maintenance 1 TM	after 2 years of operation	

TO3	Refer to 1 Maintenance and additionally to the checks listed below	upon expiration 9000 hours of operation or after 3 years of operation	Annex B
	check the tightening of all screw connections, including electrical connections in the terminal box		
	check the quality of the surface of electrical contacts in the terminal box and grounding (no oxidation, discoloration and rust, no damage to the insulating tubes between the wire and lug, no damage to the insulation of power wires in the places of cable cutting)		
	check the surface condition of paint coatings		
Replacement of sealing parts	shaft sealing collars (protection class IP55 and higher)	after every 3 years of operation	
	gaskets sealing between cover and terminal box and between terminal box and frame	after every 6 years of operation	
	sealing gasket between cable gland and terminal box (if cable gland is included in the cable gland set)		
	sealing sleeve inside the cable gland (specify frame number when ordering spare parts for the sealing bushing)		
Bearing replacement and winding	replace the closed bearing (motor disassembly will be required) See Note *		p. 3.2.1
	replace open bearing with grease replenishment (motor disassembly required) See Note *		p. 3.2.2
	replace the winding (motor disassembly is required)		p. 2.1.11

Note. Estimated service life of bearings L10 according to GOST 18855-2013 in hours of operation depends on radial and axial loads on the motor shaft from the drive mechanism.

Actual bearing life depends on many factors, including lubrication conditions (timely lubrication service), lubricant quality, pollution, skew environmental conditions and external vibrations. Actual condition of bearings should be checked during TM (visually for foreign noises or by monitoring with technical means).

3.4. PRESERVATION.

Before preservation it is necessary to clean the motor from dust, dirt, blow out with dry air under pressure of 1.2-2 atm. and remove rust. Damaged surfaces of coatings should be repaired.

Preservation involves applying a temporary coating to the outer unpainted docking surfaces of motor parts and assemblies to protect them from corrosion during transportation and storage.

During conservation, unprotected places of motors (drive end of shaft with key, supporting surfaces of feet or flange, grounding clamps and places under them, plates, etc.) should be cleaned from old grease, degreased and covered with a thin layer of oil K-17 GOST 10877-76. After application of grease it is necessary to put a cap on the drive end of the shaft or wrap it with wax paper according to GOST 9569-2006 and tie it with twine.

The permissible storage life of the motors in their packaging and with the manufacturer's conservation is specified in the motor data sheet. After expiry of this period, the motors must be reconserved.

If the motor is used seasonally, it must be cleaned and lubricated at the end of each season. At the beginning of a new working season, check the lubrication of the bearings before commissioning the motor. If the motor is idle during cold weather at temperatures below -20°C, check the insulation before starting. If necessary, dry the motor.

4. REPAIR

4.1. CURRENT REPAIR

Current repair of the motor should be carried out as the condition and failure progresses. Frequency and procedure of repairs are described in paragraph 3.3.

If the motor must be disassembled if the warranty period has not expired, the manufacturer must be contacted to determine the cause of the defect.

After repair, the motor must comply with the requirements of this manual.

4.2. DISASSEMBLY AND ASSEMBLY OF THE MOTOR

If the motor must be disassembled if the warranty period has not expired, the manufacturer must be contacted to determine the cause of the defect.

When disassembling and reassembling the motor, do not allow foreign objects to enter in the motor.

When removing old grease from fastener surfaces, do not allow gasoline or kerosene to come into contact with the motor winding.

Disassembly of the motor should be carried out in rooms preventing dust, dirt, foreign objects and precipitation from falling on and inside the motor.

Before disassembly, clean the exterior of the motor and carefully examine the way in which the component parts are connected.

Only disassemble the motor if absolutely necessary, after prior written agreement with the manufacturer (e.g. bearing replacement, winding repair) in the following order:

- disconnect the motor from the drive train and remove the coupling/sheave etc. from the shaft using special pullers;
- disassemble the ventilation unit, remove the fan with pullers;
- disassemble bearing units and remove bearing shields;
- remove the rotor without damaging the winding and mechanical parts;
- remove bearings, use pullers when dismantling bearings, heat bearings when installing bearings.

Reassemble the motor in reverse order.

When disassembling and reassembling the motor, do not strike the housing parts, shaft, bearings.

Before assembly, grease the surfaces of the motor couplings with a thin layer of grease. The presence of scratches, corrosion and other defects is not allowed.

After completing the assembly, check the motor according to the requirements of paragraph 2.2.3.

4.3. SERVICE MAINTENANCE

When ordering spare parts, please specify the name of the required parts or sub-assemblies, the full motor designation on the nameplate and the motor serial number.

The warranty claim is accepted if the following information is provided in the warranty claim report:

- type and serial number of the failed motor;
- the date on which the motor was put into operation;
- operating hours;
- the name and purpose of the equipment in which the failed motor was operated;
- operating conditions (temperature, humidity, dust, vibration at motor mounting points when operating as part of equipment, motor protection);
- motor terminal voltage and mains frequency;
- the current consumed by the motor;
- connection diagram on the terminal board;
- description of the mode of operation;
- the way in which the motor is coupled to the driven mechanism;
- radial and axial loads (if any);
- type of defect and description of the fault;
- suspected causes, a description of the faults encountered, the circumstances and the reasons why they were detected;
- the frequency and date of the last maintenance;
- a summary of the maintenance results.

5. MOTORS WITH BRAKE

Motors with electromagnetic brakes are used to drive mechanisms that require a fixed stop within a prescribed time after the motor has been disconnected from the mains. Electric motors with dual electromagnetic brakes are used in applications requiring high reliability of motor rotor holding and increased braking torque.

Marking of the connection cable for the electromagnetic brake:

"ED - ED" - electromagnetic brake (power supply ~1p, 220V);

"ET - ET" - electromagnetic brake (power supply ~3p, 380V).

5.1. ADJUSTING THE WORKING AIR GAP AND BRAKING TORQUE

The brake is adjusted and functionally tested in the basic delivery.

Manual brake release is accomplished by moving the handle towards the fan impeller, on double-braked motors the release is accomplished by bringing the handles together.

