

# MT Series

Installation manual

Retain for future use

Variable speed drives  
for AC motors

**0.5 HP (0.37 KW)...60 HP (45 KW) / 200 - 240V**  
**1 HP (0.75 KW)...100 HP (75 KW) / 380 - 480V**





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Read and understand these instructions before you begin any procedure with 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 in this variable speed drive, including printed wiring boards, operate at 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 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 15 MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 15 to verify that the DC voltage is less than 45 Vdc. 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 switched 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 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 [7](#) and [8](#))

### ■ 3 Mount the drive

- Mount the drive in accordance with the instructions in this document
- 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

**Steps 1 to 4 must be performed with the power off**



## PROGRAMMING

- **1 Please refer to the programming manual**

# Preliminary recommendations

## Handling and storage

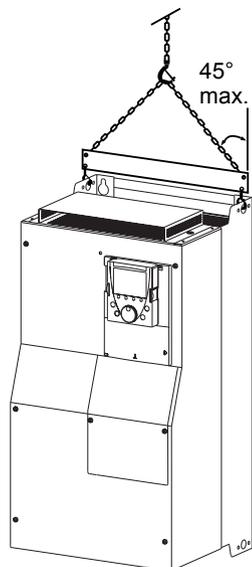
To protect the drive prior to installation, handle and store the device in its packaging. Ensure that the ambient conditions are acceptable.

### CAUTION

#### DAMAGED EQUIPMENT

Do not operate or install any drive that appears damaged.  
**Failure to follow this instruction can result in equipment damage.**

## Handling on installation



MT Series drives up to ratings MT220 and MT425 can be removed from their packaging and installed without a handling device.

A hoist must be used with higher ratings; for this reason they are fitted with handling "lugs". The precautions described below must be observed.

## Precautions

Read and understand the instructions in the "programming manual".

### CAUTION

#### INCOMPATIBLE LINE VOLTAGE

Before powering up 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 switching on and configuring the MT Series, check that the PWR (POWER REMOVAL) input is deactivated (programmed to 0) in order to prevent unexpected starts.
- Before switching 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 unexpected starts, 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

## Single 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)		Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Nominal current In (1)	Max. transient current for (1)		Reference
		at 200 V	at 240 V					60 s	2 s	
kW	HP	A	A	kA	kVA	A	A	A	A	
0.37	0.5	6.9	5.8	5	1.4	9.6	3	4.5	4.9	<b>MT201</b>
0.75	1	12	9.9	5	2.4	9.6	4.8	7.2	7.9	<b>MT202</b>
1.5	2	18.2	15.7	5	3.7	9.6	8	12	13.2	<b>MT203</b>
3	-	25.9	22	5	5.3	9.6	13.7	20.6	22.6	<b>MT205 (5)</b>
4	5	34.9	29.9	22	7	9.6	17.5	26.3	28.8	<b>MT207 (5)</b>
5.5	7.5	47.3	40.1	22	9.5	23.4	27.5	41.3	45.3	<b>MT210 (5)</b>

## 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 plate (1)		Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Nominal current In (1)	Max. transient current for (1)		Reference
		at 200 V	at 240 V					60 s	2 s	
kW	HP	A	A	kA	kVA	A	A	A	A	
0.37	0.5	3.5	3.1	5	1.3	9.6	3	4.5	4.9	<b>MT2P5</b>
0.75	1	6.1	5.3	5	2.2	9.6	4.8	7.2	7.9	<b>MT201</b>
1.5	2	11.3	9.6	5	4	9.6	8	12	13.2	<b>MT202</b>
2.2	3	15	12.8	5	5.3	9.6	11	16.5	18.1	<b>MT203</b>
4	5	25.8	22.9	5	9.2	9.6	17.5	26.3	28.8	<b>MT205</b>
5.5	7.5	35	30.8	22	12.4	23.4	27.5	41.3	45.3	<b>MT207</b>
7.5	10	45	39.4	22	15.9	23.4	33	49.5	54.5	<b>MT210</b>
11	15	53.3	45.8	22	18.8	93.6	54	81	89.1	<b>MT215</b>
15	20	71.7	61.6	22	25.1	93.6	66	99	109	<b>MT220</b>
18.5	25	77	69	22	27.7	100	75	112	124	<b>MT225</b>
22	30	88	80	22	32	100	88	132	145	<b>MT230</b>
30	40	124	110	22	42.4	250	120	180	198	<b>MT240</b>
37	50	141	127	22	51	250	144	216	238	<b>MT250</b>
45	60	167	147	22	65	250	176	264	290	<b>MT260</b>

(1) These power ratings and currents are given for an ambient temperature of 50°C (122°F) at the factory-set switching frequency, used in continuous operation (switching frequency factory setting 4 kHz for MT2P5 to MT220 drives, and 2.5 kHz for MT225 to MT260 drives). Above this factory setting, the drive will reduce the switching frequency automatically in the event of excessive temperature rise.

For continuous operation above the factory setting, derating must be applied to the drive nominal current in accordance with the curves on page 11.

(2) Current on a line supply with the "Max. prospective line Isc" indicated and for a drive without any external options.

(3) Peak current on power-up for the max. voltage (240 V +10%).

(4) All MT Series drives are provided with a graphic keypad/display as standard.

(5) A line reactor must be used (please refer to the catalog).

 Inhibit the input phase loss fault (IPL) so that MT201 to MT210 drives can operate on a single phase supply (see programming manual). If this fault is set to its factory configuration, the drive will stay locked in fault mode.

# Drive ratings

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

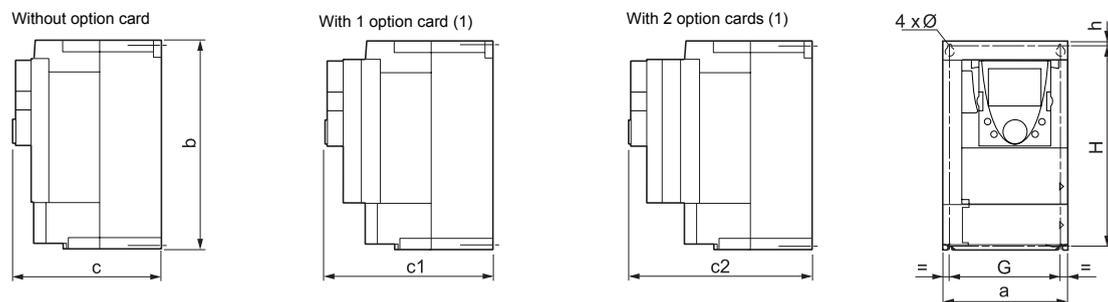
3-phase motor 380...480 V

Motor		Line supply (input)					Drive (output)			MT Series	
		Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Max. available nominal current In (1)	Max. transient current for (1)			Reference
Power indicated on plate (1)	kW	at 380 V	at 480 V					kA	kVA	A	
		HP	A	A	A	A					
	0.75	1	3.7	3	5	2.4	19.2	2.3	3.5	3.8	<b>MT401</b>
	1.5	2	5.8	5.3	5	4.1	19.2	4.1	6.2	6.8	<b>MT402</b>
	2.2	3	8.2	7.1	5	5.6	19.2	5.8	8.7	9.6	<b>MT403</b>
	4	5	14.1	11.5	5	9.4	19.2	10.5	15.8	17.3	<b>MT405</b>
	5.5	7.5	20.3	17	22	13.7	46.7	14.3	21.5	23.6	<b>MT407</b>
	7.5	10	27	22.2	22	18.1	46.7	17.6	26.4	29	<b>MT410</b>
	11	15	36.6	30	22	24.5	93.4	27.7	41.6	45.7	<b>MT415</b>
	15	20	48	39	22	32	93.4	33	49.5	54.5	<b>MT420</b>
	18.5	25	45.5	37.5	22	30.5	93.4	41	61.5	67.7	<b>MT425</b>
	22	30	50	42	22	33	75	48	72	79.2	<b>MT430</b>
	30	40	66	56	22	44.7	90	66	99	109	<b>MT440</b>
	37	50	84	69	22	55.7	90	79	118.5	130	<b>MT450</b>
	45	60	104	85	22	62.7	200	94	141	155	<b>MT460</b>
	55	75	120	101	22	81.8	200	116	174	191	<b>MT475</b>
	75	100	167	137	22	110	200	160	240	264	<b>MT4100</b>

- (1) These power ratings and currents are given for an ambient temperature of 50°C (122°F) at the factory-set switching frequency, used in continuous operation (switching frequency factory setting 4 kHz for MT401 to MT440 drives, and 2.5 kHz for MT450 to MT475 drives). Above this factory setting, the drive will reduce the switching frequency automatically in the event of excessive temperature rise. For continuous operation above the factory setting, derating must be applied to the drive nominal current in accordance with the curves on page 11.
- (2) Current on a line supply with the "Max. prospective line Isc" indicated and for a drive without any external options.
- (3) Peak current on power-up for the max. voltage (480 V +10%).
- (4) All MT Series drives are provided with a graphic keypad/display as standard.

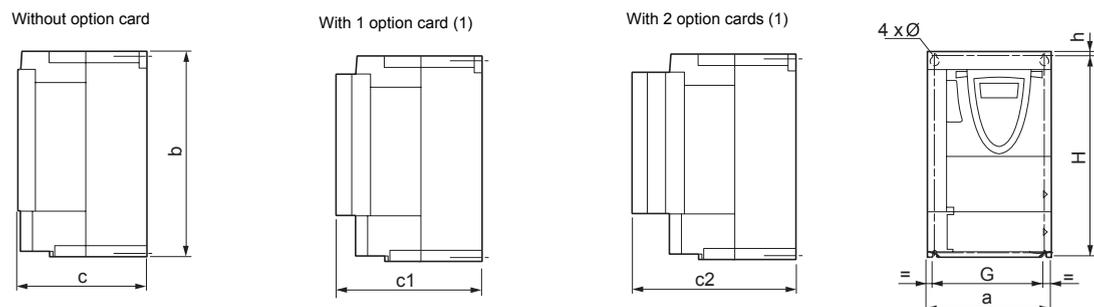
# Dimensions and weights

## With graphic display keypad



MT	a mm (in.)	b mm (in.)	c mm (in.)	c1 mm (in.)	c2 mm (in.)	G mm (in.)	H mm (in.)	h mm (in.)	Ø mm (in.)	For screw	Weight kg (lb.)
<b>2P5, 201, 202, 401, 402, 403</b>	130 (5.12)	254 (10.00)	175 (6.89)	198 (7.80)	221 (8.70)	113,5 (4.47)	220 (8.66)	5 (0.20)	5 (0.20)	M4	3 (6.61)
<b>203, 205, 405</b>	155 (6.10)	281 (11.06)	187 (7.36)	210 (8.27)	233 (9.17)	138 (5.43)	249 (9.80)	4 (0.16)	5 (0.20)	M4	4 (8.82)
<b>201, 407, 410</b>	175 (6.89)	319 (12.55)	187 (7.36)	210 (8.27)	233 (9.17)	158 (6.22)	283 (11.14)	6 (0.24)	6 (0.24)	M5	5,5 (12.13)
<b>210, 415</b>	210 (8.27)	320 (12.59)	213 (8.39)	236 (9.29)	259 (10.20)	190 (7.48)	283 (11.14)	6 (0.24)	6 (0.24)	M5	7 (15.43)
<b>215, 220, 420, 425</b>	230 (9.05)	425 (16.73)	213 (8.39)	236 (9.29)	259 (10.20)	210 (8.26)	386 (15.20)	8 (0.31)	6 (0.24)	M6	9 (19.84)
<b>225, 230, 430</b>	240 (9.45)	420 (16.54)	236 (9.29)	259 (10.20)	282 (11.10)	206 (8.11)	403 (15.87)	11 (0.45)	5,5 (0.22)	M5	30 (66.14)
<b>440, 450</b>	240 (9.45)	550 (21.65)	266 (10.47)	289 (11.38)	312 (12.28)	206 (8.11)	531,5 (20.93)	11 (0.45)	5,5 (0.22)	M5	37 (81.57)
<b>240, 250, 260</b>	320 (12.60)	550 (21.65)	266 (10.47)	289 (11.38)	312 (12.28)	280 (11.02)	524 (20.93)	20 (0.79)	8,6 (0.34)	M8	37 (81.57)
<b>460, 475, 4100</b>	320 (12.60)	630 (24.80)	290 (11.42)	313 (12.32)	334 (13.15)	280 (11.02)	604,5 (23.80)	15 (0.59)	9 (0.35)	M8	45 (99.21)

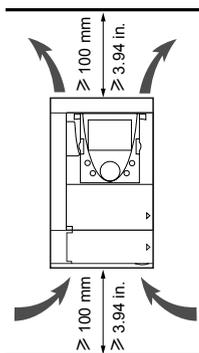
## With graphic keypad removed



MT	a mm (in.)	b mm (in.)	c mm (in.)	c1 mm (in.)	c2 mm (in.)	G mm (in.)	H mm (in.)	h mm (in.)	Ø mm (in.)	For screw	Weight kg (lb.)
<b>2P5, 201, 202, 401, 402, 403</b>	130 (5.12)	254 (10.00)	152 (5.98)	172 (6.77)	195 (7.68)	113,5 (4.47)	220 (8.66)	5 (0.20)	5 (0.20)	M4	3 (6.61)
<b>203, 205, 405</b>	155 (6.10)	281 (11.06)	164 (6.45)	184 (7.25)	207 (8.15)	138 (5.43)	249 (9.80)	4 (0.16)	5 (0.20)	M4	4 (8.82)
<b>207, 407, 410</b>	175 (6.89)	319 (12.55)	164 (6.45)	184 (7.25)	207 (8.15)	158 (6.22)	283 (11.14)	6 (0.24)	6 (0.24)	M5	5,5 (12.13)
<b>210, 415</b>	210 (8.27)	320 (12.59)	191 (7.51)	210 (8.27)	233 (9.17)	190 (7.48)	283 (11.14)	6 (0.24)	6 (0.24)	M5	7 (15.43)
<b>215, 220, 420, 425</b>	230 (9.05)	425 (16.73)	191 (7.51)	210 (8.27)	233 (9.17)	210 (8.26)	386 (15.20)	8 (0.31)	6 (0.24)	M6	9 (19.84)

(1) For the addition of I/O extension cards or communication cards.

