MT Series

Installation manual

Retain for future use

Variable speed drives
for AC motors

75 HP (55 kW) ... 100 HP (75 kW) / 200 - 240V
125 HP (90 kW) ... 400 HP (250 kW) / 380 - 480V

MOTORTRONICS MT Series

Contents

Read and understand these instructions before performing any procedure on this drive.

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this manual before installing or operating the MT Series drive. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical standards in force concerning protective grounding of all equipment.
- Many parts of this variable speed drive, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH.
  Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/- or across the DC bus capacitors.
- Install and close all the covers before applying power or starting and stopping the drive.
- Before servicing the variable speed drive:
  - Disconnect all power.
  - Place a “DO NOT TURN ON” label on the variable speed drive disconnect.
  - Lock the disconnect in the open position.
- Disconnect all power including external control power that may be present before servicing the drive. Wait for the charging LED to go off. Then follow the DC bus voltage measurement procedure given on page 21 to verify that the DC voltage is less than 45 V. The drive LEDs are not accurate indicators of the absence of DC bus voltage.

Electric shock will result in death or serious injury.

CAUTION

IMPROPER DRIVE OPERATION

- If the drive is not turned on for a long period, the performance of its electrolytic capacitors will be reduced.
- If it is stopped for a prolonged period, turn the drive on every two years for at least 5 hours to restore the performance of the capacitors, then check its operation. It is recommended that the drive is not connected directly to the line voltage. The voltage should be increased gradually using an adjustable AC source.

Failure to follow these instructions can result in equipment damage.

INSTALLATION

■ 1 Take delivery of the drive

- □ Check that the catalog number printed on the label is the same as that on the purchase order
- □ Remove the MT Series from its packaging and check that it has not been damaged in transit

■ 2 Check the line voltage

- □ Check that the line voltage is compatible with the voltage range of the drive (see pages 8 and 9)

Steps 1 to 4 must be performed with the power off

■ 3 Mount the drive

- □ Mount the drive in accordance with the instructions in this document
- □ Install and connect the DC choke (see page 11)
- □ Install any internal and external options

■ 4 Wire the drive

- □ Connect the motor, ensuring that its connections correspond to the voltage
- □ Connect the line supply, after making sure that it is turned off
- □ Connect the control
- □ Connect the speed reference

PROGRAMMING

□ 1 Please refer to the Programming Manual

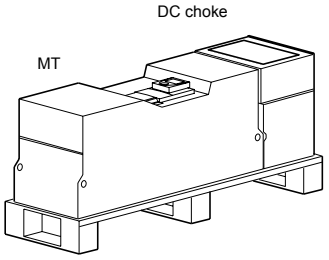


Figure 1

Receiving

The packaging contains two items:
- The drive
-A DC choke (figure 1)

Handling/storage

To protect the drive prior to installation, handle and store the device in its packaging. Ensure that the ambient conditions are acceptable.

WARNING

DAMAGED PACKAGING

If the packaging appears damaged, it can be dangerous to open and handle it. Take precautions against all risks when performing this operation.
Failure to follow these instructions can result in death or serious injury.

WARNING

DAMAGED EQUIPMENT

Do not install or operate any drive that appears damaged.
Failure to follow this instruction can result in death or serious injury.

Unpacking/handling

The drive and DC choke (if applicable) are attached to a pallet using screws (figure 1). When there is a DC choke, it is supplied assembled for ease of transport. The equipment must be unpacked in the following order:
1 Dismantle the DC choke (figure 2) so that it can subsequently be installed, and remove the choke using a hoist (figure 3).
2 Remove the screws attaching the choke support to the pallet (figure 3).

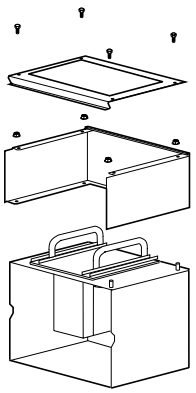


Figure 2

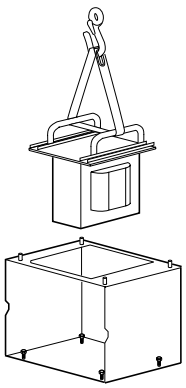


Figure 3

WARNING

RISK OF INJURY

The screws used to attach the choke support to the pallet are difficult to access, involving a risk of injury. Take every precaution to avoid this risk, and use protective gloves.
Failure to follow this instruction can result in serious injury.

3 Remove the screws attaching the drive to the pallet and handle the drive using a hoist. The drive has handling lugs for this purpose (figure 4).

WARNING

RISK OF TIPPING

Never stand the drive upright (figure 5) without supporting it, as it will tip over.
Failure to follow this instruction can result in death or serious injury and equipment damage.

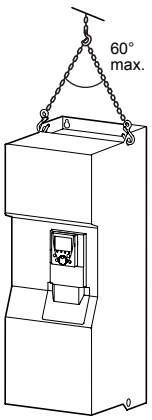


Figure 4

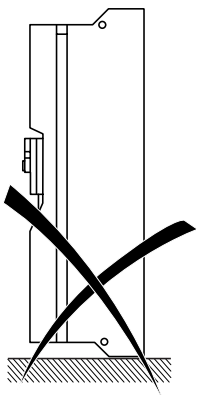


Figure 5

Preliminary recommendations

Installing the drive

- **Mount the drive** on a wall or in the back of the enclosure, in accordance with the recommendations described in this document, before installing the DC choke.

Installing the DC choke

MT275 to MT2100 and MT4125 to MT4400 drives are supplied with a DC choke that must be installed on the top of the drive and wired in accordance with the recommendations described in this document. This choke must be used for connecting drives to the 3-phase line supply.

- Mount the DC choke on the back of the enclosure or on the wall on top of the drive, and connect it. The instructions for installing and connecting the choke are given on page 11.
- Check that the seal between the drive and the choke chassis is performing its role correctly.

Recommendations

Read and understand the instructions in the Programming Manual.

CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

Failure to follow this instruction can result in equipment damage.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Before turning on and configuring the MT Series, check that the PWR (POWER REMOVAL) input is deactivated (programmedto 0) in order to prevent unintended operation. Do not forget to reactivate the Power Removal input to start the motor.
- Before turning on or on exiting the configuration menus, check that the inputs assigned to the run command are deactivated (programmed to 0) since they can cause the motor to start immediately.

Failure to follow these instructions will result in death or serious injury.

☞ If the safety of personnel requires the prohibition of unwanted or unintended operation, electronic locking is performed by the MT Series “Power Removal” function.
This function requires the use of connection diagrams conforming to category 3 of standard EN 954-1 and safety integrity level 2 according to IEC/EN 61508.
The Power Removal function takes priority over any run command.

Drive ratings

Power ratings in kW

3-phase supply voltage: 200…240 V 50/60 Hz

3-phase motor 200...240 V

Motor	Line supply (input)				Drive (output)			MT Series
Power indicated on nameplate (1)	Line current (2)		Max. prospective line Isc (4)	Apparent power	Max. available nominal current In (1)	Max. transient current (1) for		Catalog number (3)
	at 200 V	at 240 V				60 s	2 s	
kW	A	A	kA	kVA	A	A	A	
55	202	171	35	71	221	332	365	**MT275**
75	274	231	35	95	285	428	470	**MT2100**

3-phase supply voltage: 380…480 V 50/60 Hz

3-phase motor 380...480 V

Motor	Line supply (input)				Drive (output)			MT Series
Power indicated on nameplate (1)	Line current (2)		Max. prospective line Isc (4)	Apparent power	Max. available nominal current In (1)	Max. transient current (1) for		Catalog number (3)
	at 380 V	at 480 V				60 s	2 s	
kW	A	A	kA	kVA	A	A	A	
90	166	134	35	109	179	268	295	**MT4125**
110	202	163	35	133	215	322	354	**MT4150**
132	239	192	35	157	259	388	427	**MT4200**
160	289	233	50	190	314	471	518	**MT4250**
200	357	286	50	235	387	580	638	**MT4300**
220	396	320	50	261	481	721	793	**MT4400**
250	444	357	50	292				

(1) These power ratings and currents are given for an ambient temperature of 50°C (122°F) at the factory-set switching frequency of 2.5 kHz, used in continuous operation.
Above 2.5 kHz, the drive will reduce the switching frequency automatically in the event of excesive temperature rise. For continuous operation above 2.5 kHz, derating must be applied to the drive nominal current in accordance with the curves on pages 13 and 14.

(2) Typical value for the indicated motor power rating, with a standard 4-pole motor on a supply with the indicated “Max. prospective line Isc”.

(3) The drives are supplied as standard with a DC choke, which must be used for connecting the drive on a 3-phase line supply.
For connections to the DC bus, the drive can be controlled without a choke. (contact factory for details)

(4) If the drive is installed on a line supply with a prospective short circuit current that is higher than the value given in this column, use line chokes.

Power ratings in HP

3-phase supply voltage: 200…240 V 50/60 Hz

3-phase motor 200...240 V

Motor	Line supply (input)				Drive (output)			MT Series
Power indicated on name plate (1)	Line current (2)		Max. prospective line Isc (4)	Apparent power	Max. available nominal current In (1)	Max. transient current (1) for		Catalog number (3)
	at 200 V	at 240 V				60 s	2 s	
HP	A	A	kA	kVA	A	A	A	
75	206	180	35	71	221	332	365	**MT275**
100	274	237	35	95	285	428	470	**MT2100**

3-phase supply voltage: 460...480 V 50/60 Hz

3-phase motor 460 V

Motor	Line supply (input)			Drive (output)			MT Series
Power indicated on name plate (1)	Line current (2)	Max. prospective line Isc (4)	Apparent power	Max. available nominal current In (1)	Max. transient current (1) for		Catalog number (3)
	at 460 V				60 s	2 s	
HP	A	kA	kVA	A	A	A	
125	143	35	114	179	268	295	**MT4125**
150	173	35	138	215	322	354	**MT4150**
200	225	35	179	259	388	427	**MT4200**
250	281	50	224	314	471	518	**MT4250**
300	333	50	265	387	580	638	**MT4300**
350	394	50	314	481	721	793	**MT4400**
400	442	50	352				

(1) These power ratings and currents are given for an ambient temperature of 50°C (122°F) at the factory-set switching frequency of 2.5 kHz, used in continuous operation.
Above 2.5 kHz, the drive will reduce the switching frequency automatically in the event of excesive temperature rise. For continuous operation above 2.5 kHz, derating must be applied to the drive nominal current in accordance with the curves on pages 13 and 14.

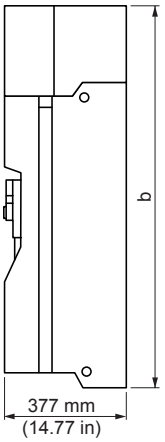
(2) Typical value for the indicated motor power rating, with a standard 4-pole motor on a supply with the indicated “Max. prospective line Isc”.

(3) The drives are supplied as standard with a DC choke, which must be used for connecting the drive on a 3-phase line supply.
For connections to the DC bus, the drive can be controlled without a choke. (contact the factory for details)

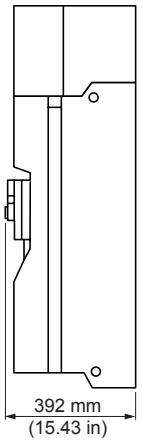
(4) If the drive is installed on a line supply with a prospective short circuit current that is higher than the value given in this column, use line chokes.

Dimensions and weights

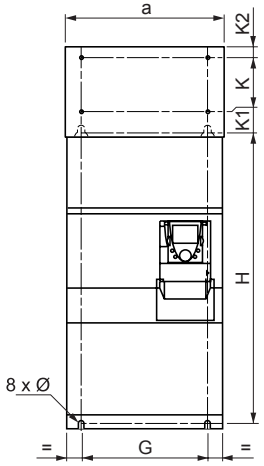
With 0 or 1 option card (1)



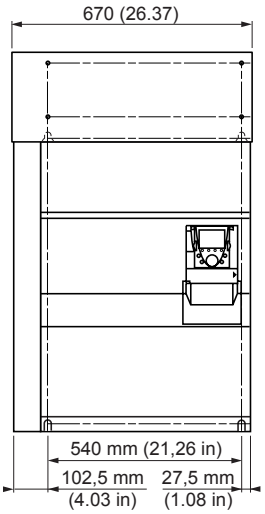
With 2 option cards (1)



MT275,MT2100,MT4125 to MT4400



I MT4300 to MT4400 with braking unit

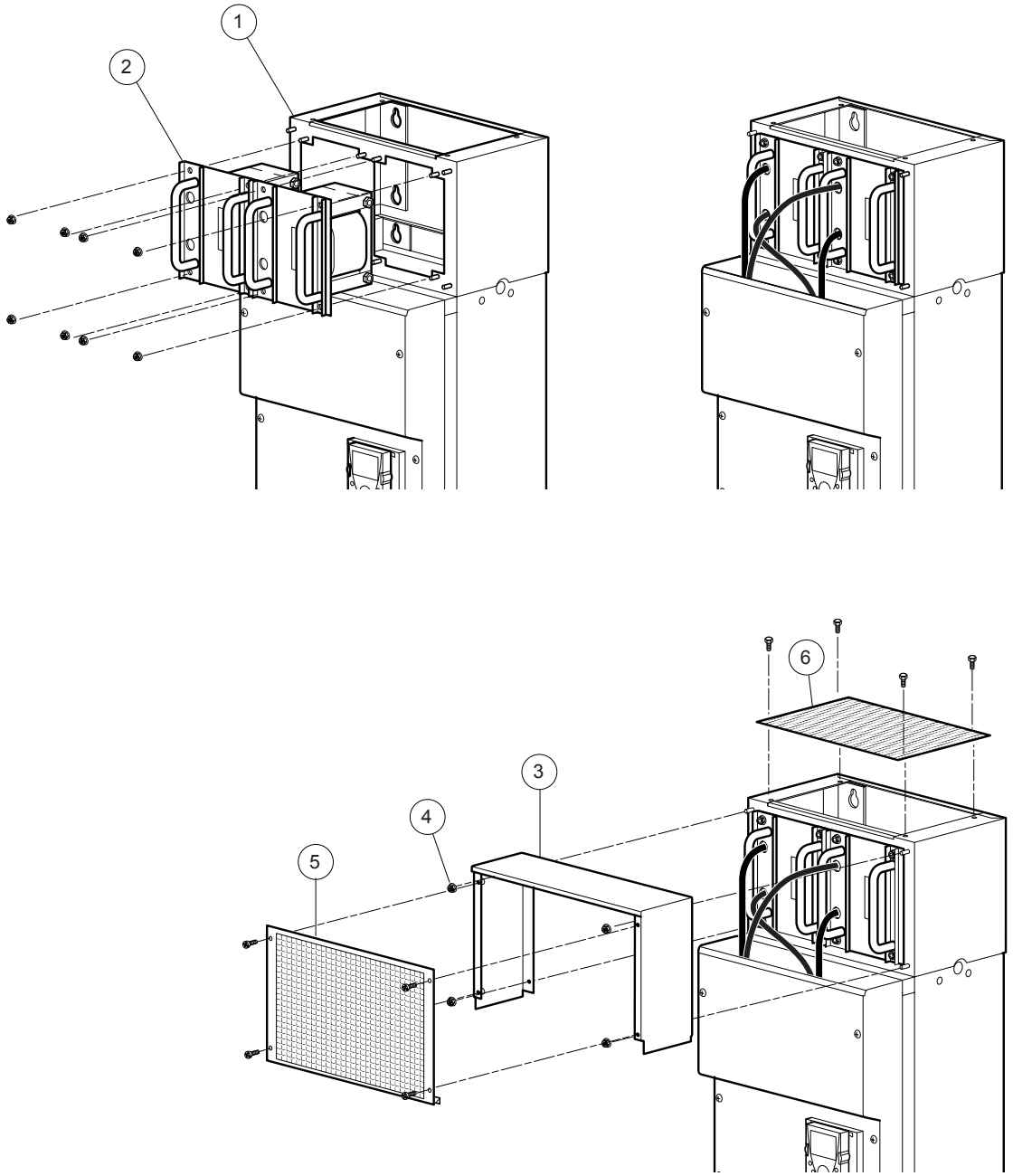


MT	a mm (in.)	b mm (in.)	G mm (in.)	H mm (in.)	K mm (in.)	K1 mm (in.)	K2 mm (in.)	Ø mm (in.)	For screws	Weight kg (lb.)
275,4125	320 (12.60)	920 (36.22)	250 (9.84)	650 (25.59)	150 (5.91)	75 (2.95)	30 (1.18)	11.5 (0.45)	M10	92 (132)
4150,2100	360 (14.17)	1022 (40.23)	298 (11.73)	758 (29.84)	150 (5.91)	72 (2.83)	30 (1.18)	11.5 (0.45)	M10	108 (163)
4200	340 (13.39)	1,190 (46.62)	285 (11.22)	920 (36.22)	150 (5.91)	75 (2.95)	30 (1.18)	11.5 (0.45)	M10	116 (255)
4250	440 (17.32)	1,190 (46.62)	350 (13.78)	920 (36.22)	150 (5.91)	75 (2.95)	30 (1.18)	11.5 (0.45)	M10	163 (358)
4300,4400,4450	595 (23.43)	1,190 (46.62)	540 (21.26)	920 (36.22)	150 (5.91)	75 (2.95)	30 (1.18)	11.5 (0.45)	M10	207 (455)

Installing the DC choke

This should be performed after mounting the drive and before wiring it. If a MT-VW3 A7 101 braking module is used, install the module on the drive before installing the DC choke.
During installation, ensure that no liquid, dust or conductive objects fall into the drive.

Example of installing DC chokes on an MT4250



- Mount the DC choke chassis (1) on the wall, on top of the drive. Ensure that the chassis is tightly secured to the drive to maintain the IP54 seal of the ventilation duct.
- Then install the DC choke (2) on the chassis (1) using the nuts provided.
- Connect the choke between the PO and PA/+ terminals on the drive (see next page and note below).
- Connect the grounding strip between the DC choke chassis (1) and the drive.
- Then mount the cover (3) on the chassis and secure it with the nuts (4) provided.
- Then mount panels (5) and (6) using the screws provided.

Once the choke has been installed, the degree of protection of the top of the drive is IP31.

Note: The number of DC chokes supplied with the drive varies according to the drive rating.

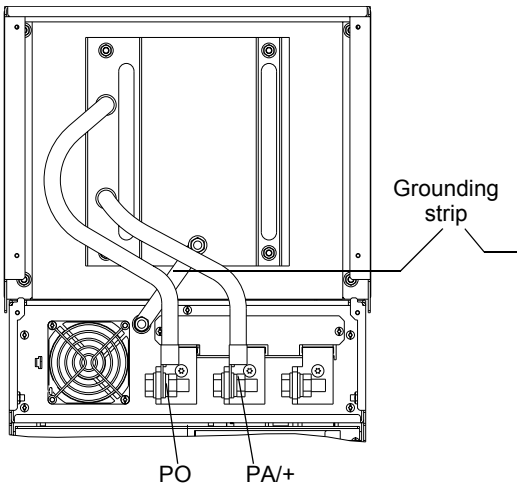
Connecting the DC choke

1 to 4 chokes can be connected in parallel as described in the examples below.

