

Nidec

All for dreams



Installation guide

Powerdrive MD2S

*100T to 1700T
270TH to 1500TH*

*High-power free-standing
drive solution*

Part number: 4972 en - 2023.07 / f

LEROY-SOMERTM

NOTE

NIDEC 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 is therefore liable to be changed without notice.



For the user's own safety, this variable speed drive must be connected to an approved earth (\perp 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, 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, can also cause the motor to stop. The removal of the causes of the shutdown can lead to restarting, which could 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 could 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.

NIDEC 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 MD2S. For commissioning, refer to manual ref. 4617.

(In accordance with the low voltage directive 2006/95/EC)



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

1 - General information

Depending on their degree of protection, variable speed drives can contain unprotected live parts, which can 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 manual.

All work relating to transportation, installation, commissioning and maintenance must be performed by experienced, qualified personnel (see IEC 364, CENELEC HD 384 or DIN VDE 0100, as well as 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 2006/42/EC (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 (EMC 2004/108/EC) are met.

The variable speed drives meet the requirements of the Low Voltage Directive 2006/95/EC. The harmonized 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 manual supplied with the product.

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.

Variable speed drives contain parts that are sensitive to electrostatic stresses and can easily be 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 that 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 manual.

Instructions for an installation which meets the requirements for electromagnetic compatibility, such as screening, earthing, presence of filters and correct laying 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 could still be charged. In view of this, the warnings fixed to the variable speed drives must be observed.

Permanent magnet motors generate electrical energy while they are rotating, even when the drive is switched off. In this case, the drive continues to be powered by the motor terminals. If the load is capable of turning the motor, a switching device must be provided upstream of the motor to isolate the drive during maintenance operations.

During operation, all doors and protective covers must be kept closed.

7 - Servicing and maintenance

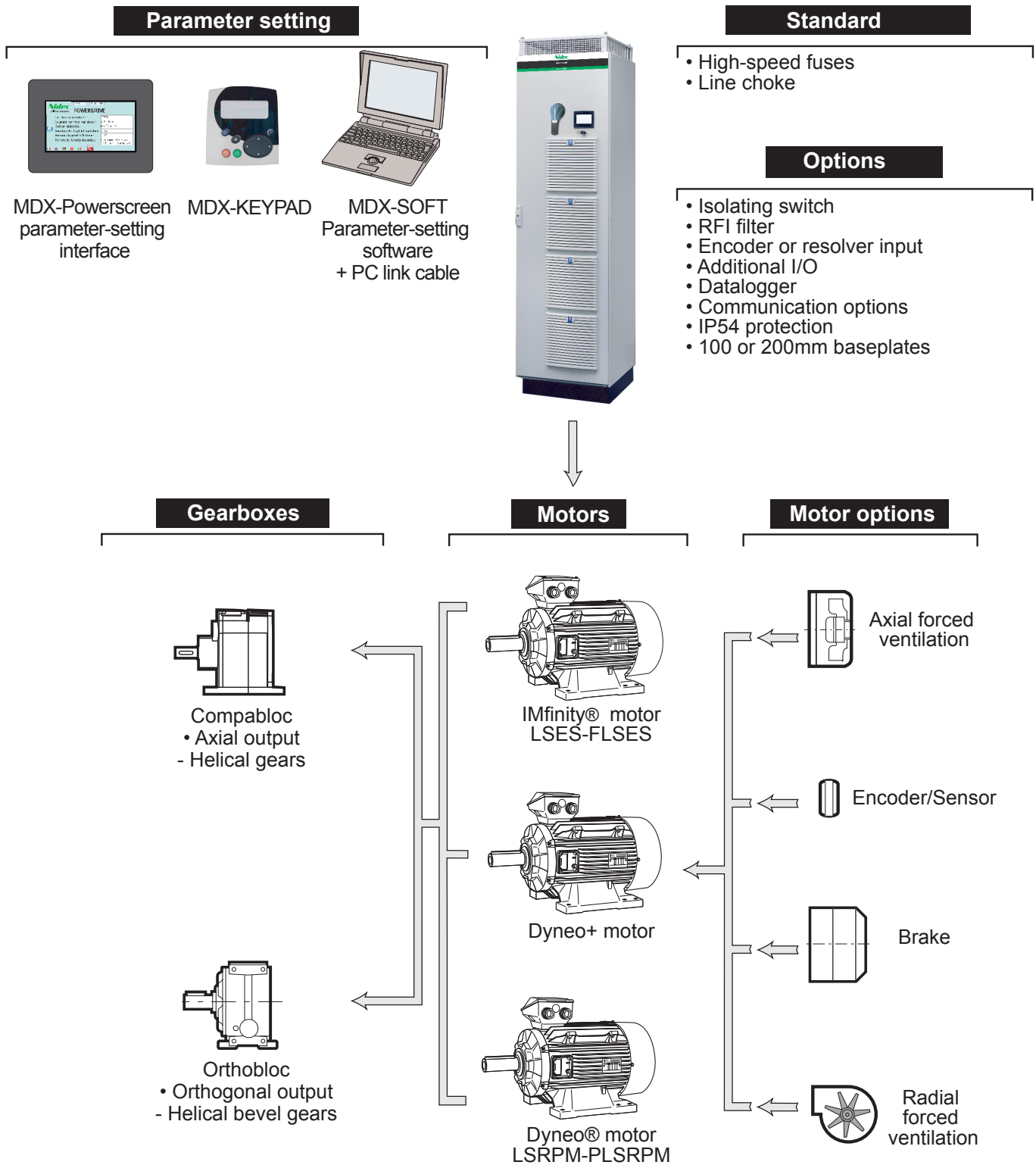
Refer to the manufacturer's documentation.

See the Maintenance section in this document.

This manual is to be given to the end user.

This manual describes the installation of **Powerdrive MD2S** variable speed drives. It also gives details of all its options and extensions which the user may choose to suit his requirements.

Powerdrive MD2S



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1 - GENERAL INFORMATION

1.1 - General

The **Powerdrive MD2S** is a variable speed drive with very high performance levels that can be used to control:

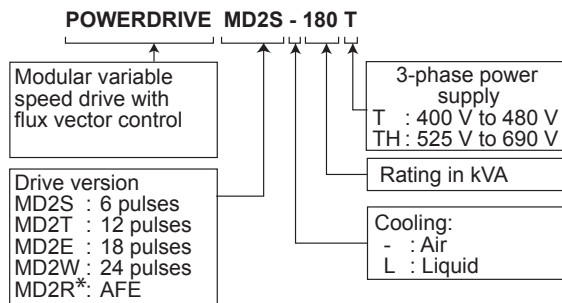
- Induction motors without a speed sensor (open loop mode select **[1]**) for applications that do not need rated torque control above 1/10th of the rated speed.
- Induction motors or synchronous permanent magnet motors with virtual speed feedback (flux vector mode with software sensor function **[2]**) for applications that require rated torque control from 1/20th of the rated speed.

Combined with the MDX-ENCODER option, the **Powerdrive MD2S** is a drive that can also be used to control asynchronous or synchronous magnet machines for applications that require very high dynamic performances, torque control from zero speed or high speed accuracy (closed loop vector mode with speed feedback **[3]**).

The performance of the **Powerdrive MD2S** is compatible with use in all 4 quadrants of the torque/speed plane with the braking module option incorporated.

With IP54 protection (optional), installation is possible directly next to the machine in harsh environments.

1.2 - Product designation



(*) See the corresponding installation manual

Depending on the options installed, a suffix (-B or -O) is added to the product commercial designation.

Nameplate

 	ENTREE - INPUT			
	Ph	V (V)	Hz (Hz)	I(A)
	3	400-480	50/60	295
	TYPE : Powerdrive MD2S 180T			
	S/N :	 09999999999		


I(A) = maximum input current for 400 V supply, in normal duty

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

1.3 - Environmental characteristics

Characteristics	Level
Protection	IP21 (IP54 as an option)
Storage and transport temperature	-30°C to +60°C (see section 7.1)
Ambient operating temperature (outside the drive cabinet)	-10°C to +40°C, up to +50°C with derating
Classification of environmental conditions	In accordance with IEC 60721-3-3: <ul style="list-style-type: none"> • Biological classification in accordance with class 3B1 • Classification as regards chemically active substances in acc. with class 3C2 • Classification as regards mechanically active substances in acc. with class 3S2
Relative humidity	In accordance with IEC 60068-2-56 < 90% non condensing
Altitude	≤ 1,000 m without derating > 1,000 m up to 4000 m maximum (as required): <ul style="list-style-type: none"> • Current derating of 1% per additional 100 m <i>E.g.: for 1,300 m, derate the I_{co} and I_{max} currents by 3%</i> • Operating temperature derating of 0.6°C per 100 m <i>E.g.: for 1,300 m, the electrical characteristics are maintained for an ambient temperature of [40° - (3 x 0.6°)] = 38.2°C.</i>
Vibrations	In accordance with IEC 60068-2-6 <ul style="list-style-type: none"> • Exposed product: 2 m/s² (9-200 Hz), 0.6 mm (2-9 Hz) • Packaged product: 10 m/s² (9-200 Hz), 3 mm (2-9 Hz)
Shocks	Packaged product: in accordance with standard IEC 60068-2-29
Atmospheric pressure	700 to 1060 hPa

1.4 - Electrical characteristics

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

1.4.1 - General characteristics

Characteristics	Level
Power supply voltage	3-phase supply: 400 V -10% to 480 V +10% ("T" ratings) or 525 V -10% to 690 V +5% ("TH" ratings)
Phase voltage imbalance	< 2%
Input frequency	"T" ratings: 50 or 60 Hz ± 5% "TH" ratings: 50 Hz ± 5%
Maximum number of power-ups per hour (power)	20
Output frequency range	0 to 590 Hz
ROHS conformance	Conforming to standard 2002-95-EC

 For operation with a neutral IT point connection, follow the instructions given in section 4.4.3

1.4.2 - Electrical characteristics

I_{co}: Continuous output current.

P_{out}: Output power.

I_{max} (60s): Maximum output current, available for 60 seconds every 600 seconds

Heavy duty: For heavy duty constant torque machines (presses, grinders, hoisting, etc.) and all applications where significant inertia has to be accelerated quickly (centrifuges, translation of travelling cranes, etc.).

Normal duty: For low overload constant torque or centrifugal torque machines (fans, compressors, etc.).

WARNING: In its factory setting, the drive operates with a switching frequency of 3 kHz.

400 V to 460 V 3-phase supply

Switching frequency = 3 kHz - ambient temperature ≤ 40°C (35°C with IP54 option) - altitude ≤ 1,000 m.

Rating	Heavy duty			Normal duty			I _{max} (60 s) (A)
	P _{out} at 400 V (kW) ⁽¹⁾	P _{out} at 460 V (HP) ⁽¹⁾	I _{co} (A)	P _{out} at 400 V (kW) ⁽¹⁾	P _{out} at 460 V (HP) ⁽¹⁾	I _{co} (A)	
100T	75	100	142	90	125	175	200
120T	90	125	170	110	150	212	240
150T	110	150	220	132	175	250	312
180T	132	175	260	160	200	315	365
220T	160	200	310	200	300	400	435
270T	200	300	375	250	350	470	530
340T	250	350	470	315	450	580	660
400T	315	450	540	355	500	650	760
470T	355	500	670	450	600	800	940
570T	400	600	750	500	650	880	1050
600T	450	650	865	550	700	1090	1210
750T	550	800	990	675	900	1220	1390
900T	675	900	1225	800	1000	1500	1720
1100T	800	1000	1375	900	1250	1650	1930
1400T	900	1250	1850	1200	1500	2250	2590
1700T	1200	1500	2065	1350	1700	2480	2890

(1) Motor winding voltage

GENERAL INFORMATION

525 V to 690 V 3-phase supply

Switching frequency = 3 kHz - ambient temperature $\leq 40^{\circ}\text{C}$ (35°C with IP54 option) - altitude ≤ 1000 m.

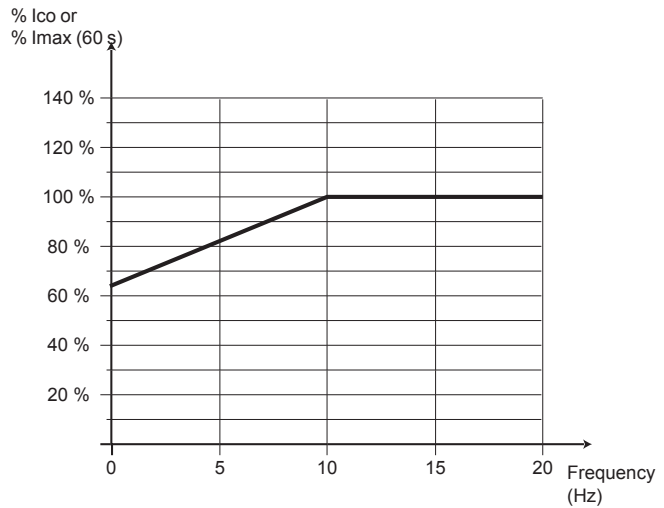
Rating Powerdrive MD2S	Heavy duty			Normal duty			I _{max} (60s) (A)
	Pout at 575 V (HP) ⁽¹⁾	Pout at 690 V (kW) ⁽¹⁾	I _{co} (A)	Pout at 575 V (HP) ⁽¹⁾	Pout at 690 V (kW) ⁽¹⁾	I _{co} (A)	
270TH	200	200	220	250	250	280	308
340TH	250	250	270	300	300	340	378
400TH	300	300	335	400	400	415	465
500TH	400	400	390	500	500	470	545
600TH	450	450	490	600	600	630	638
750TH	600	600	615	700	700	780	800
900TH	700	700	720	900	900	880	1000
1200TH	900	900	900	1100	1000	1180	1230
1500TH	1100	1000	1075	1250	1250	1320	1485

(1) Motor winding voltage

1.4.3 - Derating at low frequency

Measuring the temperature of the power bridges in conjunction with thermal modelling of the IGBTs ensures protection against overheating of the **Powerdrive MD2S**.

At low output (motor) frequencies, IGBT modules are subject to significant temperature cycling, which can reduce their life. To prevent this risk, the curve opposite indicates the derating for output currents **I_{co}** and **I_{max}** when operating at low motor frequencies in continuous operation.



1.4.4 - Standard equipment

The **Powerdrive MD2S** is equipped as standard with a line choke and high-speed fuses.

1.4.5 - Derating according to the temperature and switching frequency

See the derating tables on the next pages.

For intermediate switching frequencies (3.5 - 4.5 - 5.5 kHz), the available current value will be the average of the upper frequency and lower frequency currents.

In the IP54 version, with an ambient temperature of 40°C , the available current value will be the average of the currents at 35°C and 45°C .

GENERAL INFORMATION

Ambient temperature ≤ 40°C (≤ 35°C with IP54 option) - altitude ≤ 1,000 m.

Rating	Ico (A)									
	Heavy duty					Normal duty				
	2 kHz	3 kHz	4 kHz	5 kHz	6 kHz	2 kHz	3 kHz	4 kHz	5 kHz	6 kHz
400 V supply										
100T	142	142	142	130	118	175	175	162	148	134
120T	170	170	165	150	135	220	212	188	170	154
150T	220	220	195	175	160	260	250	224	200	182
180T	260	260	260	260	250	315	315	310	305	285
220T	310	310	310	310	285	400	400	385	355	325
270T	375	375	375	350	320	470	470	440	400	365
340T	470	470	460	415	380	580	580	525	475	430
400T	540	540	530	480	430	650	650	605	545	490
470T	670	670	640	570	515	800	800	725	650	585
570T	750	750	660	-	-	915	880	750	-	-
600T	865	865	860	785	705	1090	1090	980	890	800
750T	990	990	990	900	810	1220	1220	1130	1020	920
900T	1225	1225	1195	1075	960	1500	1500	1360	1220	1090
1100T	1375	1375	1240	-	-	1720	1650	1410	-	-
1400T	1850	1850	1795	-	-	2250	2250	2040	-	-
1700T	2065	2065	1860	-	-	2580	2480	2110	-	-
460/480 V supply										
100T	142	142	136	122	112	175	172	154	138	126
120T	170	170	155	140	125	215	200	176	158	144
150T	220	210	185	160	145	255	238	210	186	168
180T	260	260	260	260	230	315	310	305	295	265
220T	310	310	310	295	265	400	395	370	335	300
270T	375	375	370	330	295	470	465	420	375	335
340T	470	470	425	380	340	580	560	485	430	385
400T	540	535	490	430	380	650	610	555	490	435
470T	670	660	585	515	460	800	750	665	585	525
570T	750	715	630	-	-	890	815	715	-	-
600T	865	865	800	705	635	1090	1050	910	800	720
750T	990	990	915	810	715	1220	1140	1040	920	810
900T	1225	1225	1100	960	860	1500	1410	1250	1090	980
1100T	1375	1345	1180	-	-	1670	1530	1340	-	-
1400T	1850	1850	1645	-	-	2250	2110	1870	-	-
1700T	2065	2015	1770	-	-	2500	2290	2010	-	-
525/690 V supply										
270TH	220	220	220	-	-	280	280	250	-	-
340TH	270	270	270	-	-	340	340	310	-	-
400TH	335	335	290	-	-	415	415	330	-	-
500TH	390	390	305	-	-	500	470	350	-	-
600TH	490	490	490	-	-	630	630	580	-	-
750TH	615	615	545	-	-	780	780	620	-	-
900TH	720	720	570	-	-	940	880	650	-	-
1200TH	900	900	825	-	-	1180	1180	940	-	-
1500TH	1075	1075	860	-	-	1410	1320	980	-	-

GENERAL INFORMATION

Ambient temperature ≤ 50°C (≤ 45°C with IP54 option) - altitude ≤ 1,000 m.

Rating	Ico (A)									
	Heavy duty					Normal duty				
	2 kHz	3 kHz	4 kHz	5 kHz	6 kHz	2 kHz	3 kHz	4 kHz	5 kHz	6 kHz
400 V supply										
100T	140	140	130	120	110	175	168	150	136	124
120T	170	170	150	135	125	215	192	172	156	142
150T	220	205	180	160	145	255	232	206	184	166
180T	260	260	260	255	230	315	315	305	290	260
220T	310	310	310	285	260	400	390	360	325	295
270T	375	375	360	320	290	470	450	410	365	330
340T	470	470	415	375	340	570	540	475	425	385
400T	540	520	485	425	380	630	590	550	485	435
470T	670	650	575	515	460	780	740	655	585	525
570T	750	685	630	-	-	890	780	715	-	-
600T	865	865	785	695	635	1070	1010	890	790	720
750T	990	970	905	800	715	1180	1100	1030	910	810
900T	1225	1225	1085	960	860	1460	1390	1230	1090	980
1100T	1375	1285	1180	-	-	1670	1460	1340	-	-
1400T	1850	1830	1620	-	-	2190	2080	1840	-	-
1700T	2065	1930	1770	-	-	2500	2190	2010	-	-
460/480 V supply										
100T	140	140	125	110	100	175	160	142	126	114
120T	170	160	140	125	115	210	184	162	146	130
150T	220	190	170	150	135	254	220	192	172	154
180T	260	260	260	235	215	315	305	295	270	245
220T	310	310	300	265	235	400	385	340	305	270
270T	375	375	340	300	265	470	435	385	340	305
340T	470	450	380	340	305	570	510	435	385	345
400T	540	485	440	380	340	630	550	500	435	385
470T	670	600	525	460	410	780	685	595	525	465
570T	740	650	570	-	-	840	740	650	-	-
600T	865	835	715	635	565	1070	950	810	720	640
750T	990	905	825	715	635	1180	1030	940	810	720
900T	1225	1125	975	860	765	1460	1280	1110	980	870
1100T	1375	1225	1075	-	-	1570	1390	1220	-	-
1400T	1850	1700	1470	-	-	2190	1930	1670	-	-
1700T	2065	1830	1610	-	-	2360	2080	1830	-	-
525/690 V supply										
270TH	220	210	190	-	-	280	240	220	-	-
340TH	270	270	235	-	-	340	310	270	-	-
400TH	335	335	300	-	-	415	400	340	-	-
500TH	390	365	290	-	-	500	415	330	-	-
600TH	490	490	440	-	-	630	580	500	-	-
750TH	615	615	555	-	-	780	750	630	-	-
900TH	720	685	545	-	-	940	780	620	-	-
1200TH	900	900	835	-	-	1170	1120	950	-	-
1500TH	1075	1030	820	-	-	1410	1170	930	-	-

2 - MECHANICAL INSTALLATION

⚠ • It is the responsibility of the owner or user of the Powerdrive MD2S to ensure that installation, operation and maintenance of the drive and its options comply with legislation relating to the safety of equipment and personnel, and with the current regulations in the country of use.

