

# Commander C200/C300

## **Step By Step Guide**

*Guide pas à pas*

*Schritt-für-Schritt-Anleitung*

*Guida dettagliata*

*Guía detallada*

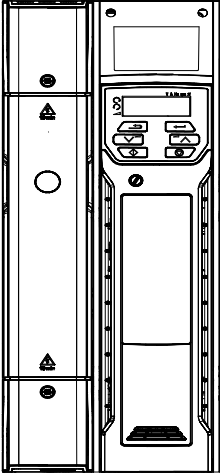
## **Frame sizes 5 to 9**

**Tailles 5 à 9**

**Baugrößen 5 bis 9**

**Taglie da 5 a 9**

**Tamaños 5 a 9**



# English

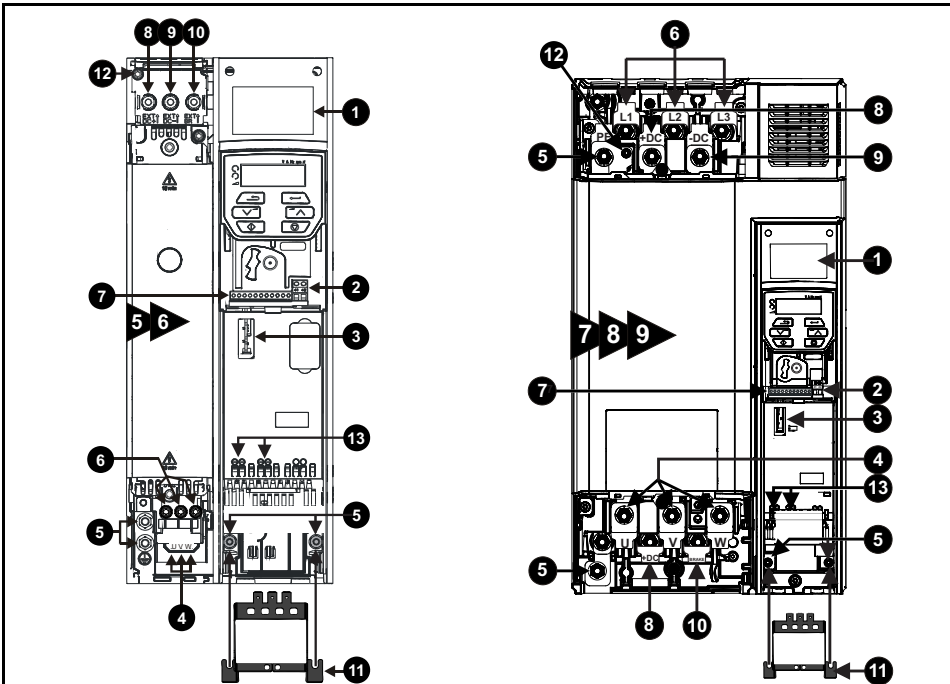
## Introduction

The Commander C200 and C300 is a simple and flexible range of drives from 0.25 kW to 132 kW in 9 frame sizes and two input voltage ranges (200 V, and 400 V).

This Step-by Step guide provides simple step-by-step instructions on how to mount the drive, fuse and cable selection, wiring the drive-up, programming the drive and running the motor in analog input mode or keypad mode on frames 5 to 9.

## Features of the drive

Figure 1-1 Feature diagram



### Key

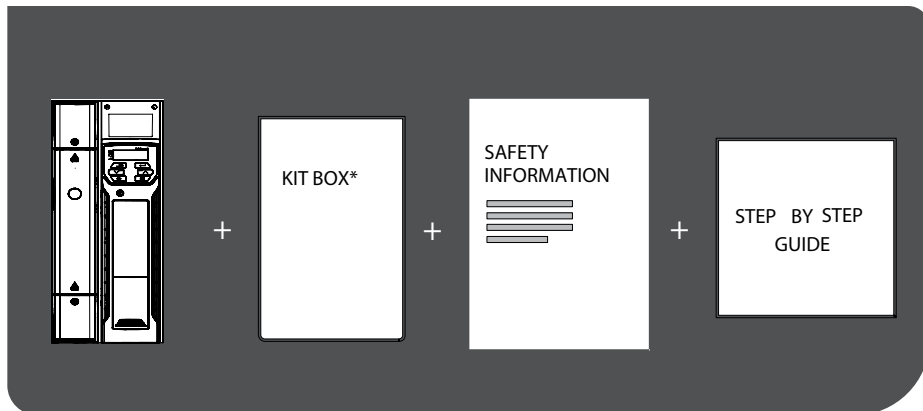
1. Rating label	2. Relay connections (Refer to Fig. 6-5)
3. Option module slot 1	4. Motor connections (Refer to Fig. 6-1 to Fig. 6-4)
5. Ground connections (Refer to Fig. 6-1 to 6-4)	6. AC supply connections (Refer to Fig. 6-1 to Fig. 6-4)
7. Control connections (Refer to Fig. 6-5)	8. DC bus +
9. DC bus -	10. Braking terminal
11. Cable bracket to ground terminals	12. Internal EMC filter screw*
13. Safe Torque Off terminals (STO)** (Refer to Fig 6-5)	

\* Before removing the screw, refer to Chapter 4 in the **Power Installation Guide**.

\*\* Commander C300 only

## STEP 1: Check the contents of the box

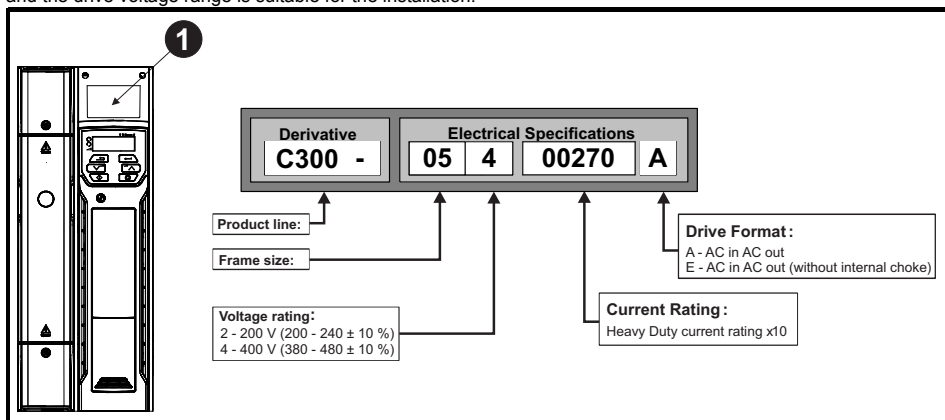
Check you have all the components and your drive has not been damaged during transportation.



