LEROY SOMER®

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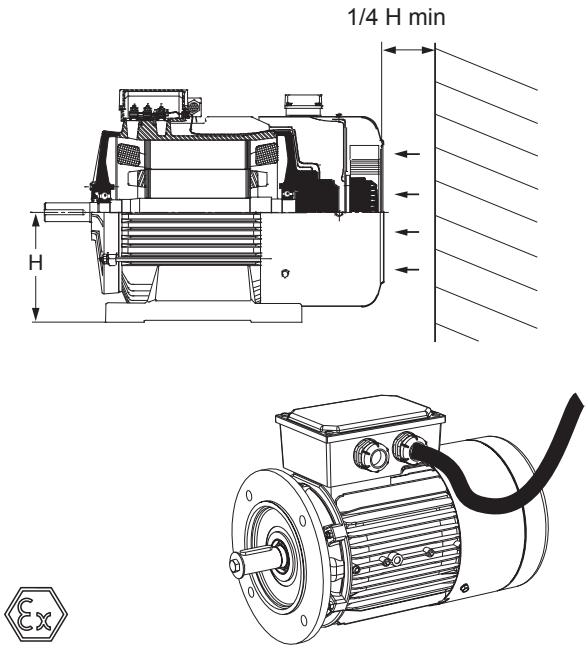
This manual is to be given to the end user



(F)LS (ES, IA, MV, PX), FCR

3-phase asynchronous TEFV brake motors

Installation

(F)LS (ES, IA, MV, PX), FCR

3-phase asynchronous TEFV brake motors

This document complements the general instructions ref. 1889 (recommendations), ref. 3770 (LS), ref. 4850 (LSES LS2/IE2), ref. 3255, 3385 (ATEX specific recommendations) and the specific instructions ref. 5025 (FCR brake motor maintenance).

FCR brake motors are monobloc units consisting of an induction motor and a failsafe brake system (safety brake).

This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-theart technology in automation, specially selected materials, rigorous quality control. As a result, the regulatory authorities have awarded our motor factories the ISO 9001 - Edition 2008 international certificate.

EC conformity: motors conform to the harmonized standard EN 60034 (IEC 34) therefore with the low voltage Directive 2006/95/EC and as EC marked.

The noise level of the machines, measured under normal conditions, conforms to the requirements of the standard (IEC 34-9).

IMPORTANT

These symbols ⚠ ⚠ appear in this document whenever it is important to take special precautions during installation, operation, servicing or maintenance of the motors.

⚠ **The specifications, instructions and descriptions are for standard operation. They do not take account of structural variants or special adaptations. Failure to comply with these recommendations may lead to premature deterioration of the motor and voiding of the manufacturer's guarantee.**
Check motor compatibility with its environment before installation and over its entire operating lifetime.

⚠ **Electric brake motors are industrial products. Therefore, they must only be installed by qualified experienced and authorised personnel. The safety of people, animals and goods should be ensured when fitting the motors into machines (please refer to current standards).**

Particular attention should be given to the equipotential ground or earthing connections.

Workforce safety: protect all rotating devices before power-up. If running a motor without fitting a coupling device, carefully immobilise the key in its location. All measures must be taken to ensure protection from the risks presented by rotating parts (sleeve, pulley, belt, etc.). Beware of backdriving when the motor is switched off, it is necessary to take appropriate precautions: pumps, install a non-return valve, for example.

⚠ **The following precautions must be taken before working on any stopped device:**
- **mains voltage disconnected and no residual voltage present**
- **careful study of the causes of the stoppage** (blocked transmission - loss of phase - cut-out due to thermal protection - lack of lubrication, etc.)

PREFACE: ATEX TRAINING

Specific ATEX marking ⑩

0080 : INERIS identification number (Notified Organisation)
Ex : Specific marking
II 2D Ex tb IIIC : Group II, category 2, Dust or:
II 3D Ex tc IIIB : Group II, category 3, non-conducting Dust

T (max) : Maximum surface temperature: 125°C for example
Db, Dc : Protection level of equipment
Attestation n° : Type test attestation n° issued by INERIS (réf. 3255 instructions)

Those persons required to work on electrical installations and equipment in zones where there is a risk of explosion must be specially trained in the necessary skills.

