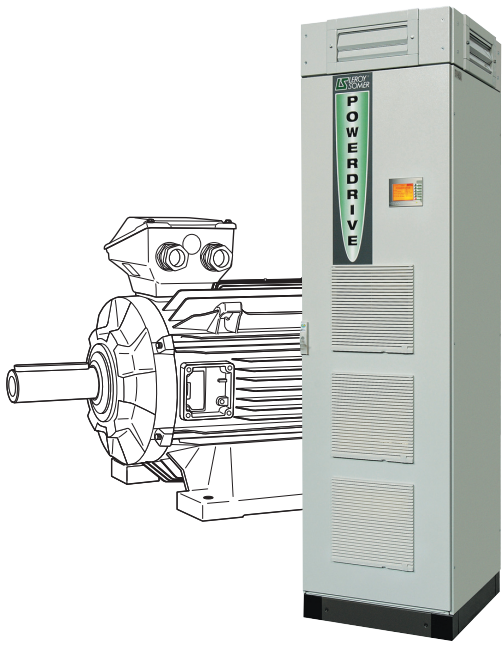
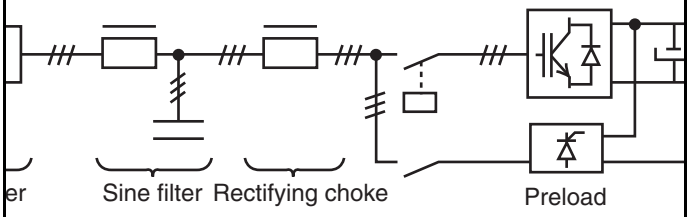
LEROY SOMER®

4001 en - 02.2008 / a



This manual is to be given to the end user



POWERDRIVE

Regenerative variable speed drive

Installation manual

POWERDRIVE
Regenerative variable speed drive

NOTE

LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

WARNING

For the user's own safety, this variable speed drive must be connected to an approved earth (⏚ terminal).

If accidentally starting the installation is likely to cause a risk to personnel or the machines being driven, it is essential to comply with the power connection diagrams recommended in this manual.

The variable speed drive is fitted with safety devices which can, in the event of a problem, control stopping and thus stop the motor. The motor itself can become jammed for mechanical reasons. Voltage fluctuations, and in particular power cuts, may also cause the motor to stop. The removal of the causes of the shutdown can lead to restarting, which may be dangerous for certain machines or installations.
In such cases, it is essential that the user takes appropriate precautions against the motor restarting after an unscheduled stop.

The variable speed drive is designed to be able to supply a motor and the driven machine above its rated speed.
If the motor or the machine are not mechanically designed to withstand such speeds, the user may be exposed to serious danger resulting from their mechanical deterioration.
Before programming a high speed, it is important that the user checks that the installation can withstand it.

The variable speed drive which is the subject of this manual is designed to be integrated in an installation or an electrical machine, and can under no circumstances be considered to be a safety device. It is therefore the responsibility of the machine manufacturer, the designer of the installation or the user to take all necessary precautions to ensure that the system complies with current standards, and to provide any devices required to ensure the safety of equipment and personnel.

LEROY-SOMER declines all responsibility in the event of the above recommendations not being observed.

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This manual only describes the general features, characteristics and installation of the POWERDRIVE. For commissioning, refer to manual 3871.

POWERDRIVE
Regenerative variable speed drive

SAFETY AND OPERATING INSTRUCTIONS FOR VARIABLE SPEED DRIVES
(In accordance with the low voltage directive 73/23/EEC modified by 93/68/EEC)

• Throughout the manual, this symbol warns of consequences which may arise from inappropriate use of the drive, since electrical risks may lead to material or physical damage as well as constituting a fire hazard.

1 - General

Depending on their degree of protection, the variable speed drives may contain unprotected live parts, which may be moving or rotating, as well as hot surfaces, during operation. Unjustified removal of protection devices, incorrect use, faulty installation or inappropriate operation could represent a serious risk to personnel and equipment.
For further information, consult the documentation.
All work relating to transportation, installation, commissioning and maintenance must be performed by experienced, qualified personnel (see IEC 364 or CENELEC HD 384, or DIN VDE 0100 and national specifications for installation and accident prevention).
In these basic safety instructions, qualified personnel means persons competent to install, mount, commission and operate the product and possessing the relevant qualifications.

2 - Use

Variable speed drives are components designed for integration in installations or electrical machines.
When integrated in a machine, commissioning must not take place until it has been verified that the machine conforms with directive 89/392/EEC (Machinery Directive). It is also necessary to comply with standard EN 60204, which stipulates in particular that electrical actuators (which include variable speed drives) cannot be considered as circuit-breaking devices and certainly not as isolating switches.
Commissioning can take place only if the requirements of the Electromagnetic Compatibility Directive (89/336/EEC, modified by 92/31/EEC) are met.
The variable speed drives meet the requirements of the Low Voltage Directive 73/23/EEC, modified by 93/68/EEC. The harmonised standards of the DIN VDE 0160 series in connection with standard VDE 0660, part 500 and EN 60146/VDE 0558 are also applicable.
The technical characteristics and instructions concerning the connection conditions specified on the nameplate and in the documentation provided must be observed without fail.

3 - Transportation, storage

All instructions concerning transportation, storage and correct handling must be observed.
The climatic conditions specified in the technical manual must be observed.

4 - Installation

The installation and cooling of equipment must comply with the specifications in the documentation supplied with the product.
The variable speed drives must be protected against any excessive stress. In particular, there must be no damage to parts and/or modification of the clearance between components during transportation and handling. Avoid touching the electronic components and contact parts.
The variable speed drives contain parts which are sensitive to electrostatic stresses and may be easily damaged if handled incorrectly. Electrical components must not be exposed to mechanical damage or destruction (risks to health!).

5 - Electrical connection

When work is performed on variable speed drives which are powered up, the national accident prevention regulations must be respected.
The electrical installation must comply with the relevant specifications (for example conductor cross-sections, protection via fused circuit-breaker, connection of protective conductor). More detailed information is given in the documentation.
Instructions for an installation which meets the requirements for electromagnetic compatibility, such as screening, earthing, presence of filters and correct insertion of cables and conductors, are given in the documentation supplied with the variable speed drives. These instructions must be followed in all cases, even if the variable speed drive carries the CE mark. Adherence to the limits given in the EMC legislation is the responsibility of the manufacturer of the installation or the machine.

6 - Operation

Installations in which variable speed drives are to be integrated must be fitted with additional protection and monitoring devices as laid down in the current relevant safety regulations, such as the law on technical equipment, accident prevention regulations, etc. Modifications to the variable speed drives using control software are permitted.
Active parts of the device and the live power connections must not be touched immediately after the variable speed drive is powered down, as the capacitors may still be charged. In view of this, the warnings fixed to the variable speed drives must be observed.
During operation, all doors and protective covers must be kept closed.

7 - Servicing and maintenance

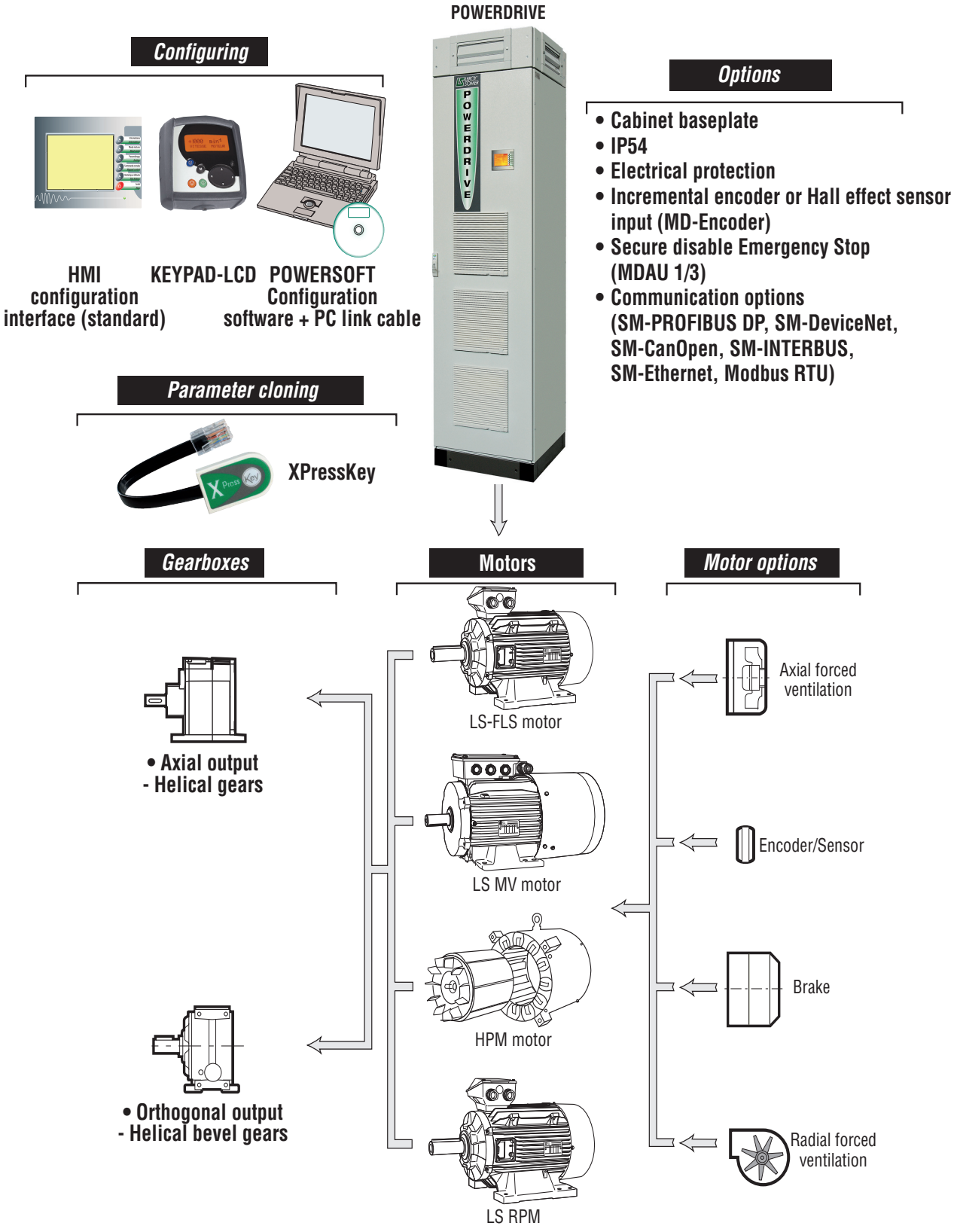
Refer to the manufacturer's documentation.

This manual is to be given to the end user.

POWERDRIVE
Regenerative variable speed drive

FOREWORD

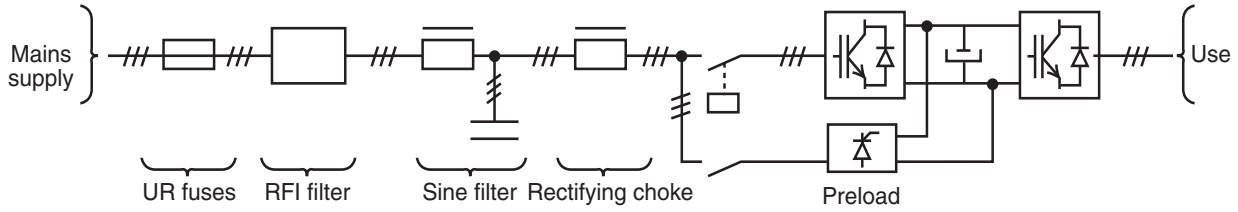
This manual describes the installation of **POWERDRIVE** variable speed drives. It also gives details of all its options and extensions which the user may choose to suit his requirements.



POWERDRIVE
Regenerative variable speed drive

1 - GENERAL INFORMATION

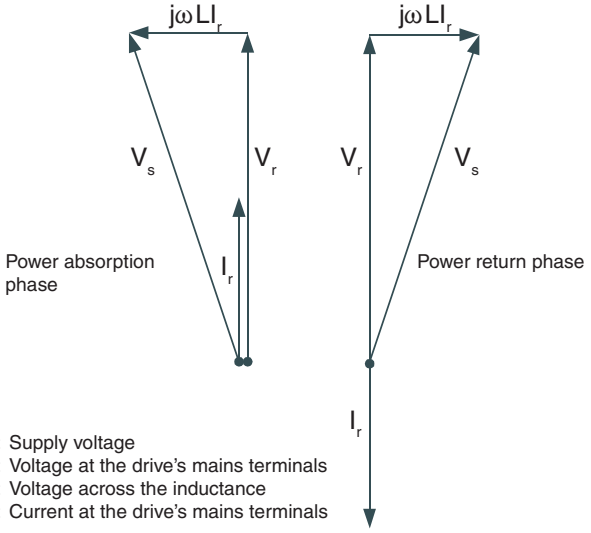
1.1 - General



The power stage of the input converter of a "non-reversible" conventional variable speed drive generally consists of an uncontrolled diode bridge, by principle preventing the return of power to the mains supply.
In its electrical input structure, the **Regenerative POWERDRIVE** has a specific assembly combining six IGBTs and six diodes assembled head to tail. This assembly, controlled by control electronics, forms a synchronous rectifier that not only converts the AC supply into a DC controlled voltage, but also allows power to be reversed.
This reversible drive consists at its three inputs of a 3-phase voltage system of the PWM type, which on principle should be interfaced with respect to the mains supply by a "rectifying" choke.
A radio-frequency filter and a sine filter mounted in cascade block the various residual current components at the converter.

1.2 - Power flow

The vector diagram below illustrates the relationship between the supply voltage and the voltage generated by the reversible drive and indicates the direction of power flow.
An action on the amplitude and phase of the system of voltages generated by the **Regenerative POWERDRIVE** fixes the direction of the power flow. The angle between the two voltage vectors is approximately 5° at full load and under these conditions the drive has a power factor close to 1.

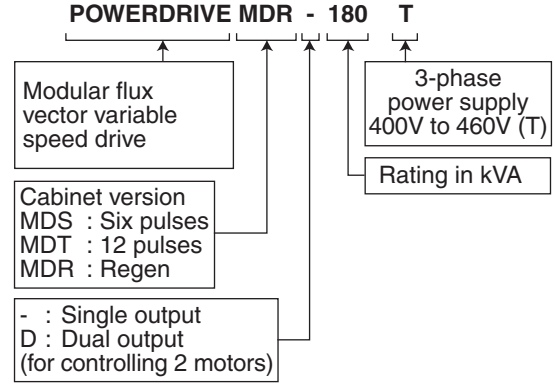


V_s : Supply voltage
V_r : Voltage at the drive's mains terminals
$j\omega LI_r$: Voltage across the inductance
I_r : Current at the drive's mains terminals

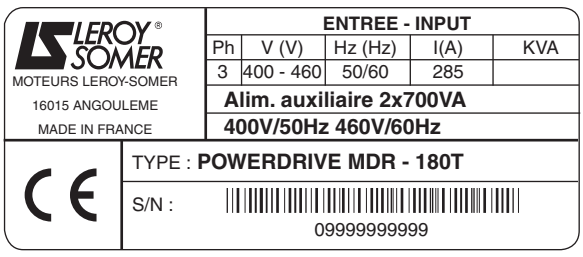
1.3 - Advantages of a Regenerative POWERDRIVE

The main advantages of such a reversible system are:
- Return of power to the mains supply is possible
- Slight distortion of the input current waveform
- The upstream power factor of the converter is very close to 1
- The output voltage for the motor can be higher than that available on the AC mains supply

1.4 - Product designation



Nameplate



The nameplate can be found at the top inside of the cabinet right-hand door (another copy can be found on the outside of the cabinet, at the top of the right-hand side).