# Mounting and temperature conditions



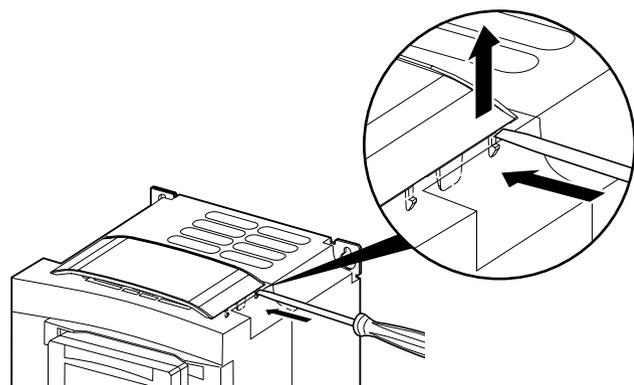
Install the drive vertically at  $\pm 10^\circ$ .  
 Do not place it close to heating elements.  
 Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

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

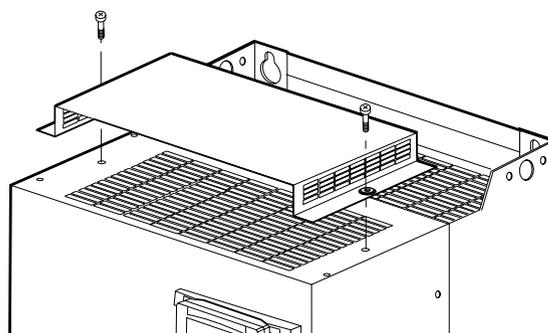
When IP20 (protected chassis) is adequate, it is recommended that the protective cover on the top of the drive is removed as shown below.

## Removing the protective cover

MT2P5 to MT220 and MT401 to MT425

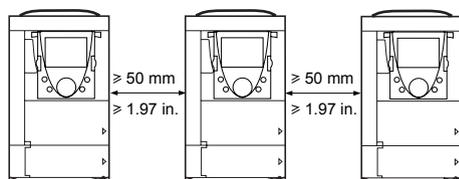


MT225 to MT260 and MT403 to MT4100

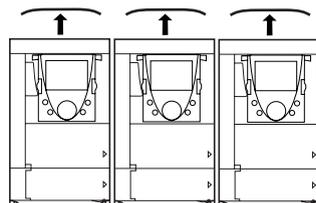


## 2 types of mounting are possible:

**Type A mounting** Free space  $\geq 50$  mm ( $\geq 1.97$  in.) on each side, with protective cover fitted



**Type B mounting** Drives mounted side by side, with the protective cover removed (the degree of protection becomes IP20)

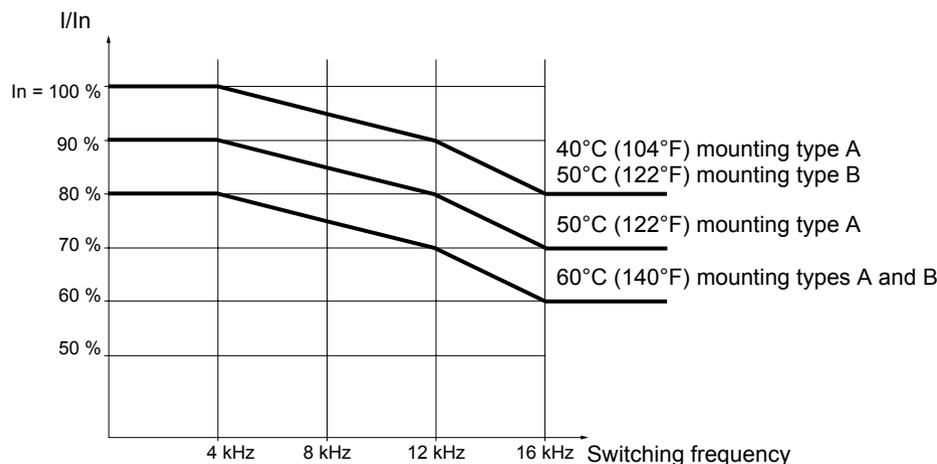


# Mounting and temperature conditions

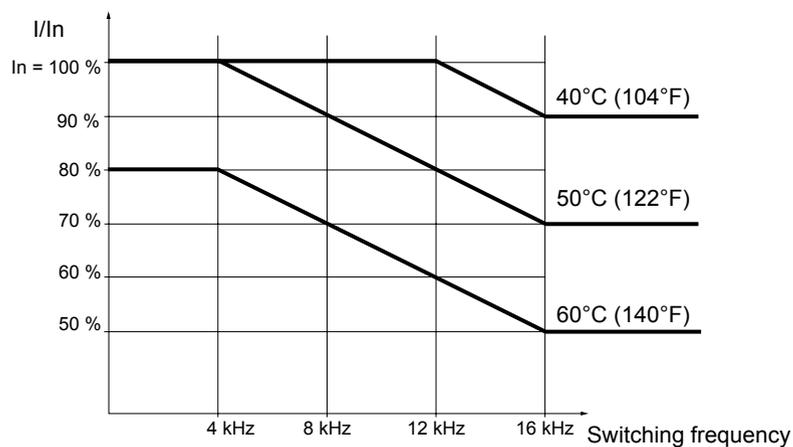
## Derating curves

Derating curves for the drive current  $I_n$  as a function of the temperature, switching frequency and type of mounting.

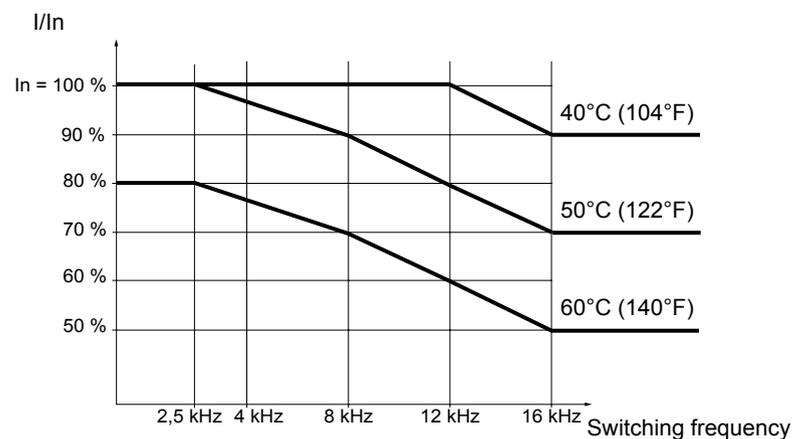
### MT2P5 to MT220 and MT401 to MT425



### MT430 and MT440



### MT225 to MT260 and MT450 to MT4100

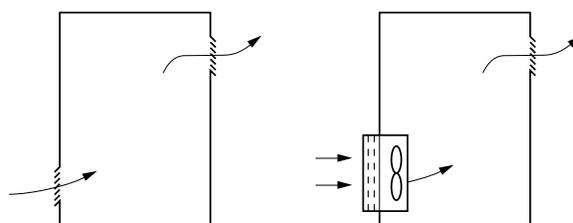


For intermediate temperatures (e.g. 55°C [131°F]), interpolate between 2 curves.

# Mounting in a wall-mounted or floor-standing enclosure

Observe the mounting recommendations on the previous pages.  
To ensure proper air circulation in the drive:

- Fit ventilation grilles
- Ensure that the ventilation is adequate: if not, install forced ventilation with a filter
- Use special IP54/Nema 12 filters



## Dust and damp proof metal wall-mounted or floor-standing enclosure (IP 54/Nema 12 degree of protection)

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

To avoid hot spots in the drive, add a fan to circulate the air inside the enclosure, catalog number MT-VW3A94●● (please refer to the catalog).

## Mounting the drive in the enclosure

### Power dissipated

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

MT	Power dissipated (1) W
2P5	46
201	66
202	101
203	122
205	191
207	293
210	363
215	566
220	620
225	799
230	865
240	1134
250	1337
260	1567

MT	Power dissipated (1) W
401	44
402	64
403	87
405	144
407	178
410	217
415	320
420	392
425	486
430	717
440	976
450	1174
460	1360
475	1559
4100	2326

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

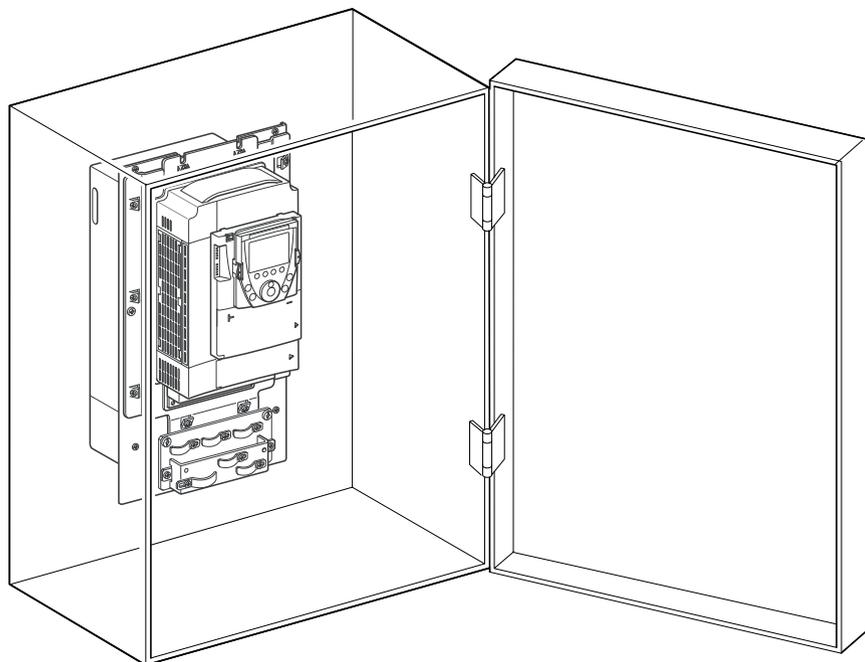
Ensure that the flow of air in the enclosure is at least equal to the value given in the table below for each drive.

MT	Flow rate	
	m <sup>3</sup> /hour	ft <sup>3</sup> /min
2P5, 201, 202, 401, 402, 403	17	10
203, 205, 405	56	33
207, 407, 410	112	66
210, 415	163	96
215, 220, 420, 425	252	148
225, 230, 430	203	119
440, 450	203	119
240, 250, 260	406	239
460, 475, 4100	406	239

## Dust and damp proof flange mounting

This mounting is used to reduce the power dissipated 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-VW3 A9 501...509 (please refer to the catalog). The degree of protection for the drive mounted in this way becomes IP54/Nema 12.

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



Example: MT407

## Power dissipated inside the enclosure for dust and damp proof flange mounting

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

<b>MT</b>	<b>Power dissipated (1)</b> W
<b>2P5</b>	25
<b>201</b>	28
<b>202</b>	35
<b>203</b>	39
<b>205</b>	48
<b>207</b>	71
<b>210</b>	81
<b>215</b>	120
<b>220</b>	137
<b>225</b>	291
<b>230</b>	294
<b>240</b>	368
<b>250</b>	447
<b>260</b>	452

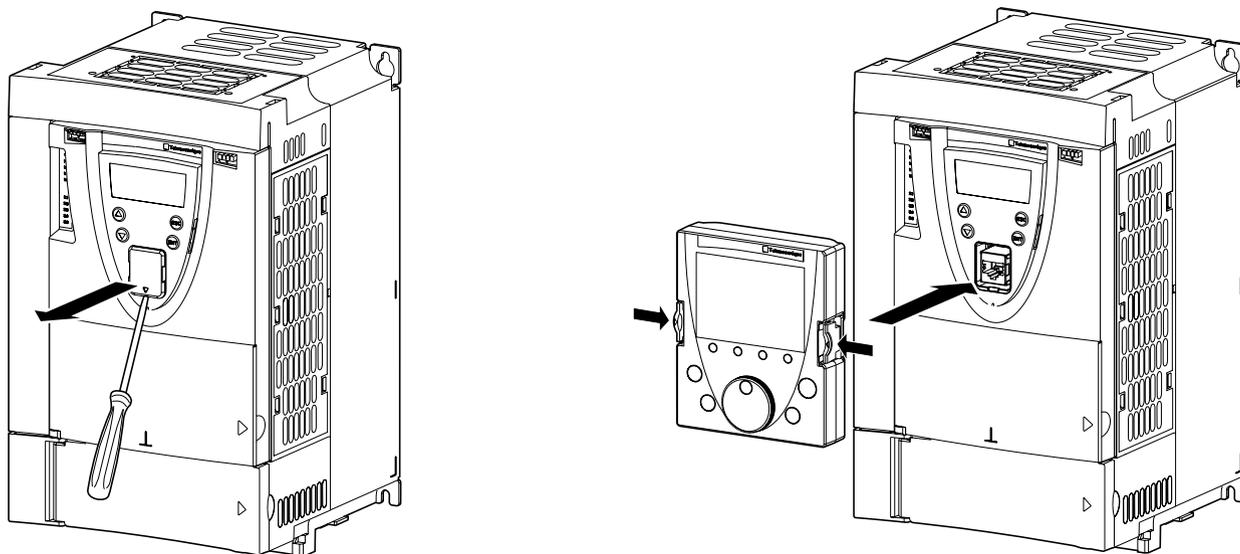
<b>MT</b>	<b>Power dissipated (1)</b> W
<b>401</b>	28
<b>402</b>	31
<b>403</b>	35
<b>405</b>	48
<b>407</b>	54
<b>410</b>	64
<b>415</b>	76
<b>420</b>	100
<b>425</b>	134
<b>430</b>	298
<b>440</b>	354
<b>450</b>	441
<b>460</b>	538
<b>475</b>	592
<b>4100</b>	958

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

# Installing the graphic keypad

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## Installing the graphic display terminal on the drive



The graphic keypad can be connected or disconnected with the power on. Before disconnecting it, drive control via the display terminal must be disabled (refer to the programming manual).