In effect, they must be familiar not only with the electrical risks, but also with those that are due to the chemical properties and physical characteristics of products used in the installation (gas, vapour, dust), as well as the environment in which the equipment operates. These elements dictate the risk of fire and explosion.

In particular, they must be informed and aware of the specific safety reasons and requirements in order to adhere to them.

For example:

- do not open when powered up,
- do not open when powered up in atmospheres containing explosive dust,
- do not separate when powered up,
- do not manoeuvre when on load,
- wait several minutes before opening,
- replace the seals tightly to ensure watertightness.

CONTENTS

NOTE : Leroy-Somer reserves the right to modify its product characteristics at any time to incorporate the latest technological developments. The information contained in this document may therefore be changed without prior warning.

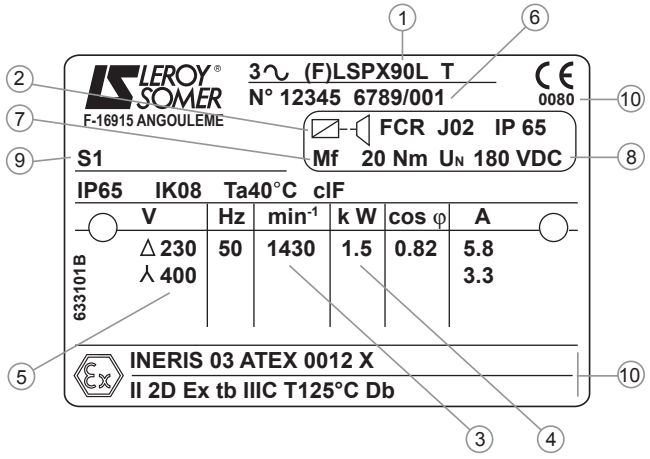
(F)LS (ES, IA, MV, PX), FCR

3-phase asynchronous TEFV brake motors

1 - RECEIPT

Check the state of the brake motor - should the motor or even the packaging be damaged in any way, inform the carrier.
Check that the brake motor conforms with the order specifications (mounting arrangement, information on the identification plate).

1.1 - Identification



Following details indicated on name plate:

Motor series, frame size	①
Brake type (FCR J02)	②
Speed rotation (min^{-1})	③
Rated power (kW)	④
Motor voltage (V)	⑤
Manufacturing number	⑥
M_f Braking torque (N.m)	⑦
U_N Brake coil voltage (V)	⑧
Duty cycle (S1)	⑨
Specific ATEX marking (p. 2)	⑩
(F)LS(IA) : Food processing industry	Option

1.2 - Storage

Store the equipment in a clean, dry place, protected from shocks, vibration and temperature fluctuations and at a relative humidity level of less than 90 %.
Special conditions apply if the motor is to be stored for more than 6 months, which we will gladly forward to you if required.
After a storage period of more than 6 months, disconnect the brake power supply unit and check the insulation resistance of the windings (phase / earth resistance greater than 10 MΩ).
Drain any condensation water.

2 - RECOMMENDATIONS

2.1 - Commissioning

The motor is designed to operate at the speeds shown on the identification plate (do not exceed the maximum speed given in our technical catalogues).
Respect voltages and frequencies on the identification plate (do not deviate by more than ±5 % of the voltages indicated and ±1 % of frequencies).
Do not use a motor for lifting applications which is not labelled S3 or S4 (variable speed use excepted). Do not use a motor for purposes other than that shown on the identification plate ⑨.

