



Motori elettrici antideflagranti per miniera
Flameproof electric motors for mines
Moteurs électriques antidéflagrants pour mines
Explosionssgeschützte Elektromotoren für Gruben
Motores eléctricos antideflagrantes para minas



I, M2 • Ex d, Ex de

istruzioni di sicurezza
safety instructions
consignes de sécurité
Sicherheitsanweisungen
instrucciones de seguridad

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Flameproof
Motors



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1. Introduction

These safety instructions refer to the installation, operation and maintenance of M2 category flameproof motors intended for use in underground parts of mines, and to parts of surface installation of such mines likely to be endangered by fire damp and/or combustible dust. Hereafter these motors are referred to as flameproof motors for mines.

The flameproof motors for mines are equipped with the following protection types against the risk of explosion:

- Ex d I : flameproof motor and terminal box
- Ex de: flameproof motor and increased safety terminal box.

These instructions must be followed in addition to those provided in the instruction manual.

2. Installation of flameproof motors for mines

2.1 Suitability of the motor to the place of installation

European directive 94/9/EC dated 23 March 1994 and the EN 1127-2 Standard "Explosion prevention and protection" establish the essential safety requirements against the risk of explosion. Basic concepts and methodology for mining".

The choice of the type of motor, according to these technical and legislative provisions, must take into account the following factors:

- Type of plant: underground plants - mines (Group I)
- Classification of danger:
 - M1 category, equipment with a very high level of protection
 - M2 category, equipment with a high level of protection
- Maximum surface temperature 150°C or 450°C.

Notes

- The I M1 category equipment must remain functional even in the presence of explosive atmosphere.
- The I M2 category equipment must be de-energised in the presence of explosive atmosphere.
- The maximum surface temperature must not exceed:
 - 150°C on surfaces where coal dust accumulation can occur.
 - 450°C if no surface dust formation / presence is supposed to occur.



The motors described in this manual are M2 category equipment and therefore must be de-energised in the presence of explosive atmosphere by switching off power.

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2.2 Nameplate safety data

In addition to operating data, the information provided on the nameplate, includes:

- information necessary to select the appropriate type of motor and for the correct installation of the motor itself.
- references to the notified bodies responsible for certification.

MARKING MOTORS FOR MINES	
	Mark of conformity to the applicable European directives
	Community mark specifically indicating explosion protection installations, M2 category = high level of protection
I M2	Motor for use in underground parts of mines or surface parts of mine installations, M2 category = high level of protection
Ex d (Ex de)	Flameproof motor with flameproof terminal box Flameproof motor with increased safety terminal box
I	Group I enclosure; suitable for atmosphere with presence of fire damp, methane and coal dust
XYZW xx ATEX yyy	XYZW: laboratory that issued the CE certificate type xx: year in which the certificate was issued yyy: type certificate number
0000	Reference number of the notified body that executed the notification of the production system quality

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Notes:

- Motors with surface temperature of 150°C are also suitable for installations where the required surface temperature is 450°C.
- If the certificate number indicated on the nameplate is followed by an "X", the user must follow specific conditions of use described in this manual.
- Flameproof motors are normally made to be used at an ambient temperature in the range of -20 °C ÷ + 40 °C. If the motor has to be employed for operations outside these ambient temperature range, the temperature values must be specified at the time the order is issued and indicated on the nameplate.
- Motors are suitable for installations where the required maximum superficial temperature is 150°C.

2.3 Mains

Connections to the mains must be performed as shown in the wiring diagrams supplied with the motor.

Connection to the power terminal is made, depending on the type of motor, in the sequence indicated in the figures below.

Connections to the main terminals must be executed using the tightening torques indicated below:

SCREW SIZE	TIGHTENING TORQUE [Nm]
M4	1,2
M5	2
M6	3
M8	6
M10	10
M12	15,5

Figure 1 - Connection sequence 71÷250

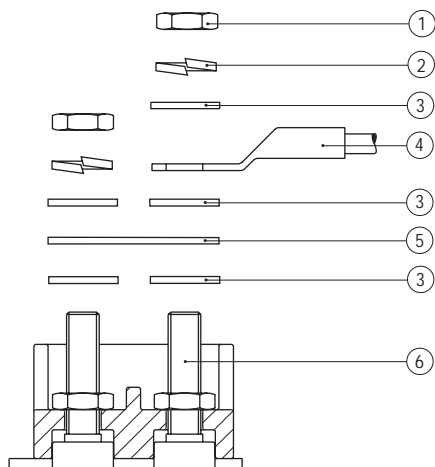
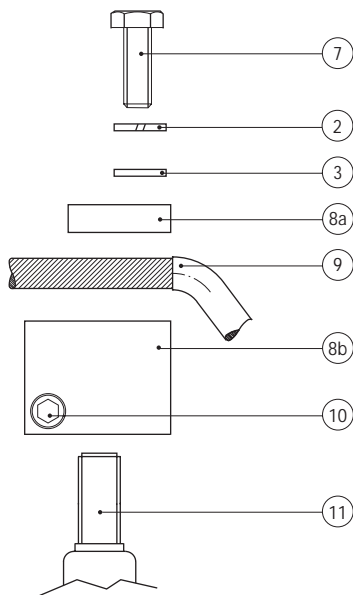