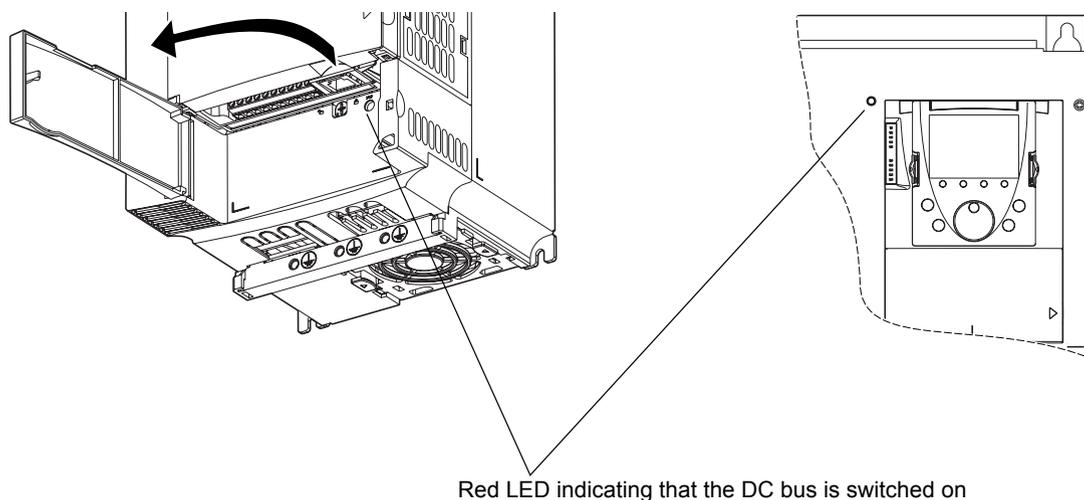
# Location of the charging LED

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

## Location of the capacitor charging LED

MT2P5 to MT225  
and MT401 to MT425

MT225 to MT260  
and MT430 to MT4100



## Procedure for measuring the DC voltage

### DANGER

#### DANGEROUS VOLTAGE

Read and understand the precautions 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 1000 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 15 minutes to allow the DC bus capacitors to discharge.
- 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 22 for the layout of the power terminals.
- 4 If the DC bus capacitors have not discharged completely, contact your local Motortronics agent (do not repair or operate the drive).

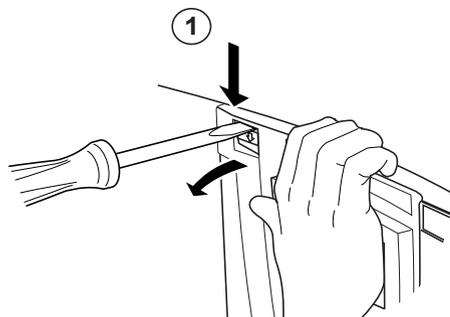
# Installing option cards

These should ideally be installed once the drive is mounted and before wiring it.

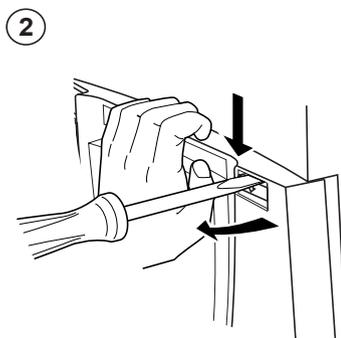
Check that the red capacitor charging LED has gone out. Measure the DC bus voltage in accordance with the procedure indicated on page 15.

The option cards are installed under the drive control front panel. If the drive has a graphic display terminal, remove it, then remove the control front panel as indicated below.

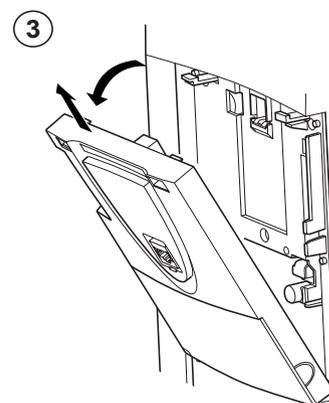
## Removing the control front panel



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



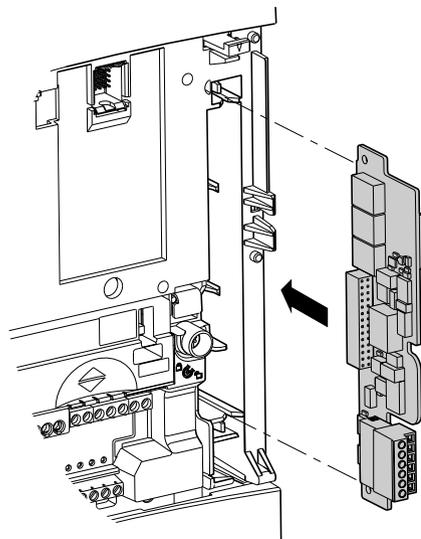
- Do the same on the right-hand side



- Pivot the control front panel and remove it

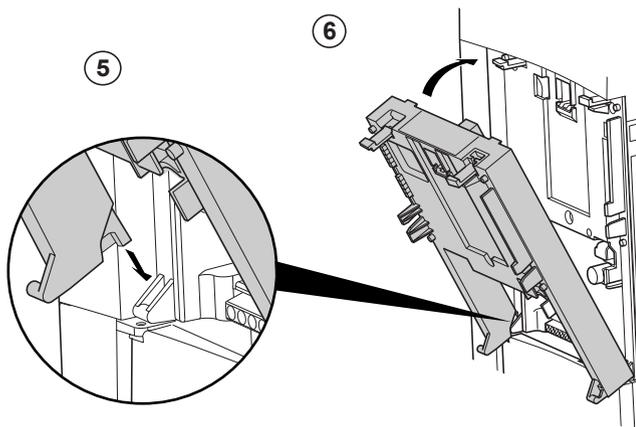
## Installing an encoder interface card

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



- If an I/O or communication option card has already been installed, remove it so you can access the slot for the encoder interface card.

## Installing an I/O extension card or communication card

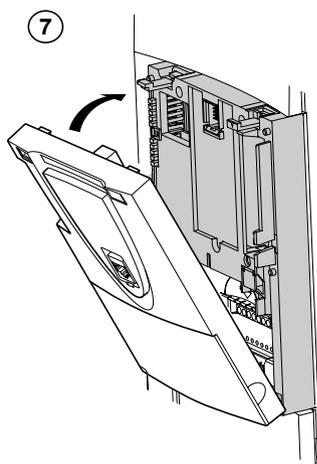


①, ② and ③ Remove the control front panel (see previous page)

④ Install an encoder interface card (if used) (see previous page)

⑤ Position the option card on the clasps

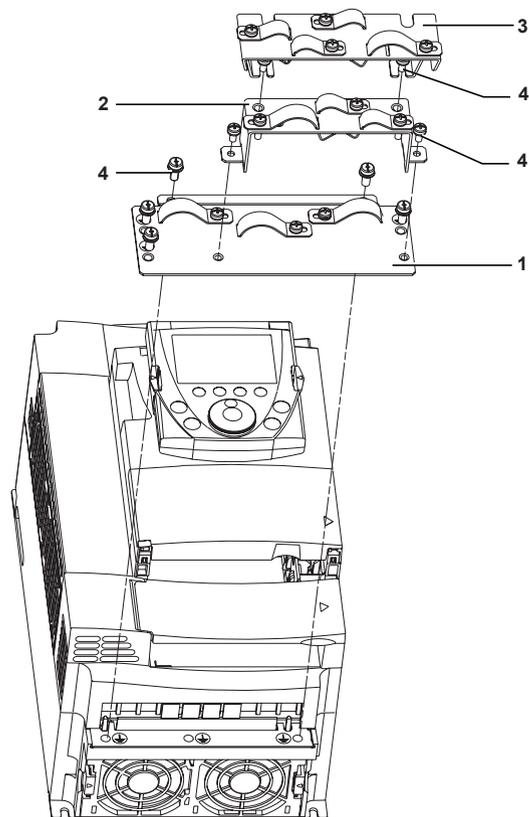
⑥ Then pivot it until it clicks into place



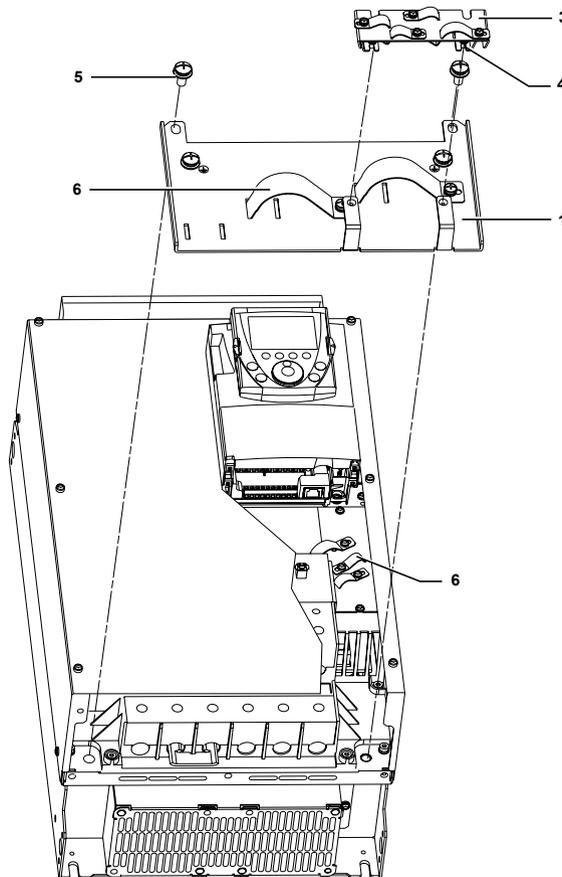
⑦ Replace the control front panel over the option card (same procedure as for installing the option card, see ⑤ and ⑥)

# Installing the EMC plates (if required for export)

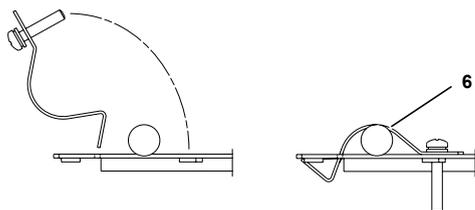
## MT2P5 to MT220 and MT401 to MT425



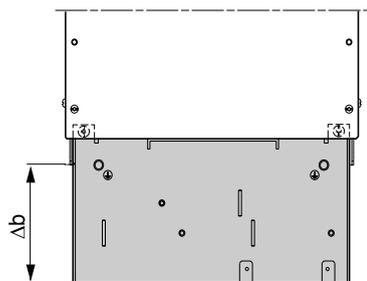
## MT225 to MT260 and MT430 to MT4100



## Installing the EMC clamps



- 1 - EMC plate for connecting the power cables
- 2 - EMC plate for connecting the control cables (only for MT2P5 to MT220 and MT401 to MT425)
- 3 - EMC plate for connecting the I/O option card cables (supplied with the option cards)
- 4 - M4 screws (supplied)
- 5 - M8 screws (supplied)
- 6 - EMC clamps with captive screws (supplied)



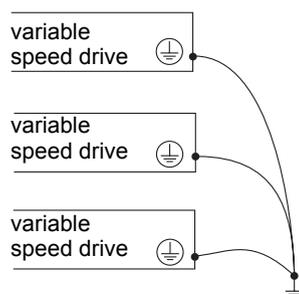
MT	Δb	
	mm	in.
2P5, 201, 202, 203, 205 401, 402, 403, 405	55	2.17
207, 210, 215, 220, 407, 410, 415, 420, 425	65	2.56
225, 230, 240, 250, 260, 430, 440, 450, 460, 475, 4100	120	4.72

# Wiring recommendations

## Power

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

 <b>DANGER</b>
<b>HAZARDOUS VOLTAGE</b> Ground equipment using the provided ground connecting point as shown in the figure below. The drive panel must be properly grounded before power is applied. <b>Failure to follow these instructions will result in death or serious injury.</b>



- Check whether the resistance to the protective ground is one ohm or less. Connect a number of variable speed drives to the protective ground, as shown in the diagram (see left). Do not lay protective grounding cables in a loop or in series.

