



## *Quick Start Guide*

# ***Unidrive M200/201***

*Frame sizes 1 to 4*

**Flexible machine integration  
through communications**

Part Number: 0478-0038-06  
Issue: 6

This guide is intended to provide basic information required in order to set-up a drive to run a motor. For more detailed installation information, please refer to the *Unidrive M200 / 201 User Guide* which is available to download from:

<http://www.emersonindustrial.com/en-EN/controltechniques/downloads/userguidesandsoftware/Pages/downloads.aspx>.

or  
[www.emersonindustrial.com/en-EN/leroy-somer-motors-drives/downloads/Pages/manuals.aspx](http://www.emersonindustrial.com/en-EN/leroy-somer-motors-drives/downloads/Pages/manuals.aspx).

## Warnings, Cautions and Notes



A **Warning** contains information which is essential for avoiding a safety hazard.



A **Caution** contains information which is necessary for avoiding a risk of damage to the product or other equipment.

### NOTE

A **Note** contains information, which helps to ensure correct operation of the product.



This guide does not include safety information. Incorrect installation or operation of the drive, could cause personnel injury or equipment damage. For essential safety information, please refer to the *Unidrive M200 / 201 User Guide* or the safety booklet supplied with the drive.

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# Declaration of Conformity

**Control Techniques Ltd**  
**The Gro**  
**Newtown**  
**Powys**  
**UK**  
**SY16 3BE**

**Moteurs Leroy-Somer**  
**Usine des Agriers**  
**Boulevard Marcellin Leroy**  
**CS10015**  
**16915 Angoulême Cedex 9**  
**France**

This declaration applies to the Unidrive-M product range comprising model numbers listed below:

| Model No. | Interpretation | Format: Xaaa-bbc ddddde                                                                                                                                                            | Format: Xaa-bbc ddddde |
|-----------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| X         | Application    | M = Manufacturing Automation, E = Elevator, F = Flow, H = HVAC, CSD = Compressor                                                                                                   | HS = High Speed        |
| aa(a)     | Control System | 100, 101, 200, 201, 300, 400, 600, 700, 701, 702                                                                                                                                   | 70, 71, 72             |
| bb        | Frame Size     | 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11                                                                                                                                         |                        |
| c         | Voltage Rating | 1 = 100 V, 2 = 200 V, 4 = 400 V, 5 = 575 V, 6 = 690 V                                                                                                                              |                        |
| dddd      | Current Rating | Example 01000 = 100 A                                                                                                                                                              |                        |
| e         | Configuration  | A = AC in AC out (with internal choke), D = DC in AC out (Inverter), C = AC in DC out (Rectifier), E = AC in AC out (without internal choke), T = AC in AC out with Dual Rectifier |                        |

The model number may be followed by additional characters that do not affect the ratings.

The variable speed drive products listed above have been designed and manufactured in accordance with the following European harmonized standards:

|                   |                                                                                                                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 61800-5-1:2007 | Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy                                                                                                                                  |
| EN 61800-3: 2004  | Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods                                                                                                                                              |
| EN 61000-6-2:2005 | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments                                                                                                                                          |
| EN 61000-6-4:2007 | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments                                                                                                                                 |
| EN 61000-3-2:2006 | Electromagnetic compatibility (EMC) - Part 3-2: Limits for harmonic current emissions (equipment input current ≤16 A per phase)                                                                                                                   |
| EN 61000-3-3:2008 | Electromagnetic compatibility (EMC) - Part 3-3: Limitation of voltage changes, voltage fluctuations and flicker in public, low voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection |

EN 61000-3-2: 2006 Applicable where input current < 16 A. No limits apply for professional equipment where input power ≥1 kW.

These products comply with the Restriction of Hazardous Substances Directive - RoHS 2011/65/EU, the Low Voltage Directive - LVD 2006/95/EC and the Electromagnetic Compatibility Directive - EMC 2004/108/EC.



**G. Williams**  
**Vice President, Technology**  
**Date: 30th July 2015**  
**Place: Newtown, Powys, UK**

These electronic drive products are intended to be used with appropriate motors, controllers, electrical protection components and other equipment to form complete end products or systems. Compliance with safety and EMC regulations depends upon installing and configuring drives correctly, including using the specified input filters. The drives must be installed only by professional installers who are familiar with requirements for safety and EMC. The assembler is responsible for ensuring that the end product or system complies with all the relevant laws in the country where it is to be used. Refer to the User Guide. An EMC data sheet is also available giving detailed EMC information.

# 1 Product information

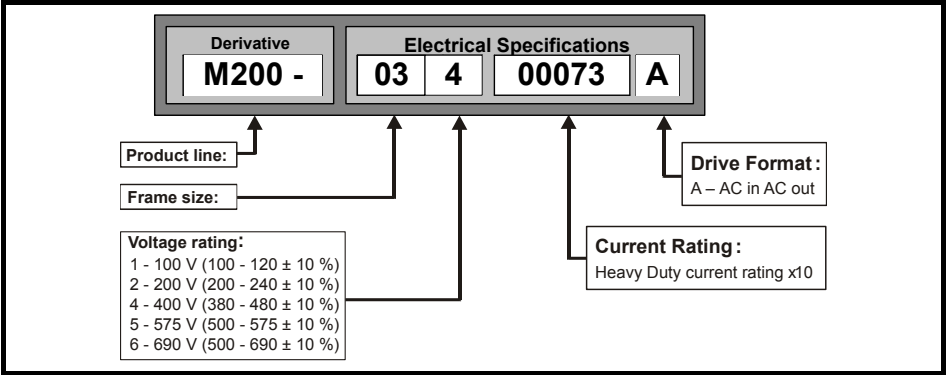
## 1.1 Ratings

| Model    | Input phases<br><br>ph | Max. cont input current<br><br>A | Max input fuse rating |      | Nominal cable size           |                               |                  |                   | Output current                    |                         |                       |
|----------|------------------------|----------------------------------|-----------------------|------|------------------------------|-------------------------------|------------------|-------------------|-----------------------------------|-------------------------|-----------------------|
|          |                        |                                  | 1 Ph                  | 3 Ph | European                     |                               | USA              |                   | Max. cont output current<br><br>A | Nominal power<br><br>kW | Motor power<br><br>hp |
|          |                        |                                  |                       |      | Input<br><br>mm <sup>2</sup> | Output<br><br>mm <sup>2</sup> | Input<br><br>AWG | Output<br><br>AWG |                                   |                         |                       |
| 01100017 | 1                      | 8.7                              | 10                    |      | 1                            | 1                             | 16               | 16                | 1.7                               | 0.25                    | 0.33                  |
| 01100024 | 1                      | 11.1                             | 16                    |      | 1                            | 1                             | 14               | 16                | 2.4                               | 0.37                    | 0.5                   |
| 01200017 | 1                      | 4.5                              | 6                     |      | 1                            | 1                             | 16               | 16                | 1.7                               | 0.25                    | 0.33                  |
| 01200024 | 1                      | 5.3                              | 6                     |      | 1                            | 1                             | 16               | 16                | 2.4                               | 0.37                    | 0.5                   |
| 01200033 | 1                      | 8.3                              | 10                    |      | 1                            | 1                             | 16               | 16                | 3.3                               | 0.55                    | 0.75                  |
| 01200042 | 1                      | 10.4                             | 16                    |      | 1                            | 1                             | 16               | 16                | 4.2                               | 0.75                    | 1                     |
| 02100042 | 1                      | 18.8                             | 20                    |      | 2.5                          | 1                             | 12               | 16                | 4.2                               | 0.75                    | 1                     |
| 02100056 | 1                      | 24                               | 25                    |      | 4                            | 1                             | 10               | 16                | 5.6                               | 1.1                     | 1.5                   |
| 02200024 | 1 / 3                  | 5.3/4.1                          | 6                     | 6    | 1                            | 1                             | 16               | 16                | 2.4                               | 0.37                    | 0.5                   |
| 02200033 | 1 / 3                  | 8.3/6.7                          | 10                    | 10   | 1                            | 1                             | 16               | 16                | 3.3                               | 0.55                    | 0.75                  |
| 02200042 | 1 / 3                  | 10.4/7.5                         | 16                    | 10   | 1                            | 1                             | 16               | 16                | 4.2                               | 0.75                    | 1                     |
| 02200056 | 1 / 3                  | 14.9/11.3                        | 20                    | 15   | 2.5/1.5                      | 1                             | 12/14            | 16                | 5.6                               | 1.1                     | 1.5                   |
| 02200075 | 1 / 3                  | 18.1/13.5                        | 20                    | 15   | 2.5                          | 1                             | 12               | 16                | 7.5                               | 1.5                     | 2                     |
| 02400013 | 3                      | 2.4                              |                       | 6    | 1                            | 1                             | 16               | 16                | 1.3                               | 0.37                    | 0.5                   |
| 02400018 | 3                      | 2.9                              |                       | 6    | 1                            | 1                             | 16               | 16                | 1.8                               | 0.55                    | 0.75                  |
| 02400023 | 3                      | 3.5                              |                       | 6    | 1                            | 1                             | 16               | 16                | 2.3                               | 0.75                    | 1                     |
| 02400032 | 3                      | 5.1                              |                       | 6    | 1                            | 1                             | 16               | 16                | 3.2                               | 1.1                     | 1.5                   |
| 02400041 | 3                      | 6.2                              |                       | 10   | 1                            | 1                             | 16               | 16                | 4.1                               | 1.5                     | 2                     |
| 03200100 | 1 / 3                  | 23.9/17.7                        | 25                    | 20   | 4                            | 1.5                           | 10/12            | 14                | 10                                | 2.2                     | 3                     |
| 03400056 | 3                      | 8.7                              |                       | 10   | 1                            | 1                             | 14               | 16                | 5.6                               | 2.2                     | 3                     |
| 03400073 | 3                      | 12.2                             |                       | 16   | 1.5                          | 1                             | 12               | 16                | 7.3                               | 3                       | 3                     |
| 03400094 | 3                      | 14.8                             |                       | 16   | 2.5                          | 1.5                           | 12               | 14                | 9.4                               | 4                       | 5                     |
| 04200133 | 1 / 3                  | 23.7/16.9                        | 25                    | 20   | 4/2.5                        | 2.5                           | 10               | 12                | 13.3                              | 3                       | 3                     |
| 04200176 | 3                      | 21.3                             |                       | 25   | 4                            | 2.5                           | 10               | 12                | 17.6                              | 4                       | 5                     |
| 04400135 | 3                      | 16.3                             |                       | 20   | 2.5                          | 2.5                           | 10               | 12                | 13.5                              | 5.5                     | 7.5                   |
| 04400170 | 3                      | 20.7                             |                       | 25   | 4                            | 2.5                           | 10               | 12                | 17                                | 7.5                     | 10                    |

### NOTE

The nominal cable sizes shown in the table above, are provided as a guide only. Ensure that the cables used conform to the local wiring regulations.

Figure 1-1 Model number structure



## 2 Options

Table 2-1 System Integration (SI) option module identification







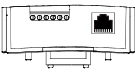
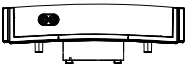
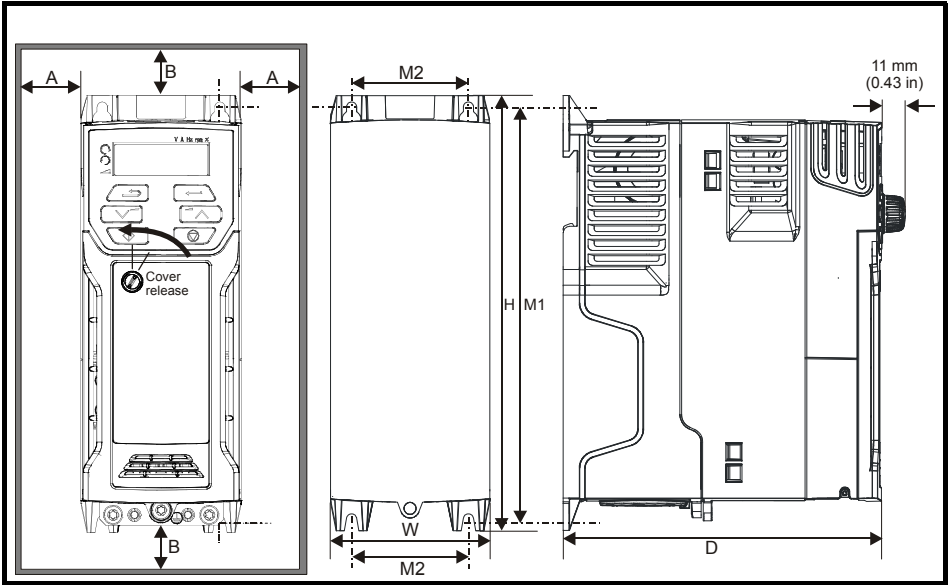
| Type                       | Option module                                                                       | Color       | Name         | Further details                       |
|----------------------------|-------------------------------------------------------------------------------------|-------------|--------------|---------------------------------------|
| Fieldbus                   |    | Purple      | SI-PROFIBUS  | See relevant option module User Guide |
|                            |    | Medium Grey | SI-DeviceNet |                                       |
|                            |    | Light Grey  | SI-CANopen   |                                       |
|                            |   | Beige       | SI-Ethernet  |                                       |
|                            |  | Brown Red   | SI-EtherCAT  |                                       |
| Automation (I/O expansion) |  | Orange      | SI-I/O       |                                       |

Table 2-2 AI Backup adaptor

| Type           | Option module                                                                     | Name              | Further Details      |
|----------------|-----------------------------------------------------------------------------------|-------------------|----------------------|
| Communications |  | AI-485 Adaptor    | See Drive User Guide |
| Backup         |  | AI-Backup Adaptor |                      |
|                |                                                                                   | AI-Smart Adaptor  |                      |

### 3 Mechanical installation

The drives can be panel mounted with 0 mm space between the drives. For further information on mechanical installation refer to the *Drive User Guide*.