\* With frame size 7, 8 and 9, surface mounting brackets are also supplied with the drive.

## STEP 2: Check model and voltage

The model number can be found on the identification label **1** on the top of the drive. Please check that the model and the drive voltage range is suitable for the installation.



### STEP 3: Mount the drive

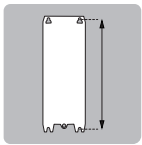
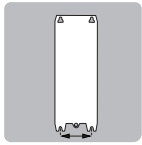
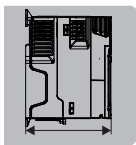

The drive should be mounted in an ambient temperature range of - 20 °C to 60 °C (- 4 °F to 140 °F).

Output current derating may be required at ambient temperatures >40 °C (104 °F). Refer to the relevant **Power Installation Guide** (section 5.1). For UL installations, the maximum ambient temperature permitted is 50 °C (122 °F) with any specified derating applied.

The drive can be screwed on a wall or Through-panel mounted (Refer to chapter 3 in the **Power Installation Guide**). Table 3-1 highlights the clearances.

**Table 3-1 Recommended spacing**

Frame size	Spacing between drive and enclosure / EMC filter	Spacing between drives	Spacing above drive	Spacing below drive
5	30 mm (1.18 in)	0 mm (0.00 in)	100 mm (4.0 in)	100 mm (4.0 in)
6	30 mm (1.18 in)	0 mm (0.00 in)	100 mm (4.0 in)	100 mm (4.0 in)
7	45 mm (1.77 in)	30 mm (1.18 in)	60 mm (2.37 in)	100 mm (4.0 in)
8	45 mm (1.77 in)	30 mm (1.18 in)	60 mm (2.37 in)	100 mm (4.0 in)
9	45 mm (1.77 in)	60 mm (2.37 in)	60 mm (2.37 in)	100 mm (4.0 in)

Frame							Weight
	Mounting	Overall	Mounting	Overall	Overall	Diameter	
5	<b>375 mm</b> <b>(14.76 in)</b>	391 mm (15.39 in)	<b>106 mm</b> <b>(4.17 in)</b>	143 mm (5.63 in)	200 mm (7.87 in)	6.5 mm (0.26 in)	7.4 kg (16.3 lb)
6	<b>378 mm</b> <b>(14.88 in)</b>	391 mm (15.39 in)	<b>196 mm</b> <b>(7.72 in)</b>	210 mm (8.27 in)	227 mm (8.94 in)	7.0 mm (0.28 in)	14 kg (30.9 lb)
7	<b>538 mm</b> <b>(21.18 in)</b>	557 mm (21.93 in)	<b>220 mm</b> <b>(8.66 in)</b>	270 mm (10.63 in)	280 mm (11.02 in)	9.0 mm (0.35 in)	28 kg (61.70 lb)
8	<b>784 mm</b> <b>(30.87 in)</b>	804 mm (31.65 in)	<b>259 mm</b> <b>(10.20 in)</b>	310 mm (12.21 in)	290 mm (11.42 in)	9.0 mm (0.35 in)	52 kg (114.6 lb)
9E	<b>1051 mm</b> <b>(41.38 in)</b>	1069 mm (42.09 in)	<b>259 mm</b> <b>(10.20 in)</b>	310 mm (12.21 in)	290 mm (11.42 in)	9.0 mm (0.35 in)	46 kg (101.4 lb)
9A	<b>1090 mm</b> <b>(42.91 in)</b>	1108 mm (43.62 in)	<b>259 mm</b> <b>(10.20 in)</b>	310 mm (12.21 in)	290 mm (11.42 in)	9.0 mm (0.35 in)	66.5 kg (146.6 lb)

## STEP 4: Select supply / motor cables and fuses

The supply/motor cables and fuses or MCB's used should follow the ratings provided in the table below:



The voltage rating of fuses must be greater than or equal to the highest supply voltage of the system.  
**Fuses:** The AC supply to the drive must be installed with suitable protection against overload. Failure to observe this requirement will cause risk of fire.

Model	Maximum continuous input current	Fuses		Cables			
		IEC Class gG or gR	UL Class CC, J, or T*	IEC60364-5-52 mm <sup>2</sup>		UL 508C AWG	
				A	A	Input	Output
05200250	31	40	40	10		8	
06200330	48.8	63	60	16		4	
06200440	56.6	63	70	25		3	
05400270	29	40	35	6		8	
05400300	29	40	35	6		8	
06400350	36	63**	40	10		6	
06400420	46	63**	50	16		4	
06400470	60	63**	70	25		3	
07200610	67	80	80	35		2	
07200750	84	100	100	35		1	
07200830	105	125	125	70		1/0	
08201160	137	200**	200***	95		3/0	
08201320	166	200**	225***	2 x 70		2 x 1	
09201760	205	250**	250***	2 x 70 (B1)	2 x 95 (B2)	2 x 2/0	
09202190	260	315**	300***	2 x 95 (B1)	2 x 120 (B2)	2 x 4/0	
07400660	74	100	80	35		1	
07400770	88	100	100	50		2	
07401000	105	125	125	70		1/0	
08401340	155	250**	225***	2 x 50		2 x 1	
08401570	177	250**	225***	2 x 70		2 x 1/0	
09402000	232	315**	300***	2 x 70 (B1)	2 x 95 (B2)	2 x 3/0	2 x 2/0
09402240	267	315**	350***	2 x 95 (B1)	2 x 120 (B2)	2 x 4/0	

\* These fuses are fast acting.

\*\* These fuses are class gR.

\*\*\* These fuses are class HSJ.

### NOTE

The product is UL listed for use on a circuit up to 100 kA maximum supply symmetrical fault current, when protected by fuses.

