

MORATTO S.R.L.

Electrical Machinery

I – 31030 PERO DI BREDA (Treviso) Italy

Via A Volta, 2

Tel. +39 0422 904032 – fax +39 0422 90363

www.moratto.it - moratto@moratto.it



ELMOR[®]

THREE PHASE AND SINGLE PHASE ASYNCHRONOUS ELECTRIC MOTORS FOR EXPLOSIVE ATMOSPHERE (ATEX)

OPERATION AND MAINTENANCE BOOKLET

Rev. 2015-01

WARNINGS



CAUTION: THIS MOTOR IS SUITABLE TO BE INSTALLED IN EXPLOSIVE ATMOSPHERE CLASSIFIED AS ZONE 2-2 ACCORDING TO DIRECTIVES 2014/34/CEE ATEX.



II 3G Ex eC IIB (IIC) T4 Gc IP55 (IP65)

II 3D Ex tc IIIB (IIIC) T135°C Dc IP55 (IP65)

(2-22 ATEX)

ZONE 2-22 INDICATES THAT THE EXPLOSIVE ATMOSPHERE IS NOT USUALLY PRESENT DURING NORMAL OPERATION, BUT IT CAN SELDOM BE AND FOR A SHORT TERM (typically under fault conditions). THE MOTOR MUST NOT THEREFORE BE INSTALLED IN A ZONE DIFFERENT FROM 2 -22 ATEX ZONE.

IIB INDICATES THAT THE MOTOR IS SUITABLE TO BE INSTALLED ON SURFACE (NO MINE, UNDERGROUND) AND THAT ALLOWED GASES BELONG TO GROUP "A" E "B" ACCORDING TO CEI NORM 31.35. GROUP "C" GASES ARE NOT ALLOWED (FOR INSTANCE: ACETYLENE, HYDROGEN)

G INDICATES THAT THE EXPLOSIVE ATMOSPHERE IS PRODUCED BY GAS, VAPOR, MIST

D INDICATES THAT THE EXPLOSIVE ATMOSPHERE IS PRODUCED BY NON CONDUCTIVE COMBUSTIBLE DUSTS

T4: INDICATES THAT IGNITION TEMPERATURE OF FLAMMABLE GASES IN T4 TEMPERATURE CLASS SHALL BE HIGHER THAN 135°C

IN CASE OF DIFFERENT TEMPERATURE CLASS, PLEASE FOLLOW THE TABLE BELOW (based on EN 13463-1)

Temperature class	Maximum surface temperature [°C]
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

WARNING: THIS APPLIANCE IS CERTIFIED FOR NON-CONDUCTIVE COMBUSTIBLE DUST.

LEGISLATIVE DECREE 233/03 GIVES THE EMPLOYER (USER) THE TASK TO CLASSIFY THE AREAS, AND SO TO CHECK ON HIS OWN RESPONSIBILITY, THAT THE AREA IN WHICH THE MOTOR WILL BE INSTALLED CORRESPOND TO THE CATEGORY ASSIGNED TO THESE MOTORS.

THE MANUFACTURER OF THE MOTOR IS NOT RESPONSIBLE FOR ANY IMPROPER SELECTION BY THE CUSTOMER OF FOR INSTALLATION OF THE MACHINE IN A DIFFERENT AREA.

ANY USE OF THE MACHINE IN THE NORMAL ATMOSPHERE (NON EXPLOSIVE) DOES NOT AFFECT THE OPERATION AND SAFETY OF WORKERS.

ANY USE OF THE MACHINE IN EXPLOSIVE ATMOSPHERE IN ZONES DIFFERENT FROM THAT WHICH HAS BEEN CERTIFIED, IS A SERIOUS RISK FOR HEALTH AND SAFETY OF PERSONS

This operation and maintenance booklet contains important information on safety measures and special instructions about transport, installation, use and maintenance of three and single phase electric motors branded ELMOR.

Read these Operating Instructions before you transport, install, commission, maintain or repair industrial motors.