To remove the terminal cover, use a flat bladed screwdriver to rotate the terminal cover locating clip by approximately 30° in a counter clockwise direction, and then slide the cover down.

| Drive Size | H   |       | W   |      | D   |      | M1  |       | M2   |      | Ø  |      | A  |      | B*  |      |
|------------|-----|-------|-----|------|-----|------|-----|-------|------|------|----|------|----|------|-----|------|
|            | mm  | in    | mm  | in   | mm  | in   | mm  | in    | mm   | in   | mm | in   | mm | in   | mm  | in   |
| 1          | 160 | 6.30  | 75  | 2.95 | 130 | 5.12 | 143 | 5.70  | 53   | 2.08 | 5  | 0.2  | 0  | 0.00 | 100 | 3.93 |
| 2          | 205 | 8.07  | 78  | 3.07 | 150 | 5.91 | 194 | 7.63  | 55   | 2.17 | 5  | 0.2  |    |      |     |      |
| 3          | 226 | 8.90  | 90  | 3.54 | 160 | 6.30 | 215 | 8.46  | 70.7 | 2.80 | 5  | 0.2  |    |      |     |      |
| 4          | 277 | 10.91 | 115 | 4.53 | 175 | 6.89 | 265 | 10.43 | 86   | 3.40 | 6  | 0.23 |    |      |     |      |

**NOTE** A minimum clearance of 100 mm above and below Frame 01 to 04 products is required for applications where the product is subjected to rated load and rated ambient temperature.

**NOTE** \* A minimum clearance of 50 mm above and below Frame 01 to 04 products is permissible in applications where either the ambient operating temperature is 35 °C or less or the average output current is derated by 20 %.

**NOTE** Derating for reduced clearances is to be applied in addition to the derating for increased switching frequency if operating above 3 kHz. Refer to the *Drive User Guide* for the current derating due to an increase in switching frequency.

**NOTE** If Din rail mounting is used in an installation, then mounting screws should be used to secure the drive to the back plate.

**Table 3-1 Tools required**

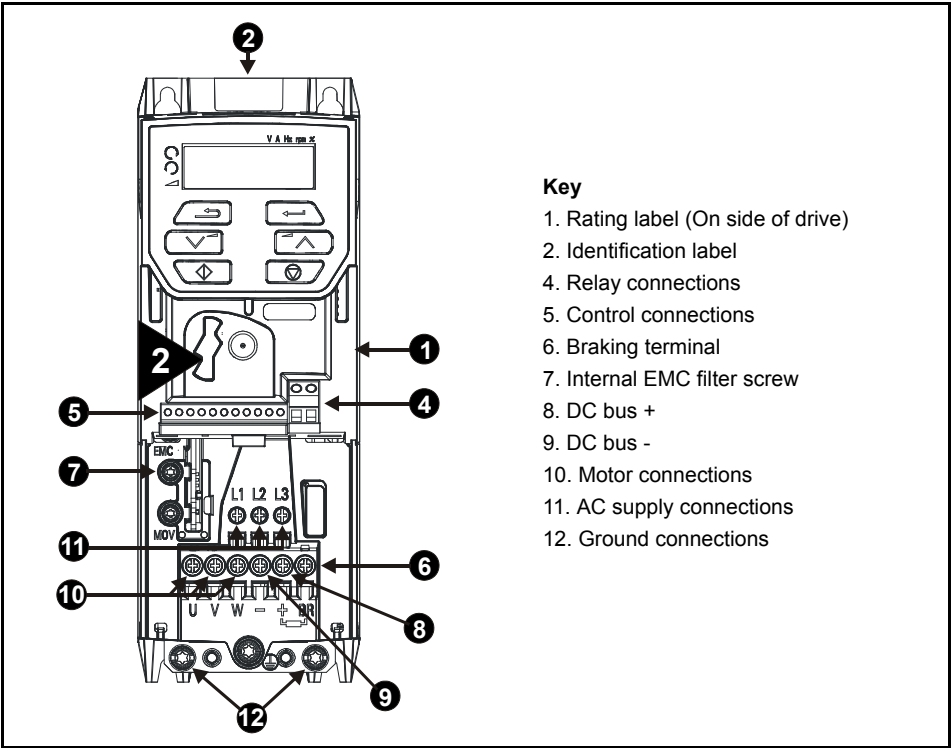
| Tool                         | Location                 | Size 1 | Size 2 | Size 3 | Size 4 |
|------------------------------|--------------------------|--------|--------|--------|--------|
| Small terminal screwdriver   | Control, relay terminals | ✓      | ✓      | ✓      | ✓      |
| 3 mm Flat-bladed screwdriver | Power terminals          | ✓      |        |        |        |
| 5 mm Flat-bladed screwdriver | Terminal cover           | ✓      | ✓      | ✓      | ✓      |
| 4 mm Flat-bladed screwdriver | AC power terminals       |        | ✓      |        |        |
| Philips screwdriver          | Power terminals          |        | ✓      | ✓      | ✓      |
| Torx 10 driver               | EMC & MOV screws         | ✓      | ✓      | ✓      | ✓      |
| Torx 15 driver               | Fan screw                | ✓      |        |        |        |
| Torx 20 driver               | Fan screw                |        | ✓      | ✓      | ✓      |

**Table 3-2 Recommended torque settings**

| Model size | Terminal block description | Torque settings      |
|------------|----------------------------|----------------------|
| All        | Control terminals          | 0.2 N m (0.15 lb ft) |
|            | Relay terminals            | 0.5 N m (0.37 lb ft) |
| 1          | Power terminals            | 0.5 N m (0.37 lb ft) |
| 2, 3, 4    |                            | 1.4 N m (1.03 lb ft) |



Figure 3-1 Feature diagram (size 2 shown)



## 4 Electrical installation

An overlay of the electrical connections / terminals is included on the back page of this manual.

### 4.1 AC supply requirements

Voltage:

100 V drive: 100 V to 120 V  $\pm 10$  %

200 V drive: 200 V to 240 V  $\pm 10$  %

400 V drive: 380 V to 480 V  $\pm 10$  %

Number of phases: 3

Maximum supply imbalance: 2 % negative phase sequence (equivalent to 3 % voltage imbalance between phases).

Frequency range: 45 to 66 Hz.

For UL compliance only, the maximum supply symmetrical fault current must be limited to 100 kA.

**NOTE** On the size 2 110 V drives or when connecting single phase to a dual rated 200 V unit, the supply should be connected to L1 and L3. Also the DC bus (-) terminal on 110 V drives has no internal connection. The 110 V drives use a voltage doubler circuit on the input, therefore the default for *Motor Rated Voltage* (00.008) is 230 V.

### 4.2 External braking resistor



WARNING

#### Overload protection

When an external braking resistor is used, it is essential that an overload protection device is incorporated in the braking resistor circuit; as shown in the electrical diagram on the back cover.

#### 4.2.1 Minimum resistance values and peak power rating for the braking resistor at 40 °C (104 °F)

Table 4-1 Braking resistor resistance and power rating (100 V)

| Model    | Minimum resistance*<br>$\Omega$ | Instantaneous power rating<br>kW | Continuous power rating<br>kW |
|----------|---------------------------------|----------------------------------|-------------------------------|
| 01100017 | 130                             | 1.2                              | 0.25                          |
| 01100024 |                                 |                                  | 0.37                          |
| 02100042 | 68                              | 2.2                              | 0.75                          |
| 02100056 |                                 |                                  | 1.1                           |

**Table 4-2 Braking resistor resistance and power rating (200 V)**

| Model    | Minimum resistance*<br>$\Omega$ | Instantaneous power rating<br>kW | Continuous power rating<br>kW |
|----------|---------------------------------|----------------------------------|-------------------------------|
| 01200017 | 130                             | 1.2                              | 0.25                          |
| 01200024 |                                 |                                  | 0.37                          |
| 01200033 |                                 |                                  | 0.55                          |
| 01200042 |                                 |                                  | 0.75                          |
| 02200024 | 68                              | 2.2                              | 0.37                          |
| 02200033 |                                 |                                  | 0.55                          |
| 02200042 |                                 |                                  | 0.75                          |
| 02200056 |                                 |                                  | 1.1                           |
| 02200075 |                                 |                                  | 1.5                           |
| 03200100 | 45                              | 3.4                              | 2.2                           |
| 04200133 | 22                              | 6.9                              | 3.0                           |
| 04200176 |                                 |                                  | 4.0                           |

**Table 4-3 Braking resistor resistance and power rating (400 V)**

| Model    | Minimum resistance*<br>$\Omega$ | Instantaneous power rating<br>kW | Continuous power rating<br>kW |
|----------|---------------------------------|----------------------------------|-------------------------------|
| 02400013 | 270                             | 2.3                              | 0.37                          |
| 02400018 |                                 |                                  | 0.55                          |
| 02400023 |                                 |                                  | 0.75                          |
| 02400032 |                                 |                                  | 1.1                           |
| 02400041 |                                 |                                  | 1.5                           |
| 03400056 | 100                             | 6.1                              | 2.2                           |
| 03400073 |                                 |                                  | 3                             |
| 03400094 |                                 |                                  | 4                             |
| 04400135 | 50                              | 12.2                             | 5.5                           |
| 04400170 |                                 |                                  | 7.5                           |

\* Resistor tolerance:  $\pm 10\%$

## 4.3 Ground leakage

The ground leakage current depends upon whether the internal EMC filter is installed or not. The drive is supplied with the filter installed. Instructions for removing the internal filter are given in section 4.5.1 *Internal EMC filter* on page 23.

With internal filter installed:

### Size 1:

2.5 mA\* AC at 230 V 50 Hz (line to line supply, star point ground)

9.2 mA\* AC at 230 V 50 Hz (line to neutral supply, star point ground)

### Size 2:

9.36 mA\* AC at 110 V, 50 Hz (2 phase, line to line supply, star point ground)

16.4 mA\* AC at 110 V, 50 Hz (1 phase, line to neutral supply, star point ground)

5.3 mA\* AC at 230 V, 50 Hz (3 phase supply, star point ground)

15.4 mA\* AC at 230 V, 50 Hz (1 phase, line to neutral supply, star point ground)

9.6 mA\* AC at 400 V, 50 Hz (3 phase supply, star point ground)

### Size 3:

19.7 mA\* AC at 400 V 50 Hz (star point ground)

47.4 mA\* AC at 400 V 50 Hz (corner ground)

### Size 4:

21 mA\* AC at 230 V 50 Hz (3 phase, star point ground)

6.8 mA\* AC at 230 V 50 Hz (1 phase, line to line supply, star point ground)

30 mA\* AC at 230 V 50 Hz (1 phase, line to neutral supply, star point ground)

50 mA\* AC at 400 V 50 Hz (3 phase, star point ground)

\*Proportional to the supply voltage and frequency.

With internal filter removed:

**Size 1:** <1.5 mA (line to line supply, star point ground)

<1 mA (line to neutral supply, star point ground)

**Size 2:** <1.7 mA (line to line supply, star point ground)

<1.9 mA (line to neutral supply, star point ground)

**Size 3:** <3.3 mA (star point ground)

<4.9 mA (corner ground)

**Size 4:** < 3.5 mA (star point ground)

**NOTE** The above leakage currents are just the leakage currents of the drive with the internal EMC filter connected and do not take into account any leakage currents of the motor or motor cable.



When the internal filter is installed the leakage current is high. In this case a permanent fixed ground connection must be provided, or other suitable measures taken to prevent a safety hazard occurring if the connection is lost.



When the leakage current exceeds 3.5 mA, a permanent fixed ground connection must be provided using two independent conductors each with a cross-section equal to or exceeding that of the supply conductors. The drive is provided with two ground connections to facilitate this. Both ground connections are necessary to meet EN 61800-5-1: 2007.

### 4.3.1 Use of residual current device (RCD)

There are three common types of ELCB / RCD:

1. AC - detects AC fault currents
2. A - detects AC and pulsating DC fault currents (provided the DC current reaches zero at least once every half cycle)
3. B - detects AC, pulsating DC and smooth DC fault currents
  - Type AC should never be used with drives.
  - Type A can only be used with single phase drives
  - Type B must be used with three phase drives



**WARNING**

Only type B ELCB / RCD are suitable for use with 3 phase inverter drives.

If an external EMC filter is used, a delay of at least 50 ms should be incorporated to ensure spurious trips are not seen. The leakage current is likely to exceed the trip level if all of the phases are not energized simultaneously.