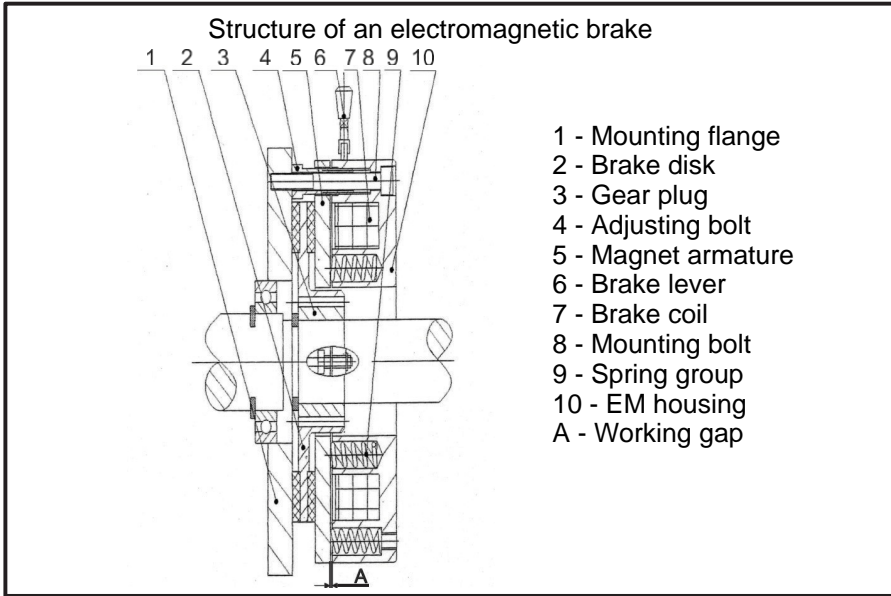
5.2. ADJUSTING THE WORKING AIR GAP OF THE ELECTROMAGNETIC BRAKES.

1. Screw the adjusting bolts (4) into the electromagnet housing (10) to release the bolt (8);
2. Set the required working air gap (A) with the bolt (8);
3. Remove the bolts (4) from the electromagnet housing to secure the working gap and the electromagnetic brake.
4. Check gap, repeat adjustment if necessary.

5.3. ADJUSTING THE BRAKING TORQUE

1. Remove the fan impeller cover;
2. Remove the motor cooling impeller;
3. Adjust the maximum braking torque by evenly tightening or loosening (not more than half a turn) the bolts in the end part of the electromagnetic brake. It is IMPORTANT to check the motor braking torque when the motor is the rectifier energized;

4. Install the impeller and cover.



5.4. BRAKE HEATING

Brakes can be equipped with a heater to prevent freezing of the brake disk. The heater is designed for power supply from AC mains with voltage 210-250V and frequency 50Hz and power:

Frame, mm	Brake heating power, W
56, 63	12.2
71	13.4
80	26.5
90	28.4
100	41.2
112	58.9
132	83.3
160	95.3

Frame, mm	Brake heating power, W
180	119.2
200	200.0
225	243.9
250	337.5
280	445.3
315	595.2

A typical brake heating wiring diagram is shown in Figure A.6 of Annex A. The output wires for the brake heater are routed to the terminal box, marked "ET3" and connected to the terminals. The heater must be energized when the electric motor is not running at temperatures below -20°C mandatory and at temperatures below 0°C recommended. The heater must not be operated at the same time as the motor is running.

5.5. POSSIBLE WIRING SCHEME FOR THE ELECTROMAGNETIC BRAKE

5.5.1. Connection of electromagnetic brake with rectifier type ZLKS-99-6 220VAC/99VDC with AC interruption to 380V network:

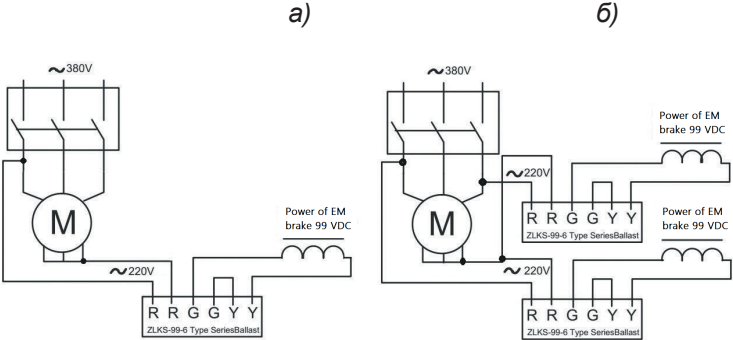


Diagram 5.5.1.1. When windings are connected in the "star" scheme, a) with one brake, b) with two brakes

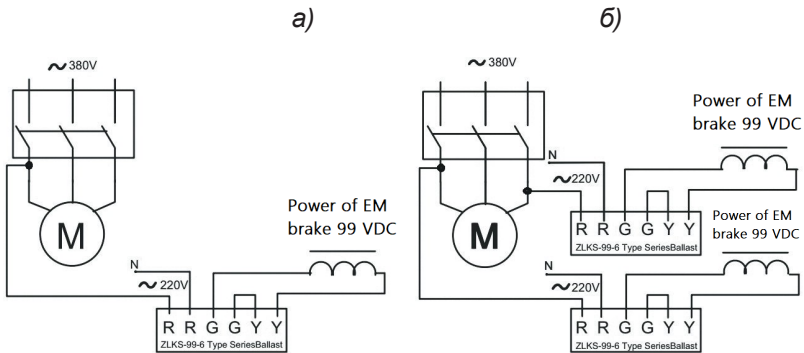


Fig. 5.5.1.2. When windings are connected in "delta" scheme, a) with one brake, b) with two brakes

5.5.2. Connection of electromagnetic brake with rectifier type ZLKS-99-6 220VAC/99VDC with DC interruption to 380V network:

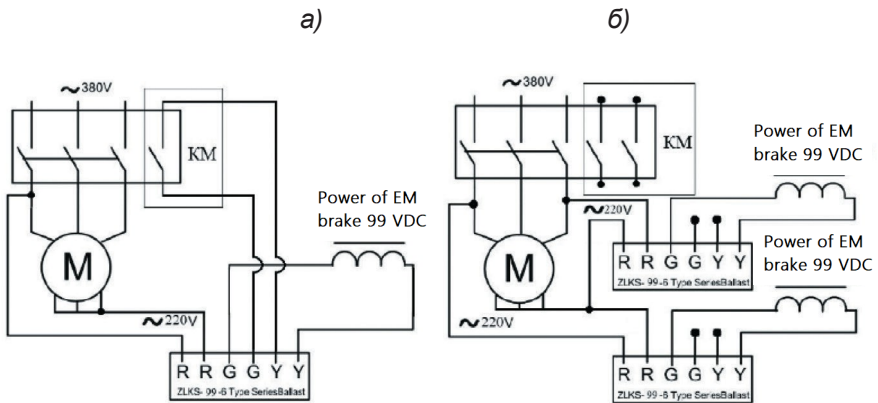


Diagram 5.5.2.1. When windings are connected in the "star" scheme, a) with one brake, b) with two brakes