 <b>WARNING</b>
<b>IMPROPER WIRING PRACTICES</b> <ul style="list-style-type: none"><li>• The MT drive will be damaged if input line voltage is applied to the output terminals (U/T1,V/T2,W/T3).</li><li>• Check the power connections before energizing the MT drive.</li><li>• If replacing another drive, verify that all wiring connections to the MT drive comply with all wiring instructions in this manual.</li></ul> <b>Failure to follow these instructions can result in death or serious injury.</b>

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 incorporating:

- 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 accidental 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.

 <b>WARNING</b>
<b>INADEQUATE OVERCURRENT PROTECTION</b> <ul style="list-style-type: none"><li>• Overcurrent protective devices must be properly coordinated.</li><li>• The Canadian Electricity Code and the National Electrical Code require branch circuit protection. Use the fuses recommended on the drive name plate to achieve published short-circuit current ratings.</li><li>• Do not connect the drive to a power feeder whose short-circuit capacity exceeds the drive short-circuit current rating listed on the drive nameplate.</li></ul> <b>Failure to follow these instructions can result in death or serious injury.</b>

# Wiring recommendations

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

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

Do not immerse the motor cables in water.

Do not use lightning arresters or power factor correction capacitors on the variable speed drive output.

## CAUTION

### IMPROPER USE OF A BRAKING RESISTOR

- Only use the braking resistors recommended in our catalogs.
- Wire the thermal protection contact on the resistor so that the drive power supply is disconnected immediately in the event of a fault (refer to the manual supplied with the resistor).

**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

MT		0 m (0 ft)	50 m (164 ft)	100 m (328 ft)	150 m (492 ft)	300 m (984 ft)	1000 m (3280 ft)
2P5 to 210 401 to 420	Shielded cable						
	Unshielded cable						
215 to 260 425 to 4100	Shielded cable						
	Unshielded cable						

 with dv/dt filters

 with output filters

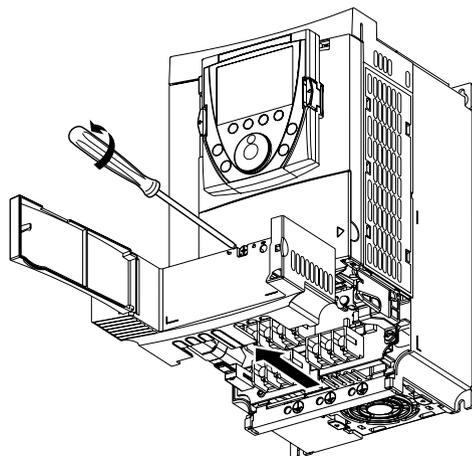
### Choice of associated components:

Please refer to the catalog.

## Access to the power terminals

### MT2P5 to MT220 and MT401 to MT425

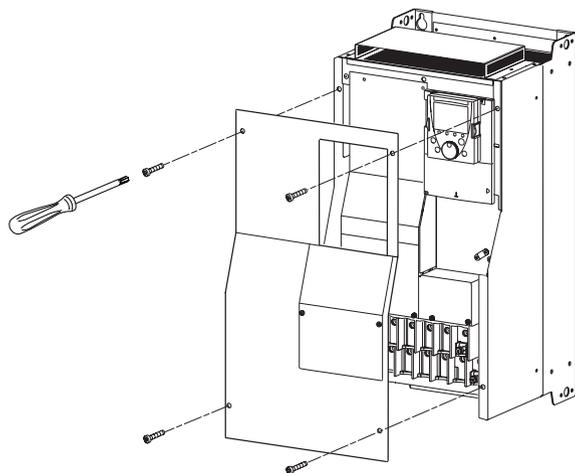
Unlock the power part access flap and remove it as shown below.



Example of MT203

### MT225 to MT260 and MT430 to MT4100

To access the power terminals, remove the front panel as shown below.



Example of MT4100

## Characteristics and functions of the power terminals

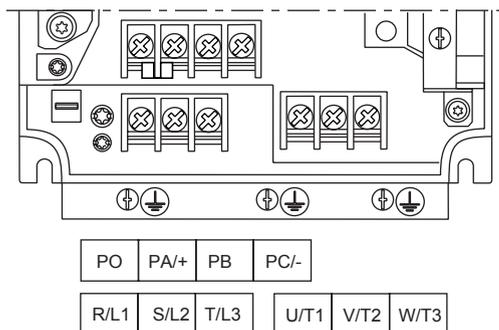
Terminal	Function
$\perp$	Protective ground connection terminal
R/L1 S/L2 T/L3	Power supply
PO	DC bus + polarity
PA/+	Output to braking resistor (+ polarity)
PB	Output to braking resistor
PC/-	DC bus - polarity
U/T1 V/T2 W/T3	Outputs to the motor

 Only remove the link between PO and PA/+ if a DC choke has been added. The screws on the PO and PA/+ terminals must always be fully tightened as there is a high current flowing in the link.

# Power terminals

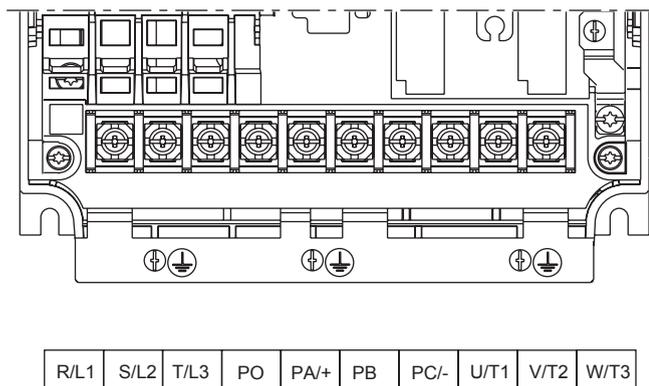
## Layout of the power terminals

**MT** 2P5, 201, 202, 203, 205,  
401, 402, 403, 405



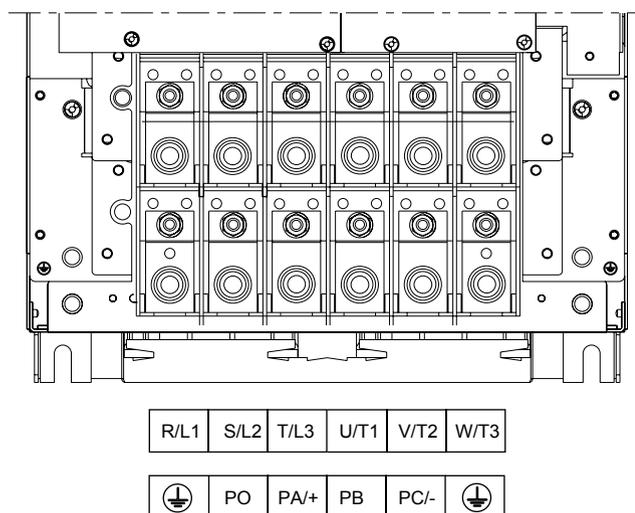
MT	Maximum wire size		Tightening torque
	mm <sup>2</sup>	AWG	Nm (lb.in)
<b>2P5,201, 202 401, 402, 403</b>	2,5	14	1,2 (10.6)
<b>203, 205 405</b>	6	8	1,2 (10.6)

**MT** 207, 201, 215, 220  
407, 410, 415, 420, 425



MT	Maximum wire size		Tightening torque
	mm <sup>2</sup>	AWG	Nm (lb.in)
<b>207, 407, 410</b>	10	6	2 (17.7)
<b>210, 415</b>	16	4	2,4 (21)
<b>215, 220, 420, 425</b>	35	1	2,4 (21)

**MT** 225, 230, 240, 250, 260  
430, 440, 450, 460, 475, 4100

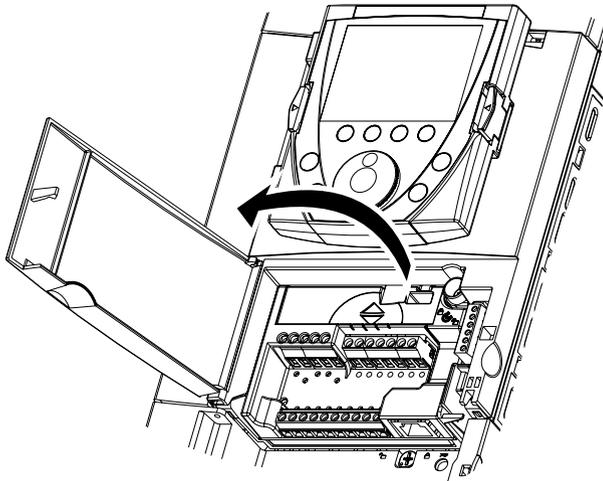


MT	Maximum wire size		Tightening torque
	mm <sup>2</sup>	AWG	Nm (lb.in)
<b>225, 230, 430,440,450</b>	50	1/0	6 (53)

MT	Maximum wire size		Tightening torque
	mm <sup>2</sup>	kcmils	Nm (lb.in)
<b>460, 475, 4100, 240, 250, 260</b>	120	350	19 (168)

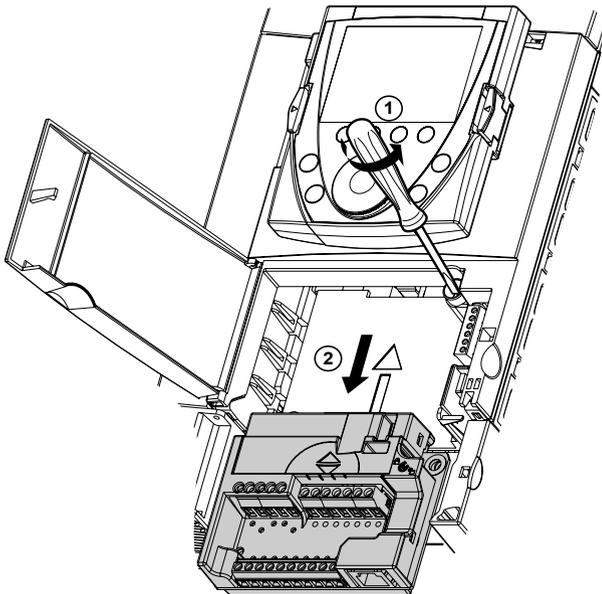
# Control terminals

## 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

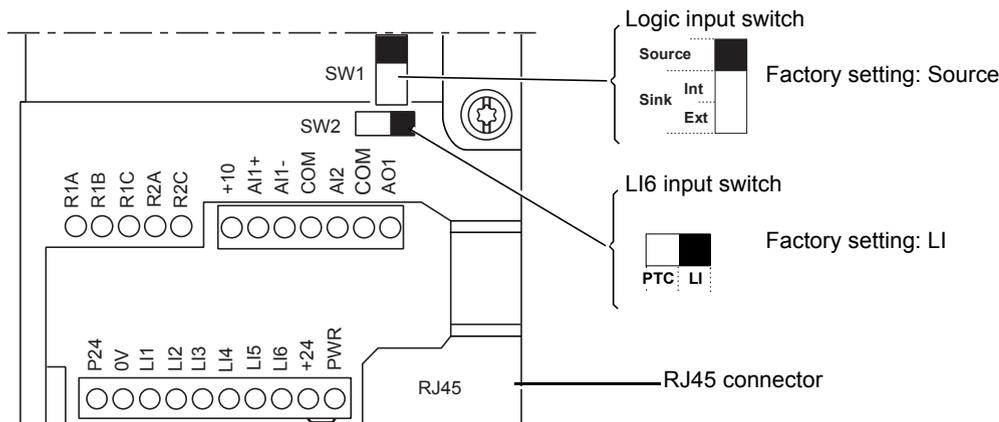
### CAUTION

#### IMPROPERLY SECURED BOARD

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

**Failure to follow this instruction can result in material damage.**

## Layout of the control terminals



Maximum wire size:  
2.5 mm<sup>2</sup> - AWG 14

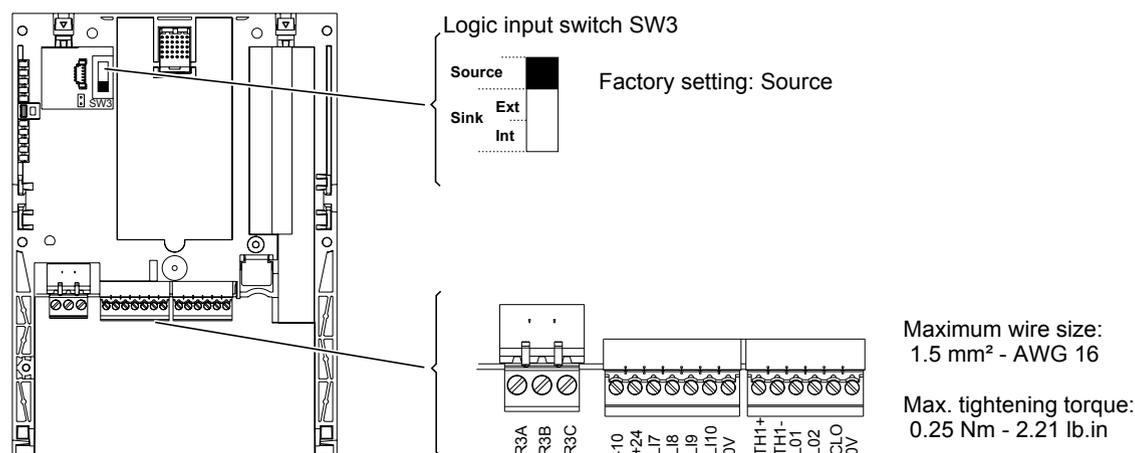
Max. tightening torque:  
0.6 Nm - 5.3 lb.in