• The Powerdrive MD2S drives must be installed in an environment free from conducting dust, corrosive fumes, gases and fluids, and condensation (class 2 according to IEC 664-1). The Powerdrive MD2S must not be installed near flammable materials. The drives must not be installed in hazardous areas unless they are in appropriate enclosures. In this case, the installation must be approved. • In atmospheres where condensation can form, install a heating system (to be switched off when the drive is operating).

• Prevent access by unauthorized personnel.

2.1 - Checks on receipt

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

Before installing the **Powerdrive MD2S**, 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 center of gravity could be high up and/or off-centre, so beware of the risk of the drive cabinet tipping over.

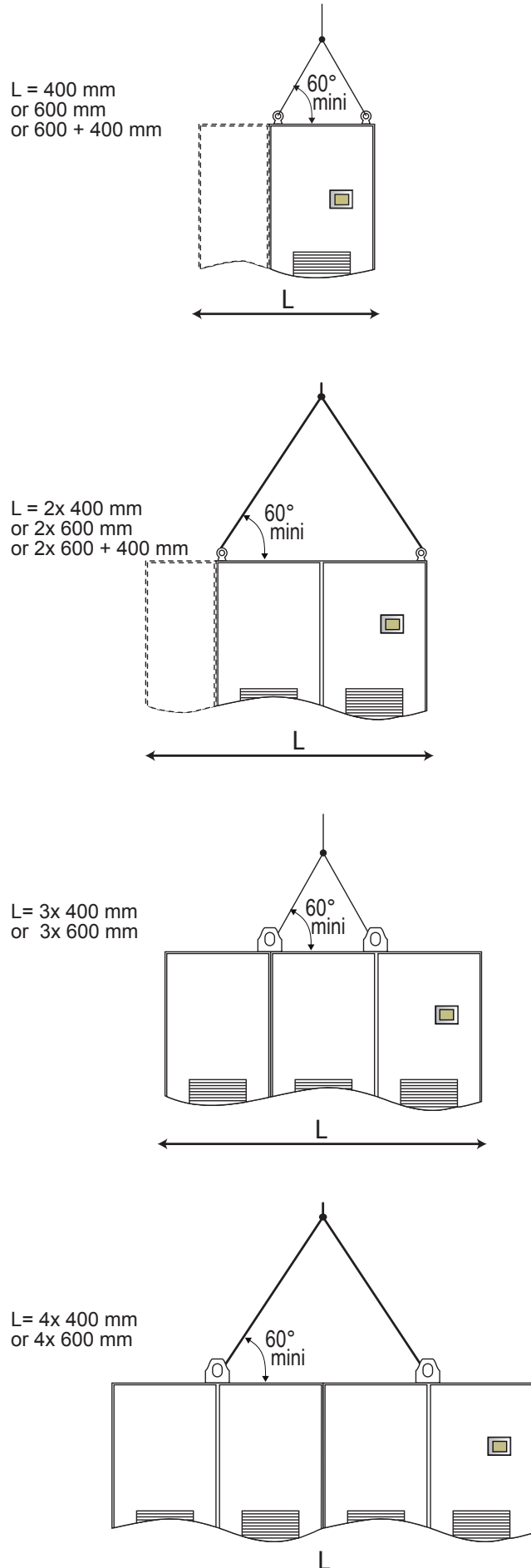
- Check that the handling equipment is suitable for the weight to be handled.
- The lifting accessories provided are limited solely to handling the drive cabinet. If subsequent handling operations are carried out, always check that these lifting accessories are in good condition.

The drive cabinet must be handled without the IP21 or IP54 roof in place.

The **Powerdrive MD2S** IP21 versions are supplied with the roof assembled. Before handling the drive cabinet, follow the procedure described in section 2.4. For handling, follow the instructions below, and then re-fit the roof.

The **Powerdrive MD2S** IP54 versions are supplied with the lifting rings or rails fitted. When handling the drive cabinet, follow the instructions below, depending on the cubicle width, as indicated below. After handling, assemble the roof as described in section 2.5.

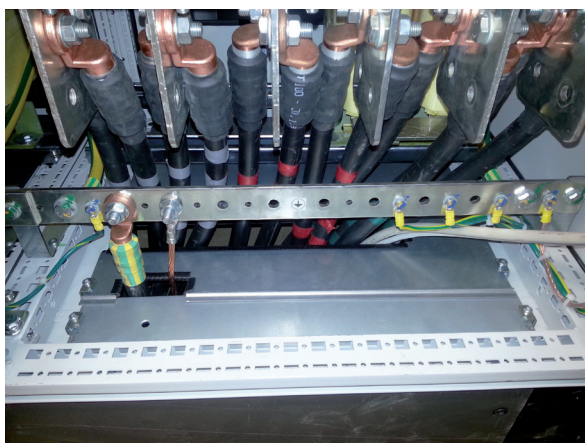
Above 2,400 mm wide (W), a baseplate 100 mm high is installed as standard to ensure the rigidity of all the drive cabinets.



2.3 - Installation recommendations

Ensure that hot air is not being recycled via the air inlets by leaving sufficient free space above the **Powerdrive MD2S** or providing a means of evacuating the hot air expelled by the product. If necessary, add a suction hood. Never obstruct the drive ventilation grilles; the air intake filters must be cleaned and changed regularly.

⚠ After connecting the power, reposition the cable bush plates at the back of the drive cabinet and fill any gaps with expanding foam.



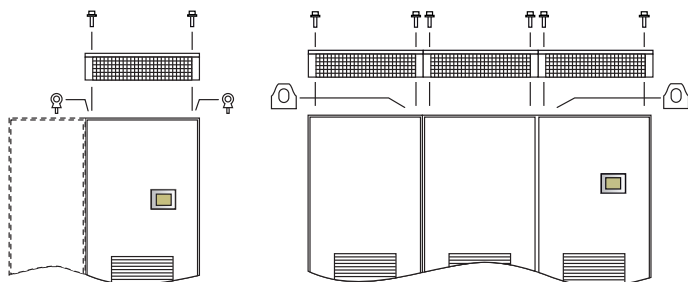
2.4 - Removing and re-fitting the IP21 roof

• **Removal**

- 1 – Take out the M12 screws.
- 2 – Take off the roof(s).
- 3 - Screw in the 4 lifting rings or the 2 lifting rails with the M12 screws at the places indicated (tightening torque = 20 N.m).

• **Re-fitting**

Reverse the procedure.



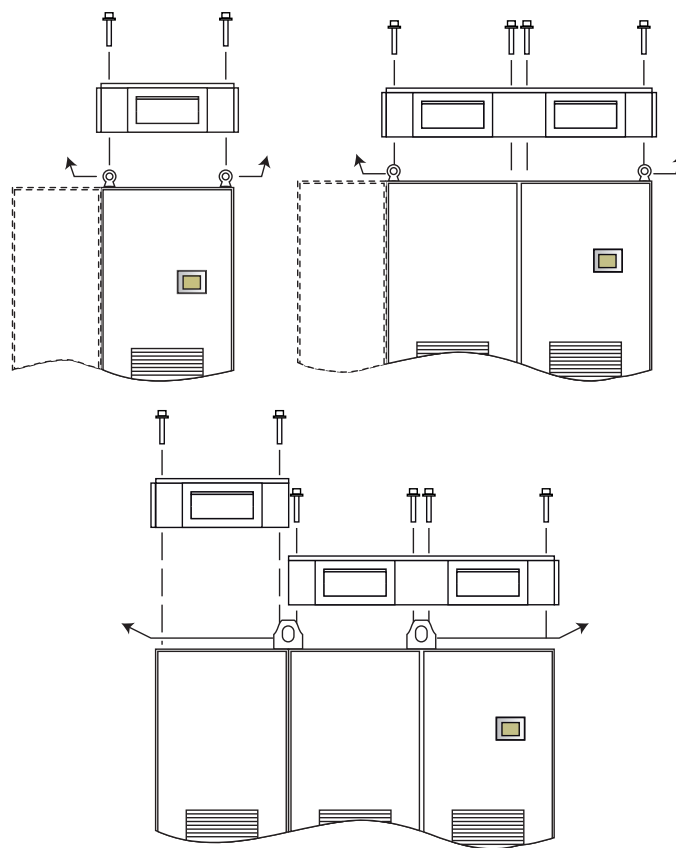
2.5 - Assembly and removal of the IP54 roof

• **Assembly:**

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

• **Removal, if necessary:**

Reverse the procedure.



2.6 - Dimensions

The cabinet-mounted **Powerdrive MD2S** solution is obtained by assembling drive cabinet modules 400 or 600 mm wide and 600 mm deep.

The table below gives the product **width (W)** in mm depending on the options incorporated:

MD2S ratings	No options (-B)		With options (-O)		
	Width W (mm)	Switch	RFI filter	Braking transistor ⁽¹⁾	Width W (mm)
100T to 150T	412	✓	✓	✓	412
180T to 270T	412	✓	✓	✓	812
340T & 400T	612	✓	✓	✓	1012
470T & 570T	612	✓	✓	✓	1012
600T to 1100T	1212	✓	✓	✓	1812
1400T & 1700T	1812	-	✓	✓	2412 (2)
270TH to 500TH	612	✓	✓	✓	1012
600TH to 900TH	1012	✓	✓	✓	1612
1200TH to 1500TH	1212	-	✓	✓	2812 (2)

(1) The braking transistor kit comprises an MD2TF and a thermal relay calibrated to the braking resistor.

The following options can be incorporated into the **Powerdrive MD2S** without altering its size:

- MD-AU1 emergency stop
- Communication modules
- Additional I/O modules
- Speed feedback modules



The table below gives the product **height (H)** depending on the options incorporated:

Option	Height (mm)
Powerdrive MD2S (standard)	2100
IP21 protection	+ 0
IP54 protection	+ 100
100 mm baseplate	+ 100
200 mm baseplate	+ 200
Baseplate for width ≥ 2,400 mm ⁽²⁾	+ 100

(2) Above 2,400 mm long (L), a baseplate 100 mm high must always be installed to ensure the rigidity of all the drive cabinets. This baseplate does not allow the cables to pass through, but can be combined with a 100 or 200 mm baseplate.

For more precise information depending on the options, use the LEROY-SOMER configurator:

- <http://configureurls.leroy-somer.com>

2.7 - Weight

The values indicated in the table below are maximum net weights.

Powerdrive MD2S rating	Weight w/o option (kg)	Maximum weight (kg)
100T to 150T	225	260
180T to 270T	260	360
340T & 400T	380	560
470T & 570T	410	610
600T & 750T	760	1100
900T & 1100T	820	1220
1400T & 1700T	1350	1720
270TH & 340TH	355	560
400TH & 500TH	400	620
600TH	720	780
750TH & 900TH	810	1050
1200TH & 1500TH	1250	1520

2.8 - Drive losses

Losses according to the switching frequency for currents at 40°C and normal duty.

MD2S rating	Losses (kW)				
	2 kHz	3 kHz	4 kHz	5 kHz	6 kHz
100T	2.3	2.4	2.4	2.3	2.2
120T	2.9	2.9	2.8	2.7	2.6
150T	3.4	3.5	3.3	3.1	3.1
180T	4.1	4.4	4.6	4.8	4.8
220T	5.3	5.5	5.7	5.6	5.4
270T	6.2	6.5	6.5	6.3	6.1
340T	7.6	8.0	7.7	7.4	7.2
400T	8.6	9.0	8.9	8.5	8.2
470T	10.5	11.1	10.6	10.2	9.8
570T	12.0	12.2	11.0	-	-
600T	14.3	15.1	14.4	13.9	13.4
750T	16.1	16.9	16.6	16.0	15.4
900T	19.7	20.8	20.0	19.1	18.3
1100T	22.6	22.9	20.7	-	-
1400T	29.6	31.2	30.0	-	-
1700T	34.0	34.4	31.0	-	-
270TH	6.4	6.7	6.6	-	-
340TH	7.7	8.1	8.2	-	-
400TH	9.4	9.9	8.8	-	-
500TH	11.4	11.2	9.3	-	-
600TH	14.3	15.1	15.4	-	-
750TH	17.7	18.6	16.4	-	-
900TH	21.3	21.0	17.2	-	-
1200TH	26.8	28.2	24.9	-	-
1500TH	32.0	31.6	26.0	-	-

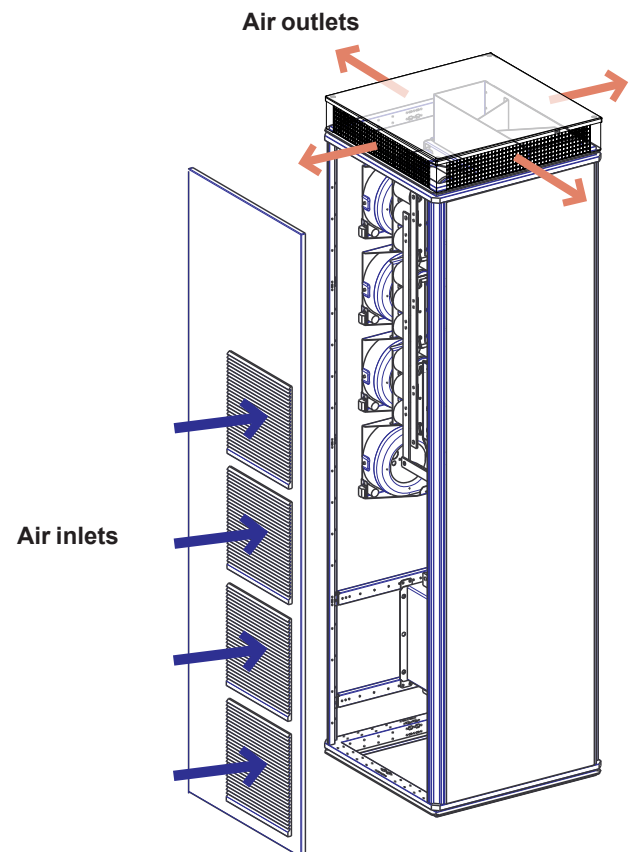
Note: The values given above correspond to operation in normal duty and the choke losses are included.

2.9 - Drive ventilation flow rates and noise levels

Powerdrive MD2S rating	Forced ventilation flow rates (m³/h)	Noise level (dBA)
100T to 150T	600	75
180T to 270T	1200	79
340T to 570T	1700	77
600T to 1100T	3400	80
1400T & 1700T	5100	82
270TH to 500TH	1700	77
600TH to 900TH	3400	80
1200TH and 1500TH	5100	82

Air can exit on all sides of the roof. The drive cabinet can be installed with one side only against a wall (with the IP21 or IP54 roofs). Under no circumstance must the difference between the drive cabinet internal temperature and the ambient temperature outside the cabinet exceed 5°C.

In atmospheres where condensation can form, install a heating system (to be switched off when the drive is operating). It is advisable to control the heating system automatically.



3 - CONNECTIONS

⚠ • All connection work must be performed by qualified electricians in accordance with the laws in force in the country where the drive is installed. This includes grounding to ensure that no directly accessible part of the drive can be at the AC supply voltage or any other voltage which may be dangerous.

- The drive must be supplied via an approved circuit-breaking device so that it can be powered down safely.
- The optional switch supplied with the drive does not isolate the drive input busbars. It must without fail be associated with a circuit-breaking device in the switchboard.
- The drive power supply must be protected against overloads and short-circuits.
- Check that the voltage and current of the drive, the motor and the AC supply are compatible.
- The voltages on the connections of the AC supply, the motor, the braking resistor or the filter can cause fatal electric shocks. The protective plates supplied with the drive must always be installed correctly to protect the user against direct electric shocks.
- Only one permanent magnet motor can be connected to the drive output. It is advisable to install a circuit-breaking device between the permanent magnet motor and the drive output to eliminate the risk of hazardous voltage feedback when performing maintenance work.
- Also comply with the recommendations in section 7.

3.1 - Power connections

3.1.1 - General

The power connections for the Powerdrive MD2S are detailed for each model in section 3.1.4.

The Powerdrive MD2S versions with ratings higher than 570T are obtained by connecting in parallel Powerdrive MD2S versions with lower ratings.

- In the -B version (without options), each drive cabinet has its own U/V/W motor outputs and its own L1/L2/L3 line inputs.
- In -O versions (with options) each drive cabinet has its own U/V/W motor outputs; the R/S/T line inputs are contained in the option cabinet.

⚠ • The cables for each of the motor U/V/W phases must be distributed evenly over the U/V/W connection plates in each drive cabinet.

- In -B versions, the incoming line cables must be distributed evenly over the L1/L2/L3 connection plates in each drive cabinet.

3.1.2 - Connection terminal characteristics

Functions/ connections	Marking	Type of connection and tightening torque		
		100T to 150T	180T to 270T	340T to 1400T 270TH to 1500TH
AC power supply	L1, L2, L3, or R, S, T	M10 screw bolt - 20 Nm		
Motor outputs	U, V, W			
Earth	PE	M10 bolt - 20 Nm		
Braking resistor (1)	BR1, BR2	M8 bolt - 12 Nm		

⚠ Do not exceed the indicated maximum tightening torque.

(1) If the braking transistor option is installed.

CONNECTIONS

3.1.3 - Electronics and forced ventilation power supply

The control electronics and forced ventilation units are supplied through a single-phase transformer whose primary is connected to terminals L1-L2 of the power supply. If necessary, this transformer can be supplied by an external power source (PX4 terminal block).

⚠ The neutral of the electronics power supply must not be connected to earth

3.1.3.1 - Electrical characteristics:

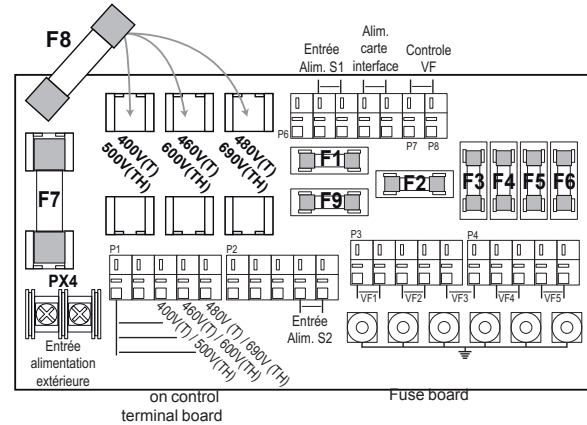
	Ratings	Voltage
Primary	T	400 V±10%/50 Hz or 460-480 V ±10%/60 Hz
	TH	500-690 V±5%/50 Hz
	Voltage	Maximum power
Secondary 1 (Electronics power supply)	230 V isolated	100 VA
Secondary 2 (Forced ventilation and auxiliaries power supply)	230 V connected to earth	100T to 150T: 300 VA 180T to 270T: 500 VA 340T to 570T: 1,200 VA 600T to 1100T: 2 x 1,200 VA 1400T to 1700T: 3 x 1,200 VA 270TH to 500TH: 1,200 VA 600TH to 900TH: 2 x 1,200 VA 1200TH to 1500TH: 3 x 1,200 VA

3.1.3.2 - Fuse boards

Depending on the rating, the Powerdrive MD2S can contain one or more identical fuse boards:

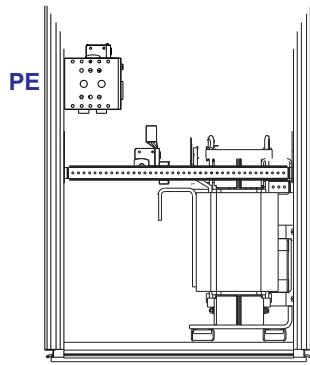
- 100T to 270T: 1 board (1)
- 340T to 570T & 270TH to 500TH: 1 board (2)
- 600T to 1100T & 600TH to 900TH: 2 boards (2)
- 1400T & 1200TH and 1500TH & 1700TH: 3 boards (2)

- (1) Located on the right-hand side of each cabinet
- (2) Located on the left-hand side of each cabinet

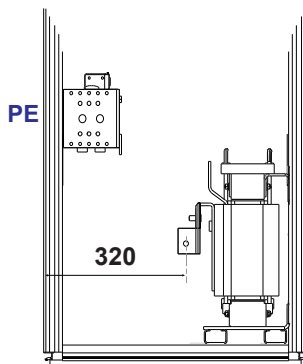
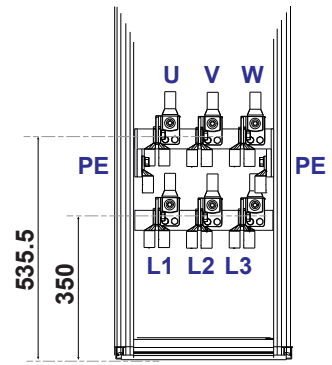


⚠ Position the F8 fuse according to the versions supply voltage.