Figure 2 - Connection sequence 280÷315



- Legend:
- 1 - Nut
 - 2 - Spring washer
 - 3 - Flat washer
 - 4 - Insulated cable lug.
 - 5 - Connecting plate
 - 6 - Pin
 - 7 - Locking screw
 - 8a/8b - Cable fastener terminal
 - 9 - Power cable
 - 10 - Hexagon-head screw for locking terminal
 - 11 - Through pin

The air insulation distances as specified in the EN 50019 standard and indicated in the following table must be maintained when connections are made among conductors having different potential:

RATED VOLTAGE - U [V]	MINIMUM DISTANCE IN AIR - L _m [mm]
200 < U ≤ 250	5
250 < U ≤ 320	6
320 < U ≤ 400	6
400 < U ≤ 500	8
500 < U ≤ 630	10
630 < U ≤ 800	12
800 < U ≤ 1000	14

2.4 Auxiliary connections

2.4.1 Thermal protection

Verify the type of protection installed before proceeding with the connection.

With (PTC) or PT 100 thermistors, use a suitable relay (see point 5).

2.4.2 Anti-condensation heater

The anticondensation heaters must be fed from a different line from the motor power supply one. Check that the power voltage matches the one indicated on the nameplate. The heaters must not operate when the motor is powered.

Check the type of auxiliary present on the motor by looking at the "auxiliaries marking diagram".

2.5 Cable entries

Connections must be made using cable entries, which comply to applicable standards. The cable entry must be made without modifying the specific characteristics of the protection type as indicated in the IEC 60079-1 standard (§13.1, 13.2) for Ex d motors (flameproof protection) and the IEC 60079-7 standard for Ex de motors (increased safety protection).

When the cable entry is made using a cable gland, the type of cable gland must be selected correctly in relation to the type of plant and the type of cable. The cable gland must be tightened fully until the seal rings ensure the necessary pressure:

- to prevent transmission of mechanical stress to the motor terminals
- to ensure the mechanical protection (degree) of the terminal box.

Cable entries for Ex d terminal boxes must consist of Ex d cable glands certified according to the IEC 60079-0, IEC 60079-1 Standards and the ATEX Directive (94/9/CE). Furthermore, they must have a minimum IP55 protection class.

For the Ex de terminal boxes, Ex e cable glands certified according to ATEX generation IEC 60079-0 and IEC 60079-7 standards must be used. Furthermore, they must have a minimum IP55 protection class.

Gaskets must not be added, unless supplied by the manufacturer.

Unused cable entries must be closed with certified caps.

Note:

According to the IEC 60079-1 par. 13.2.1, the pipe entries are not admissible for Group I electrical equipment. **With motors described in this manual, cable entry must be done using cable glands.**

The cable and cable gland used must be suitable to the temperature indicated on the warning plate.

2.6 Earthing connection

Flameproof motors are provided with two earthing terminals: one inside the terminal box and the other on the motor frame. Depending on the cross-section of the line conductor, the earthing conductor cross-section must be:

LINE CONDUCTOR SECTION	EARTH CONDUCTOR SECTION
Less than or equal to 16 mm ²	Same section
Between 16 mm ² and 35 mm ²	16
Greater than 35 mm ²	Greater than or equal to 50% of the section

2.7 Further warnings for the installation

Flameproof motors must be protected against overloads with automatic power supply disconnection by using a countdown protection device or by using a device to control directly the temperature by means of temperature sensors inserted in the windings.

It is necessary to ensure that the motor ventilation is not impaired by obstacles positioned in the surrounding area when flameproof motors are installed. For this purpose a minimum distance must be maintained between the motor and any device that is not part of the motor, according to the following table:

SIZE	MINIMUM DISTANCE FROM OTHER DEVICES [mm]
up to 160	40
from 180 to 225	85
≥ 250	125

The terminal board box must always be closed before starting the motor.

Lightly re-grease machined flamepath surfaces, fit terminal box lid and tighten fixing bolts to torques as indicated in table.