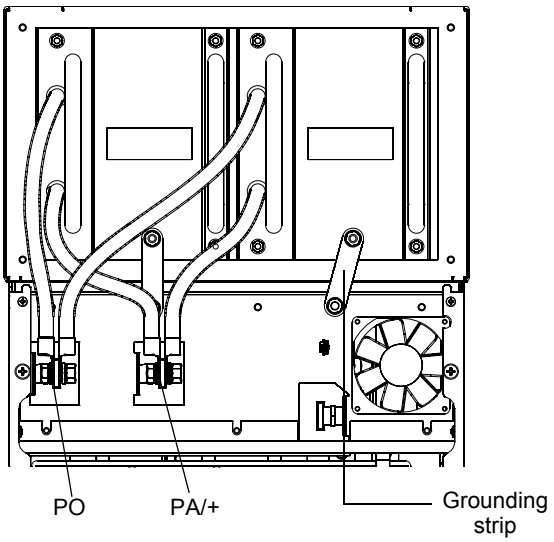
Table showing possible drive/choke combinations

Drive	Number of chokes in parallel	Choke model
MT275	1	DC-CHOKE 5
MT2100	1	DC-CHOKE 6
MT4125	1	DC-CHOKE 1
MT4150	1	DC-CHOKE 2
MT4200	1	DC-CHOKE 4
MT4250	2	DC-CHOKE 1
MT4300	2	DC-CHOKE 3
MT4400	2	DC-CHOKE 4

Example 1:
MT275... MT2100,
MT4125... MT4200



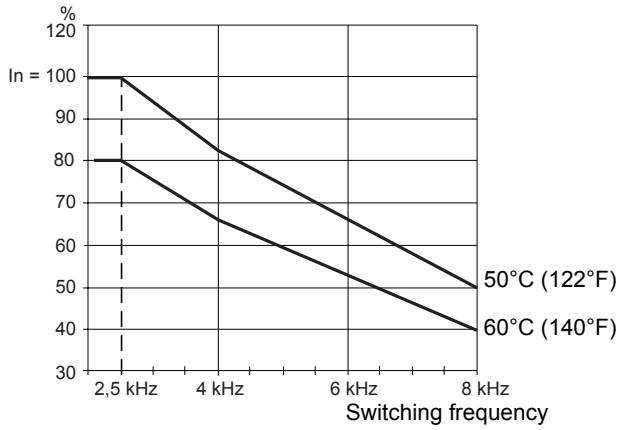
Example 2:MT4250... MT4400



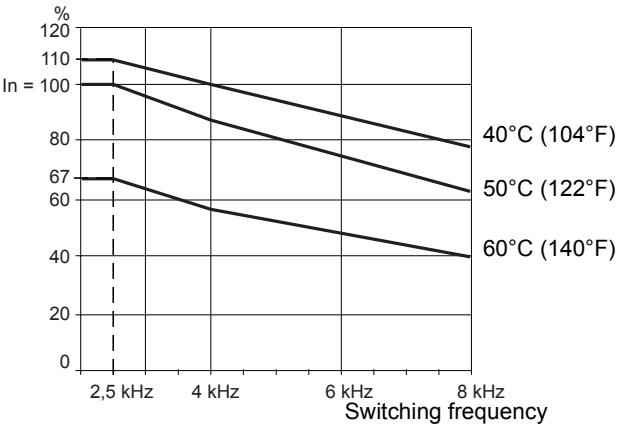
Derating as a function of temperature and switching frequency

Derating curves for the drive current In as a function of the temperature and switching frequency.

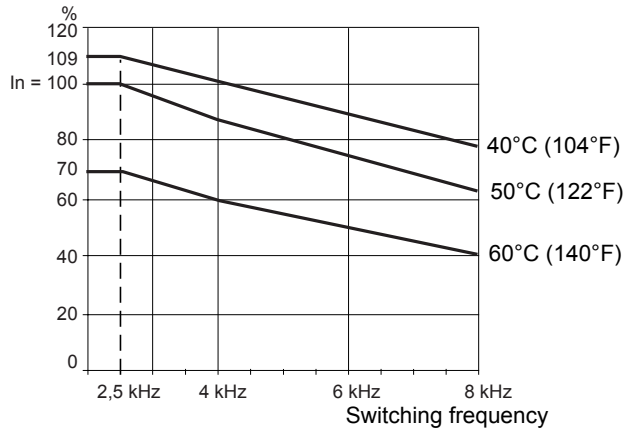
MT275 , MT2100



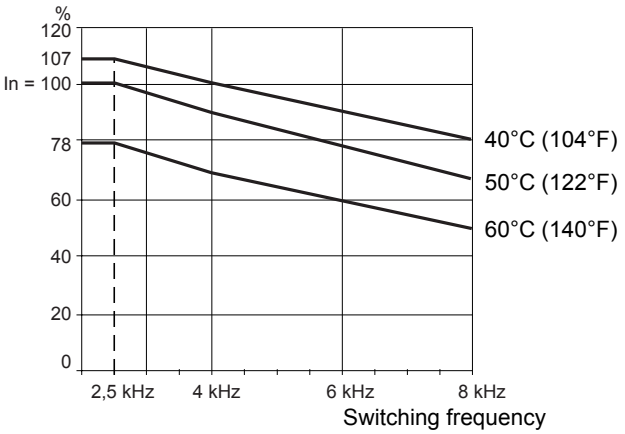
MT4125



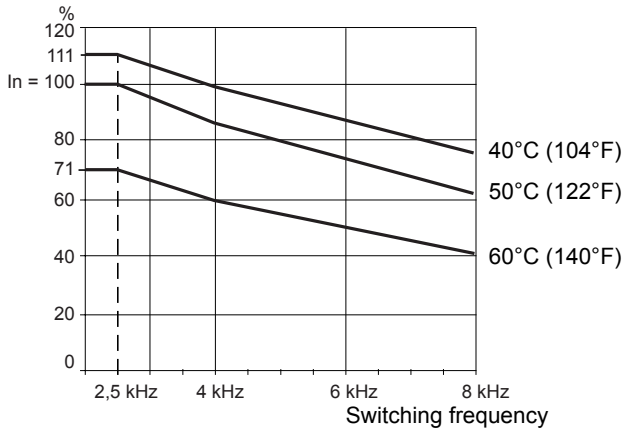
MT4150



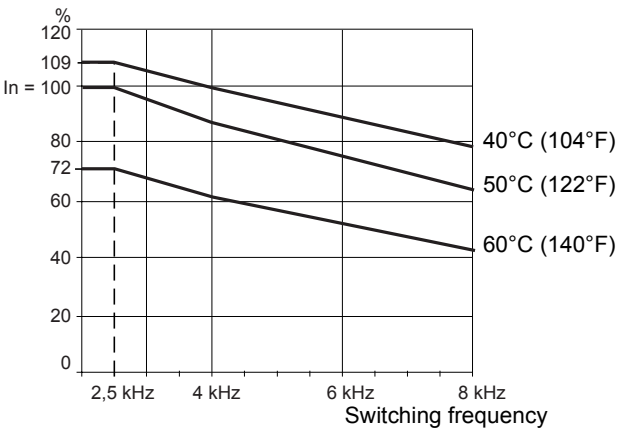
MT4200



MT4250



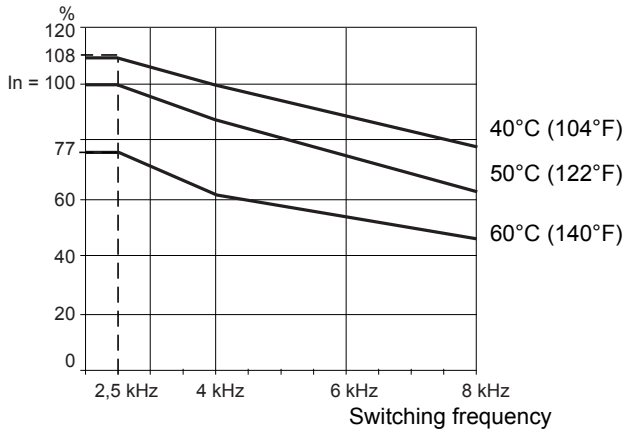
MT4300



For intermediate temperatures (e.g. 55°C (131°F)), interpolate between 2 curves.

Derating as a function of the temperature and the switching frequency

MT4400



For intermediate temperatures (e.g. 55°C (131°F)), interpolate between 2 curves.

Mounting in a wall-mounted or floor-standing enclosure

Install the drive vertically at ± 10°. Do not place it close to heating elements.

Installing the heatsink inside the enclosure

The power dissipated by the drive power components is given in the table below.

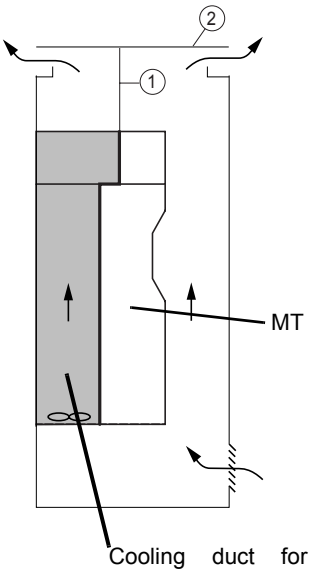
Dissipated power

These levels of power dissipation are given for operation at nominal load and for a switching frequency of 2.5 Hz.

MT	Dissipated power W
275	1,715
2100	2,204
4125	2,403
4150	2,593
4200	2,726
4250	3,812

MT	Dissipated power W
4300	4,930
4400	5,873

Figure 1

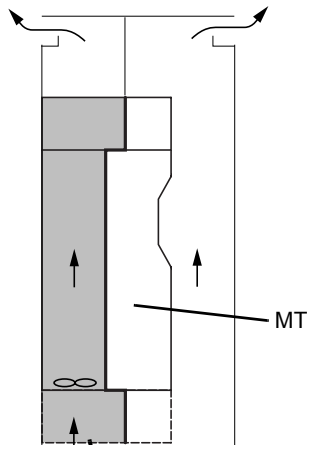


Cooling duct for power components.
IP54 protection(nema 12)

The drive has a fan for cooling the power components. The air is circulated from the bottom to the top of the unit via a duct (the duct is shown shaded gray on the diagram opposite). This du is isolated from the control section by IP54 protection. The DC choke extends this duct whi maintaining IP54 protection.
The drive dissipates a great deal of power, which must be evacuated to the outside of th enclosure.
Air inlets and outlets must be provided to ensure that the flow of air in the enclosure is at lea equal to the value given in the table below for each drive.

MT	Flow rate	
	m^3/hour	ft^3/min
275,4125	402	236
2100,4150	774	455
4200	745	438
4250	860	506
4300,4400	1,260	742

Figure 2



Kit for IP31 or NEMA type 1 conformity

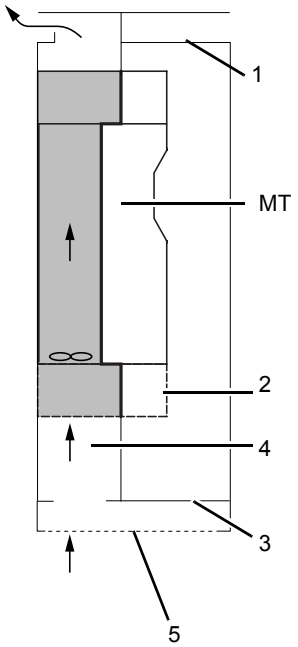
Several methods of evacuation are possible. The following is a proposed method for IP23 ar IP54 mounting.

IP23 mounting (standard operating conditions):

Figure 1
Install the drive on an enclosure baseplate.
Install the DC choke in accordance with the mounting recommendations.
The simplest mounting is to extend the IP54 duct between the upper outlet of the DC choke and the top of the enclosure (1). Fixing points are provided for this purpose on the top of the DC choke.
The hot air is thus evacuated to the outside and does not contribute towards increasing the internal temperature of the enclosure.
It is advisable to add a plate (2) approximately 150 mm from the top of the enclosure over the air outlet opening to prevent foreign bodies falling into the drive cooling duct.
The air inlet can be via a grille on the bottom front panel of the enclosure door, in accordance with the required flow rates given in the above table.

Figure 2
It is advisable to use a kit for IP31/NEMA type 1 conformity (to be ordered as an option) for attaching the power cables. The design of the IP31 kit is based on the same principle as the DC choke, and has an IP54 duct to help guide the incoming air.

Note:
- If the air in the power circuit is totally evacuated to the outside, very little power is dissipated inside the enclosure. In this case, use the dissipated power table for dust and damp proof flange mounting (see the next page).
- Connect all the additional metal parts to ground.



Mounting the heatsink inside the enclosure (continued)

IP54 mounting (standard operating conditions):

The drive must be mounted in an IP54 enclosure in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.

The simplest way of obtaining an enclosure with IP54 protection is to follow the mounting recommendations for IP23 protection with the following 5 additional points:

1 Do not make an air outlet hole for the control section. Do not make an air inlet hole in the enclosure door. The air for the power section will enter through the bottom of the enclosure via a plinth added for the purpose.
2 Add the IP31 or NEMA type 1 conformity kit in accordance with the mounting instructions.
3 Add an enclosure baseplate designed to provide IP54 protection around the power cables.
4 Add an air evacuation duct between the baseplate and the duct of the IP31 or NEMA type 1 conformity kit. The IP31 or NEMA type 1 conformity kit enables an extension duct to be mounted. Drill a hole in the base of the enclosure to allow air to enter. Place seals around the duct that has been added to maintain IP54 protection.
5 Add a 200 mm plinth at the bottom of the enclosure with grilles to allow air to enter.
6 Use the dissipated power table below to calculate the size of the enclosure.

Note: Connect all the additional metal parts to ground.

Power dissipated inside the enclosure by the control section (for calculating the size of the enclosure)

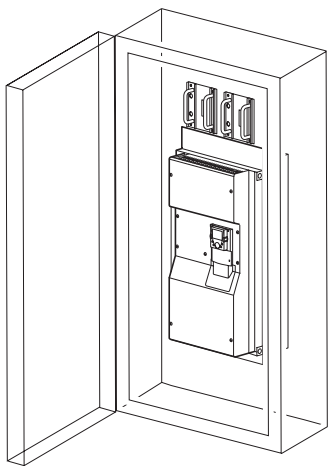
These power ratings are given for operation at nominal load and for the factory-set switching frequency.

MT	Dissipated power (1) W
275	154
2100	154
4125	237
4150	261
4200	296
4250	350

MT	Dissipated power (1) W
4300	493
4400	586

(1)Add 7W to this value for each option card added

Dust and damp proof flange mounting (heatsink outside the enclosure)



This mounting is used to reduce the dissipated power in the enclosure by locating the power section outside the enclosure.
This requires the use of the dust and damp proof flange mounting kit MT-VW3A9509. (please refer to the catalog).
The degree of protection for the drive mounted in this way becomes IP54.(nema 12)

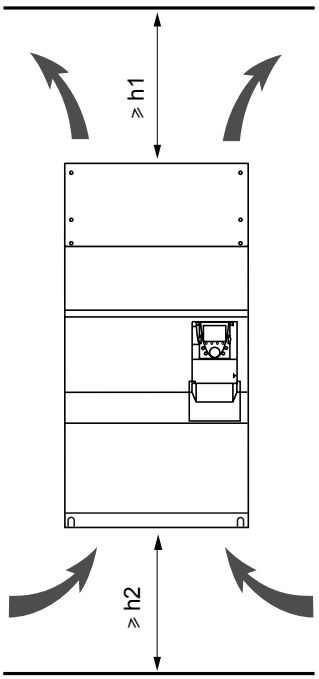
To mount the kit on the drive, please refer to the manual supplied with the kit.

Use the dissipated power table above to calculate the size of the enclosure.

In this case the DC choke can be mounted directly on the back of the enclosure.

Mounting in a wall-mounted or floor-standing enclosure

If the hot air exiting the drive is not ducted and evacuated to the outside, it may be sucked back in again, which would render the ventilation ineffective. To prevent this, leave sufficient free space around the drive, as shown below.
The wall-mounted or floor-standing enclosure must be cooled in order to evacuate the dissipated heat.



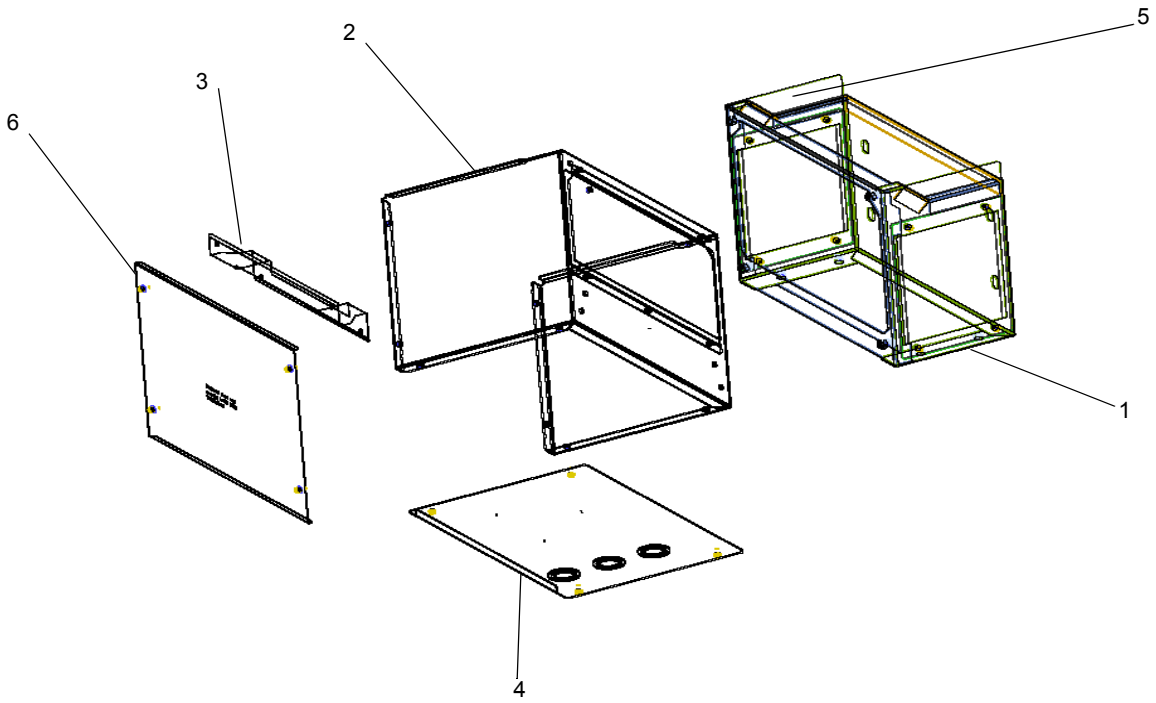
MT	h1		h2	
	mm	in.	mm	in.
275,2100,4125	100	3.94	100	3.94
4150,4200,4250	150	5.90	150	5.90
4300,4400	200	7.87	150	5.90

Free space in front of the drive: 10 mm (0.39 in.) minimum

Installing the kit for IP31/NEMA type 1 conformity

On MT275 to MT2100 and MT4125 to MT4400 drives, the cable shielding can be attached and connected to ground using one of the following two kits:
- Kit for IP31 conformity (MT-VW3 A9 109)
- Kit for NEMA Type 1 conformity (MT-VW3 A9 209)

This kit is not supplied with the drive. It must be ordered separately (please refer to the catalog). It is mounted under the drive as shown below.