### NOTE

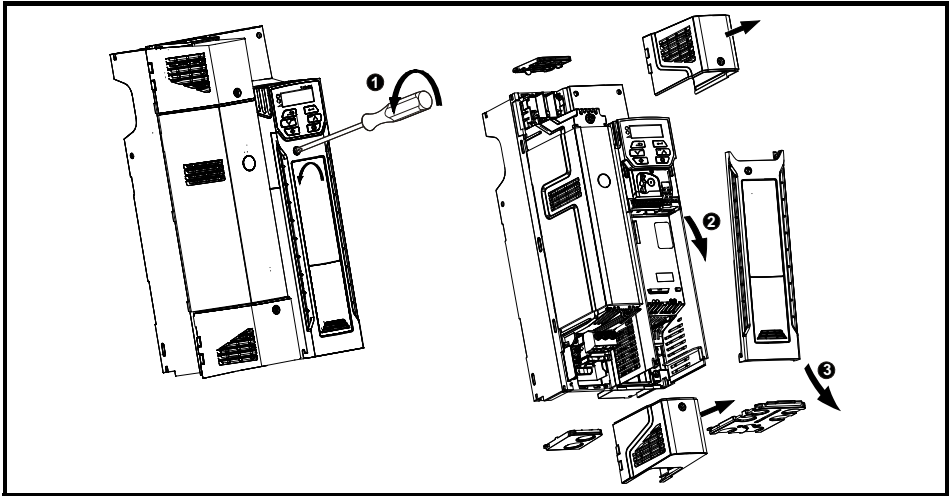
IEC cable sizes assume Copper conductor, PVC insulation, Installation method B2 and ambient temperature of 40 °C (104 °F). UL cable sizes assume Copper conductor with insulation rated at 75 °C (167 °F).

**Table 4-1 Protective ground cable ratings**

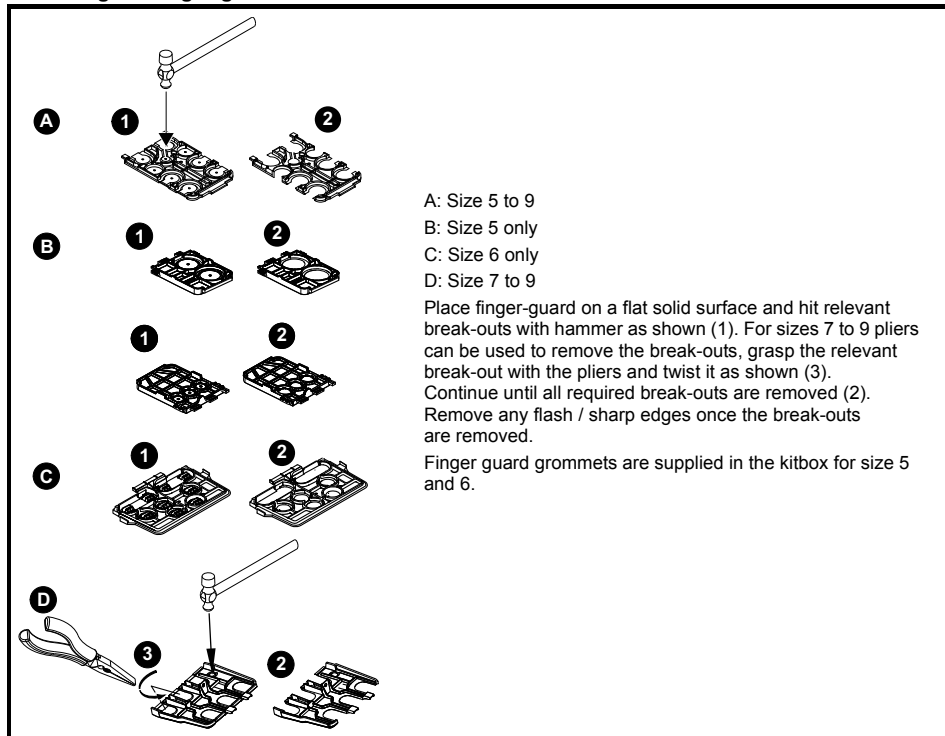
Input phase conductor size	Minimum ground conductor size
$\leq 10 \text{ mm}^2$	Either 10 mm <sup>2</sup> or two conductors of the same cross-sectional area as the input phase conductor
$> 10 \text{ mm}^2$ and $\leq 16 \text{ mm}^2$	The same cross-sectional area as the input phase conductor
$> 16 \text{ mm}^2$ and $\leq 35 \text{ mm}^2$	16 mm <sup>2</sup>
$> 35 \text{ mm}^2$	Half of the cross-sectional area of the input phase conductor

***STEP 5: Remove the terminal cover and finger guard breakouts***

1. Using a flat bladed screwdriver, turn the terminal cover locking clip anti-clockwise by approximately 30°.
2. Slide the terminal cover down.
3. Remove terminal cover in direction shown.



## Removing the finger-guard break-outs



## STEP 6: Wire the drive up

When wiring the drive the power, ground and control connections, they should be tightened to the recommended torque settings shown in the table below:

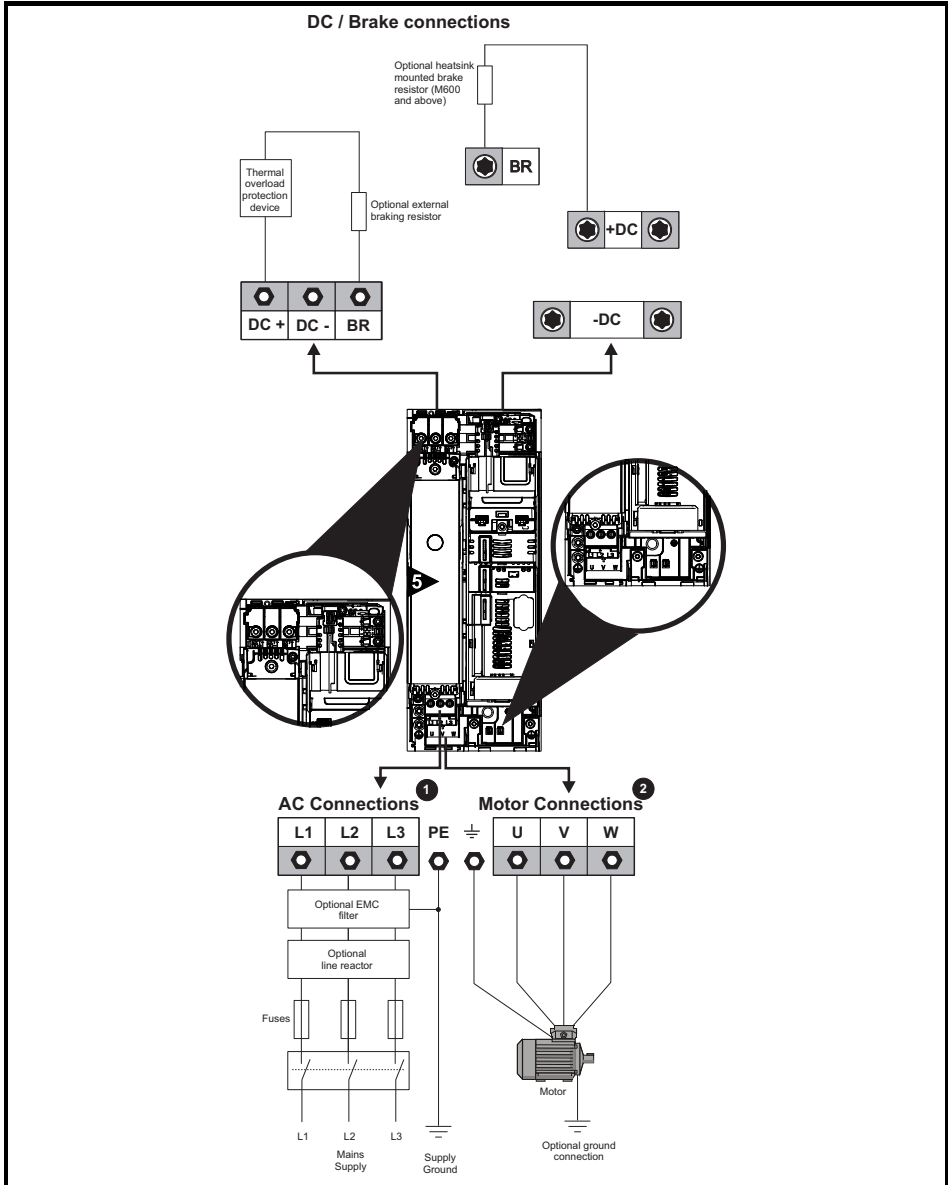
**Table 6-1 Recommended torque settings**