These symbols will draw your attention to the safety measures and additional instructions given in these Operating Instructions

Special instructions regarding safety and warranty:



For reasons of protection of persons and objects, all the safety measures and additional instructions given in these Operating Instructions must be strictly complied with.

CAUTION: DO NOT OPERATE THE MOTOR IF IT HAS BEEN DAMAGED DURING THE TRANSPORT OR IF IT HAS UNDERGONE VISIBLE DAMAGES. CONTACT THE DEALER OR THE MANUFACTURER FOR ANY CLARIFICATION.



Low-voltage machines have dangerous rotating and conductive parts, as well as possibly hot surfaces. All transport, installation, commissioning, maintenance and repair works have to be carried out exclusively by qualified personnel and checked by responsible experts (observe 73/23/CEE, IEC EN 60204, IEC EN 60335)

Inappropriate use may cause major damage to persons and objects

Should additional data be required, you should immediately consult the manufacturer or an authorized service workshop.



All work on electrical connections to the motors and generators should only be carried out by qualified personnel.

General information

Scope

These instructions refer to surface-ventilated three-phase and AC low-voltage cage induction motors and generators, IP 54 and IP 55 to EN 60034 and IEC 34-5. Higher degrees of protection are indicated on the rating plate.

These low-voltage machines are intended for industrial installations. They comply with the harmonized standards EN 60034. Observe any possible special prescriptions for their use. Air-cooled low-voltage machines are designed for operating at altitudes ≤ 1000 m above sea level and at ambient temperatures between $- 20^{\circ}$ C and $+40^{\circ}$ C. Exceptions are stated on the nameplate.



Observe especially different indications on the nameplate. The conditions of use (like altitude, ambient temperature and so on) must coincide with all the data on the rating plate.

The low-voltage machines are components of a machine according to the Directive 2006/42/CE. The commissioning of this machine is forbidden until the final product does not comply with this directive (observe EN 60204-1).

Transport

Should any damage be observed after the delivery of the low voltage machine at its destination, these should be notified immediately to the transport company; avoid commissioning.

Eyebolts



Lift motors only on provided eyebolts. Do not add any load to the motor. Lifting eyes are designed for the motor weight only. If it should be necessary, use appropriate cable guides.

Ventilation

The distance between air intake of the motor and walls or other machinery must be at least $\frac{1}{4}$ of the diameter of the air intake opening. Cooling air flows from the non-drive end towards the drive end. The air which leaves the motor must not be drawn in again by the fan. Keep air inlets and outlets clean.



For vertical shaft-up designs, suitable protection must be provided at the mounting end so that no foreign matter can enter the ventilation hole. Such protection must, however, not affect the cooling and the air which leaves the motor/generator - or adjacent groups - must not be drawn in again.

The motor should not be installed within closed casings without the possibility of air cooling.

Condensation drain holes

Not planned for execution in explosive atmosphere

Installation and commissioning

Mechanical – Transmission elements

Use elastic couplings only; rigid couplings require a special bearing design.



When using transmission elements which provoke radial or axial shaft loads during operation (e.g. pulleys, gearwheels, etc.) take care that the permissible loads are not exceeded. Relevant data are given in the respective technical catalogue.

In no way the ball bearings should suffer pressure or strokes, in transit, installation and during motor operation.

Mechanical - Substructure



Make sure that the feet or flanges are safely fixed and rest positively on their entire surface. Check also the exact alignment with direct coupling.

All motor feet must rest positively on their entire surface to avoid distortion of the motor frame.

Mechanical - Alignment

When the motor is connected to the driven machine via a coupling, the shafts must be aligned radially and axially to each other.



The correct alignment of the transmission must be verified after a reasonable period of operation of the machine, when the motor is warm.



Do not disable the safety devices even during testing. If in doubt, turn the motor off.

Electrical – Voltage and winding connection

The admissible fluctuation between rated voltage and supply voltage is $\pm 5\%$; for rated frequency, $\pm 2\%$ is allowed. Observe different connection indications and data on the rating plate, as well as the connection diagram in the terminal box.