2.2 - Mechanical installation

(refere also to maintenance ref. 1889)
Allow a minimum gap of 210 mm at the rear of the brake motor for removing the cover (servicing and brake adjustment).
Install the brake motor in an environment which meets the order specifications (temperature, relative humidity, altitude).
If the brake motor is supplied with eye bolts, they are only designed to lift the brake motor.
Mount the brake motor in its intended position, on a level, firm surface to avoid distortion and vibration.
Ensure that the correct tightening torque is used for the fixing screws (minimum class 8.8 according to ISO 898-1). The diameter of the screws should correspond to the size of the fixing holes.
Ensure that the mechanical shafts are aligned and the coupling and the pulley are mounted using the latest technology.
Do not knock the motor (terminal box, cover), the shaft or the coupling when mounting it. Take care not to crush the waterproof seal and do not exceed the shoulder of the shaft.
Check that the brake motor is able to cool properly, and that the air intakes and outlets are clear. Check that the load applied to the motor shaft (especially the tension of the belt) is compatible with the values given in our technical catalogues..

Brake with lever
Manual release. If the brake has a lever, push it down, exerting pressure towards non drive end shaft.
After releasing the brake for any reason, **make sure it is locked** once all maintenance operations have been carried out.
See procedure for desmantling / reassembling ref. 5025 Maintenance FCR.

2.3 - Electrical connection

The cables must be wired power off by qualified personnel.
Select the protection system and the cables using the information on the nameplate (during the starting phase the voltage drop should be less than 3 %).
Electrical connections must be performed by qualified personnel, using the latest technology, and adhering to current safety standards.
Tighten the terminal screws, connectors and power supply cables to the torque shown below (N.m):

Terminal	M4	M5	M6	M8
Steel	2	3.2	6	10
Brass	1	2	3	6

If the cables are connected without connectors then use calipers instead.
- Do not place washers or nuts between the lugs of the motor and those of the supply cable.
Connect the thermal protection and any accessories.
Check the cable gland seal (the cable gland must correspond to the diameter of the cable being used).
Feed the cable to the terminal box using a bending radius which avoids water entering the cable gland.
Check the direction of rotation of the motor (§ 2.5).

Earthing
Earthing the motor is compulsory and must be performed in accordance with existing regulations (protection of workforce).

Power supply (see connection diagrams under the cover of the terminal box)
Brake motors with built-in power supply can be connected in the same way as standard motors. They are fitted with a DC coil of 100 V or 180 V. The brake is directly supplied from the motor stator (220-380, 230-400, 240-415 or 254-440 V) via a brake power supply unit, with a rectifier mounted in the terminal box.
For different voltages and motors which start with reduced voltage or operate at variable voltage or frequency, the power supply unit must be separate from the brake. (As well as for a 20 VCC brake coil).
Precautions during connection at ATEX variable speed ref. 5025 (§ 4.7).
For a shorter response time on locking the brake (essential for lifting applications), it is necessary to break the brake DC power supply at the same time as that of the motor, usually using an auxiliary contact from the motor's starting contactor.

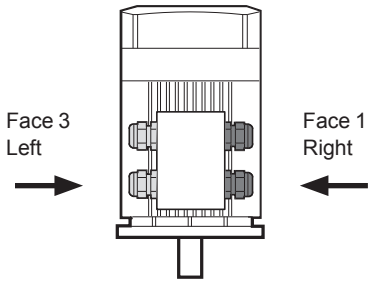
(F)LS (ES, IA, MV, PX), FCR
3-phase asynchronous TEFV brake motors

2.4 - Terminal box and cable gland for FCR brake motors

2.4.1 - Terminal box for FCR brake motors

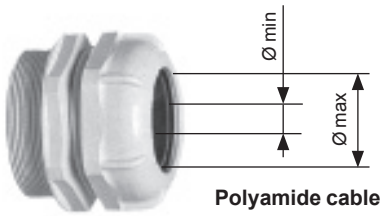
Terminal box is drilled as standard with holes on face 1 and 3:
- LS 71 up to 132 S : ISO M20 x 1.5 + ISO M20 x 1.5
- LS 132 M, LS 160 MP, LR : ISO M25 x 1.5 + ISO M20 x 1.5

It is delivered closed by obturator plug. A cable gland kit (option in LS2/IE2) is supplied following shart below, terminal box sealing is obtained after fitting the components included in the kit and tightening each cable gland up to the cable tightening capacity.