**Note:** The MT Series 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	<ul style="list-style-type: none"> <li>Minimum switching capacity: 3 mA for 24 VDC</li> <li>Maximum switching capacity on resistive load: 5 A for 250 VAC or 30 VDC</li> </ul>									
R2A R2C	N/O contact of programmable relay R2	<ul style="list-style-type: none"> <li>Maximum switching current on inductive load (<math>\cos \varphi = 0.4</math> L/R = 7 ms): 2 A for 250 VAC or 30 VDC</li> <li>Reaction time: 7 ms <math>\pm</math> 0.5 ms</li> <li>Service life: 100,000 operations at max. switching power</li> </ul>									
+10	+10 VDC power supply for reference potentiometer 1 to 10 k $\Omega$	<ul style="list-style-type: none"> <li>+10 VDC (10.5 V <math>\pm</math> 0,5V)</li> <li>10 mA max.</li> </ul>									
AI1+ AI1 -	Differential analog input AI1	<ul style="list-style-type: none"> <li>-10 to +10 VDC (max. safe voltage 24 V)</li> <li>Reaction time: 2 ms <math>\pm</math> 0.5 ms, 11-bit resolution + 1 sign bit</li> <li>Accuracy <math>\pm</math> 0.6% for <math>\Delta\theta = 60^\circ\text{C}</math> (140°F), linearity <math>\pm</math> 0.15% of max. value</li> </ul>									
COM	Analog I/O common	0V									
AI2	Depending on software configuration: Analog voltage input  or Analog current input	<ul style="list-style-type: none"> <li>Analog input 0 to +10 VDC (max. safe voltage 24 V), impedance 30 k<math>\Omega</math></li> <li>or</li> <li>analog input X - Y mA, X and Y can be programmed from 0 to 20 mA,</li> <li>Impedance 250 <math>\Omega</math></li> <li>Reaction time: 2 ms <math>\pm</math> 0.5 ms</li> <li>Resolution 11 bits, accuracy <math>\pm</math> 0.6% pour <math>\Delta\theta = 60^\circ\text{C}</math> (140°F), linearity <math>\pm</math> 0.15% of max. value</li> </ul>									
COM	Analog I/O common	0V									
AO1	Depending on software configuration: Analog voltage output or Analog current output	<ul style="list-style-type: none"> <li>analog output 0 to +10 VDC, min. load impedance 50 k<math>\Omega</math></li> <li>or</li> <li>analog output X - Y mA, X and Y can be programmed from 0 to 20 mA</li> <li>max. load impedance 500 <math>\Omega</math></li> <li>10-bit resolution, reaction time: 2 ms <math>\pm</math> 0.5 ms</li> <li>Accuracy <math>\pm</math> 1% for <math>\Delta\theta = 60^\circ\text{C}</math> (140°F), linearity <math>\pm</math> 0.2% of max. value</li> </ul>									
P24	Input for external +24 VDC control power supply	<ul style="list-style-type: none"> <li>+24 VDC(min. 19 V, max. 30 V)</li> <li>Power 30 Watts</li> </ul>									
0V	Logic input common and 0V of P24 external power supply	0V									
LI1 LI2 LI3 LI4 LI5	Programmable logic inputs	<ul style="list-style-type: none"> <li>+24 VDC (max. 30 V)</li> <li>impedance 3.5 k<math>\Omega</math></li> <li>Reaction time: 2 ms <math>\pm</math> 0.5 ms</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>SW1 switch</th> <th>State 0</th> <th>State 1</th> </tr> </thead> <tbody> <tr> <td>Source (factory setting)</td> <td>&lt; 5 VDC</td> <td>&gt; 11 VDC</td> </tr> <tr> <td>Int Sink or Ext Sink</td> <td>&gt; 16 VDC</td> <td>&lt; 10 VDC</td> </tr> </tbody> </table>	SW1 switch	State 0	State 1	Source (factory setting)	< 5 VDC	> 11 VDC	Int Sink or Ext Sink	> 16 VDC	< 10 VDC
SW1 switch	State 0	State 1									
Source (factory setting)	< 5 VDC	> 11 VDC									
Int Sink or Ext Sink	> 16 VDC	< 10 VDC									
LI6	Depending on the position of the SW2 switch. - Programmable logic input  or - Input for PTC probes	<ul style="list-style-type: none"> <li>SW2 switch on LI (factory setting)</li> <li>Same characteristics as logic inputs LI1 to LI5</li> <li>or</li> <li>SW2 switch on PTC</li> <li>Trip threshold 3 k<math>\Omega</math>, reset threshold 1.8 k<math>\Omega</math></li> <li>Short-circuit detection threshold &lt; 50 <math>\Omega</math></li> </ul>									
+24	Logic input power supply	<ul style="list-style-type: none"> <li>SW1 switch in Source or Int Sink position</li> <li>+24 VDC power supply (min. 21 V, max. 27 V), protected against short-circuits and overloads</li> <li>Max. current available for customers 200 mA</li> <li>SW1 switch in Ext Sink position</li> <li>Input for external +24 VDC power supply for the logic inputs</li> </ul>									
PWR	Power Removal safety function input When PWR is not connected to the 24V, the motor cannot be started (compliance with functional safety standard EN 954-1 and IEC/EN 61508)	<ul style="list-style-type: none"> <li>24 VDC power supply (max. 30 V)</li> <li>Impedance 1.5 k<math>\Omega</math></li> <li>State 0 if &lt; 2V, state 1 if &gt; 17V</li> <li>Reaction time: 10ms</li> </ul>									

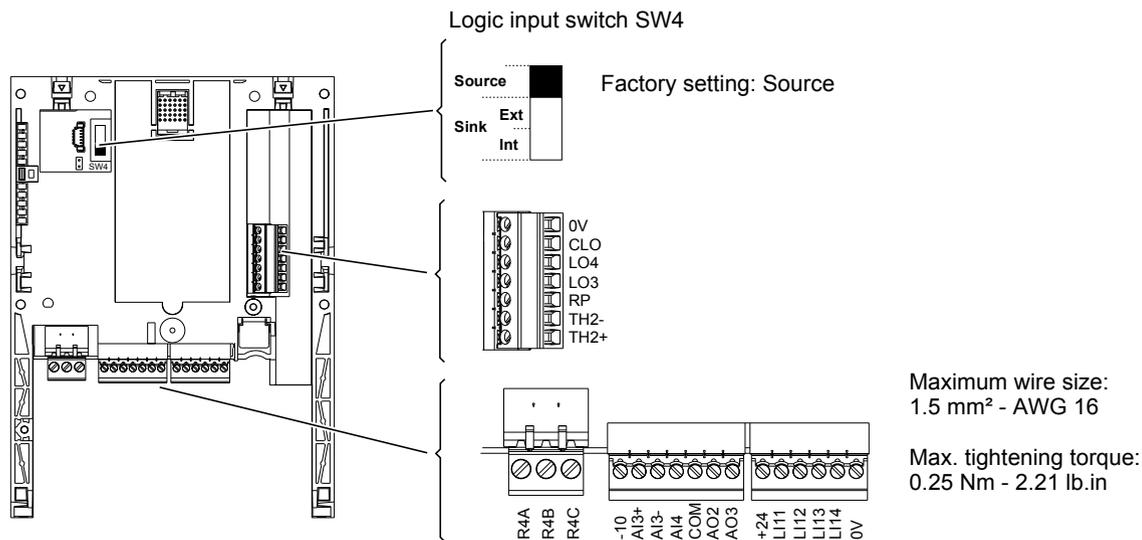
## Logic I/O option card terminals (MT-VW3A3201)



### Characteristics and functions of the terminals

Terminal	Function	Electrical characteristics									
R3A R3B R3C	Common point C/O contact R3C of programmable relay R3	<ul style="list-style-type: none"> <li>Minimum switching capacity: 3mA for 24 VDC</li> <li>Maximum switching capacity on resistive load: 5 A for 250 VAC or 30 VDC</li> <li>Maximum switching capacity on inductive load (<math>\cos \varphi = 0.4</math> L/R = 7 ms): 2 A for 250 VAC or 30 VDC</li> <li>Reaction time: 7 ms <math>\pm</math> 0.5 ms</li> <li>Service life: 100,000 operations</li> </ul>									
-10	-10 VDC power supply for reference potentiometer 1 to 10 k $\Omega$	<ul style="list-style-type: none"> <li>-10 VDC (-10.5 V <math>\pm</math> 0.5V)</li> <li>10 mA max.</li> </ul>									
+24	Logic input power supply	<p>SW3 switch in Source or Int Sink position</p> <ul style="list-style-type: none"> <li>+24 VDC power supply (min. 21 V, max. 27 V), protected against short-circuits and overloads</li> <li>Max. current available for customers 200 mA (This current corresponds to the total consumption on the control card +24 and the option cards +24)</li> </ul> <p>SW3 switch in Ext Sink position</p> <ul style="list-style-type: none"> <li>Input for external +24 VDC power supply for the logic inputs</li> </ul>									
L17 L18 L19 L10	Programmable logic inputs	<ul style="list-style-type: none"> <li>+24 VDC power supply (max. 30 V)</li> <li>Impedance 3.5 k<math>\Omega</math></li> <li>Reaction time 2 ms <math>\pm</math> 0.5 ms</li> </ul> <table border="1"> <thead> <tr> <th>Switch SW3</th> <th>State 0</th> <th>State 1</th> </tr> </thead> <tbody> <tr> <td>Source (factory setting)</td> <td>&lt; 5 VDC</td> <td>&gt; 11 VDC</td> </tr> <tr> <td>Int Sink or Ext Sink</td> <td>&gt; 16 VDC</td> <td>&lt; 10 VDC</td> </tr> </tbody> </table>	Switch SW3	State 0	State 1	Source (factory setting)	< 5 VDC	> 11 VDC	Int Sink or Ext Sink	> 16 VDC	< 10 VDC
Switch SW3	State 0	State 1									
Source (factory setting)	< 5 VDC	> 11 VDC									
Int Sink or Ext Sink	> 16 VDC	< 10 VDC									
0 V	0 V	0 V									
TH1+	PTC probe input	<ul style="list-style-type: none"> <li>Trip threshold 3 k<math>\Omega</math>, reset threshold 1.8 k<math>\Omega</math></li> <li>Short-circuit detection threshold &lt; 50 <math>\Omega</math></li> </ul>									
TH1-											
L01 L02	Open collector programmable logic outputs	<ul style="list-style-type: none"> <li>+24 VDC (max. 30 V)</li> <li>Max. current 200 mA for internal power supply and 200 mA for external power supply</li> <li>Reaction time: 2 ms <math>\pm</math> 0.5 ms</li> </ul>									
CLO	Logic output common										
0V	0 V	0 V									

## Extended I/O option card terminals (MT-VW3A3202)



### Characteristics and functions of the terminals

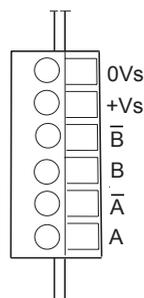
Terminal	Function	Electrical characteristics
R4A R4B R4C	Common point C/O contact R4C of programmable relay R4	<ul style="list-style-type: none"> <li>Minimum switching capacity: 3mA for 24 VDC</li> <li>Maximum switching capacity on resistive load: 5 A for 250 VAC or 30 VDC</li> <li>Maximum switching capacity on inductive load (<math>\cos \varphi = 0.4</math> L/R = 7 ms): 1.5 A for 250 VAC or 30 VDC</li> <li>Reaction time 10 ms <math>\pm</math> 1ms</li> <li>Service life: 100,000 operations</li> </ul>
-10	-10 VDC power supply for reference potentiometer 1 to 10 k $\Omega$	<ul style="list-style-type: none"> <li>-10 VDC (-10.5 V <math>\pm</math> 0,5V)</li> <li>10 mA max.</li> </ul>
AI3 +	+ polarity of the current differential analog input AI3	<ul style="list-style-type: none"> <li>Analog input X - Y mA, X and Y can be programmed from 0 to 20 mA, impedance 250 <math>\Omega</math></li> <li>Reaction time: 5 ms <math>\pm</math> 1 ms</li> <li>11-bit resolution + 1 sign bit, accuracy <math>\pm</math> 0.6% for <math>\Delta\theta = 60^\circ\text{C}</math> (140°F)</li> <li>Linearity <math>\pm</math> 0.15% of max. value</li> </ul>
AI3 -	- polarity of the current differential analog input AI3	
AI4	Depending on software configuration: Analog current input  or Analog voltage input	<ul style="list-style-type: none"> <li>Analog input 0 to +10 VDC (max. safe voltage 24 V), impedance 30 k<math>\Omega</math></li> <li>or</li> <li>Analog input X - Y mA, X and Y can be programmed from 0 to 20 mA, impedance 250 <math>\Omega</math></li> <li>Reaction time: 5 ms <math>\pm</math> 1 ms</li> <li>Resolution 11 bits, accuracy <math>\pm</math> 0.6% pour <math>\Delta\theta = 60^\circ\text{C}</math> (140°F), linearity <math>\pm</math> 0.15% of max. value</li> </ul>
COM	Analog I/O common	0 V
AO2 AO3	Depending on software configuration: Analog voltage outputs  or Analog current outputs	<ul style="list-style-type: none"> <li>0 - 10 VDC or -10/+10 VDC bipolar analog output depending on software configuration, min. load impedance 50 k<math>\Omega</math></li> <li>or</li> <li>Analog current output X-Y mA, X and Y can be programmed from 0 to 20 mA, max. load impedance 500 <math>\Omega</math></li> <li>10-bit resolution</li> <li>Reaction time 5 ms <math>\pm</math> 1ms, accuracy <math>\pm</math> 1% for <math>\Delta\theta = 60^\circ\text{C}</math> (140°F), linearity <math>\pm</math> 0.2%</li> </ul>