Model size	Terminal description	Torque settings
All	Control terminals	0.2 N m (0.15 lb ft)
	Relay terminals	0.5 N m (0.37 lb ft)
5	Power terminals	1.5 N m (1.1 lb ft)
	Ground terminals	2.0 N m (1.4 lb ft)
6	Power and ground terminals	6.0 N m (4.4 lb ft)
7	Power and ground terminals	12 N m (8.85 lb ft)
8 and 9	Power and ground terminals	15 N m (11.1 lb ft)

## Power and Ground connections

Connect the supply and motor connections using the cables and fuses quoted in the table shown in Step 4.

**Figure 6-1 Size 5 power and ground connections**



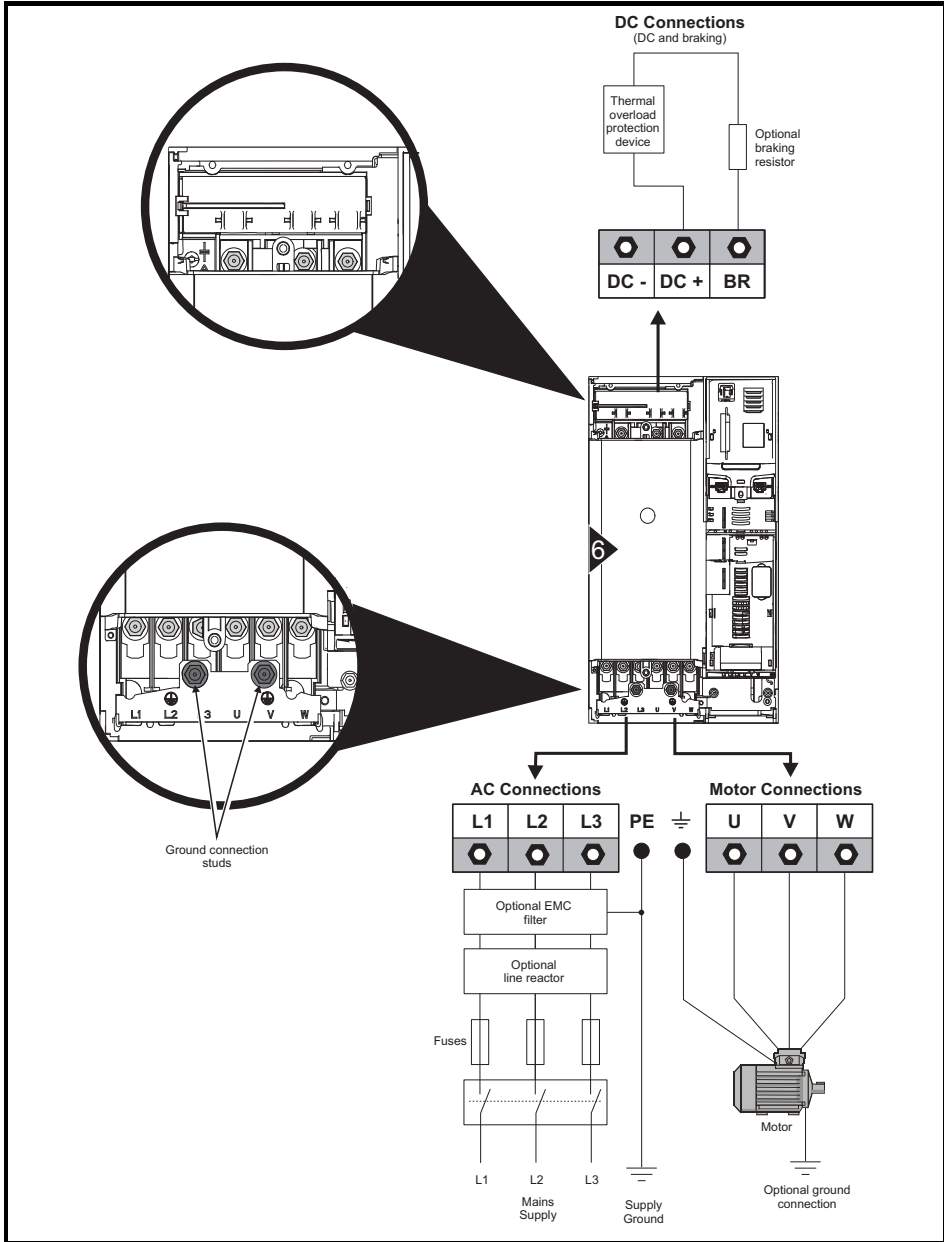
The upper terminal block (1) is used for AC supply connection.

The lower terminal block (2) is used for Motor connection.

On size 5, the supply and motor ground connections are made using the M5 studs located near the plug-in power connector. Refer to Figure 6-1.