1.5 - Environmental characteristics

Characteristic	Level
Protection	IP21 (IP54 as an option)
Storage and transport temperature	-25°C to +60°C 12 months maximum. After this, the drive (power and electronics) must be switched on for 24 hours every 6 months.
Operating temperature	-10°C to +40°C, up to +50°C with derating (see section 1.6.3)
Relative humidity	• In accordance with IEC 60068-2-56. • < 90% non condensing.
Altitude	• < 1000 m: no derating • > 1000 m: operating temperature derating of 0.6°C per 100 m. E.g. for an altitude of 1300 m, the electrical characteristics must be taken into account for an ambient temperature of [40°- (3 x 0.6°)] = 38.2°C.
Vibrations	• In accordance with IEC • Non-packaged product: 2 m/s^2 (9-200 Hz), 0.6 mm (2-9 Hz) • Packaged product: 10 m/s^2 (9-200 Hz), 3 mm (2-9 Hz)
Shocks	Packaged product: In accordance with IEC 60068-2-29.
Atmospheric pressure	700 to 1060 hPa
Temperature cycle	In accordance with IEC 60068-2-14 -10°C to +40°C, 5 cycles

1.6 - Electrical characteristics

• All work relating to installation, commissioning and maintenance must be carried out by experienced, qualified personnel.

1.6.1 - General characteristics

Characteristic	Level
Power supply voltage	3-phase mains supply: 400 V -10% to 460 V +10%
Phase voltage imbalance	2%
Auxiliary power supply and forced ventilation voltage and power	Single phase mains supply: 400 V/50 Hz (± 10%) or 460-480 V/60 Hz (±10%) • 60T to 150T : P = 600 VA • 180T to 270T: P = 1400 VA (2 x 700 VA) • 340T to 470T: P = 2200 VA (2 x 1100 VA) • 600T and 750T: P = 4400 VA (4 x 1100 VA)
Input frequency	2% around the rated frequency (50 or 60 Hz)
Maximum number of power-ups per hour	20
Output frequency range	0 to 999 Hz

1.6.2 - Electrical characteristics at 40°C

CAUTION:
In its factory setting, the drive operates with a switching frequency of 3 kHz at an ambient temperature of 40°C.

I_{co}: Continuous output current.
P_{out}: Output power.
I_{max}: Maximum output current *.
I_{max} (2 s): Peak output current for 2 s after start-up.
High overload: For high overload constant torque machines, for example: presses, grinders, extruders, conveyors, sieves, hoisting and all applications where significant inertia has to be accelerated quickly.
Low overload: For low overload constant torque or centrifugal torque machines, for example: pumps, fans, compressors.
(*) Current available for 60 seconds every 600 seconds, at maximum drive temperature.

3-phase mains, 400 V -10% to 460 V +10%

POWERDRIVE rating	High overload				Low overload			
	Pout (kW)	Ico (A)	Imax (60s) (A)	Imax (2s) (A)	Pout (kW)	Ico (A)	Imax (60s) (A)	Imax (2s) (A)
60T	45	90	120	140	55	110	120	140
75T	55	110	165	175	75	145	165	175
100T	75	145	200	220	90	175	200	220
120T	90	175	240	270	110	215	240	270
150T	110	220	308	375	132	260	308	375
180T	132	260	360	425	160	305	360	425
220T	160	305	450	460	200	380	450	460
270T	200	380	530	600	250	470	530	600
340T	250	470	660	770	315	580	660	770
400T	315	570	760	900	355	630	760	900
470T	355	680	940	1060	450	800	940	1060
600T	450	820	1140	1210	550	990	1140	1210
750T	550	990	1400	1525	675	1220	1400	1525

Note: With the IP54 option, the values in the above table are valid for a switching frequency setting of 2 kHz.

1.6.3 - Derating according to the temperature and switching frequency

POWERDRIVE rating	Temperature	Ico (A)									
		High overload					Low overload				
		2 kHz	3 kHz	4 kHz	5 kHz	6 kHz	2 kHz	3 kHz	4 kHz	5 kHz	6 kHz
60T	40°C	90	90	82	76	72	110	110	100	92	85
	50°C	85	75				105	90			
75T	40°C	110	110	100	94	90	145	145	132	120	112
	50°C	102	100				135	120			
100T	40°C	145	145	132	122	115	180	175	165	150	138
	50°C	135	125				165	165			
120T	40°C	175	175	160	148	138	215	215	200	180	165
	50°C	165	155				205	195			
150T	40°C	220	220	195	175	165	260	260	240	215	195
	50°C	205	210				245	230			
180T	40°C	260	260	245	230	220	305	305	305	290	265
	50°C	240	250				295	305			
220T	40°C	305	305	290	265	250	380	380	330	315	290
	50°C	290	260				355	315			
270T	40°C	380	380	350	320	305	470	470	430	390	355
	50°C	360	320				440	400			
340T	40°C	470	470	430	400	375	580	580	510	460	425
	50°C	440	400				515	475			
400T	40°C	570	570	520	480	455	650	630	600	550	500
	50°C	535	470				590	540			
470T	40°C	680	680	620	590	550	800	800	750	680	625
	50°C	640	600				770	720			
600T	40°C	820	820	760	710	670	990	990	920	830	760
	50°C	770	745				930	900			
750T	40°C	990	990	920	850	800	1220	1220	1120	1020	930
	50°C	930	900				1150	1100			

Note: With the IP54 option, look at the values in the 3 kHz column for a switching frequency setting of 2 kHz.

2 - MECHANICAL INSTALLATION

• It is the responsibility of the owner or user of the POWERDRIVE to ensure that the installation, operation and maintenance of the drive and its options comply with legislation relating to the safety of personnel and equipment and with the current regulations of the country of use.
The drive must not be installed in hazardous areas unless it is in an appropriate enclosure. In this case the installation must be approved.
• In atmospheres where condensation may form, install a heating system which operates when the drive is not in use and is switched off when the drive is in use. It is advisable to control the heating system automatically.

2.1 - Checks on receipt

• Make sure that the cabinet has been transported vertically, as otherwise it could be damaged.

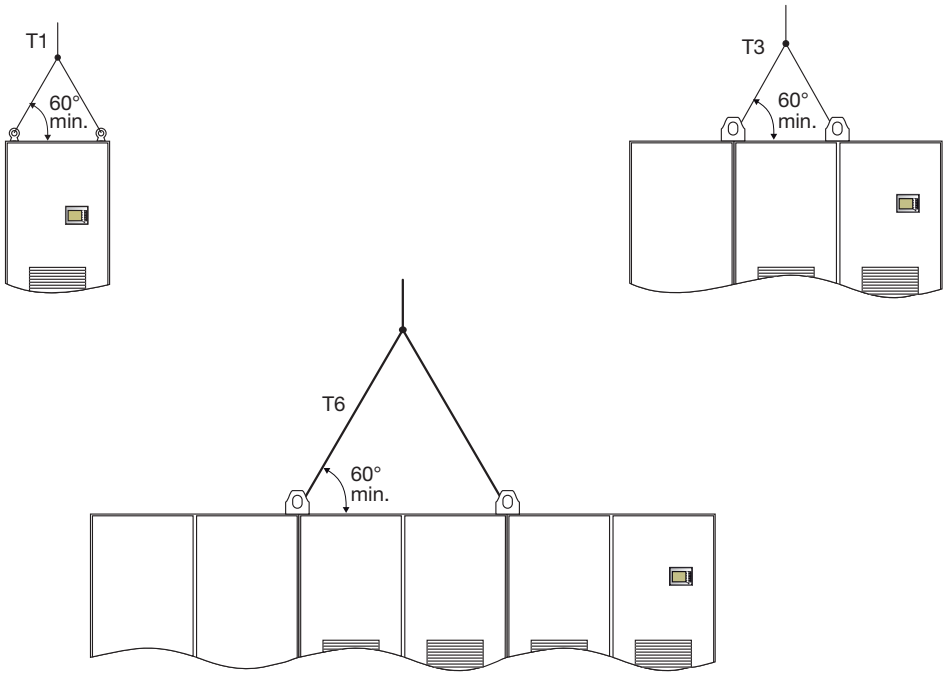
Before installing the **POWERDRIVE**, check that:
- The drive has not been damaged during transport.
- The information on the nameplate is compatible with the power supply.

2.2 - Handling

• The centre of gravity may be high up and/or off-centre, so beware of the risk of the cabinet tipping over.
• Check that the handling equipment is suitable for the weight to be handled.

Handling must be done without the IP21 or IP54 roof.
IP21 **POWERDRIVEs** are supplied with the roof assembled. Before handling the cabinet, follow the procedure described in section 2.3. After handling, follow the instructions below, and then reassemble the roof.
IP54 **POWERDRIVEs** are supplied with the lifting rings or rails assembled. For handling the cabinet, follow the instructions below. After handling, assemble the roof as described in section 2.4.

• The lifting rails or rings supplied are for the sole use of handling the POWERDRIVE and may under no circumstances be appropriated for another use.



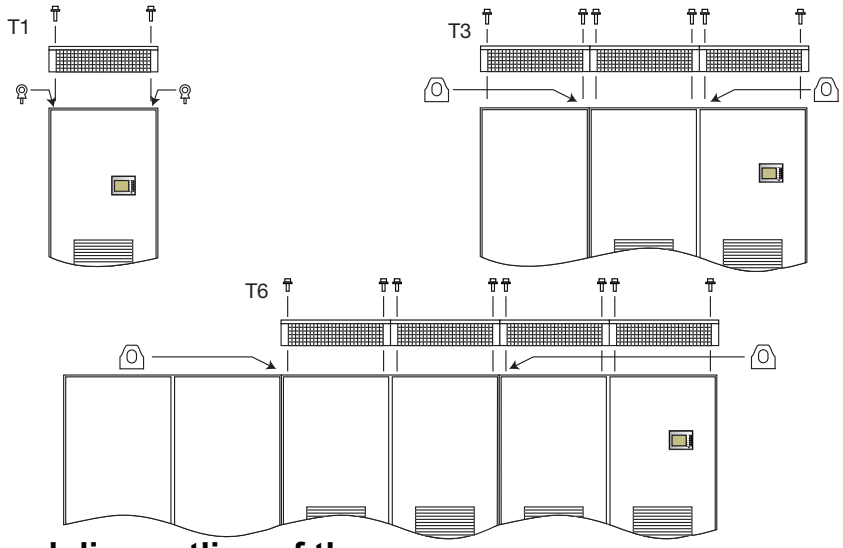
2.3 - Dismantling and assembly of the IP21 roof

• Dismantling

1 - Remove the class 12/9 M12 x 90 mm screws and washers supplied by LEROY-SOMER.
2 - Remove the roof(s).
3 - Screw on the 4 lifting rings or the 2 lifting rails with the M12 screws at the places indicated (tightening torque = 20 N.m).

• Assembly

Follow the reverse procedure.



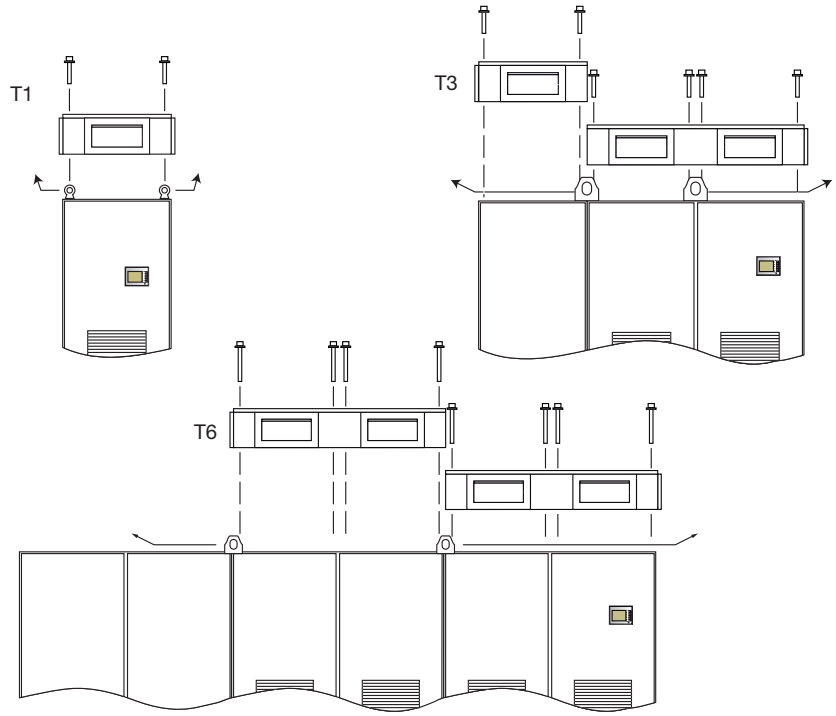
2.4 - Assembly and dismantling of the IP54 roof

• Assembly:

1 - Dismantle the 4 lifting rings or the 2 lifting rails.
2 - Open up the roof assembly in accordance with the diagrams below. The side panels with no vent are to be mounted facing one another; the rear of the drive will have no vent.
3 - Insert the supplied M12 screws through the roof assembly.
4 - Adjust the roof assembly to optimise sealing.
5 - Finally tighten the fixing screws (Tightening torque: 20 N.m).

• Dismantling:

Follow the reverse procedure.



2.5 - Installation recommendations

• The drives must be installed away from conducting dust, corrosive gas, dripping water and any source of condensation. Prevent access by unauthorised personnel.

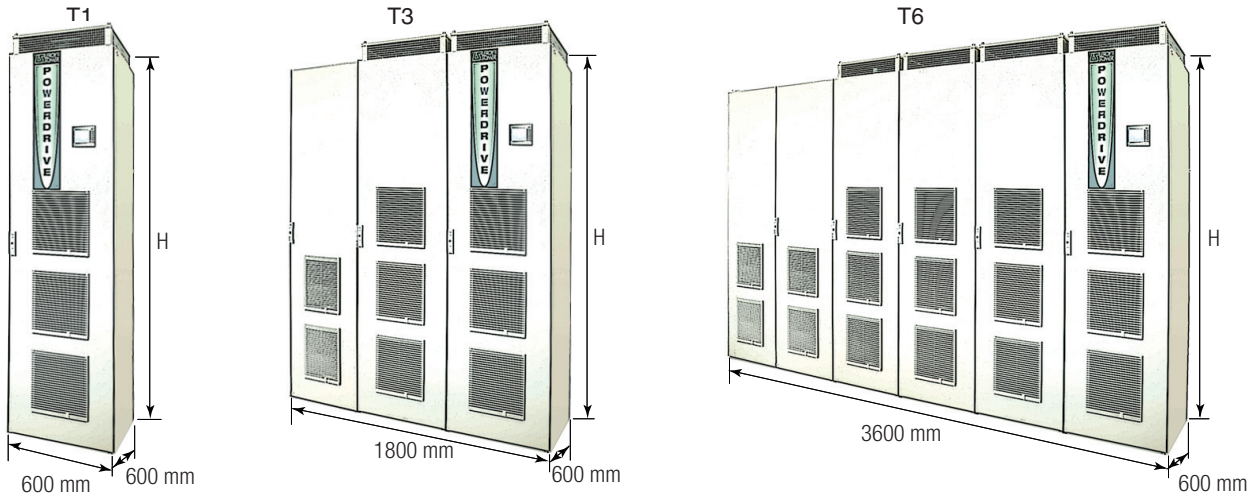
Make sure there is no recycling of hot air at the air inlets, by leaving a sufficient clear space above the **POWERDRIVE** or providing a means of removing the hot air, if necessary using a suction hood.
Never obstruct the drive ventilation grilles; the air inlet filters must be cleaned and changed regularly.