## 4.4 Control terminal configurations and wiring

| 00.005 |     | Drive Configuration                                                                                          |  |  |   |         |    |    |  |
|--------|-----|--------------------------------------------------------------------------------------------------------------|--|--|---|---------|----|----|--|
| RW     | Txt |                                                                                                              |  |  |   |         | PT | US |  |
| OL     | ⇕   | AV (0), AI (1), AV.Pr (2), AI.Pr (3),<br>Preset (4), Pad (5), Pad.Ref (6),<br>E.Pot (7), torque (8), Pid (9) |  |  | ⇒ | AV (0)* |    |    |  |
| RFC-A  |     |                                                                                                              |  |  |   |         |    |    |  |

\* With Unidrive M201, the default is Pad (5). The setting of Pr 00.005 automatically sets the drive configuration.

| Value | Text    | Description                                                                                                                 |
|-------|---------|-----------------------------------------------------------------------------------------------------------------------------|
| 0     | AV      | Analog input 1 (voltage) Analog input 2 (voltage) selected by terminal (Local/Remote)                                       |
| 1     | AI      | Analog input 1 (current) or Analog input 2 (voltage) selected by terminal (Local/Remote)                                    |
| 2     | AV.Pr   | Analog input 1 (voltage) or 3 presets selected by terminal                                                                  |
| 3     | AI.Pr   | Analog input 1 (current) or 3 presets selected by terminal                                                                  |
| 4     | Preset  | Four presets selected by terminal                                                                                           |
| 5     | Pad     | Keypad reference                                                                                                            |
| 6     | Pad.Ref | Keypad reference with terminal control                                                                                      |
| 7     | E.Pot   | Electronic Potentiometer                                                                                                    |
| 8     | torque  | Torque mode, Analog input 1 (current frequency reference) or Analog input 2 (voltage torque reference) selected by terminal |
| 9     | Pid     | PID mode, Analog input 1 (current feedback source) and Analog input 2 (voltage reference source)                            |

Defaults are loaded before drive configuration changes are made.

Action will only occur if the drive is inactive, not in UU state and no User Actions are running.

Otherwise, the parameter will return to its pre altered value on exit from edit mode. All parameters are saved if this parameter changes.

**Figure 4-1 Pr 00.005 = AV (50 Hz)**

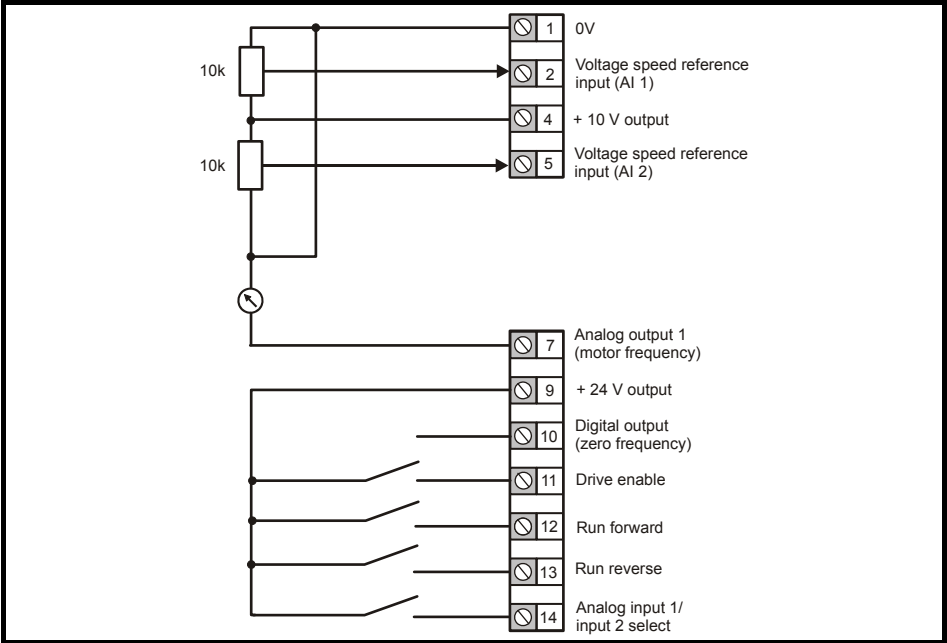


Figure 4-2 Pr 00.005 = AV (60 Hz)

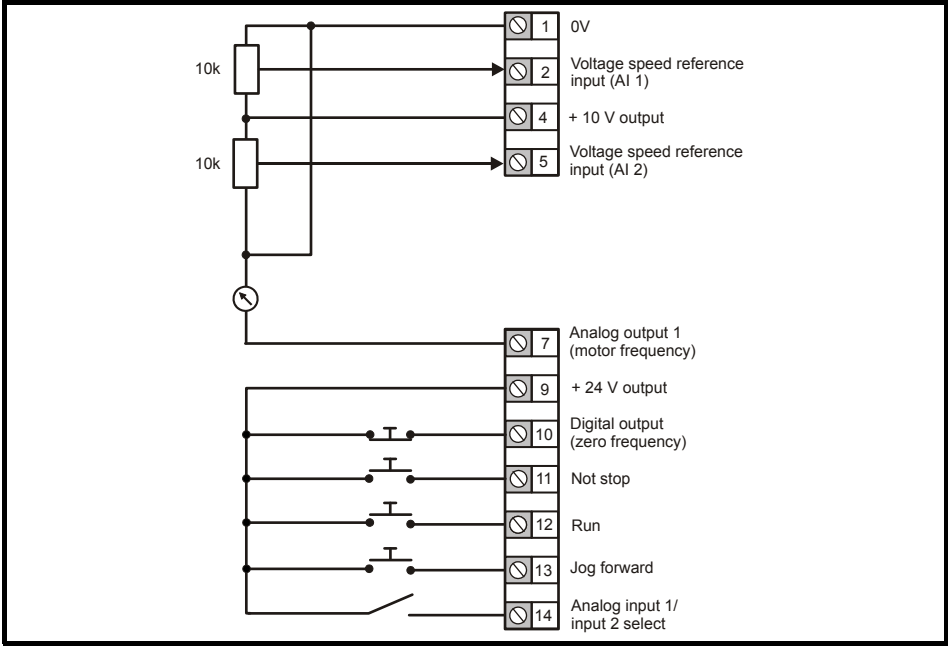


Figure 4-3 Pr 00.005 = AI (50 Hz)

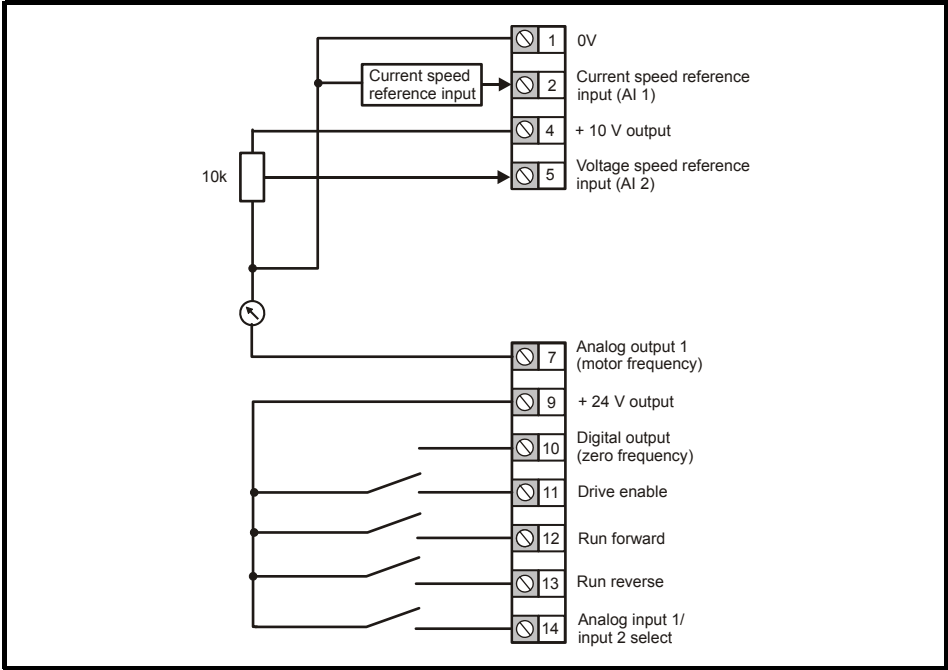


Figure 4-4 Pr 00.005 = AI. (60 Hz)

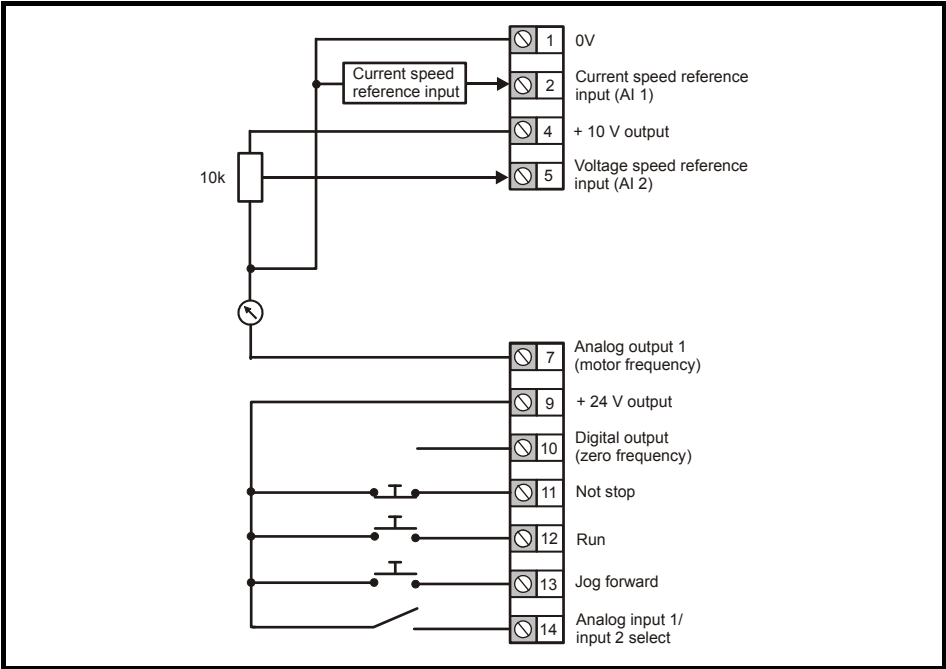
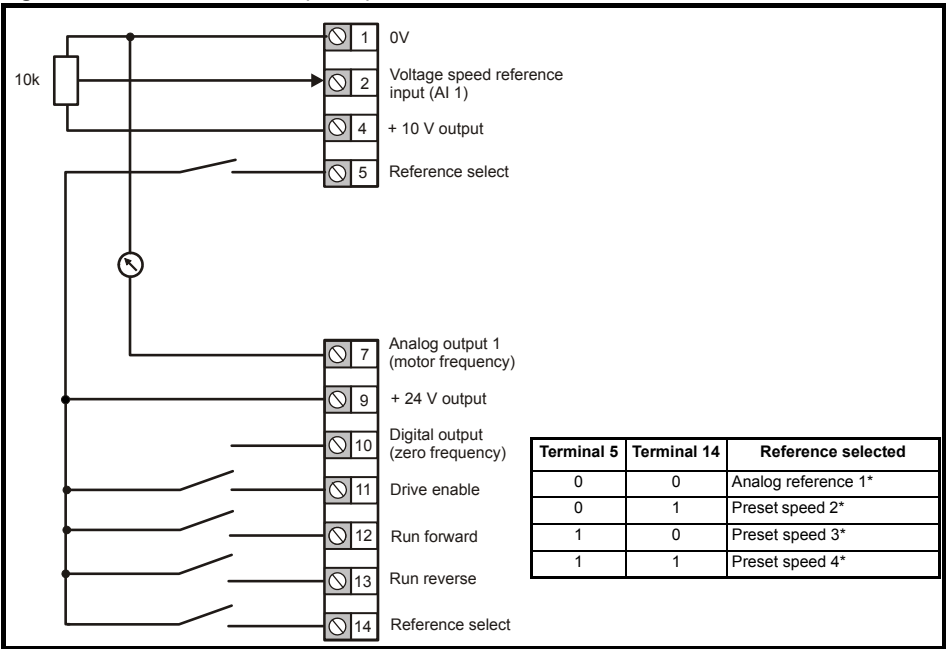


Figure 4-5 Pr 00.005 = AV.Pr (50 Hz)



\*Refer to Drive User Guide.