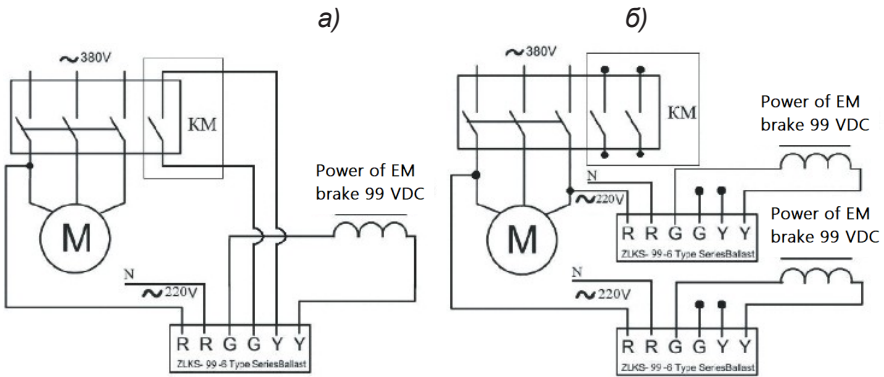


Fig. 5.5.2.2. When windings are connected in "delta" scheme a) with one brake, b) with two brakes

5.5.3. Connection of electromagnetic brake with rectifier type ZLKS-170-6 380VAC/170VDC with AC interruption to 380V network:

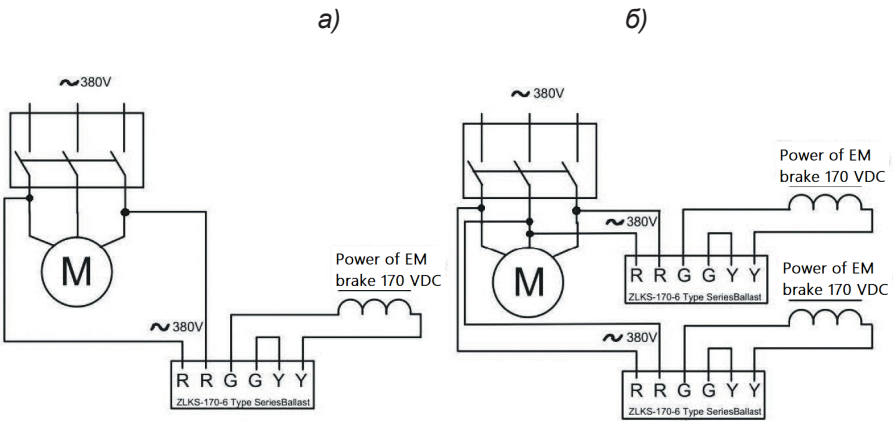


Figure 5.5.3.1. a) with one brake, b) with two brakes

5.5.4. Connection of electromagnetic brake with rectifier type ZLKS-170-6 380VAC/170VDC with DC interruption to 380V network:

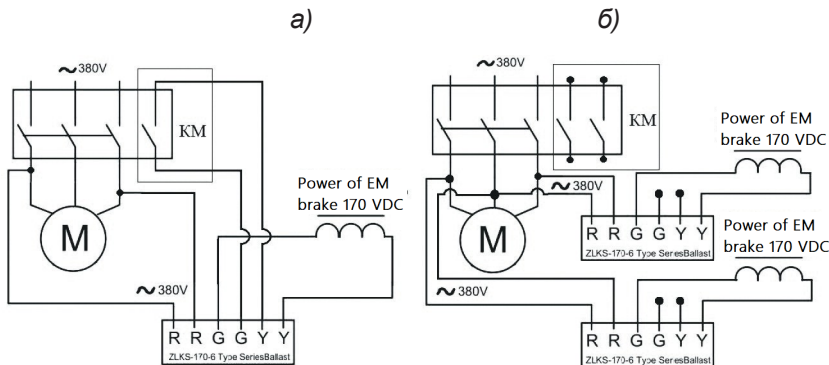


Figure 5.5.4.1. a) with one brake, b) with two brakes

5.6 BRAKE SPECIFICATIONS

Tables 4-6 show types and technical characteristics of electromagnetic brakes, Tables 7-9 show types and technical characteristics of double electromagnetic brakes, which can be equipped with 5AI, AIP motor of special version. The brakes can be equipped with output units designed for both 2p~380V, 50Hz and 1p~220V, 50Hz powersupply.

IMPORTANT: When the electric motor is operated as part of a variable frequency drive, as well as when the electric motor is started with soft starters, the electromagnetic brake must be supplied independently (see Annex D, p.12).

Table 4: Technical characteristics of electromagnetic brake SDZ1

Type	SDZ1-02	SDZ1-04	SDZ1-08	SDZ1-15	SDZ1-30	SDZ1-40	SDZ1-80	SDZ1-150
Motor Frame	56, 63	71	80	90	100	112	132	160
Braking torque rat. / max, N*m	2/4	4/6	7.5/9	15/17	30/35	40/50	75/85	150/160
Rectifier type	ZLKS-99-6, ZLKS-170-6.					ZLKS-170-6		
Rectifier AC supply voltage, V	220, 380					380		
Brake coil supply voltage DC, V	99, 170					170		
Power consumption, W	25	30	45	50	65	70	95	110
Braking time, s	0.18		0.2			0.25		0.35
Recommended working air gap A, mm	0.2		0.3	0.4		0.5		0.6
Max working air gap A, mm	0.6	0.8	1				1.2	
Max rotation speed, rpm	3000							

Type	SDZ1-200	SDZ1-300	SDZ1-450	SDZ1-600	SDZ1-850	SDZ1-2000	SDZ1-4000
Motor Frame	180	200	225	250	280	315	355
Braking torque rat. / max, N*m	200/220	300/330	450/500	600/660	850/940	2000/2200	4000/4400
Rectifier type	ZLKS-170-6						
Rectifier AC supply voltage, V	380						
Brake coil supply voltage DC, V	170						
Power consumption, W	150	200	210	340	400	480	
Braking time, s	0.35	0.45	0.5	0.6	0.7	0.85	
Recommended working air gap A, mm	0.6	0.8				1	
Max working air gap A, mm	1.2	1.5				2	2.5
Max rotation speed, rpm	3000						1500