2.6 - Dimensions and weights

The **POWERDRIVE** in a cabinet solution is obtained by assembling 600x600x2000 (mm) cabinet modules.
The depth is therefore constant and the width varies according to the rating.
All options can be incorporated into the Regenerative POWERDRIVE with no change to its dimensions.

POWERDRIVE rating	Maximum weight (kg)												
	60T	75T	100T	120T	150T	180T	220T	270T	340T	400T	470T	600T	750T
T1	400	400	400	450	450								
T3						1200	1200	1300	1300	1400	1500		
T6												2100	2200

• Dimensions



POWERDRIVE	Dimension H (mm)	
	Without baseplate	With 100 mm baseplate
IP21	2160	2260
With IP54 option	2260	2360

2.7 - Losses, ventilation flow rate and noise levels

• Losses according to the switching frequency

Losses (kW)	POWERDRIVE												
	60T	75T	100T	120T	150T	180T	220T	270T	340T	400T	470T	600T	750T
at 2.5 kHz	2.16	2.52	3.05	4.04	5.07	6.5	7.5	9.1	11.3	13.2	17.4	23.7	26.3
at 3 kHz	2.26	2.64	3.19	4.24	5.32	6.8	7.9	9.6	11.9	13.8	18.2	24.7	27.4
at 4 kHz	2.45	2.86	3.48	4.66	5.84	7.4	8.7	10.6	13	15.2	19.4	26.2	29.2

• Forced ventilation flow rates

Forced ventilation	POWERDRIVE												
	60T	75T	100T	120T	150T	180T	220T	270T	340T	400T	470T	600T	750T
Flow rate	450	450	450	450	1350	1350	1350	1350	2500	2500	2500	5000	5000

• Noise

Forced ventilation	POWERDRIVE												
	60T	75T	100T	120T	150T	180T	220T	270T	340T	400T	470T	600T	750T
Level (dBA)	73	73	73	76	76	76	76	76	77	77	77	80	80

3 - CONNECTIONS

• All connection work must be performed in accordance with the laws in force in the country in which the drive is installed. This includes earthing to ensure that no directly accessible part of the drive can be at the mains voltage or any other voltage which may be dangerous.

• The voltages on the cables or connections of the mains supply, the motor, the braking resistor or the filter may cause fatal electric shocks. Contact with these items must be avoided under all circumstances.

• The drive must be supplied via a circuit-breaking device so that it can be powered down safely.

• The drive power supply must be protected against overloads and short-circuits.

• The drive stop function does not protect against high voltages on the terminal blocks.

• Make sure that the DC bus voltage is below 40 V before carrying out any work.

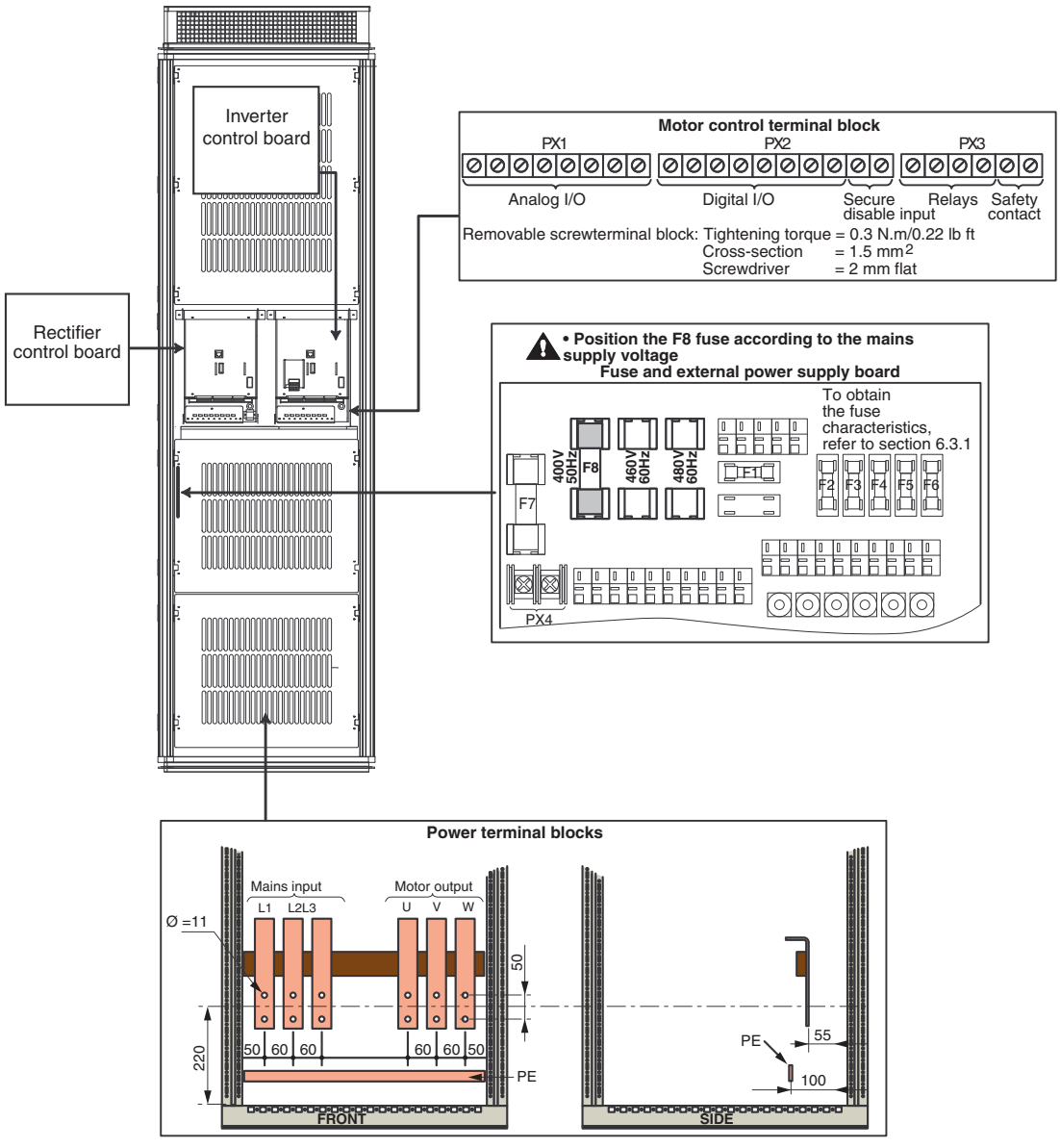
• Check that the voltage and current of the drive, the motor and the mains supply are compatible.

• After the drive has been operating, keep away from the heatsink as it may be very hot (70°C).

3.1 - Location of terminal blocks

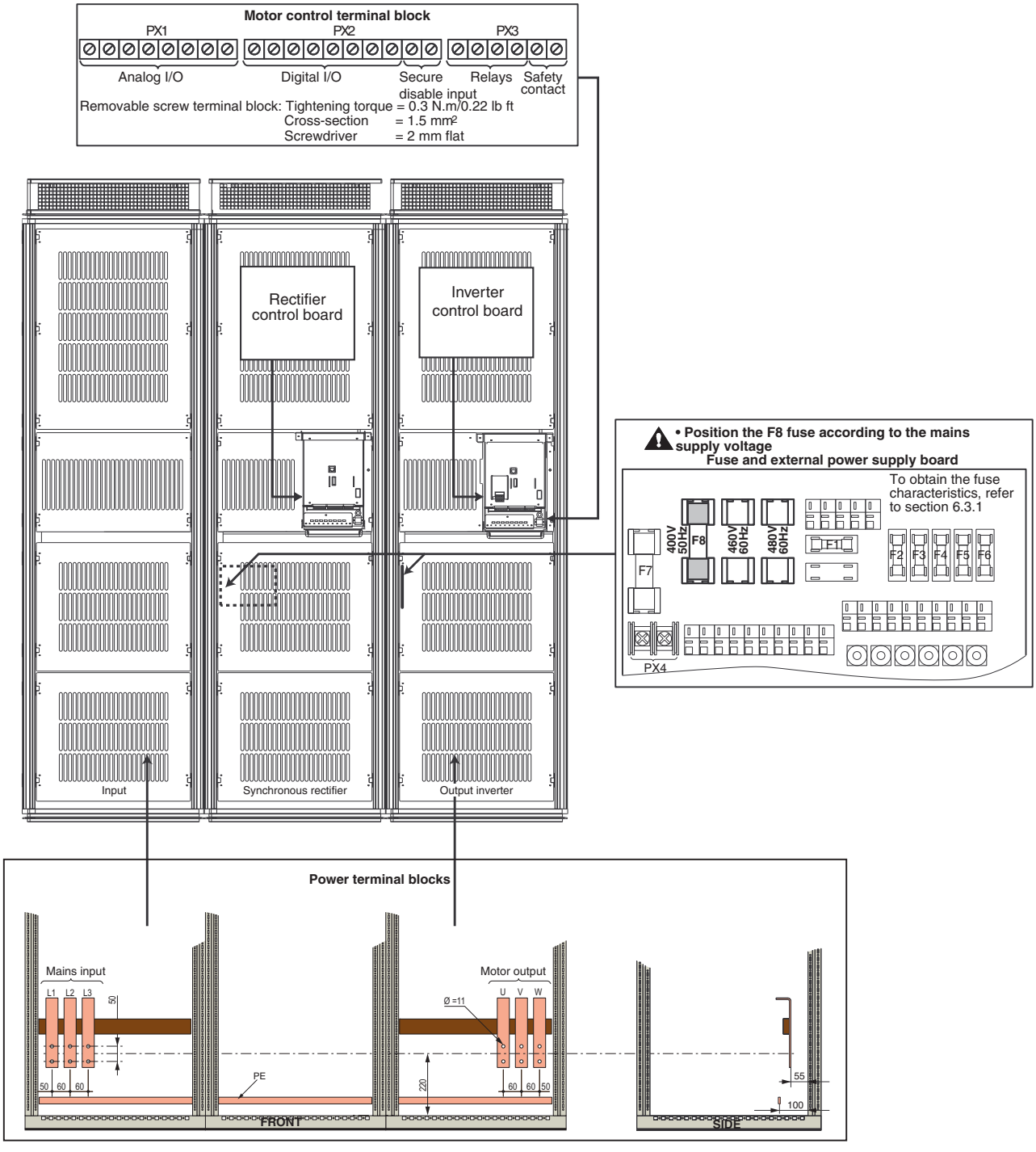
3.1.1 - 60T to 150T

CAUTION:
Customer connections and installation of options are done on the inverter control board.



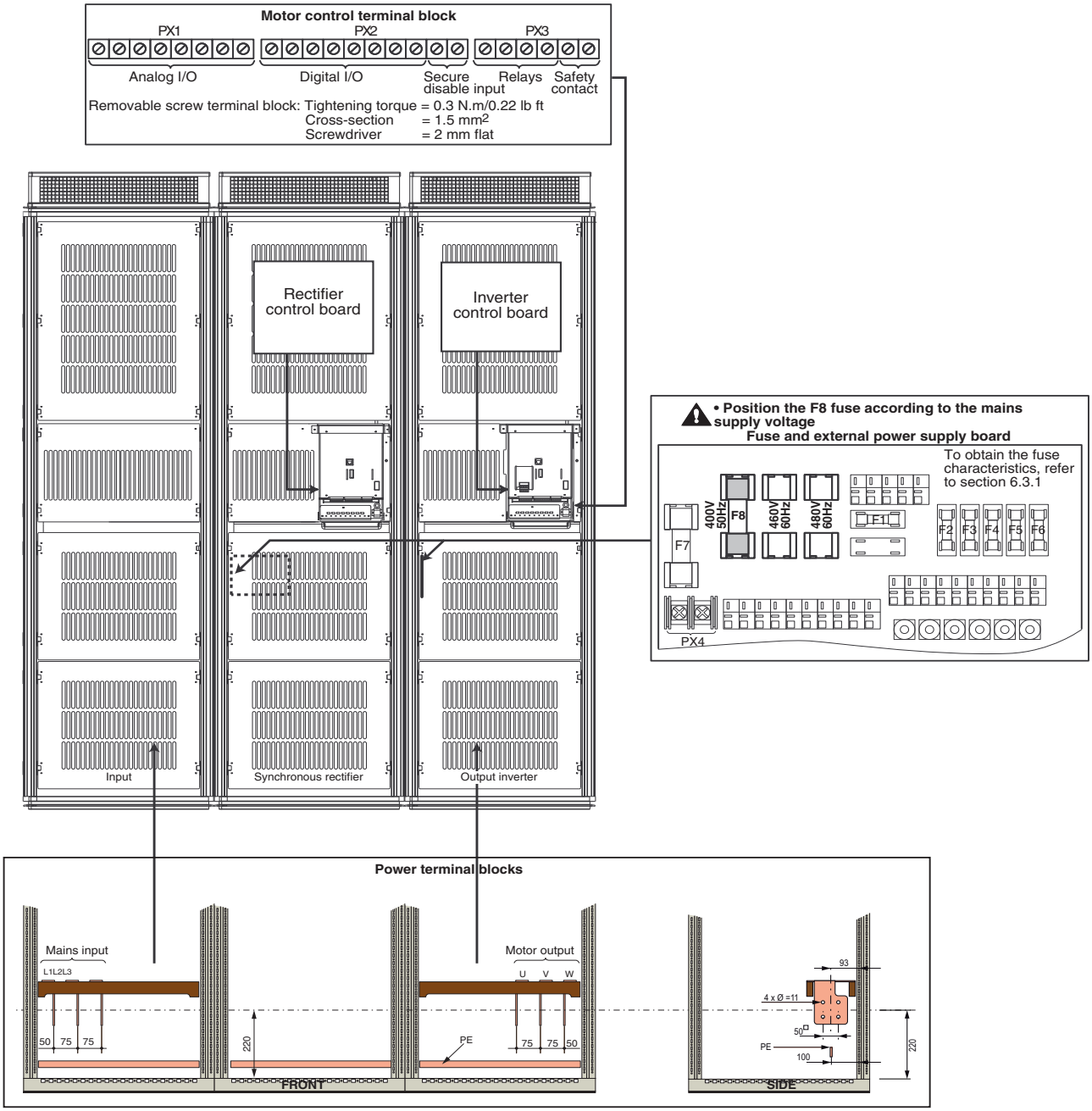
3.1.2 - 180T to 270T

CAUTION:
Customer connections and installation of options are done on the inverter control board.