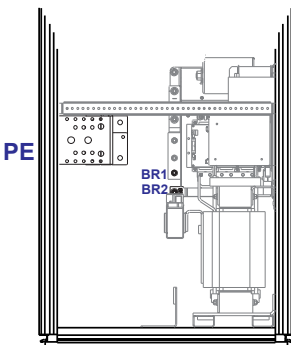
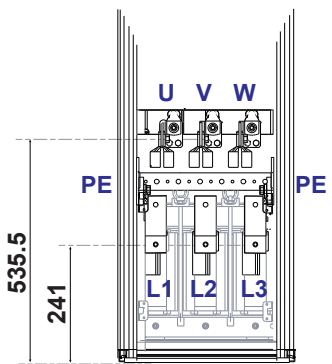
3.1.4 - Power terminal block location



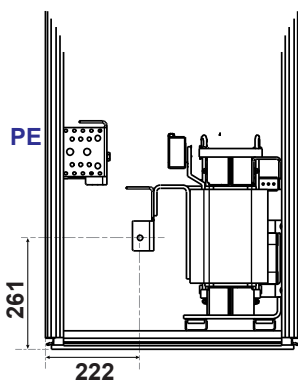
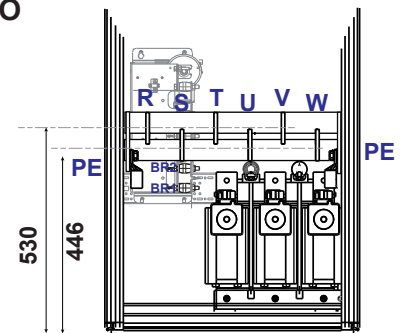
MD2S 100T-B / MD2S 120T-B / MD2S 150T-B
MD2S 100T-O / MD2S 120T-O / MD2S 150T-O



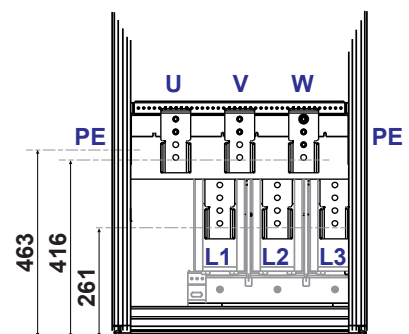
MD2S 180T-B / MD2S 220T-B / MD2S 270T-B



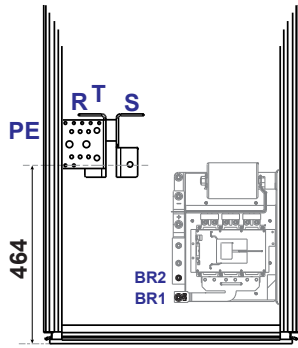
MD2S 180T-O / MD2S 220T-O / MD2S 270T-O



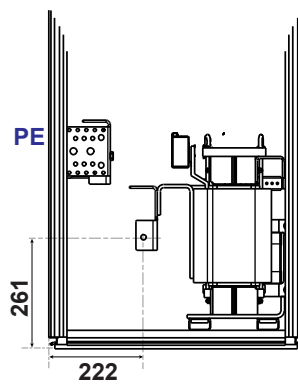
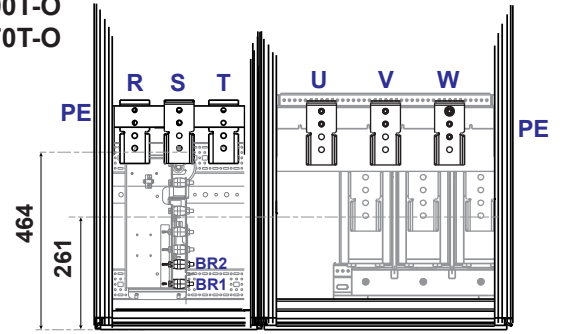
MD2S 340T-B / MD2S 400T-B
MD2S 470T-B / MD2S 570T-B



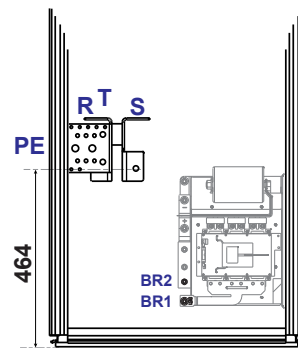
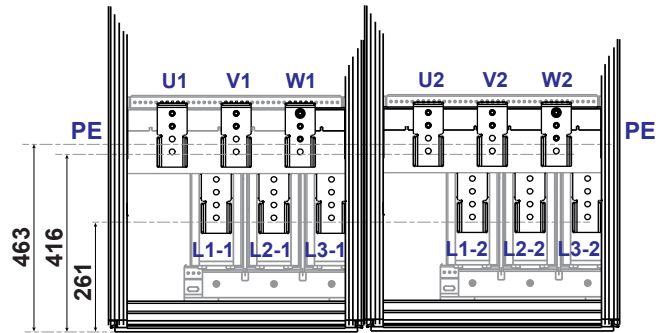
CONNECTIONS



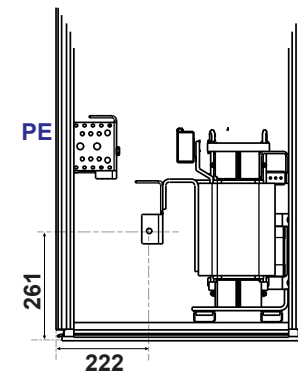
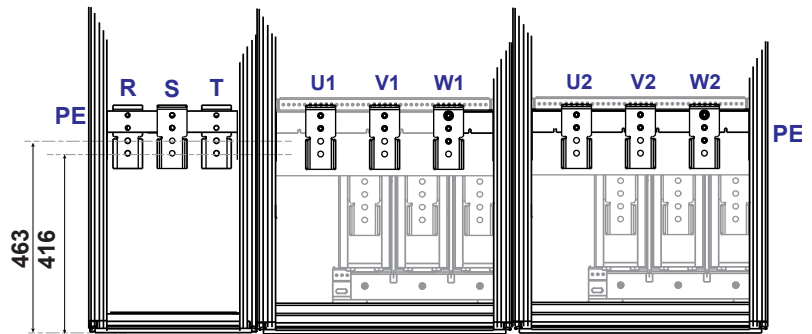
**MD2S 340T-O / MD2S 400T-O
MD2S 470T-O / MD2S 570T-O**



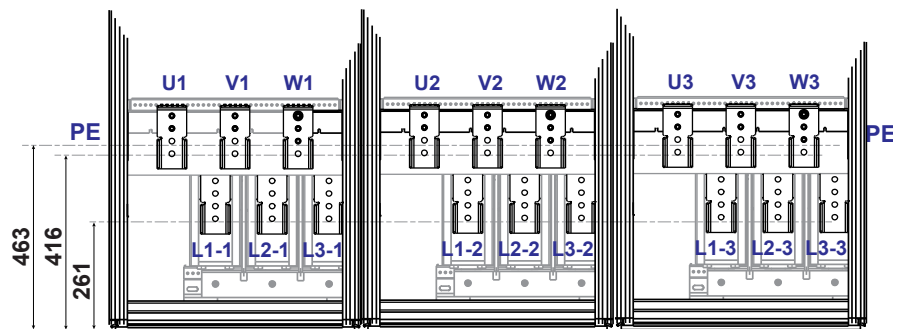
MD2S 600T-B / MD2S 750T-B / MD2S 900T-B / MD2S 1100T-B



MD2S 600T-O / MD2S 750T-O / MD2S 900T-O / MD2S 1100T-O

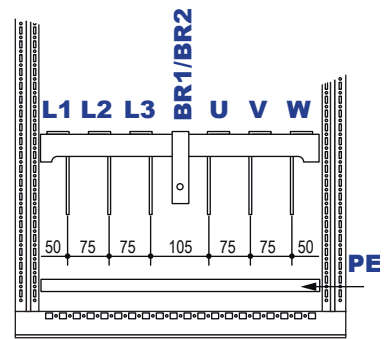
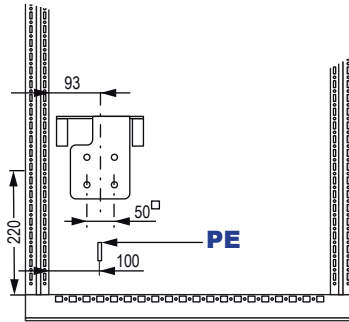


MD2S 1400T-B / MD2S 1700T-B

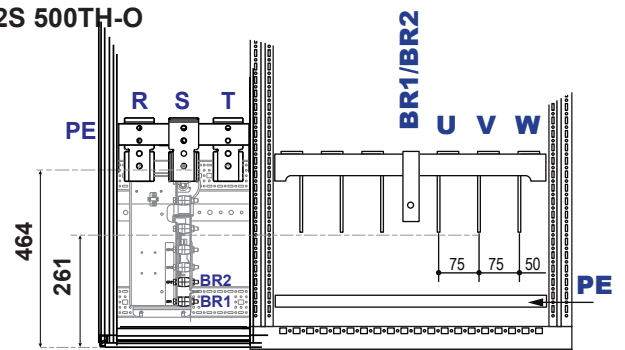
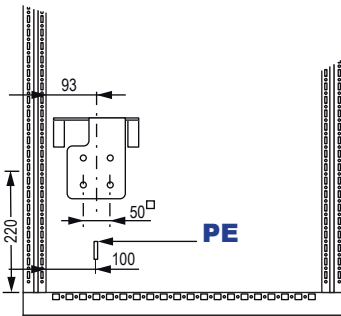


CONNECTIONS

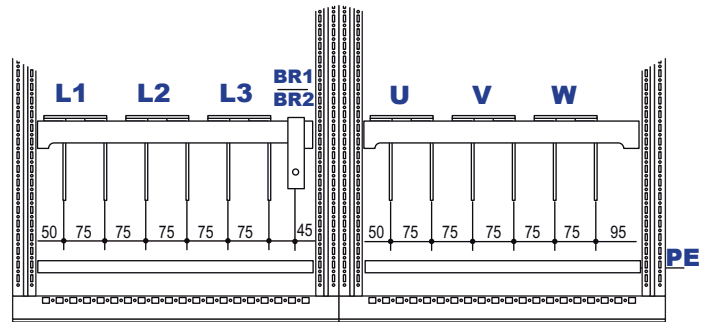
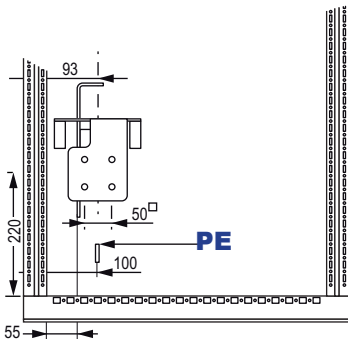
**MD2S 270TH-B / MD2S 340TH-B
MD2S 400TH-B / MD2S 500TH-B**



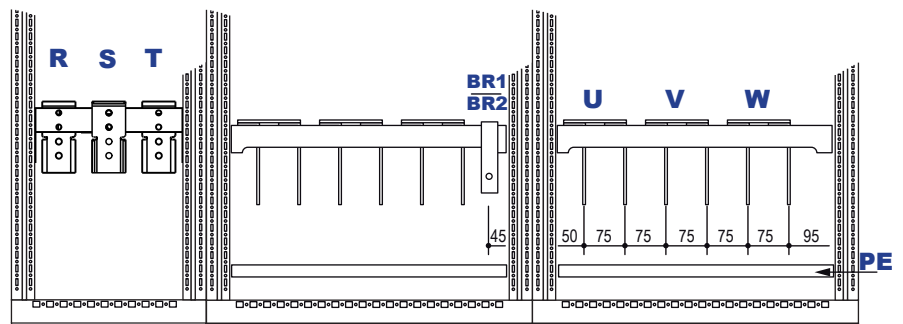
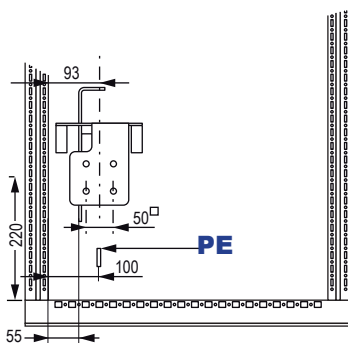
**MD2S 270TH-O / MD2S 340TH-O
MD2S 400TH-O / MD2S 500TH-O**



MD2S 600TH-B / MD2S 750TH-B / MD2S 900TH-B

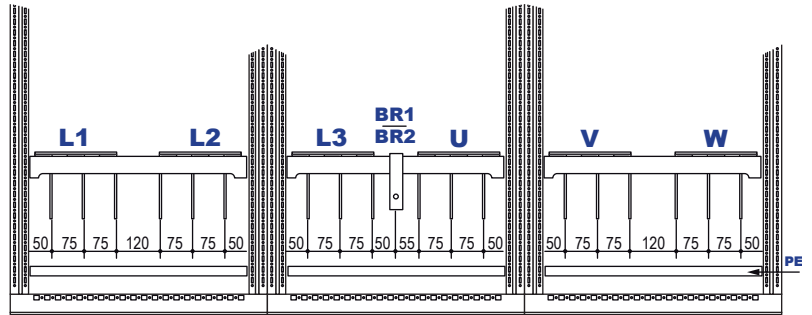
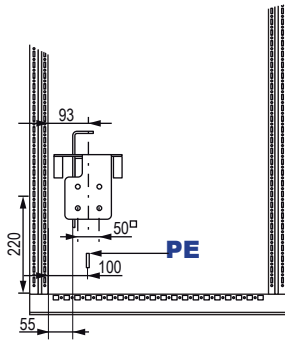


MD2S 600TH-O / MD2S 750TH-O / MD2S 900TH-O

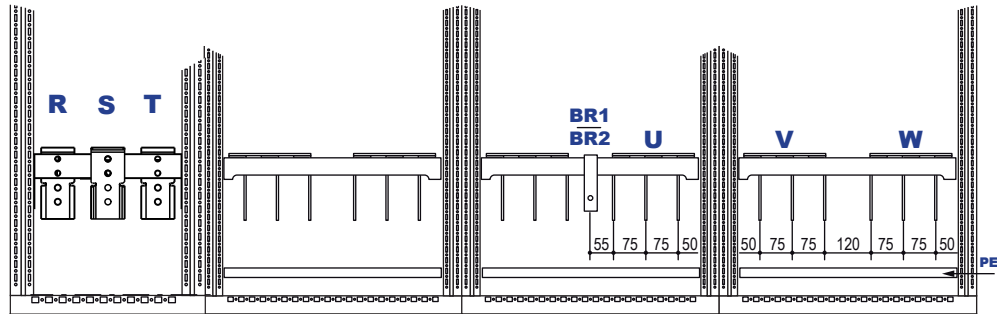
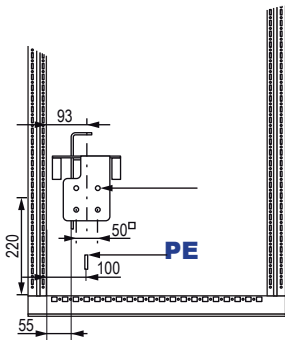


CONNECTIONS

MD2S 1200TH-B / MD2S 1500TH-B



MD2S 1200TH-O / MD2S 1500TH-O



3.1.5 - Cables and fuses

⚠ • It is the responsibility of the user to connect the Powerdrive MD2S and fit protective devices in accordance with the legislation and regulations in force 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.

- The installation must have a short-circuit current (I_{sc}) > 20 I_L at the point of drive connection.
- This table is given for information only, and must under no circumstances be used in place of the current standards.

I_L : Maximum line current

I_{co} : Continuous output current

POWERDRIVE rating		AC supply							Motor	
		400 V - 50 Hz			460/480 V - 60 Hz					
		I_L (A)	Fuses Gg type (1)	Cable cross-section (mm ²) (2) (4) (5)	I_L (A)	Fuses		Cable cross-section (mm ²) (2) (4) (5)	I_{co} (A)	Cable cross-section (mm ²) (3) (4) (5)
				Gg type (1)	Class J (UL)					
100T	Heavy	140	160	3x50 + PE	120	160	200	3x50 + PE	142	3x50 + PE
	Normal	170	200	3x70 + PE	150	200	225	3x70 + PE	175	3x70 + PE
120T	Heavy	170	200	3x70 + PE	150	200	225	3x70 + PE	170	3x70 + PE
	Normal	205	250	3x95 + PE	180	200	250	3x70 + PE	212	3x95 + PE
150T	Heavy	205	250	3x95 + PE	180	200	250	3x70 + PE	220	3x95 + PE
	Normal	245	315	3x120 + PE	210	250	300	3x95 + PE	250	3x120 + PE
180T	Heavy	245	315	3x120 + PE	210	250	300	3x95 + PE	260	3x150 + PE
	Normal	295	315	3x150 + PE	240	315	400	3x120 + PE	315	3x185 + PE
220T	Heavy	295	315	3x150 + PE	240	315	400	3x120 + PE	310	3x185 + PE
	Normal	370	400	3x240 + PE	360	400	500	3x240 + PE	400	3x240 + PE
270T	Heavy	370	400	3x240 + PE	360	400	500	3x240 + PE	375	3x240 + PE
	Normal	460	500	2x[3x150 + PE]	420	500	600	2x[3x120 + PE]	470	2x[3x150 + PE]
340T	Heavy	460	500	2x[3x150 + PE]	420	500	600	2x[3x120 + PE]	470	2x[3x150 + PE]
	Normal	580	630	2x[3x185 + PE]	535	630	-	2x[3x185 + PE]	580	2x[3x185 + PE]
400T	Heavy	580	630	2x[3x185 + PE]	535	630	-	2x[3x185 + PE]	540	2x[3x185 + PE]
	Normal	650	800	2x[3x240 + PE]	595	630	-	2x[3x185 + PE]	650	2x[3x240 + PE]
470T	Heavy	650	800	2x[3x240 + PE]	595	630	-	2x[3x185 + PE]	670	2x[3x240 + PE]
	Normal	825	1000	4x[3x120 + PE]	710	800	-	4x[3x95 + PE]	800	4x[3x120 + PE]
570T	Heavy	735	1000	4x[3x120 + PE]	710	800	-	4x[3x95 + PE]	750	4x[3x120 + PE]
	Normal	915	1000	4x[3x150 + PE]	770	1000	-	4x[3x120 + PE]	880	4x[3x150 + PE]
600T	Heavy	825	1000	4x[3x150 + PE]	770	1000	-	4x[3x120 + PE]	865	4x[3x150 + PE]
	Normal	1010	1250	4x[3x185 + PE]	830	1000	-	4x[3x120 + PE]	1090	4x[3x185 + PE]
750T	Heavy	1010	1250	4x[3x185 + PE]	950	1000	-	4x[3x150 + PE]	990	4x[3x185 + PE]
	Normal	1235	1600	4x[3x240 + PE]	1070	1250	-	4x[3x185 + PE]	1220	4x[3x240 + PE]
900T	Heavy	1235	1600	4x[3x240 + PE]	1070	1250	-	4x[3x185 + PE]	1225	4x[3x240 + PE]
	Normal	1460	1800	-	1180	1600	-	4x[3x240 + PE]	1500	-
1100T	Heavy	1460	1800	-	1180	1600	-	4x[3x240 + PE]	1375	-
	Normal	1640	2000	-	1475	1800	-	-	1650	-
1400T	Heavy	1640	2000	-	1475	1800	-	-	1850	-
	Normal	2190	2500	-	1770	2000	-	-	2250	-
1700T	Heavy	2190	2000	-	1770	1800	-	-	2065	-
	Normal	2460	2500	-	2010	2000	-	-	2480	-

CONNECTIONS

POWERDRIVE rating		AC supply				Motor	
		575 V - 60 Hz/690 V - 50 Hz					
		I_L (A)	Fuses		Cable cross-sections (mm ²) (2) (4)	I _{co} (A)	Cable cross-sections (mm ²) (3) (4)
Gg type (1)	Class J (UL)						
270TH	Heavy	210	250	300	3x95 + PE	220	3x95 + PE
	Normal	260	315	350	3x120 + PE	280	3x150 + PE
340TH	Heavy	260	315	350	3x120 + PE	270	3x150 + PE
	Normal	330	400	450	3x185 + PE	340	3x185 + PE
400TH	Heavy	325	400	450	3x185 + PE	335	3x185 + PE
	Normal	415	400	500	2x[3x120 + PE]	415	2x[3x120 + PE]
500TH	Heavy	415	400	500	2x[3x120 + PE]	390	2x[3x120 + PE]
	Normal	470	500	600	2x[3x150 + PE]	470	2x[3x150 + PE]
600TH	Heavy	470	500	600	2x[3x150 + PE]	490	2x[3x150 + PE]
	Normal	570	630	-	2x[3x185 + PE]	630	2x[3x185 + PE]
750TH	Heavy	570	630	-	2x[3x185 + PE]	615	2x[3x185 + PE]
	Normal	730	800	-	4x[3x120 + PE]	780	4x[3x120 + PE]
900TH	Heavy	730	800	-	4x[3x120 + PE]	720	4x[3x120 + PE]
	Normal	885	1000	-	4x[3x150 + PE]	880	4x[3x150 + PE]
1200TH	Heavy	885	1000	-	4x[3x150 + PE]	900	4x[3x150 + PE]
	Normal	1145	1250	-	4x[3x240 + PE]	1180	4x[3x240 + PE]
1500TH	Heavy	1145	1250	-	4x[3x240 + PE]	1075	4x[3x240 + PE]
	Normal	1300	1600	-	-	1320	-

Note: The line current value I_L is a typical value which depends on the source impedance.