Table 5: Technical characteristics of electromagnetic brake SDZ3

Type	SDZ3-04	SDZ3-08	SDZ3-15	SDZ3-30	SDZ3-40	SDZ3-80	SDZ3-150
Motor Frame	71	80	90	100	112	132	160
Braking torque rat. / max, N*m	4	7,5	15	30	40	75	150
Rectifier type	ZLKS-99-6, ZLKS-170-6.				ZLKS-170-6		
Rectifier AC supply voltage, V	220, 380				380		
Brake coil supply voltage DC, V	99, 170				170		
Power consumption, W	30	40	50	60	70	85	110
Braking time, s	0.18	0.2			0.25		0.35
Recommended working air gap A, mm	0.3	0.5				0.6	
Max working air gap A, mm	0.5	1.0				1.2	
Max rotation speed, rpm	3000						

Table 6: Technical data of the DHM3 electromagnetic brake

Type	DHM3-04	DHM3-05	DHM3-08	DHM3-15	DHM3-30	DHM3-40	DHM3-80	DHM3-150
Motor Frame	56,63	71	80	90	100	112	132	160
Braking torque, rat. / max, N*m	4/6	5/7	7,5/9	15/17	30/35	40/50	80/90	150/160
Rectifier type	RY-99V-3A-6 Rectifier	RY-99V-3A-6 Rectifier, RY-170V-3A-6 Rectifier			RY-170V-3A-6 Rectifier			
Rectifier AC supply voltage, V	220	220, 380			380			
Brake coil supply voltage DC, V	99	99, 170			170			
Power consumption, W	25	35	40	45	80	85	90	130
Braking time, s	0,06	0,063	0,087	0,11	0,14	0,152	0,165	0,214
Release time, s	0,05	0,055	0,072	0,095	0,12	0,13	0,14	0,18
Recommended working air gap A, mm	0,2		0,3	0,4		0,5		0,6
Maximum working air gap A, mm	0,8		1,0			1,2		
Max rotation speed, rpm	3000							

Table 7: Technical characteristics of the 2SDZ1 double electromagnetic brake

Type	2SDZ1-02	2SDZ1-04	2SDZ1-08	2SDZ1-15	2SDZ1-30
Motor Frame	56, 63	71	80	90	100
Braking torque, rat./ max, N*m	4/8	8/12	15/18	30/34	60/70
Rectifier type	ZLKS-99-6, ZLKS-170-6.				
Rectifier AC supply voltage, V	220, 380				
DC brake supply voltage, V	99, 170				
Power consumption, W	25	30	45	50	65
Braking time, s	0.18		0.2		
Recommended working air gap A, mm	0.2		0.3	0.4	
Maximum working air gap A, mm	0.6	0.8	1		
Max rotation speed, rpm	3000				

Table 8: Technical data of the 2SDZ3 double electromagnetic brake

Type	2SDZ3-04	2SDZ3-08	2SDZ3-15	2SDZ3-30
Motor Frame	71	80	90	100
Braking torque, rat./ max, N*m	8	15	30	60
Rectifier type	ZLKS-99-6, ZLKS-170-6.			
Rectifier AC supply voltage, V	220, 380			
DC brake supply voltage, V	99, 170			
Power consumption, W	60	80	100	120
Braking time, s	0.18	0.2		
Recommended working air gap A, mm	0.3	0.5		
Maximum working air gap A, mm	0.5	1		
Max rotation speed, rpm	3000			

Table 9: Technical data of the 2DHM3 double electromagnetic brake

Type	2DHM3-04	2DHM3-05	2DHM3-08	2DHM3-15	2DHM3-30
Motor Frame	56, 63	71	80	90	100
Braking torque, rat./max, N*m	8/12	10/14	15/18	30/34	60/70
Rectifier type	RY-99V-3A-6 Rectifier	RY-99V-3A-6 Rectifier, RY-170V-3A-6 Rectifier			
Rectifier AC supply voltage, V	220	220, 380			
DC brake supply voltage, V	99	99, 170			
Power consumption, W	25	35	40	45	80
Braking time, s	0.06	0.063	0.087	0.11	0.14
Release time, s	0.05	0.055	0.072	0.095	0.12
Recommended working air gap A, mm	0.2		0.3	0.4	
Maximum working air gap A, mm	0.8		1.0		
Max rotation speed, rpm	3000				

6. INDEPENDENTLY COOLED MOTORS

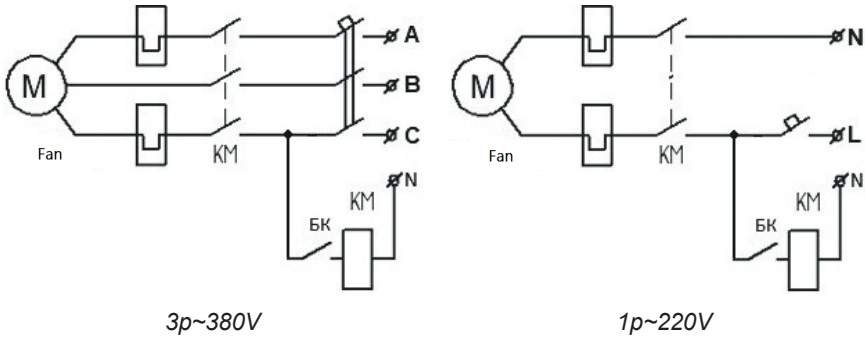
Motors intended for operation at reduced relative to rated speeds are equipped with independent cooling fans (hereinafter - fan), the performance of which does not depend on the motor speed. Independent cooling fans can be both single-phase (1p~220V, 50Hz) and three-phase (3p~380V,50Hz).

If the motor on which the fan is installed is controlled by a frequency converter, the fan must not be connected to the motor terminals.

The independent ventilation fan is designed to be started directly from the mains (1p~220V, 50Hz or 3p~380V, 50Hz) by appropriate equipment (starter/contactor through separate protection devices) and a separate cable not included in the delivery set.

The fan is started at the same time as the electric motor on which it is mounted. It is not allowed to run the main electric motor when the fan is switched off.

Fan wiring scheme:



БК - auxiliary contact of the starter/contactor for switching on the main electric motor.

Fan connection

The fan power cable can be connected into the motor terminal box or into the fan's own terminal box located on the motor housing.