Figure 4-6 Pr 00.005 = AV.Pr (60 Hz)

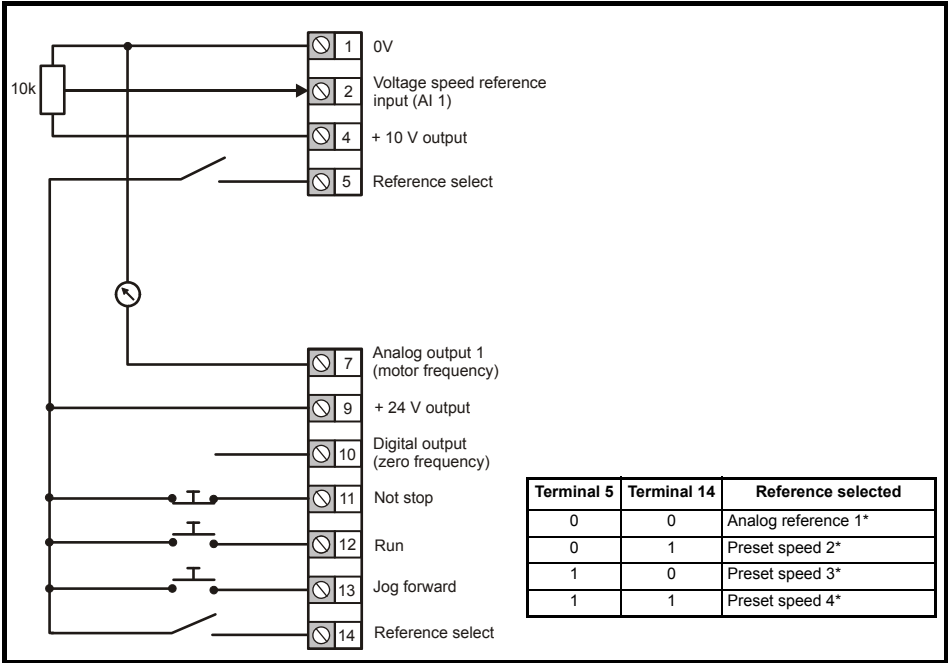
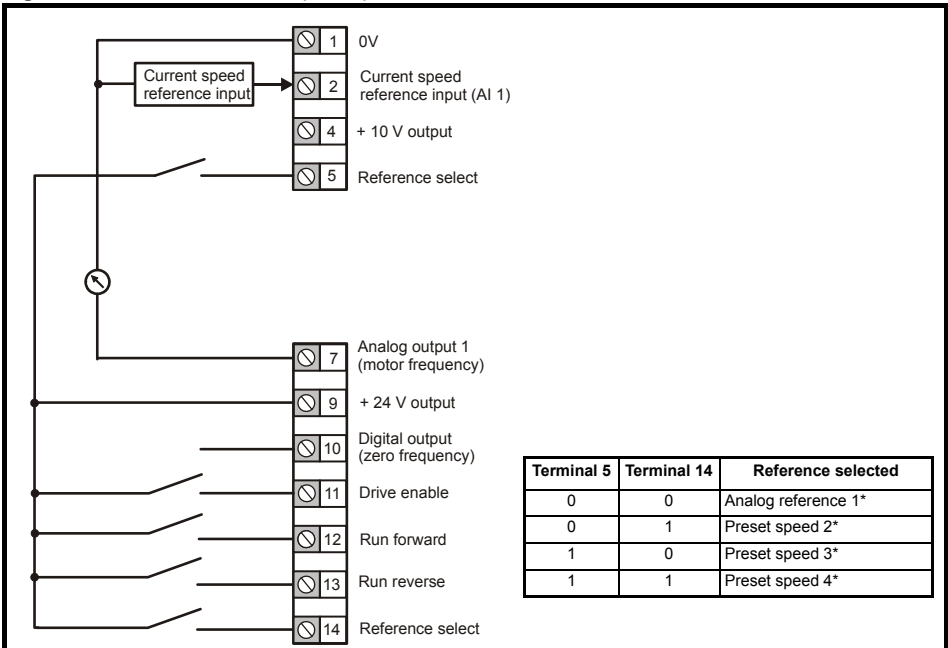


Figure 4-7 Pr 00.005 = AI.Pr (50 Hz)



\*Refer to *Drive User Guide*.

Figure 4-8 Pr 00.005 = AI.Pr (60 Hz)

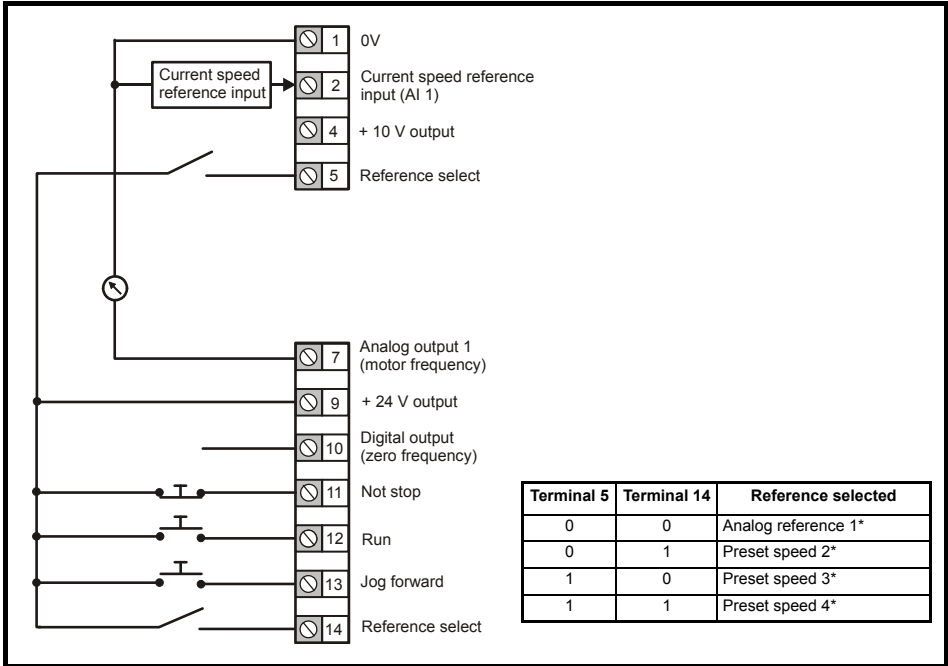
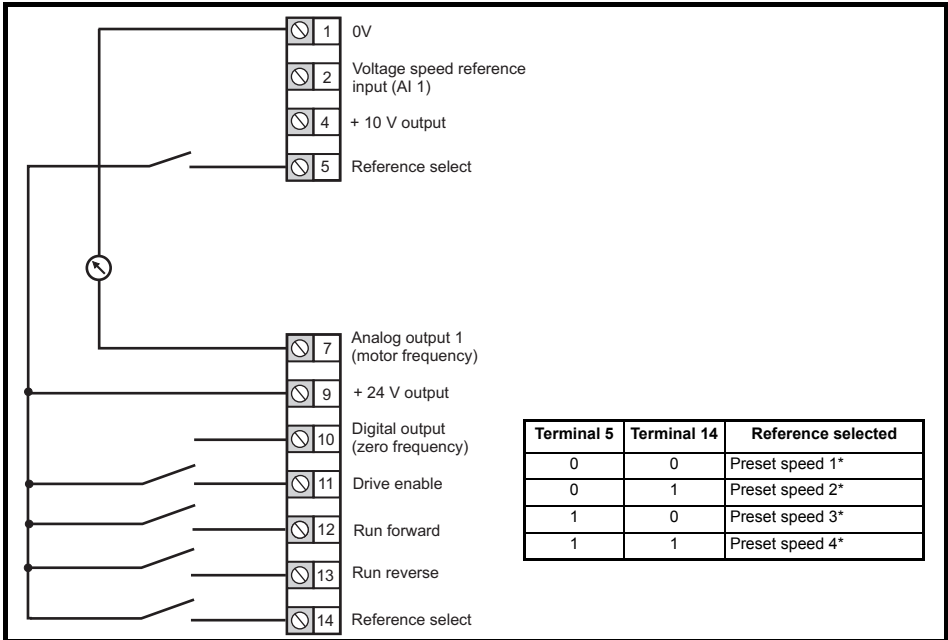


Figure 4-9 Pr 00.005 = Preset (50 Hz)



\*Refer to Drive User Guide.

Figure 4-10 Pr 00.005 = Preset (60 Hz)

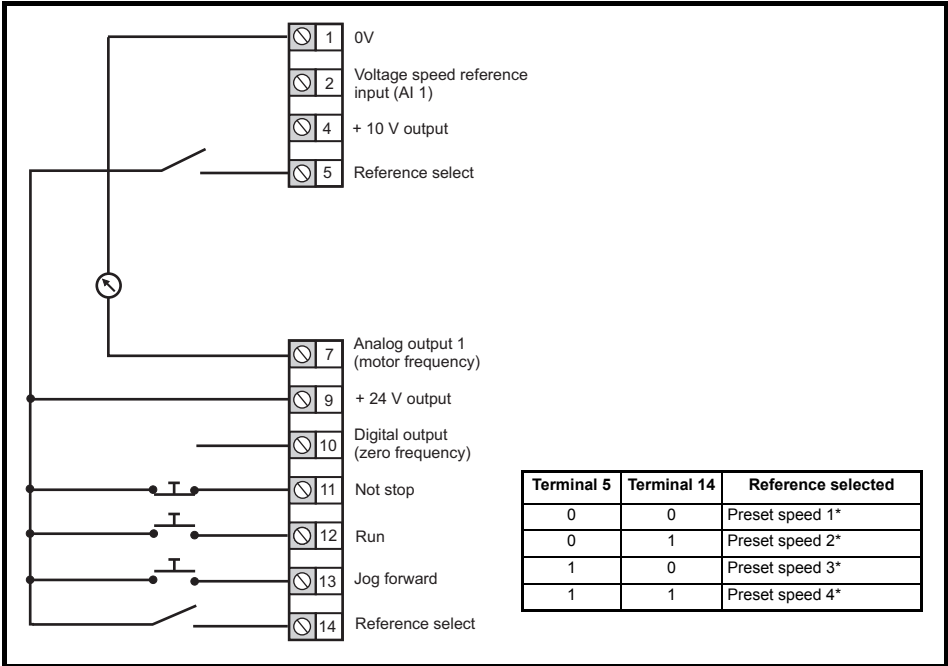
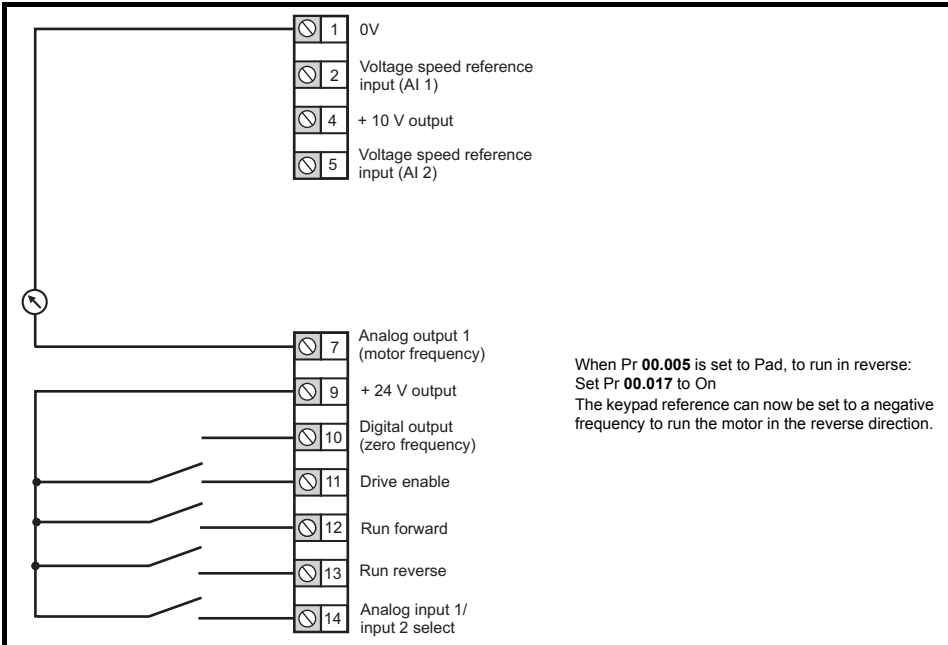


Figure 4-11 Pr 00.005 = Pad (50 Hz & 60 Hz)



\*Refer to *Drive User Guide*.

Figure 4-12 Pr 00.005 = Pad.Ref (50 Hz & 60 Hz)

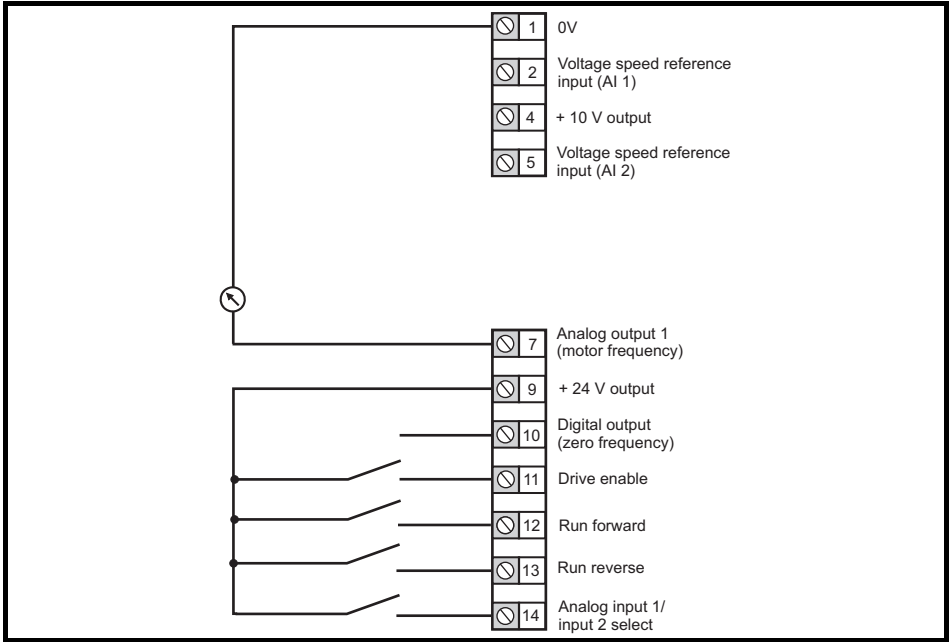


Figure 4-13 Pr 00.005 = E.Pot (50 Hz)