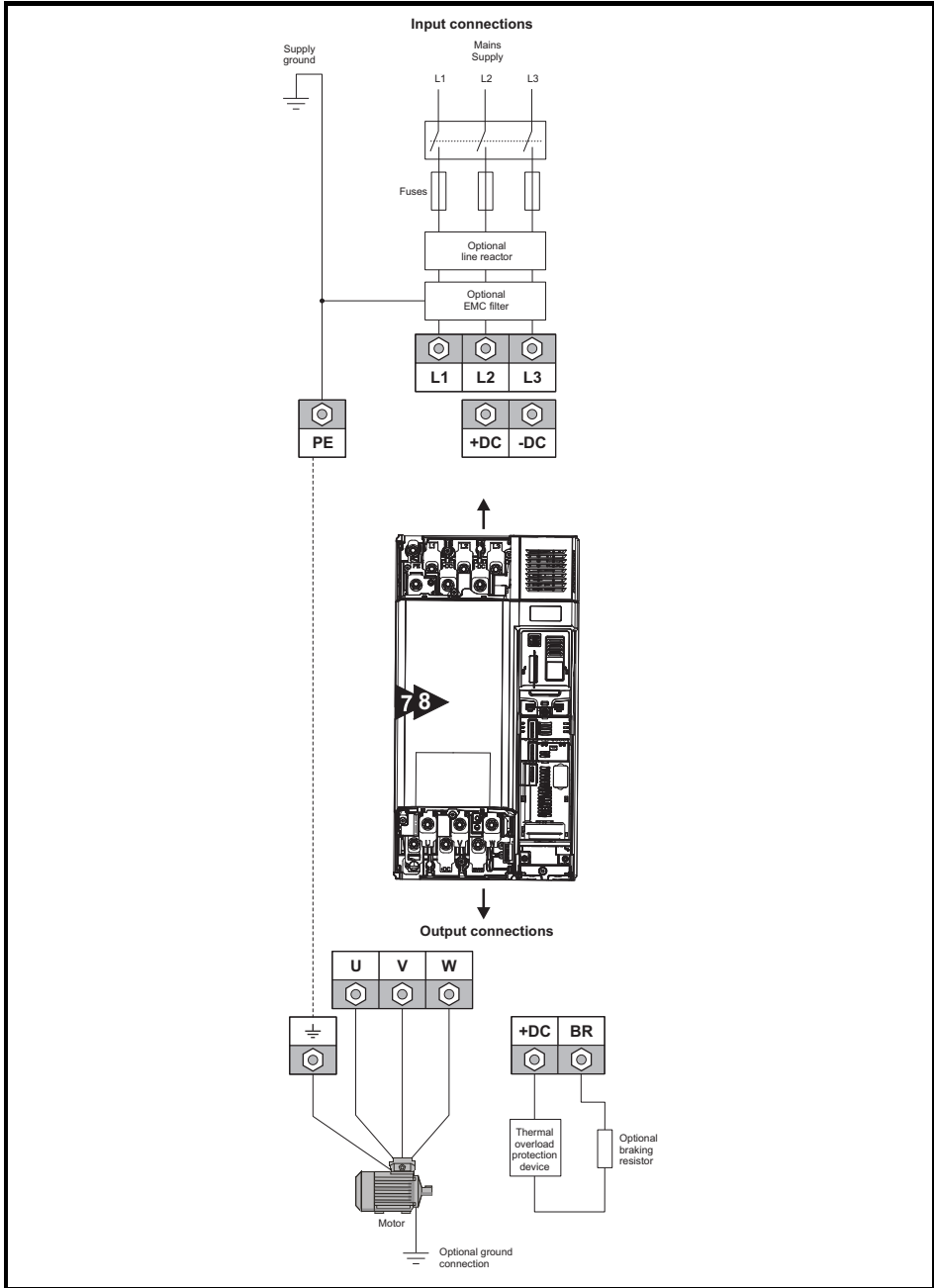


**Figure 6-2 Size 6 power and ground connections**



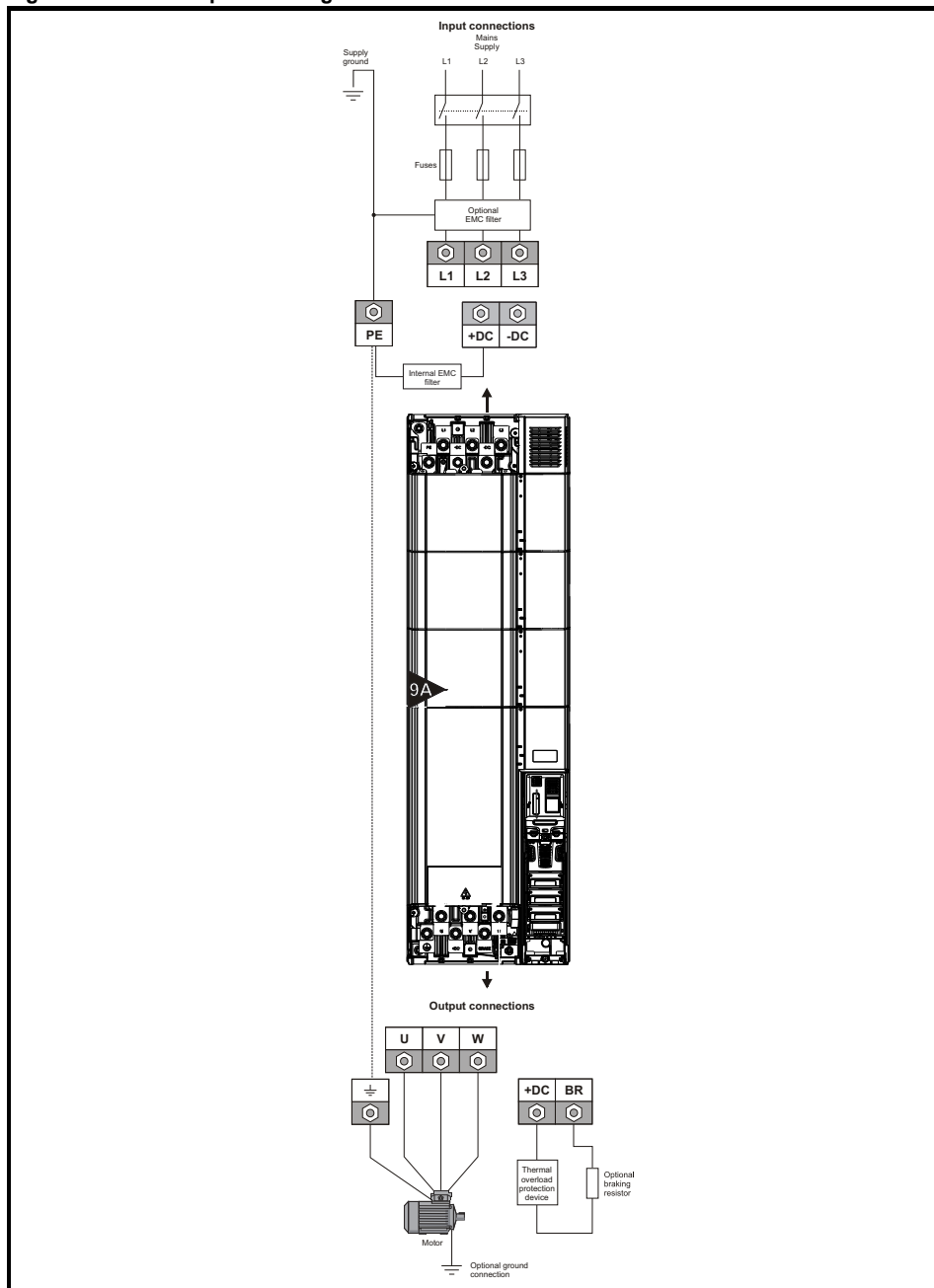
On a size 6, the supply and motor ground connections are made using the M6 studs located above the supply and motor terminals. Refer to Figure 6-2.