(1) The aR semi-conductor fuses included as standard do not protect the drive power supply line. They must be combined with an overload protection device (gG fuses, C type circuit-breaker, etc.) suitable for the installation configuration and located at the start of the line.

(2) The recommended AC supply cable cross-sections have been determined for single-core cable with a maximum length of 20 m. For longer cables, take line drops due to the length into account.

(3) The motor cable cross-sections are given for information only for a current corresponding to the value of the I_{co} current at 3 kHz in normal duty, a maximum length of 50 m, output frequency less than 100 Hz and an ambient temperature of 40°C. **The recommended motor cables are shielded multicore type.** The values supplied are typical values.

Example: Cable cross-section of 2 x [3 x 150 + PE] corresponds to 2 cables each consisting of 3 phase conductors (cross-section 150 mm²) + earth conductors (see below).



(4) The earth (PE) conductor cross-section cannot be less than half the cross-section of a live conductor, with the same material used. Example: The earth conductor cross-section for a live conductor 2x 240 mm² must be:

- 2x 120 mm²

- 2 x (3 x 40 mm²) when the earth conductor is divided by 3 (see above figure)

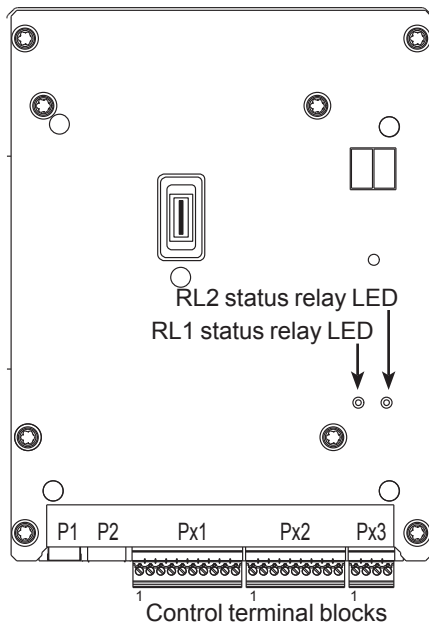
(5) For the Powerdrive MD2S 600T/750T/900T/1100T/1400T/1700T:

- The cables for each of the motor U/V/W phases must be distributed symmetrically over the U/V/W connection plates in each drive cabinet
- In -B versions, the incoming line cables must be distributed symmetrically over the L1/L2/L3 connection plates in each drive cabinet

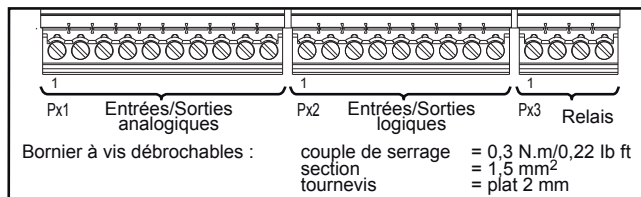
3.2 - Connection of the control

- ⚠ • The Powerdrive MD2S inputs have a positive logic configuration. Using a drive with a control system which has a different control logic may cause unexpedted starting of the motor.
- The Powerdrive MD2S control circuit is isolated from the power circuits by single insulation. Its electronic 0V is connected to the connection terminal on the outer protective conductor (earth terminal). 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 complying with SELV safety requirements, additional insulation must be inserted to maintain the SELV classification (see EN 61140).

3.2.1 - Control terminal block location



Bornier de contrôle



3.2.2 - Control terminal block characteristics

3.2.2.1 - PX1 terminal block characteristics

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

2	AI1+	Differential analog input 1 (+)
3	AI1-	Differential analog input 1 (-)
Factory setting		0-10V speed reference
Input type		± 10 V differential bipolar analog voltage (for common mode, connect terminal 3 to terminal 6)
Absolute maximum voltage range		± 36 V
Voltage range in common mode		± 24 V/0 V
Input impedance		> 100 kΩ
Resolution		11 bits + sign
Sampling period		2 ms
Input filter bandwidth		~ 200 Hz

4	AI2+	Differential analog input 2 (+)
5	AI2-	Differential analog input 2 (-)
Factory setting		4-20 mA speed reference
Input type		Unipolar current (0 to 20 mA, 4 to 20 mA, 20 to 0 mA, 20 to 4 mA)
Absolute maximum current		30 mA
Voltage range in common mode		± 24 V/0 V
Input impedance		100 Ω
Resolution		12 bits
Sampling period		2 ms
Input filter bandwidth		~ 200 Hz

6	0V	Analog circuit common 0 V
The 0 V on the electronics is connected to the metal ground of the drive		

7	AI3	Analog input 3
Factory setting		No assignment
Input type		± 10 V bipolar analog voltage in common mode or unipolar current (0 to 20 mA, 4 to 20 mA)
Resolution		11 bits + sign
Sampling period		2 ms
Input filter bandwidth		~ 200 Hz
Voltage range in common mode		± 24 V/0 V
Voltage mode		
Input impedance		> 50 kΩ
Absolute maximum voltage range		± 30 V
Current mode		
Input impedance		100 Ω
Absolute maximum current		30 mA

CONNECTIONS

8	AO1	Analog output	
Factory setting		4-20 mA motor current signal	
Output type		Bipolar analog voltage in common mode or unipolar current in common mode	
Resolution		13 bits	
Sampling period		2 ms	
Voltage mode			
Voltage range		± 10 V	
Load resistance		1 kΩ minimum	
Current mode			
Current range		0 to 20 mA, 4 to 20 mA	
Load resistance		500 Ω maximum	

9	DI1 PTC	Digital input 1 or PTC thermal sensor	
Factory setting		No assignment	
Sampling period		2 ms	
Thermal sensor input			
Voltage range		± 10 V	
Trip threshold		> 3.3 kΩ	
Reset threshold		< 1.8 kΩ	
Digital input			
Type		Digital input in positive logic	
Voltage range		0 to + 24 V	
Absolute maximum voltage range		0 V to + 35 V	
Thresholds		0 : < 5 V 1 : > 13 V	

10	0V	Analog circuit common 0 V	
The 0 V on the electronics is connected to the metal ground of the drive			

3.2.2.2 - PX2 terminal block characteristics

1	+24V ref	+24 VDC user output	
9			
+24 VDC user output			
Output current		100 mA	
Accuracy		± 5%	
Protection		Current limiting and setting to trip mode	


2	DO1	Digital output	
Factory setting		Zero speed	
Characteristic		Open collector	
Absolute maximum voltage		+ 30 V/0 V	
Overload current		150 mA	

3	STO-1	Drive enable input 1 (Safe Torque Off function)	
6	STO-2	Drive enable input 2 (Safe Torque Off function)	
Input type		Positive logic only	
Absolute maximum voltage		+ 30 V	
Thresholds		0 : < 5 V 1 : > 13 V	
Response time		< 20 ms	

4	DI2	Digital input 2	
5	DI3	Digital input 3	
7	DI4	Digital input 4	
8	DI5	Digital input 5	
DI2 factory setting		Selection of speed reference	
DI3 factory setting			
DI4 factory setting		Run FWD/Stop input	
DI5 factory setting		Run reverse/Stop input	
Type		Digital inputs in positive logic	
Voltage range		0 to + 24 V	
Absolute maximum voltage range		0 to + 35 V	
Thresholds		0 : < 5 V 1 : > 13 V	

3.2.2.3 - PX3 terminal block characteristics

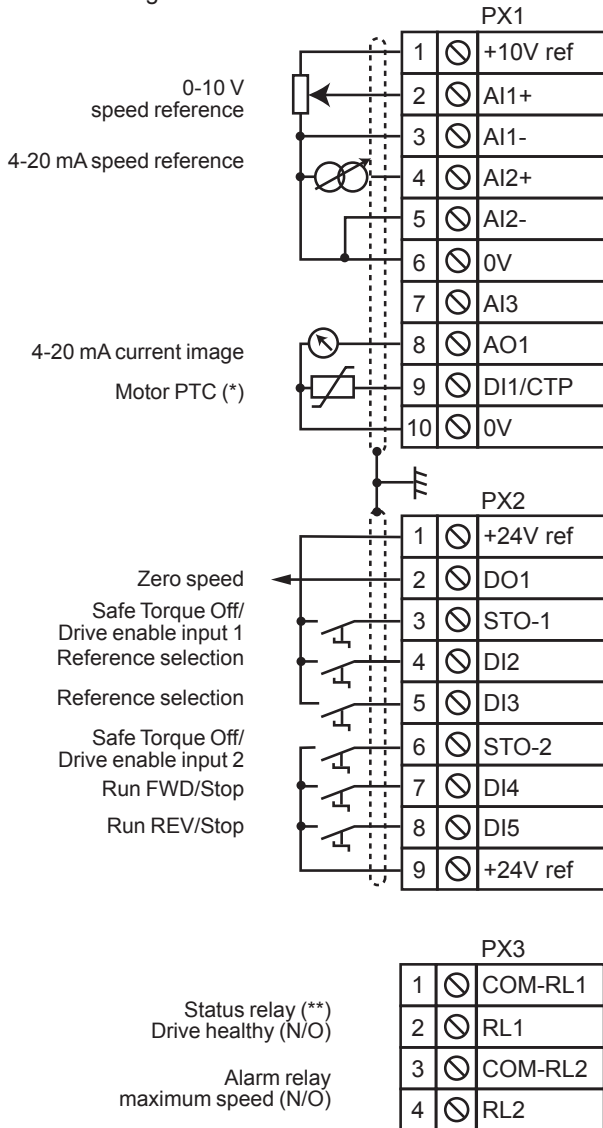
1	COM-RL1	N/O (normally open) relay output	
2	RL1		
3	COM-RL2	N/O (normally open) relay output	
4	RL2		
Factory setting RL1		Drive status relay	
Factory setting RL2		Maximum speed alarm	
Voltage		250 VAC	
Maximum contact current		2 A - 250 VAC, resistive load	
		1 A - 250 VAC, inductive load	
		2 A - 30 VDC, resistive load	

 • Provide a fuse or other overcurrent protection in the relay circuit.

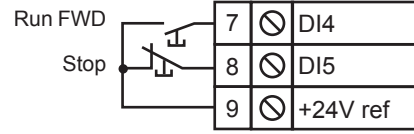
Note: When the RL1 or RL2 relay is activated, the corresponding status LED on the control board lights up.

3.2.3 - Factory configuration of control terminal blocks

Nota : For more details on the parameters, please refer to the commissioning manual ref.4617



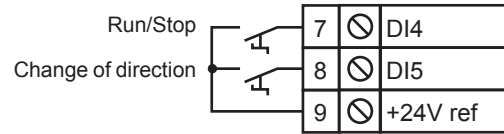
- **Modification of the Run/Stop control logic**
- For "3-wire" control (jog Run/Stop):



List of parameters to set:

- Ctr.06 (06.04)** = Run Latched (1)
- I/O.10 (08.25)** = **06.39** Stop (DI5 terminal)

- For Run/Stop control with change of direction:



List of parameters to set:

- Ctr.06 (06.04)** = Run Fwd/Rev (2)
- I/O.09 (08.24)** = **06.34** Run/Stop (DI4 terminal)
- I/O.10 (08.25)** = **06.33** Fwd/Reverse (DI5 terminal)

- **Selection of the reference via digital inputs:**

DI2	DI3	Selection
0	0	Voltage speed reference (0-10 V) on analog input AI1+, AI1-
0	1	Current speed reference (4-20 mA) on analog input AI2+, AI2-
1	0	Preset reference 2
1	1	Spd.05 (01.22) to be set

Note: This configuration has been obtained from a drive with factory settings (default parameter settings).
The STO-1 and STO-2 inputs must be closed before giving a run command.

(*) If the motor thermal sensor needs to be connected to DI1/PTC, set **Mtr.06 (05.70)** = Drive terminal (1).

(**) If the 2 STO inputs are not in the same status, the relay RL1 opens.

3.3 - STO-1/STO-2 inputs: Safe Torque Off function

The STO-1 and STO-2 inputs are safety inputs that can be used to disable the drive output so no torque at the motor shaft is generated.

They are independent of one another. They are created by simple hardware not connected to the microcontroller. They act on two different stages of the IGBT output bridge control. To enable the drive, the STO-1 and STO-2 inputs must be connected to the +24V source.

The opening of a minimum of one input locks the output bridge.

These 2 inputs can be used in conjunction to create a "Safe Torque Off" function with a logic combining 2 separate channels.

In this configuration, the "Safe Torque Off" function is guaranteed with a very high level of integrity in conformity with standards:

- EN 61800-5-2
- EN/ISO 13849-1: 2006; PLe
- IEC/EN 62061: 2005; SIL3

(CETIM approval no. CET0047520)

This built-in function enables the drive to act as a contactor that switches off the motor power, allowing a deceleration in a free wheel mode. This corresponds to an uncontrolled stop in accordance with stop category 0 og IEC 60204-1.

The STO-1 and STO-2 inputs are compatible with self-tested logic outputs in controllers such as PLCs, for which the test pulse lasts for 1 ms maximum.

If the data sent by the 2 inputs are not identical, this generates a drive trip. The RL1 relay opens and the drive indicates a "t.r./63" trip on the drive 2-digit display or "STO input inconsistency" trip on the parameter-setting interface.

For correct use, the power and control connection diagrams described in the following paragraphs must be adhered to.

⚠ • The STO-1/STO-2 inputs are safety components which must be incorporated in the complete system dedicated to machine safety. As for any installation, the complete machine must be subject to a risk analysis. The integrator must determine the safety category which the installation must comply with.

• The STO-1 and STO-2 inputs, when open, lock the drive, so 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 the locking automatically after the end of braking.

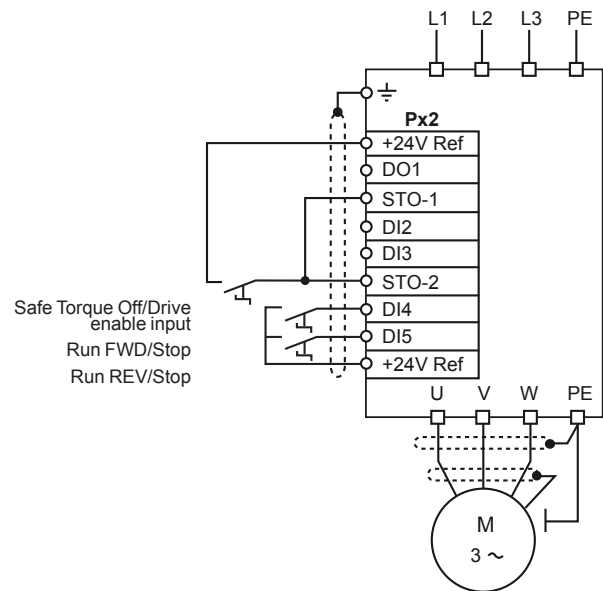
If braking needs to be a machine safety function, it must be provided by an electromechanical solution since the dynamic braking by the drive function is not considered as a secure disable function.

• The STO-1/STO-2 inputs do not provide the electrical isolation function. Prior to any work carried out on the drive / installation, the power supply must therefore be switched off through an approved isolating device (isolator, switch, etc).

• The line switch integrated as an option in the drive does not isolate the drive input busbars. During the installation and maintenance phases, make sure that the power supply line is disrupted.

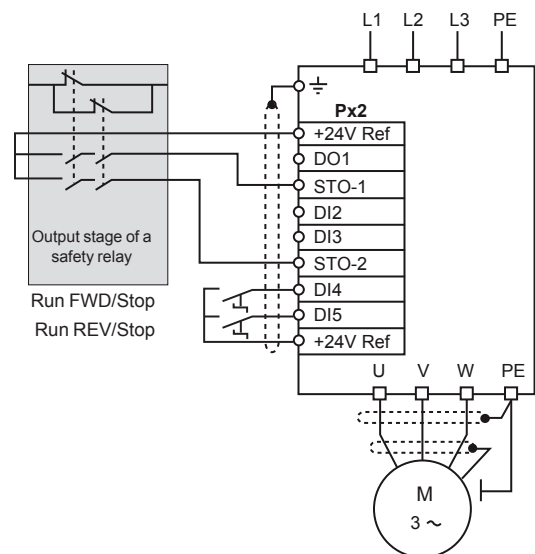
3.3.1 - Single channel locking (SIL1 - PLb)

3-phase AC power supply, in accordance with safety standard IEC/EN 62061: 2005 and EN/ISO 13849-1: 2006 - Single channel locking (SIL1 - PLb).



3.3.2 - Double channel locking (SIL3 - PLe).

3-phase AC power supply, in accordance with safety standard IEC/EN 62061: 2005 and EN/ISO 13849-1: 2006 - Double channel locking (SIL3 - PLe)



4 - GENERAL EMC - HARMONICS - MAINS INTERFERENCE

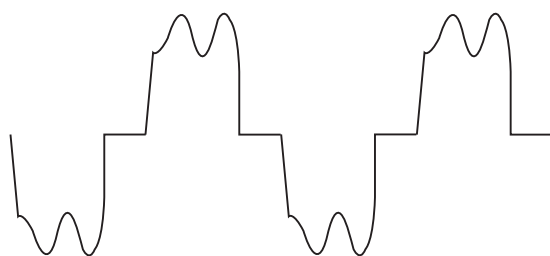
The power structure of frequency inverters leads to the occurrence of two types of phenomenon :

- Low-frequency harmonics fed back to the mains supply
- Emission of radio-frequency signals (RFI)

These are independent phenomena. They have different consequences on the electrical environment.

4.1 - Low-frequency harmonics

The rectifier, at the head of the frequency inverter, generates a non-sinusoidal AC line current.



3-phase rectifier line current consumption.

This current carries harmonics with number $6n \pm 1$.

Their amplitudes depend on the impedance of the mains supply upstream the rectifier bridge, and on the structure of the DC bus downstream the rectifier bridge.

The more inductive the mains supply and the DC bus, the more these harmonics are reduced.

They only affect the quality of the mains supply for loads on frequency inverters of several hundred kVA, if these loads represent more than a quarter of the total load on a site.

In the above conditions:

- These harmonics have virtually no effect on the electrical energy consumption level.
- The associated temperature rises in transformers and motors directly connected to the mains supply are negligible.

It is very rare for these low-frequency harmonics to cause interference on sensitive equipment.

4.2 - Radio-frequency interference: Immunity

4.2.1 - 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.

4.2.2 - 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).

4.2.3 - 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.

4.3 - Radio-frequency interference: Emission

4.3.1 - General

In order to limit motor losses and obtain a low level of motor noise, frequency inverters use high-speed switches (transistors, semi-conductors) which switch high voltages (> 550 V) at high frequencies (several kHz).

As a result, they generate radio-frequency (R.F.) signals which may disturb operation of other equipments 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 through the motor via the metal structures which support it.
- 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 distribution company.

4.3.2 - Standards

Standard EN 61800-3 defines the maximum emission levels to comply with according to the type of environment the drive is installed in. In some cases, it may be necessary to add an external RFI filter (see section 4.6).

4.4 - Mains supply

4.4.1 - General

Each industrial power supply has its own intrinsic characteristics (short-circuit capability, voltage value and fluctuation, phase imbalance, etc) and supplies equipment some of which can distort its voltage either permanently or temporarily (notches, voltage dips, overvoltage, etc). The quality of the mains supply has an impact on the performance and reliability of electronic equipments, especially variable speed drives.

The **Powerdrive MD2S** is designed to operate with mains supplies typical of industrial sites throughout the world. However, for each installation, it is important to know the characteristics of the mains supply in order to carry out corrective measures in the event of abnormal conditions.

4.4.2 - Mains transient overvoltages

There are numerous sources of overvoltages on an electrical installation:

- Connection/disconnection of banks of power factor correction capacitors
- High-power thyristor-controlled equipment (oven, DC drive, etc)
- Results of lightning

4.4.2.1 - Connection/disconnection of a bank of power factor correction capacitors

Connecting power factor correction capacitors in parallel on the drive power supply line when the drive is running can generate transient overvoltages that are likely to trip the drive safety devices, or even damage it in extreme cases.

If banks of power factor correction capacitors are used on the power supply line, make sure that:

- The threshold between steps is low enough to avoid causing overvoltage on the line
- The capacitors are not permanently connected

4.4.2.2 - Presence of commutation notches on the line

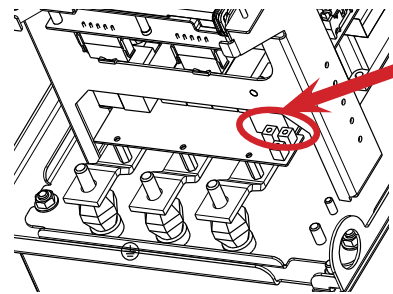
When high-power thyristor-controlled equipment is connected on the same line as the drive, it is essential to ensure that the harmonics generated by the commutation notches do not excessively distort the mains voltage and do not create voltage peaks with amplitude higher than $2 \times$ mains V_{rms} . If this is the case, it is essential to take corrective measures by inserting a choke in the line supplying the thyristor-controlled equipment or by moving the drive power supply line to another source.