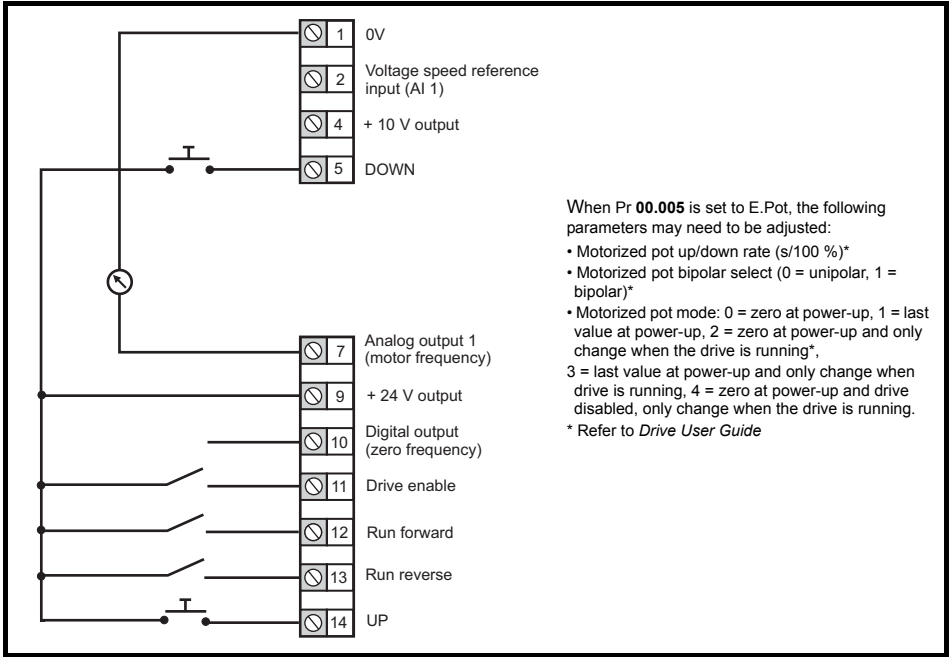


Figure 4-14 Pr 00.005 = E.Pot (60 Hz)

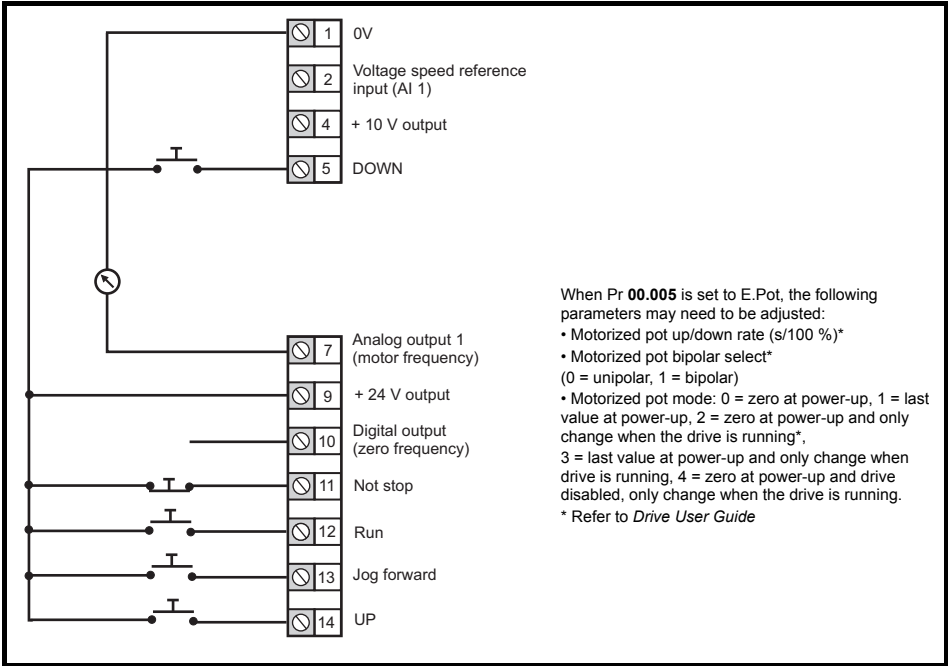


Figure 4-15 Pr 00.005 = torque (50 Hz)

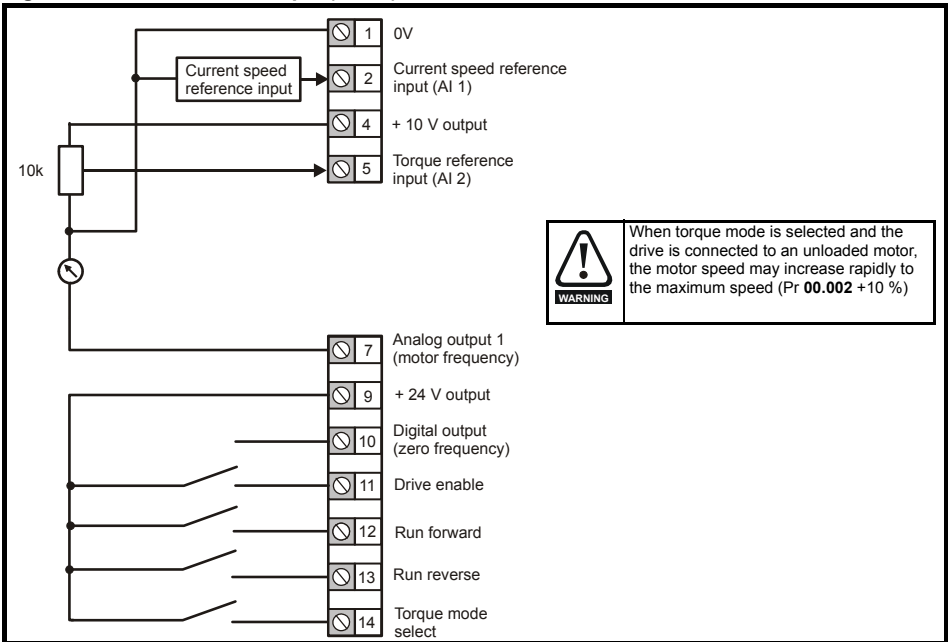


Figure 4-16 Pr 00.005 = torque (60 Hz)

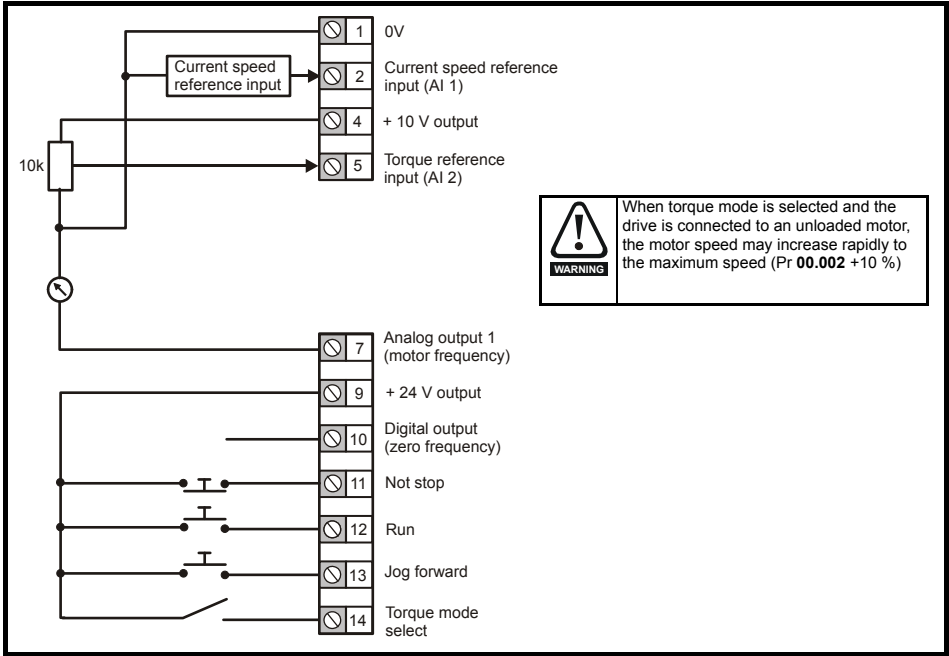
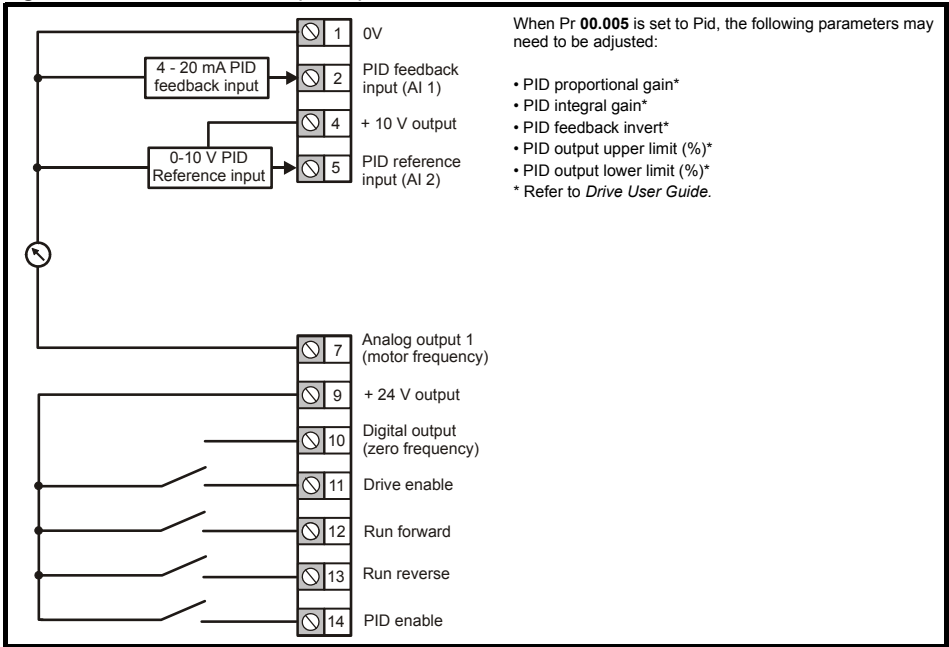
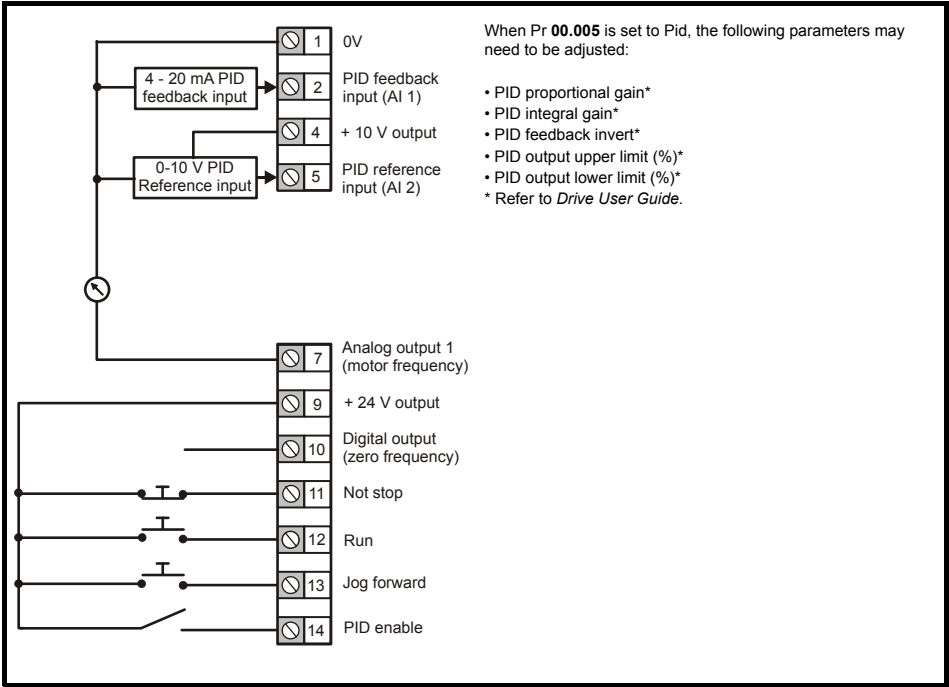


Figure 4-17 Pr 00.005 = Pid (50 Hz)



**Figure 4-18 Pr 00.005 = Pid (60 Hz)**



## 4.5 EMC

### 4.5.1 Internal EMC filter

It is recommended that the internal EMC filter be kept in place unless there is a specific reason for removing it. If the drive is used as a motoring drive as part of a regen system, then the internal EMC filter must be removed.

The internal EMC filter reduces radio-frequency emission into the line power supply.

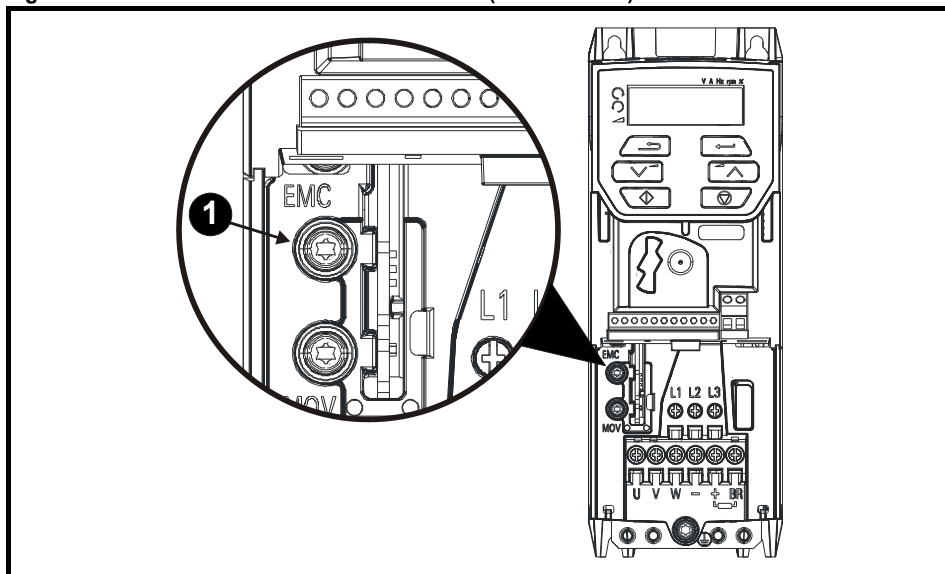
For longer motor cables, the filter continues to provide a useful reduction in emission levels and when used with any length of shielded motor cable up to the limit for the drive, it is unlikely that nearby industrial equipment will be disturbed. It is recommended that the filter be used in all applications unless the instructions given above require it to be removed, or where the ground leakage current is unacceptable.