Marking of the wire ends of the independent cooling fan:

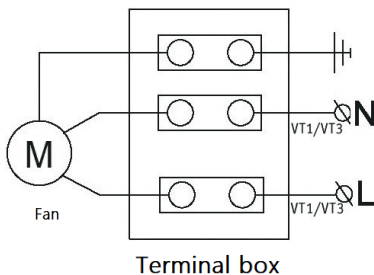
"VT1 - VT1" - built-in single-phase axial fan (power supply ~1p, 220V);

"VT2 U - VT2 V - VT2 W" - built-in three-phase axial fan (power supply ~3p, 380V);

"VT3 - VT3" - fan attached (rider) (power supply ~1p, 220V);

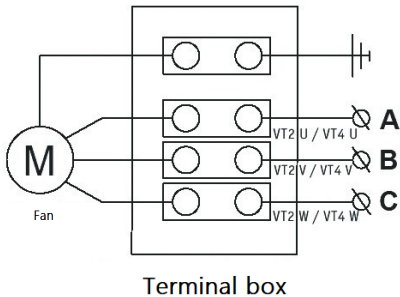
"VT4 U - VT4 V - VT4 W" - fan attached (rider) (power supply ~3p, 380V).

1. When the supply voltage is 1p~220V, 3 wires are connected to the terminal box from the fan:



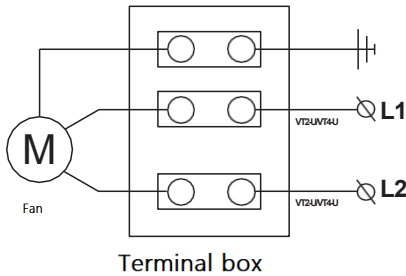
- yellow/green - ground
- brown/black - "phase"
- blue - neutral

2. When the supply voltage is 3p~380V, 4 wires are connected to the terminal box from the fan:



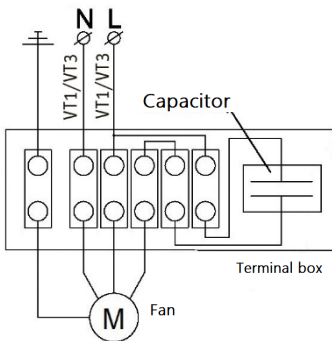
- yellow/green - ground
- three phase wires

3. When the supply voltage is 2p~380V, 3 wires are connected to the terminal box from the fan:



- yellow/green - ground
- two phase conductors

4. When a three-phase fan is supplied from a 1p~220V network, 4 wires are connected to the terminal box from the fan:



- yellow/green - ground
- three phase wires, which are connected to the supply mains phase wire via a capacitor and to the neutral wire.

Connecting the outdoor fan

When using an asynchronous motor mounted outside the main the connection must be made with sheet or the scheme in the terminal box of the motor.

When connecting the independent ventilation, make sure that the direction of rotation of the fan impeller is in line with the arrow on the fan cover. If the direction of rotation does not match, swap any two supply wires of the independent ventilator, previously cut off power the circuit to which is connected. Afterwards, check again that the fan rotation corresponds to the arrow on the fan guard.

7. MOTORS WITH ENCODER

The motors can be equipped with an encoder upon customer request. The type of installed encoder is specified in the motor data sheet. The technical data and the encoder wiring scheme are specified in the encoder documentation, which is included in addition to the main accompanying motor documentation.

Encoder connection cable marking: "ENC".

8. TRANSPORTATION AND STORAGE

8.1. TRANSPORTATION

Avoid sharp jolts and shocks when transporting the motor. When loading a packed motor, check inscriptions on the package. Only lift the unpacked motor by the load securing devices and check the screw connections.

Do not load, unload or move the motor by using the rotor shaft end!

Upon receipt of the motor, it should be inspected for damage during transportation. If the packaging is damaged and motor can be damaged, than package should be removed in the presence of an authorized representative of the transporter.

8.2. STORAGE

The storage conditions of the motors, depending on the type of packaging and the storage period in the manufacturer's packaging, must correspond to the packaging options listed in the table.

After the specified storage period, the motor must be reconditioned and repacked. The placement of the storage motors must ensure that:

- the stability of the motor crates;
- free access of the lifting and transportation mechanism;
- compliance with fire safety rules;
- ventilating the packed motors.

The packaging must not be opened or damaged during storage.

When storing motors, the room must be free of aggressive gases and vapors in concentrations that are destructive to metals and insulation. To prevent damage to the bearings, motors should only be stored in vibration-free rooms.

When storing under a shelter or in an open area, measures must be taken to prevent water from flooding the lower tiers of motor crates. For this purpose, it is recommended to use platform at least 100 mm high to prevent flooding in case of heavy precipitation. In winter, take measures to prevent snow from covering the packaging.

9. POSSIBLE FAULTS AND REMEDIES

Possible malfunction	Probable cause	Method of elimination
The motor won't start	Fuse blown	Replace the fuse with an identical fuse of the same rating
	Overload trip	Check and setup the motor overload tripping
	Supply voltage value does not match nameplate data	Check that the supply voltage match to the nameplate data
	Inconsistency between the wiring scheme and the diagram on the terminal box cover	Check that the wiring scheme matches the scheme on the terminal box cover
	Faulty starting equipment	Check wiring connections and operation of controls
	Mechanical defect	Check rotation of motor and drive; Check bearings and their grease
	Short-circuit fault in stator	Open the terminal box cover and determine the fault by measurement
	Weak stator winding connections	Open the terminal box cover and determine the fault by measurement
	Defective rotor	Check rotor core and short-circuiting rings for proper functioning
	Motor overload	Reduce the load
The motor is stopped	Circuit break	Check fuses, overload protection device, winding connections, control circuits
	Incorrect motor selection	Change motor type, contact the manufacturer
	Motor overload	Reduce the load
	Low voltage	Check voltage at motor terminals, check connections
The motor starts, then stops	Phase failure	Check connections
	Loss of supply voltage	Check connections, fuses and control circuits