TIGHTENING TORQUES [Nm]						
Cast iron frame						
Steel class	M4	M5	M6	M8	M10	M12
8.8	2.9	5.6	10	23	35	80

3. Motors without fan

3.1 Cooling method IC 418

Ventilation is supplied by a fan directly coupled to the motor. Ensure that the motor ventilation is not impaired in all operating conditions and that the temperature limits allowed by the insulation category B are complied with.

Fans must comply with the EN 1127-1 standard and any possible product standards referring to fans.

3.2 Cooling method IC 410

The motor is without a fan. The following limitations must be observed:

- For "S1" operation, the motor power output is derated by 50% to comply with the limits allowed by insulation class B.
- For "S2" operation, regular power output can be used provided the motor does not work long enough for it to reach the temperature limits of insulation class B. Said time limits are indicated on the plate.

4. Motors with forced ventilation

4.1 Cooling method IC 416

Cooling is assured by ventilation provided by an auxiliary flameproof motor, covered by separate certification, fitted on the back of the main motor.

The user must have a safety device fitted enabling the main motor to be started only once the auxiliary motor is running.

In addition, motors must be equipped with PTC or PT100 thermal probes, which must be connected with a cut-out disconnecting the motor's power supply. This cut-out must not have a manual reset.

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5. Motors suitable for frequency converter drive

For operation with an inverter, motors must be equipped with PTC or PT100 thermistors inserted in the winding to ensure compliance with the limits of the temperature class.

If the motor temperature class is T4, the user must connect the PTC or PT100 terminals to a tripping relay ensuring that the power supply is cut off whenever a dangerous temperature is reached. The reset of said cut-out must be performed manually only, and not automatically.

The user, in compliance with the essential safety requirements provided for under point 1.5 of European Directive 94/96 EC, must:

- use a cut-out in compliance with IEC 61508 standard

or

- use a cut-out that automatically switches to safety position in case of a failure (fail-safe)

or

- use a dual protection circuit. As an alternative, the user can employ a dual device such as that indicated in section 4 for forced ventilation.

Rated performance relating to operation at mains power frequency cannot be maintained if powered by an inverter. In particular, power output could be significantly reduced to maintain the assigned temperature class and to avoid damage caused by overheating.

Inverter motors have an auxiliary plate. Before starting the motor, check the ratings (kW – Hz – torque) indicated on the auxiliary plate. The user must contact the manufacturer if this information is not provided.

Induction motors supplied from the mains conform to the immunity and emission limits relating to electromagnetic compatibility as foreseen by the standards.

When power is supplied by a frequency converter, the installer bears responsibility for checks and any measures required to comply with immunity and emission limits as laid down by the standards.

The choice of the type of frequency converter must be made taking into account that the motor must not be subjected to voltage peaks exceeding 1100 V, which would significantly reduce the life of the windings insulation. It is necessary to consider in this respect that the voltage peaks value is also influenced by the length of the power supply cable.

When the motor does not come with forced ventilation provided by an auxiliary motor, motors with IC416 cooling, the user must follow instructions given in point 4.1 (Cooling method IC416).

6. Inspections and maintenance of flameproof motors for mines

The inspections and maintenance of flameproof motors shall be executed in compliance with the criteria of the EN 60079-17 standard.

The electrical connection terminals must be tightened fully to avoid high contact resistances and consequential overheating.

Care must be taken to ensure that the insulation distances in air and on the surfaces between the conductors are maintained, as established by the standards.

All bolts used to secure both motor and terminal box must be tightened using the torque values as indicated in the table TIGHTENING TORQUES par. 2.7. All screws utilised to seal the motor and the terminal board shall be tightened fully.

Replacement of gaskets and cable entry parts shall be executed using components that are identical to the components supplied by the manufacturer to ensure the protection degree is maintained.

The surfaces of flameproof joints must not be machined and sealing gaskets different from those supplied by the manufacturer must not be inserted. These surfaces must be maintained in a clean condition. A thin layer of non-hardening grease must be used against corrosion and to prevent water from entering. This grease layer must be renewed at every disassembly.

7. Repair of flameproof motors for mines

Repairs made to flameproof motors shall be executed in compliance with the criteria specified in the IEC 60079-19 standard.

If repairs are not executed by the manufacturer, they must be carried out at workshops which have the necessary equipment and with adequate technical expertise concerning the motor protection types.

If repair work has to be performed on parts that influence the flameproof protection characteristics the motor construction data must not be changed (for example: dimensions of joints, windings characteristics, etc.) and the repaired parts must be tested.

A written report must be prepared with the detailed indication of the work carried out.