2.4.2 - Tightening capacity and torque of cable gland for FCR brake motors (EN 50262)

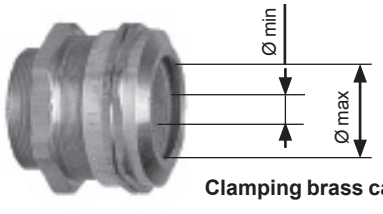
LS (MV) FCR series for rated supply voltage 400V, standard polyamide cable gland



Polyamide cable gland

Cable gland type	Standard polyamide cable gland		
	Tightening capacity		Tightening torque
	Ø min cable (mm)	Ø max cable (mm)	Gland nut and body (N.m)
ISO 20a (71 -> 132 S)	5	12	2
ISO 20 (71 -> 132 S)	7	14	2
ISO 25 (132 / 160)	9	18	3

(F)LS (PX) FCR series for rated supply voltage 400V, clamping brass cable gland

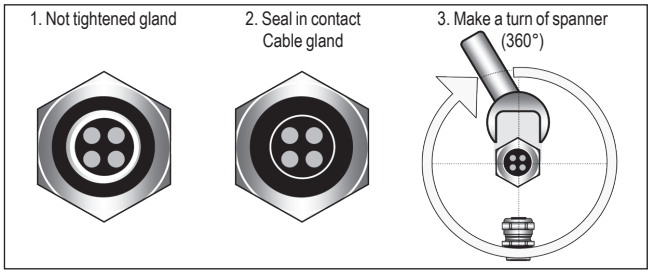


Clamping brass cable gland

Cable gland type	Clamping brass cable gland		
	Tightening capacity		Tightening torque
	Ø min cable (mm)	Ø max cable (mm)	Gland nut and body (N.m)
ISO 20a (71 -> 132 S)	6	10	4
ISO 20 (71 -> 132 S)	8	12	4
ISO 25 (132 / 160)	11.5	18	6

⚠ The installer is responsible for ensuring that the cable path is sealed to IP 6X.

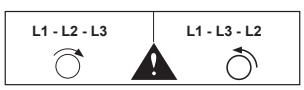
⚠ Adapt the cable gland and its reducer or amplifier if fitted to the diameter of the cable being used.
In order to preserve the motor's original IP 65 protection, it is essential to ensure the seal between the rubber ring and the cable by tightening the cable gland correctly (so that it cannot be unscrewed by hand).
Unused cable glands must be replaced with threaded plugs.
Unused orifices must also be covered by threaded plugs. It is essential that the cable gland devices or plugs are fitted with the aid of a Perbunan, polyurethane mastic seal between the cable glands, the plugs, the reducers or (and) the amplifiers, the support or terminal box.



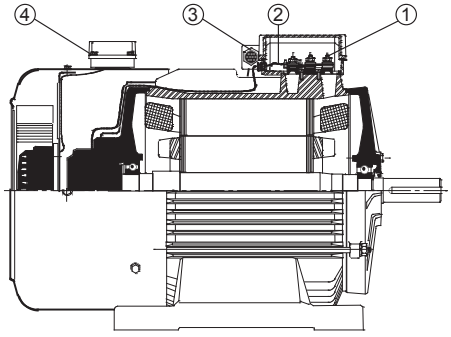
Installation zones

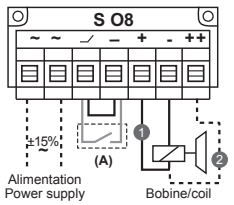
Our LS(PX), (F)LS(PX) motors conform to IP 65 protection and we guarantee their surface temperature.
They are therefore intended for use in atmospheres containing explosive dust of group II - Category 2 D Ex tb IIIC (zone 21: conducting dust for example) or Category 3 D Ex tc IIIB (zone 22).

2.5 - Wiring diagrams



⚠ Check brake wiring connection according to motor supply.