# Option terminals

Terminal	Function	Electrical characteristics									
+24	Logic input power supply	SW4 switch in Source or Int Sink position <ul style="list-style-type: none"> <li>+24 VDC output (min. 21 V, max. 27 V), protected against short-circuits and overloads</li> <li>Max. current available for customers 200 mA (This current corresponds to the total consumption on the control card +24 and the option cards +24)</li> </ul> SW4 switch in Ext Sink position <ul style="list-style-type: none"> <li>Input for external +24 VDC power supply for the logic inputs</li> </ul>									
LI11 LI12 LI13 LI14	Programmable logic inputs	<ul style="list-style-type: none"> <li>+24 VDC (max. 30 V)</li> <li>Impedance 3.5 k<math>\Omega</math></li> <li>Reaction time: 5 ms <math>\pm</math> 1 ms</li> </ul> <table border="1" data-bbox="1015 401 1482 499"> <thead> <tr> <th>SW4 switch</th> <th>State 0</th> <th>State 1</th> </tr> </thead> <tbody> <tr> <td>Source (factory setting)</td> <td>&lt; 5 VDC</td> <td>&gt; 11 VDC</td> </tr> <tr> <td>Int Sink or Ext Sink</td> <td>&gt; 16 VDC</td> <td>&lt; 10 VDC</td> </tr> </tbody> </table>	SW4 switch	State 0	State 1	Source (factory setting)	< 5 VDC	> 11 VDC	Int Sink or Ext Sink	> 16 VDC	< 10 VDC
SW4 switch	State 0	State 1									
Source (factory setting)	< 5 VDC	> 11 VDC									
Int Sink or Ext Sink	> 16 VDC	< 10 VDC									
0V	Logic input common	0 V									
TH2 + TH2 -	PTC probe input	<ul style="list-style-type: none"> <li>Trip threshold 3 k<math>\Omega</math>, reset threshold 1.8 k<math>\Omega</math></li> <li>Short-circuit detection threshold &lt; 50 <math>\Omega</math></li> </ul>									
RP	Frequency input	<ul style="list-style-type: none"> <li>Frequency range 0 to 30 kHz</li> <li>Reaction time 5 ms <math>\pm</math> 1ms</li> </ul>									
LO3 LO4	Open collector programmable logic outputs	<ul style="list-style-type: none"> <li>+24 VDC (max. 30 V)</li> <li>Max. current 20 mA for internal power supply and 200 mA for external power supply</li> <li>Reaction time 5 ms <math>\pm</math> 1ms</li> </ul>									
CLO	Logic output common										
0V	0 V	0 V									

## Encoder interface card terminals

MT-VW A3 401...407



Maximum wire size:  
1.5 mm<sup>2</sup> - 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	<ul style="list-style-type: none"> <li>5VDC (max. 5.5V) protected against short-circuits and overloads</li> <li>Max. current 200 mA</li> </ul>	<ul style="list-style-type: none"> <li>15VDC (max. 16V) protected against short-circuits and overloads</li> <li>Max. current 175 mA</li> </ul>
A, /A B, /B	Incremental logic inputs	<ul style="list-style-type: none"> <li>Max. resolution: 10000 points/rev</li> <li>Max. frequency: 300kHz</li> </ul>	

### Encoder interface cards with open collector outputs

Terminal	Function	Electrical characteristics	
		MT-VW3 A3 403	MT-VW3 A3 404
+Vs 0Vs	Encoder power supply	<ul style="list-style-type: none"> <li>12VDC (max. 13V) protected against short-circuits and overloads</li> <li>Max. current 175 mA</li> </ul>	<ul style="list-style-type: none"> <li>15VDC (max. 16V) protected against short-circuits and overloads</li> <li>Max. current 175 mA</li> </ul>
A, /A B, /B	Incremental logic inputs	<ul style="list-style-type: none"> <li>Max. resolution: 10000 points/rev</li> <li>Max. frequency: 300 kHz</li> </ul>	

### 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	<ul style="list-style-type: none"> <li>12VDC (max. 13V) protected against short-circuits and overloads</li> <li>Max. current 175 mA</li> </ul>	<ul style="list-style-type: none"> <li>15VDC (max. 16V) protected against short-circuits and overloads</li> <li>Max. current 175 mA</li> </ul>	<ul style="list-style-type: none"> <li>24VDC (min. 20V, max. 30V) protected against short-circuits and overloads</li> <li>Max. current 100 mA</li> </ul>
A, /A B, /B	Incremental logic inputs	<ul style="list-style-type: none"> <li>Max. resolution: 10000 points/rev</li> <li>Max. frequency: 300 kHz</li> </ul>		

## Selecting the encoder

The 7 encoder interface cards available as an option 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 10000 points/revolution

Choose the max. standard resolution within these two 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.

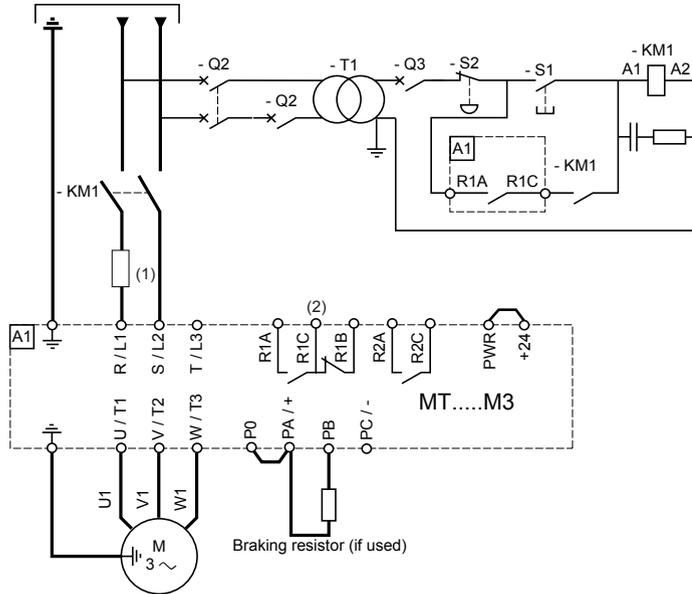
The minimum cross-section of the conductors must comply with the table below, in order to limit line voltage drop:

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 mm <sup>2</sup>	AWG 24	100 mA	0.2 mm <sup>2</sup>	AWG 24
	200 mA	0.2 mm <sup>2</sup>	AWG 24	200 mA	0.2 mm <sup>2</sup>	AWG 24
50 m 164 ft	100 mA	0.5 mm <sup>2</sup>	AWG 20	100 mA	0.5 mm <sup>2</sup>	AWG 20
	200 mA	0.75 mm <sup>2</sup>	AWG 18	200 mA	0.75 mm <sup>2</sup>	AWG 18
100 m 328 ft	100 mA	0.75 mm <sup>2</sup>	AWG 18	100 mA	0.75 mm <sup>2</sup>	AWG 18
	200 mA	1.5 mm <sup>2</sup>	AWG 15	200 mA	1.5 mm <sup>2</sup>	AWG 16
200 m 656 ft	-	-	-	100 mA	0.5 mm <sup>2</sup>	AWG 20
	-	-	-	200 mA	1.5 mm <sup>2</sup>	AWG 15
300 m 984 ft	-	-	-	100 mA	0.75 mm <sup>2</sup>	AWG 18
	-	-	-	200 mA	1.5 mm <sup>2</sup>	AWG 15

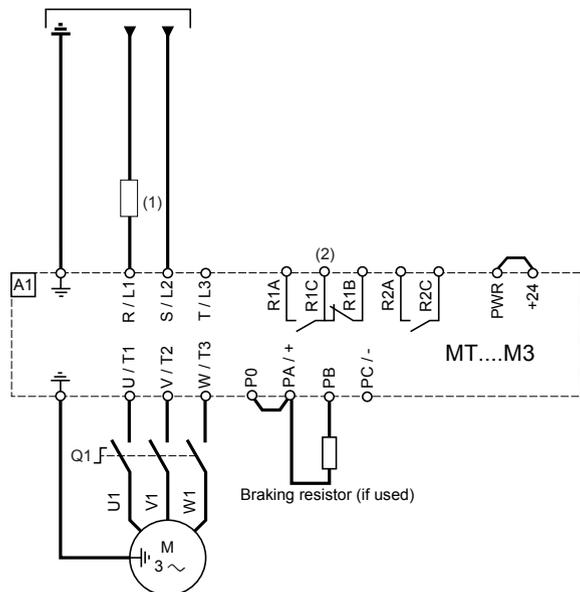
## Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204 1 (if required)

### Single phase power supply (MT201 to MT210)

#### Diagram with line contactor



#### Diagram with switch disconnect



(1) Line reactor, if used (required for MT205 to MT210 drives)

(2) Fault relay contacts, for remote signaling of drive status

 Inhibit the input phase loss fault (IPL) so that MT201 to MT210 drives can operate on a single phase supply (see programming manual). If this fault is set to its factory configuration, the drive will stay locked in fault mode.

**Note:** Fit interference suppressors to all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

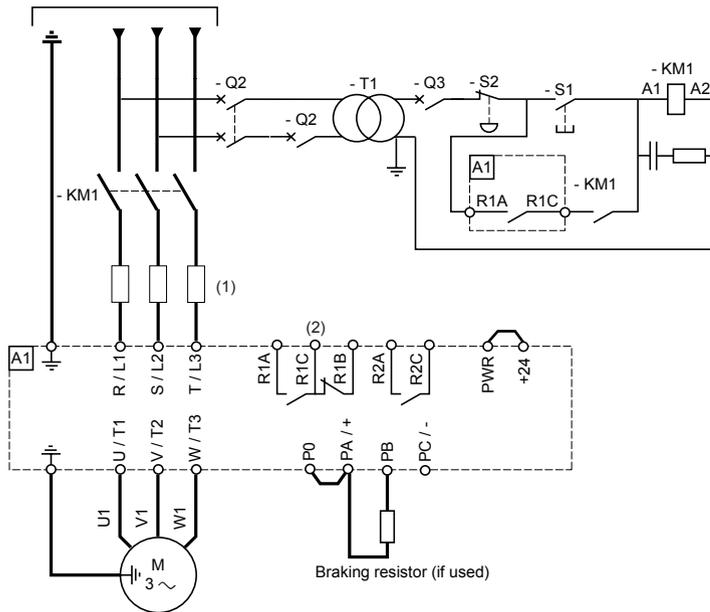
#### Choice of associated components:

Please refer to the catalog.