3.1.3 - 340T to 470T

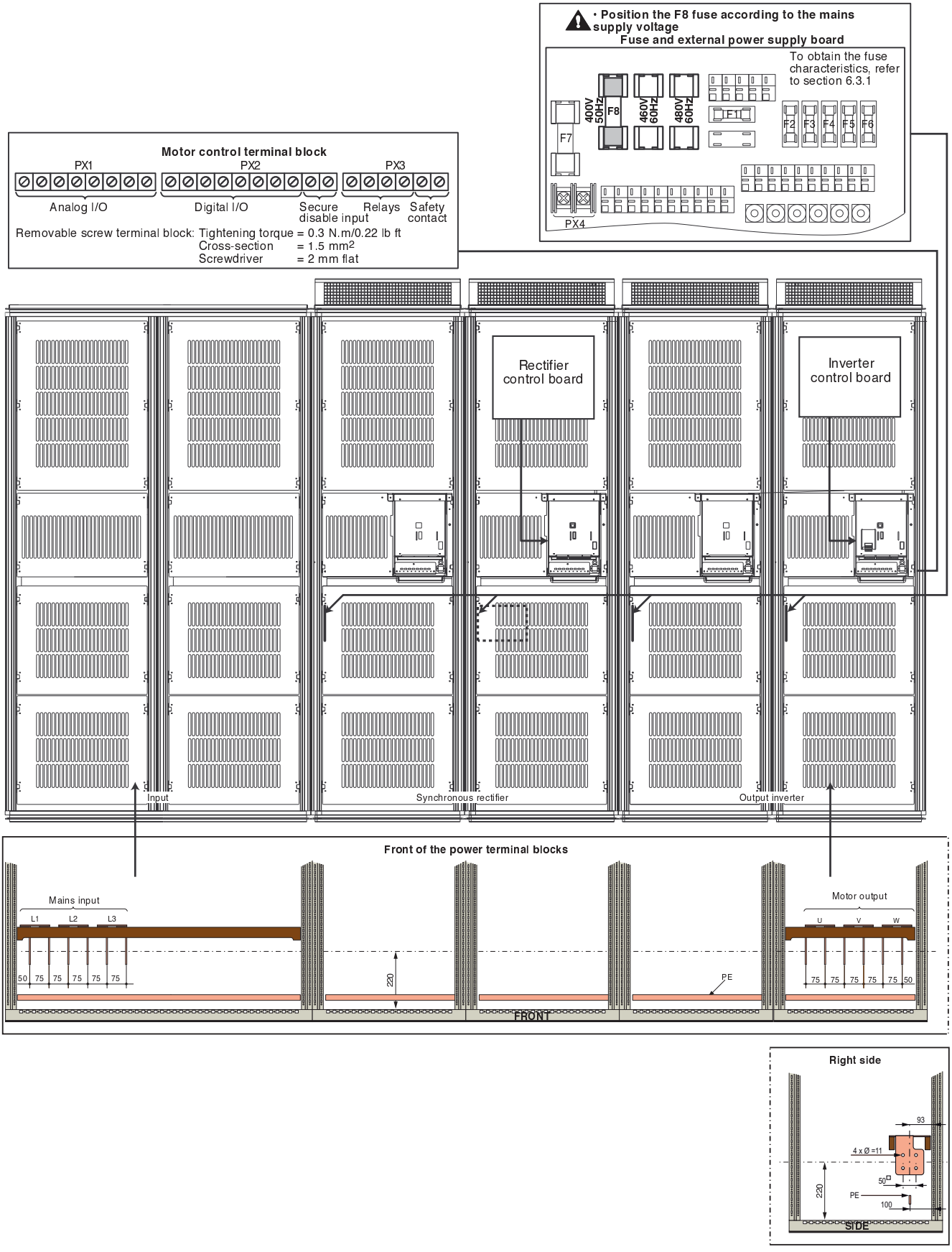
CAUTION:
Customer connections and installation of options are done on the inverter control board.



POWERDRIVE
Regenerative variable speed drive
CONNECTIONS

3.1.4 - 600T to 750T

CAUTION:
Customer connections and installation of options are done on the inverter control board.



3.2 - Connection of the power

3.2.1 - Secure disable input

This input, when open, causes the drive to lock. It is independent of the microprocessor and acts on several levels of control from the output bridge. It is designed in such a way that even if one or more circuit components were to fail, the absence of torque on the motor shaft is guaranteed with a very high level of integrity.
This input is used to create a standard EN 954-1 category 1 or 3 safety function, depending on the application scheme.
The design of the "freewheel stop" function using input SDI2 is approved by CETIM (report no. 781422/5D2/472). This built-in functionality enables the drive to act as substitute for a contactor in order to stop the motor in freewheel mode.
By using this secure disable input redundantly with another drive logic input, a scheme can be used which is capable of withstanding a single fault. The drive will stop the motor in freewheel mode using two different control channels.
For correct use, the power (and control) connection schemes described in the following paragraphs must be adhered to.
To enable the drive and provide the secure disable function, secure disable input SDI2 must be connected to the +24V source SDI1.
This +24V source must be reserved exclusively for the secure disable input function.

• The secure disable input is a safety component which must be incorporated in the complete system dedicated to machine safety. As for any installation, the integrator must carry out a risk analysis of the whole machine, which will determine the safety category with which the installation must comply.

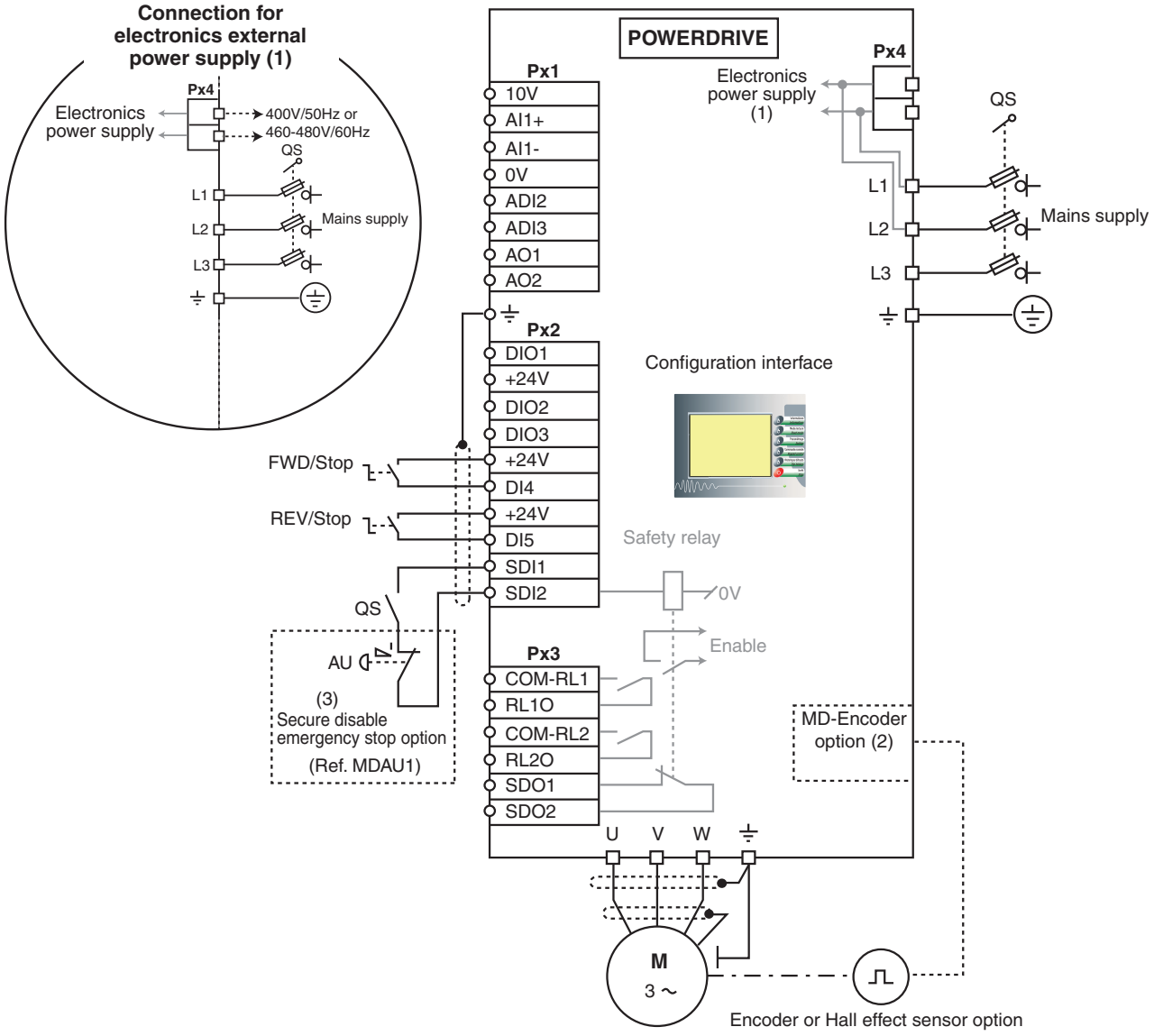
• The secure disable input, when open, locks the drive, meaning the dynamic braking function is no longer available. If a braking function is required before the drive secure disable lock is applied, a time-delayed safety relay must be installed to activate locking automatically after the end of braking.
If braking needs to be a machine safety function, it must be provided by an electromechanical solution since the dynamic braking by the drive function is not considered to be a safety function.

• The secure disable input does not provide the electrical isolation function. Before any work is carried out, the power supply must therefore be cut by an approved isolating device (isolator, switch, etc).

• When the drive is controlled via the fieldbus or keypad, the SDI secure disable input is configured automatically as an enabling input.
The safety function complying with standard EN 954-1 is thus no longer enabled in categories 2 and 3. However, compliance with standard EN 954-1 is still assured for category 1.

3.2.2 - AC 3-phase mains supply, in accordance with safety standard EN 954-1 - CATEGORY 1

Using secure disable input SDI2 to stop safely



The terminal blocks (PX1, PX2 and PX3) are those of the inverter control board. Customer connections must be made only on this board.

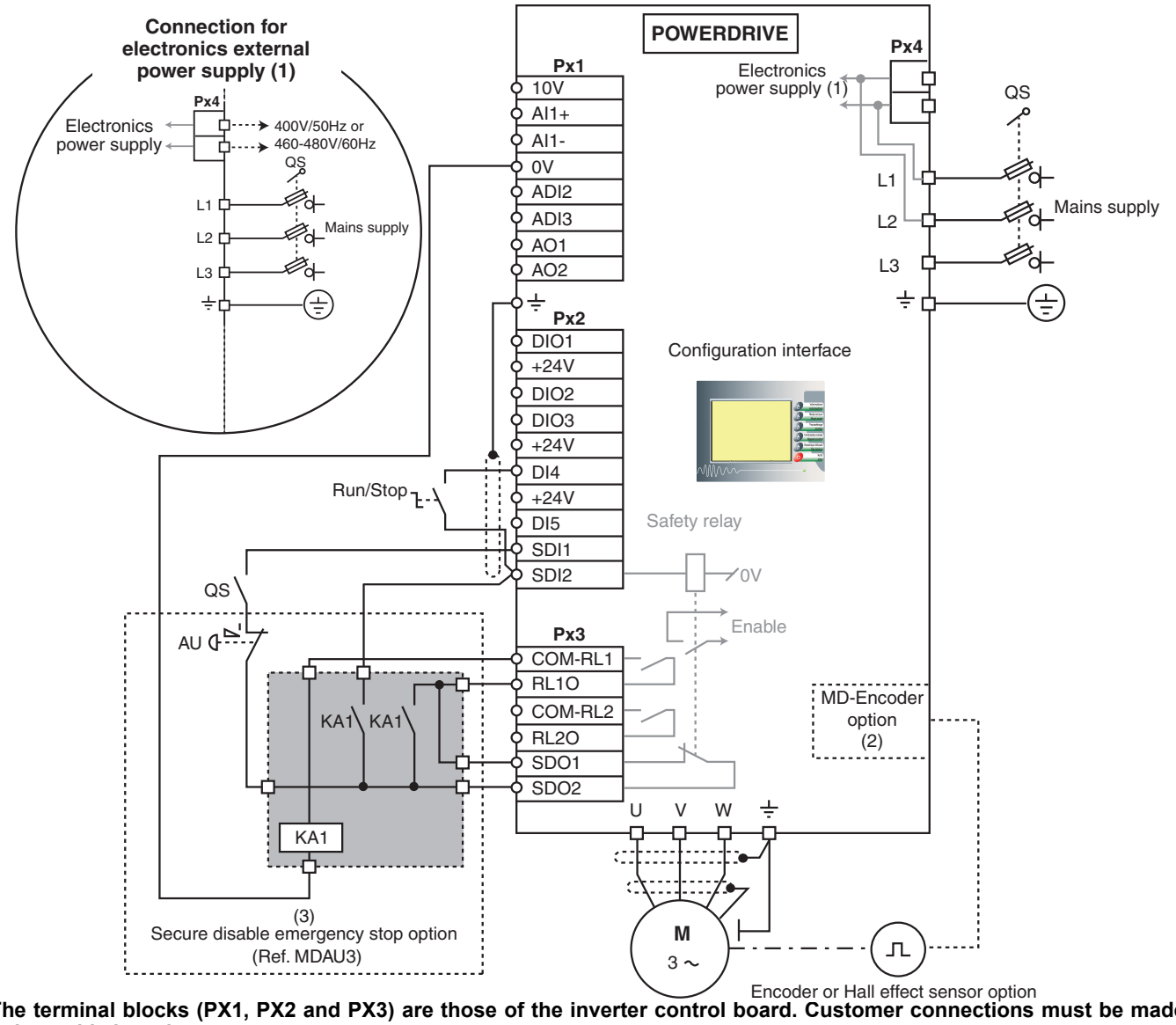
QS : Fused isolator: QS must be opened before carrying out any work on the electrical parts of the drive or motor.
AU : Emergency stop button.
(1) The electronics power supply is connected internally as standard. If an external power supply is being used, get in touch with your usual LEROY-SOMER contact.
(2) MD-Encoder option. Used to manage the encoder feedback or a Hall effect sensor (see section 5.2.6).
(3) The MDAU1 option consists of an "emergency stop" wired into the secure disable input circuit (refer to section 5.1).

Using the secure disable input means the motor can be stopped in freewheel mode without using a line contactor. The drive's internal principles are sufficiently safe to perform a stop using the secure disable input directly (EN 954-1 category 1).

CAUTION:
Whatever the configuration of the SDI input (00.24 = 08.10 = ENABLE or SECURE DISABLE) and the origin of the commands, conformity with standard EN 954-1 Category 1 is still assured.

3.2.3 - AC 3-phase mains supply, in accordance with safety standard EN 954-1 - CATEGORY 2 or 3

Using secure disable input SDI2 redundantly with digital input DI4



The terminal blocks (PX1, PX2 and PX3) are those of the inverter control board. Customer connections must be made only on this board.

QS : Fused isolator: QS must be opened before carrying out any work on the electrical parts of the drive or motor.
AU : Emergency stop button.
KA1 : Remote control safety relay.
(1) The electronics power supply is connected internally as standard. If an external power supply is being used, get in touch with your usual LEROY-SOMER contact.
(2) MD-Encoder option. Used to manage the encoder feedback or a Hall effect sensor (see section 5.2.6).
(3) The MDAU3 option is a category 2 or 3 remote control that consists of a safety relay and an "emergency stop" supplied wired and built-in (see section 5.1).

Using the secure disable input means the motor can be stopped in freewheel mode without using a line contactor. The drive's internal principles are sufficiently safe to perform a stop using the secure disable input directly (EN 954-1 category 2 or 3).

Duplication of the stop command on a digital input enables use of the internal drive redundancy to perform a freewheel stop (application of category 3 principles in accordance with EN 954 for the part relating to the drive).

CAUTION:
The special way in which the secure disable input is managed is not compatible with the Run/Stop commands being controlled by the POWERDRIVE configuration interface or a fieldbus. When control via a keypad or fieldbus is required, the SDI2 input should be viewed as a simple enabling input. In this case, the power scheme must comply with the usual safety regulations.

3.2.4 - Cables and fuses

• It is the responsibility of the user to connect and provide protection for the POWERDRIVE in accordance with the current legislation and regulations in the country of use. This is particularly important as regards the size of the cables, the type and rating of fuses, the earth or ground connection, powering down, acknowledging trips, isolation and protection against overcurrents.