Electrical - Connection

Choose cable cross-sections in accordance with the rated current. Not used cable entries must be closed by compression glands. (IEC EN 60204-1)

Work should only be carried out by qualified personnel, always with the machine out of operation, disconnected and previously secured against starting. This is also valid for auxiliary circuits (e.g. heaters). Make sure that there is no voltage!

The supply cables must be connected with special care to ensure permanent and reliable contact (without loose cable ends); use suitable terminals for the connection cables.

Supply cables must be stress-relieved so that no cantilever loads are exerted on the terminals.

Ensure a good connection of the protective conductor.

The minimum safety distances between conductors and between those and earth should not exceed the following values:

$\leq 550 \text{ V} \rightarrow 8\text{mm};$

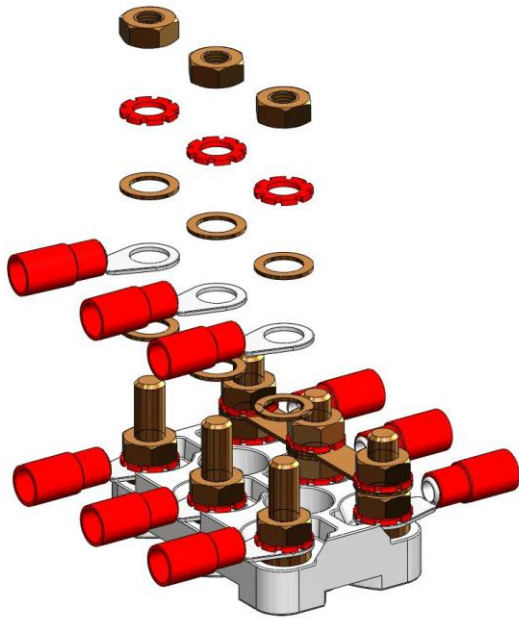
$\leq 750 \text{ V} \rightarrow 10\text{mm};$

$\leq 1000 \text{ V} \rightarrow 14\text{mm}.$

Make sure that no foreign matter is left in the terminal box, and that it is clean and dry. Cable entries which are not used and the terminal box itself have to be sealed dust and water-tight. In order to maintain the degree of protection, always make sure that the original gaskets are used when closing the terminal box.



Connect protective conductor here.



MOTOR TERMINALS ARE ANTILOOSENING TYPE, in order to avoid that, over time, the conditions for a fake electrical contact, resulting in an electric bow and potential ignition of an explosive atmosphere, can be created. SO IT IS IMPORTANT that the user connects the cables in the sequence shown on the left.

The tightening torque of nuts must not completely crush the spring washer.

Thread	Tightening torque [Nm]
M4	1,2
M5	2
M6	3
M8	6
M10	10
M12	12

Terminal box screw	Tightening torque [Nm]
Trilobated 3,5	1,5
M5	5,5

The terminal box cover must be closed properly. The tightening torque of the screws must be in accordance with the prescription of this booklet.

Cables entry

To ensure compliance with the specifications of the motor, exclusively the supplied cable glands must be used. The proper tightening torque and the maximum diameters of the cables are the following:

	Tool [mm]	Tightening torque		Cable size	
		Min [Nm]	Max [Nm]	Min [mm]	Max [mm]
M16	19	1,0	1,1	4	8
M20	24	2,5	2,6	6,5	12
M25	33	4,0	4,2	9	16
M32	42	5,5	5,7	13	20



If the power supply cable is damaged, it must be replaced by the manufacturer or its service agent or a similarly qualified person in order to prevent any risk.

Electrical - Starting



Before running the test of the motor without transmission elements, lock the key/keys against the screening and check that the motor is securely fixed. Before the start up of the brake motors, make sure that the brake is working properly.