Possible malfunction	Probable cause	Method of elimination
The motor is not reaching nominal speed	Incorrect motor selection	Change motor type, contact the manufacturer
	Low voltage at motor terminals	Supply higher voltage or use a starting transformer, reduce the load, check connections, cable cross-sections
	Heavy start-up load	Check the maximum load of the motor at start-up
	Defective rotor	Check rotor core and short-circuiting rings for proper functioning
	Open circuit in the stator power supply circuit	Find the fault and rectify it
Motor acceleration time is too long and/or high current consumption	Motor overload	Reduce the load
	Low voltage at motor terminals	Supply higher voltage or use a starting transformer, reduce load, check connections, cable cross-sections
	Defective rotor	Check rotor core and short-circuiting rings for proper functioning
Wrong direction of rotation	Incorrect phase sequence	Change the connection at the motor terminals or in the power supply panel
Increased bearing heating	Bearing damage	Replace bearing
	Bearing overload	Check alignment, radial and axial forces
	Centering failure	Re-centering
	Bearing polluted	Wash the bearing
	Lack of grease	Refill grease
	Excess grease	Remove the grease outlet bolts (plugs) and run the motor until all excess grease has been removed
	Deterioration of the grease	Wash bearings, replace old grease with new grease
	Over tightened belt	Reduce belt tightening
	Shaft bent or broken	Replace shaft or rotor
	The pulleys are far from the bearing	Move pulleys closer to the bearing
Small pulley diameter	Use a larger diameter pulley	
Increased motor vibration	Rotor or operating mechanism is badly balanced	Eliminate the cause of the imbalance
	Foundation bolts and other fasteners on the motor are tightless	Retighten all fasteners
	Insufficient foundation (frame) rigidity	Increase the rigidity of the foundation (frame)
	Defective bearings	Replace bearings
	Three-phase motor operates in two-phase mode	Check connections
	Large axial clearance	Check bearings

Possible malfunction	Probable cause	Method of elimination
Increased motor noise	The fan is rubbing against the casing	Repair the fan/casing
	The motor has separated from the foundation	Tighten bolts, check centering
	Air gap uneven	Check centering and bearings
	Rotor unbalance	Rebalance
The motor is overheating	The supply voltage is unacceptably high	Set nominal values of supply network parameters
	The motor is overloaded	Check the phase current of the motor (must not exceed the data on the nameplate); Eliminate the overload (the angle of attack of the drive fan may be greater than normal).
	Poor cooling	Check the requirements of paragraph 2.1.5. Clean the housing if it is dirty
The motor won't turn over, it's humming	Mechanism jamming	Eliminate causes of jamming
	The supply voltage is unacceptably low	Set nominal values of supply network parameters
	Internally fault in stator winding	Measure winding phase resistances and currents
	Short circuit fault between phases or to the housing	Measure insulation resistance
	Mains phase failure	Check mains supply

10. RESPONSIBILITY

- Warranty period of operation for electric motors of 5AI, AIP, ESQ, АДЧР, etc. series. - two years from the date of the motor operation with the warranty period of 10000 hours, but not more than 30 months from the date of sale.

- During the warranty period, the manufacturer is not liable for any damage caused by the consumer's fault:

- improper transportation and storage;

- incorrect and unqualified installation, connection, operation and maintenance;

- disassembly, modification or alteration of the motor without the manufacturer's approval.

Attention! The motor must be installed and put into operation for the first time in the presence of a representative of the manufacturer

(if there is a separate contract for supervision and commissioning works), or upon written agreement with Elcom Ltd. - without the manufacturer's representative, with subsequent sending of the commissioning certificate to the manufacturer within 20 calendar days from the date of commissioning.

Disassembly of the motor, including bearing unit and removal of the fan casing (except for cases when the casing is packed with spare parts, temperature control device or other motor equipment) during the warranty period without the presence of a representative or written authorization of the manufacturer is prohibited!

The technical commissioning report must be drawn up in accordance with the manufacturer's prescribed form (the commissioning report form can be downloaded from https://www.elcomspb.ru/downloads/?cat_id=145 or by clicking on the QR code below.

The manufacturer's warranty for the period of use of the motor is only validated if a technical report is sent within the above-mentioned time frames



11. DISPOSAL

Motors that have lost their original consumer properties do not pose a risk to human health or the environment.

The materials from which the motor parts are made (cast iron, steel, copper, aluminum) are externally recyclable and can be recycled at the customer's discretion.

Motor parts made of plastic and insulation materials can be recycled or utilize.

ANNEX A (MANDATORY)

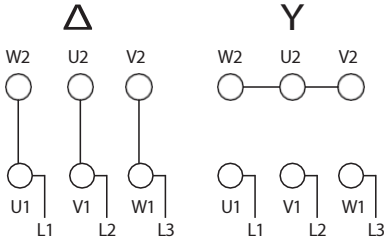


Figure A.1.2 - Wiring scheme of the motor with winding phase connection "Δ/Y" (six lead ends)

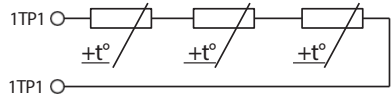


Figure A.2.1 - Typical wiring scheme of RTS thermistors (the number of thermistors connected in series can be different)

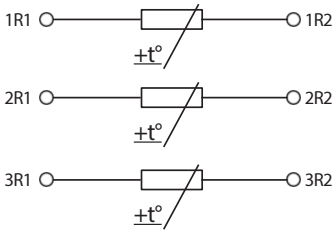


Figure A.3.1 - Typical wiring scheme of Pt100 resistance meters

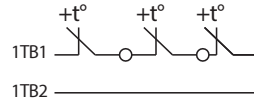


Figure A.4.1 - Typical wiring scheme for 6-metal normally closed thermal switches

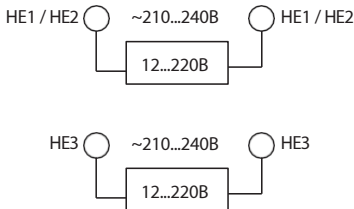


Figure A.5 - Wiring scheme for the anti-condensation belt repeater

Figure A.6 - Wiring scheme of the brake relay

ANNEX B (MANDATORY)

Motor drying

The motor can be dried in the following ways:

- with outdoor heating;
- with alternating current;
- with direct current.

When drying by external heating is not allowed:

- direct exposure to fire;
- if the heating temperature exceeds 90°C.

For single-phase alternating current or direct current drying, the current values are given in the table depending on the winding connection and ambient temperature. The motor drying winding wiring scheme are shown in figure B.1 for connection "Δ" and figure B.2 for connection "Y".

Table of drying current values.

Ambient temperature	Controlled parameter	Connection	
		Δ	Y
-10°C..... +10°C	AC current, %In	59%	68%
	DC current, %In	93%	107%
+10°C +40°C	AC current, %In	48%	55%
	DC current, %In	74%	85%

The reference values for the power supply voltage may vary:

- for AC from 10% U_{HOM} to 30% U_{HOM} ;
- for DC from 1% U_{HOM} to 10% U_{HOM} , where U_{HOM} is the rated motor voltage.