• This table is given for information only, and must under no circumstances be used in place of the current standards.

• **I_{co}:** Continuous output current

POWERDRIVE		Mains supply									Motor (1)	
		400 V - 50 Hz				460/480 V - 60 Hz						
Ratings		Current (A)	Fuses		Cable cross-section (mm^2)	Current (A)	Fuses			Cable cross-section (mm^2)	Ico (A)	Cable cross-section (mm^2) (2)
			Gg type	aR type			Gg type	aR type	Class J (UL)			
60T	High	85	100	200	3x35+16	70	100	150	125	3x35 + 16	90	3x35+16
	Low	100	125	200	3x50+25	90	125	200	150	3x35+16	110	3x50+25
75T	High	100	125	200	3x50+25	90	125	200	150	3x35+10	110	3x50+25
	Low	135	160	250	3x70+35	120	160	250	200	3x70+35	145	3x70+35
100T	High	135	160	250	3x70+35	120	160	250	200	3x70+30	145	3x70+35
	Low	165	200	350	3x95+50	140	200	350	225	3x70+35	175	3x95+50
120T	High	165	200	350	3x95+50	140	200	350	225	3x70+35	175	3x95+50
	Low	195	250	400	3x120+70	170	200	350	250	3x95+50	215	3x120+70
150T	High	195	250	400	3x120+70	170	200	350	250	3x95+50	220	3x120+70
	Low	235	250	500	3x150+70	200	250	450	300	3x120+70	260	3x150+70
180T	High	235	250	500	3x150+70	200	250	450	300	3x120+70	260	3x150+70
	Low	285	315	630	3x240+120	245	315	500	400	3x185+90	305	3x240+120
220T	High	285	315	630	3x240+120	245	315	500	400	3x185+90	305	3x240+120
	Low	355	400	800	2x(3x95+50)	305	400	630	500	3x240+120	380	2x(3x95+50)
270T	High	355	400	800	2x(3x95+50)	305	400	630	500	3x240+120	380	2x(3x95+50)
	Low	440	500	1000	2x(3x150+95)	375	400	800	600	2x(3x120+70)	470	2x(3x150+95)
340T	High	440	500	1000	2x(3x150+95)	375	400	800	600	2x(3x120+70)	470	2x(3x150+95)
	Low	550	630	1250	2x(3x185+95)	475	500	1000	--	2x(3x150+95)	580	2x(3x185+95)
400T	High	550	630	1250	2x(3x185+95)	475	500	1000	--	2x(3x150+95)	570	2x(3x185+95)
	Low	620	800	1250	2x(3x240+120)	535	630	1000	--	2x(3x185+95)	630	2x(3x240+120)
470T	High	620	800	1250	2x(3x240+120)	535	630	1000		2x(3x185+95)	680	2x(3x240+120)
	Low	785	1000	1400	3x(3x185+95)	675	800	1250		2x(3x240+120)	800	3x(3x185+95)
600T	High	785	1000	1400	3x(3x185+95)	675	800	1250	--	2x(3x240+120)	820	3x(3x185+95)
	Low	960	1250	1600	4x(3x150+95)	825	1000	1400	--	3x(3x185+95)	990	4x(3x150+95)
750T	High	960	1250	1600	4x(3x150+95)	825	1000	1400	--	4x(3x150+95)	990	4x(3x150+95)
	Low	1180	1600	1800	3x(3x240+120)	1010	1250	1600	--	4x(3x150+95)	1220	3x(3x240+120)

(1) The value of the rated current and the motor cable cross-sections are given for information only. The motor rated current permitted by the drive varies according to the switching frequency and the temperature.
(2) The recommended cross-sections have been determined for single-conductor cable with a maximum length of 10 m. For longer cables, take line drops due to the length into account.

Note:
• The mains current value is a typical value which depends on the source impedance. The higher the impedance, the lower the current.
• The cable cross-sections are defined according to the following model:
E.g. for a 750T, a cable cross-section of 3 x (3 x 240 + 120) is given, i.e. 3 cables each with 3 phase conductors (cross-section 240) and 1 earth conductor (cross-section 120).

Notes

3.3 - Connection of the control

• The POWERDRIVE inputs have a positive logic configuration. Using a drive with a control system which has a different control logic may cause unwanted starting of the motor.

• The control circuits in the drive are isolated from the power circuits by single insulation (IEC 664-1). The installer must ensure that the external control circuits are isolated against any human contact.

• If the control circuits need to be connected to circuits conforming to SELV safety requirements, additional insulation must be inserted to maintain the SELV classification.

3.3.1 - Characteristics of control terminal blocks

3.3.1.1 - Characteristics of analog I/O terminal blocks (PX1)

1	10 V	+10 V internal analog source
Accuracy		± 2%
Maximum output current		20 mA

2	AI1+	Differential analog input 1 (+)
3	AI1-	Differential analog input 1 (-)
Factory setting		± 10 V analog input
Characteristics		Bipolar voltage (differential mode and common mode) or unipolar current (common mode only, connect terminal 3 to the 0 V)
Resolution		13 bits + sign
Sampling		2 ms
Voltage input		
Full scale voltage range		±10 V ± 2%
Maximum voltage		27 V
Input impedance		95 kΩ
Current input		
Current ranges		0 to 20 mA ± 5%
Maximum voltage		27V / 0V
Maximum current		50 mA
Input impedance		100 Ω

4	0 V	Logic circuit common 0 V
The electronics 0 V is connected to the metallic ground of the drive.		

5	ADI2	Analog or digital input 2
Factory setting		4-20 mA analog input
Characteristics		Bipolar voltage (common mode) or unipolar current
Resolution		9 bits + sign
Sampling		2 ms
Voltage input		
Full scale voltage range		±10 V ± 2%
Maximum voltage		27 V
Input impedance		95 kΩ
Current input		
Current ranges		0 to 20 mA ± 5%
Maximum voltage		27V / 0V
Maximum current		50 mA
Input impedance		100 Ω
Digital input (if connected to the +24V)		
Thresholds		0 : < 5 V 1 : > 10 V
Voltage range		0 to +24 V
Maximum voltage		27V / 0V
Load		50 kΩ
Input threshold		7.5 V

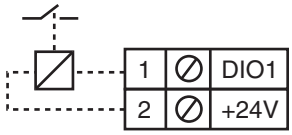
6	ADI3	Analog or digital input or motor sensor (PTC)
Factory setting		0-10 V analog input
Characteristics		Analog voltage (common mode)
Resolution		10 bits
Sampling		2 ms
Voltage input		
Full scale voltage range		10 V ± 2%
Maximum voltage		27 V
Input impedance		50 kΩ
Digital input (if connected to the +24V)		
Thresholds		0 : < 5 V 1 : > 10 V
Voltage range		0 to +24 V
Maximum voltage		27V / 0V
Load		95 kΩ
Input threshold		7.5 V
Motor sensor input		
Internal voltage		5 V
Trip threshold		≥ 3.3 kΩ
Trip reset threshold		< 1.8 kΩ

7	AO1	Analog output 1
8	AO2	Analog output 2
Factory setting		Analog output 1: 4-20 mA Analog output 2: ±10 V
Characteristics		Bipolar analog voltage (common mode) or unipolar current
Resolution		AO1: 15 bits + sign AO2: 11 bits + sign
Sampling		2 ms
Voltage output		
Voltage range		±10 V
Load resistance		2 kΩ minimum
Protection		Short-circuit (40 mA max)
Current output		
Current ranges		0 to 20 mA
Maximum voltage		+10 V
Load resistance		500 Ω maximum

3.3.1.2 - Characteristics of digital I/O terminal blocks (PX2)

1	**DIO1**	Digital input or output 1
3	**DIO2**	Digital input or output 2
4	**DIO3**	Digital input or output 3
Factory setting		Digital output DIO1 Digital input DIO2 Digital input DIO3
Characteristics		Digital inputs (positive or negative logic) Digital outputs (positive logic)
Thresholds		Inactive (0) < 4 V = output connected to 0V Active (1) > 13.5 V = output not connected
Voltage range		0 to +24 V
Sampling/refreshing		2 ms
Digital input		
Absolute maximum voltage range		0 V to +35 V
Load		15 kΩ
Digital output (open collector type)		
Overload current		50 mA

Note: If DIO1 is used for relay control, the state of the relay is the opposite of that of the output (in its factory setting, the output is active, therefore the relay is inactive).



2 **5** **7**	**+24V**	+24V internal source
Output current		100 mA total
Accuracy		0 to -15%
Protection		Current limiting and setting to trip mode

6	**DI4**	Digital input 4
8	**DI5**	Digital input 5
Characteristics		Digital input (positive or negative logic)
Thresholds		0 : < 4 V 1 : > 13.5 V
Voltage range		0 to +24 V
Sampling/refreshing		2 ms
Absolute maximum voltage range		0 V to +35 V
Load		15 kΩ
Input threshold		7.5 V

9	**SDI1**	+24 V dedicated to the secure disable
10	**SDI2**	Secure disable/drive enable input
Factory setting		Secure disable input
Characteristics		Digital input (positive logic)
Thresholds		0 : < 5 V 1 : > 18 V
Voltage range		9 V to 33 V
Impedance		820 Ω

3.3.1.3 - Characteristics of relay output terminal blocks (PX3)

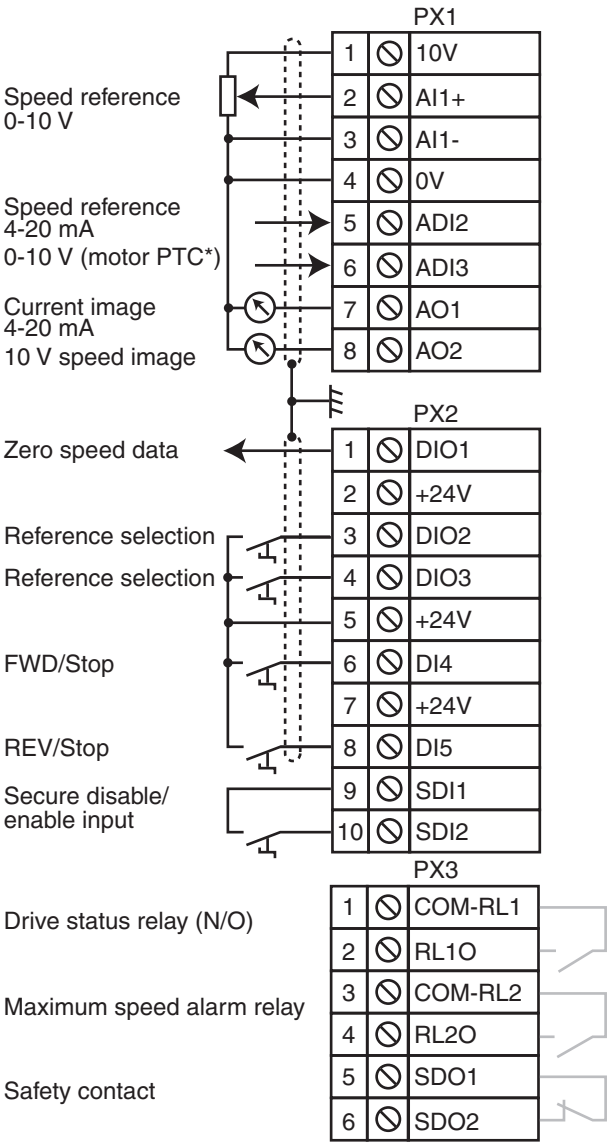
1 **2**	**COM-RL1** **RL1O**	N/O relay output
Characteristics		250 VAC output relay
Maximum contact current		• 2 A, resistive load • 1 A, inductive load

3 **4**	**COM-RL2** **RL2O**	N/O relay output
Characteristics		250 VAC output relay
Maximum contact current		• 2 A, resistive load • 1 A, inductive load

5 **6**	**SDO1** **SDO2**	Safety contact
Characteristics		250 VAC
Maximum contact current		• 2 A, resistive load • 1 A, inductive load

3.3.2 - Factory configuration of control terminal blocks (see commissioning manual 3871)

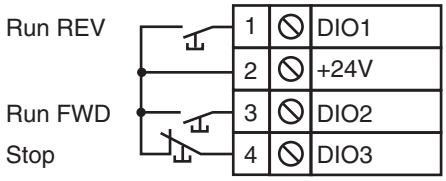
Note: For details of the various parameters, refer to the commissioning manual, ref. 3871.



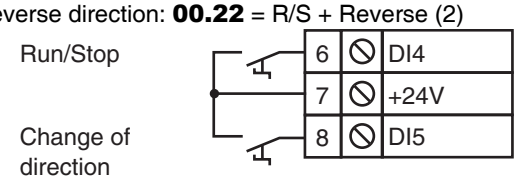
Note: Input SDI2 must be closed before executing the run command.

This configuration is obtained by returning to the "factory settings" (**00.45** = 50 Hz HIGH (1) or 50 Hz LOW (3)). This modification can only be made when the drive is disabled (SDI2 open).

- For "3-wire" control (jog Run/Stop):
00.22 = Jog R/S (1)
This mode is not operational from the user menu. (If necessary, refer to parameter 06.04 in menu 6, commissioning manual ref. 3871).

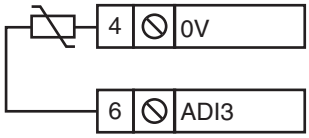


- In reverse direction: **00.22** = R/S + Reverse (2)



• List of parameters to be set:
00.28 = (*)
00.35 = **06.34**
00.36 = **06.33**
00.47 = preset reference 2 value in rpm

(*) If the motor thermal probe is to be connected on ADI3, set **00.28** = PTC, otherwise keep the factory value of **00.28** (0-10 V).



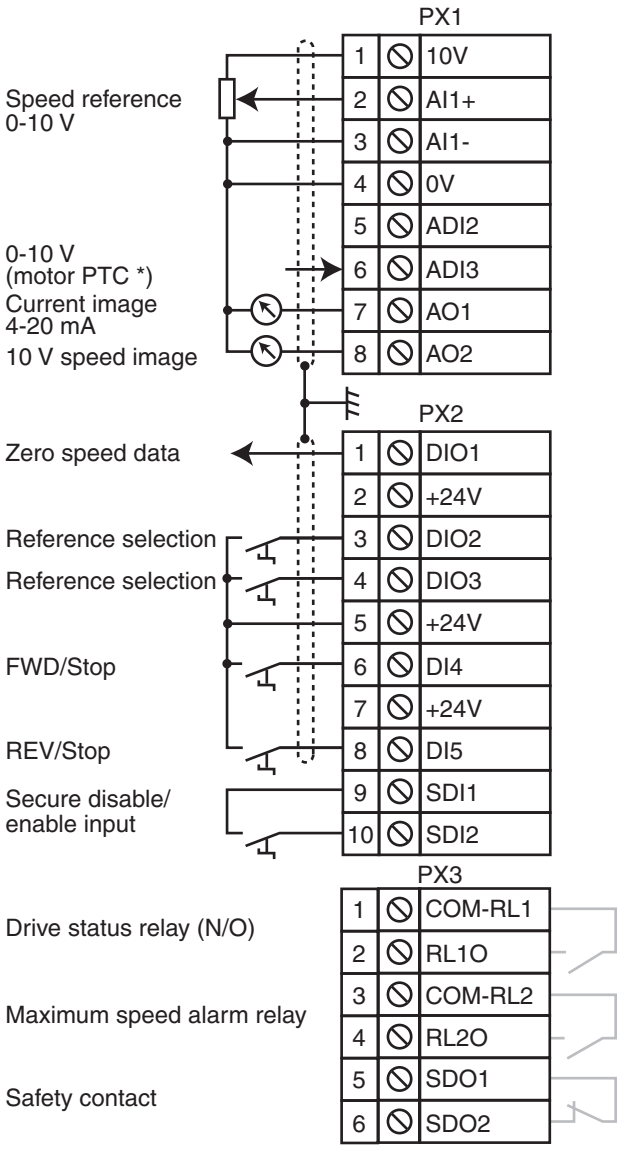
• Selection of the reference via digital inputs:

DIO2	DIO3	Selection
0	0	Voltage speed reference (0-10 V)
0	1	Current speed reference (4-20 mA)
1	0	Preset reference 2
1	1	

3.3.3 - Quick configuration of the control terminal block depending on the reference

Note: For details of the various parameters, refer to the commissioning manual, ref. 3871.