Alimentation Power supply	Bobine Coil	Câblage* Cabling*
400V AC 230V AC	180V DC 100V DC	1
230V AC 127V AC	180V DC 100V DC	2

*suivant alimentation et bobine
* according power supply and coil

(A) coupure sur continu : temps de réponse réduit
obligatoire en levage : ENLEVER LE STRAP
(A) DC braking : shorter response time
Mandatory for lifting application : REMOVE WIRE

① **Brake motor: diagram under the cover of the terminal box**
② **Brake: coil 180VDC (std), 100VDC**

(F)LS (ES, IA, MV, PX), FCR

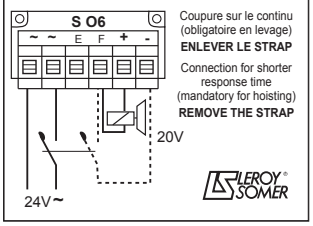
3-phase asynchronous TEFV brake motors

20V brake coil
Wiring diagram for option:
separate power supply 24V

(LS 71 to 112)

IMPORTANT
Débrancher le bloc redresseur
pour essai d'isolement ou diélectrique
Disconnect the rectifier cell when testing
for current insulation or dielectric

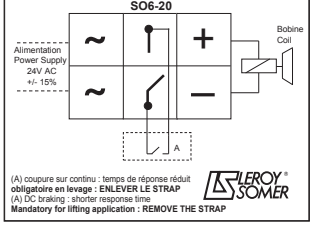
Schéma de branchement
Connection diagram
FREIN - BRAKE



(LS 112-60Nm S3, LS 132, LS 160)

IMPORTANT
Débrancher le bloc redresseur
pour essai d'isolement ou diélectrique
Disconnect the rectifier cell when testing
for current insulation or dielectric

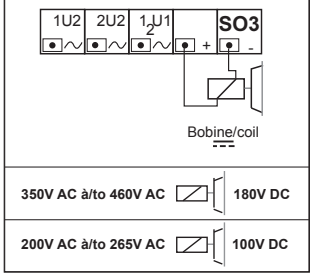
Schéma de branchement
Connection diagram
FREIN - BRAKE
SO6-20



(A) coupure sur continu : temps de réponse réduit
obligatoire en levage : ENLEVER LE STRAP
(A) DC braking : shorter response time
Mandatory for lifting application : REMOVE THE STRAP

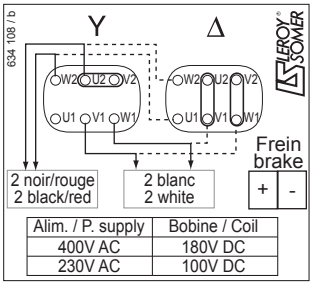
180VDC, 100VDC brake coil
2 speeds motor,
2 windings, 1 voltage

IMPORTANT
Débrancher le bloc redresseur
pour essai d'isolement ou diélectrique
Disconnect the rectifier cell when testing
for current insulation or dielectric



OPTIONS

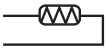
Wiring diagram for option:
reduced responce time TRR



Thermal protection

PTO -> screws terminals (purple/white)

CTP -> terminal block (black/black)
ATEX CTP -> terminal block (blue/blue)

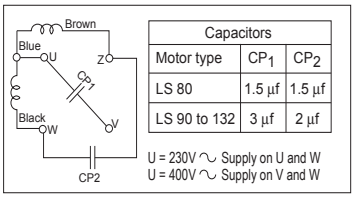


③ Incremental encoder

12 pins	1	2	3	4	5	6	7	8	9	10	11	12
Connector	–	+	A	B	0	$\overline{A}$	$\overline{B}$	$\overline{0}$		⏚	⏚	⏚
Shielded cable	White	Brown	Green	Yellow	Grey	Pink	Blue	Red		Braided	Braided	Braided