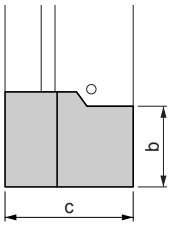
- Mount the chassis (1) on the wall or in the back of the enclosure under the drive. Ensure that the chassis is tightly secured to the drive to maintain the IP54 seal of the ventilation duct. Use the 2 clamps which fit into the drive's carrying holes for this purpose (5).
- Mount the nema 1 box (2) on the kit chassis using the screws provided.
- Mount the clamp (3) to ensure emc plate is securely grounded.
- Mount the conduit cover (4) on the nema 1 box using the screws provided.
- Then mount the top cover cover (6) on the box plate using the screws provided.

Note:

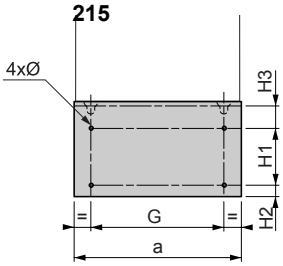
This kit can be used to help guide the incoming air. It is supplied with a seal to ensure IP54 protection between the duct and the drive. Close the carrying holes on the drive (5) with the plastic plugs provided for the purpose.

Installing the kit for IP31/NEMA type 1 conformity

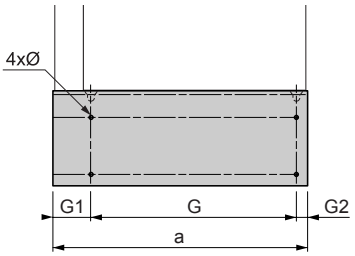
MT-VW3 A9 209 ... 216



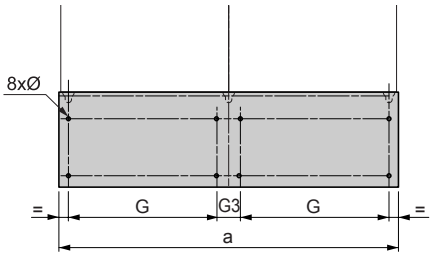
MT-VW3 A9 209 ... 213, 215



MT-VW3 A9 214



MT-VW3 A9 216

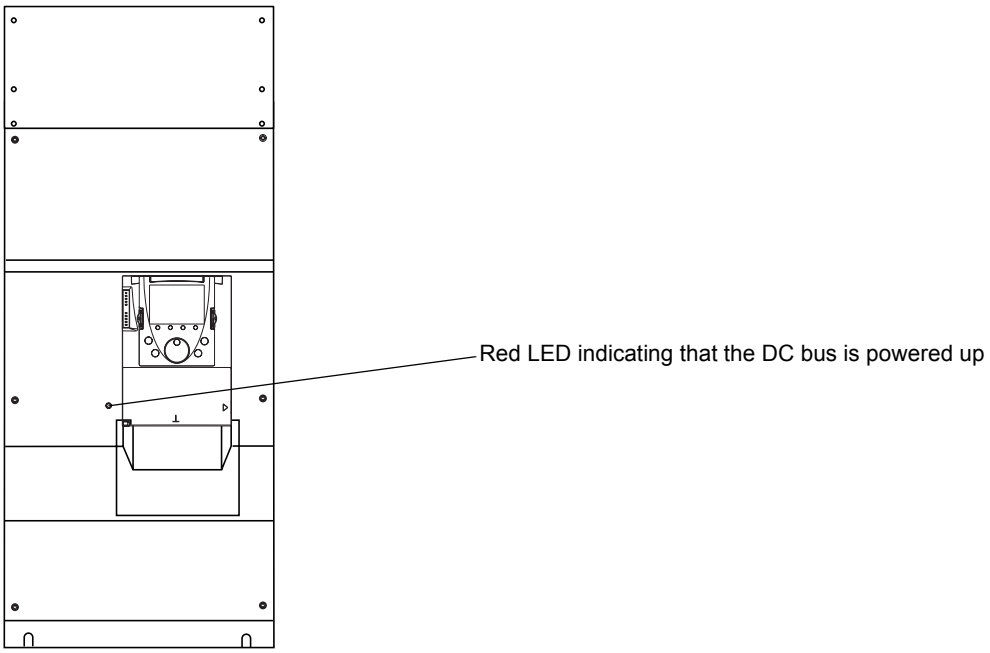


MT-VW3	a mm (in.)	b mm (in.)	c mm (in.)	G mm (in.)	G1 mm (in.)	G2 mm (in.)	G3 mm (in.)	H1 mm (in.)	H2 mm (in.)	H3 mm (in.)	Ø mm (in.)	For screws
A9 209	320 (12.6)	220 (8.66)	367 (14.45)	250 (9.84)	- -	- -	- -	95 (3.74)	65 (2.56)	75 (2.95)	11.5 (0.45)	M10
A9 210	360 (14.17)	300 (11.81)	367 (14.45)	298 (11.73)	- -	- -	- -	172 (6.77)	65 (2.56)	75 (2.95)	11.5 (0.45)	M10
A9 211	340 (13.39)	315 (12.4)	369 (14.53)	285 (11.22)	- -	- -	- -	240 (9.40)	35 (1.37)	55 (2.15)	11.5 (0.45)	M10
A9 212	440 (17.32)	375 (14.76)	424 (16.69)	350 (13.78)	- -	- -	- -	250 (9.84)	65 (2.56)	75 (2.95)	11.5 (0.45)	M10
A9 213	595 (23.43)	375 (14.76)	472 (18.58)	540 (21.26)	- -	- -	- -	250 (9.84)	65 (2.56)	75 (2.95)	11.5 (0.45)	M10
A9 214	670 (23.43)	375 (14.76)	472 (18.58)	540 (21.26)	102.5 (4.03)	27.5 (1.08)	- -	250 (9.84)	65 (2.56)	75 (2.95)	11.5 (0.45)	M10
A9 215	(890) (35.04	475 (18.7)	474 (18.66)	835 (32.87)	- -	- -	- -	350 (13.78)	65 (2.56)	75 (2.95)	11.5 (0.45)	M10
A9 216	1,120 (44.09	475 (18.7)	474 (18.66)	495 (19.49)	- -	- -	70 (2.76)	350 (13.78)	65 (2.56)	75 (2.95)	11.5 (0.45)	M10

Location of the charging LED

Before working on the drive, turn it off, wait until the red capacitor charging LED has gone out, then measure the DC bus voltage.

Location of the capacitor charging LED



Procedure for measuring the DC bus voltage

⚠ DANGER

HAZARDOUS VOLTAGE

Read and understand the instructions on page 4 before performing this procedure.
Failure to follow this instruction will result in death or serious injury.

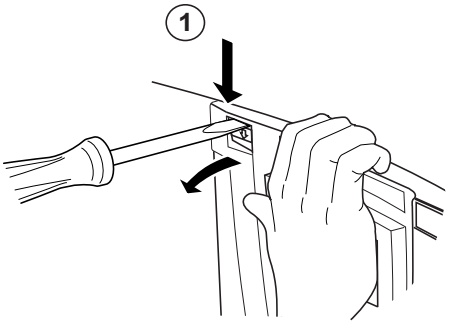
The DC bus voltage can exceed 1,000 VDC. Use a properly rated voltage sensing device when performing this procedure. To measure the DC bus voltage:

1. Disconnect the drive power supply.
2. Wait for the capacitor charging LED to go off.
3. Measure the voltage of the DC bus between the PA/+ and PC/- terminals to check whether the voltage is less than 45 VDC. Refer to page 25 for the layout of the power terminals.
4. If the DC bus capacitors have not discharged completely, contact Motortronics agent (do not repair or operate the drive).

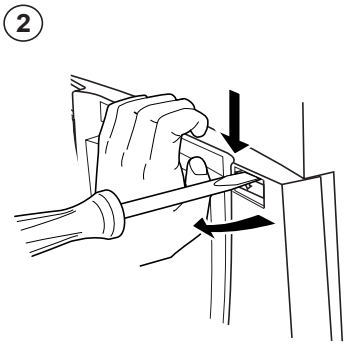
Installing option cards

These should ideally be installed once the drive is mounted and before wiring it.
Check that the red capacitor charging LED has gone out. Measure the DC bus voltage in accordance with the procedure indicated on page 20.
The option cards are installed under the drive control front panel. Remove the graphic keypad then take off the control front panel as indicated below.

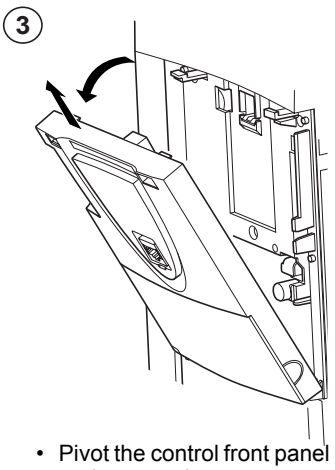
Remove the control front panel



- Using a screwdriver, press down on the catch and pull to release the left-hand part of the control front panel



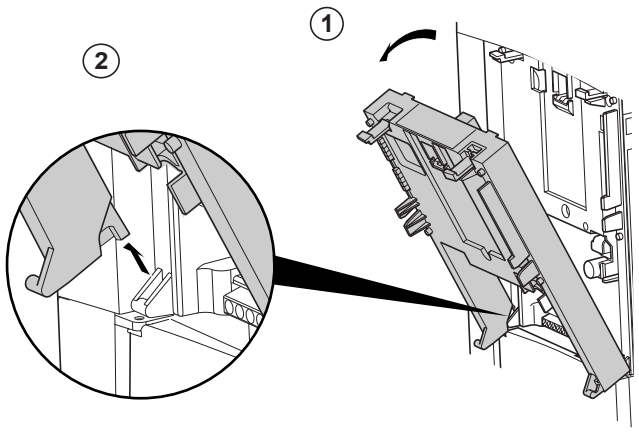
- Do the same on the right-hand side



- Pivot the control front panel and remove it

Removing the empty option card support

MT275 to MT2100 and MT4125 to MT4400 drives are supplied with an empty option card support. If adding an I/O or communication option card or a “Controller Inside” programmable card, remove the support following the instructions below. This card support serves no purpose if one or more option cards are used.



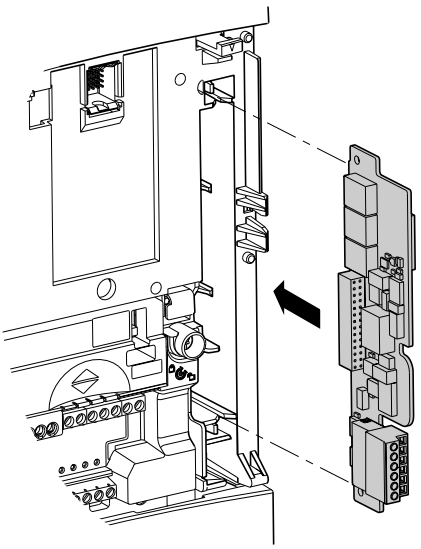
(1) Open the empty option card support

(2) Release the support from its hooks and remove it

Installing option cards

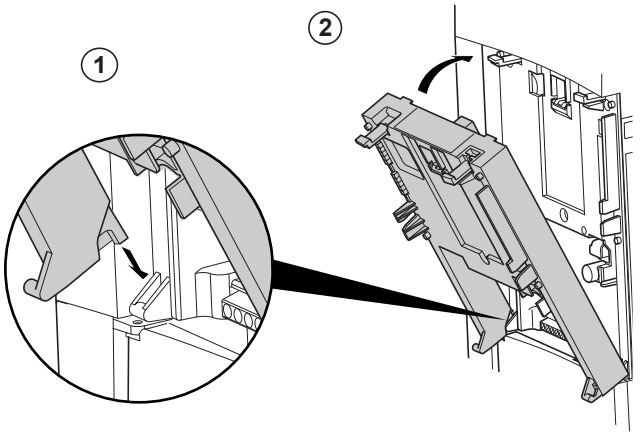
Installing an encoder interface card

There is a special slot on the drive for adding an encoder interface card.



• First remove the empty option card support if it is still in place, as shown on the previous page, so that you can access the slot for the encoder feedback card.
• If an I/O or communication option card has already been installed, remove it so you can access the slot for the encoder feedback card.
• After installing the encoder interface card, replace the empty card support or the option card(s).

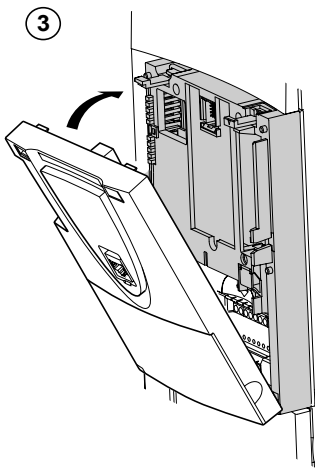
Installing an I/O extension card or a communication card



(1) Position the option card on the clasps

(2) Pivot the card until it clicks into place

Replacing the control front panel



(3) Replace the control front panel over the option card (same procedure as for installing the option card, see (1) and (2))

Wiring recommendations

Power

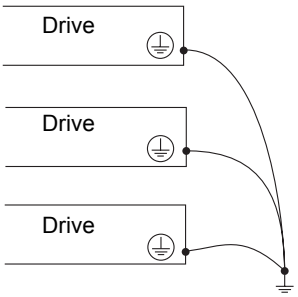
The drive must be connected to the protective ground. To comply with local regulations concerning high leakage currents (above 3.5 mA), use at least a 10 mm² (AWG 6) protective conductor or 2 protective conductors with the same cross-section as the power supply conductors.

⚠ DANGER

HAZARDOUS VOLTAGE

Ground equipment using the ground connecting point provided as shown in the figure below. The drive panel must be properly grounded before power is applied.

Failure to follow these instructions will result in death or serious injury.



- Check whether the resistance to the protective ground is one ohm or less.
- If several drives are to be connected to the protective ground, each drive must be connected directly to this ground as shown opposite.

⚠ WARNING

IMPROPER WIRING PRACTICES

- The MT drive will be damaged if input line voltage is applied to the output terminals (U/T1,V/T2,W/T3).
- Check the power connections before powering up the MT drive.
- If replacing another drive, verify that all wiring connections to the MT drive comply with all wiring instructions in this manual.

Failure to follow these instructions can result in death or serious injury.

When upstream protection by means of a “residual current device” is required by the installation standards, a type A device should be used for single phase drives and type B for 3-phase drives. Choose a suitable model integrating:

- HF current filtering
- A time delay which prevents tripping caused by the load from stray capacitance on power-up. The time delay is not possible for 30 mA devices. In this case, choose devices with immunity against nuisance tripping, for example “residual current devices” with reinforced immunity from the **s.i** range.

If the installation includes several drives, provide one “residual current device” per drive.

⚠ WARNING

INADEQUATE OVERCURRENT PROTECTION

- Overcurrent protective devices must be properly coordinated.
- The Canadian Electricity Code and the National Electrical Code require branch circuit protection. Use the fuses recommended on the drive nameplate to achieve published short-circuit current ratings.
- Do not connect the drive to a power feeder whose short-circuit capacity exceeds the drive short-circuit current indicated in the tables on pages 8 and 9.

Failure to follow these instructions can result in death or serious injury.

Wiring recommendations

Keep the power cables separate from circuits in the installation with low-level signals (detectors, PLCs, measuring apparatus, video, phone).

The motor cables must be at least 0.5 m (20 in.) long.

Do not immerse the motor cables in water.
Do not use surge arresters or power factor correction capacitors on the variable speed drive output.

CAUTION

IMPROPER USE OF A BRAKING RESISTOR

- Only use the braking resistor values recommended in our catalogs.
- Wire a thermal overload relay in the sequence or configure the braking resistor protection (please refer to the Programming Manual) so that the drive power section AC supply is disconnected in the event of a fault.

Failure to follow these instructions can result in equipment damage.

Control

Keep the control circuits away from the power circuits. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (0.98 and 1.97 in.) and connecting the shielding to ground at each end.

If using conduit, do not lay the motor, power supply and control cables in the same conduit. Keep the metal conduit containing the power supply cables at least 8 cm (3 in.) away from the metal conduit containing the control cables. Keep the non-metal conduits or cable ducts containing the power supply cables at least 31 cm (12 in.) away from the metal conduits containing the control cables. If it is necessary for control and power cables to cross each other, be sure they cross at right angles.