3.3.3.1 - Connection and parameter setting for selecting a reference (0-10 V) or 3 preset references



Note: Input SDI2 must be closed before executing the run command.

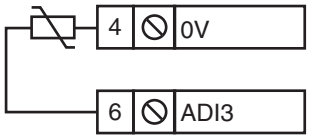
- Setting of parameters must be done with the drive disabled (SDI2 open).
- Parameter **00.22** is used to modify the run command type ("3-wire" or reverse command: see section 3.3.2).

• List of parameters to adjust based on the factory configuration

- Set:

00.05 = Analog input 1 (1)
00.28 = (*),
00.34 = **01.46** (DIO3 is configured as a digital input which can be used to select the reference)
00.47 = preset reference 2 value in rpm
00.48 = preset reference 3 value in rpm
00.49 = preset reference 4 value in rpm

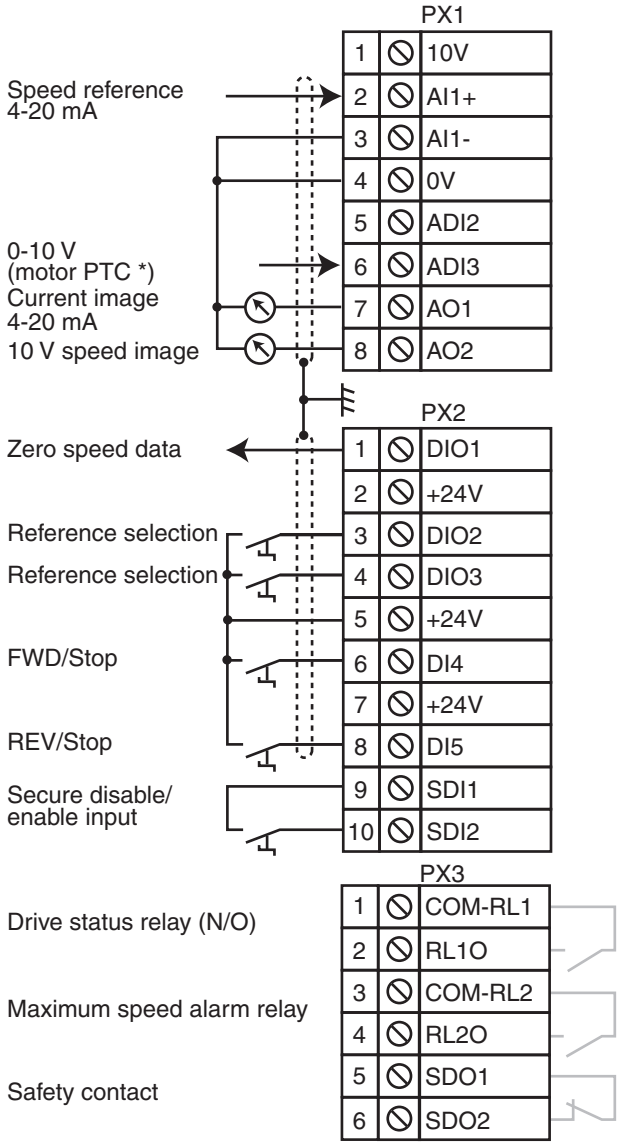
(*) If the motor thermal probe is to be connected on ADI3, set **00.28** = PTC, otherwise keep the factory value of **00.28** (0-10 V).



• Selection of the reference via digital inputs:

DIO2	DIO3	Selection
0	0	0-10 V analog reference
1	0	Preset reference 2
0	1	Preset reference 3
1	1	Preset reference 4

3.3.3.2 - Connection and parameter setting for selecting a reference (4-20 mA) or 3 preset references



Note: Input SDI2 must be closed before executing the run command.

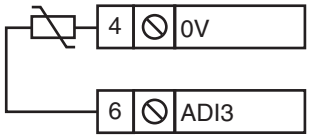
- Setting of parameters must be done with the drive disabled (SDI2 open).
- Parameter **00.22** is used to modify the run command type ("3-wire" or reverse command: see section 3.3.2).

• List of parameters to adjust based on the factory configuration

- Set:

00.05 = Analog input 2 (2)
00.25 = 4-20 mA no trip (4) (AI1 is configured as an analog current input, 4-20 mA range without detection of signal loss)
00.28 = (*)
00.34 = **01.46** (DIO3 is configured as a digital input which can be used to select the reference)
00.47 = preset reference 2 value in rpm
00.48 = preset reference 3 value in rpm
00.49 = preset reference 4 value in rpm

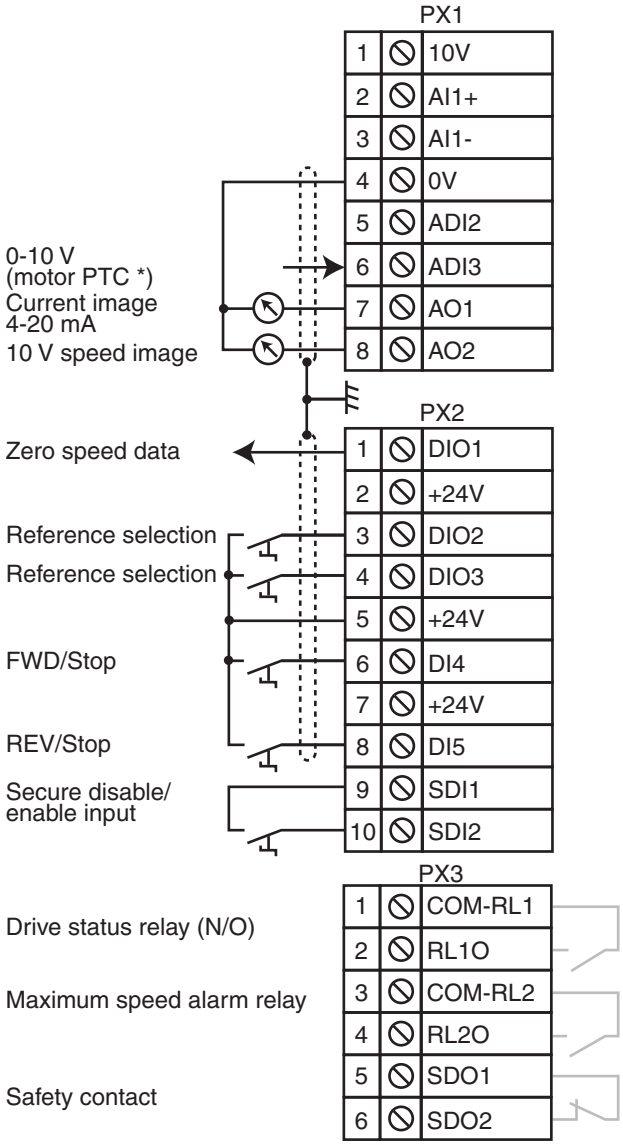
(*) If the motor thermal probe is to be connected on ADI3, set **00.28** = PTC, otherwise keep the factory value of **00.28** (0-10 V).



• Selection of the reference via digital inputs:

DIO2	DIO3	Selection
0	0	4-20 mA analog reference
1	0	Preset reference 2
0	1	Preset reference 3
1	1	Preset reference 4

3.3.3.3 - Connection and parameter setting for selecting 4 preset references



Note: Input SDI2 must be closed before executing the run command.

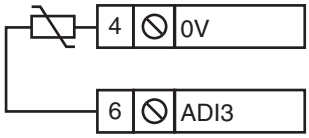
- Setting of parameters must be done with the drive disabled (SDI2 open).
- Parameter **00.22** is used to modify the run command type ("3-wire" or reverse command: see section 3.3.2).

• List of parameters to adjust based on the factory configuration

- Set:

00.05 = Preset (4).
00.28 = (*)
00.34 = **01.46** (DIO3 is configured as a digital input which can be used to select the reference)
00.46 = preset reference 1 value in rpm
00.47 = preset reference 2 value in rpm
00.48 = preset reference 3 value in rpm
00.49 = preset reference 4 value in rpm

(*) If the motor thermal probe is to be connected on ADI3, set **00.28** = PTC, otherwise keep the factory value of **00.28** (0-10 V).



• Selection of the reference via digital inputs:

DIO2	DIO3	Selection
0	0	Preset reference 1
1	0	Preset reference 2
0	1	Preset reference 3
1	1	Preset reference 4

4 - GENERAL EMC - HARMONICS - MAINS INTERFERENCE

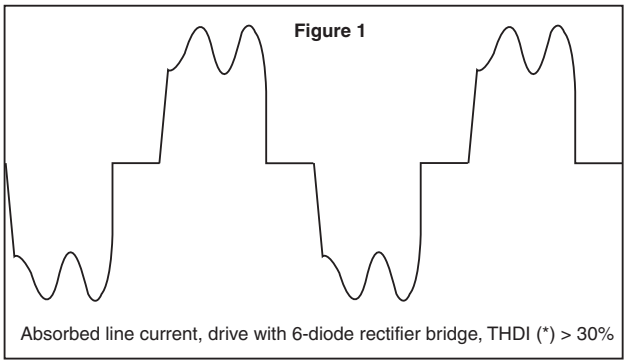
The electrical structures of the power converter stages of frequency inverters generally lead to the occurrence of "EMC" phenomena of two orders:
- Low frequency harmonics fed back to the mains power supply
- Emissions of radio-frequency signals
These phenomena are independent and their effects on the electrical environment are different.

4.1 - Low frequency harmonics

The input converter of a conventional drive most frequently consists of a rectifier with six diodes mounted as a Graetz bridge. This electrical converter configuration by construction absorbs a non-sinusoidal AC line current (Fig. 1) that has harmonics of order 6n ± 1. Their amplitudes are related to the impedances of the network upstream of the rectifier bridge, and to the structure of the DC bus.

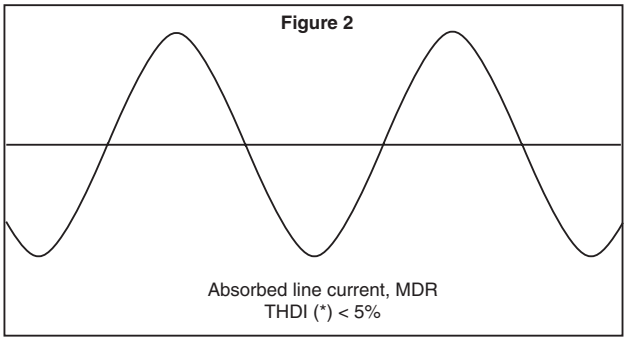
The controlled structure of the **REGEN POWERDRIVE** drive allows almost sinusoidal current absorption (Fig. 2). The low level of harmonic distortion helps the dimensioning and reduces the interference at the point of use.

Figure 1



Absorbed line current, drive with 6-diode rectifier bridge, THDI (*) > 30%

Figure 2



Absorbed line current, MDR
THDI (*) < 5%

(*) : Indicative values, with no pre-existing distortion on the mains supply and for the rated current of the drive.

4.2 - Radio-frequency interference: Emission

4.2.1 - General

Frequency inverters use high-speed switches (transistors, semi-conductors) which switch high voltages (around 550 V) and currents at high frequencies (several kHz). This provides better efficiency and a low level of motor noise.
As a result, they generate radio-frequency signals which may disturb operation of other equipment or distort measurements taken by sensors:
- Due to high-frequency leakage currents which escape to earth via the stray capacity of the drive/motor cable and that of the motor via the metal structures which support the motor
- By conduction or feedback of R.F. signals on the power supply cable: **conducted emissions**
- By direct radiation near to the mains supply power cable or the drive/motor cable: **radiated emissions**
These phenomena are of direct interest to the user.
The frequency range concerned (radio frequency) does not affect the energy supply company.

4.2.2 - Standards

The maximum emission level is set by the standards for variable speed drives (EN 61800-3).

4.2.3 - Recommendations

• Experience shows that the levels set by the standards do not necessarily need to be observed to eliminate interference phenomena.
• Following the basic precautions described in section 4.5 generally results in the correct operation of the installation.

4.3 - Interference: Immunity

4.3.1 - General

The immunity level of a device is defined by its ability to operate in an environment which is contaminated by external elements or by its electrical connections.

4.3.2 - Standards

Each device must undergo a series of standard tests (European standards) and meet a minimum requirement in order to be declared as compliant with the variable speed drive standards (EN 61800-3).

4.3.3 - Recommendations

An installation consisting exclusively of devices which comply with the standards concerning immunity is very unlikely to be subject to a risk of interference.
The earth equipotential of some industrial sites is not always observed. This lack of equipotential leads to leakage currents which flow via the earth cables (green/yellow), the machine chassis, the pipework, etc. but also via the electrical equipment. In extreme cases, these currents may cause drive malfunctions (spurious faults). It is essential that the recommendations in section 4.4 are observed in order to minimise the impact of these currents.

4.4 - Influence of the mains power supply

The mains power supply may be subject to interference (voltage drops, voltage imbalances, fluctuation, overvoltages, etc.) which can have a real negative impact on the performance and reliability of all electronic power equipment, including drives.
LEROY-SOMER drives are designed to operate with a mains power supply typical of industrial sites throughout the world. However, for each installation, it is important to know the characteristics of the mains power supply in order to implement corrective measures in the event of abnormal conditions.

4.4.1 - Transient overvoltages

There are numerous reasons for overvoltages on an electrical installation:
- Connection/disconnection of a bank of capacitors which increases the cos φ.
- Short-circuit in a high-power device when an isolator is opened and/or fuses are damaged.
- Devices (ovens, DC or AC drives, etc.) with high-power thyristors (>1 MW).
- High-power motors during start-up.
- Overhead power supply.
- Etc.

The **POWERDRIVE** incorporates high-power overvoltage limiters, which protect the drive and enable reliable operation on industrial sites.

4.4.2 - Unbalanced power supply

Similar to what is observed on an electric motor, the line current imbalance of a drive operating on an unbalanced mains supply may be several times the value of the voltage imbalance measured on the power supply.
A highly unbalanced mains supply (> 2%) associated with a low mains impedance may result in a high level of stress on the components at the input stage of a drive.

4.4.3 - Impedance of the mains supply

The **POWERDRIVE** is designed to operate on industrial mains supplies having a short-circuit power between 20 and 100 times the rated power of the drive.

4.5 - Basic installation precautions

These are to be taken into account when wiring the cabinet and the external components. In each paragraph, they are listed in decreasing order of effect on correct operation of the installation.

4.5.1 - Wiring inside the cabinet

- Do not run the control cables and the power cables in the same cable ducts.
- For control cables, use shielded twisted cables.