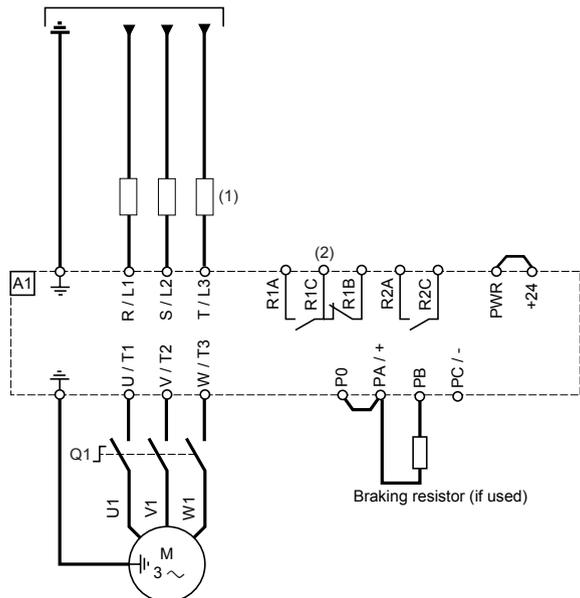
## Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1 (if required)

### 3-phase power supply

#### Diagram with line contactor



#### Diagram with switch disconnect



(1) Line reactor (if used)

(2) Fault relay contacts, for remote signaling of drive status

**Note:** 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:

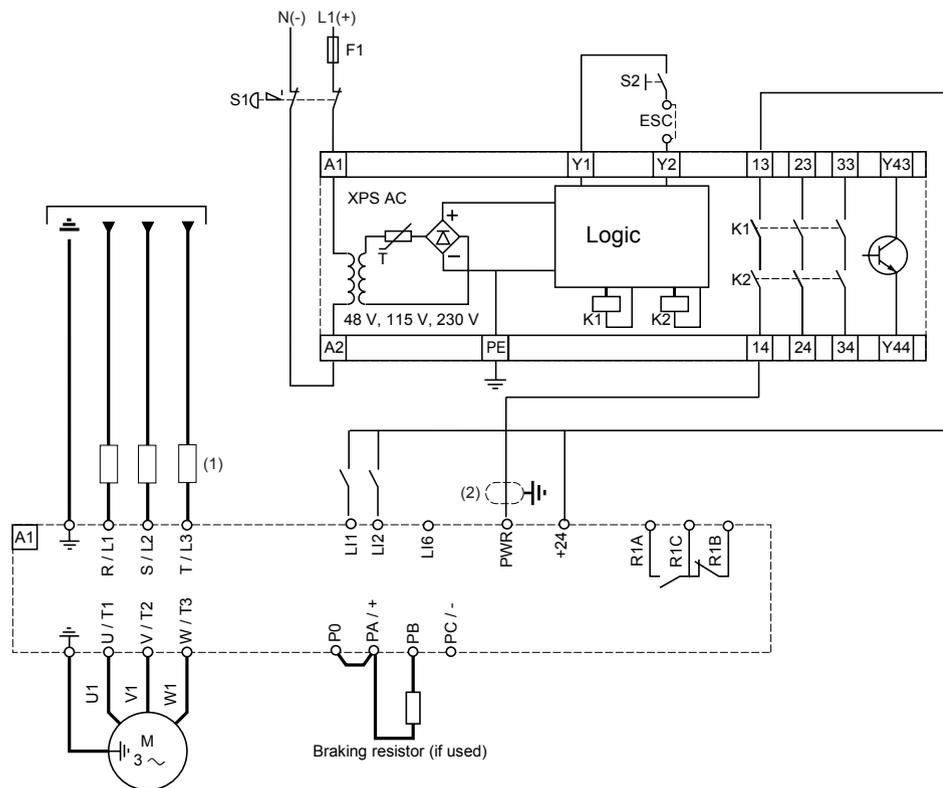
Please refer to the catalog.

## Connection 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 stop request is activated, the motor power supply is switched off immediately and it stops in accordance with category 0 of standard IEC/EN 60204-1.

 **This diagram must be used for hoisting applications if a mechanical brake is controlled by the MT.**

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 reactor (if used)

(2) 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 switching on 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 switched 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)

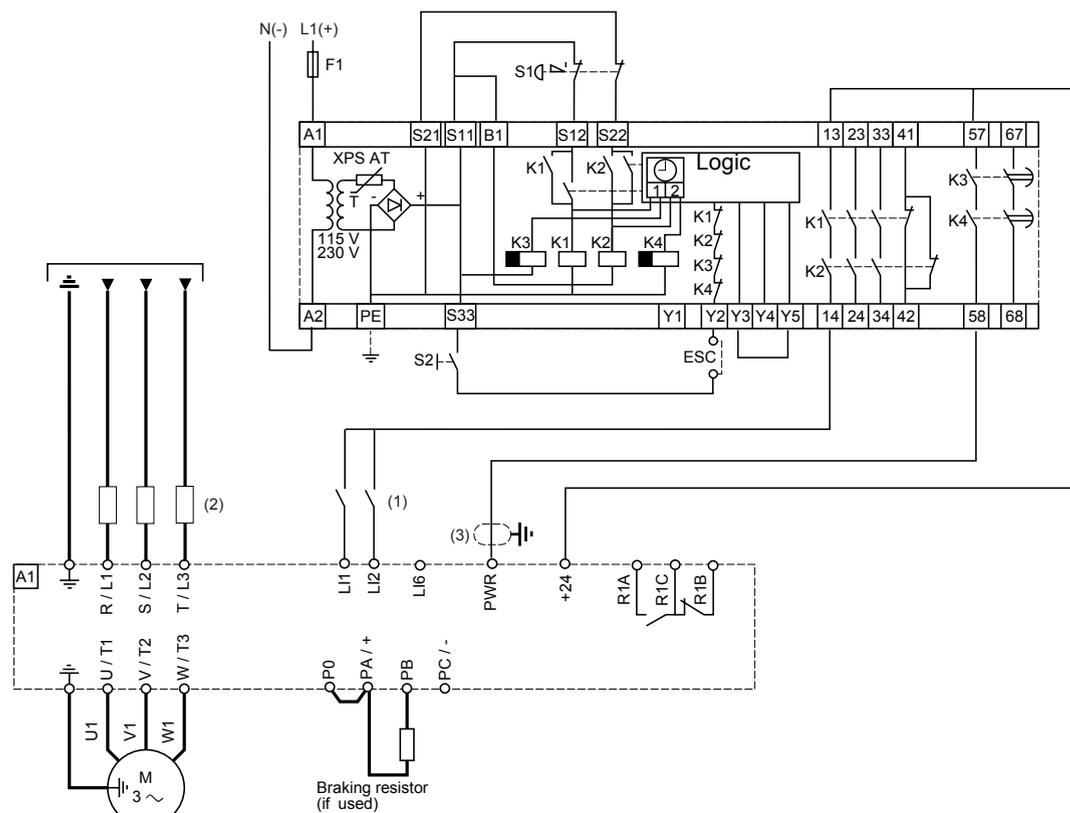
This connection diagram is suitable for use with machines with a long freewheel stop time (machines with high inertia or low resistive torque).

 **This diagram must not be used for lifting applications.**

When the stop request 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) In this example, the logic inputs LI● are wired as "Source" but can be wired as "Int Sink" or "Ext Sink".
- (2) Line reactor (if used)
- (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 switching on 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 switched off and then on again before carrying out this preventive maintenance.

The drive logic output signals cannot be considered as safety-type signals.

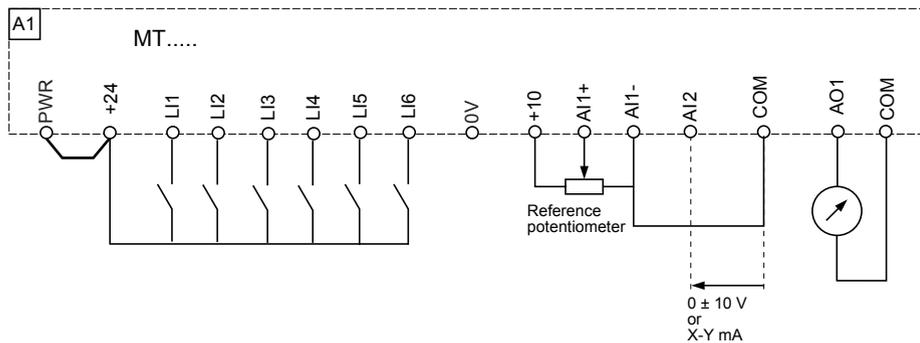
Fit interference suppressors to all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

### Choice of associated components:

Please refer to the catalog.

## Control connection diagrams

### Control card connection diagram

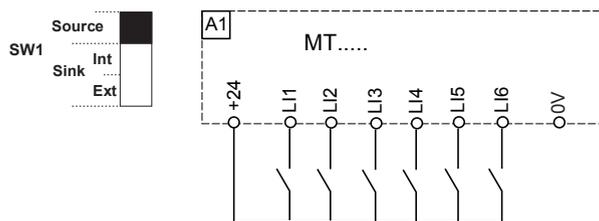


### Logic input switch (SW1)

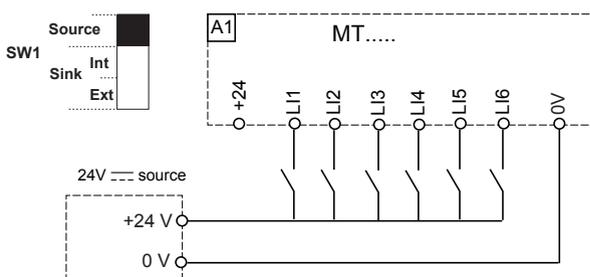
The logic input switch (SW1) is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

- Set the switch to Source (factory setting) if using PLC outputs with PNP transistors.
- Set the switch to Int Sink or Ext Sink if using PLC outputs with NPN transistors.

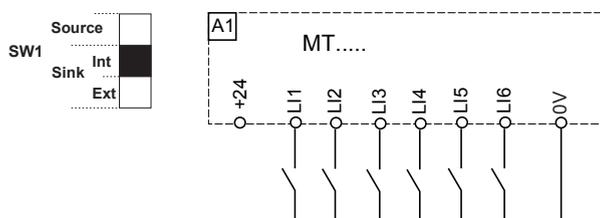
- SW1 switch set to "Source" position



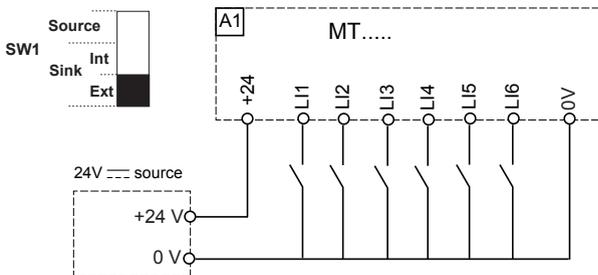
- SW1 switch set to "Source" position and use of an external power supply for the LIs



- SW1 switch set to "Int Sink" position



- SW1 switch set to "Ext Sink" position



## WARNING

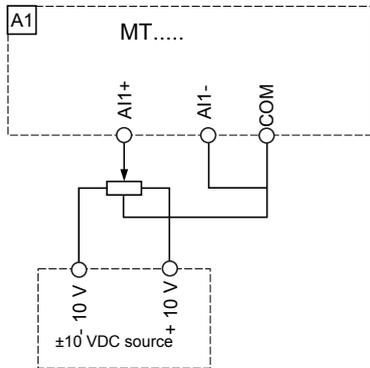
### Unintended equipment operation

- When the SW1 switch is set to "Int Sink" or "Ext Sink", 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.

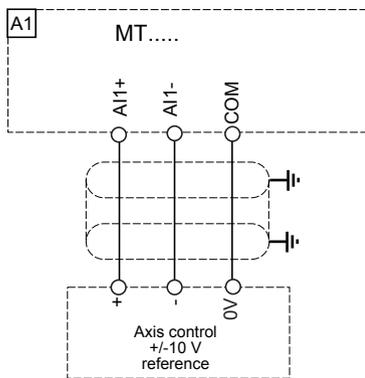
**Failure to follow this instruction can result in death or serious injury.**

# Connection diagrams

## Bipolar speed reference



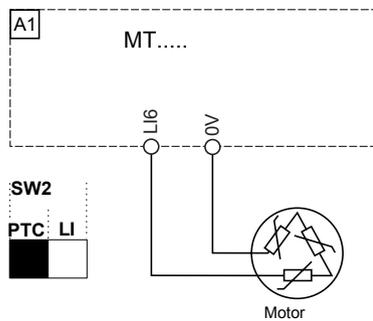
## Speed reference using axis control



## SW2 switch

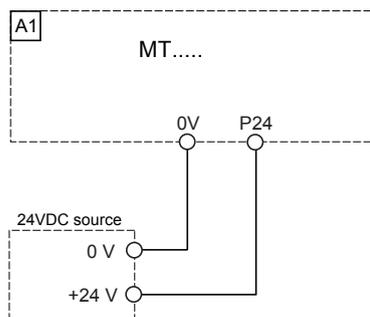
The LI6 logic input switch (SW2) makes it possible to use the LI6 input:

- 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



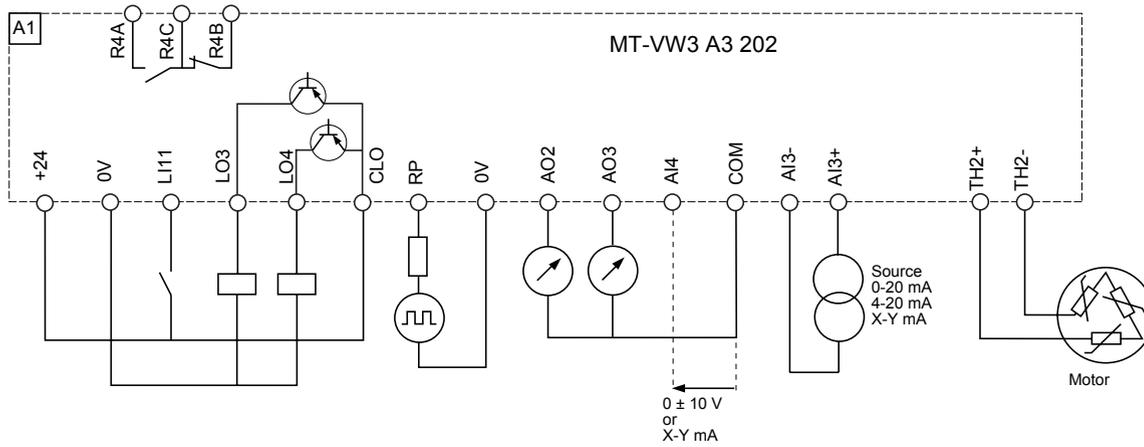
## Control power supply via an external source