Length of motor cables

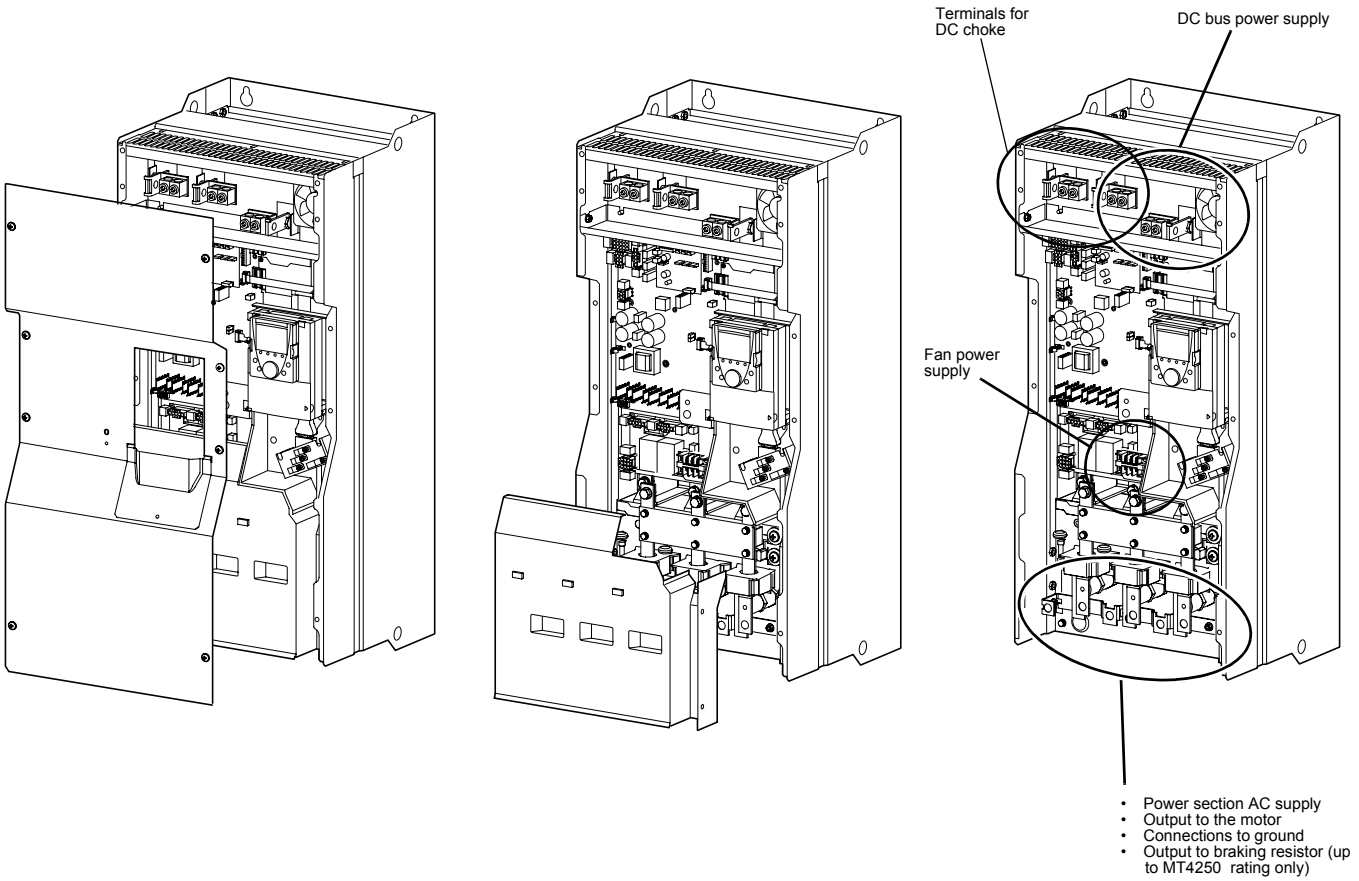
<table>
<tr><th colspan="2"></th><th>0 ... 50 m
(0 ... 164 ft)</th><th>50 ... 100 m
(164 ... 328 ft)</th><th>100 ... 200 m
(328 ... 656 ft)</th><th>200 ... 300 m
(656 ... 984 ft)</th><th>300 ... 400 m
(984 ... 1,312 ft)</th><th>400 ... 600 m
(1,312 ... 1,968 ft)</th></tr>
<tr><td rowspan="2">MT275 to MT2100
MT4125 to MT4400</td><td>Shielded cable</td><td colspan="2"></td><td>Motor choke</td><td colspan="3">2 motor chokes in series</td></tr>
<tr><td>Unshielded cable</td><td colspan="2"></td><td colspan="2">Motor choke</td><td colspan="2">2 motor chokes in series</td></tr>
</table>

Note: On old generation motors or those with poor insulation it is advisable to use a motor choke with 5 m (16.4 ft) of cable.

Choice of associated components:
Please refer to the catalog.

Access to the power terminals

To access the power terminals, unscrew the front panel and remove the protective cover



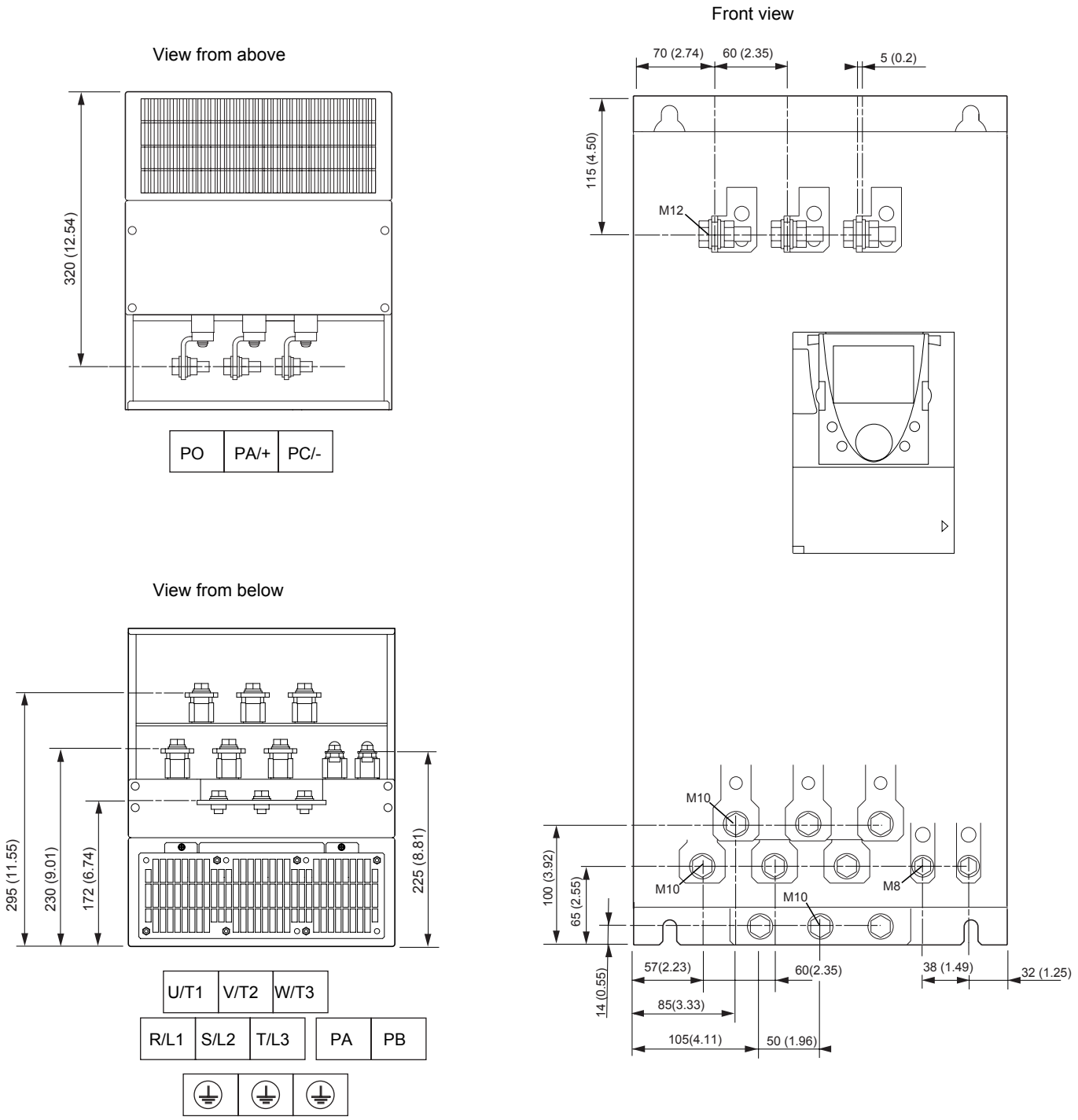
Characteristics and functions of the power terminals

Terminal	Function	MT
3 x ⏚	Protective ground connection terminals	All ratings
R/L1, S/L2, T/L3 (1)	Power supply	All ratings
PO	DC choke connection	MT275 , MT2100 MT4125 to MT4400
PA/+	DC bus + polarity and DC choke connection	All ratings
PC/-	DC bus - polarity	All ratings
PA	Output to braking resistor	MT275 , MT2100 MT4125 to MT4250 (2)
PB	Output to braking resistor	
U/T1, V/T2, W/T3	Output to the motor	All ratings
RO, SO, TO	Separate power supply for the fan when the drive is powered by the DC bus only	MT2100 MT4150 to MT4400
BU+, BU-	+ and - polarities to be connected to the braking unit	MT4300 to MT4400 Refer to the braking unit User's Manual.
X20, X92, X3	Braking unit control cable connection	

(1) From the MT4300 upwards, there are no braking resistor connection terminals on the drive as the braking unit is optional (please refer to the catalog). The braking resistor is then connected to the braking unit.

Power terminals

MT275 , MT4125

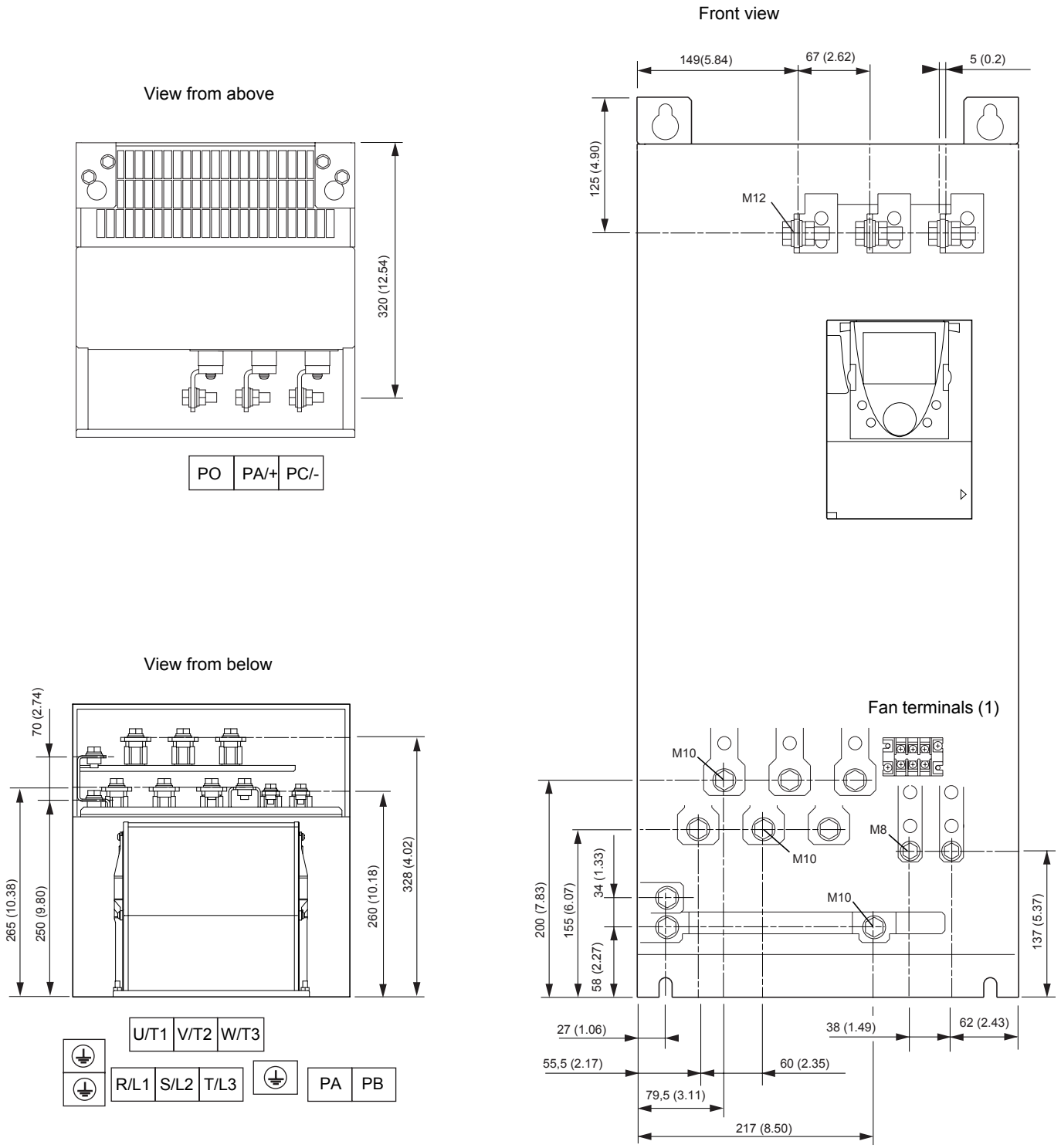


Max. wire size/terminal tightening torque

Drive terminals	L1/R, L2/S, L3/T, U/T1, V/T2, W/T3	PC/-, PO, PA/+	PA, PB
	2 x 100 mm^2 / 24 Nm	2 x 100 mm^2 / 41 Nm	60 mm^2 / 12 Nm
	2 x 250 MCM / 212 lb.in	2 x 250 MCM / 360 lb.in	250 MCM / 106 lb.in

Power terminals

MT2100 , MT4150



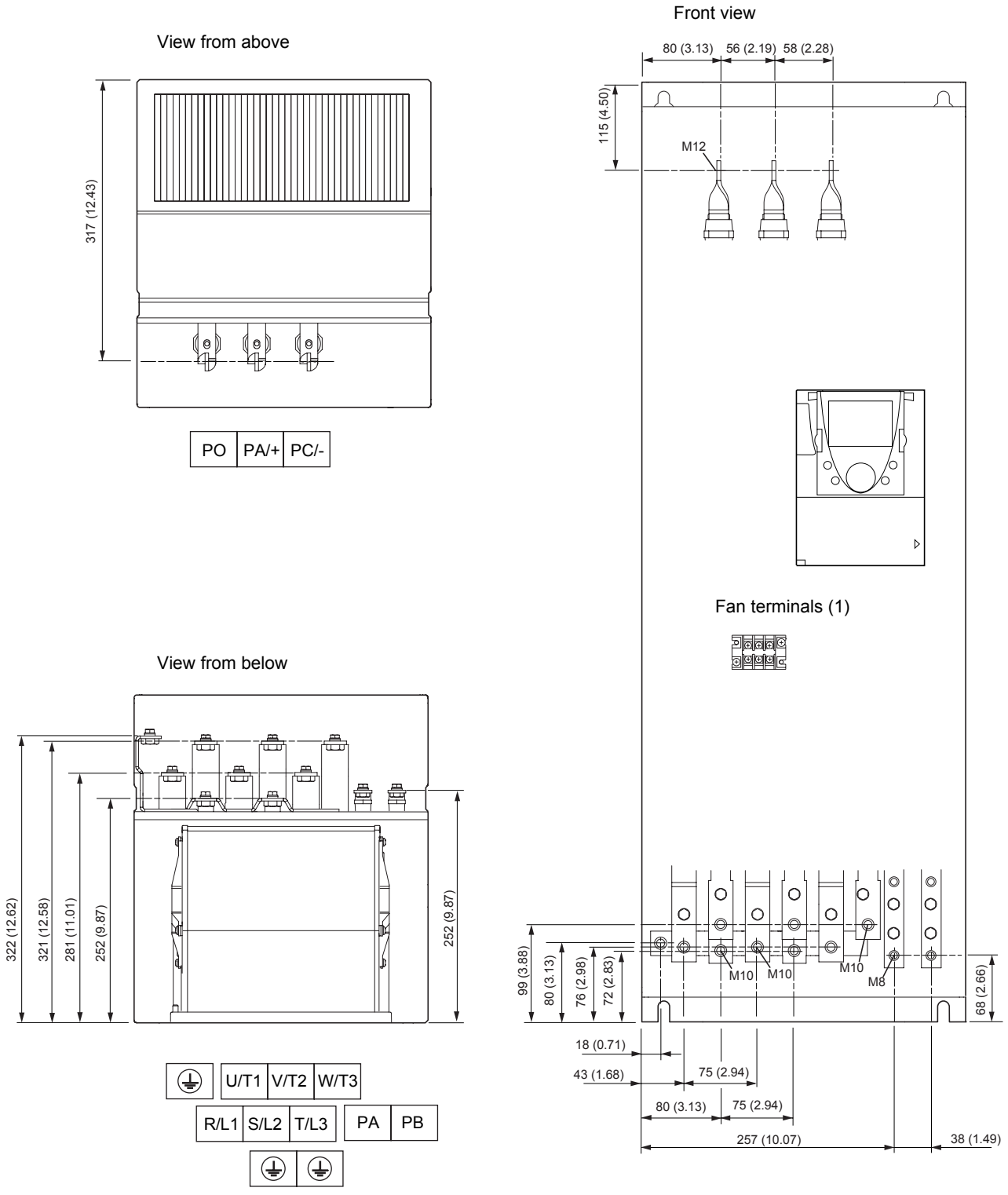
Max. wire size/terminal tightening torque

Drive terminals	L1/R, L2/S, L3/T, U/T1, V/T2, W/T3	PC/-, PO, PA/+	PA, PB	RO, SO, TO (1)
	2 x 100 mm^2 / 24 Nm	2 x 150 mm^2 / 41 Nm	60 mm^2 / 12 Nm	5.5 mm^2 / 1.4 Nm
	2 x 250 MCM / 212 lb.in	2 x 250 MCM / 360 lb.in	250 MCM / 106 lb.in	AWG 10 / 12 lb.in

(1) Power supply for the fans, compulsory if the drive is powered by the DC bus only. Do not use if the drive has a 3-phase AC supply via L1/R, L2/S, L3/T.

Power terminals

MT4200



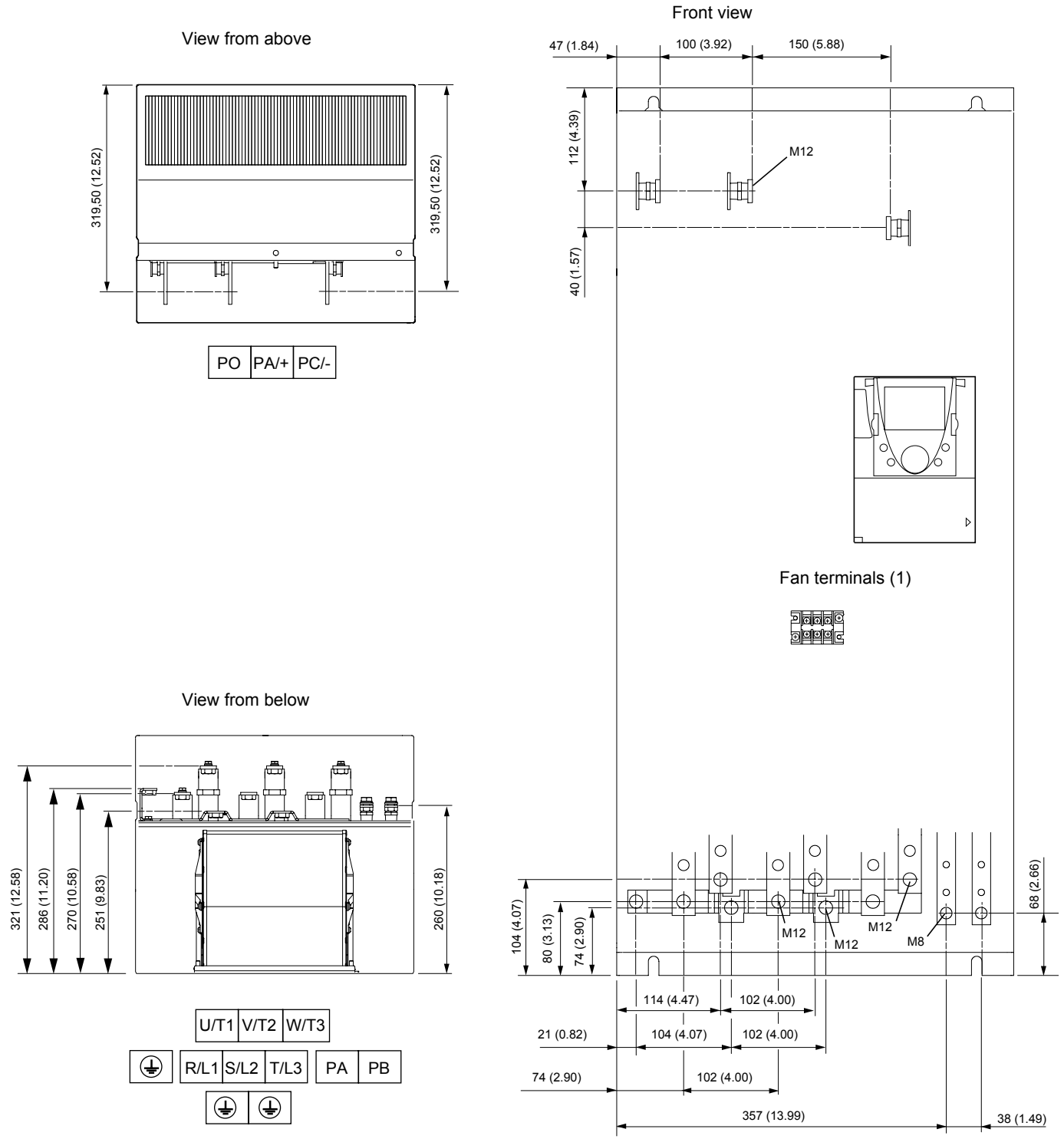
Max. wire size/terminal tightening torque

Drive terminals	L1/R, L2/S, L3/T, U/T1, V/T2, W/T3	PC/-, PO, PA/+	PA, PB	RO, SO, TO (1)
	2 x 120 mm^2 / 24 Nm	2 x 120 mm^2 / 41 Nm	120 mm^2 / 24 Nm	5.5 mm^2 / 1.4 Nm
	2 x 250 MCM / 212 lb.in	2 x 250 MCM / 360 lb.in	250 MCM / 212 lb.in	AWG 10 / 12 lb.in

(1) Power supply for the fans, compulsory if the drive is powered by the DC bus only. Do not use if the drive has a 3-phase AC supply via L1/R, L2/S, L3/T.