4.5.2 - Wiring outside the cabinet

- Connect the motor earth terminal directly to that of the drive.
It is recommended that a shielded symmetrical cable is used: three phase conductors and coaxial or symmetrical PE conductor and shielding.
A separate PE protective conductor is mandatory if the conductivity of the cable shielding is less than 50% of the conductivity of the phase conductor.
- The shielding must be connected at both ends: drive end and motor end (completely connected).
- In the second industrial environment, the shielded motor power supply cable can be replaced by a 3-core + earth cable placed in a fully enclosed metal conduit (metal cable duct for example). This metal conduit must be mechanically connected to the electrical cabinet and the structure supporting the motor. If the conduit consists of several pieces, these must be interconnected by braids to ensure earth continuity. The cables must be fixed securely at the bottom of the conduit.
- There is no need to shield the power supply cables between the mains supply and the drive.
- Isolate the power cables from the control cables. The power cables must intersect the other cables at an angle of 90°.
- Isolate sensitive components (probe, sensors, etc.) from metal structures which may be shared by the motor support.

4.5.3 - Importance of ground wiring

The immunity and radio-frequency emission level are directly linked to the quality of the ground connections. Metal grounds must be mechanically connected to each other with the largest possible electrical contact area. Under no circumstances can the earth connections, which are designed to protect people by linking metal grounds to earth via a cable, serve as a substitute for the ground connections.

4.6 - Electromagnetic compatibility (EMC)

CAUTION:
Conformity of the drive is only assured when the mechanical and electrical installation instructions described in this manual are adhered to.

Immunity			
Standard	**Description**	**Application**	**Conformity**
IEC 61000-4-2 EN 61000-4-2	Electrostatic discharges	Product casing	Level 3 (industrial)
IEC 61000-4-3 EN 61000-4-3	Immunity standards for radiated radio-frequency	Product casing	Level 3 (industrial)
IEC 61000-4-4 EN 61000-4-4	Bursts of fast transients	Control cable	Level 4 (industrially hardened)
		Power cable	Level 3 (industrial)
IEC 61000-4-5 EN 61000-4-5	Shock waves	Power cables	Level 4
IEC 61000-4-6 EN 61000-4-6	Generic immunity standards for conducted radio-frequency	Control and power cables	Level 3 (industrial)
EN 50082-2 IEC 61000-6-2 EN 61000-6-2	Generic immunity standards for the industrial environment	-	Conforming
EN 61800-3 IEC 61800-3 EN 61000-3	Variable speed drive standards	Conforming to the first and second environment	
Emission			
Standard	**Description**	**Application**	**Conformity conditions according to the switching frequency** **- Switching frequency < 4 kHz** **- Cable length < 100 m**
EN 61800-3	Variable speed drive standards	Second environment	Conforming
		First environment with restricted distribution	Conforming
EN 50081-2 EN 61000-6-4	Generic emission standards	Industrial environment	Conforming

• In accordance with IEC 61800-3, in the first environment, the POWERDRIVE is a device from the restricted distribution class. In a residential environment, this device may cause radio-electrical interference. In this case, the user may be asked to take appropriate action.

Notes

5 - OPTIONS

5.1 - Electrical protection

• For electrical protection, the different options that can be included are:
- Emergency stop, category 1 to 3
- Thermal relay

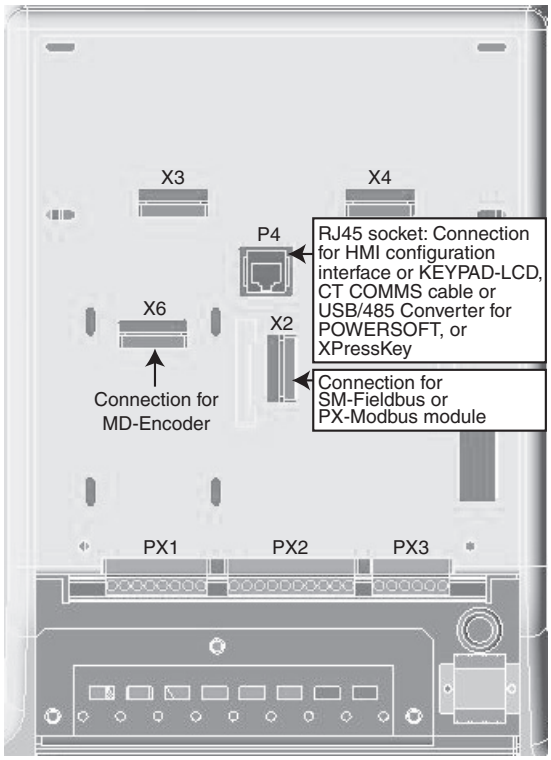
For selecting and dimensioning electrical protection, get in touch with your usual LEROY-SOMER contact.

• Emergency stop, category 1 to 3: MD-AU 1/3

MD-AU 1 category 1 protection consists of an emergency stop wired into the secure disable input circuit and mounted on the front panel (IP21 or IP54 version).
MD-AU3 protection is a category 2 or 3 remote control with secure disable input. This option consists of 1 safety relay and an emergency stop supplied wired and mounted on the front panel (IP21 or IP54 version).

5.2 - Add-on options

5.2.1 - Location of options



Customer connections and installation of options are done on the inverter control board shown in section 3.1.

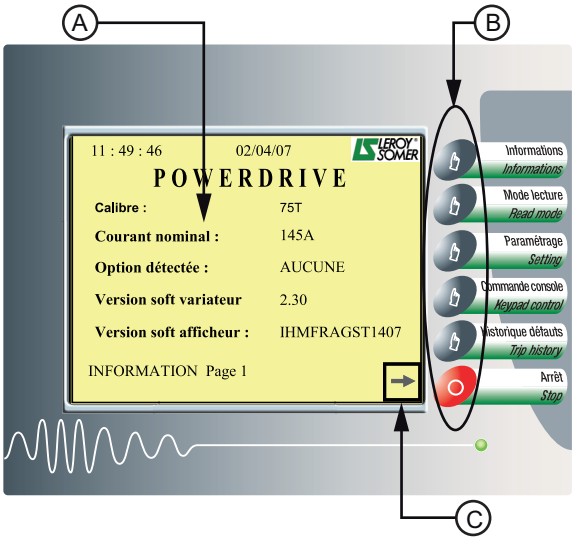
5.2.2 - POWERSOFT

This software can be downloaded from the following website: http://www.leroy-somer.com, "Downloads" tab
Using POWERSOFT it is very easy to set parameters and supervise the **POWERDRIVE** from a PC. Numerous functions are available:
- Fast commissioning
- LEROY-SOMER motor database
- File saving
- Online help
- Comparison of 2 files or one file with the factory settings
- Printing of a complete file or differences compared to the factory setting
- Supervision
- Diagnostics
- Representation of parameters in table or graphic form

To connect the PC to the POWERDRIVE, use the CT Comms Cable (PC RS232 port) or USB/485 Converter (PC USB port).

5.2.3 - HMI configuration interface

This HMI (Human Machine Interface) configuration interface is the standard configuration option for the **POWERDRIVE**. It consists of a touch screen and 6 selection buttons:
- Information: Used to give the user information quickly on the drive characteristics (rating, version, options, current, etc.) and for selecting the language.
- Read mode: Used to display the status of the drive and its main measurement points when stopped or running.
- Setting: Used for reading and modifying all parameters and configuring the drive's control mode.
- Keypad control: Gives direct access to the "Keypad control" page and allows control of the drive via the HMI.
- Trip history: Gives a quick overview of the 10 most recent drive trips.
- Stop: Button for stop command, active in factory settings.



Ref.	Function
A	Touch screen
B	6 selection buttons for easy access to the different functions. They can also be used to exit the configuration interface menus and sub-menus at any time.
C	Touch-sensitive button for moving to the following pages

For further information, see the commissioning manual ref. 3871.

5.2.4 - KEYPAD-LCD

5.2.4.1 - General

With this console, setting up the **POWERDRIVE** is user-friendly and all parameters are accessible. Its LCD display, consisting of one line of 12 characters and 2 lines of 16 characters, offers text which can be displayed in 5 languages (English, French, German, Italian and Spanish).
The KEYPAD-LCD has 2 main functions:
- A read mode for **POWERDRIVE** supervision and diagnostics
- Access to all the **POWERDRIVE** parameters in order to optimise settings or even configure particular applications

5.2.4.2 - Read mode

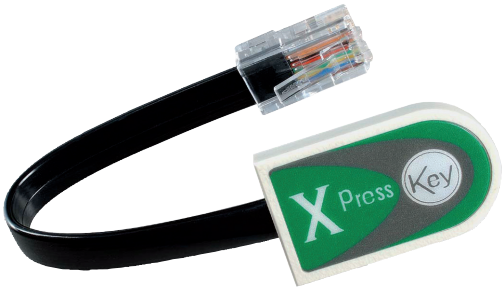
- As soon as it is switched on, the KEYPAD-LCD is set to read mode. By pressing the keys, the user can scroll through the all parameters required for supervision and diagnostics:
- Motor current
- Motor frequency
- Motor voltage
- Analog I/O levels
- Digital I/O states
- Logic function states
- Timer
- Most recent trips

5.2.5 - XPressKey

5.2.5.1 - General

The XPressKey option can be used to save a copy of all **POWERDRIVE** parameters, contained on a control board, so that they can be duplicated very simply on another drive. **Disable the drive before saving or setting drive parameters.**

Note: The **REGEN POWERDRIVE** contains an inverter control board and a rectifier control board. Two XPressKeys will therefore be required to duplicate all the parameters.



5.2.5.2 - Saving parameters in XPressKey

- Using the configuration interface, check that the drive is disabled (terminal SDI2 open). Set **00.44** = Drive to Key.
- Then replace the configuration interface cable connector in the RJ45 socket with that of the XPressKey.
- Pressing the key button causes the parameters contained in the drive to be stored in the copy key. The green LED on the key remains lit throughout the transfer then goes out, indicating that the operation has been successfully completed.
- Once the configuration interface is reconnected, parameter **00.44** returns to "no".

Note: If the transfer cannot take place, the XPressKey LED flashes quickly.

CAUTION:
Press the key button within 10 seconds maximum after selecting "Drive to key" in 00.44, otherwise the action is cancelled.

5.2.5.3 - Setting the parameters of a drive with the same rating using XPressKey

The "Key to drive" function is activated using the pushbutton located on the copy key once the key has been connected to the RJ45 socket. A first press on the button corresponds to parameter **00.44** changing to "Key to drive". The XPressKey LED flashes slowly. A second press on the button confirms the transfer. The green LED on the key remains lit throughout the transfer then goes out when it is complete.

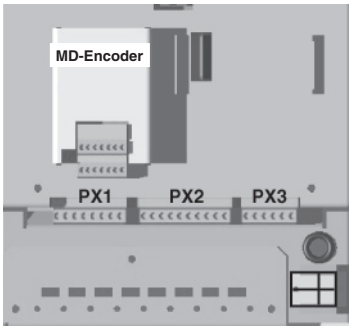
Note: If the transfer cannot be performed, the XPressKey LED flashes quickly.

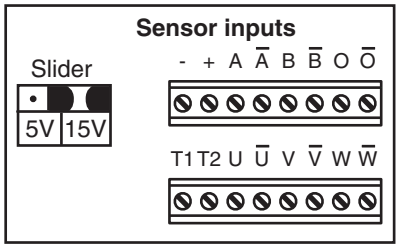
CAUTION:
Press the key button the second time within 10 seconds maximum, otherwise the action is cancelled.

5.2.6 - MD-Encoder

The MD-Encoder option is used to manage the motor speed feedback: MD-Encoder manages incremental encoders with or without commutation channels and Hall effect sensors. Connect the cable shielding fully to the drive chassis.

5.2.6.1 - Terminal block installation and location





Note: The MD-Encoder card can manage the motor PTC thermal probe via terminals T1 and T2.

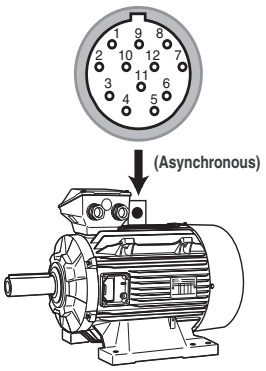
CAUTION:
For software versions ≤ 2.40, connect the motor PTC to the drive control terminal block between ADI3 and 0V.

5.2.6.2 - Connection of an incremental encoder

-	0V of the encoder power supply
+	Encoder power supply depending on the position of the selector switch (slider), 5V or 15V
A	Connection of encoder channels
A	
B	
B	
0	• 0 marker connection (1)
0	• 0\ marker connection (1)

(1) Process currently being developed (do not connect).

• LEROY-SOMER motor connector wiring



12-pin connector
encoder side (male plug)

Ref.	Description
1	0V
2	+5 V or +15 V
3	A
4	B
5	O
6	A\
7	B\
8	O\
9	-
10	-
11	Shielding (*)
12	-

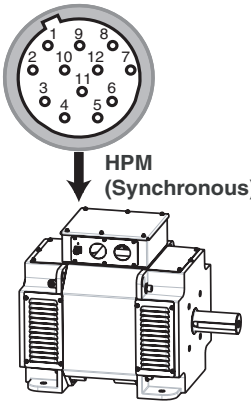
(*) to be connected to connector housing

5.2.6.3 - Connection of a Hall effect sensor

-	0V of the sensor power supply
+	Sensor power supply according to position of selector to be positioned on 15V
T1 T2	• Sensor thermal probe connection (see 5.2.6.1)
U	• Sensor channel U connection
U\	• Sensor channel U\ connection
V	• Sensor channel V connection
V\	• Sensor channel V\ connection
W	• Sensor channel W connection
W\	• Sensor channel W\ connection

CAUTION:
Check the switch position carefully: 15V for the Hall effect sensor power supply.

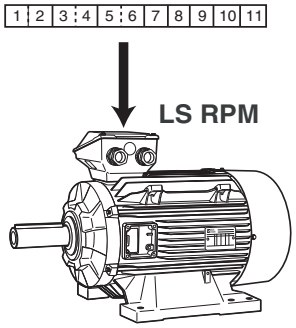
• LEROY-SOMER motor connector wiring



12-pin connector Hall effect sensor side (male plug)

Ref.	Description
1	U
2	U\
3	V
4	V\
5	W
6	W\
7	-
8	-
9	+15 V
10	0 V
11 12	Motor thermal sensor (see 5.2.6.1)
	Shielding (*)

(*) to be connected to connector housing



11-pin terminal block Hall effect sensor side

1	U
2	W\
3	V
4	U\
5	W
6	V\
7	0 V
8	+15 V
9	Shielding (*)
10 11	Motor thermal sensor (see 5.2.6.1)

(*) cable shielding to be connected to terminal 9 of terminal block

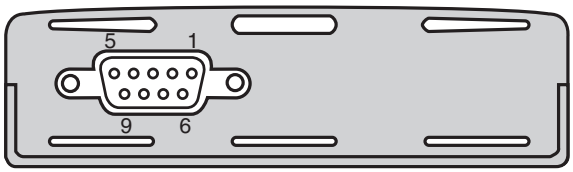
5.2.7 - Fieldbus modules

5.2.7.1 - SM-PROFIBUS DP module

• General

The SM-PROFIBUS DP module is used to communicate with a PROFIBUS-DP network.
It incorporates a 16-bit microprocessor, and its transmission speed can reach 12 Mbps.
The **POWERDRIVE** powers the module internally.