### 4.5.2 Removing the internal EMC filter



The supply must be disconnected before removing the internal EMC filter.

**Figure 4-19 Removal of the internal EMC filter (size 2 shown)**



To electrically disconnect the internal EMC filter, remove the screw as shown above (1).

#### **4.5.3 Further EMC precautions**

Further EMC precautions are required if more stringent EMC emission requirements apply:

- Operation in the first environment of EN 61800-3: 2004
- Conformity to the generic emission standards
- Equipment which is sensitive to electrical interference operating nearby

In this case it is necessary to use:

- The optional external EMC filter
- A shielded motor cable, with shield clamped to the grounded metal panel
- A shielded control cable, with shield clamped to the grounded metal panel

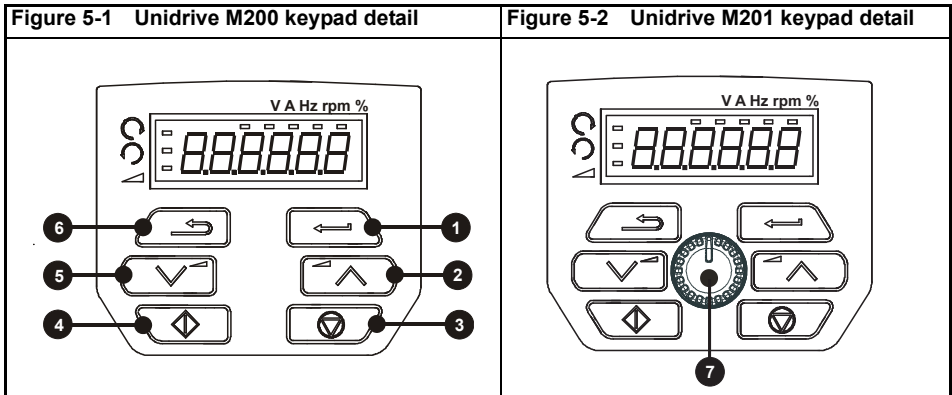
Full instructions are given in the *Drive User Guide*.

A full range of external EMC filters are also available for use with *Unidrive M200 / 201*, shown in the *Drive User Guide*.



## 5 Keypad and display

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



- (1) The Enter button is used to enter parameter view or edit mode, or to accept a parameter edit.
- (2 / 5) The Navigation keys can be used to select individual parameters or to edit parameter values.
- (3) The Stop / Reset key is used to stop and reset the drive in keypad mode. It can also be used to reset the drive in terminal mode.
- (4) The Start key is used to start the drive in keypad mode.
- (6) The Escape key is used to exit from the parameter edit / view mode.
- (7) The Speed ref pot is used to control the speed reference in keypad mode (only on Unidrive M201).

**Table 5-1 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. The other conditions that can prevent the drive from enabling are shown as bits in <i>Enable Conditions</i> . | 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>S.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 either in low voltage or high voltage mode.                                                                                                                                                         | Disabled           |

## 5.1 Saving parameters

When changing a parameter in Menu 0, the new value is saved when pressing the Enter button




to return to parameter view mode from parameter edit mode.

If parameters have been changed in the advanced menus, then the change will not be saved automatically. A save function must be carried out.

### Procedure

1. Select 'Save\*' in Pr **mm.000** (alternatively enter a value of 1001\* in Pr **mm.000**)
2. Either:

- Press the red  reset button
- Carry out a drive reset through serial communications by setting Pr **10.038** to 100

\* If the drive is in the under voltage state (i.e. when the AI-Backup adaptor terminals are being supplied from a +24 Vdc supply) a value of 1001 must be entered into Pr **mm.000** to perform a save function.

## 5.2 Restoring parameter defaults

Restoring parameter defaults by this method saves the default values in the drives memory. *User Security Status* (00.010) and *User Security Code* (00.025) are not affected by this procedure).

### Procedure

1. Ensure the drive is not enabled, i.e. terminal 11 is open or is OFF (0)
2. Select 'Def.50' or 'Def.60' in Pr **mm.000**. (alternatively, enter 1233 (50 Hz settings) or 1244 (60 Hz settings) in Pr **mm.000**).
3. Either:

- Press the red  reset button

Carry out a drive reset through serial communications by setting Pr **10.038** to 100

## 6 Basic parameters (Menu 0)

Menu 0 is used to bring together various commonly used parameters for basic easy set up of the drive. All the parameters in Menu 0 appear in other menus in the drive (denoted by {...}). Menus 22 can be used to configure the parameters in Menu 0.

### 6.1 Menu 0: Basic parameters

| Parameter |                                                  | Range (⌘)                                                                                                                                                |       | Default (⇨)                                                                                  |                                                      | Type |     |    |    |    |    |
|-----------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------|------------------------------------------------------|------|-----|----|----|----|----|
|           |                                                  | OL                                                                                                                                                       | RFC-A | OL                                                                                           | RFC-A                                                |      |     |    |    |    |    |
| 00.001    | Minimum Reference Clamp                          | ±VM_NEGATIVE_REF_CLAMP1 Hz                                                                                                                               |       | 0.00 Hz                                                                                      |                                                      | RW   | Num |    |    |    | US |
| 00.002    | Maximum Reference Clamp                          | ±VM_POSITIVE_REF_CLAMP Hz                                                                                                                                |       | 50Hz default: 50.00 Hz<br>60Hz default: 60.00 Hz                                             |                                                      | RW   | Num |    |    |    | US |
| 00.003    | Acceleration Rate 1                              | ±VM_ACCEL_RATE s/100 Hz                                                                                                                                  |       | 5.0 s/100 Hz                                                                                 |                                                      | RW   | Num |    |    |    | US |
| 00.004    | Deceleration Rate 1                              | ±VM_ACCEL_RATE s/100 Hz                                                                                                                                  |       | 10.0 s/100 Hz                                                                                |                                                      | RW   | Num |    |    |    | US |
| 00.005    | 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)                                                   |       | AV (0)*                                                                                      |                                                      | RW   | Txt |    |    | PT | US |
| 00.006    | Motor Rated Current                              | 0.00 to VM_RATED_CURRENT A                                                                                                                               |       | Maximum Heavy Duty Rating A                                                                  |                                                      | RW   | Num |    | RA |    | US |
| 00.007    | Motor Rated Speed                                | 0.0 to 80000.0 rpm                                                                                                                                       |       | 50Hz default: 1500.0 rpm<br>60Hz default: 1800.0 rpm                                         | 50Hz default: 1450.0 rpm<br>60Hz default: 1750.0 rpm | RW   | Num |    |    |    | US |
| 00.008    | Motor Rated Voltage                              | 0 to VM_AC_VOLTAGE_SET V                                                                                                                                 |       | 110V drive: 230 V<br>200V drive: 230 V<br>400V drive 50 Hz: 400 V<br>400V drive 60 Hz: 460 V |                                                      | RW   | Num |    | RA |    | US |
| 00.009    | Motor Rated Power Factor                         | 0.00 to 1.00                                                                                                                                             |       | 0.85                                                                                         |                                                      | RW   | Num |    | RA |    | US |
| 00.010    | User Security Status                             | LEVEL.0 (0), ALL (1), r.only.0 (2), r.only.A (3), Status (4), no.acc(5)                                                                                  |       | LEVEL.0 (0)                                                                                  |                                                      | RW   | Num | ND | NC | PT |    |
| 00.015    | Jog Reference                                    | 0.00 to 300.00 Hz                                                                                                                                        |       | 1.50 Hz                                                                                      |                                                      | RW   | Num |    |    |    | US |
| 00.016    | Analog Input 1 Mode                              | 4-20.S (-6), 20-4.S (-5), 4-20.L (-4), 20-4.L (-3), 4-20.H (-2), 20-4.H (-1), 0-20 (0), 20-0 (1), 4-20.tr (2), 20-4.tr (3), 4-20 (4), 20-4 (5), Volt (6) |       | Volt (6)                                                                                     |                                                      | RW   | Txt |    |    |    | US |
| 00.017    | Bipolar Reference Enable                         | Off (0) or On (1)                                                                                                                                        |       | Off (0)                                                                                      |                                                      | RW   | Bit |    |    |    | US |
| 00.018    | Preset Reference 1                               | ±VM_SPEED_FREQ_REF Hz                                                                                                                                    |       | 0.00 Hz                                                                                      |                                                      | RW   | Num |    |    |    | US |
| 00.025    | User Security Code                               | 0 to 9999                                                                                                                                                |       | 0                                                                                            |                                                      | RW   | Num | ND | NC | PT | US |
| 00.027    | Power-up Keypad Control Mode Reference           | Reset (0), Last (1), Preset (2)                                                                                                                          |       | Reset (0)                                                                                    |                                                      | RW   | Txt |    |    |    | US |
| 00.028    | Ramp Mode Select                                 | Fast (0), Std (1), Std.bst (2), Fst.bst (3)                                                                                                              |       | Std (1)                                                                                      |                                                      | RW   | Txt |    |    |    | US |
| 00.029    | Ramp Enable                                      | Off (0) or On (1)                                                                                                                                        |       | On (1)                                                                                       |                                                      | RW   | Bit |    |    |    | US |
| 00.030    | Parameter Cloning                                | None (0), rEAd (1), Prog (2), Auto (3), boot (4)                                                                                                         |       | None (0)                                                                                     |                                                      | RW   | Txt |    | NC |    | US |
| 00.031    | Stop Mode                                        | CoASt (0), rP (1), rP.dc I (2), dc I (3), td.dc I (4), dis (5), No.rP (6)                                                                                |       | rp (1)                                                                                       |                                                      | RW   | Txt |    |    |    | US |
| 00.032    | Dynamic V to F Select / Flux Optimization Select | 0 to 1                                                                                                                                                   |       | 0                                                                                            |                                                      | RW   | Num |    |    |    | US |

| Parameter |                                                     | Range (⇅)                                                                                                         |                                                       | Default (⇒)                      |                          | Type |     |    |    |    |
|-----------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------|--------------------------|------|-----|----|----|----|
|           |                                                     | OL                                                                                                                | RFC-A                                                 | OL                               | RFC-A                    |      |     |    |    |    |
| 00.033    | Catch A Spinning Motor                              | dis (0), Enable (1), Fr.Only (2), Rv.Only (3)                                                                     |                                                       | dis (0)                          |                          | RW   | Txt |    |    | US |
| 00.034    | Digital Input 5 Mode                                | Input (0), th.Sct (1), th (2), th.Notr (3), Fr (4)                                                                |                                                       | Input (0)                        |                          | RW   | Txt |    |    | US |
| 00.035    | Digital Output 1 Control                            | 0 to 21                                                                                                           |                                                       | 0                                |                          | RW   | Num |    |    | US |
| 00.036    | Analog Output 1 Control                             | 0 to 14                                                                                                           |                                                       | 0                                |                          | RW   | Txt |    |    | US |
| 00.037    | Maximum Switching Frequency                         | 0.667 (0), 1 (1), 2 (2), 3 (3), 4 (4), 6 (5), 8 (6), 12 (7), 16 (8) kHz                                           | 2 (2), 3 (3), 4 (4), 6 (5), 8 (6), 12 (7), 16 (8) kHz | 3 (3) kHz                        |                          | RW   | Txt |    |    | US |
| 00.038    | Autotune                                            | 0 to 2                                                                                                            | 0 to 3                                                | 0                                |                          | RW   | Num |    | NC | US |
| 00.039    | Motor Rated Frequency                               | 0.00 to VM_SPEED_FREQ_REF_UNIPOLAR Hz                                                                             |                                                       | 50Hz: 50.00 Hz<br>60Hz: 60.00 Hz |                          | RW   | Num |    | RA | US |
| 00.040    | Number of Motor Poles**                             | Auto (0) to 32 (16)                                                                                               |                                                       | Auto 0                           |                          | RW   | Num |    |    | US |
| 00.041    | Control Mode                                        | Ur.S (0), Ur (1), Fd (2), Ur.Auto (3), Ur.l (4), SrE (5), Fd.tap (6)                                              |                                                       | Ur.l (4)                         |                          | RW   | Txt |    |    | US |
| 00.042    | Low Frequency Voltage Boost                         | 0.0 to 25.0 %                                                                                                     |                                                       | 3.0 %                            |                          | RW   | Num |    |    | US |
| 00.043    | Serial Baud Rate                                    | 300 (0), 600 (1), 1200 (2), 2400 (3), 4800 (4), 9600 (5), 19200 (6), 38400 (7), 57600 (8), 76800 (9), 115200 (10) |                                                       | 19200 (6)                        |                          | RW   | Txt |    |    | US |
| 00.044    | Serial Address                                      | 1 to 247                                                                                                          |                                                       | 1                                |                          | RW   | Num |    |    | US |
| 00.045    | Reset Serial Communications                         | Off (0) or On (1)                                                                                                 |                                                       | Off (0)                          |                          | RW   |     | ND | NC | US |
| 00.046    | Brake Controller Upper Current Threshold            | 0 to 200 %                                                                                                        |                                                       | 50 %                             |                          | RW   | Num |    |    | US |
| 00.047    | Brake Controller Lower Current Threshold            | 0 to 200 %                                                                                                        |                                                       | 10 %                             |                          | RW   | Num |    |    | US |
| 00.048    | Brake Controller Brake Release Frequency            | 0.00 to 20.00 Hz                                                                                                  |                                                       | 1.00 Hz                          |                          | RW   | Num |    |    | US |
| 00.049    | Brake Controller Brake Apply Frequency              | 0.00 to 20.00 Hz                                                                                                  |                                                       | 2.00 Hz                          |                          | RW   | Num |    |    | US |
| 00.050    | Brake Controller Brake Delay                        | 0.0 to 25.0 s                                                                                                     |                                                       | 1.0 s                            |                          | RW   | Num |    |    | US |
| 00.051    | Brake Controller Post-brake Release Delay           | 0.0 to 25.0 s                                                                                                     |                                                       | 1.0 s                            |                          | RW   | Num |    |    | US |
| 00.053    | Brake Controller Initial Direction                  | Ref (0), For (1), Rev (2)                                                                                         |                                                       | Ref (0)                          |                          | RW   | Txt |    |    | US |
| 00.054    | Brake Controller Brake Apply Through Zero Threshold | 0.00 to 25.00 Hz                                                                                                  |                                                       | 0.00 Hz                          |                          | RW   | Num |    |    | US |
| 00.055    | Brake Controller Enable                             | dis (0), Relay (1), dig IO (2), User (3)                                                                          |                                                       | dis (0)                          |                          | RW   | Txt |    |    | US |
| 00.065    | Frequency Controller Proportional Gain Kp1          |                                                                                                                   | 0.000 to 200.000 s/rad                                |                                  | 0.100 s/rad              | RW   | Num |    |    | US |
| 00.066    | Frequency Controller Integral Gain Ki1              |                                                                                                                   | 0.00 to 655.35 s <sup>2</sup> /rad                    |                                  | 0.10 s <sup>2</sup> /rad | RW   | Num |    |    | US |