Electrical - Direction of rotation

Normally, the motors are suitable for both directions of rotation. Exceptions are indicated on the rating plate by an arrow. For the desired direction of rotation, the stator winding is connected as follows:

L1,L2,L3 connection	Direction of rotation from the control side
U1, V1, W1	Clockwise
W1, V1, U1	Counterclockwise

Electrical – Reversing the direction of rotation

The direction of rotation of the motor can be reversed as shown in the following table. Verify the absence of power supply, before proceeding to the change the direction of rotation.

Mode of starting and winding	Measures
Direct-on-line starting and pole-changing motors with separate windings	Exchange two supply-cable conductors on the terminal board of the motor
Star/delta starting and pole-changing motors with Dahlander winding	Exchange two supply-cable conductors at the incoming supply to the contactor combination

Electrical - Test

To check the direction of rotation, switch quickly ON/OFF the properly connected but uncoupled motor.

Electrical - Y/ Δ Starting



In order to avoid excessive transient currents and torques, before changing over from Y to Δ , wait until the starting current of the Y stage has died down or run-up has concluded (e.g. change over when rated speed is reached).

Electrical – Motor protection

Unless specifically requested during the purchase, motors have no protection against overcurrent, overtemperature and overspeed. These are mandatory and charged to the user, unless otherwise agreed. (IEC EN 60204-1)

Connect semiconductor temperature detectors to the release device in accordance with the wiring diagram. Continuity test, if necessary, to be carried out by means of a measuring bridge only (max. 2.5 V).



In order to achieve full thermal protection, an additional thermally delayed overload protection must be installed. Normally, fuses alone protect only the supply system not the motor.

Maintenance

ATTENTION:

Before acting on the equipment it is necessary to ensure that the environment has been cleared from the explosive atmosphere.

If this conditions is not obtainable, keep in mind that the operations in explosive atmosphere shall be carried out only by specialized staff, trained on the specific risks, as well as provided with the suitable protective devices (i.e.: spark-proof tooling, etc...)



Before carrying out any work on the motor, disconnect it and secure it against restarting.

Caution, danger of accidents: Take care not to come in contact with moving parts!

Cleaning

Depending on the local conditions, air passages should be cleaned regularly.

Maintenance of bearings

Motors made by Moratto S.r.l. have ball bearings with permanent lubrication. Under normal operating conditions, motors can be operated for about 20,000 hours without maintenance. However, the maximum period of maintenance-free operation is four years. If necessary, replace the bearings. Fill the spaces between the balls and the roller tracks as well as the grease compartments half with grease. Coat shaft bushings in the bearing caps or end shields with a thin layer of grease. Permanently greased bearings (2RS and 2Z bearings) cannot be washed and re-greased. Such bearings must therefore be replaced. To dismantle the bearings, use pressing screws or other appropriate devices.

Sealing rings lubrication

Sealing rings must be lubricated every 1600 hours of work, with an appropriate lubricant

Nuts and bolts tightening torque

Nuts and bolts tightening torque must be verified every 1600 hours of work according to the following table:

Screw	Rated torque [Nm]
M4	2,7
M5	5,5
M6	9,4
M8	23
M10	45
M12	78

Layers of dust

The layer of dust reduces the ability of the motor to dissipate heat and can consequently bring its surface to such temperatures that it can, in certain situations, inflame the layer of combustible dusts.

To avoid this danger, the user must activate a cleaning program that keeps the motor as much as possible free from layers of dust.

Electric terminals tightening check

The user must provide every six months an inspection on the status of the electrical connections and the tightening of terminals.

Repair instructions



Any repair work within the guarantee period is subject to the approval of the motor manufacturer.

General

It is strongly recommended to use original spare parts while repairing the motor.

Instructions for storage of motors

For prolonged storage of electric motors (e.g. spare motors), the following precautions shall be observed:

Place

Make sure that they are kept in a dry and dust free place with minimum vibration (Speed eff. ≤ 0.2 mm/s) (damage to stalled bearings). Ambient temperature + 10° C to + 40° C, relative humidity < 50 %.

If pulleys, half couplings, etc. are already mounted on the shaft extension, fit the locking device or place the motor on vibration dampers, if possible.