Power terminals

MT4250



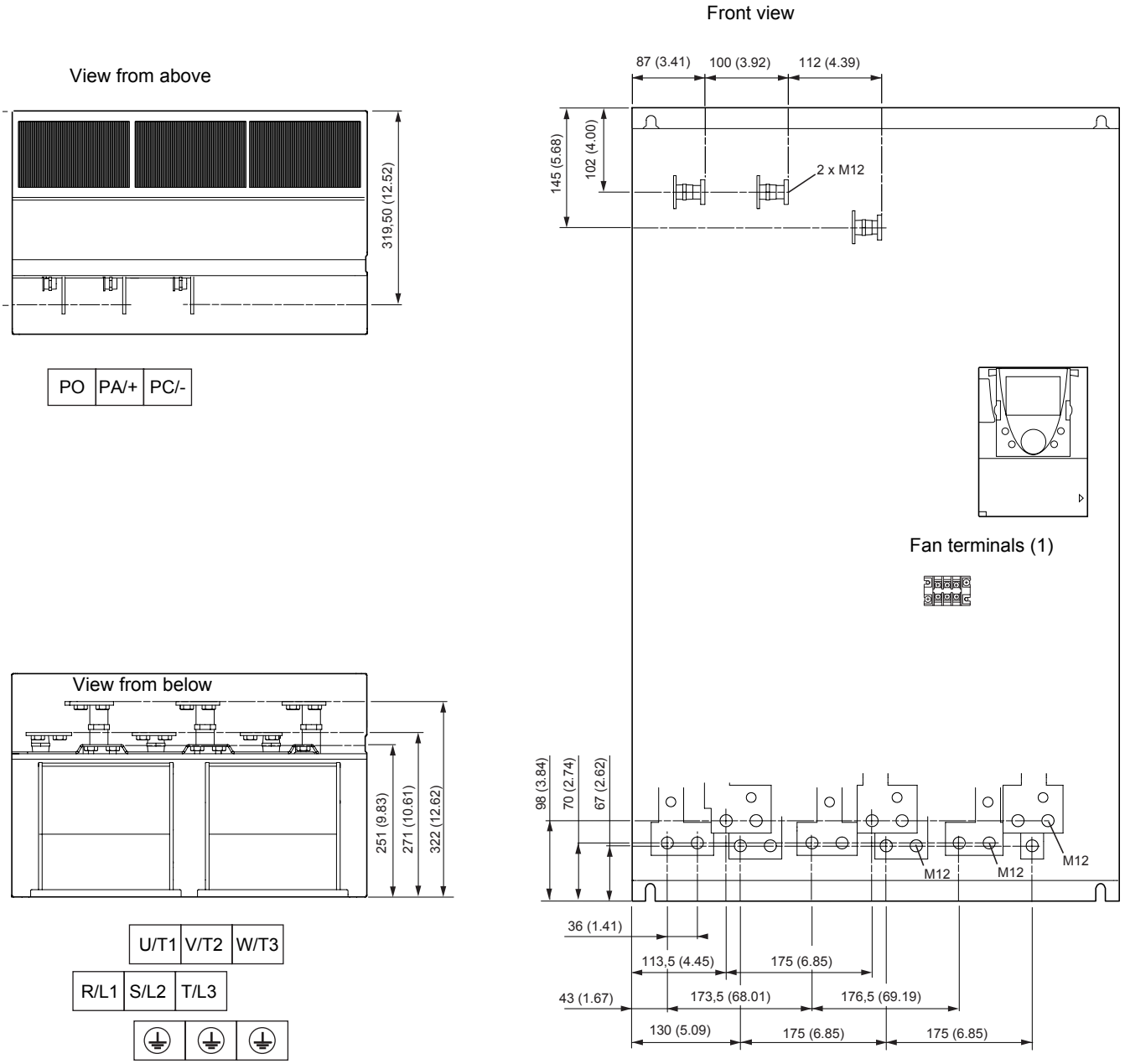
Max. wire size/terminal tightening torque

Drive terminals	L1/R, L2/S, L3/T, U/T1, V/T2, W/T3	PC/-, PO, PA/+	PA, PB	RO, SO, TO (1)
	2 x 150 mm^2 / 41 Nm	2 x 150 mm^2 / 41 Nm	120 mm^2 / 24 Nm	5.5 mm^2 / 1.4 Nm
	2 x 350 MCM / 360 lb.in	2 x 350 MCM / 360 lb.in	250 MCM / 212 lb.in	AWG 10 / 12 lb.in

(1) Power supply for the fans, compulsory if the drive is powered by the DC bus only. Do not use if the drive has a 3-phase AC supply via L1/R, L2/S, L3/T.

Power terminals

MT4300 , MT4400



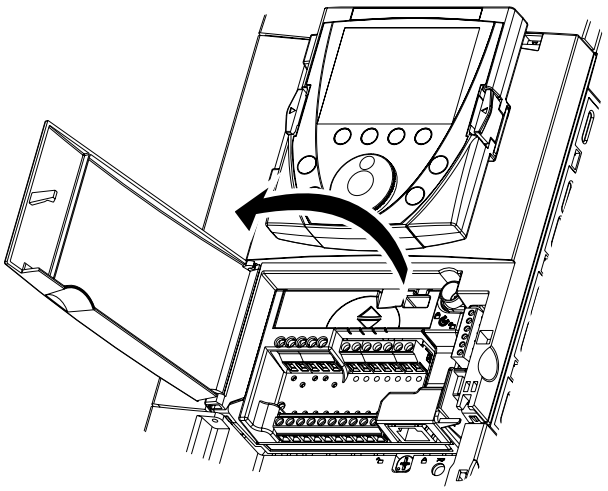
Max. wire size/terminal tightening torque

Drive terminals	L1/R, L2/S, L3/T, U/T1, V/T2, W/T3	PC/-, PO, PA/+	RO, SO, TO (1)
	4 x 185 mm^2 / 41 Nm	4 x 185 mm^2 / 41 Nm	5.5 mm^2 / 1.4 Nm
	3 x 350 MCM / 360 lb.in	3 x 350 MCM / 360 lb.in	AWG 10 / 12 lb.in

(1) Power supply for the fans, compulsory if the drive is powered by the DC bus only. Do not use if the drive has a 3-phase AC supply via L1/R, L2/S, L3/T.

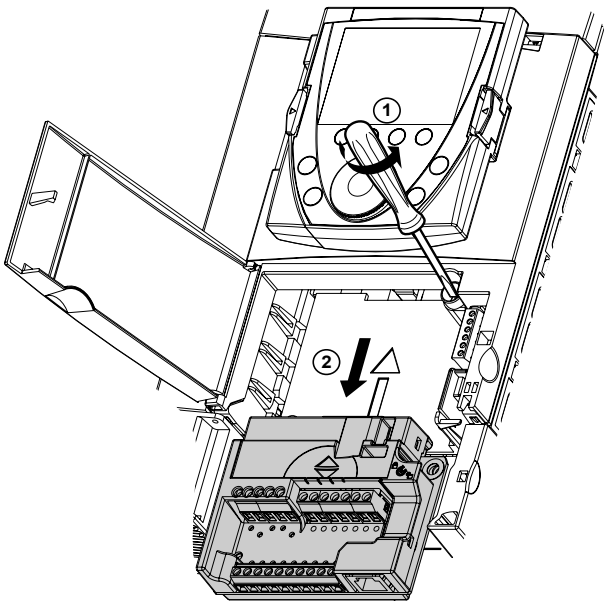
Control terminals

Access to the control terminals



To access the control terminals,
open the cover on the control front panel.

Removing the terminal card



To make it easier to wire the drive control section,
the control terminal card can be removed.

- Undo the screw until the spring is fully extended.
- Remove the card by sliding it downwards.

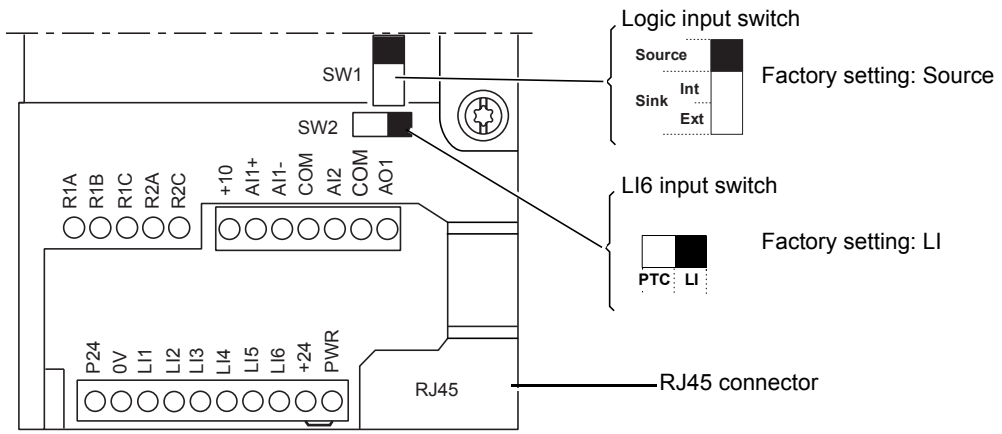
CAUTION

IMPROPERLY SECURED TERMINAL CARD

When replacing the control terminal card, it is essential to fully tighten the captive screw.

Failure to follow this instruction can result in equipment damage.

Arrangement of the control terminals



Maximum wire size:
2.5 mm² – AWG 14

Max. tightening torque:
0.6 Nm – 5.3 lb.in

Note: The MT is supplied with a link between the PWR and +24 terminals.

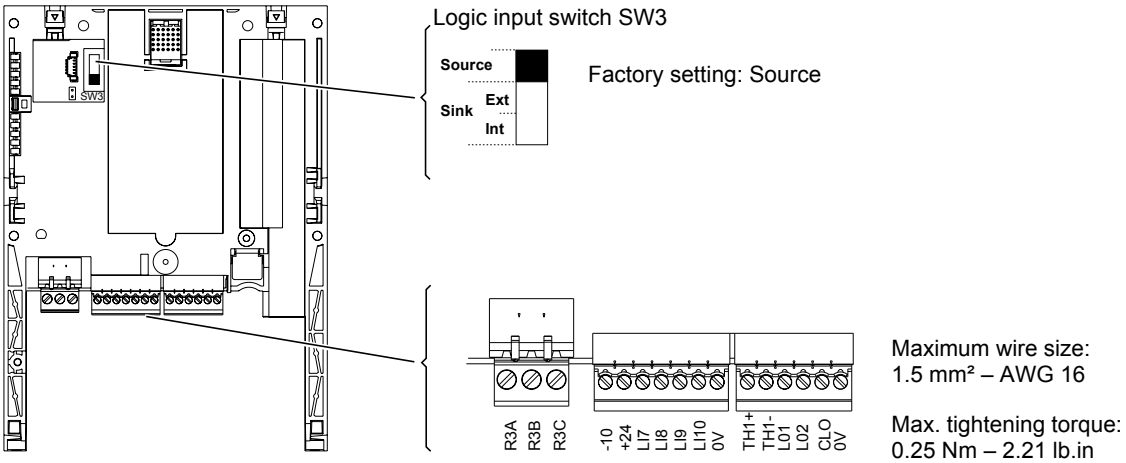
Characteristics and functions of the control terminals

Terminal	Function	Electrical characteristics
R1A R1B R1C	Common point C/O contact (R1C) of programmable relay R1	• Minimum switching capacity: 3 mA for 24 VDC • Maximum switching capacity on resistive load: 5 A for 250 VAC or 30 VDC • Maximum switching current on inductive load (cos φ = 0.4 L/R = 7 ms): 2 A for 250 VAC or 30 VDC • Reaction time: 7 ms ± 0.5 ms • Service life: 100,000 operations at max. switching power
R2A R2C	N/O contact of programmable relay R2	
+10	+ 10 VDC power supply for reference potentiometer 1 to 10 kΩ	• + 10 VDC (10.5 V ± 0.5V) • 10 mA max.
AI1+ AI1-	Differential analog input AI1	• -10 to +10 VDC (max. safe voltage 24 V) • Reaction time: 2 ms ± 0.5 ms, 11-bit resolution + 1 sign bit • Accuracy ± 0.6% for Δθ = 60°C (140°F), linearity ± 0.15% of max. value
COM	Analog I/O common	0V
AI2	Depending on software configuration: Analog voltage input or Analog current input	• Analog input 0 to +10 VDC (max. safe voltage 24 V), impedance 30 kΩ or • Analog input X – Y mA, X and Y can be programmed from 0 to 20 mA, • Impedance 250 Ω • Reaction time: 2 ms ± 0.5 ms • 11-bit resolution, accuracy ± 0.6% for Δθ = 60°C (140°F), linearity ± 0.15% of max. value
COM	Analog I/O common	0V
AO1	Depending on software configuration: Analog voltage output or Analog current output	• Analog output 0 to +10 VDC, load impedance greater than 50 kΩ or • Analog output X – Y mA, X and Y can be programmed from 0 to 20 mA • Max. load impedance 500 Ω • 10-bit resolution, reaction time: 2 ms ± 0.5 ms • Accuracy ± 1% for Δθ = 60°C (140°F), linearity ± 0.2% of max. value
P24	Input for external +24 VDC control power supply	• +24 VDC (min. 19 V, max. 30 V) • Power 30 Watts
0V	Logic input common and 0V of P24 external power supply	0V
LI1 LI2 LI3 LI4 LI5	Programmable logic inputs	• +24 VDC (max. 30 V) • Impedance 3.5 kΩ • Reaction time: 2 ms ± 0.5 ms

SW1 switch	State 0	State 1
Source (factory setting)	< 5 VDC	> 11 VDC
Sink Int or Sink Ext	> 16 VDC	< 10 VDC

LI6	Depending on the position of the SW2 switch: - Programmable logic input or - Input for PTC probes	SW2 switch on LI (factory setting) • Same characteristics as logic inputs LI1 to LI5 or SW2 switch on PTC • Trip threshold 3 kΩ, reset threshold 1.8 kΩ • Short-circuit detection threshold < 50 Ω
+24	Logic input power supply	SW1 switch in Source or Sink Int position • +24 VDC power supply (min. 21 V, max. 27 V), protected against short-circuits and overloads • Max. current available for customers 200 mA SW1 switch in Sink Ext position • Input for external +24 VDC power supply for the logic inputs
PWR	Power Removal safety function input When PWR is not connected to the 24 V, the motor cannot be started (compliance with functional safety standard EN 954-1 and IEC/EN 61508)	• 24 VDC power supply (max. 30 V) • Impedance 1.5 kΩ • State 0 if < 2V, state 1 if > 17V • Reaction time: 10 ms

Logic I/O option card terminals (MT-VW3 A3 201)



Characteristics and functions of the terminals

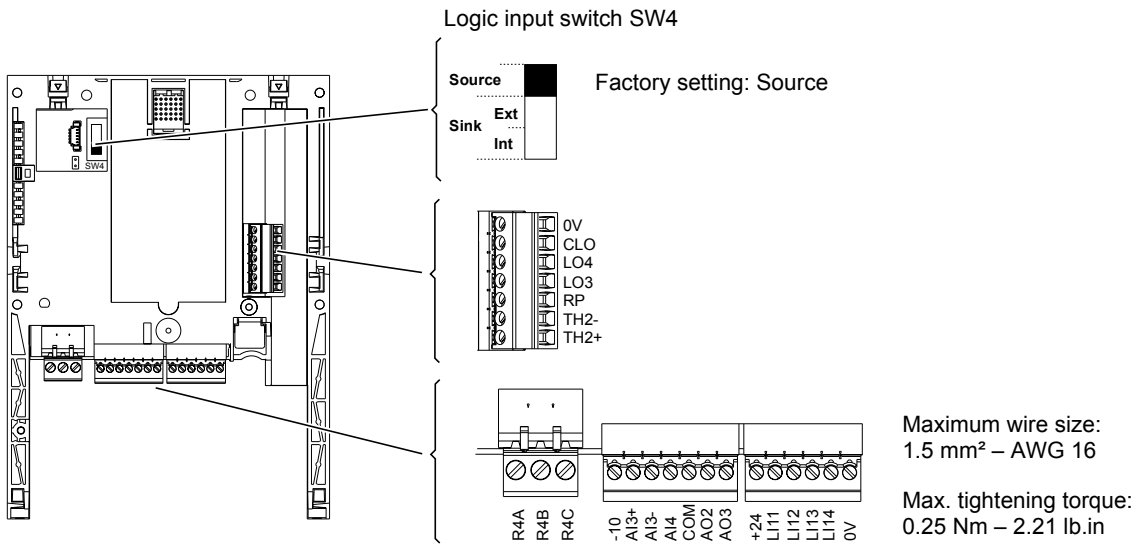
Terminal	Function	Electrical characteristics
R3A R3B R3C	Common point C/O contact R3C of programmable relay R3	• Minimum switching capacity: 3 mA for 24 VDC • Maximum switching capacity on resistive load: 5 A for 250 VAC or 30 VDC • Maximum switching capacity on inductive load (cos φ = 0.4 L/R = 7 ms): 2 A for 250 VAC or 30 VDC • Reaction time: 7 ms ± 0.5 ms • Service life: 100,000 operations