Dry the motor should be with removed the terminal box cover and housing.

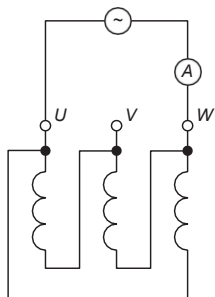


Figure B.1 - Scheme of winding connection "Δ" during winding drying.

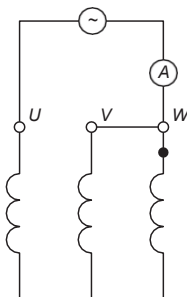


Figure B.2 - Scheme of "Y" winding connection during winding drying.

ANNEX TO (REFERENCE)

Table B.1 - Tightening torque of contact bolt connections

Thread diameter	Tightening torque of contact bolts, N-m, $\pm 10\%$
M4	1-2
M5	3-5
M6	6-8
M8	10-20
M10	20-30
M12	40-50

ANNEX D (REFERENCE)

A complete list of lead end (cable) markings:

Labeling	Description
U1 - U2	stator winding phase A
V1 - V2	phase B of the stator winding
W1 - W2	phase C of the stator winding
1TR1 - 1TR2	RTS thermistors in the stator winding
1R1 IS (1R2:1R2), 2R1 IS (2R2:2R2), 3R1 - (3R2:3R2)	Resistance thermistors for 3-wire circuit 3 sensors in 3 phases
1R1 - (1R2:1R2)	PT100 resistance thermistors for 3-wire circuit one sensor per stator winding
1TB1 - 1TB2	bimetallic thermal switches in the stator winding
7TR1 - 7TR2	PTC thermistor in the drive side bearing (D-end)
8TR1 - 8TR2	PTC thermistor in the bearing on the non-drive side (N-end)
7R1 - (7R2:7R2)	PT100 resistance thermistors for 3-wire circuit in drive-side bearing (D-end)
8R1 - (8R2:8R2)	PT100 resistance thermistors for 3-wire circuit in non-drive side bearing (N-end)
7TB1 - 7TB2	bimetallic thermal switch in the bearing on the drive side (D-end)
8TB1 - 8TB2	bimetallic thermal switch in bearing on the non-drive side (N-end)
HE1	anti-condensation heating of the front bearing shield
HE2	anti-condensation heating of the rear bearing shield
HE3	brake heating

VS1	X-axis vibration sensor on the motor bed at the front bearing unit side
VS2	X-axis vibration sensor on the motor bed at the rear bearing unit side
VS3	X-axis vibration sensor in the center of the motor bed
VS4	Vibration sensor according to customer specifications
ED - ED	electromagnetic brake (power supply ~1p, 220V)
ET - ET	electromagnetic brake (power supply ~3p, 380V)
VT1 - VT1	built-in single-phase axial fan (power supply ~1p, 220V)
VT2 U - VT2 V - VT2 W	built-in three-phase axial fan (power supply ~3p, 380V)
VT3 - VT3	fan attached (rider) (power supply ~1p, 220V)
VT4 U - VT4 V - VT4 W	fan attached (rider) (power supply ~3p, 380V)
ENC	encoder (feedback sensor)
(1R1:1R1) - (1R2:1R2)	PT100 resistance thermistors for 4-wire circuit one sensor per stator winding
(1R1:1R1) - (1R2:1R2), (2R1:2R1) - (2R2:2R2), (3R1:3R1) - (3R2:3R2)	PT100 resistance thermistors for 4-wire circuit 3 sensors in 3 phases
(7R1:7R1) - (7R2:7R2)	PT100 resistance thermistors for 4-wire circuit in drive-side bearing (D-end)
(8R1:8R1) - (8R2:8R2)	Pt100 resistance thermistors for 4-wire circuit in non-drive side bearing (N-end)

ANNEX E (REFERENCE)

Decoding of the electric motor designation.

1	2	3	4	5	6	7	8	9	10	11	12							
5AI	112	M	A	8	SDN	-	CH	-	B12	-	W0	-	H	-	F2	-	S1	-

13	14	15	16	17	18	19	20	21	22	23									
EDH12	-	V1	-	N1250	-	1	2	1	-	D	-	FF265	-	CR3	-	IP65	-	Y2	-

№	Designation	Deciphering of the designation
1	Electric motor brand	5AI, ESQ, АДЧР, 5AИС, AИР and others
2	Frame	Height of the axis of rotation
3	Installation dimension along the length of the frame	S - short M - medium L - long
4	Stator core length (if required)	A, B, C
5	Number of poles	2, 4, 6, 8, 10, 12
6	Connection dimensions of ESQ RW series: GOST DIN	GST SDN
7	Modification sign	CH - for driving rocker arms; HTG - high-temperature grease; SBU - sealing of the bearing unit; Y - according to customer's specifications.
8	Built-in temperature protection	B1 - stator winding temperature protection sensor (bimetallic, 3 pcs. connected in series, one for each phase of stator winding); B2 - bearing temperature protection sensor (bimetallic, 1 piece for each bearing); B3 - stator winding temperature protection sensor (PTC-thermistor, 3 pcs. connected in series, one for each phase of stator winding); B4 - bearing temperature protection sensor (PTC-thermistor, 1 piece for each bearing); B5.1 - Stator winding temperature protection sensor (thermoresistive, PT100, 1 per stator winding); B5.2 - Stator winding temperature protection sensor(thermoresistive, PT100, 2 pcs. - main and backup); B5.3 - Statorwinding temperature protection sensor (thermoresistive, PT100, 3pcs. - one for each stator winding phase); B6 - bearing temperature protection sensor (thermoresistive,PT100, 1 piece for each bearing); B7 - sensor type andquantity according to customer's specifications.