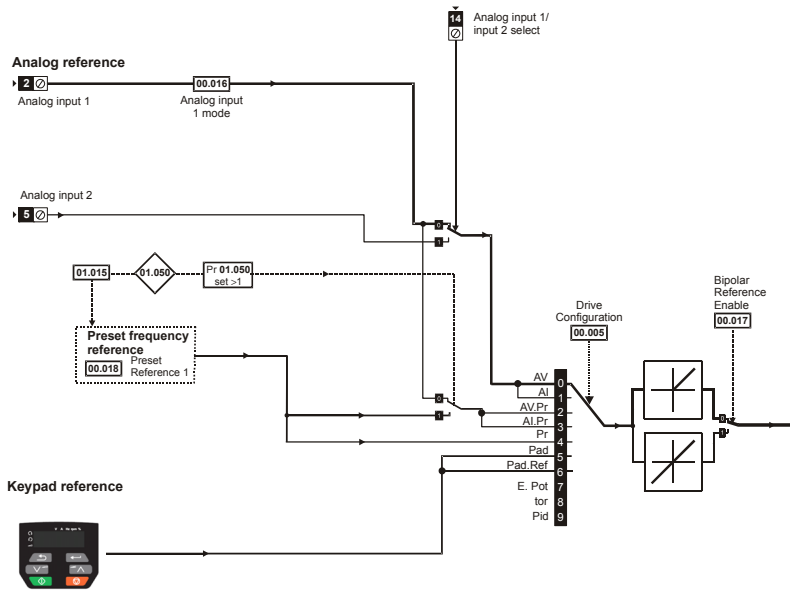
| Parameter |                                   | Range (⇄)              |                                               | Default (⇒) |           | Type |     |    |    |    |    |
|-----------|-----------------------------------|------------------------|-----------------------------------------------|-------------|-----------|------|-----|----|----|----|----|
|           |                                   | OL                     | RFC-A                                         | OL          | RFC-A     |      |     |    |    |    |    |
| 00.067    | Sensorless Mode Filter            |                        | 4 (0), 5 (1), 6 (2), 8 (3), 12 (4), 20 (5) ms |             | 4 (0) ms  | RW   | Txt |    |    |    | US |
| 00.069    | Spin Start Boost                  | 0.0 to 10.0            |                                               | 1.0         |           | RW   | Num |    |    |    | US |
| 00.076    | Action on Trip Detection          | 0 to 31                |                                               | 0           |           | RW   | Num | ND | NC | PT | US |
| 00.077    | Maximum Heavy Duty Current Rating | 0.00 to 9999.99 A      |                                               |             |           | RO   | Num | ND | NC | PT |    |
| 00.078    | Software Version                  | 0 to 999999            |                                               |             |           | RO   | Num | ND | NC | PT |    |
| 00.079    | User Drive Mode                   | OPEn.LP (1), RFC-A (2) |                                               | OPEn.LP (1) | RFC-A (2) | RW   | Txt | ND | NC | PT | US |

\* With Unidrive M201, the default is Pad (5).

\*\* If this parameter is read via serial communications, it will show pole pairs.

|    |                  |    |            |     |                     |     |                  |     |             |     |                  |    |             |
|----|------------------|----|------------|-----|---------------------|-----|------------------|-----|-------------|-----|------------------|----|-------------|
| RW | Read / Write     | RO | Read only  | Num | Number parameter    | Bit | Bit parameter    | Txt | Text string | Bin | Binary parameter | FI | Filtered    |
| ND | No default value | NC | Not copied | PT  | Protected parameter | RA  | Rating dependent | US  | User save   | PS  | Power-down save  | DE | Destination |

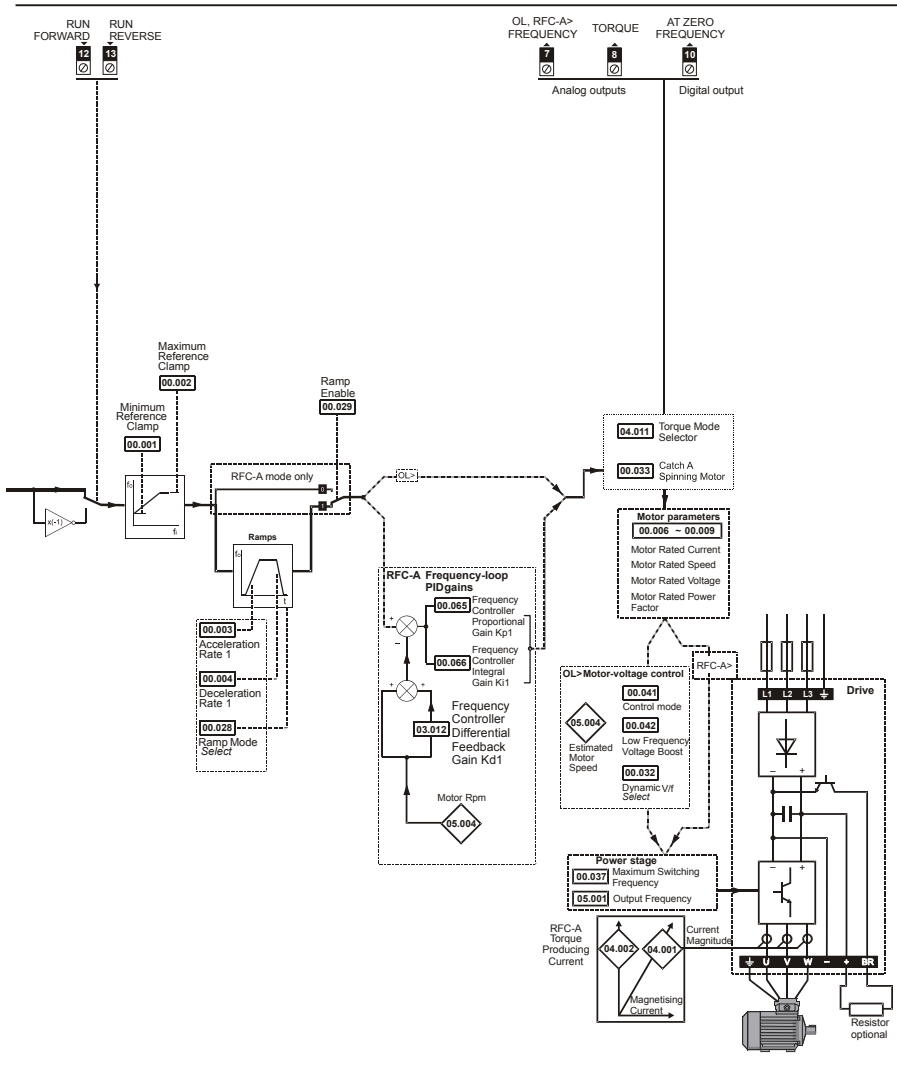
Figure 6-1 Menu 0 logic diagram



**Key**

|                  |                           |
|------------------|---------------------------|
| Input terminals  | Read-write (RW) parameter |
| Output terminals | Read-only (RO) parameter  |

The parameters are all shown in their default settings



## 6.2 Unidrive M200/201 parameter descriptions

Key:

| RW | Read / Write     | RO | Read only  | Num | Number parameter    | Bit | Bit parameter    | Txt | Text string | Bin | Binary parameter | FI | Filtered    |
|----|------------------|----|------------|-----|---------------------|-----|------------------|-----|-------------|-----|------------------|----|-------------|
| ND | No default value | NC | Not copied | PT  | Protected parameter | RA  | Rating dependent | US  | User save   | PS  | Power-down save  | DE | Destination |

| 00.001 {01.007} |   | Minimum Reference Clamp    |  |  |  |  |   |         |  |  |  |    |  |
|-----------------|---|----------------------------|--|--|--|--|---|---------|--|--|--|----|--|
| RW              |   | Num                        |  |  |  |  |   |         |  |  |  | US |  |
| OL              | ⇕ | ±VM_NEGATIVE_REF_CLAMP1 Hz |  |  |  |  | ⇒ | 0.00 Hz |  |  |  |    |  |
| RFC-A           |   |                            |  |  |  |  |   |         |  |  |  |    |  |

Set Pr **00.001** at the required minimum output frequency of the drive for both directions of rotation. The drive speed reference is scaled between Pr **00.001** and Pr **00.002**. Pr **00.001** is a nominal value; slip compensation may cause the actual frequency to be higher. When the drive is jogging, Pr **00.001** has no effect.

| 00.002 {01.006} |   | Maximum Reference Clamp   |  |  |  |  |   |                                                        |  |  |  |    |  |
|-----------------|---|---------------------------|--|--|--|--|---|--------------------------------------------------------|--|--|--|----|--|
| RW              |   | Num                       |  |  |  |  |   |                                                        |  |  |  | US |  |
| OL              | ⇕ | ±VM_POSITIVE_REF_CLAMP Hz |  |  |  |  | ⇒ | 50.0 Hz default: 50.00 Hz<br>60.0 Hz default: 60.00 Hz |  |  |  |    |  |
| RFC-A           |   |                           |  |  |  |  |   |                                                        |  |  |  |    |  |

Set Pr **00.002** at the required maximum output frequency for both directions of rotation. The drive speed reference is scaled between Pr **00.001** and Pr **00.002**. Pr **00.002** is a nominal value; slip compensation may cause the actual frequency to be higher. The drive has additional over-speed protection.

| 00.003 {02.011} |   | Acceleration Rate 1     |  |  |  |  |   |              |  |  |  |    |  |
|-----------------|---|-------------------------|--|--|--|--|---|--------------|--|--|--|----|--|
| RW              |   | Num                     |  |  |  |  |   |              |  |  |  | US |  |
| OL              | ⇕ | ±VM_ACCEL_RATE s/100 Hz |  |  |  |  | ⇒ | 5.0 s/100 Hz |  |  |  |    |  |
| RFC-A           |   |                         |  |  |  |  |   |              |  |  |  |    |  |

Set Pr **00.003** at the required rate of acceleration. Note that larger values produce lower acceleration. The rate applies in both directions of rotation.



| 00.004 {02.021} |     | Deceleration Rate 1     |  |  |   |               |  |    |  |
|-----------------|-----|-------------------------|--|--|---|---------------|--|----|--|
| RW              | Num |                         |  |  |   |               |  | US |  |
| OL              | ⇕   | ±VM_ACCEL_RATE s/100 Hz |  |  | ⇒ | 10.0 s/100 Hz |  |    |  |
| RFC-A           |     |                         |  |  |   |               |  |    |  |

Set Pr **00.004** at the required rate of deceleration. Note that larger values produce lower deceleration. The rate applies in both directions of rotation.

| 00.005 {11.034} |     | Drive Configuration                                                                                          |  |  |   |         |    |    |  |
|-----------------|-----|--------------------------------------------------------------------------------------------------------------|--|--|---|---------|----|----|--|
| RW              | Txt |                                                                                                              |  |  |   |         | PT | US |  |
| OL              | ⇕   | AV (0), AI (1), AV.Pr (2), AI.Pr (3),<br>Preset (4), Pad (5), Pad.Ref (6),<br>E.Pot (7), torque (8), Pid (9) |  |  | ⇒ | AV (0)* |    |    |  |
|                 |     |                                                                                                              |  |  |   |         |    |    |  |

\* With Unidrive M201, the default is Pad (5).

Use Pr **00.005** to select the required frequency/speed reference as follows:

| Value | Text    | Description                                                                                                                 |
|-------|---------|-----------------------------------------------------------------------------------------------------------------------------|
| 0     | AV      | Analog input 1 (voltage) Analog input 2 (voltage) selected by terminal (Local/Remote)                                       |
| 1     | AI      | Analog input 1 (current) or Analog input 2 (voltage) selected by terminal (Local/Remote)                                    |
| 2     | AV.Pr   | Analog input 1 (voltage) or 3 presets selected by terminal                                                                  |
| 3     | AI.Pr   | Analog input 1 (current) or 3 presets selected by terminal                                                                  |
| 4     | Preset  | Four presets selected by terminal                                                                                           |
| 5     | Pad     | Keypad reference                                                                                                            |
| 6     | Pad.Ref | Keypad reference with terminal control                                                                                      |
| 7     | E.Pot   | Electronic Potentiometer                                                                                                    |
| 8     | torque  | Torque mode, Analog input 1 (current frequency reference) or Analog input 2 (voltage torque reference) selected by terminal |
| 9     | Pid     | PID mode, Analog input 1 (current feedback source) and Analog input 2 (voltage reference source)                            |

**NOTE** A change to Pr **00.005** is set by pressing the MODE key on exit from parameter edit mode. The drive must be disabled, stopped or tripped for a change to take place. If Pr **00.005** is changed while the drive is running, when the MODE key is pressed on exit from parameter edit mode, Pr **00.005** will change back to its previous value.