-10	-10 VDC power supply for reference potentiometer 1 to 10 kΩ	• - 10 VDC (-10.5 V ± 0.5V) • 10 mA max.
+24	Logic input power supply	SW3 switch in Source or Sink Int position • +24 VDC power supply (min. 21 V, max. 27 V), protected against short-circuits and overloads • Max. current available for customers 200 mA (This current corresponds to the total consumption on the control card +24 and the option cards +24) SW3 switch in Sink Ext position • Input for external +24 VDC power supply for the logic inputs
LI7 LI8 LI9 LI10	Programmable logic inputs	• +24 VDC power supply (max. 30 V) • Impedance 3.5 kΩ • Reaction time 2 ms ± 0.5 ms
0 V	0 V	0 V

Switch SW3	State 0	State 1
Source (factory setting)	< 5 VDC	> 11 VDC
Sink Int or Sink Ext	> 16 VDC	< 10 VDC

TH1+ TH1-	PTC probe input	• Trip threshold 3 kΩ, reset threshold 1.8 kΩ • Short-circuit detection threshold < 50 Ω
LO1 LO2	Open collector programmable logic outputs	• +24 VDC (max. 30 V) • Max. current 200 mA for internal power supply and 200 mA for external power supply • Reaction time: 2 ms ± 0.5 ms
CLO	Logic output common	
0V	0 V	0 V

Extended I/O option card terminals (MT-VW3 A3 202)



Characteristics and functions of the terminals

Terminal	Function	Electrical characteristics
R4A R4B R4C	Common point C/O contact R4C of programmable relay R4	• Minimum switching capacity: 3 mA for 24 VDC • Maximum switching capacity on resistive load: 5 A for 250 VAC or 30 VDC • Maximum switching capacity on inductive load (cos φ = 0.4 L/R = 7 ms): 1.5 A for 250 VAC or 30 VDC • Reaction time 10 ms ± 1 ms • Service life: 100,000 operations
-10	-10 VDC power supply for reference potentiometer 1 to 10 kΩ	• -10 VDC (-10.5 V ± 0.5V) • 10 mA max.
AI3+	+ polarity of the current differential analog input AI3	• Analog input X – Y mA, X and Y can be programmed from 0 to 20 mA, impedance 250 Ω • Reaction time: 5 ms ± 1 ms • 11-bit resolution + 1 sign bit, accuracy ± 0.6% for $\Delta\theta$ = 60°C (140°F) • Linearity ± 0.15% of max. value
AI3-	- polarity of the current differential analog input AI3	
AI4	Depending on software configuration: Analog current input or Analog voltage input	• Analog input 0 to +10 VDC (max. safe voltage 24 V), impedance 30 kΩ or • Analog input X – Y mA, X and Y can be programmed from 0 to 20 mA Impedance 250 Ω • Reaction time: 5 ms ± 1 ms • 11-bit resolution, accuracy ± 0.6% for $\Delta\theta$ = 60°C (140°F), linearity ± 0.15% of max. value
COM	Analog I/O common	0 V
AO2 AO3	Depending on software configuration: Analog voltage outputs or Analog current outputs	• 0 – 10 VDC or -10/+10 VDC bipolar analog output depending on software configuration, load impedance greater than 50 kΩ or • Analog current output X-Y mA, X and Y can be programmed from 0 to 20 mA, max. load impedance 500 Ω • 10-bit resolution • Reaction time 5 ms ± 1 ms, accuracy ± 1% for $\Delta\theta$ = 60°C (140°F), linearity ± 0.2%

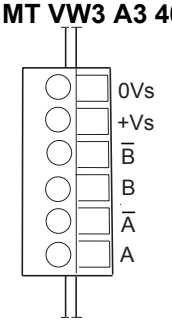
<table>
<tr><th>Terminal</th><th>Function</th><th>Electrical characteristics</th></tr>
<tr><td>+24</td><td>Logic input power supply</td><td>SW4 switch in Source or Sink Int position
• +24 VDC output (min. 21 V, max. 27 V), protected against short-circuits and overloads
• Max. current available for customers 200 mA (This current corresponds to the total consumption on the control card +24 and the option cards +24)

SW4 switch in Sink Ext position
• Input for external +24 VDC power supply for the logic inputs</td></tr>
<tr><td>LI11
LI12
LI13
LI14</td><td>Programmable logic inputs</td><td>• +24 VDC (max. 30 V)
• Impedance 3.5 kΩ
• Reaction time: 5 ms ± 1 ms
<table><tr><td>SW4 switch</td><td>State 0</td><td>State 1</td></tr><tr><td>Source (factory setting)</td><td>< 5 VDC</td><td>> 11 VDC</td></tr><tr><td>Sink Int or Sink Ext</td><td>> 16 VDC</td><td>< 10 VDC</td></tr></table></td></tr>
<tr><td>0V</td><td>Logic input common</td><td>0 V</td></tr>
</table>

<table>
<tr><td>TH2+
TH2-</td><td>PTC probe input</td><td>• Trip threshold 3 kΩ, reset threshold 1.8 kΩ
• Short-circuit detection threshold < 50 Ω</td></tr>
<tr><td>RP</td><td>Frequency input</td><td>• Frequency range: 0…30 kHz
• Cyclic ratio: 50% ± 10%
• Maximum sampling time: 5 ms ± 1 ms
• Maximum input voltage 30 V, 15 mA
• Add a resistor if the input voltage is greater than 5 V (510 Ω for 12 V, 910 Ω for 15 V, 1.3 kΩ for 24 V)
• State 0 if < 1.2 V, state 1 if > 3.5 V</td></tr>
<tr><td>LO3
LO4</td><td>Open collector programmable logic outputs</td><td>• +24 VDC (max. 30 V)
• Max. current 20 mA for internal power supply and 200 mA for external power supply
• Reaction time 5 ms ± 1 ms</td></tr>
<tr><td>CLO</td><td>Logic output common</td><td></td></tr>
<tr><td>0V</td><td>0 V</td><td>0 V</td></tr>
</table>

Encoder interface card terminals

MT VW3 A3 401..407



Maximum wire size:
1.5 mm² – AWG 16

Max. tightening torque:
0.25 Nm – 2.21 lb.in

Characteristics and functions of the terminals

Encoder interface cards with RS422-compatible differential outputs

Terminal	Function	Electrical characteristics	
		MT-VW3 A3 401	MT-VW3 A3 402
+Vs 0Vs	Encoder power supply	• 5VDC (max. 5.5V) protected against short-circuits and overloads • Max. current 200 mA	• 15 VDC (max. 16 V) protected against short-circuits and overloads • Max. current 175 mA
A, /A B, /B	Incremental logic inputs	• Max. resolution: 5,000 points/rev • Max. frequency: 300 kHz	

Encoder interface cards with open collector outputs

Terminal	Function	Electrical characteristics	
		MT-VW3 A3 403	MT-VW3 A3 404
+Vs 0Vs	Encoder power supply	• 12 VDC (max. 13 V) protected against short-circuits and overloads • Max. current 175 mA	• 15 VDC (max. 16 V) protected against short-circuits and overloads • Max. current 175 mA
A, /A B, /B	Incremental logic inputs	• Max. resolution: 5,000 points/rev • Max. frequency: 300 kHz	

Encoder interface cards with push-pull outputs

Terminal	Function		Electrical characteristics		
			MT-VW3 A3 405	MT-VW3 A3 406	MT-VW3 A3 407
+Vs 0Vs	Encoder power supply		• 12 VDC (max. 13 V) protected against short-circuits and overloads • Max. current 175 mA	• 15 VDC (max. 16 V) protected against short-circuits and overloads • Max. current 175 mA	• 24 VDC (min. 20V, max. 30V) protected against short-circuits and overloads • Max. current 100 mA
		State 0	If <1.5 V		
		State 1	If > 7.7 V and < 13 V	If > 7.7 V and < 16 V	If > 11.5 V and < 25 V
A, /A B, /B	Incremental logic inputs		• Max. resolution: 5,000 points/rev • Max. frequency: 300 kHz		

Selecting the encoder

The 7 encoder interface cards available as options with the MT Series enable three different encoder technologies to be used.

- Optical incremental encoder with differential outputs compatible with the RS422 standard
- Optical incremental encoder with open collector outputs
- Optical incremental encoder with push pull-outputs

The encoder must comply with the following two limits:
- Maximum encoder frequency 300 kHz
- Maximum resolution 5,000 points/revolution

Choose the max. standard resolution within these limits to obtain optimum accuracy.

Wiring the encoder

Use a shielded cable containing 3 twisted pairs with a pitch of between 25 and 50 mm (0.98 in. and 1.97 in.). Connect the shielding to ground at both ends.
The minimum cross-section of the conductors must comply with the table below to limit line voltage drop:

Max. length of encoder cable	MT-VW3 A3 401...402			MT-VW3 A3 403...407		
	Max. consumption current of encoder	Minimum cross-section of conductors		Max. consumption current of encoder	Minimum cross-section of conductors	
10 m 32.8 ft	100 mA	0.2 mm²	AWG 24	100 mA	0.2 mm²	AWG 24
	200 mA	0.2 mm²	AWG 24	200 mA	0.2 mm²	AWG 24
50 m 164 ft	100 mA	0.5 mm²	AWG 20	100 mA	0.5 mm²	AWG 20
	200 mA	0.75 mm²	AWG 18	200 mA	0.75 mm²	AWG 18
100 m 328 ft	100 mA	0.75 mm²	AWG 18	100 mA	0.75 mm²	AWG 18
	200 mA	1.5 mm²	AWG 15	200 mA	1.5 mm²	AWG 16
200 m 656 ft	-	-	-	100 mA	0.5 mm²	AWG 20
	-	-	-	200 mA	1.5 mm²	AWG 15
300 m 984 ft	-	-	-	100 mA	0.75 mm²	AWG 18
	-	-	-	200 mA	1.5 mm²	AWG 15

Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1(if required)

Diagram with line contactor

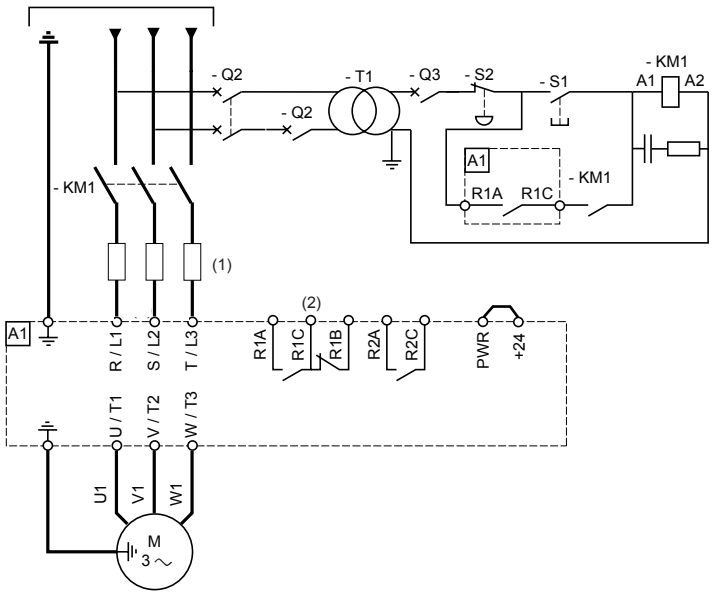
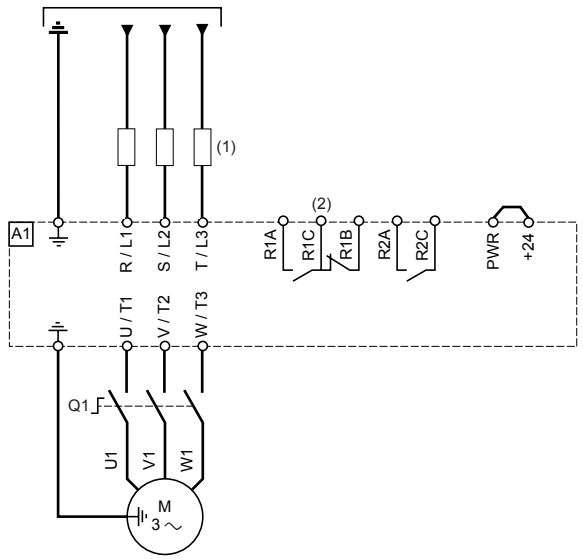


Diagram with disconnect switch



(1) Line choke (if used)
(2) Fault relay contacts, for remote signaling of drive status.

Note: Install interference suppressors on all inductive circuits near the drive or connected to the same circuit (relays, contactors, solenoid valves, etc).

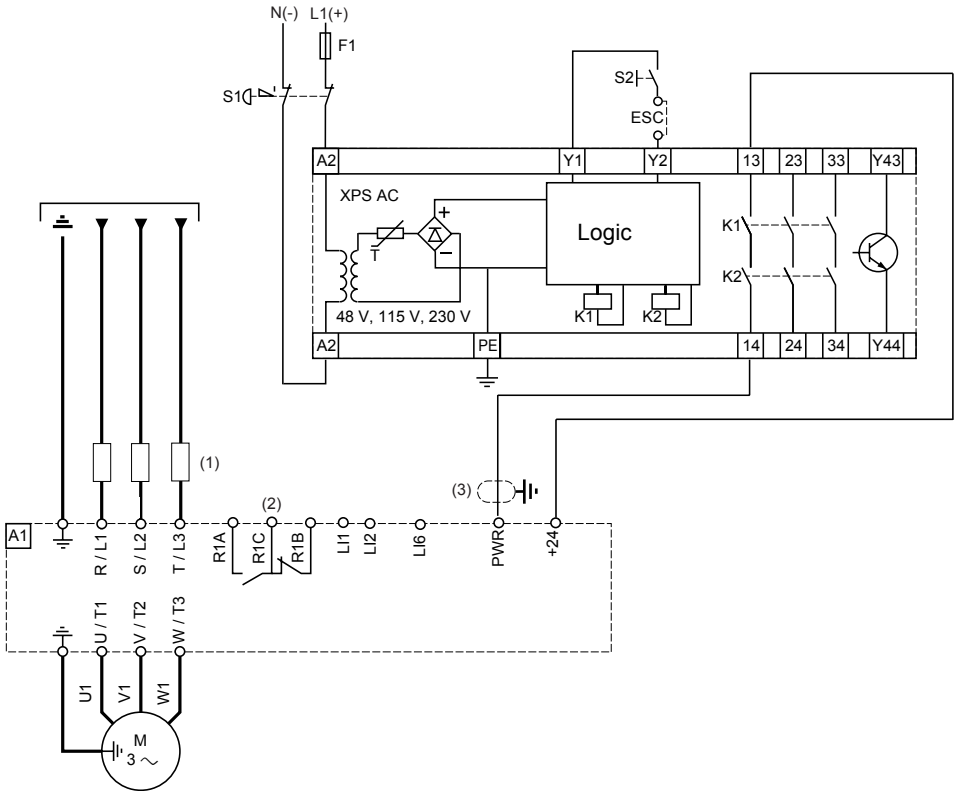
Choice of associated components:
Please refer to the catalog.

Connection diagrams conforming to standards EN 954-1 category 3 and IEC/EN 61508 capacity SIL2, stopping category 0 in accordance with standard IEC/EN 60204-1(if required)

This connection diagram is suitable for use with machines with a short freewheel stop time (with low inertia or high resistive torque).
When the emergency stop is activated, the drive power supply is turned off immediately and the motor stops in accordance with category 0 of standard IEC/EN 60204-1.

This diagram must be used for hoisting applications.

A contact on the safety relay must be inserted in the brake control circuit to engage it safely when the Power Removal safety function is activated.



(1) Line choke, if used.
(2) Fault relay contacts, for remote signaling of drive status
(3) It is essential to connect the shielding on the cable connected to the Power Removal input to ground.

- Standard EN 954-1 category 3 requires the use of a stop button with double contact (S1).
- S1 is used to activate the Power Removal safety function.
- S2 is used to initialize the safety relay when powering up or after an emergency stop. ESC enables the use of other initialization conditions for the module.
- One Preventa module can be used for the Power Removal safety function on several MT drives.
- A logic input on the safety relay can be used to indicate safely that the drive is operating in safe conditions.

Note:
For preventive maintenance, the Power Removal function must be activated at least once a year.
The drive power supply must be turned off and then on again before carrying out this preventive maintenance.
The drive logic output signals cannot be considered as safety-type signals.
Fit interference suppressors to all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

Choice of associated components:
Please refer to the catalog.

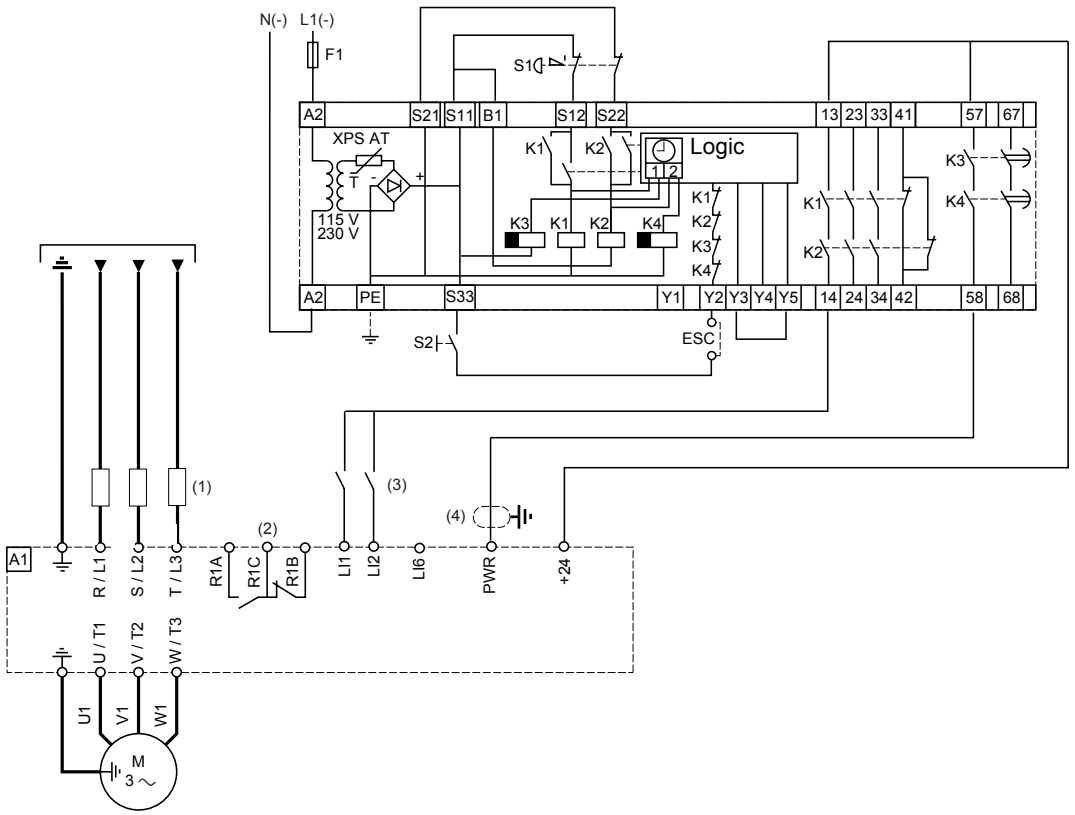
Connection diagram conforming to standards EN 954-1 category 3 and IEC/EN 61508 capacity SIL2, stopping category 1 in accordance with standard IEC/EN 60204-1(if required)

This connection diagram is suitable for use with machines with a long freewheel stop time (machines with high inertia or low resistive torque).