4.4.3 - Unbalanced power supply

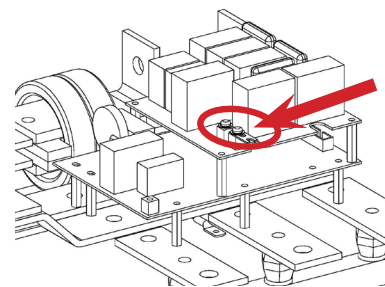
Similar to what is observed on an electric motor, the line current imbalance of a drive operating on an unbalanced mains supply may be several times the value of the voltage imbalance measured on the power supply. A highly unbalanced mains supply ($>2\%$) associated with a low mains impedance may result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

Neutral IT point connection

For IT power supplies, open the commoning link connecting the EMC capacitors to earth as indicated below.



Powerdrive MD2S 100T to 270T



Other Powerdrive MD2S ratings

4.4.4 - Ground connections

The equipotential earth bonding of some industrial sites is not always observed. This lack of equipotentiality leads to leakage currents which flow via the earth cables (green/yellow), the machine chassis, the pipework, etc, and also via the electrical equipment. In some extreme cases, these currents can trip the drive.

It is essential that the earth network is designed and implemented by the installation supervisor so that its impedance is as low as possible, so as to distribute the fault currents and high-frequency currents without them passing through electronic equipment.

Metal grounds must be mechanically connected to each other with the largest possible electrical contact area. Under no circumstances can the earth connections designed to protect people, by linking metal grounds to earth via a cable, serve as a substitute for the ground connections (see IEC 61000-5-2).

The immunity and radio-frequency emission level are directly linked to the quality of the ground connections.

4.5 - Basic precautions for installation

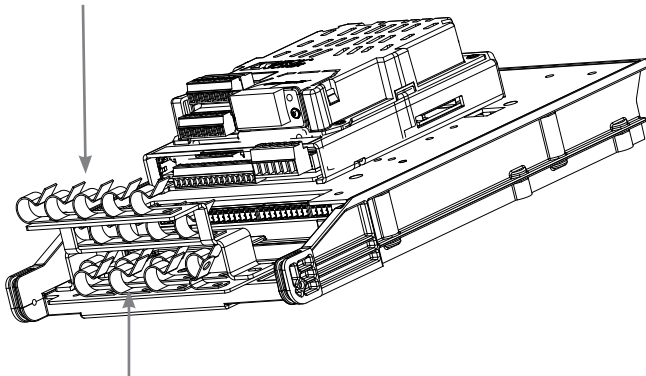
These should be taken into account when wiring the **Powerdrive MD2S** and the external components. In each paragraph, they are listed in decreasing order of effect on correct operation of the installation.

4.5.1 - Wiring inside the cabinet

- Separate as far as possible control cables and power cables (Do not run them in the same cable ducts).
- For control cables, use shielded twisted cables and connect the shield to the grounding bracket..

The bracket for connecting the option shielding is supplied with each option. To attach it, screw the bracket, placing it on top of the control cable shielding clamps (the shielding clamp furthest to the right should be removed).

Grounding bracket
of the options



Grounding bracket

4.5.2 - Wiring outside the cabinet

4.5.2.1 - Control wiring

If the control cable needs to run outside the cabinet, use a shielded cable and connect the shield to the grounding bracket.

4.5.2.2 - Power wiring

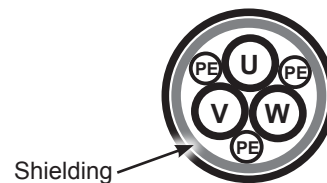
- **Connect the motor earth terminal directly to that of the drive.**



Never use shielded single-core cables

Use shielded 3-core cables with symmetrical conductors for protective earthing as indicated below.

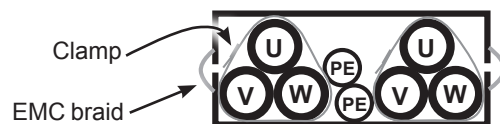
The shield must be connected at both ends: drive end and motor end (connected round the whole circumference).



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 (connected round the whole circumference).
- 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 should be interconnected by braids to ensure earth continuity. The cables must be positioned and held in a cloverleaf formation in 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 elements (probes, sensors, etc) from metal structures which may be shared by the motor support.
- The motor cables and network power cables should not be routed side by side in the same channel to reduce proximity couplings.

4.6 - Electromagnetic compatibility (EMC)

CAUTION:

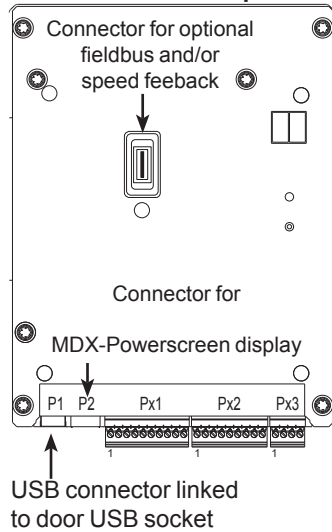
Conformity of the drive is only assured when the mechanical and electrical installation instructions described in this manual are adhered to.

Immunity			
Standard	Description	Application	Conformity
IEC 61000-4-2	Electrostatic discharges	Product casing	Level 3 (industrial)
EN 61000-4-2			
IEC 61000-4-3	Immunity standards for radiated radio-frequency	Product casing	Level 3 (industrial)
EN 61000-4-3			
IEC 61000-4-4	Bursts of fast transients	Control cable	Level 4 (industrially hardened)
EN 61000-4-4		Power cable	Level 3 (industrial)
IEC 61000-4-5	Shock waves	Power cables	Level 4
EN 61000-4-5			
IEC 61000-4-6	Generic immunity standards for conducted radio-frequency	Control and power cables	Level 3 (industrial)
EN 61000-4-6			
EN 50082-2	Generic immunity standards for the industrial environment	-	Conforming
IEC 61000-6-2			
EN 61000-6-2			
EN 61800-3	Variable speed drive standards	Conforming to the first and second environment	
IEC 61800-3			
EN 61000-3			

Emission				
Standard	Description	Catégory	Conformity conditions	
			Standard	With optional RFI filter
EN 61800-3	Variable speed drive standards	C1	-	-
		C2	-	Conforming - Cable length < 10 m - Switching frequency < 4 kHz
		C3	Conforming - Cable length < 100 m - Switching frequency < 4 kHz	Conforming - Cable length < 100 m - Switching frequency < 6 kHz

5 - PARAMETER-SETTING INTERFACE AND OPTIONS

Location of the drive connectors / ports



◦ P1 connector

This connector is a slave type B USB connector linked to door USB socket, and is used to communicate via PC using the MDX-SOFT software.

⚠ In conformity with standard EN 60950, the USB link can only be used via a device that provides isolation of 4 kV (MDX-USB isolator option).

◦ P2 terminal block

This is a standard RS485/RS422 terminal block which is used to connect a parameter-setting interface (MDX Powerscreen, MDX Keypad) or to communicate via Modbus RTU.

Terminals	Description
1	0V
2	Rx\, Tx\
3	Rx, Tx
4	24V

⚠ Check that control circuits are powered down before disconnecting the programming interface from the P2 connector.

5.1 - Parameter setting interfaces

5.1.1 - MDX-KEYPAD

5.1.1.1 - General

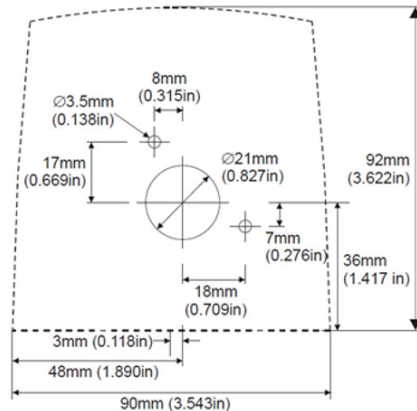
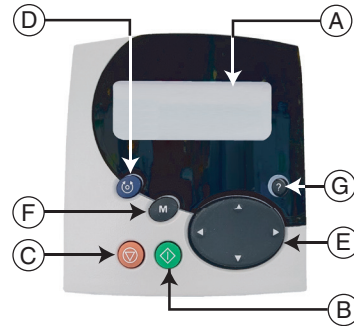
This keypad, which is remote from the drive, makes it easy to set up the **POWERDRIVE MD2S** and provides access to all parameters. Its LCD display, consisting of one line of 12 characters and 2 lines of 16 characters, offers text which can be displayed in 5 languages (English, French, German, Italian and Spanish).

The MDX-KEYPAD has 2 main functions:

- A read mode for **POWERDRIVE MD2S** supervision and diagnostics
- Access to all the **POWERDRIVE MD2S** parameters in order to optimise settings or even configure particular applications.

As soon as it is switched on, the MDX-KEYPAD is set to read mode. The buttons are used to 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.



Pos.	Function
Ⓐ	3-line backlist LCD display indicating: - The drive operating status and its lain data, - The main adjustment parameters via a “ Quick parameter setting ” menu, - All the drive parameters via 21 “ Advanced parameter setting ” menus (access via a code).
Ⓑ	Green button for run command if control via the keypad is enable. See “ Parameter setting via the keypad ”.
Ⓒ	Red button for drive reset or to give a stop command if control via the keypad is enabled. See parameters Ctr.05 (6.43) and 06.12 .
Ⓓ	Blue button for change of direction of rotation if control via the keypad is enabled. See parameter Ctr.05 (6.43) .
Ⓔ	Navigation button () for moving through the various menus and changing the contents of parameters.
Ⓕ	button for storing settings and changing mode (display, read, set parameters).
Ⓖ	“?” button not used.

For more information, see the commissioning manual ref.4617. This manual describes configuration using the MDX-Powerscreen parameter-setting interface, but the commissioning procedure also applies to the MDX-KEYPAD.

5.1.1.2 - Installation

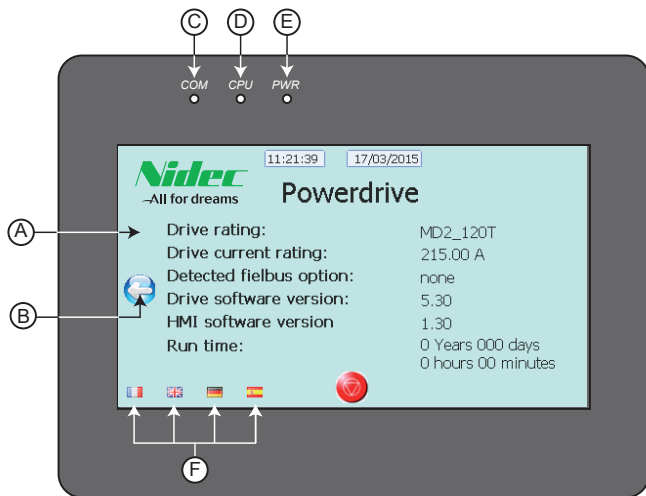
The MDX-KEYPAD does not require any special installation. Simply connect it via its 1.5 metre cable (supplied with the keypad), as shown in section 5.1.1.

5.1.2 - MDX-Powerscreen

• General

The POWERSCREEN interface is a touch screen which can be used to access various menus to setup and supervise the drive. It is installed as standard on the **POWERDRIVE MD2S**.

After the loading phase following the power-up of the drive, the parameter-setting interface displays the screen below in french. Select language using the "F" buttons below



Ref.	Function
A	4.3" touch screen
B	Touch-sensitive button to access the main menu
C	"COM" LED, indicates the state of the communication with the drive. Off: no communication Flashing: communicating
D	"CPU" LED, indicates the status of the interface CPU
E	"PWR" LED, indicates the state of the interface power supply
F	Touch-sensitive buttons for language selection (can take a few minutes to load)

• Architecture

From the welcome screen, press the button to access the main page of the parameter-setting interface, consisting of 5 touch-sensitive buttons:

- **Information:** Can be used to obtain information very quickly about the drive, the fieldbus option, the parameter-setting interface, and can also be used to select the language.
- **Read mode:** Is used to display the status of the drive when stopped or in operation, as well as its main operating data.
- **Parameter setting:** Used for reading and/or modifying all the drive parameters, as well as setting the date and time on the display.

- **Control via keypad:** Gives direct access to motor control via the touch screen (Run/Stop, direction of rotation, speed reference). These screen parameters can be set using the Parameter setting/Parameter setting via the keypad menu. Control via the keypad is disabled in factory-set configuration.
- **Trip history:** Gives a quick overview of the last 10 drive trips.
- : This button is accessible on all screens in factory-set configuration and is used to give a stop command (can be disabled).

At any time and regardless of the screen displayed, the button can be used to return to previous pages, as far as the interface main page.

For further information, see the commissioning manual ref. 4617.

5.1.3 - MDX-SOFT

The MDX-SOFT enables parameter setting or supervision of the **Powerdrive MD2S** from a PC. Numerous functions are available:

- Fast commissioning
- File saving
- Comparison of 2 files or one file with the factory settings
- Printing of a complete file or differences compared to the factory settings
- Supervision
- Diagnostics

To connect the PC to the Powerdrive MD2S, use an "MDX-USB Isolator" isolated USB cable.

This software can be downloaded from the web at the following address: <http://www.leroy-somer.com/>

Powerdrive MD2S can be set via the USB connector, even if the drive is not powered.

Attention. In this case, options modules will not be powered and settings will not be saved. To make an option module setting / backup , it is necessary to provide an auxiliary power supply.

5.1.4 - Special settings

Refer to the installation manual of (ref. 4617) for details on settings.

• Clogged filter alarm

Powerdrive MD2S has an "overtemperature" alarm (# 10.18) which warns the user when the internal temperature of the product reaches 60°C or when a power module overheats.

To set a different alarm treshold, you can use the following settings:

Using comparator 3:

- #12.63 = 7.55 (source = control board temperature)
- #12.64 = 60 (threshold = 60 ° C)
- #12.65 = 2°C (hysteresis)
- #12.65 = 0

To display information on the HMI of the drive:

#12.67 = 10.54 (User Alarm 1)

To adress information to a digital output (eg. DO1)

8.26 = 12.61 (DO1 assigned to comparator 3)

Reminder: **Powerdrive MD2S** filters are washable and must be kept clean. See § 7 - Maintenance

5.2 - Add-on options

The control board is designed to be plugged with various optional modules. Several options can be combined:

- Fieldbus (see section 5.2.1)
- Speed feedback (see section 5.2.2)
- Additional I/O (see section 5.2.3)

5.2.1 - Fieldbus modules

Depending on the configuration of the speed feedback and inputs/outputs optional modules, two types of fieldbus are proposed:



MDX option: option to be fitted to the control board



CM module: compact module to be integrated in an existing MDX board

Association table :

Main option	Fieldbus	
	MDX version	CM version
None		
MDX-ENCODER		X
MDX-RESOLVER		X
MDX-I/O Lite		X
MDX I/O M2M	X	
MDX-ENCODER + MDX I/O M2M		X
MDX-RESOLVER + MDX I/O M2M		X

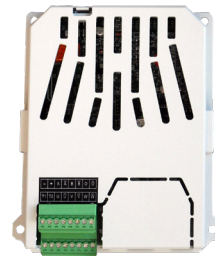
Fieldbus modules can be used to communicate with the corresponding networks respective. They can be integrated in and are supplied by the drive.

The following fieldbus are available on **Powerdrive MD2S** :

- **MDX/CM-MODBUS** : Modbus RTU (RS485/232)
- **MDX/CM-ETHERNET** : Modbus TCP (Ethernet)
- **MDX/CM-ETHERNET-IP** : EtherNet/IP
- **MDX/CM-PROFIBUS** : Profibus DP V1
- **MDX/CM-PROFINET** : ProfiNet

For more details, consult the specific documentations.

5.2.2 - Speed feedback options



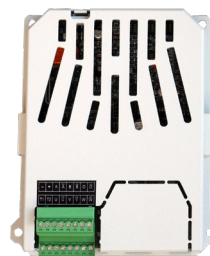
Two options are available to manage the motor speed feedback. :

- **MDX-ENCODER:** The MDX-ENCODER option is used to It manages incremental encoders with or without commutation channels (up to 500kHz).
- **MDX-RESOLVER:** The MDX-RESOLVER option is used to manage 2 to 8 poles resolvers.

For more details, consult the specific documentations.

5.2.3 - Additional I/O options

Two options are available to increase the **Powerdrive MD2S** number of inputs and outputs :



MDX-I/O LITE



MDX-I/O M2M

Fonctions	MDX-I/O Lite	MDX-I/O M2M
Analog input (V, mA)	-	1
Differential analog input (V, mA)	1	1
Analog ouputs (V, mA)	2	1
Motor thermistor KTY84-130 or PT100	1	1
Digital inputs	2	4
Digital outputs	1	2
Assignable relay	1	2
Drive forced fan's management	✓	✓
Real time clock	-	✓
Ethernet connection : • WEB pages: drive configuration and status • 2 Programmable emails • Configuration backup & restoration	-	✓
Datalogger	-	✓

For more details, consult the specific documentations.

5.3 - Electrical protection

In the factory, an isolating device can be incorporated into the **Powerdrive MD2S**.

⚠ The AC supply switchgear integrated as an option in the drive does not isolate the drive input busbars. During the installation and maintenance phases, make sure that the power supply line is open circuit.

The references and dimensions of the options below, mounted in a **Powerdrive MD2S**, are given on the LEROY-SOMER configurator: <http://configureurls.leroy-somer.com>

5.3.1 - Switch

A 3-pole switch is available for the **Powerdrive MD2S**. This option is used to isolate the motor from the AC supply during maintenance operations.

- Fully visible break with padlockable handle on the front of the drive cabinet (can be turned manually, padlock not supplied)
 - Conforming to standard IEC/EN 60947-3
- The QS3P switch must **always** be included in aR semiconductor fuse kits, in accordance with the table in section 3.1.5.

Characteristics at 40°C in category AC21

I_{th} = thermal current

Rating	Switch			
	Reference	I_{th} @ 400 V (A)	I_{th} @ 690 V (A)	Number of operations
150T to 150T	QS3P_250A	250	250	10,000
180T and 220T	QS3P_400A	400	400	5,000
270TH and 340TH				
270T to 340T	QS3P_630A	630	630	5,000
400TH to 600TH	QS3P_800A	800	800	3,000
400T				
750TH	QS3P_1000A	1000	800	3,000
470T to 600T				
750T	QS3P_1250A	1250	1000	4,000
900TH				
900T	QS3P_1600A	1600	1000	4,000
1100T	QS3P_1800A	1800	1000	4,000
1400T and 1700T	Please consult Nidec Leroy-Somer			
1200TH to 1500TH				

The dimensions of a **Powerdrive MD2S** equipped with a switch is described in section 2.6.

5.3.2 - Emergency stop

- **MD-AU 1: SIL1/PLb protection device**

The MD-AU 1 protection device consists of an emergency stop wired on the STO inputs and mounted on the front.

- **SIL3/PLe protection device**

The **Powerdrive MD2S** can be made compatible with SIL3/PLe by incorporating a safety relay for double channel locking.

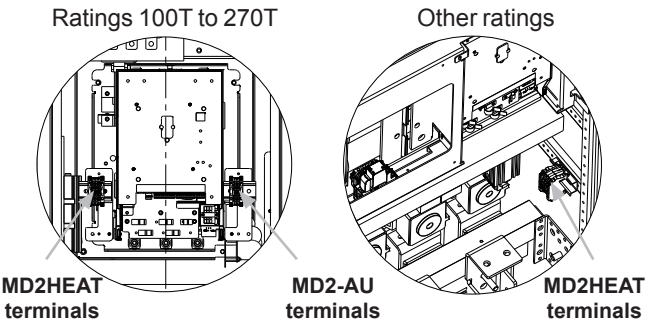
Contact NIDEC LEROY-SOMER.

5.4 - Heater kit

To prevent condensation in the **Powerdrive MD2S** a self-limited temperature heater is available as an option.

The connection is made on a dedicated terminal (see below). The installer must provide ~230V single phase protection (fuse rating indicated below) and ensure its control (the module must be turned off when the drive is in operation).

Reference	Pn (W)	Max current (A)	Time delay fuse (A)
MD2HEAT2	150	9	6,3



5.5 - RFI filter

The use of RFI filters helps reduce the emission levels of conducted and radiated radio-frequency signals. They ensure that **Powerdrive MD2S** components conform to variable speed drive standard EN61800-3.

Depending on the drive used, install the RFI filter recommended in the table below between the AC supply and the drive input.