• Connection



SUB-D pins	Functions	Description
1	Shielding	Connection for the cable shielding
3	RxD/TxD-P	Positive data line (B)
4	CNTR-P	RTS line
5	0V ISO	Isolated 0 V, used for termination resistors only
6	+5V ISO	Isolated 5 V power supply, used for termination resistors only
8	RxD/TxD-N	Negative data line (A)

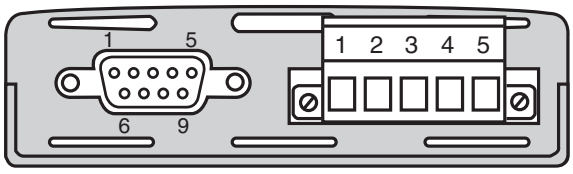
We strongly recommend the use of Profibus certified connectors.
These connectors can take 2 Profibus cables and have a terminal block with 4 screws, one for each data wire connection. They also have a shielding connection holder, which ensures continuity of the shielding for good immunity to interference on the Profibus network.

5.2.7.2 - SM-DeviceNet module

• General

The SM-DeviceNet module is used to communicate with a DeviceNet network.
It incorporates a 16-bit microprocessor, and its transmission speed can reach 500 Kbps.
The module must be powered by the DeviceNet power supply.

• Connection



5-terminal term. blk	9-pin SUB-D	Functions	Description
1	6	0V	0 V of the external power
2	2	CAN-L	Negative data line
3	3,5	Shielding	Connection for the cable shielding
4	7	CAN-H	Positive data line
5	9	+24V	External power supply

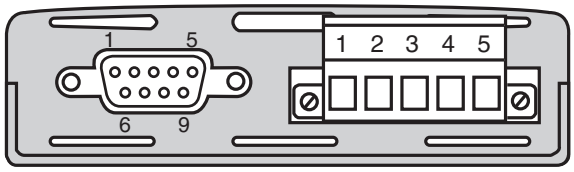
CAUTION:
We recommend using a screw terminal block rather than a SUB-D connector for connection to the DeviceNet network, because SUB-D connectors are not recognised for DeviceNet conformity.

5.2.7.3 - SM-CANopen module

• General

The SM-CANopen module is used to communicate with a CANopen network. It incorporates a 16-bit microprocessor and its transmission speed can reach 1 Mbps.
The **POWERDRIVE** powers the module internally.

• Connection



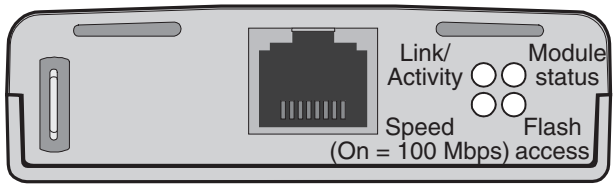
5-terminal term. blk	9-pin SUB-D	Functions	Description
1	6	0V	0 V of the external power
2	2	CAN-L	Negative data line
3	3.5	Shielding	Connection for the cable shielding
4	7	CAN-H	Positive data line
5	9	+24V	External power supply

5.2.7.4 - SM-Ethernet module

• General

The SM-Ethernet module is used to communicate with an Ethernet network in MODBUS-TCP only.
The **POWERDRIVE** supplies the module internally (current consumption 280 mA).

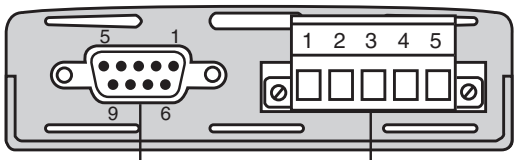
• Connection



RJ45	Internal crossover disabled (#mm.43 = 0)	Internal crossover enabled (#mm.43 = 1)
1	Transmission +Ve	Reception +Ve
2	Transmission -Ve	Reception -Ve
3	Reception +Ve	Transmission +Ve
4	-	-
5	-	-
6	Reception -Ve	Transmission -Ve
7	-	-
8	-	-

5.2.8 - PX-MODBUS module

As standard, the **POWERDRIVE** incorporates a non-isolated 2-wire RS485 serial link port accessible via the RJ45 connector. When the user wishes to keep the configuration interface permanently connected, it is necessary to add the Modbus RTU option with an isolated 2 or 4-wire serial link port.



Female 9-pin SUB-D	
Pin	Description
1	0 V
2	TX\
3	RX\
4	not connected
5	not connected
6	TX
7	RX
8	not connected
9	not connected
Shielding: 0 V	

5-point screw terminal block	
Terminal	Description
1	0 V
2	RX\
3	RX
4	TX\
5	TX

6 - MAINTENANCE

• All work relating to installation, commissioning and maintenance must be carried out by experienced, qualified personnel.

• When a trip detected by the drive causes it to switch off, fatal residual voltages remain at the output terminals and in the drive.

• Before carrying out any work on the drive or the motor, disconnect and lock the drive power supply and wait for 5 minutes to ensure that the capacitors have discharged.

• Make sure that the DC bus voltage is below 40 V before carrying out any work.

• During maintenance operations performed with the drive switched on, the operator must stand on an insulated surface which is not connected to earth.

• All protective covers must remain in place during tests.

There are very few maintenance and repair operations to be performed by the user on **POWERDRIVE** drives. Regular servicing operations and simple methods for checking that the drive is operating correctly are described below.

6.1 - Servicing

Printed circuits and the drive components do not normally require any maintenance. Contact your vendor or the nearest approved repair company in the event of a problem.

CAUTION:

Do not dismantle the printed circuits while the drive is still under warranty, as this would then immediately become null and void.

Do not touch the integrated circuits or the microprocessor either with your fingers or with materials which are charged or live. Earth yourself, as well as the workbench or the soldering iron, when performing any work on the circuits.

From time to time, with the drive powered down check that the power connections are correctly tightened. The door filters must be checked and changed regularly depending on their state.

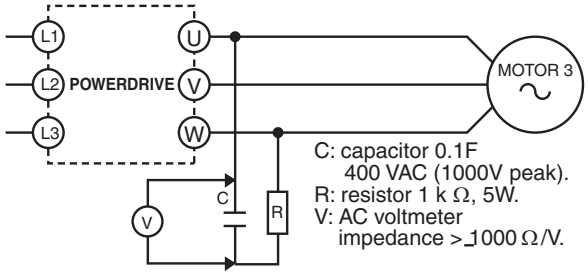
If the drive has been stored for more than 12 months, it is essential to switch it on for 24 hours, and repeat this operation every 6 months.

6.2 - Voltage, current and power measurements

6.2.1 - Measuring the voltage at the drive output

The harmonics generated by the drive mean that it is not possible to take a correct measurement of the voltage at the motor input using a conventional type of voltmeter.

However it is possible to obtain an approximate value of the rms voltage of the fundamental wave (that which affects the torque) using a conventional voltmeter connected as shown in the diagram below.



6.2.2 - Measuring the motor current

The current drawn by the motor and the drive input current can be measured approximately using a conventional moving coil ammeter.

6.2.3 - Measuring the drive input and output power

The drive input and output power can be measured using an electrodynamic instrument.

6.3 - List of spare parts

6.3.1 - Internal fuses on "fuse and external power supply board"

The detailed location of the fuses is given in section 3.1. The number of boards differs depending on the drive rating, but the names of the fuses remain the same for each board.

Drive rating	Fuse name	Number	Size	Type	Value	LS code
60T to 750T	F1	1	5x20	SA	1.25 A/250 V	PEL001FA004
	F2	1	5x20	SA	1.25 A/250 V	PEL001FA004
	F3	1	5x20	SA	1.25 A/250 V	PEL001FA004
	F4	1	5x20	SA	1.25 A/250 V	PEL001FA004
	F5	1	5x20	SA	1.25 A/250 V	PEL001FA004
	F6	1	5x20	SA	1.25 A/250 V	PEL001FA004
	F7	1	10x38	aM/ATQ	4 A/500 V	PEL004FA000
	F8	1	10x38	aM/ATQ	4 A/500 V	PEL004FA000

Note: In the event of a problem, check the fuses on each board.

6.3.2 - Mains input fuses

Drive rating	Fuse name	Number	Size	Type	Value	LS code
60T	Fua, Fub, Fuc	3	T30	UR	200 A/660 V	PEL200FU001
75T	Fua, Fub, Fuc	3	T30	UR	250 A/660 V	PEL250FU005
100T	Fua, Fub, Fuc	3	T31	UR	350 A/660 V	PEL350FU001
120T	Fua, Fub, Fuc	3	T31	UR	400 A/660 V	PEL400FU001
150T	Fua, Fub, Fuc	3	T31	UR	500 A/660 V	PEL500FU001
180T	Fua, Fub, Fuc	3	T33	UR	630 A/660 V	PEL630FU001
220T	Fua, Fub, Fuc	3	T33	UR	800 A/660 V	PEL800FU003
270T	Fua, Fub, Fuc	3	T33	UR	1000 A/660 V	PEL999FU000
340T	Fua, Fub, Fuc	3	T33	UR	1250 A/660 V	PEL999FU002
400T	Fua, Fub, Fuc	3	T33	UR	1250 A/660 V	PEL999FU002
470T	Fua, Fub, Fuc	3	T33	UR	1400 A/660 V	PEL999FU006
600T	Fua, Fub, Fuc	3	T33	UR	1600 A/660 V	PEL999FU005
750T	Fua, Fub, Fuc	3	T33	UR	1800 A/660 V	-

For the location of the fuses, refer to section 6.3.6.

6.3.3 - Preload and 3-phase power supply pick-up fuses

Drive rating	Fuse name	Number	Size	Type	Value	LS code
60T to 150T	Fud	3	14x51	GF	20 A/500 V	PEL020FG002
180T to 750T	Fu4	3	10x38	Am	10 A/500 V	PEL010FA000

For the location of the fuses, refer to section 6.3.6.

6.3.4 - Motor output bar fuses

Drive rating	Fuse name	Number	Size	Type	Value	LS code
60T to 750T	-	3	6.3x32	FA	2 A/660 V	PEL002FU004

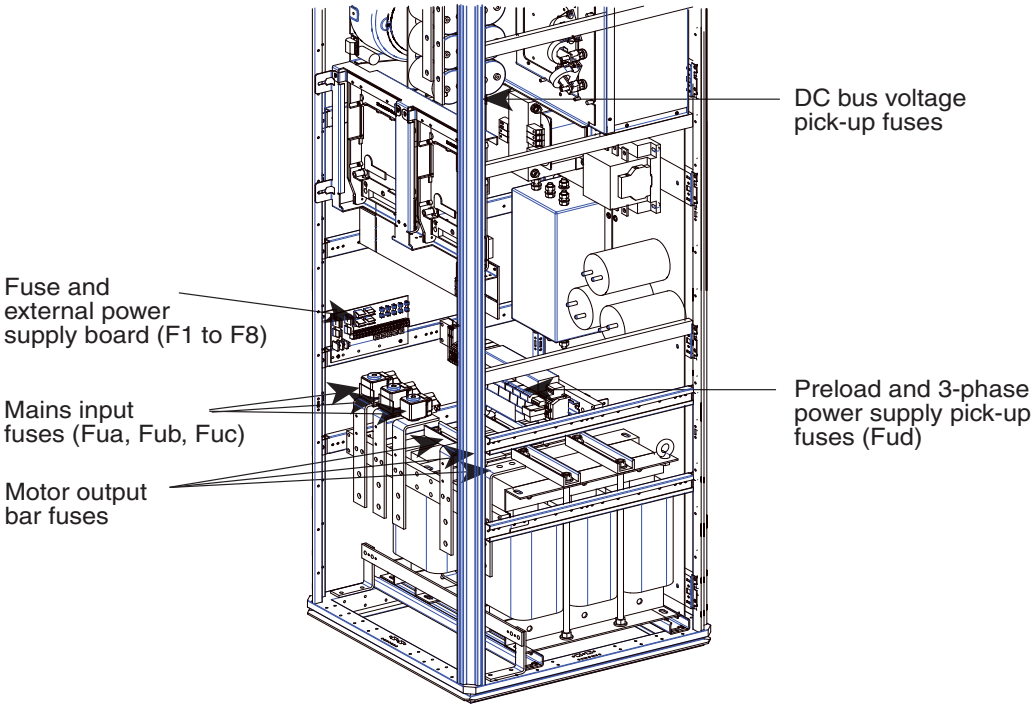
For the location of the fuses, refer to section 6.3.6.

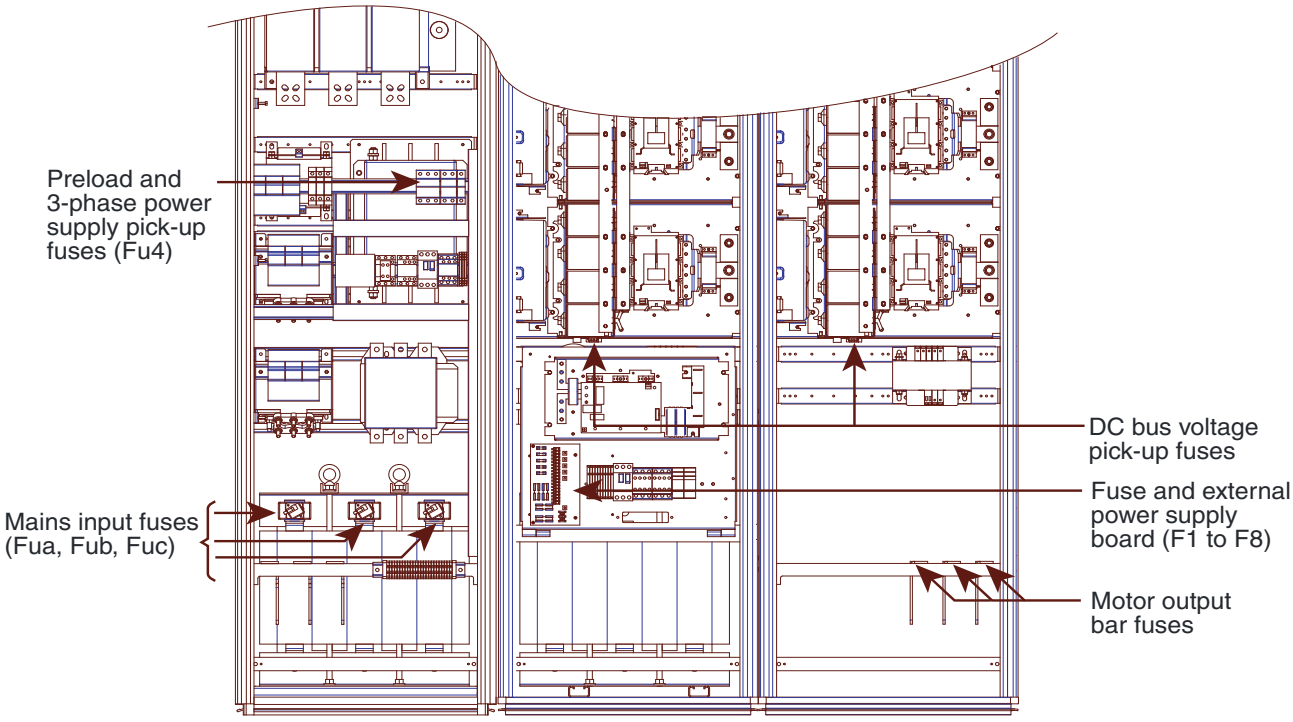
6.3.5 - DC bus voltage pick-up fuses

Drive rating	Fuse name	Number	Size	Type	Value	LS code
60T to 470T	-	4	6.3x32	FA	2 A/660 V	PEL002FU004
600T and 750T	-	8	6.3x32	FA	2 A/660 V	PEL002FU004

For the location of the fuses, refer to section 6.3.6.

6.3.6 - Location of fuses





6.4 - Exchanging products

CAUTION:
Before returning any product, please get in touch with your usual LEROY-SOMER contact.

Notes

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Notes

IMP297NO507

MOTEURS LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE

338 567 258 RCS ANGOULÊME
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