This diagram must not be used for hoisting applications.

When the emergency stop is activated, deceleration of the motor controlled by the drive is requested first. Then, after a time delay corresponding to the deceleration time, the Power Removal safety function is activated.

Example:
- 2-wire control
- LI1 assigned to forward
- LI2 assigned to reverse



(1) Line choke, if used.
(2) Fault relay contacts, for remote signaling of drive status
(3) In this example, the logic inputs Lix are wired as “Source” but can be wired as “Sink Int” or “Sink Ext” (please refer to page 42).
(4) It is essential to connect the shielding on the cable connected to the Power Removal input to ground.

- Standard EN 954-1 category 3 requires the use of an emergency stop with double contact (S1).
- S1 is used to activate the Power Removal safety function.
- S2 is used to initialize the braking module when powering up or after an emergency stop. ESC enables the use of other initialization conditions for the module.
- One Preventa module can be used for the Power Removal safety function on several MT Series drives. In this case the time delay must be set to the longest stopping time.
- A logic input on the safety relay can be used to indicate safely that the drive is operating in safe conditions.

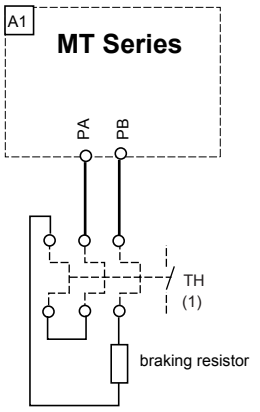
Note: For preventive maintenance, the Power Removal function must be activated at least once a year.
The drive power supply must be turned off and then on again before carrying out this preventive maintenance.
The drive logic output signals cannot be considered as safety-type signals.
Install interference suppressors on all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

Choice of associated components:
Please refer to the catalog.

Braking resistor connection diagram

MT275 to MT2100
MT4125 to MT4250

Up to 160 kW power (MT4250), braking resistors are connected directly to the terminals at the base of the drive (terminals PA and PB).



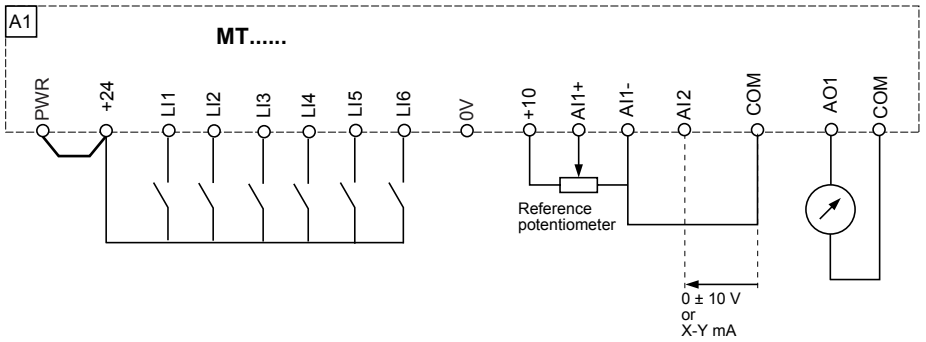
(1) Thermal overload relay

MT 4300 to MT4400

From 200 kW upwards (MT 4300), the braking resistor is connected to the external braking unit. Refer to the braking unit User's Manual.

Control connection diagrams

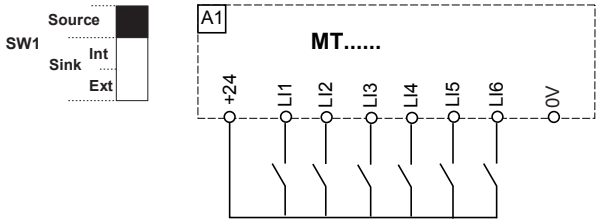
Control card connection diagram



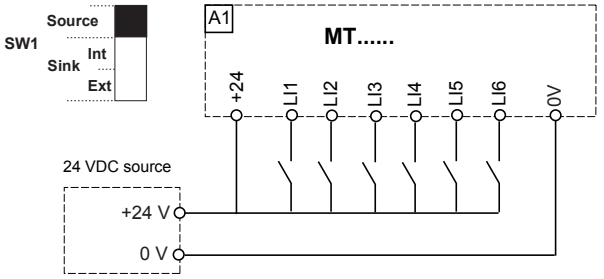
Logic input switch (SW1)

The logic input switch (SW1) is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.
- Set the switch to Source (factory setting) if using PLC outputs with PNP transistors.
- Set the switch to Sink Int or Sink Ext if using PLC outputs with NPN transistors.

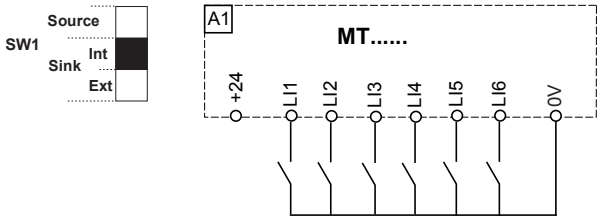
- SW1 switch set to “Source” position



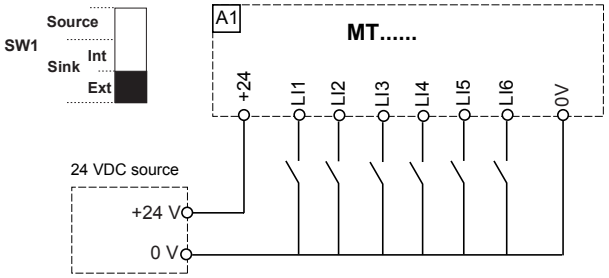
- SW1 switch set to “Source” position and use of an external power supply for the LIs



- SW1 switch set to “Sink Int” position



- SW1 switch set to “Sink Ext” position



WARNING

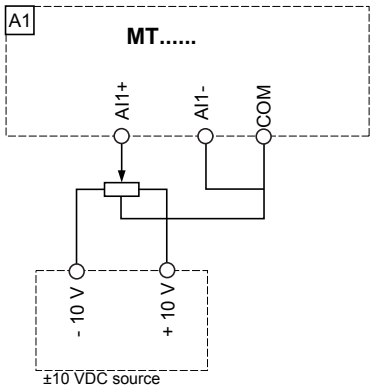
Unintended Equipment Operation

- When the SW1 switch is set to “Sink Int” or “Sink Ext”, the common must never be connected to ground or the protective ground, as there is then a risk of unintended starting on the first insulation fault.

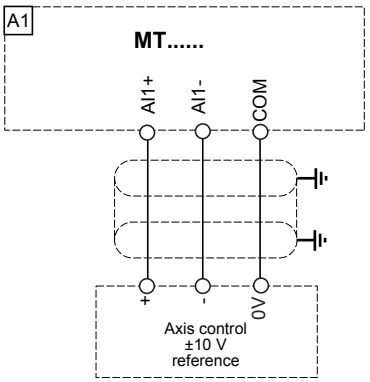
Failure to follow these instructions can result in death or serious injury.

Connection diagrams

Bipolar speed reference

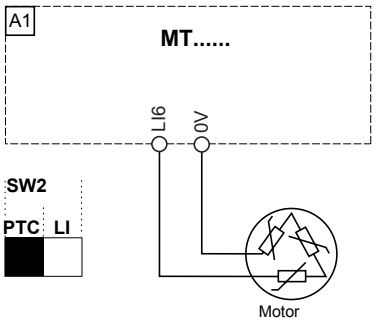


Speed reference using axis control



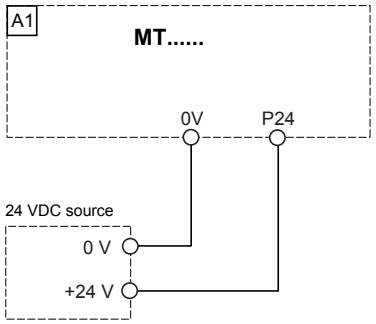
SW2 switch

The LI6 logic input switch (SW2) makes it possible to use the LI6 input:
- either as a logic input by setting the switch to LI (factory setting)
- or for motor protection via PTC probes by setting the switch to PTC



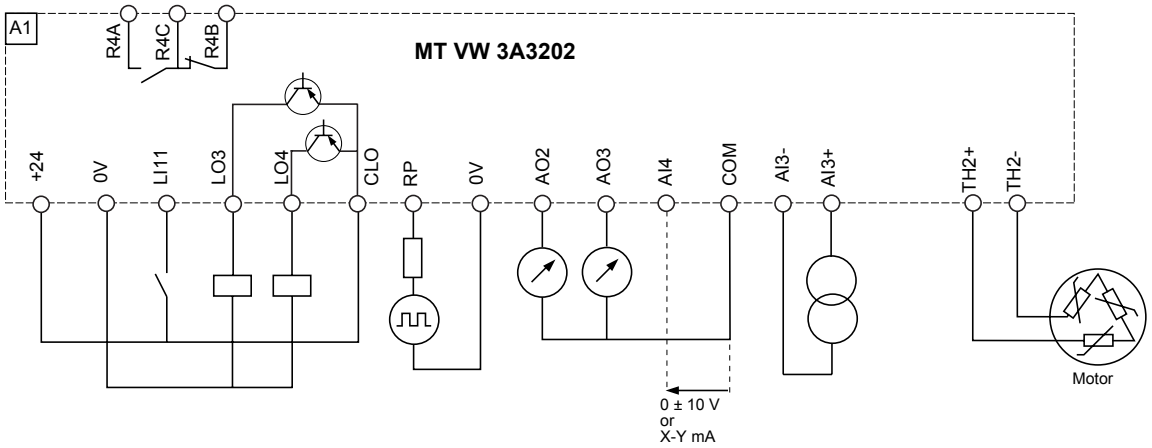
Control power supply via an external source

The control card can be powered via an external +24 VDC source

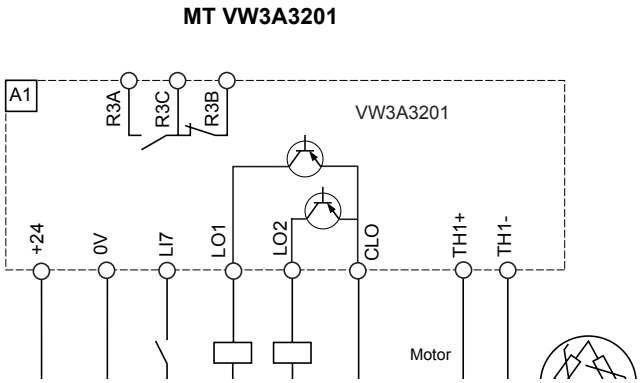


I/O extension card connection diagrams

Connection diagram for extended I/O option card (MT-VW3A3202)



Connection diagram for logic I/O option card (MT-VW3A3201)

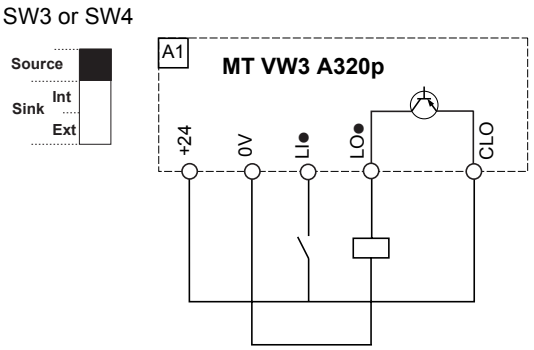


Connection diagrams

SW3/SW4 logic I/O switch

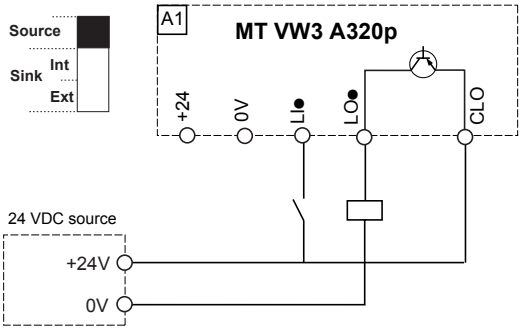
- Switch in “Source” position

SW3 or SW4



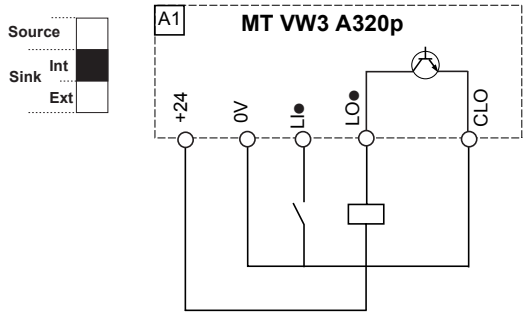
- Switch in “Source” position and use of an external +24 VDC source

SW3 or SW4



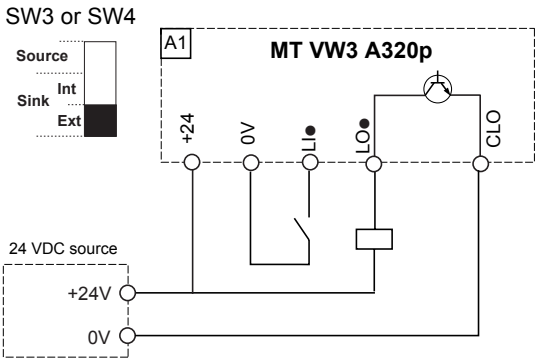
- Switch in “Sink Int” position

SW3 or SW4



- Switch in “Sink Ext” position

SW3 or SW4



WARNING

Unintended Equipment Operation

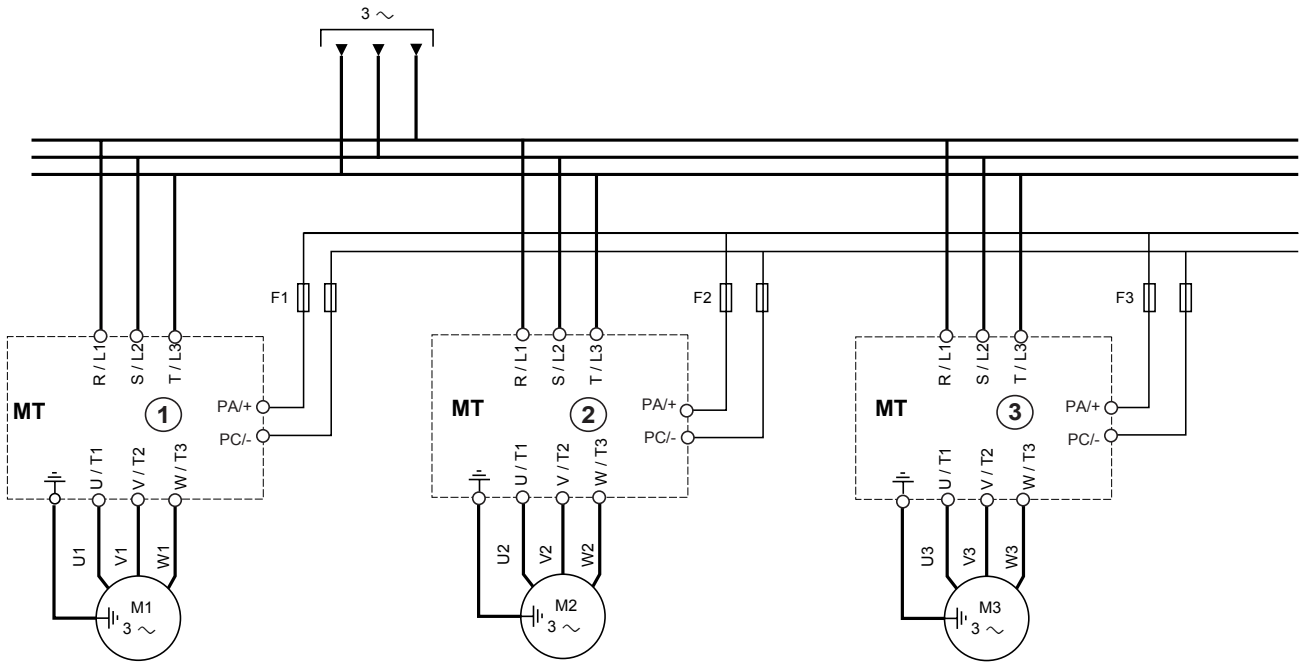
- When the SW3 or SW4 switches are set to “Sink Int” or “Sink Ext”, the common must never be connected to ground or the protective ground, as there is then a risk of accidental starting on the first insulation fault.

Failure to follow these instructions can result in death or serious injury.

Connection of several drives in parallel on the DC bus

Connection on DC bus between drives with equivalent ratings

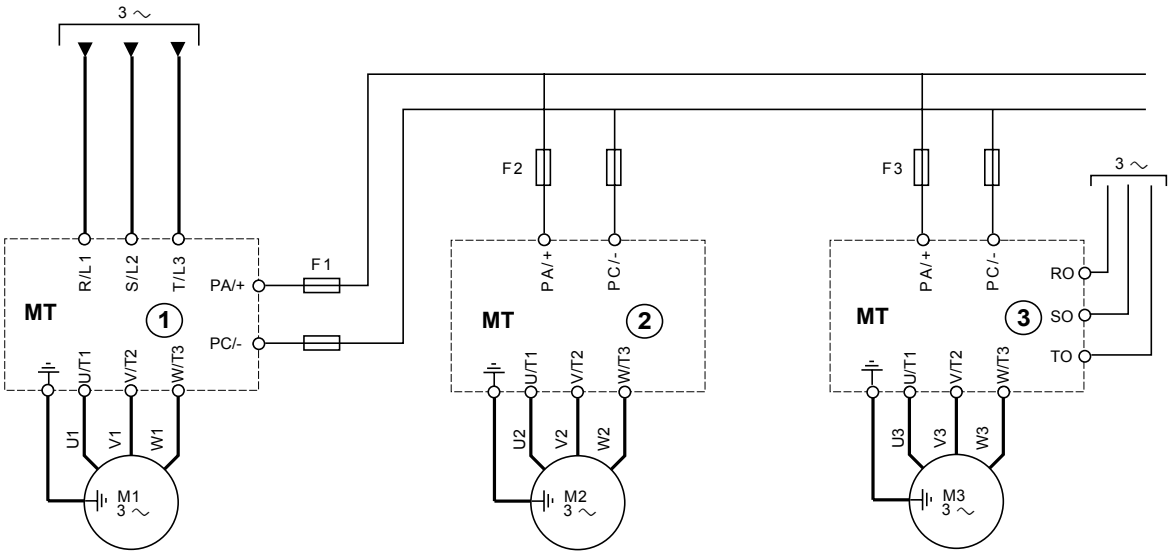
Each drive uses its own charging circuit.



Drives (1), (2) and (3) must not be more than one size apart when they are connected in this way.

F1, F2, F3: fast-acting semiconductor fuses for protection on the DC bus side.

Connection on DC bus between drives with different ratings



Drives (2) and (3) powered by their DC buses only do not need to have a DC choke (catalog number MT).