Powerdrive MD2S rating	RFI filter			
	Reference	Irated at 40°C (A)	Leakage current (mA)	Losses (W)
100T	FN 3359 HV-180	197	<6	34
120T to 150T	FN 3359 HV-250	250	<6	49
270TH	FN 3359 HV-320	350	<6	19
180T and 220T	FN 3359 HV-400	438	<6	29
340TH				
270T to 400T	FN 3359 HV-600	657	<6	44
400TH to 600TH				
470T to 600T	FN 3359 HV-1000	1095	<6	60
750TH to 900TH				
750T to 1100T	FN 3359 HV-1600	1600	<6	131
1200TH and 1500TH				
1400T and 1700T	FN 3359 HV-2500	2500	<6	300

WARNING:

The specific design of these filters makes it possible to use them in the context of installations with a neutral IT point connection. The installer should, however, ensure that insulation monitoring systems dedicated to these installations are suitable for monitoring electrical equipment that may contain electronic variable speed drives.

5.6 - Braking modules and associated resistors

Braking phases occur when energy is sent back from the motor to the drive. Without an additional device, the maximum power that can be absorbed by a **Powerdrive MD2S** is limited to its internal losses. If the application calls for significant braking power (inertia slowdown with short deceleration times, fast braking, etc.) a device must be added to the standard product consisting of an add-on braking module and an external resistor.

Several MD2TF braking modules can be combined to increase the braking capacity. They must not be mounted in parallel on a single resistor: use as many resistors as there are braking modules.

5.6.1 - Braking modules

MD2TF braking modules consist of an IGBT transistor and a control circuit.

Rating	T	TH
Braking transistor reference	MD2TF 400	MD2THF 330
Peak current (A)	400	330
Continuous current (A)	250	110
Minimum value of the associated resistor (Ω)	1.8	3.5

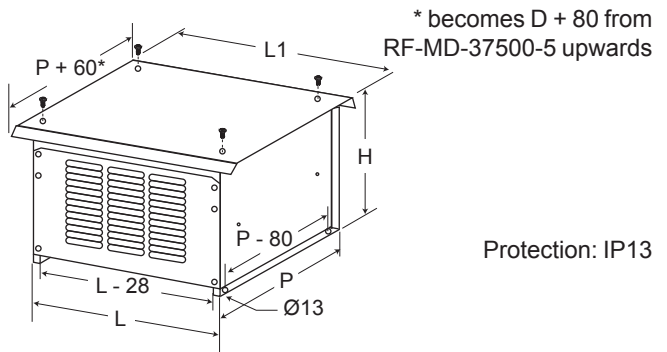
Braking transistors are only mounted in the factory.

Nidec Leroy-Somer offers MD2TF units on their own or combined with a thermal relay. This must be set to the stated current for the resistor associated with it. See table below.

5.6.2 - Braking resistors

- ⚠ **Before installing a braking resistor, make sure that its presence does not constitute a fire hazard.**
- A braking resistor must be mounted outside the drive cabinet, as close as possible. Ensure that it is incorporated in a grounded ventilated metal case, to avoid any direct contact.**
- The braking resistor must be wired in series with a thermal relay calibrated to the resistor rms current. When the relay trips, the drive must immediately stop and be disconnected from the AC supply.**
- Specific information warning of the presence of high temperature must be affixed to the resistor.**
- The braking resistor must be installed so that it does not damage neighboring components with its heat dissipation.**

• Dimensions



• Braking resistor characteristics:

Type	Electrical characteristics							Dimensions (mm)				Weight (kg)
	Ohmic value (Ω)	Thermal power (kW)	Rating	Braking transistor kit	Thermal relay	Peak power (kW)	rms current (A)	L	L1	D	H	
RF-MD-27500-10	10	27.5	T	MD2TF400-27500	48 to 65A	51	52	860	890	480	690	66
RF-MD-37500-5	5	37.5	T	MD2TF400-37500	80 to 104A	100	87	960	1140	380	1150	77
RF-MD-55000-5	5	55	T	MD2TF400-55000	95 to 125A	100	105	960	1140	540	1150	105
RF-MD-75000-4	3.5	75	T	MD2TF400-75000	120 to 160A	145	146	1080	1260	680	1150	145
			TH	MD2THF330-75000	120 to 160A	345	146					
RF-MD-110000-3	2.35	110	T	MD2TF400-110000	160 to 220A	220	216	960	1140	740	1520	200

5.7 - Internal wiring schemes for the options

The internal wiring schemes for the **Powerdrive MD2S** for the options described in the preceding pages are illustrated on the next 4 pages.

OPTIONS REPRESENTÉES SUR CE SCHEMA DE CABLAGE:
 OPTIONS SHOWN IN THIS WIRING DIAGRAM:

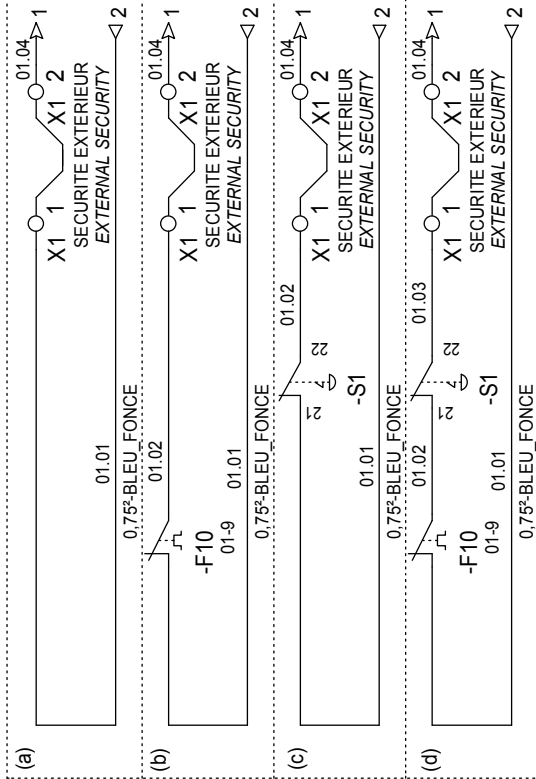
(CB)	INTER-SECTIONNEUR : CIRCUIT BREAKER :	AVEC YES
(FLT)	FILTRE CEM : EMC FILTER :	AVEC YES
(BT)	TRANSISTOR DE FREINAGE + RELAIS THERMIQUE * : BRAKING TRANSISTOR + THERMAL RELAY * :	AVEC/SANS YES / NO
(ES)	BOUTON ARRÊT D'URGENCE : EMERGENCY STOP BUTTON :	AVEC/SANS YES / NO
(FCK)	GESTION DES VENTILATIONS : MD2 FAN CONTROL KIT :	AVEC/SANS YES / NO
(HR)	RESISTANCE DE RECHAUFFAGE : HEATING RESISTOR :	AVEC/SANS YES / NO

(*) Voir la notice d'installation pour la localisation
 See the installation manual for localization

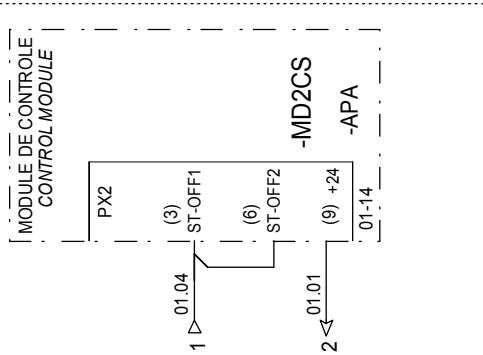
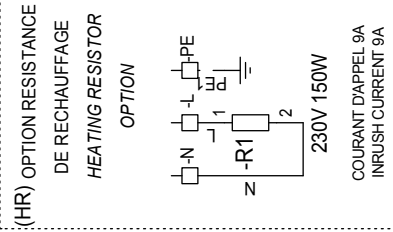
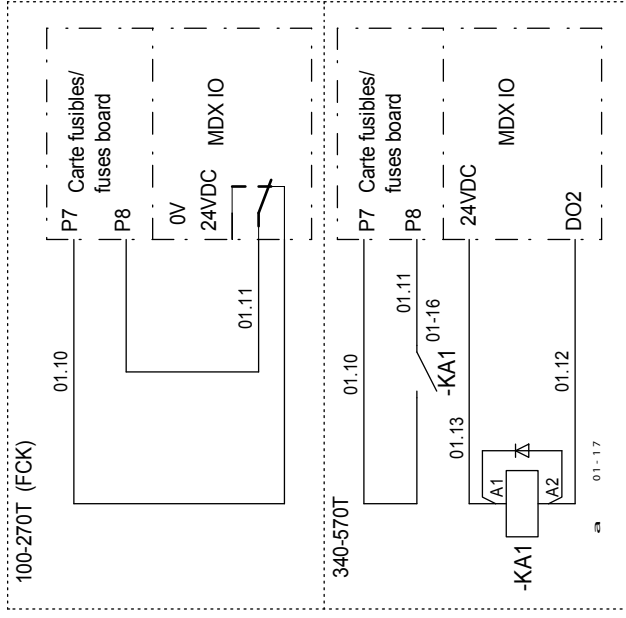
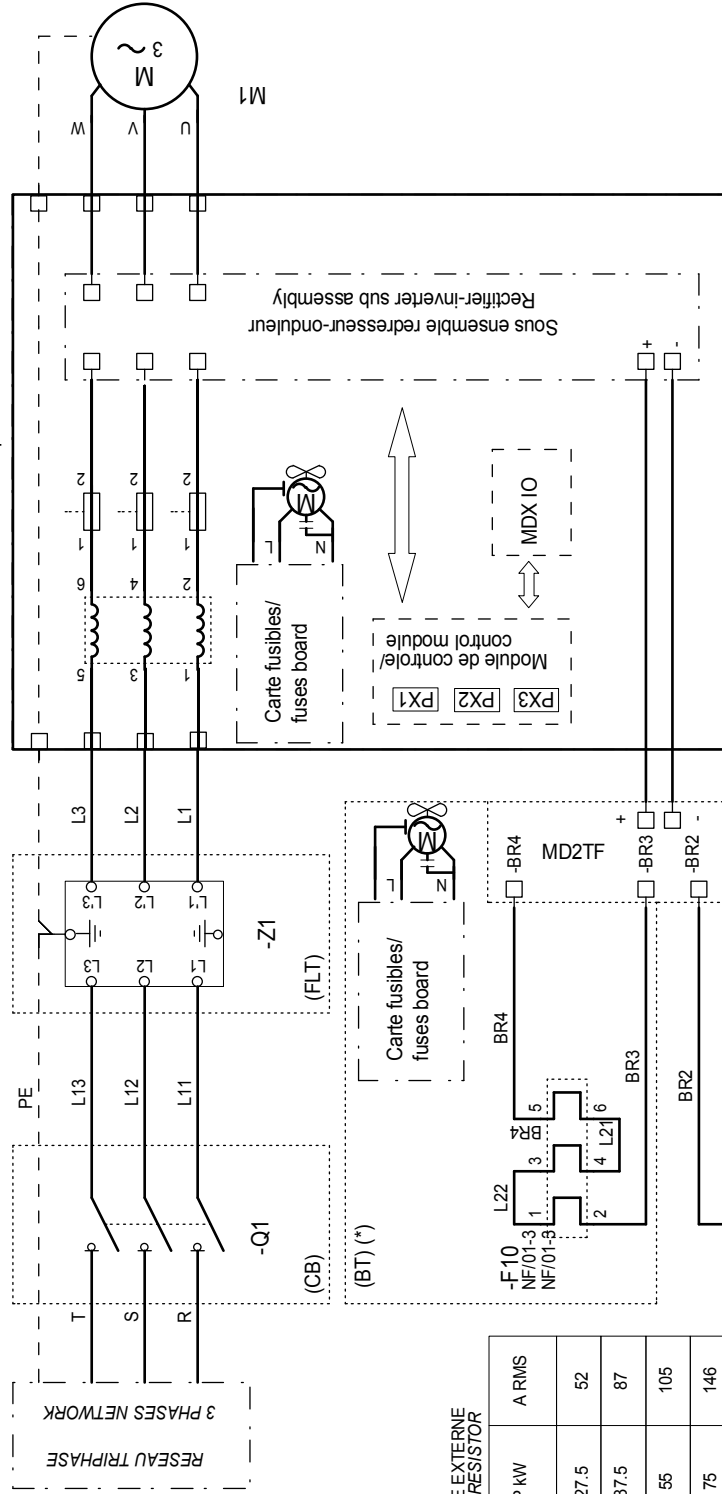
RESISTANCE FREINAGE EXTERNE
 EXTERNAL BRAKING RESISTOR

TYPE RESISTANCE RESISTOR TYPE	OHM	P KW	A RMS
RF-MD-27500-10	10	27.5	52
RF-MD-37500-5	5	37.5	87
RF-MD-55000-5	5	55	105
RF-MD-75000-4	3.5	75	146
RF-MD-11000-3	2.35	110	216

- (a) (ES : NO/NON - BT : NO/NON)
- (b) (ES : NO/NON - BT : YES/OUI)
- (c) (ES : YES/OUI - BT : NO/NON)
- (d) (ES : YES/OUI - BT : YES/OUI)



Armoire standard de base
 / Standard base product



OPTIONS REPRESENTÉES SUR CE SCHEMA DE CABLAGE:
 OPTIONS SHOWN IN THIS WIRING DIAGRAM:

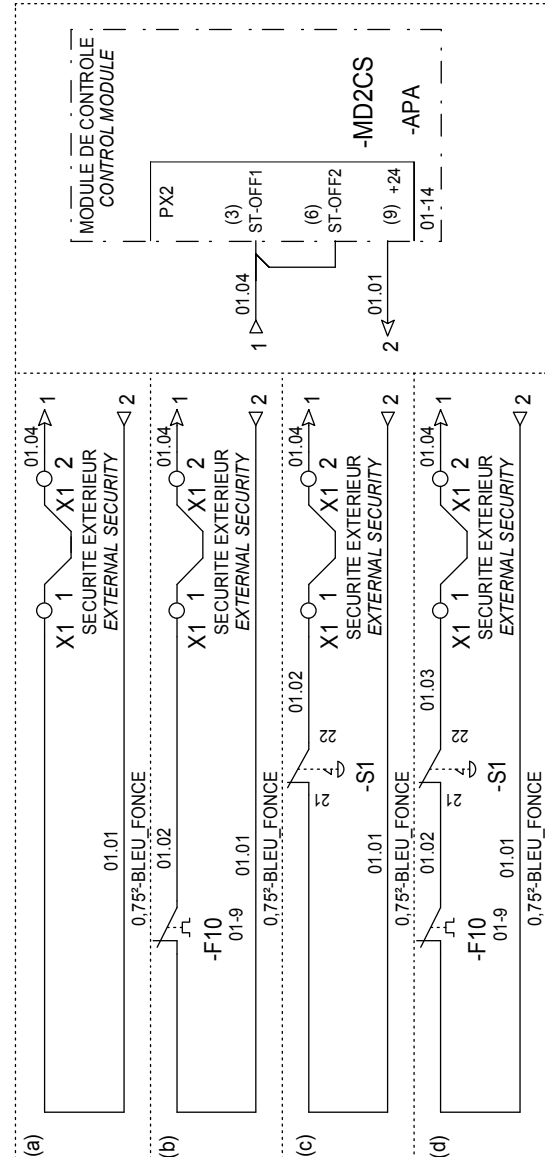
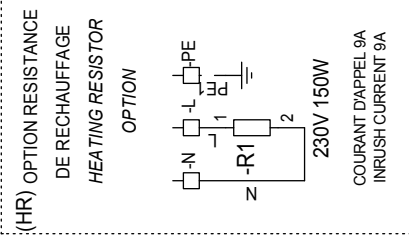
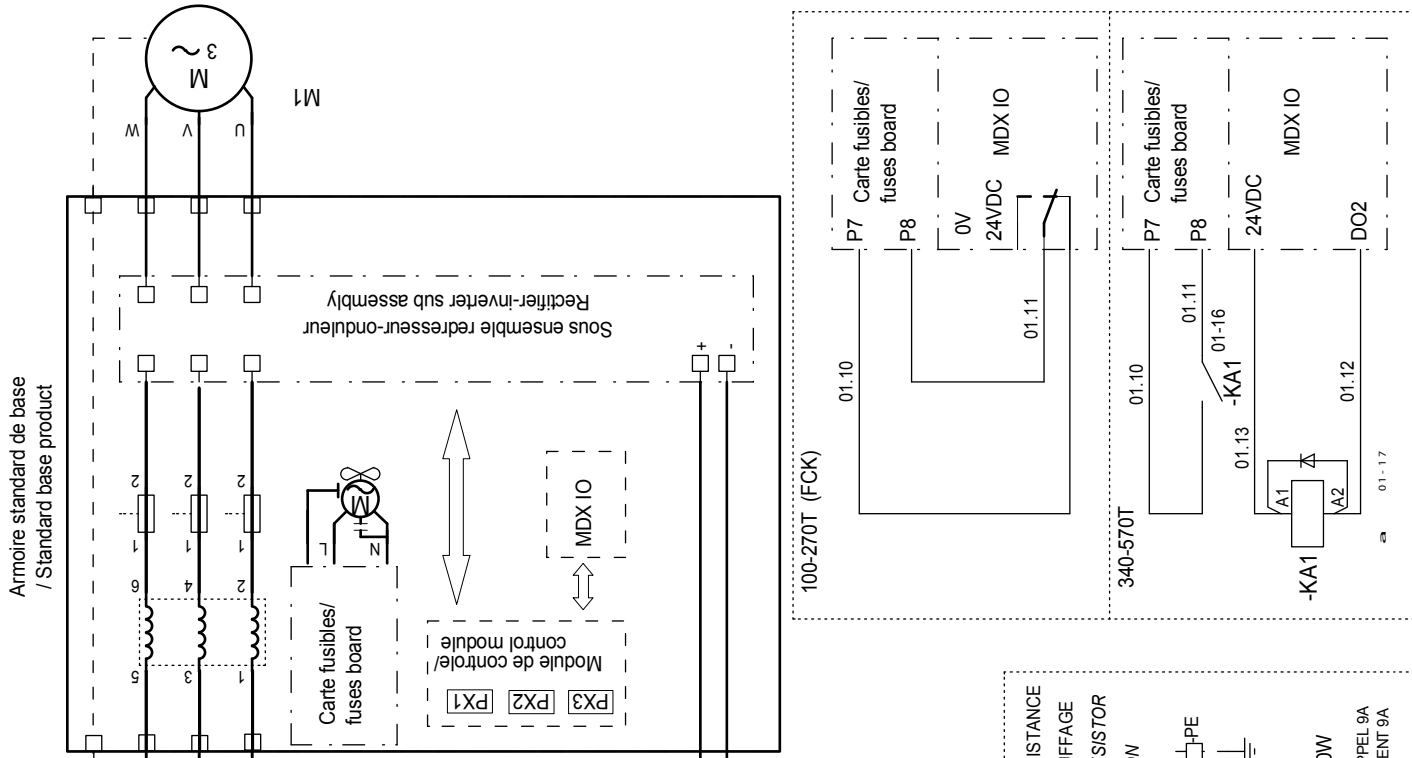
(CB)	INTER-SECTIONNEUR : CIRCUIT BREAKER :	AVEC YES
(BT)	TRANSISTOR DE FREINAGE + RELAIS THERMIQUE * : BRAKING TRANSISTOR + THERMAL RELAY * :	AVEC/SANS YES / NO
(ES)	BOUTON ARRÊT D'URGENCE : EMERGENCY STOP BUTTON :	AVEC/SANS YES / NO
(FCK)	GESTION DES VENTILATIONS : MD2 FAN CONTROL KIT :	AVEC/SANS YES / NO
(HR)	RESISTANCE DE RECHAUFFAGE : HEATING RESISTOR :	AVEC/SANS YES / NO

(*) Voir la notice d'installation pour la localisation
 See the installation manual for localization

RESISTANCE FREINAGE EXTERNE
 EXTERNAL BRAKING RESISTOR

TYPE RESISTANCE RESISTOR TYPE	OHM	P KW	A RMS
RF-MD-27500-10	10	27.5	52
RF-MD-37500-5	5	37.5	87
RF-MD-55000-5	5	55	105
RF-MD-75000-4	3.5	75	146
RF-MD-110000-3	2.35	110	216

- (a) (ES : NO/NON - BT : NO/NON)
- (b) (ES : NO/NON - BT : YES/OUI)
- (c) (ES : YES/OUI - BT : NO/NON)
- (d) (ES : YES/OUI - BT : YES/OUI)



OPTIONS REPRESENTÉES SUR CE SCHEMA DE CABLAGE:
 OPTIONS SHOWN IN THIS WIRING DIAGRAM:

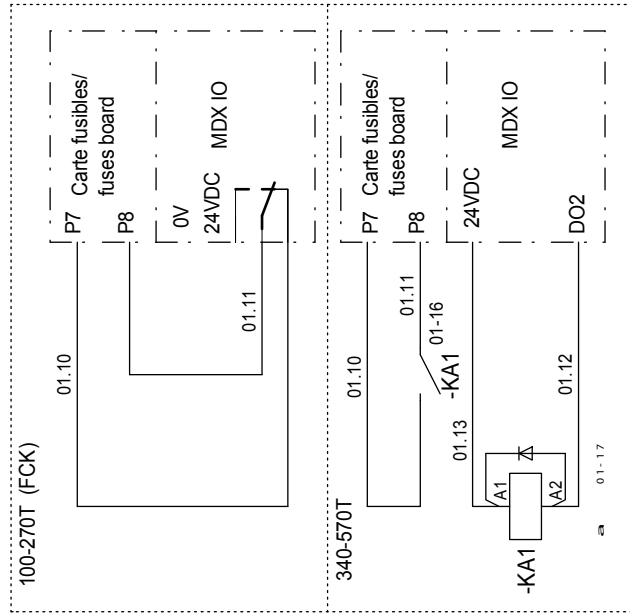
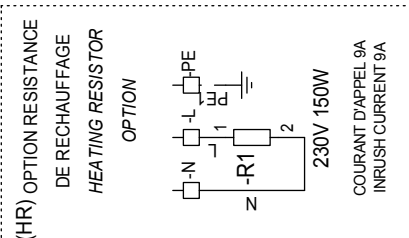
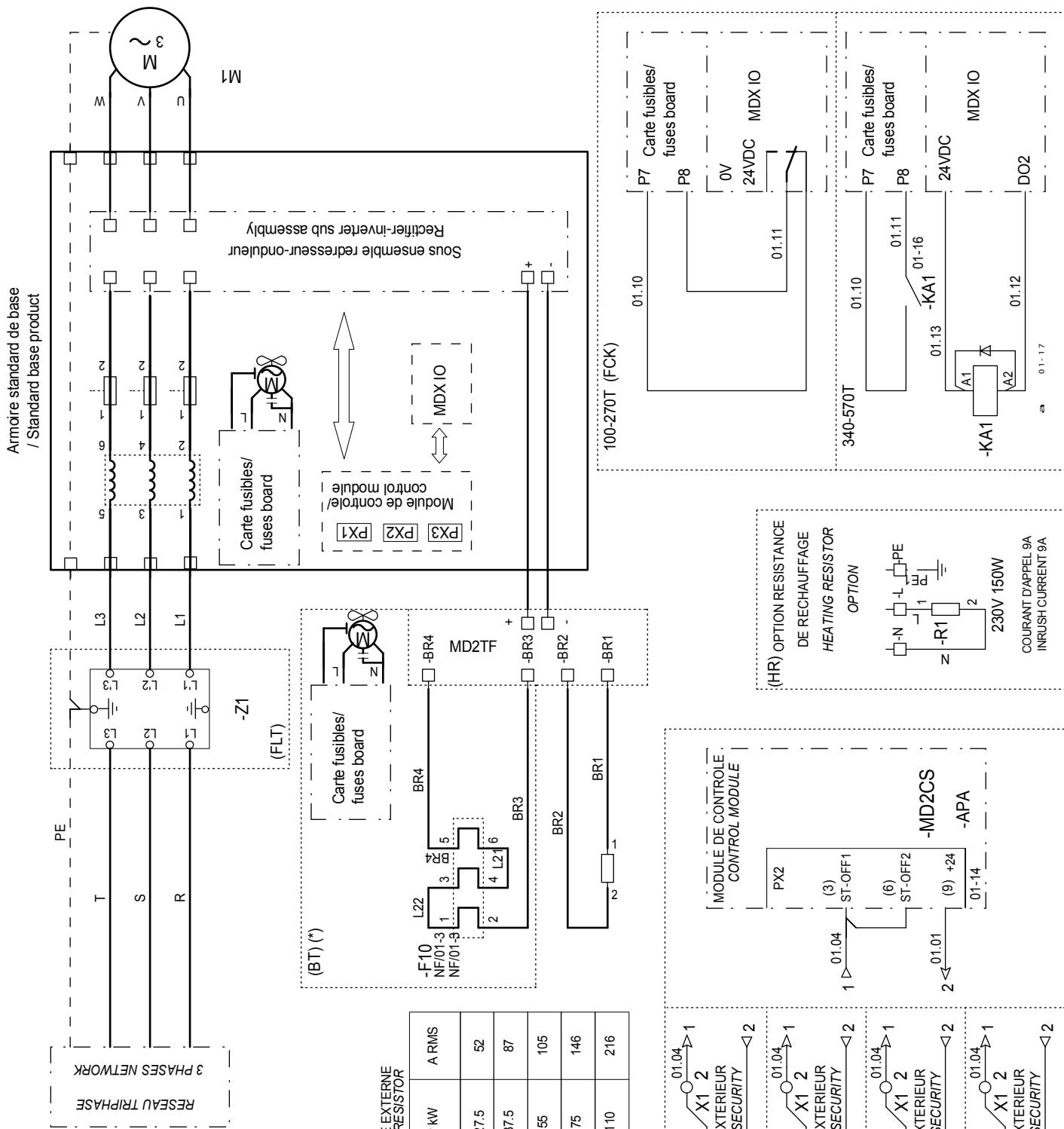
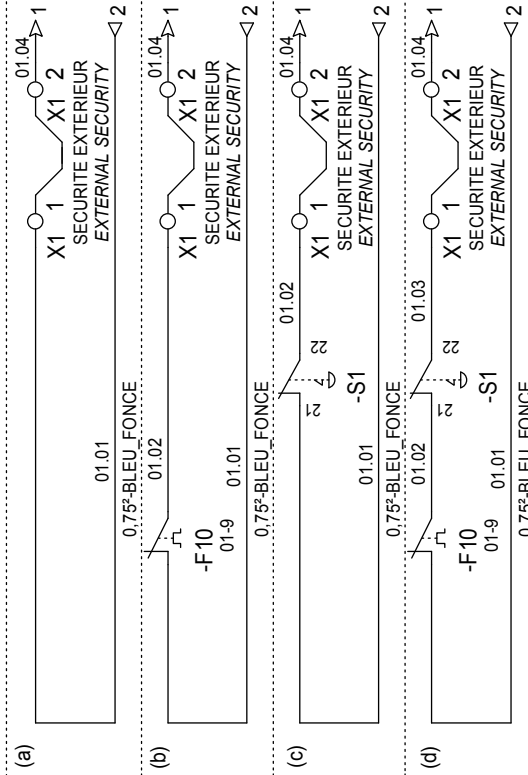
(FLT)	FILTRE CEM : EMC FILTER :	AVEC YES
(BT)	TRANSISTOR DE FREINAGE + RELAIS THERMIQUE * : BRAKING TRANSISTOR + THERMAL RELAY * :	AVEC/SANS YES / NO
(ES)	BOUTON ARRÊT D'URGENCE : EMERGENCY STOP BUTTON :	AVEC/SANS YES / NO
(FCK)	GESTION DES VENTILATIONS : MD2 FAN CONTROL KIT :	AVEC/SANS YES / NO
(HR)	RÉSISTANCE DE RECHAUFFAGE : HEATING RESISTOR :	AVEC/SANS YES / NO

(*) Voir la notice d'installation pour la localisation
 See the installation manual for localization

RÉSISTANCE FREINAGE EXTERNE
 EXTERNAL BREAKING RESISTOR

TYPE RESISTANCE RESISTOR TYPE	OHM	P KW	A RMS
RF-MD-27500-10	10	27.5	52
RF-MD-37500-5	5	37.5	87
RF-MD-55000-5	5	55	105
RF-MD-75000-4	3.5	75	146
RF-MD-11000-3	2.35	110	216

- (a) (ES : NO/NON - BT : NO/NON)
- (b) (ES : NO/NON - BT : YES/OUI)
- (c) (ES : YES/OUI - BT : NO/NON)
- (d) (ES : YES/OUI - BT : YES/OUI)



OPTIONS REPRESENTÉES SUR CE SCHEMA DE CABLAGE:
 OPTIONS SHOWN IN THIS WIRING DIAGRAM:

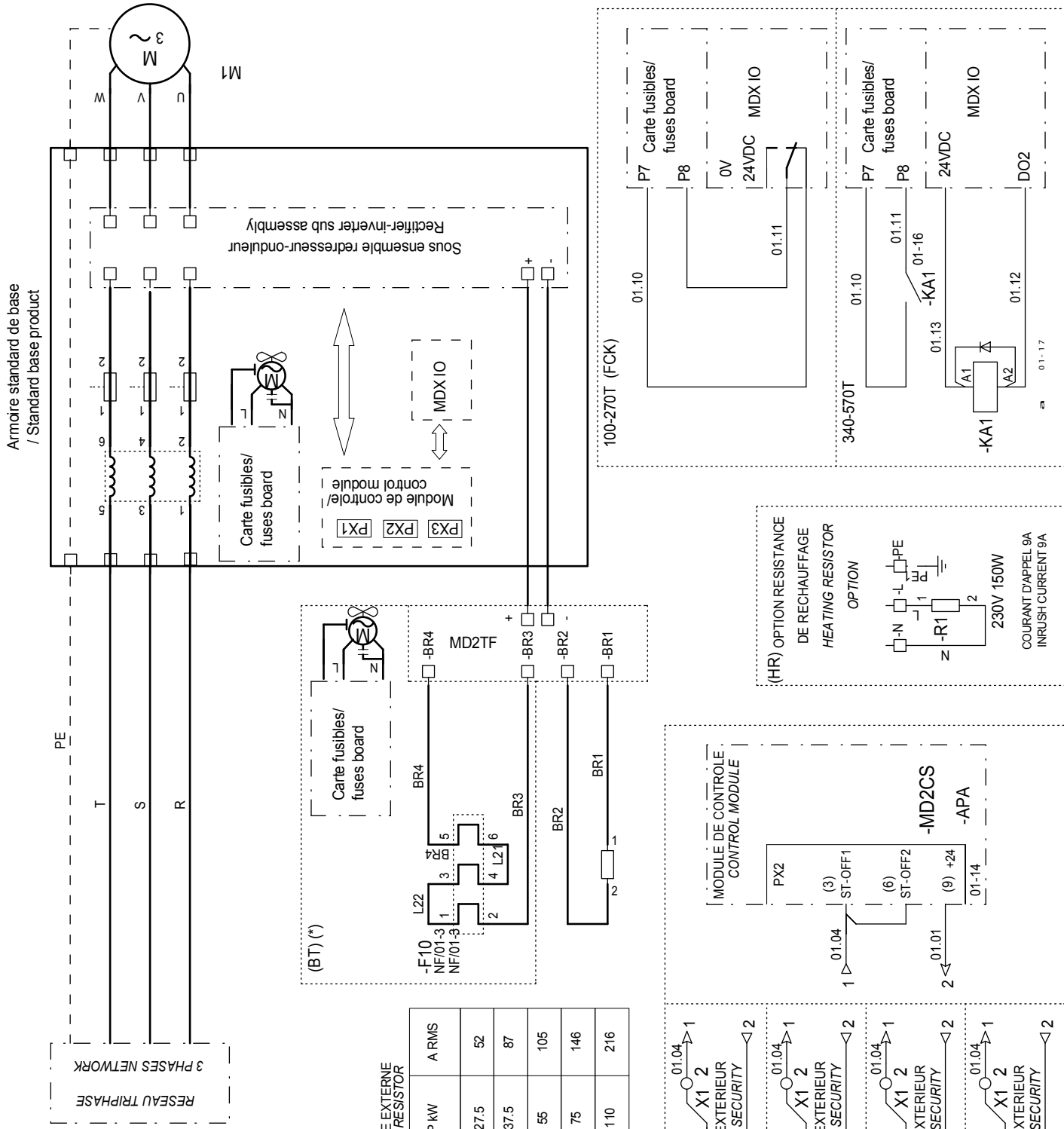
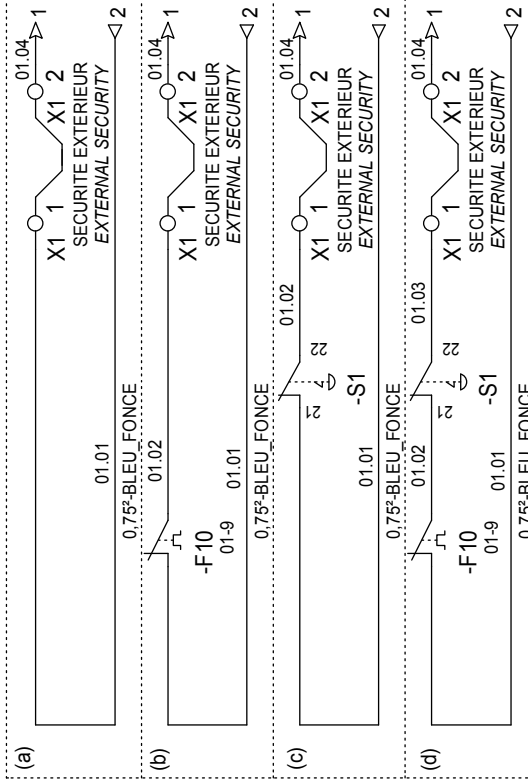
(BT)	TRANSISTOR DE FREINAGE + RELAIS THERMIQUE * : BRAKING TRANSISTOR + THERMAL RELAY *	AVEC/ISANS YES/NO
(ES)	BOUTON ARRÊT D'URGENCE : EMERGENCY STOP BUTTON :	AVEC/ISANS YES/NO
(FCK)	GESTION DES VENTILATIONS : MD2 FAN CONTROL KIT :	AVEC/ISANS YES/NO
(HR)	RESISTANCE DE RECHAUFFAGE : HEATING RESISTOR :	AVEC/ISANS YES/NO

(*) Voir la notice d'installation pour la localisation
 See the installation manual for localization

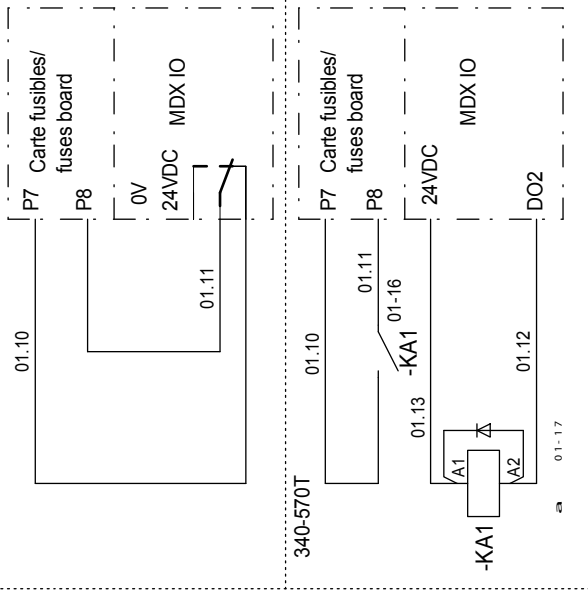
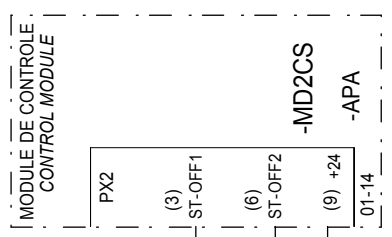
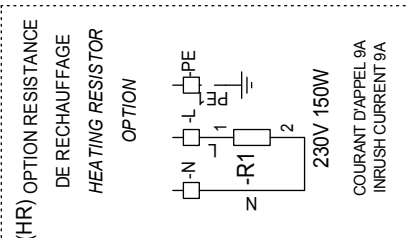
RESISTANCE FREINAGE EXTERNE
 EXTERNAL BRAKING RESISTOR

TYPE RESISTANCE RESISTOR TYPE	OHM	P KW	A RMS
RF-MD-27500-10	10	27.5	52
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RF-MD-11000-3	2.35	110	216

- (a) (ES : NO/NON - BT : NO/NON)
- (b) (ES : NO/NON - BT : YES/OUI)
- (c) (ES : YES/OUI - BT : NO/NON)
- (d) (ES : YES/OUI - BT : YES/OUI)




100-270T (FCK)



6 - TRIPS - DIAGNOSTICS

6.1 - Safety notice

 **The user must not attempt to repair the drive himself, nor perform diagnostics other than those listed in this section. If the drive malfunctions, please contact your local technical support.**

6.2 - Alarms

Alarms may appear during drive operation.

These alarms are for information only, in order to warn the user: the drive continues to operate but may trigger a safetrip if no corrective action is taken.

The HMI displays a page «active trips» where «ALARM» appears at the top of the screen. All alarms shown on the console or the configuration interface are listed in the following table.

On the drive control board, 2 LED displays indicate alternately "A.L." and a number that can be used to identify the alarm by means of the table below (this number corresponds to the value of parameter **10.97**).

Code	No.	Meaning
A.L.	1 to 4	User alarm 1 (10.54) to User alarm 4 (10.54)
	6	Motor overload (10.17)
	7	Drive overtemperature (10.18)
	8	Microcontroller overoccupancy
	9	Rectifier
	10	Emergency operation (see menu 20)


6.3 - Tripping on a safetrip

If the drive trips, the drive output bridge is inactive, and the drive no longer controls the motor.

When a trip is active, the LEDs present on the control board display alternately "t.r." and a number that can be used to identify the active trip (see left-hand column in the table below). For trips numbered higher than 100, only the last 2 digits are displayed with a point displayed on both LEDs to indicate the hundred.

Example:

 : indicates trip no. 1


 : indicates trip no. 101

After consulting the table, follow the procedure below:

- Make sure that the drive is disabled (STO-1 and STO-2 terminals open)
- Isolate the drive power supply
- Carry out the necessary checks in order to eliminate the reason for the trip
- Activate the STO-1 and STO-2 inputs to clear the trip

The HMI displays an active trip page, where "TRIP" appears at the top of the screen.

All the trips indicated on the keypad or parameter-setting interface are listed in the table below.

 **Opening and then closing the STO-1/STO-2 drive enable terminals and clear the trip. If the Run FWD or Run reverse terminal is closed at that time, the motor may or may not start immediately, depending on the setting of Ctr.06 (06.04).**

No.	Parameter-setting interface name	Reason for trip	Solution
1	DC UnderVolt	DC bus undervoltage	<ul style="list-style-type: none"> • Check the input fuses. • Check the quality of the power supply (voltage dips).
2	DC over volt	DC bus overvoltage	<ul style="list-style-type: none"> • Check that the mains voltage is within the permitted tolerance. • Check the quality of the power supply (commutation notches or transient overvoltages). • Check the motor insulation. • Check that the deceleration mode (02.04) is compatible with the application. • If an MD2-TF option is used, check its size, its wiring and the state of the thermal relay.
3	Over current	Overcurrent at drive output	<ul style="list-style-type: none"> • Check the motor insulation. • Check the motor cables (connections and insulation). • Check the quality of the mains supply. • Run power diagnostics.
This trip cannot be reset for a period of 10 seconds.			

TRIPS - DIAGNOSTICS

No.	Parameter-setting interface name	Reason for trip	Solution
4	Brak. IGBT	Braking IGBT transistor overcurrent	<ul style="list-style-type: none"> • Check the braking resistor wiring and insulation level. • Make sure that the resistor ohmic value is compatible with the MD-TF option used.
		This trip cannot be reset for a period of 10 seconds.	
5	I IMBALANCED	Motor current imbalance: vectorial sum of the 3 motor currents is not zero	<ul style="list-style-type: none"> • Check the motor insulation. • Check the cable insulation.
6	Out Ph. loss of a motor phase	Loss of a motor phase	Check the motor cable and resistance values between motor phases.
7	Overspeed	The speed is greater than $(1.3 \times \mathbf{01.06})$ or $(\mathbf{01.06} + 1000 \text{ rpm})$	<ul style="list-style-type: none"> • Check the drive settings. • When the flying restart function is not being used, check that 06.09 is at "Disabled".
8	Drive overload lxt	The drive overload level exceeds the conditions defined in section 1.4.2 of the installation manual	<ul style="list-style-type: none"> • Check the drive is suitable for the motor current cycle. • Check the ambient temperature.
9	IGBT U	Internal protection of phase U IGBTs	<ul style="list-style-type: none"> • Check the motor and cable insulation. • Run power diagnostics.
10	Th rectifier	Rectifier heatsink temperature too high	<ul style="list-style-type: none"> • Clean the cabinet dust filters. • Check the drive external and internal fans are working correctly. • Check that the product air inlet temperature is not outside the limits.
11	Encoder rot	The measured position does not vary (only if a feedback speed option is present)	<ul style="list-style-type: none"> • Check the encoder wiring. • Check that the motor shaft turns.
13	UVW invert	The encoder U, V, W signals are reversed (only if a feedback speed option is present)	Check the conformity of the encoder wiring.
14	TUNE U Encod	During the autotune phase, one of the encoder U, V or W commutation channels is not present	<ul style="list-style-type: none"> • Check the encoder wiring. • Check the encoder connections. • Change the encoder.
15	TUNE V Encod		
16	TUNE W Encod		
18	AUTOTUNE	A stop command has been given during the autotune phase.	Repeat the autotune procedure (see 05.12)
19	Brak. resist.	Parameter 10.39 "Braking energy overload accumulator" has reached 100%	<ul style="list-style-type: none"> • Check the settings of 10.30 and 10.31. • Check the resistor is compatible with the application requirements.
21	IGBT U overheating	Overheating of phase U IGBTs	<ul style="list-style-type: none"> • Clean the cabinet dust filters. • Check the drive ventilation units are working correctly. • Check that the product air inlet temperature is not outside the limits. • If the trip appears at frequencies lower than 10 Hz, check that the current levels depending on the frequency are complied with. • Check that the switching frequency 05.18 is compatible with the motor current level.