**Figure 6-3 Size 7 and 8 power and ground connections (size 7 shown)**



On size 7 and 8, the supply and motor ground connections are made using the M8 studs located by the supply and motor connection terminals. Refer to Figure 6-3.

**Figure 6-4 Size 9A power and ground connections**



On size 9A, the supply and motor ground connections are made using the M10 studs located by the supply and motor connection terminals. Refer to Figure 6-4.



### Electrochemical corrosion of grounding terminals

Ensure that grounding terminals are protected against corrosion i.e. as could be caused by condensation.

The drive must be connected to the system ground of the AC supply. The ground wiring must conform to local regulations and codes of practice.



The ground loop impedance must conform to the requirements of local safety regulations. The drive must be grounded by a connection capable of carrying the prospective fault current until the protective device (fuse, etc.) disconnects the AC supply. The ground connections must be inspected and tested at appropriate intervals.

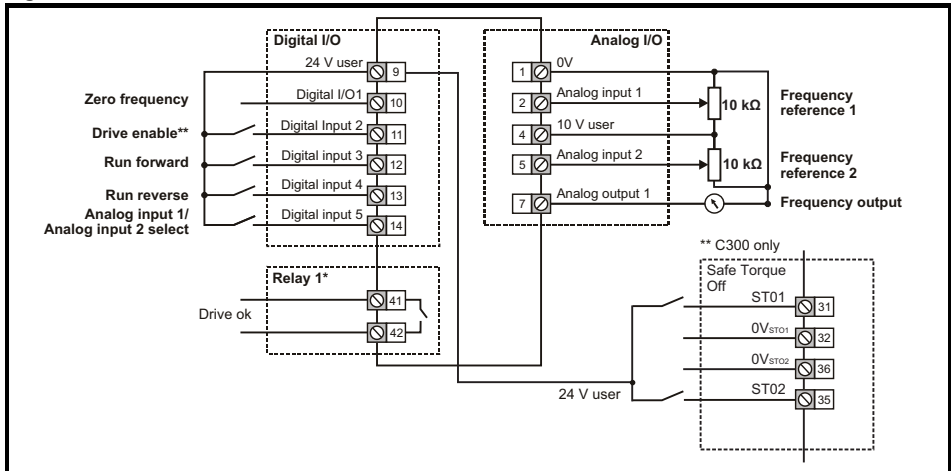
**Table 6-2 Protective ground cable ratings**

Input phase conductor size	Minimum ground conductor size
≤ 10 mm <sup>2</sup>	Either 10 mm <sup>2</sup> or two conductors of the same cross-sectional area as the input phase conductor
> 10 mm <sup>2</sup> and ≤ 16 mm <sup>2</sup>	The same cross-sectional area as the input phase conductor
> 16 mm <sup>2</sup> and ≤ 35 mm <sup>2</sup>	16 mm <sup>2</sup>
> 35 mm <sup>2</sup>	Half of the cross-sectional area of the input phase conductor

### Control connections

The control terminals are configured by default for the arrangement shown below:

**Figure 6-5 Commander C200/C300 control terminal connections**



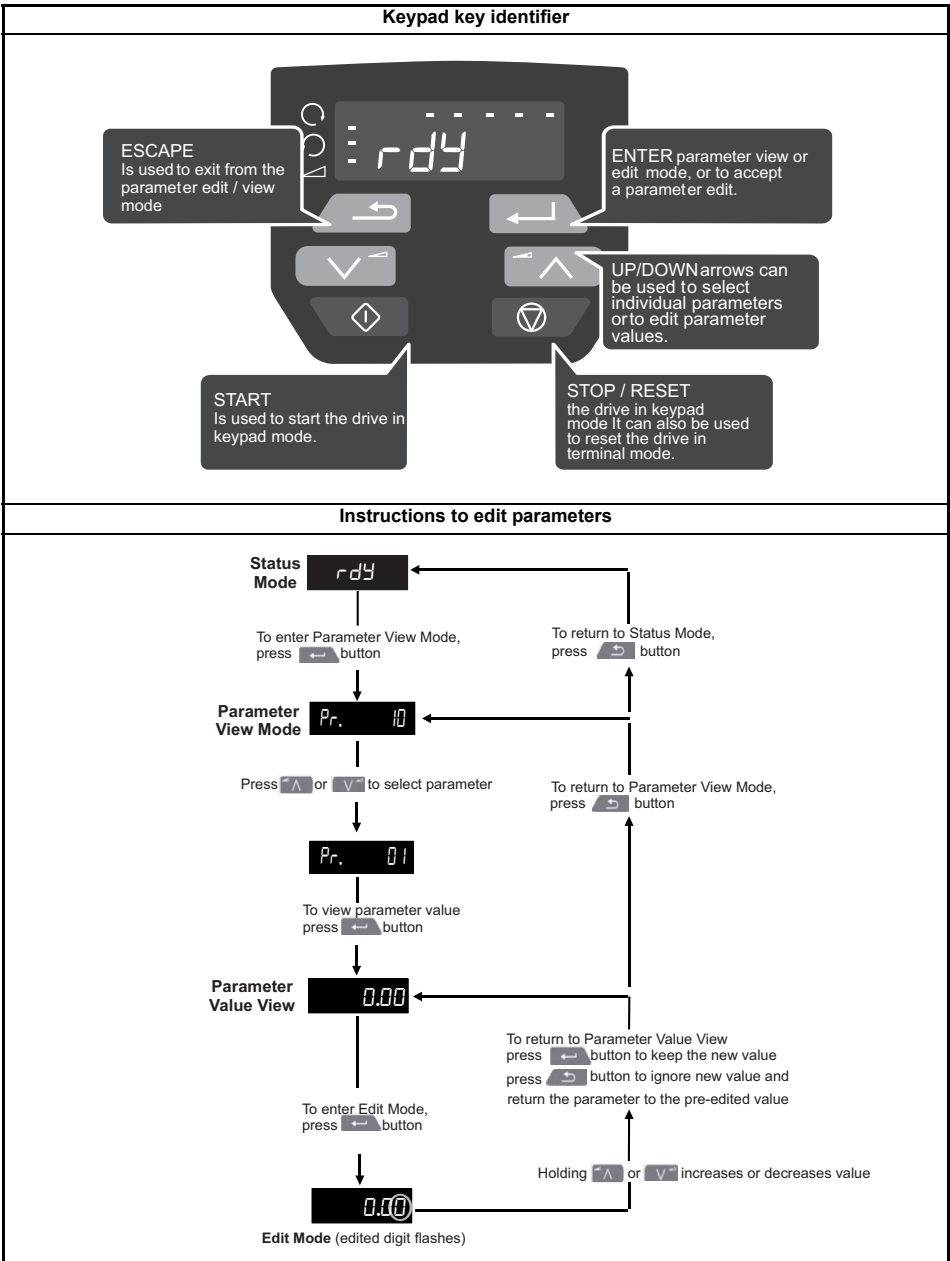
\* 250 Vac maximum (UL class1)