№	Designation	Deciphering of the designation
9	Vibration sensors and vibration sensor pads	W0 - sites for vibration sensors according to customer's specifications; W1 - vibration sensor single-coordinate VK-310C is installed on the X-axis on the electric motor bed from the side of the front bearing unit; W2 - single-axis vibration sensor VK-310C is installed on the X-axis on the electric motor bed from the side of the rear bearing unit; W3 - single-axis vibration sensor VK-310C is installed along the X axis in the center of the motor bed; W4 - vibration sensors according to customer's specifications.
10	Integrated anti-condensation heating	H - with anti-condensation heating (220V power supply)
11	Current-insulated bearing	F1 - front bearing F2 - rear bearing
12	SKF, NSK, KOYO, FAG bearing	S1 - front ball bearing S2 - rear ball bearing S3 - front roller bearing (cylindrical rollers) S4 - rear roller bearing (cylindrical rollers)
13	Integrated electromagnetic brake	ED0 - electromagnetic brake provided by the customer/ preparation of the brake installation site according to the customer's specifications; ED - electromagnetic brake (220V supply) - up to 100 gauge inclusive; ET - electromagnetic brake (380V supply); EDM - low-noise electromagnetic brake (220V supply) - up to 100 gauge inclusive; ETM - low-noise electromagnetic brake (380V supply); ED1 - electromagnetic brake (220V supply) with independent power supply up to and including 100 gauge; ET1 - electromagnetic brake (380V power supply) independently powered; ED1M - low-noise electromagnetic brake (220V power supply) with independent power supply up to 100 gauge inclusive; ET1M - low-noise electromagnetic brake (380V power supply) with independent power supply; ED2 - electromagnetic brake (220V supply) with manual brake release up to 100 gauge inclusive; ET2 - electromagnetic brake (380V supply) with manual brake release up to 200 gauge inclusive; ED2M - low-noise electromagnetic brake (220V supply) with manual release device up to and including 100 gauge; ET2M - low-noise electromagnetic brake (380V power supply) with manual release device up to 200 gauge inclusive; EDED - double electromagnetic brake (220V power supply) - up to and including 100 gauge; ETET - double electromagnetic brake (380V supply); EDEDM - low-noise double electromagnetic brake (220V supply) - up to 100 gauge inclusive; ETETM - low-noise double electromagnetic brake (380V power supply); EDH - electromagnetic brake (220V power supply) equipped with heating; ETH - electromagnetic brake (380V power supply) equipped with heating.

№	Designation	Deciphering of the designation
14	Independent motor cooling	V1 - built-in single-phase axial fan (power supply ~1p, 220V) - up to 250 frame inclusive; V2 - built-in three-phase axial fan (power supply ~3p, 380V) - up to 132 frame; V3 - fan attached (rider) (power supply ~1p, 220V) - from 112 to 200 frame; V4 - fan attached (rider) three-phase (power supply ~3p, 380V) - from 225 to 355 frame; V5 - attached single-phase axial fan based of 5AIE (power supply ~1p, 220V); V6 - attached three-phase axial fan based of 5AI (power supply ~3p, 380V).
15	Encoder	N0 - space for encoder; N0000- N5000 - number of pulses per revolution.
16	Encoder supply voltage	1 - (+5 V) 2 - (+10...30 V)
17	Encoder output signal type	1 - ST (~11 μ A) 2 - CH (~1 V) 3 - PI (TTL) 4 - PI (HTL) 5 - OS
18	Encoder accuracy	1 - $\pm 15''$ (accuracy class 5 according to GOST 26242); 2 - $\pm 30''$ (accuracy class 6 according to GOST 26242); 3 - $\pm 75''$ (accuracy class 7 according to GOST 26242); 4 - $\pm 150''$ (accuracy class 8 according to GOST 26242); 5 - $\pm 25^{\circ}$ el (scale tolerance); 6 - $\pm 50^{\circ}$ el (scale tolerance); 7 - $\pm 90^{\circ}$ el (scale tolerance).
19	Shaft parameters	D - any modification of the shaft according to the customer's drawing
20	Flange plate parameters according to customer's order	FF265 - flange with smooth mounting holes; FT265 - flangewith threaded mounting holes. Note: 265 - diameter at the centers of holes, mm.
21	Chemical resistant coating	CR3 - chemical resistant protective coating C3 CR5 - chemical resistant protective coating C5-I CA - chemical resistant protective coating according to customer's specifications
22	Degree of protection	IP54, IP55, IP56, IP65, IP66 - according to customer specifications
23	Climatic version	Y1, Y2, Y3, УХЛ1, УХЛ2, УХЛ3, УХЛ4, ХЛ1, ХЛ2, ХЛ3 according to GOST15150-69

Example of decoding of the symbol:

5AI 112MA8 B5.22-H-F2-S1-EDH12-V1-N1250-131-D-FF265-CR5-IP65-Y2

Decoding: 5AI brand electric motor, height of rotation axis 112 mm, housing length dimension M, stator core length A, number of poles 8, 2 sensors PT100 built into winding and bimetallic sensors built into bearing units, built-in anti-condensation heating with 220 V power supply, isolated rear bearing and imported (SKF, NSK, KOYO, FAG) front ball bearing, built-in electromagnetic brake with independent 220 V power supply, with manual brake release and heating, independent cooling of the electric motor by built-in single-phase fan 220 V, encoder 1250 pulses per revolution, encoder supply voltage +5V, encoder output signal type PI (TTL), encoder accuracy class 5 ($\pm 15''$), shaft according to customer's drawing, value at the centers of flange shield holes $d_{20}=265$ mm, anticorrosion coating according to customer's specifications, protection degree IP65, climatic version U2.

In case of absence of one of the options - the field is not filled in.

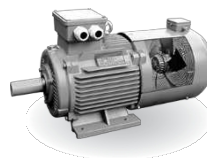
ELECTRIC MOTORS



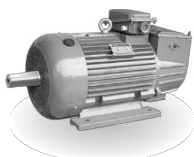
General industrial



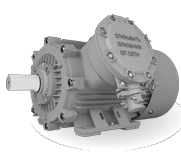
With electromagnetic
brake



Prepared for frequency
regulation



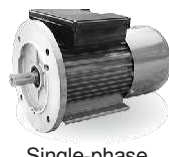
Crane



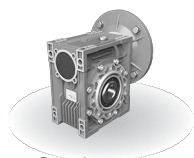
Explosion-proof



High-voltage



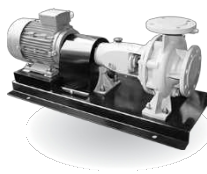
Single-phase



Gearboxes
and gearmotors



Frequency
converters



Pumps



ООО «Элком»

ОКПО 49016308, ИНН 7804079187

Сервисный центр:
192102, Санкт-Петербург,
ул. Витебская Сортировочная, д.34
телефон: (812) 320-88-81
elcomspb.ru
spb@elcomspb.ru