If after the repair work has been completed, the motor complies entirely with the standard and with the certificate, an additional nameplate shall be affixed to the motor (without removing the original nameplate) showing the following marks:

- Symbol **R**
- name or trademark of the repairer
- serial number given to the repair operation by the repairer
- date of repair

If following a repair that modifies relevant aspects concerning protection against explosions, the motor does not comply with the certificate, the original nameplate must be removed and the motor can no longer be considered suitable for use in areas where there is danger of explosion.

In order to be utilised in such areas the motor must be examined again by a competent certification body.

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Programma di vendita	Sales programme	Programme	Lieferprogramm	Programa de venta
Motori antideflagranti Ex d - Ex de <ul style="list-style-type: none"> • gruppo I-IIA-IIB-IIC • categoria M2, 2G, 2D, 2GD • classe T3-T4-T5-T6 • trifasi, monofasi • con freno 	Flameproof motors Ex d - Ex de <ul style="list-style-type: none"> • group I-IIA-IIB-IIC • category M2, 2G, 2D, 2GD • class T3-T4-T5-T6 • threephase, singlephase • with brake 	Moteurs antidéflagrants Ex d - Ex de <ul style="list-style-type: none"> • groupe I-IIA-IIB-IIC • catégorie M2, 2G, 2D, 2GD • classes de température T3-T4-T5-T6 • triphasés, monophasés • avec frein 	Explosionsgeschützte Motoren Ex d - Ex de <ul style="list-style-type: none"> • Gruppe I-IIA-IIB-IIC • Kategorie M2, 2G, 2D, 2GD • Klasse T3-T4-T5-T6 • Dreiphasen- und Einphasen-Ausführung • mit Bremse 	Motores antideflagrantes Ex d - Ex de <ul style="list-style-type: none"> • grupo I-IIA-IIB-IIC • categoría M2, 2G, 2D, 2GD • classe T3-T4-T5-T6 • trifásicos, monofásicos • con freno
Motori a sicurezza aumentata Ex e <ul style="list-style-type: none"> • gruppo II • categoria 2G • classe T1-T2-T3 	Increased safety motors Ex e <ul style="list-style-type: none"> • group II • category 2G • class T1-T2-T3 	Moteurs à sécurité augmentée Ex e <ul style="list-style-type: none"> • groupe II • catégorie 2G • classes de température T1-T2-T3 	Motoren in Schutzart "erhöhte Sicherheit" Ex e <ul style="list-style-type: none"> • Gruppe II • Kategorie 2G • Klasse T1-T2-T3 	Motores de seguridad aumentada Ex e <ul style="list-style-type: none"> • grupo II • categoría 2G • clase T1-T2-T3
Motori non sparking Ex nA <ul style="list-style-type: none"> • gruppo II • categoria 3G, 3GD 	Non sparking motors Ex nA <ul style="list-style-type: none"> • group II • category 3G, 3GD 	Moteurs anti-étincelle Ex nA (non sparking) <ul style="list-style-type: none"> • groupe II • catégorie 3G, 3GD 	Funknfreie Motoren Ex nA <ul style="list-style-type: none"> • Gruppe II • Kategorie 3G, 3GD 	Motores no sparking Ex nA <ul style="list-style-type: none"> • grupo II • categoría 3G, 3GD
Motori chiusi con ventilazione esterna IEC <ul style="list-style-type: none"> • trifasi, monofasi • categoria 3D 	Totally enclosed fan cooled IEC motors <ul style="list-style-type: none"> • threephase, singlephase • category 3D 	Moteurs IP55 IEC avec ventilation extérieure <ul style="list-style-type: none"> • triphasés, monophasés • catégorie 3D 	Vollgekapselte luftgekühlte Motoren nach IEC <ul style="list-style-type: none"> • Dreiphasen- und Einphasen-Ausführung • Kategorie 3D 	Motores cerrados con ventilación exterior IP 55 IEC <ul style="list-style-type: none"> • trifásicos, monofásicos • categoría 3D
Elettropompe centrifughe antideflagranti per macchine da stampa Ex d - Ex de	Centrifugal flameproof electric pumps for printing machines Ex d - Ex de	Elettropompe centrifuges antidéflagrantes pour machines d'imprimerie Ex d - Ex de	Explosionsgeschützte Zentrifugal-Elektropumpen für Druckmaschinen Ex d - Ex de	Electrobombas centrifugas para máquinas de impresión Ex d - Ex de
Elettropompe centrifughe per macchine utensili	Centrifugal electric pumps for machine tools	Elettropompe centrifuges pour machines-outils	Elektropumpen für Werkzeugmaschinen	Electrobombas centrifugas para máquinas herramientas

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