Signal: B before A view from the «DAC» side, clockwise rotation

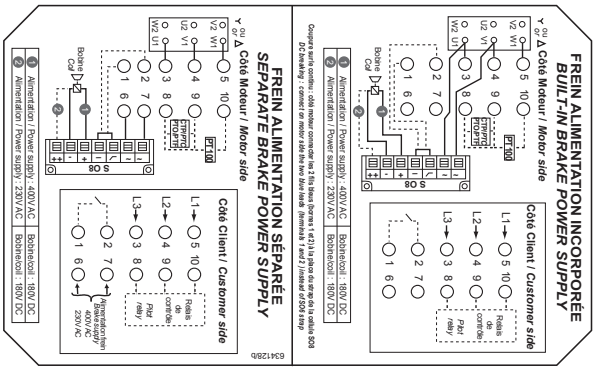
④ Single-phase forced ventilation
230 or 400V for frame size ≤ 132



Capacitors		
Motor type	CP_1	CP_2
LS 80	1.5 µf	1.5 µf
LS 90 to 132	3 µf	2 µf

U = 230V ∿ Supply on U and W
U = 400V ∿ Supply on V and W

Option: clamp connector

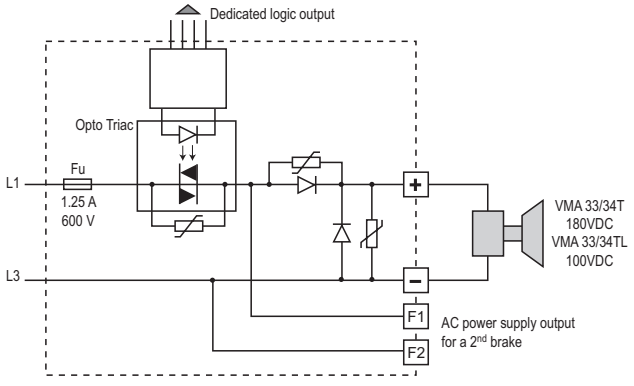


Precautions during connection

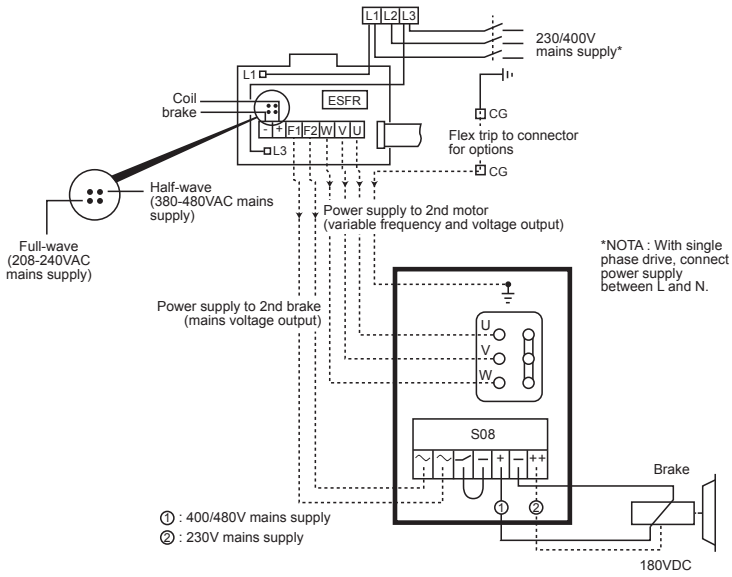
- Switch off the power supply before performing any connection operation (connection or disconnection, with or without connectors) at the encoder ar cubicle end.
- For reasons of synchronisation, power up and power down the encoders and any associated electronic devices simultaneously.
On the first power-up, check that the «supply +» terminal is supplying the required voltage before connection.
- Use stabilised power supply sources. Power supplies via transformers providing 5 V (or 24 V) rms, followed by rectifiers and filter capacitors, **MUST NOT BE USED**, as in reality the resulting DC voltages are:
For 5V: 5 x √2 = 7.07V
For 24V: 24 x √2 = 33.936V

VARMECA Brake motors (Installation and maintenance ref. 3776)
Built-in power supply