\*\* Commander C300 uses 'Safe Torque Off' so terminal 11 is unassigned on the Commander C300. When using a Commander C300 refer to the 'Safe Torque Off' wiring instructions above.

After completing step 6 re-fit the terminal cover (refer to step 5).

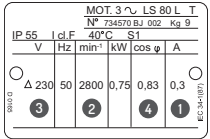




## STEP 7: Use the keypad

The display provides information to the user regarding the operating status of the drive, alarms and trip codes. The keypad provides the means for changing parameters, stopping and starting the drive, and the ability to perform a drive reset.



## STEP 8: Run the motor

This step will provide instruction on how to set-up the basic drive parameters, perform an auto-tune and run the motor in analog input terminal mode or keypad mode.

Action	Detail
Power Up	<b>Ensure:</b> <ul style="list-style-type: none"> <li>The drive displays: inh (Enable terminal(s) is open)</li> </ul>
Minimum and maximum speed	<b>Enter:</b> <ul style="list-style-type: none"> <li>Minimum speed Pr <b>01</b> (Hz)</li> <li>Maximum speed Pr <b>02</b> (Hz)</li> </ul>
Accel and Decel rates	<b>Enter:</b> <ul style="list-style-type: none"> <li>Acceleration rate Pr <b>03</b> (s)</li> <li>Deceleration rate Pr <b>04</b> (s)</li> </ul>
Motor nameplate details	<ol style="list-style-type: none"> <li>Motor rated current in Pr <b>06</b> (Amps)</li> <li>Motor rated speed in Pr <b>07</b> (rpm / min<sup>-1</sup>)</li> <li>Motor rated voltage in Pr <b>08</b> (Volts)</li> <li>Motor rated power factor in (cos φ) Pr <b>09</b></li> </ol> 
<b>Ready to autotune</b>	
Autotune	<p>The drive is able to perform either a stationary or a rotating autotune. The motor must be at a standstill before any autotune is enabled and disconnected from the load for a rotating autotune.</p> <p><b>To perform an autotune:</b></p> <ul style="list-style-type: none"> <li>Set Pr <b>10</b> to L2</li> <li>Go to Pr <b>38</b></li> <li>Set Pr <b>38</b> = 1 for a stationary autotune or set Pr <b>38</b> = 2 for a rotating autotune</li> <li>Close the drive enable signal (apply +24 V to terminal 11 or terminal 31 and 35 on Commander C300). The drive will display 'rdy'.</li> <li>Give a Run command (apply +24 V to terminal 12 - Run forward or terminal 13 - Run reverse. The display will flash 'tuning' while the drive is performing the autotune.</li> <li>Wait for the drive to display 'inh' and for the motor to come to a standstill.</li> <li>Remove the drive enable and run signal from the drive.</li> </ul>
<b>Ready to run (Analog input terminal mode by default)</b>	
Run	The drive is now ready to run the motor. Close enable (C200) or Safe Torque Off (C300) and the Run Forward or Run Reverse terminals.
Increasing and decreasing speed	Changing the selected Analog frequency reference will increase and decrease the speed of the motor.
Stopping	To stop the motor by following the selected deceleration rate, open either the run forward or run reverse terminals. If the enable terminal is opened while the motor is running, the drive output is immediately disabled and the motor will coast to a stop.
<b>Ready to run (Keypad mode)</b>	
Run	The drive is now ready to run the motor. Set Pr <b>05</b> to 'PA0'. Close enable (C200) or Safe Torque Off (C300). Press the start key 
Increasing and decreasing speed	Press the up and down keys   to increase and decrease the speed.
Stopping	Press the Stop/Reset key 

## Additional Information

### Troubleshooting

When the drive detects a fault it will display an error code. To locate and solve all error codes, a 'Diagnostic Tool (App)' is available on Microsoft, Android and iOS platform via the 'Apps' store on Smartphone / Tablet, search for '**Control Techniques diagnostics tool in the Apps store**'. Alternatively, please download the 'Diagnostic Tool (App)' from the Control Techniques 'App Center' or view the diagnostics section in the **Control User Guide** available for download from the Control Techniques or Leroy Somer website.

### Status Indicators


The table below shows the different status indicators available on the display.

**Table 8-1 Status indications**

String	Description	Drive output stage
<b>INH</b>	The drive is inhibited and cannot be run. The Drive Enable signal is not applied to the drive enable terminal or is set to 0.	Disabled
<b>RDY</b>	The drive is ready to run. The drive enable is active, but the drive inverter is not active because the final drive run is not active	Disabled
<b>STOP</b>	The drive is stopped / holding zero speed.	Enabled
<b>LOSS</b>	Supply loss condition has been detected	Enabled
<b>dc INJ</b>	The drive is applying dc injection braking	Enabled
<b>Er</b>	The drive has tripped and no longer controlling the motor. The trip code appears on the display.	Disabled
<b>UV</b>	The drive is in the under voltage state.	Disabled

### Restoring drive defaults

The drive can be restored to the original factory settings by following the procedure below:

1. Ensure the drive is not enabled, i.e. terminal 11(or terminal 31 and 35 on Commander C300) is open.
2. Select 'Def.50 (50 Hz settings) or Def.60 (60 Hz settings)' in Pr **00**.
3. Press the red  reset button.