Use dampers and locking device also for any future transport of the motor.

Check before commissioning

Bearings

Before commissioning a motor that has been stored for more than 4 years, check the bearings. For motors without regreasing device, grease has to be renewed or bearings have to be changed after 2 years at the latest.

Insulation resistance



Before commissioning check the insulation resistance. With values $\leq 1\text{k}\Omega$ per Volt rated voltage, dry the winding.

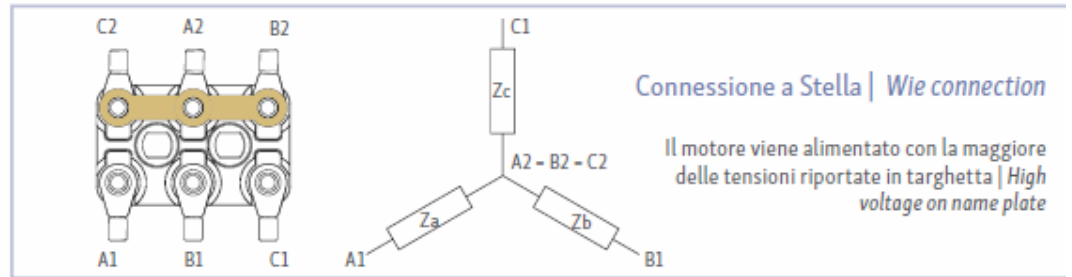
Check the insulation resistance of each phase against earth by means of a hand-driven generator (max. 630 V DC) until the measured value is constant. The insulation resistance of new windings is above 10 M Ω . The resistance can be lowered considerably by moisture.

If, at room temperature, the resistance is below 0.5 M Ω , the winding must be dried. In this case the winding temperature must not exceed 80° C. For drying connect the space heater or another heating device, or apply an AC voltage of 5 or 6 % (connect in delta) of the rated motor voltage to terminals U1 and V1. Repeat the measurement. The motor can be put into operation when the resistance is above 0.5 M Ω .

Insulation resistance is temperature-dependent, i.e. if the temperature is increased/decreased by 10 K, the resistance value is halved/doubled, respectively.

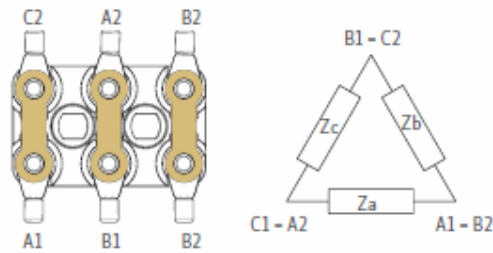
Wiring diagrams

Threephase motor



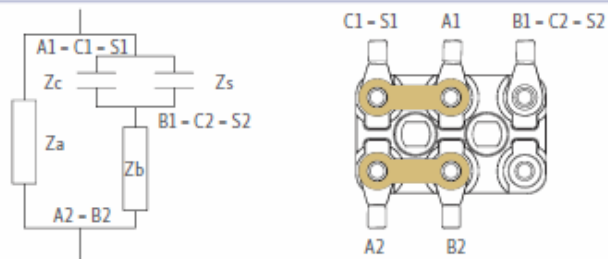
Connessione a Triangolo | Delta connection

Il motore viene alimentato con la minore delle tensioni riportate in targhetta | Low voltage on name plate