ESFR VMA 33/34

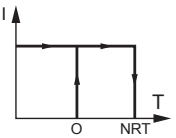
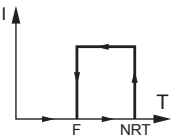
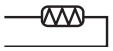
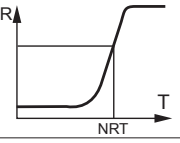
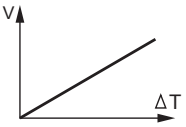
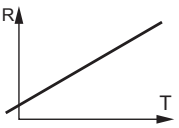


ESFR VMA 31/32



2.6 - Electrical advices

Thermal protection and space heaters

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number required*
Normally closed thermostat **PTO**	Bimetallic strip, indirectly heated, with N/C contact 		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in series
Normally open thermostat **PTF**	Bimetallic strip, indirectly heated, with N/O contact 		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in parallel
Positive temperature coefficient thermistor **CTP**	Variable non-linear resistor, indirectly heated 		0	general surveillance for transient overloads	Mounted with associated relay on control circuit 3 in series
Thermocouples ***T*** (*T* < 150 °C) Constantan copper **K** (*T* < 1000 °C) Copper-Nickel	Peltier effect		0	continuous surveillance at hot spots at regular intervals	Mounted on control panels with associated reading device (or recording device) 1 per hot spot
Platinum resistance thermometer **PT 100**	Variable linear resistor, indirectly heated		0	high accuracy continuous surveillance at key hot spots	Mounted on control panels with associated reading device (or recording device) 1 per hot spot

- NRT: nominal running temperature
- The NRTs are chosen according to the position of the sensor in the motor and the class of temperature rise.

* The number required affects the protection of the windings.

Alarm and early warning
All protective equipment may be backed up by another type of equipment (with a different NRT). The first device will then act as an «early warning» system (light or sound signals given without shutting down the power circuits), and the second device will be the actual alarm, shutting down the power circuits.

Protection against condensation: space heaters
Identification: 1 red label
A glass fibre flexible resistor is fixed on 1 or 2 coil end turn(s) which heats the machines when stopped and therefore prevents any condensation inside the machines.
Power supply: 230 V single phase unless otherwise requested by the customer.
The drain plugs underneath the motor should be opened approximately every six months. They should then be replaced to ensure IP -- motor protection.

Thermal magnetic protection
The motor must be protected by a thermal magnetic device, sited between the isolating switch and the motor. These protective devices safeguard motors fully from non-transient overloads.
This device can be fitted with a fused circuit-breaker.

Built-in direct thermal protection
For low rated currents, bimetallic strip-type protection may be used. The line current passes through the strip, which shuts down or restores the supply circuit as necessary. The design of this type of protection allows for manual or automatic reset.

Built-in indirect thermal protection
The motors can be equipped with optional heat sensors; these sensors can be used to monitor temperature rises at «hot spots»: overload detection, cooling check, monitoring strategic points for installation maintenance.

It must be emphasized that these sensors cannot ever be used to directly control the motor operating cycles.

Thermal protection

Caution: whatever the type of protection, (PTO or PTF), its NRT must not exceed:
• 150 °C max for the stator and 120 °C max for the shields if the maximum surface temperature = 125 °C.
• 160 °C max for the stator and 130°C max for the shields if the maximum surface temperature = 135 °C.
• 170 °C max for the stator and 140 °C max for the shields if the maximum surface temperature = 145 °C.

If using sensors with variable resistances or thermocouples, the associated equipment must stop the motor at a temperature of:
• 150 °C max for the stator and 120 °C max for the shields if the maximum surface temperature = 125 °C.
• 160 °C max for the stator and 130 °C max for the shields if the maximum surface temperature = 135 °C.
• 170 °C max for the stator and 140 °C max for the shields if the maximum surface temperature = 145 °C.

Line protection: setting the thermal protective device
This must be set at the level of current shown on the motor nameplate for the voltage and frequency of the connected mains supply.

(F)LS (ES, IA, MV, PX), FCR

3-phase asynchronous TEFV brake motors

MOTEURS LEROY-SOMER SAS - RCS 338 567 258 ANGOULÊME - CAPITAL DE 65 800 512 €