TRIPS - DIAGNOSTICS

No.	Parameter-setting interface name	Reason for trip	Solution
24	Motor PTC	Opening of the PTC input of the PX1 terminal block or T1 and T2 inputs of the MDX-ENCODER option	<ul style="list-style-type: none"> • Check the ambient temperature around the motor. • Check that the motor current is less than the stated current. • Check the thermal sensor wiring.
26	Overload + 24V	Overload on the +24 V power supply or digital outputs	Check the I/O wiring.
28	AI2 loss	Loss of the current reference on analog input AI2	Check the input wiring and source.
29	AI3 loss	Loss of the current reference on analog input AI3	
30	COM loss	Loss of communication on the P2 connector serial link	<ul style="list-style-type: none"> • Check the cable connections. • Check that parameter 11.63 is compatible with the timing of requests from the master.
31	EEPROM	Number of write cycles to EEPROM exceeded (>1,000,000)	<ul style="list-style-type: none"> • Change the control board. • Check the recurrence of write cycles from the drive controller.
33	Stator resistance	Trip during measurement of the stator resistance	Check the motor wiring.
34	Fieldbus loss	Disconnection of the fieldbus during operation or timing error	<ul style="list-style-type: none"> • Check the fieldbus connections. • Check that parameter 15.07 is compatible with the timing of requests from the master.
35	STO inputs	Simultaneous opening of both STO (Safe Torque Off) inputs during operation	Check the remote control link.
37	Encoder break	One of the encoder feedback data items is missing	<ul style="list-style-type: none"> • Check the encoder wiring. • Check the encoder connections.
38	Breakdown	Breakdown of synchronous motor in sensorless closed loop mode	Check the menu 5 parameters are compatible with the values on the motor nameplate
39	Mains synchro	Not used	
41	User 1	User trip 1 triggered by 10.61 .	• See 10.61 .
42	User 2	User trip 2 triggered by 10.63 .	• See 10.63 .
43	User 3	User trip 3 triggered by 10.65 .	• See 10.65 .
44	User 4	User trip 4 triggered by 10.67 .	• See 10.67 .
45	User 5	User trip 5 triggered by the serial link 10.38 = 45	• See 10.38 .
46	User 6	User trip 6 triggered by the serial link 10.38 = 46	
47	User 7	User trip 7 triggered by the serial link 10.38 = 47	
48	User 8	User trip 8 triggered by the serial link 10.38 = 48	
49	User 9	User trip 9 triggered by the serial link 10.38 = 49	
50	User 10	User trip 10 triggered by the serial link 10.38 = 50	
51	DO2 MDX-I/O over Id	The DO2 output load current (MDX-I/O option) is >200 mA	Check that DO2 is not short-circuited.

TRIPS - DIAGNOSTICS

No.	Parameter-setting interface name	Reason for trip	Solution
52	DO3 MDX-I/O over Id	The DO3 output load current (MDX-I/O option) is >200 mA	Check that DO3 is not short-circuited.
53	MDX-I/O link	Communication problem between the drive and the MDX-I/O option	Check the MDX-I/O option mounting.
54		Not used	
55	Unstable DC bus	The drive DC bus oscillates significantly	<ul style="list-style-type: none"> • Check the balancing of the mains phases. • Check that all 3 mains phases are present.
56	IGBT V	Internal protection of phase V IGBTs	<ul style="list-style-type: none"> • Check the motor and cable insulation. • Run power diagnostics.
57	IGBT W	Internal protection of phase W IGBTs	
58	IGBT V overheating	Overheating of phase V IGBTs	<ul style="list-style-type: none"> • Clean the cabinet dust filters. • Check the drive ventilation units are working correctly. • Check that the product air inlet temperature is not outside the limits. • If the trip appears at frequencies lower than 10 Hz, check that the current levels depending on the frequency have been complied with. • Check that the switching frequency 05.18 is compatible with the motor current level.
59	IGBT W overheating	Overheating of phase W IGBTs	
60	Diagnostic	Problem detected during the control and interface boards test, the power test or during the self-test	<ul style="list-style-type: none"> • Check that the STO1 and STO2 inputs are closed. • See diagnostic error table.
63	STO input inconsistency	The STO1 and STO2 inputs have had a different state for more than 100 ms	Check the remote control link for the STO1 and STO2 inputs.
65	10V over Id	Overload on the +10 V power supply	Check the I/O wiring
66	DO1 over Id	The DO1 output load current is >200 mA	Check that DO1 is not short-circuited.
67	Internal ventilation	Not used	
68	Motor overcurrent	The current has exceeded the limit programmed in 05.55 . The load is too high for the setting.	Check that 05.55 is consistent with the application.
69	24 V MDX-I/O over Id	The 24 V load current is too high	Check the MDX-I/O option I/O wiring.
70	4 mA loss on MDX-I/O AI4	Loss of the current reference on analog input AI4 of the MDX-I/O option	Check the input wiring and source of the MDX-I/O option.
71	4 mA loss on MDX-I/O AI5	Loss of the current reference on analog input AI5 of the MDX-I/O option	
101	AC mains loss	Loss of AC supply	<ul style="list-style-type: none"> • Check the input fuses • Check the quality of the power supply (voltage dips)
102	Rectifier	Not used	

7 - MAINTENANCE

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 • All work relating to installation, commissioning and maintenance must be carried out by experienced, qualified personnel.
- When a trip detected by the drive causes the motor to stop, fatal residual voltages remain on the terminals and in the drive.
- The drive stop function does not protect against high voltages on the terminal blocks.
- Before carrying out any work on the drive or the motor, disconnect and padlock the isolating switch in the switchboard.
- The line switch integrated as an option in the drive does not isolate the drive input busbars. During the installation and maintenance phases, make sure that the power supply line is disrupted.
- When the drive controls a permanent magnet motor, the isolating switch between the drive and the motor must be open to avoid the risk of motor voltage feedback. If there is no isolating switch, make sure the machine shaft is jammed to prevent it turning while work is carried out.
- After the drive is switched off, the external control circuits can still be active and presents dangerous voltage. Check that these circuits are powered down before working on the control cables.
- Ensure that the DC bus voltage is below 40V before carrying out any work (the control board power-on indicator LED must be off).
- After the drive has been operated, keep away from the heatsink as it may be very hot (70°C).
- After working on the motor, check that the phase order is correct when re-connecting the motor cables.
- All protective covers must remain in place during tests.
- Before performing high voltage tests or voltage withstand tests on the motor, switch off the drive and disconnect the motor.

There are very few maintenance and repair operations to be performed by the user on **Powerdrive MD2S** drives. Regular servicing operations are described below.

• Servicing

Printed circuits and 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 immediately makes the warranty null and void.

Do not touch the integrated circuits or the microprocessor with your fingers (ESD risk).

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.

• Preventive maintenance

Device	Action	Frequency
Door filters (10µm)	Clean (1)	3 months
	Replace	2 years
Power connections	Check tightness	1 year
Internal ventilation and in cabinet roof	Replace	5 years
Surge suppressor board	Replace	5 years

(1) Door filters are washable.

7.1 - Storage

The **Powerdrive MD2S** incorporates aluminium electrolytic capacitors.

If the drive has been stored for more than 12 months, it must therefore be switched on for 5 hrs at the rated operating voltage, and this operation must be repeated every 6 months.

If the drive has been stored for more than 36 months, the capacitors must be reformed.

This consists of gradually applying a DC voltage to the banks of capacitors, until voltage values close to the rated voltages are achieved, while ensuring that the dissipated power does not exceed the maximum values authorised by the manufacturer.

An instruction sheet is available - please contact your local technical support.

7.2 - Replacing products

CAUTION:

Products must be returned in their original packaging or in similar packaging, to prevent them being damaged. Otherwise, replacement under warranty could be refused.

7.3 - List of spare parts

The 600T to 1700T and 600TH to 1500TH ratings consist of products in parallel.

Each module is identical to the standard module.

Rating	Modules in parallel	Standard module
600T	2	340T
750T	2	400T
900T	2	470T
1100T	2	570T
1400T	3	470T
1700T	3	570T
600TH	2	340TH
750TH	2	400TH
900TH	2	500TH
1200TH	3	400TH
1500TH	3	500TH

The spare parts described in the following chapters concern standard modules. For the ratings in the above table, multiply the quantities by the number of modules in parallel.

7.3.1 - Circuit boards (PCBs)

- **Master module board only:**

There can only be one of the following boards on a drive, regardless of the number of modules in parallel.

Description	LS code
Control board	PEF400NB000A
Interface board for MD2S	PEF400NE003A
Flying restart board	PEF280NH000A
EMC board for 100T to 270T ratings	PEF180NA000A or PEF180NA002A
HMI: MDX POWERSCREEN	RDKITIHMM0SPR2

- **Boards for each module:**

The following boards are present on each standard module (multiply by the number of modules in parallel).

Description	LS code
Flying restart board	PEF280NH000A
DC bus measurement board	PEF720NH000
Distribution board for 100T to 150T ratings	PEF190NE000A
Distribution board for other ratings	PEF720NG000
Parallelization card for 600T to 1100T & 600TH to 900TH ratings	2X PEF28ENA001A
Parallelization card for 1400T - 1700T & 1200TH - 1500TH ratings	3X PEF28FNA001A

7.3.2 - Remote control fuses

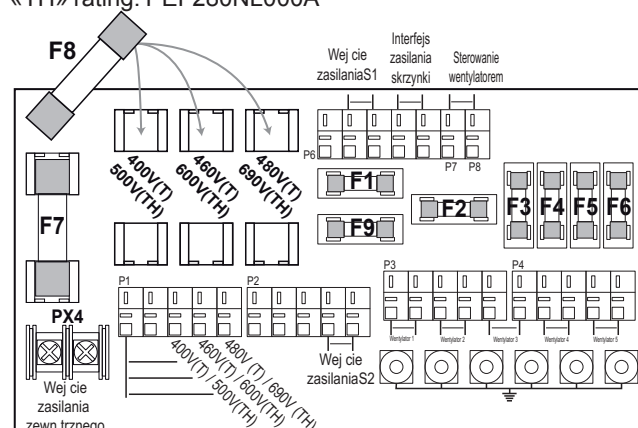
All the remote control fuses on the **Powerdrive MD2S** can be controlled by means of the EDA016LF006 kit. It includes the following references:

- **Input protection board**

Board reference:

«T» rating: PEF28ANE000A

«TH» rating: PEF280NL000A



- **Protection fuses for the forced ventilation units:**

Fuse	Size	Type	Value	LS code
F2	5 x 20	SA	1.25 A/250 V	PEL001FA004
F3				
F4				
F5				
F6				

F3 to F6 are not used on 60T to 150T ratings.

F4 to F6 are not used on 180T to 270T ratings.

- **Protection fuses for the control electronics:**

Fuse	Size	Type	Value	LS code
F1	5 x 20	SA	1.25 A/250 V	PEL001FA004
F9				

Note: F9 is not used on the **Powerdrive MD2S**

- **Protection fuses for the transformer primary:**

Rtg.	Fuse	Size	Type	Value	LS code	Fuse kit
T	F7	10 x 38	aM/ ATQ	4 A/500 V	PEL004FA000	EDA004LF004
	F8					
TH	F7	10 x 38	aM	4 A/690 V	PEL004FA005	
	F8					

- **Fuses on the PEF720NH000 DC bus measurement board**

These fuses are placed under the power bridge capacitor banks, on top of the control block.

Fuse	Size	Type	Value	LS code	Fuse kit
F1	6 x 32	FA	2 A/660 V	PEL002FU004	EDA002LF005
F2					

7.3.3 - High-speed power fuses

These fuses are placed on the incoming choke. Each phase is equipped with a fuse.

Rating	Size	Value	LS code	Kit of 3 fuses
60T	T30	200 A/660 V	PEL200FU001	EDA200LF001
75T	T31	250 A/660 V	PEL250FU005	-
100T	T31	315 A/660 V	PEL315FU001	-
120T	T31	350 A/660 V	PEL350FU001	-
150T	T31	450 A/660 V	PEL450FU000	-
180T	T31	500 A/660 V	PEL500FU001	EDA500LF001
220T	T33	630 A/690 V	PEL630FU004	-
270T	T33	800 A/690 V	PEL800FU003	-
340T	T33	1,000 A/660 V	PEL999FU000	
400T	T33	1,400 A/660 V	PEL999FU006	
470T	T33			
570T	T33	1,600 A/660 V	PEL999FU005	
270TH	T31	450 A/660 V	PEL450FU000	
340TH	T31	550A/690A	PEL550FU003	
400TH	T33	700 A/660 V	PEL700FU002	
500TH	T31	800A/690V	PEL800FU003	

7.3.4 - Power modules

• Rectifier module

Rating	Qty	LS code
60T - 75T	1	MPRB
100T - 120T	1	MPRC
150T	1	RDMPRD
180 T- 220T	1	MPRE
270T	1	RDMPRF
340T - 470T	1	LSRDG
570	1	LSRDH
270TH to 500TH	1	LSRDG 690V
600TH to 900TH	1	LSRDG 690V
1200TH to 1500TH	1	LSRDG 690V

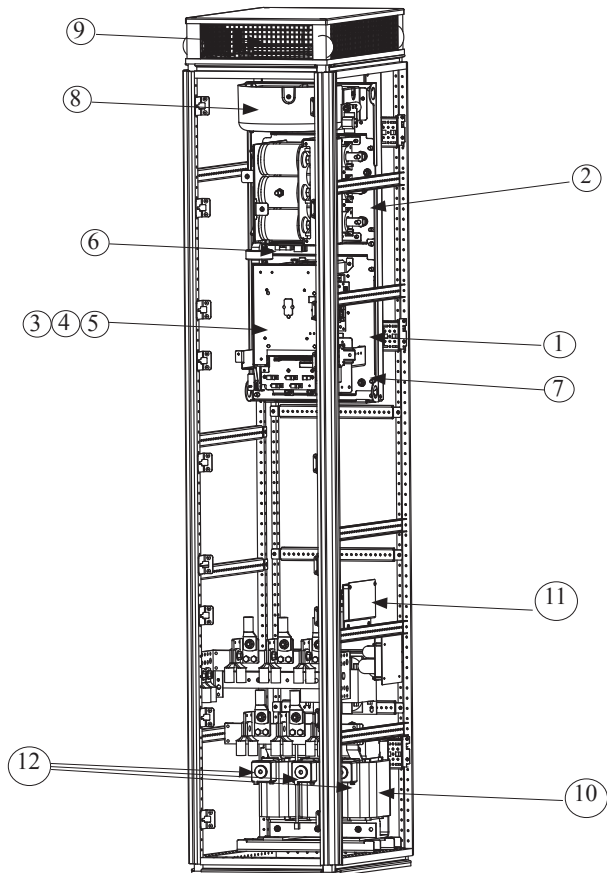
• Inverter module

Rating	Qty	LS code
60T	1	RDMPOA
75T	1	MPOC
100T	1	RDMPOD
120T	1	MPOE
150T	1	RDMPOF
180T	3	MPOG
220T	3	MPOH
270T	3	RDMPOI
340T	3	LSPPJ
400T	3	LSPPJ
470T	3	LSPPN
570T	3	LSPPR
270TH	3	LSPPL 690V
340TH	3	LSPPM 690V
400TH to 500TH	3	LSPPN 690V

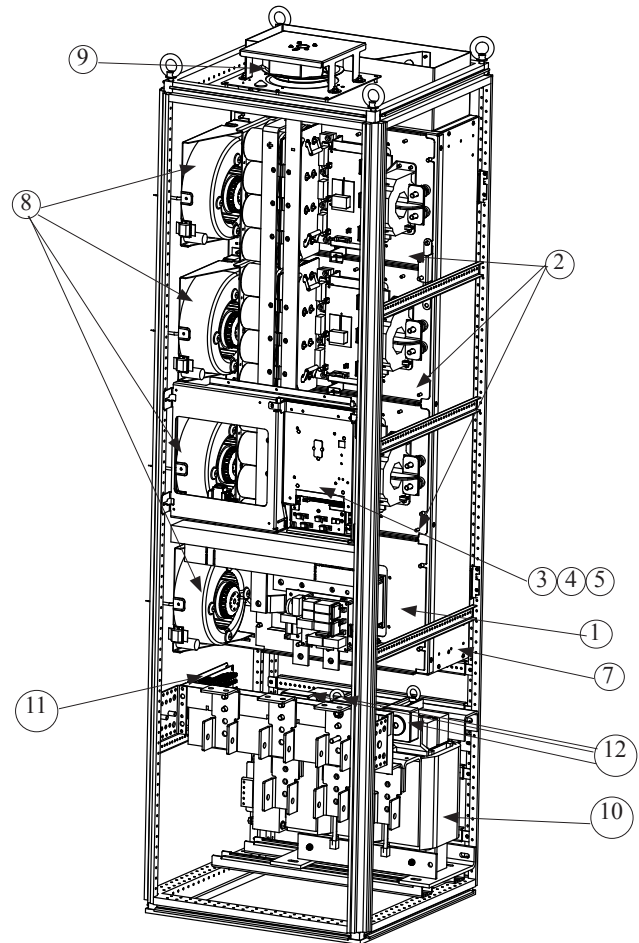
7.3.5 - Other parts

Description	Qty	LS code
100T to 150T fan	1	BLOCVF3MDVIR
180T to 270T fan	2	
340T to 570T fan	4	BLOCVF340A400
340TH to 500TH fan		
Roof fan (100T to 570T & 340TH to 500TH)	1	BLOCVFTOIT
100T to 270T transformer	1	TRF750MA003
340T to 570T transformer	1	TRF115MA001

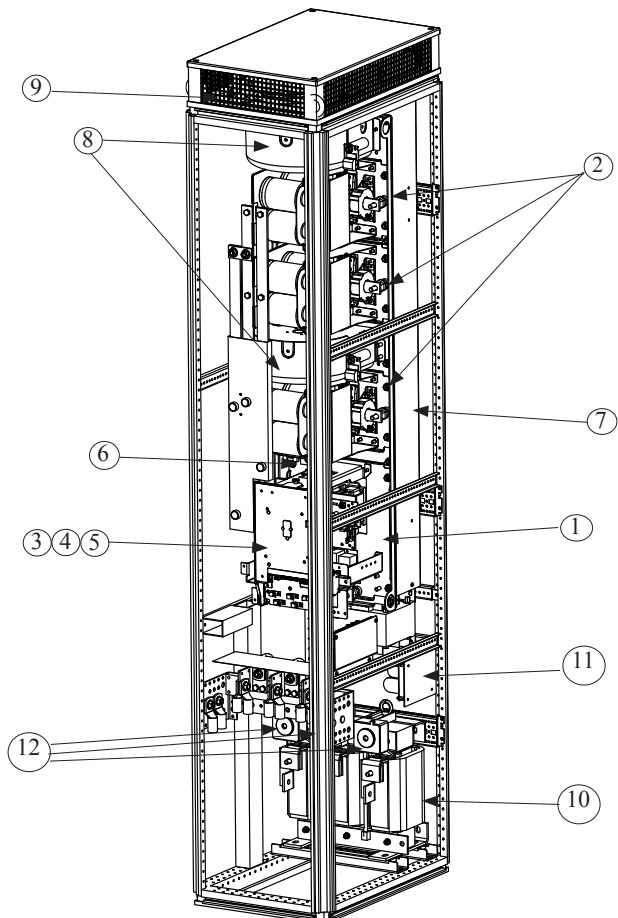
• 100T to 150T ratings



• 340T to 570T & 270 TH to 500T ratings



• 180T to 270T ratings



No.	Name
1	Rectifier module
2	Inverter module
3	Control block
4	Distribution board
5	Customization board
6	DC bus measurement board
7	Assembled ventilated frame
8	Forced ventilation unit
9	Forced ventilation in roof
10	AC choke
11	Fuse board
12	AC fuses

NOTES

NOTES

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Moteurs Leroy-Somer
Headquarter: Boulevard Marcellin Leroy - CS 10015
16915 ANGOULÊME Cedex 9

Limited company with capital of 38,679,664 €
RCS Angoulême 338 567 258
www.leroy-somer.com