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

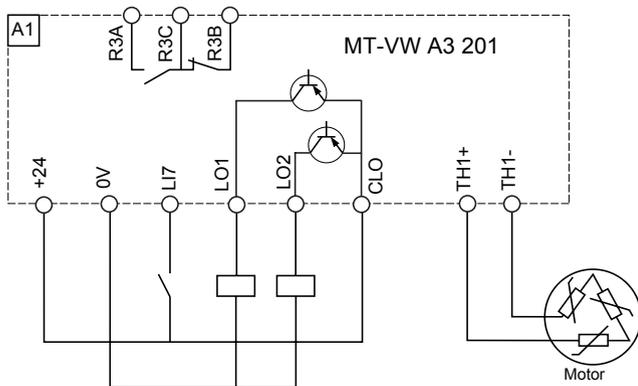


## I/O extension card connection diagrams

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



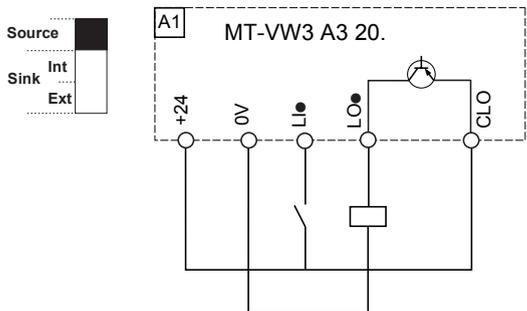
Connection diagram for logic I/O option card (VW3A3201)



## SW3/SW4 logic I/O switch

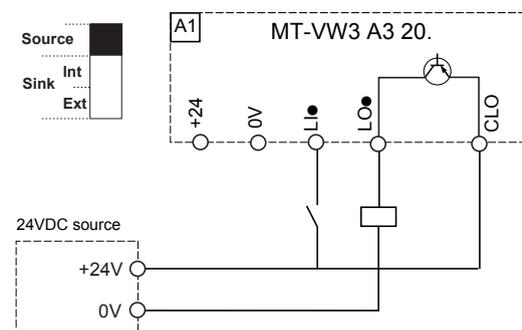
- Switch in "Source" position

SW3 or SW4



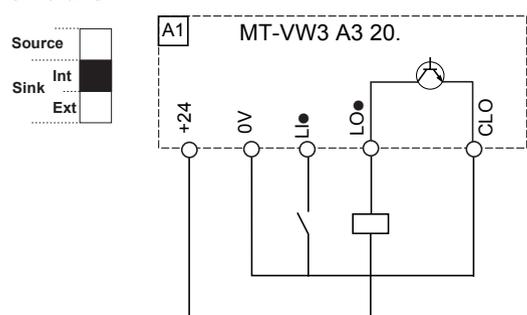
- Switch in "Source" position and use of an external +24 VDC source

SW3 or SW4



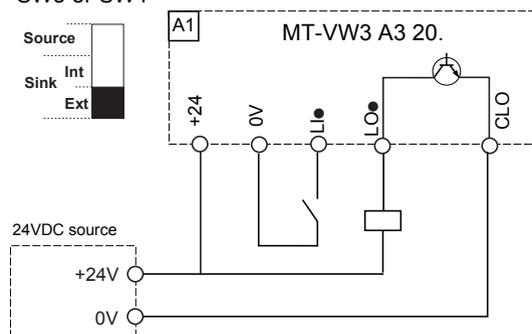
- Switch in "Int Sink" position

SW3 or SW4



- Switch in "Ext Sink" position

SW3 or SW4



## WARNING

### Unintended equipment operation

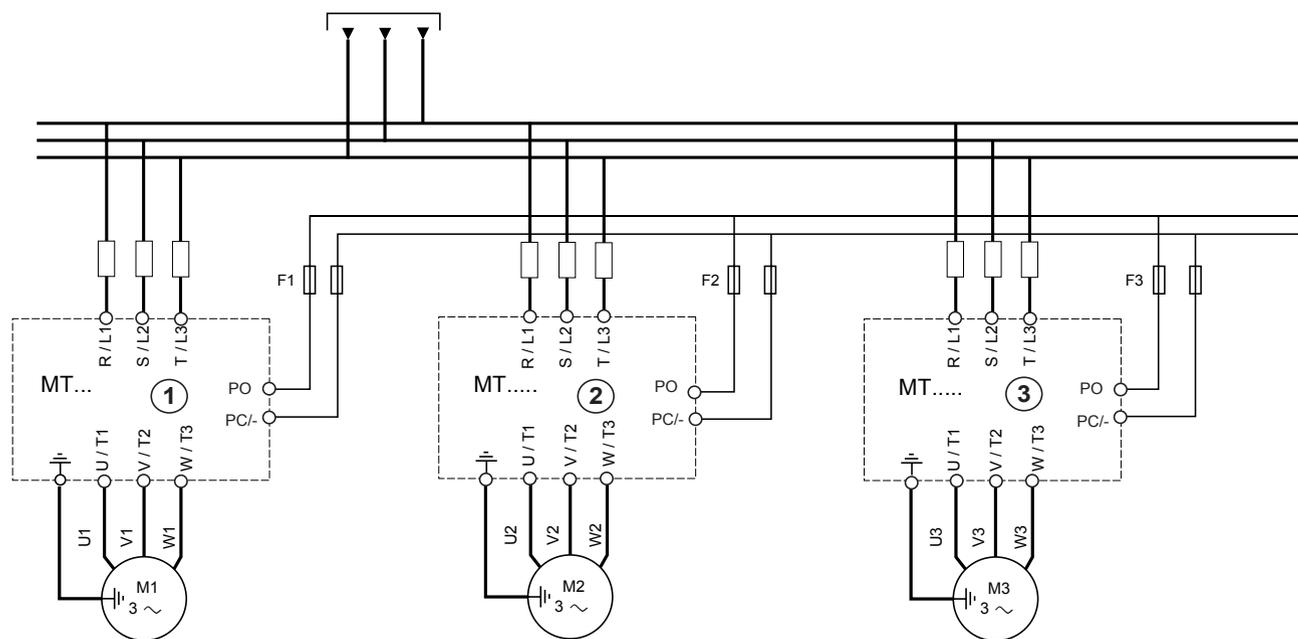
- When the SW3 or SW4 switches are set to "Int Sink" or "Ext Sink", the common must never be connected to ground or the protective ground, as there is then a risk of accidental starting on the first insulation fault.

**Failure to follow this instruction can result in death or serious injury.**

## Connection of several drives in parallel on the DC bus

Connection in parallel on the DC bus is recommended in applications for which full motor power must be guaranteed.

### 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 semi-conductor fuses for protection on the DC bus side.

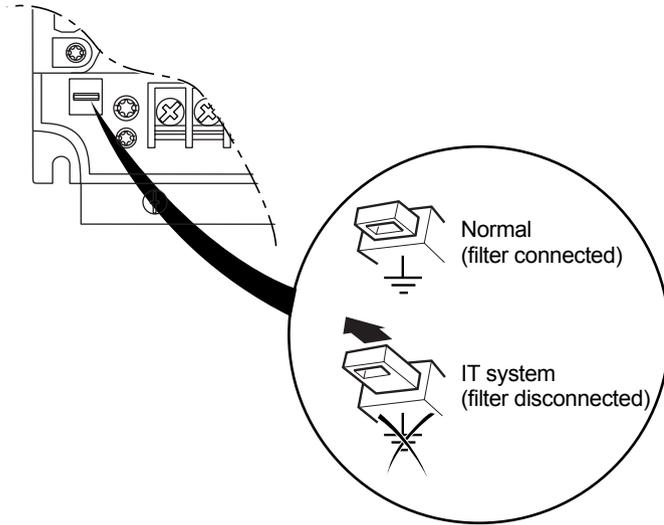
# Operation on an IT (Isolated or impedance grounded neutral) system

IT system: Isolated or impedance grounded neutral.

Use a permanent insulation monitor compatible with non-linear loads: a Merlin Gerin type XM200 or equivalent.

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

Remove the jumper located to the left of the power terminals



## 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 this instruction can result in material damage.**

## Electromagnetic compatibility (If required)

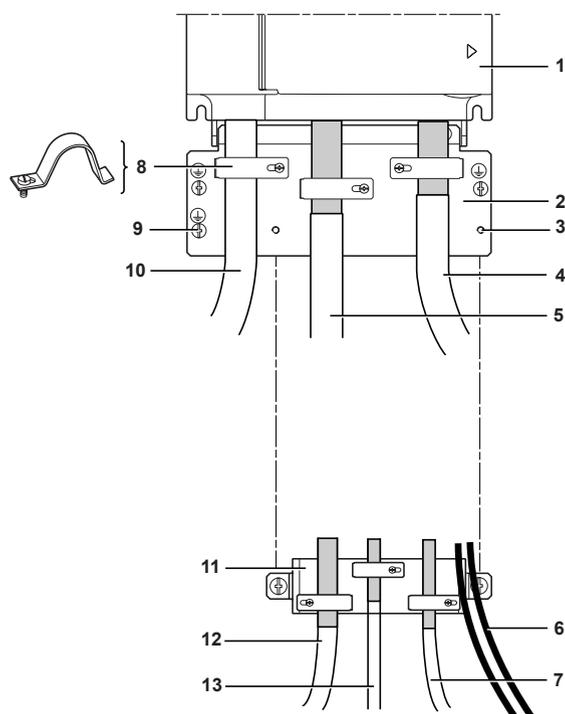
### Principle

- Grounds between drive, motor and cable shielding must have "high frequency" equipotentiality.
- Use of shielded cables with shielding connected to ground at both ends for the motor cables, braking resistor (if used) and control-signaling 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

#### MT2P5 to MT220 and MT401 to MT425

- Attach and ground the shielding of cables **4** and **5** as close as possible to the drive:
  - Strip the shielding.
  - Use stainless metal cable clamps on the parts from which the shielding has been stripped, to attach them to the plate **2**. The shielding must be clamped tightly enough to the metal plate to ensure correct contact.
- Install the control EMC plate **11** on the sheet steel grounded plate **2**, as shown in the drawing.
- Attach and ground the shielding of cables **7**, **12** and **13** as close as possible to the drive:
  - Strip the shielding.
  - Use stainless metal cable clamps on the parts from which the shielding has been stripped, to attach them to the control EMC flange **9**. The shielding must be clamped tightly enough to the metal plate to ensure correct contact.



**1** MT Series>

**2** Sheet steel grounded plate supplied with the drive.

**3** Tapped holes for installing the control EMC plate.

**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** Non-shielded wires for relay contact output.

**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** Metal clamps.

**9** Connection to the protective ground.

**10** Non-shielded power supply wires or cable.

**11** Control EMC plate.

**12** Shielded cables for connecting the control-signal wiring. For applications requiring several conductors, use cables with a small cross-section (0.5 mm<sup>2</sup>(AWG 20)).

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

#### Note:

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

## Installation diagram

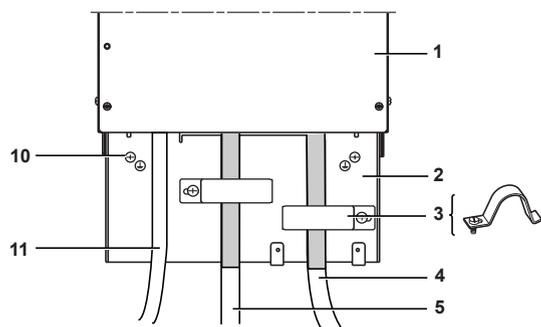
### MT225 to MT260 and MT430 to MT4100

Fix and ground the shielding of cables **4** and **5** as close as possible to the drive:

- Strip the shielding.
- Use stainless metal cable clamps on the parts from which the shielding has been stripped, to attach them to the plate **2**. The shielding must be clamped tightly enough to the metal plate to ensure correct contact.

• Fix and ground the shielding of cables **6**, **7** and **8** as close as possible to the drive:

- Strip the shielding.
- Use stainless metal cable clamps on the parts from which the shielding has been stripped, to attach them to the drive. The shielding must be clamped tightly enough to the metal plate to ensure correct contact.



**1** MT Series

**2** Sheet steel grounded plate supplied with the drive.

**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-signaling cables. For applications requiring several conductors, use cables with a small cross-section (0.5 mm<sup>2</sup>(AWG 20)).

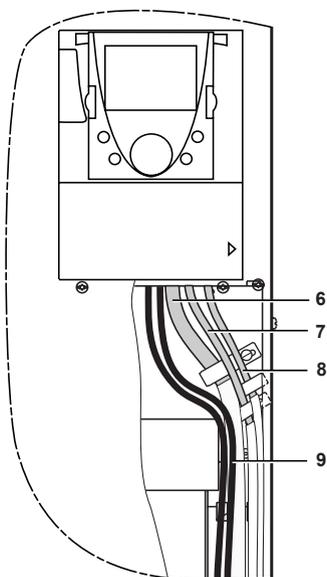
**7** Shielded cables for connecting the Power Removal safety function input. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

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

**9** Non-shielded wires for relay contact output.

**10** Connection to the protective ground.

**11** Non-shielded power supply wires or cable.



### Note:

- If using an additional input filter, it should be fitted under the drive and connected directly to the line supply via an unshielded cable. Link **4** on the drive is then via the filter output cable.
- The HF equipotential 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.