F1, F2, F3: fast-acting semiconductor fuses for protection on the DC bus side.

CAUTION

- Drive 1 must be of such a size that it can supply all the motors that may operate simultaneously.
- When drive ratings MT2100, MT4150 to MT4400 (drive 3 in the above diagram) are powered by their DC buses only and not by their R/L1, S/L2, T/L3 terminals, it is essential to supply the fans separately with 3-phase 380... 480 V, 50/60 Hz (terminals RO, SO, TO), with protection by fuses or motor circuit-breaker. Details of the power and connection are given on the next page.

Failure to follow these instructions can result in equipment damage.

Power consumed by the fans

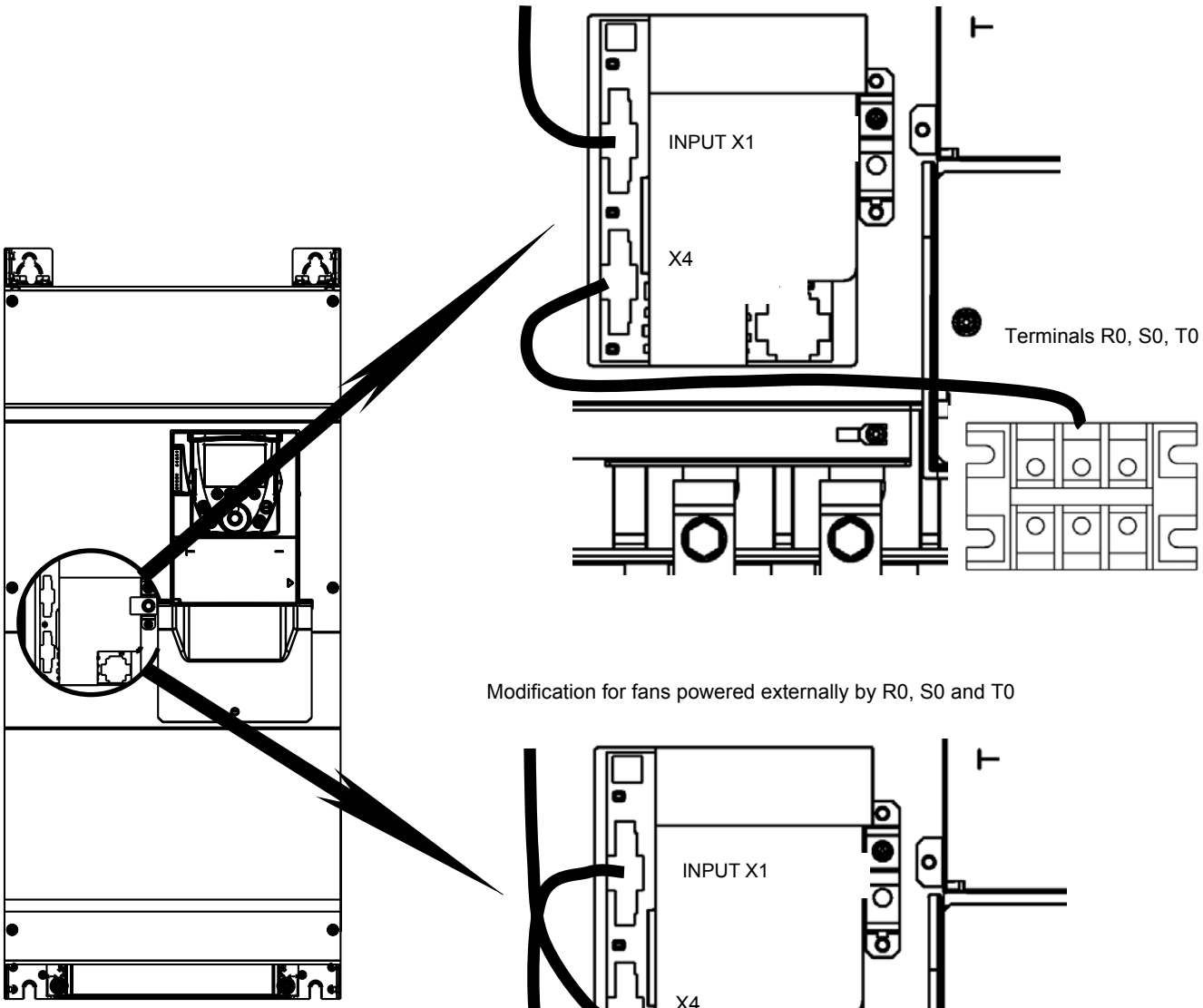
MT drive	Power consumed by the fans
2100,4150,4200,4250	550 VA
4300,4400	1,145 VA

Connection of fans for separate power supply

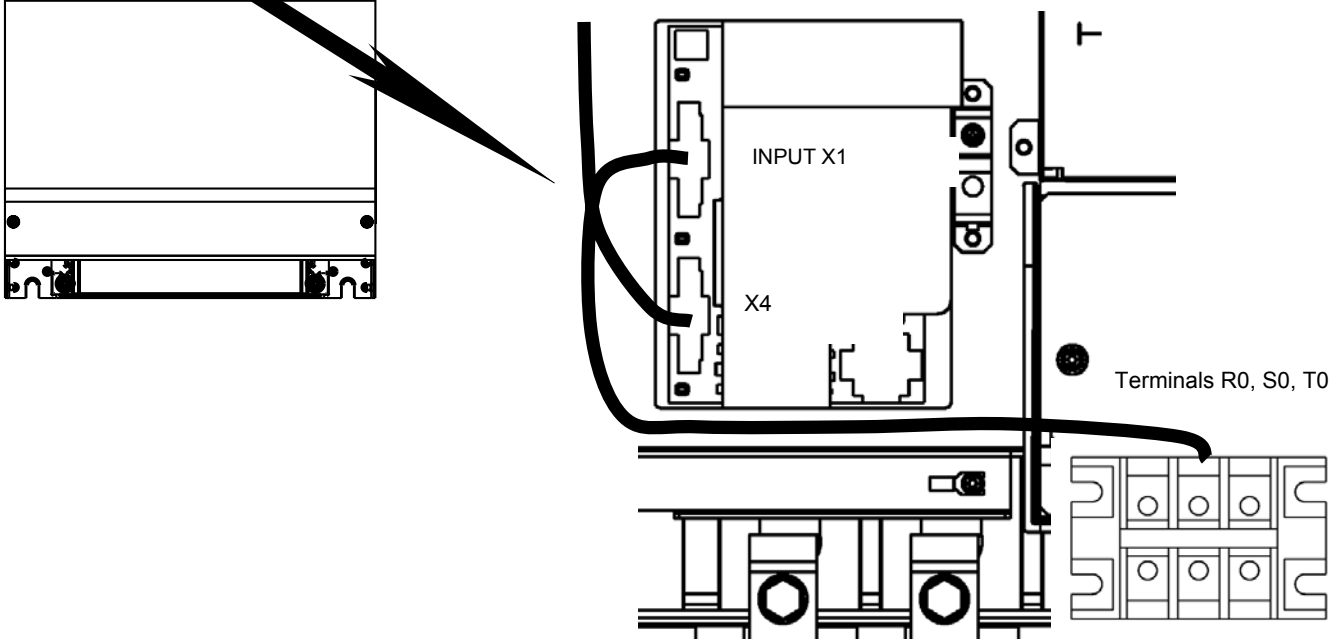
In order to remove the links on the fans to the power supply terminals R/L1, S/L2 and T/L3 and move it to terminals RO, SO and TO, connectors X1 and X4 must be crossed over as shown in the following diagrams.

MT2100 , MT4150

Factory-set wiring: fans powered internally by R/L1, S/L2 and T/L3

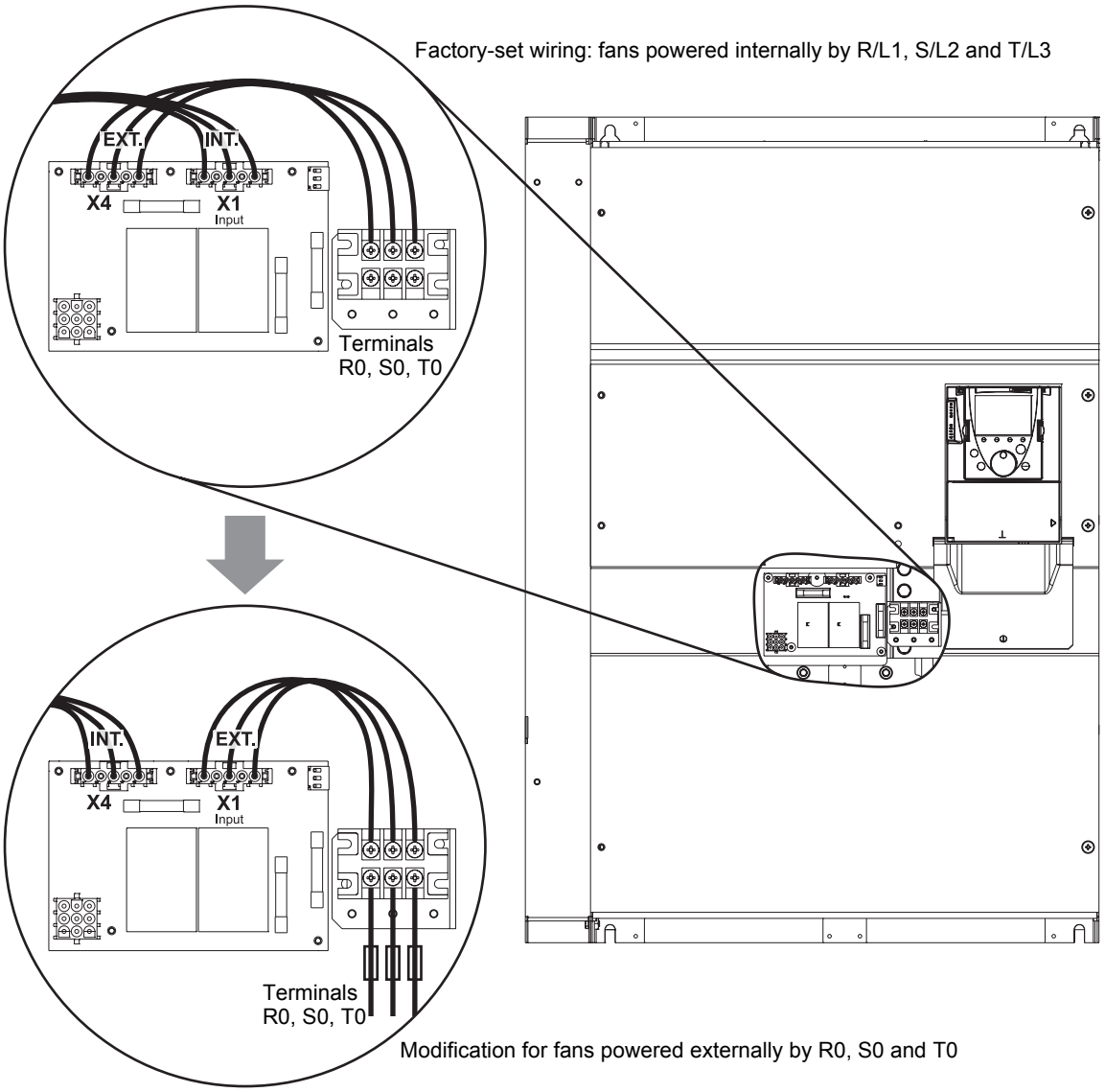


Modification for fans powered externally by R0, S0 and T0



Connection diagrams

MT4200,MT4250,MT4300,MT4400



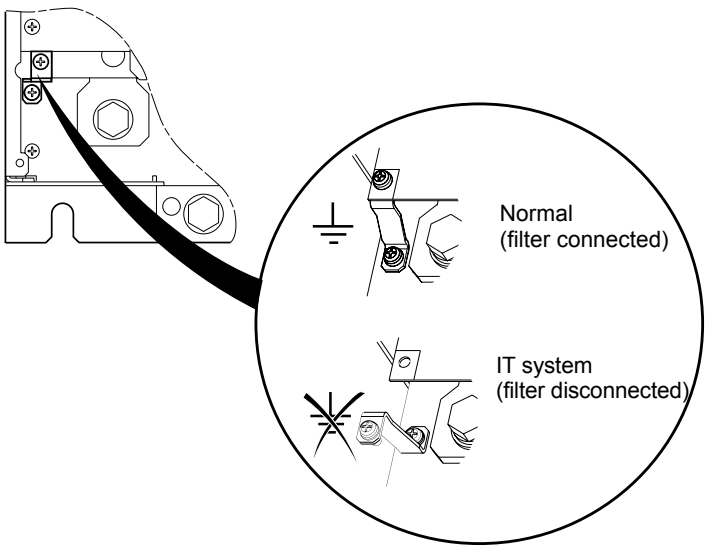
Operation on an IT system

IT system: Isolated or impedance grounded neutral.
Use a permanent insulation monitor compatible with non-linear loads.

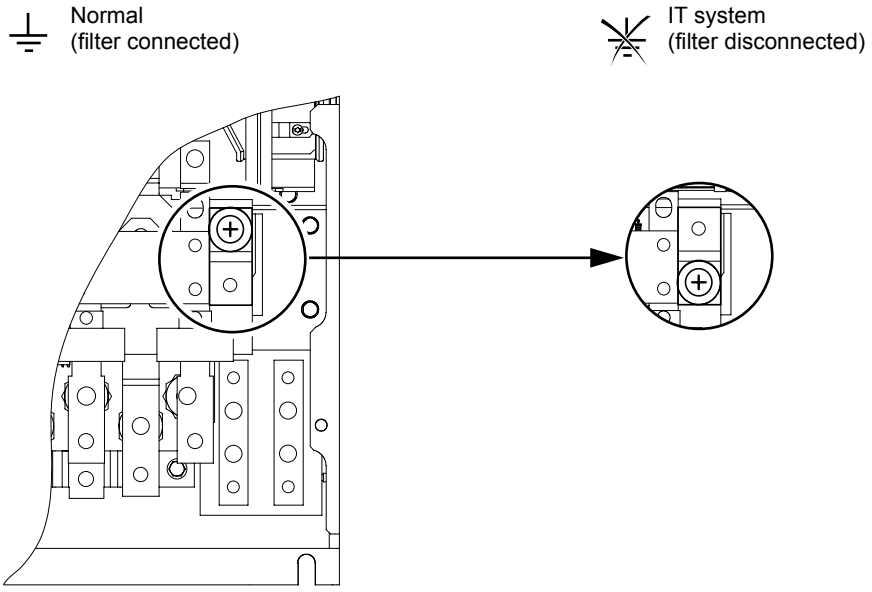
MT Series drives feature built-in RFI filters. These filters can be isolated from ground for operation on an IT system as follows:

Disconnecting the RFI filters

MT275 to MT2100 and MT4125 to MT4150:



MT4200 to MT4250:



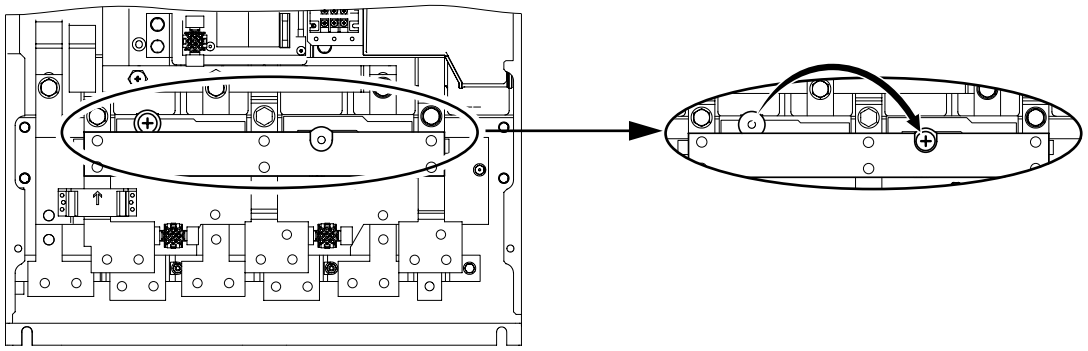
CAUTION
When the filters are disconnected, the drive switching frequency must not exceed 4 kHz. Refer to the Programming Manual for the corresponding parameter setting. **Failure to follow these instructions can result in equipment damage.**

Operation on an IT (Isolated or impedance grounded neutral) system

MT4300 to MT4400:

Normal
(filter connected)

IT system
(filter disconnected)



CAUTION
When the filters are disconnected, the drive switching frequency must not exceed 4 kHz. Refer to the Programming Manual for the corresponding parameter setting. **Failure to follow these instructions can result in equipment damage.**

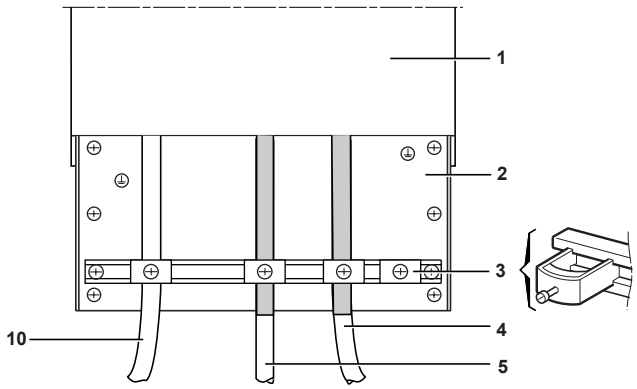
Electromagnetic compatibility (if required)

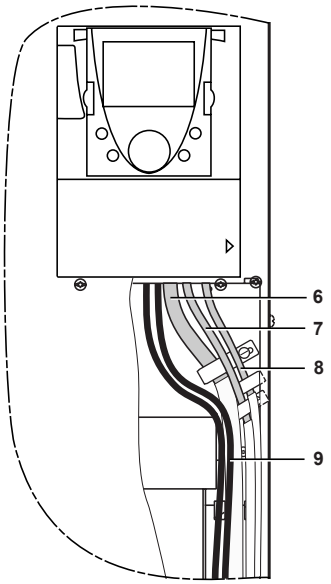
Principle

- Grounds between drive, motor and cable shielding must have “high frequency” potential.
- Use of shielded cables with shielding connected to ground at both ends for the motor cables, braking resistor (if used) and control-signal wiring. Conduits or metal ducting can be used for part of the shielding length provided that there is no break in continuity.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Installation diagram

MT275 to MT2100 and MT4125 to MT4400





1 MTSeries

2 Sheet steel grounded plate

3 Metal clamps

4 Shielded cable for motor connection with shielding connected to ground at both ends. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

5 Shielded cable for connecting the braking resistor, if used. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

6 Shielded cables for connecting the control-signal cables. For applications requiring several conductors, use cables with a small cross-section (0.5 mm2).

7 Shielded cables for connecting the Power Removal safety function input The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

8 Shielded cables for connecting the encoder. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

9 Unshielded wires for relay contact output.

10 Unshielded drive power supply cables

Note:

- If using an additional input filter, it should be connected directly to the line supply via an unshielded cable. Link **10** on the drive is then via the filter output cable.
- The HF potential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.