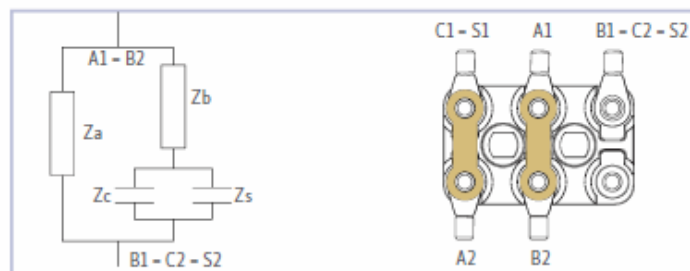


Singlephase motor

Rotazione Oraria
Clock wise rotation



Rotazione Antioraria
Anti Clock wise rotation



Troubleshooting

Three phase motor

PROBLEM	REASON	SOLUTION
The motor does not start, you cannot hear the typical starting noise	At least two phases are discontinued, lack of voltage	Check all protective elements, power lines and terminals
The motor does not start, you hear a loud buzzing	One phase is discontinued Friction between rotor and stator	Locate the interrupted phase, check the fuses, replace the damaged ones. Check the ball bearings, check the coupling and the correct tension in the belts
The motor does not start under load, but the magnetic hiss is regular	Too high resistant torque Too low voltage	Check the machine coupled to the motor, uncouple the motor and see if it work properly at no load Measure line voltage
The motor does not reach the correct speed Loss of speed, buzz	One phase is discontinued after starting The ammeter in the stator circuit reports periodic variations	Check the supply line Possible rotor fault, see a specialist
The motor warms up already during the idle running	Wiring error, for instance Y connection instead of delta connection. Too high voltage Insufficient cooling due to the ventilation channels clogged	Check and fix the connections according to the diagram Measure line voltage and no load current Clean the ventilation channels
The motor gets too hot under load	Too high load Too low or too high voltage One phase is discontinued Friction between rotor and stator	Measure current Measure both voltage and current Check line voltage Find the discontinued phase Check the coupling and the correct tension in the belts
The motor makes abnormal noise	Mechanical or electrical factors	If defects concern the electrical part, the noises disappear when disconnecting the motor; in case of defects on the mechanical part, noises often decrease with the reduction of speed. Contact the manufacturer
The pole-changing motor rotates with a wrong number of revolutions	Wiring error	Check and fix the connections according to the diagram
The pole-changing motor rotates with a single speed only	One or more lines or connections between terminals and pole-changer are defective or broken	Check the connections between terminals and line

Single speed motor

PROBLEM	REASON	SOLUTION
The motor does not start, you cannot hear the typical starting noise	Interruption of the line, lack of voltage	Check all protective elements power lines and terminals
The motor does not start under load, but the magnetic hiss is regular	Too high resistant torque The ammeter in the stator circuit reports periodic variations	Check the machine coupled to the motor, uncouple the motor and see if it work properly at no load Possible rotor fault, see a specialist
The motor warms up already during the idle running	Insufficient cooling due to the ventilation channels clogged	Clean the ventilation channels

The motor gets too hot under load	Too high load Too low or too high voltage Friction between rotor and stator	Check the coupling and the correct tension in the belts Measure the current Contact the manufacturer
The motor makes abnormal noise	Mechanical or electrical factors	If defects concern the electrical part, the noises disappear when disconnecting the motor; in case of defects on the mechanical part, noises often decrease with the reduction of speed. Contact the manufacturer

CAUTION

The motor is composed by the following materials: aluminum, plastic, steel and copper. The user should carefully verify that the machine is not concerned by atmospheric elements that can produce abnormal chemical reactions (eg exothermic chemical reactions) or that can lead to a deterioration of the equipment.

CAUTION

The electrical systems installed in areas with danger of explosion are subjected to a complaint to the regional ARPA and to ISPESL, as well as to a biennial verification by ARPA or by a Notified Body chosen by the user.

CAUTION

The electrical connections to the motor must be coherent with the category of certification. The ordinary electrical system is not suitable for operation in potentially explosive atmospheres and it also must therefore be ATEX certified.

CAUTION

Periodic maintenance of the motor is of fundamental importance to maintain constant over time the security features for the purposes of the explosion risk of the equipment. The user is therefore required to observe faithfully the maintenance schedule described in the relevant section of this instructions manual.

CAUTION

The motor is equipped with one thermistor which intervenes if the maximum safety temperature is exceeded. It is a duty of the user to properly connect the contacts of the thermistor to the control equipment so that if the thermistor intervenes, the power supply is cut off.