### Basic parameters range and default

For information on parameters beyond Pr **00** to Pr **10** refer to the Quick Start Guide.

Parameter		Range (↕)	Default (⇒)
<b>01</b>	Minimum Speed	0.00 to Pr <b>02</b> Hz	0.00 Hz
<b>02</b>	Maximum Speed	0.00 to 550.00 Hz	Def.50: 50.00 Hz Def.60: 60.00 Hz
<b>03</b>	Acceleration Rate 1	0.0 to 32000.0 s	5.0 s
<b>04</b>	Deceleration Rate 1	0.0 to 32000.0 s	10.0 s
<b>05</b>	Drive Configuration	AV (0), AI (1), AV.Pr (2), AI.Pr (3), PrESEt (4), PAd (5), PAd.rEF (6), E.Pot (7), torque (8), Pid (9) Refer to the <b>Control User Guide</b> for further information	AV (0)
<b>06</b>	Motor Rated Current	0.00 to Drive Rating Amps	Maximum Heavy Duty Rating Amps
<b>07</b>	Motor Rated Speed	0.0 to 33000.0 rpm	Def.50: 1500.0 rpm Def.60: 1800.0 rpm
<b>08</b>	Motor Rated Voltage	0 to 240 V or 0 to 480 V	110V drive: 230 V 200V drive: 230 V 400V drive Def.50: 400 V 400V drive Def.60: 460 V
<b>09</b>	Motor Rated Power Factor	0.00 to 1.00	0.85
<b>10</b>	User Security Status	Refer to the <b>Control User Guide</b> for further information	LEVEL.1

## Appendix A UL listing information

### A.1 UL file reference

All models are UL Listed to both Canadian and US requirements. The UL file reference is: NMMS/7.E171230. Products that incorporate the Safe Torque Off function have been investigated by UL. The UL file reference is: FSPC.E171230.

### A.2 Option modules, kits and accessories

Option Modules, Control Pods, Installation Kits and other accessories for use with these drives are UL Listed.

### A.3 Enclosure ratings

#### Open Type

With the exception of free-standing cubicle drives, all models are Open Type as supplied. The drive housing is not rated as a fire enclosure. A separate fire enclosure must be provided.

#### Type 1

When fitted with a conduit box the drives meet the requirements for UL Type 1. Type 1 enclosures are intended for indoor use, primarily to provide a degree of protection against limited amounts of falling dirt.

#### Plenum rating with conduit box

When fitted with a conduit box, the drives comply with the requirements in the Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces, UL 2043.

#### Through-hole mounting

The drives meet the requirements for UL Type 12 when installed inside a Type 12 enclosure with the heatsink through-hole mounted using the sealing kit and the high-IP insert (where provided).

When through-hole mounted, the drives have been evaluated as suitable for use in surrounding air temperatures up to 40 °C.

When the drive is through-panel mounted, the main terminal cover(s) must be removed in order to provide access to the mounting holes. Once the drive has been mounted, the terminal cover(s) can be replaced.

The tightening torque of the securement brackets shall be advised as being 3 N m (26.6 lb.in).

#### Remote Keypads

Remote keypads are UL Type 12 when installed with the sealing washer and fixing kit provided.

### A.4 Mounting

Drives may be surface, through-panel or tile mounted using the appropriate brackets. Drives may be mounted singly or side by side with suitable space between them (bookcase mounting).

### A.5 Environment

Drives must be installed in a Pollution Degree 2 environment or better (dry, non-conductive pollution only).

The drives have been evaluated for use at ambient temperatures up to 40 °C. The drives have additionally been evaluated for 50 °C and 55 °C ambient air temperatures with a derated output.

### A.6 Electrical Installation

#### OVERVOLTAGE CATEGORY

Drives have been evaluated for OVC III.

#### SUPPLY

The drives are suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 600 Volts AC Maximum.

#### TERMINAL TORQUE

Terminals must be tightened to the rated torque as specified in the Installation Instructions.

#### WIRING TERMINALS

Drives must be installed using cables rated for 75 °C operation, copper wire only.

Where possible, UL Listed closed-loop connectors sized according to the field wiring shall be used for all field power wiring connections.



## GROUND CONNECTION INSTRUCTIONS

UL Listed closed-loop connectors sized according to the field wiring shall be used for grounding connections.

## BRANCH CIRCUIT PROTECTION

The fuses and circuit breakers required for branch circuit protection are specified in the Installation Instructions.

### OPENING OF BRANCH CIRCUIT

Opening of the branch-circuit protective device may be an indication that a fault has been interrupted. To reduce the risk of fire or electric shock, the equipment should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code (NEC), The Canadian Electrical Code, and any additional local codes.

## A.7 Motor overload protection and thermal memory retention

The devices incorporate solid state overload protection for the motor load. The protection levels are expressed as a percentage of full-load current. Refer to the *Control User Guide* for further information.

In order for the motor protection to work properly, the motor rated current must be entered into Pr **06** or Pr **05.007**. The protection level may be adjusted below 150 % if required. Refer to the *Control User Guide* for further information. All models are provided with thermal memory retention.

## A.8 External Class 2 supply

The external power supply used to power the 24 V control circuit shall be marked: "UL Class 2". The power supply voltage shall not exceed 24 Vdc.

## A.9 Modular Drive Systems

Drives with DC+ and DC- supply connections, rated 230 V or 480 V have been investigated for use in Modular Drive Systems as inverters when supplied by the converter sections from the Unidrive-M range. In these applications the inverters are required to be additionally protected by supplemental fuses.

Alternatively, the inverters may be supplied by converter models: Mentor MP25A, 45A, 75A, 105A, 155A or 210A. Contact the supplier of the drive for more information.

## A.10 Requirement for Transient Surge Suppression

This requirement only applies to Frame Size 7 drives with rated input voltage = 575 V.

TRANSIENT SURGE SUPPRESSION SHALL BE INSTALLED ON THE LINE SIDE OF THIS EQUIPMENT AND SHALL BE RATED 575 Vac (PHASE TO GROUND), 575 Vac (PHASE TO PHASE), SUITABLE FOR OVERVOLTAGE CATEGORY III, AND SHALL PROVIDE PROTECTION FOR A RATED IMPULSE VOLTAGE TO WITHSTAND VOLTAGE PEAK OF 6 kV AND A CLAMPING VOLTAGE OF MAXIMUM 2400 V.