**NOTE** When the setting of Pr **00.005** is changed, the appropriate drive configuration parameters are set back to their default values.

| 00.006 {05.007} |   | Motor Rated Current        |  |  |   |                             |    |  |    |
|-----------------|---|----------------------------|--|--|---|-----------------------------|----|--|----|
| RW              |   | Num                        |  |  |   |                             | RA |  | US |
| OL              | ⇕ | 0.00 to VM_RATED_CURRENT A |  |  | ⇒ | Maximum Heavy Duty Rating A |    |  |    |
| RFC-A           |   |                            |  |  |   |                             |    |  |    |

The rated current parameter must be set to the maximum continuous current of the motor (taken from the name plate). The motor rated current is used in the following:

- Current limits
- Motor thermal overload protection
- Vector mode voltage control
- Slip compensation (see *Enable Slip Compensation*)
- Dynamic V/F control

| 00.007 {05.008} |   | Motor Rated Speed  |  |  |   |                                                        |  |    |  |
|-----------------|---|--------------------|--|--|---|--------------------------------------------------------|--|----|--|
| RW              |   | Num                |  |  |   |                                                        |  | US |  |
| OL              | ⇕ | 0.0 to 80000.0 rpm |  |  | ⇒ | 50 Hz default: 1500.0 rpm<br>60 Hz default: 1800.0 rpm |  |    |  |
| RFC-A           |   |                    |  |  |   | 50 Hz default: 1450.0 rpm<br>60 Hz default: 1750.0rpm  |  |    |  |

Set to the rated speed of the motor (taken from the motor name plate). The motor rated speed is used to calculate the correct slip speed for the motor.

| 00.008 {05.009} |   | Motor Rated Voltage      |  |  |   |                                                                                                  |    |  |    |
|-----------------|---|--------------------------|--|--|---|--------------------------------------------------------------------------------------------------|----|--|----|
| RW              |   | Num                      |  |  |   |                                                                                                  | RA |  | US |
| OL              | ⇕ | 0 to VM_AC_VOLTAGE_SET V |  |  | ⇒ | 110 V drive: 230 V<br>200 V drive: 230 V<br>400 V drive 50 Hz: 400 V<br>400 V drive 60 Hz: 460 V |    |  |    |
| RFC-A           |   |                          |  |  |   |                                                                                                  |    |  |    |

The *Rated Voltage* (00.008) and the *Rated Frequency* (00.039) are used to define the voltage to frequency characteristic applied to the motor. The *Rated Frequency* (00.039) is also used in conjunction with the *Motor Rated Speed* (00.007) to calculate the rated slip for slip compensation.

| 00.009 {05.010} |   | Motor Rated Power Factor |  |  |   |      |    |  |    |
|-----------------|---|--------------------------|--|--|---|------|----|--|----|
| RW              |   | Num                      |  |  |   |      | RA |  | US |
| OL              | ⇕ | 0.00 to 1.00             |  |  | ⇒ | 0.85 |    |  |    |
| RFC-A           |   |                          |  |  |   |      |    |  |    |

Enter the motor rated power factor  $\cos \phi$  (taken from the motor name plate).

The drive can measure the motor rated power factor by performing a rotating autotune (see Autotune (Pr 00.038)).

| 00.010 {11.044} |   | User Security Status                                                     |  |  |  |    |             |    |    |  |
|-----------------|---|--------------------------------------------------------------------------|--|--|--|----|-------------|----|----|--|
| RW              |   | Num                                                                      |  |  |  | ND | NC          | PT | US |  |
| <b>OL</b>       | ⇕ | LEVEL.0 (0), ALL (1), r.only.0 (2), r.only.A (3), Status (4), no.Acc (5) |  |  |  | ⇒  | LEVEL.0 (0) |    |    |  |
| <b>RFC-A</b>    |   |                                                                          |  |  |  |    |             |    |    |  |

This parameter controls access via the drive keypad as follows:

| Value | Text                        | Function                                                                                                                                                                           |
|-------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0     | Menu 0 (LEVEL.0)            | All writable parameters are available to be edited but only parameters in Menu 0 are visible.                                                                                      |
| 1     | All Menus (ALL)             | All writable parameters are visible and available to be edited.                                                                                                                    |
| 2     | Read-only Menu 0 (r.only.0) | All parameters are read-only. Access is limited to Menu 0 parameters only.                                                                                                         |
| 3     | Read-only (r.only.A)        | All parameters are read-only however all menus and parameters are visible.                                                                                                         |
| 4     | Status Only (Status)        | The keypad remains in status mode and no parameters can be viewed or edited.                                                                                                       |
| 5     | No Access (no.Acc)          | The keypad remains in status mode and no parameters can be viewed or edited. Drive parameters cannot be accessed via a comms/fieldbus interface in the drive or any option module. |

| 00.015 {01.005} |   | Jog Reference     |  |  |  |   |         |  |    |  |
|-----------------|---|-------------------|--|--|--|---|---------|--|----|--|
| RW              |   | Num               |  |  |  |   |         |  | US |  |
| <b>OL</b>       | ⇕ | 0.00 to 300.00 Hz |  |  |  | ⇒ | 1.50 Hz |  |    |  |
| <b>RFC-A</b>    |   |                   |  |  |  |   |         |  |    |  |

Defines the reference when jog is enabled.

| 00.016 {07.007} |   | Analog Input 1 Mode                                                                                                                                               |  |  |   |          |  |    |  |
|-----------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---|----------|--|----|--|
| RW              |   | Txt                                                                                                                                                               |  |  |   |          |  | US |  |
| OL              | ⇕ | 4-20.S (-6), 20-4.S (-5), 4-20.L (-4),<br>20-4.L (-3), 4-20.H (-2), 20-4.H (-1),<br>0-20 (0), 20-0 (1), 4-20.tr (2),<br>20-4.tr (3), 4-20 (4), 20-4 (5), Volt (6) |  |  | ⇒ | Volt (6) |  |    |  |

Defines the mode of analog input 1.

The table below gives all the possible analog input modes.

| Value | Text    | Function                                                       |
|-------|---------|----------------------------------------------------------------|
| -6    | 4-20.S  | Stop on loss                                                   |
| -5    | 20-4.S  | Stop on loss                                                   |
| -4    | 4-20.L  | 4-20 mA switching to equivalent of 4 mA input current on loss  |
| -3    | 20-4.L  | 20-4 mA switching to equivalent of 20 mA input current on loss |
| -2    | 4-20.H  | 4-20 mA hold at level before loss on loss                      |
| -1    | 20-4.H  | 20-4 mA hold at level before loss on loss                      |
| 0     | 0-20    | 0-20 mA                                                        |
| 1     | 20-0    | 20-0 mA                                                        |
| 2     | 4-20.tr | 4-20 mA trip on loss                                           |
| 3     | 20-4.tr | 20-4 mA trip on loss                                           |
| 4     | 4-20    | 4-20 mA no action on loss                                      |
| 5     | 20-4    | 20-4 mA no action on loss                                      |
| 6     | Volt    | Voltage                                                        |

**NOTE** In 4-20 mA and 20-4 mA modes loss of input is detected if the current falls below 3 mA.

**NOTE** If both analog inputs (A1 and A2) are to be set-up as voltage inputs, and if the potentiometers are supplied from the drive's +10 V rail (terminal T3), they must have a resistance >4 kΩ each.

| 00.017 {01.010} |   | Bipolar Reference Enable |  |  |   |         |  |    |  |
|-----------------|---|--------------------------|--|--|---|---------|--|----|--|
| RW              |   | Bit                      |  |  |   |         |  | US |  |
| OL              | ⇕ | Off (0) or On (1)        |  |  | ⇒ | Off (0) |  |    |  |
| RFC-A           |   |                          |  |  |   |         |  |    |  |

Pr **00.017** determines whether the reference is uni-polar or bi-polar.

See *Minimum Reference Clamp* (00.001). Allows negative speed reference in keypad mode.

| 00.018 {01.021} |     | Preset Reference 1    |  |  |   |         |  |    |  |
|-----------------|-----|-----------------------|--|--|---|---------|--|----|--|
| RW              | Num |                       |  |  |   |         |  | US |  |
| OL              | ⇅   | ±VM_SPEED_FREQ_REF Hz |  |  | ⇒ | 0.00 Hz |  |    |  |
| RFC-A           |     |                       |  |  |   |         |  |    |  |

If the preset reference has been selected (see Pr **00.005**), the speed at which the motor runs is determined by these parameters.

See *Drive Configuration* (00.005).

| 00.025 {11.030} |     | User Security Code |  |  |    |    |    |    |  |
|-----------------|-----|--------------------|--|--|----|----|----|----|--|
| RW              | Num |                    |  |  | ND | NC | PT | US |  |
| OL              | ⇅   | 0-9999             |  |  | ⇒  | 0  |    |    |  |
| RFC-A           |     |                    |  |  |    |    |    |    |  |

If any number other than 0 is programmed into this parameter, user security can be applied so that no parameters except Pr **00.010** can be adjusted with the keypad. When this parameter is read via a keypad it appears as zero. Refer to the *Drive User Guide* for further information.

| 00.027 {01.051} |     | Power-up Keypad Control Mode Reference |  |  |    |           |    |    |  |
|-----------------|-----|----------------------------------------|--|--|----|-----------|----|----|--|
| RW              | Txt |                                        |  |  | ND | NC        | PT | US |  |
| OL              | ⇅   | Reset (0), Last (1), Preset (2)        |  |  | ⇒  | Reset (0) |    |    |  |
| RFC-A           |     |                                        |  |  |    |           |    |    |  |

Defines which value of keypad control mode reference is displayed at power-up.

| Value | Text   | Description                                                        |
|-------|--------|--------------------------------------------------------------------|
| 0     | Reset  | Keypad reference is zero                                           |
| 1     | Last   | Keypad reference is the last used value                            |
| 2     | Preset | Keypad reference is copied from <i>Preset Reference 1</i> (00.018) |

| 00.028 {02.004} |     | Ramp Mode Select                               |  |  |   |         |  |    |  |
|-----------------|-----|------------------------------------------------|--|--|---|---------|--|----|--|
| RW              | Txt |                                                |  |  |   |         |  | US |  |
| OL              | ⇅   | Fast (0), Std (1), Std.bst (2),<br>Fst.bst (3) |  |  | ⇒ | Std (1) |  |    |  |
| RFC-A           |     |                                                |  |  |   |         |  |    |  |

Defines the mode used by the ramp system.

**0:** Fast ramp

**1:** Standard ramp

**2:** Standard ramp with motor voltage boost

### 3: Fast ramp with motor voltage boost

Fast ramp is linear deceleration at programmed rate, normally used when a braking resistor is installed.

Standard ramp is controlled deceleration to prevent DC bus over-voltage trips, normally used when there is no braking resistor installed.

If a high motor voltage mode is selected, deceleration rates can be faster for a given inertia but motor temperatures will be higher.

| 00.029 {02.002} |   | Ramp Enable       |  |  |  |  |   |        |  |    |  |  |
|-----------------|---|-------------------|--|--|--|--|---|--------|--|----|--|--|
| RW              |   | Bit               |  |  |  |  |   |        |  | US |  |  |
| OL              | ⇕ |                   |  |  |  |  | ⇒ |        |  |    |  |  |
| RFC-A           |   | Off (0) or On (1) |  |  |  |  |   | On (1) |  |    |  |  |

Setting Pr **00.029** to 0 allows the user to disable the ramps. This is generally used when the drive is required to closely follow a speed reference which already contains acceleration and deceleration ramps.

| 00.030 {11.042} |     | Parameter Cloning                                      |  |  |  |    |          |     |  |
|-----------------|-----|--------------------------------------------------------|--|--|--|----|----------|-----|--|
| RW              | Txt |                                                        |  |  |  | NC |          | US* |  |
| OL              | ⇕   | None (0), Read (1), Program (2),<br>Auto (3), Boot (4) |  |  |  | ⇒  | None (0) |     |  |
| RFC-A           |     |                                                        |  |  |  |    |          |     |  |

\* Only a value of 3 or 4 in this parameter is saved.

If Pr **00.030** is equal to 1 or 2, this value is not transferred to the EEPROM or the drive. If Pr **00.030** is set to a 3 or 4 the value is transferred.

| Parameter string | Parameter value | Comment                                          |
|------------------|-----------------|--------------------------------------------------|
| None             | 0               | Inactive                                         |
| Read             | 1               | Read parameter set from the NV Media Card        |
| Program          | 2               | Programming a parameter set to the NV Media Card |
| Auto             | 3               | Auto save                                        |
| Boot             | 4               | Boot mode                                        |

For further information, please refer to Chapter 9 *NV Media Card Operation* on page 56.

| 00.031 {06.001} |   | Stop Mode                                                                    |  |  |   |        |  |    |  |
|-----------------|---|------------------------------------------------------------------------------|--|--|---|--------|--|----|--|
| RW              |   | Txt                                                                          |  |  |   |        |  | US |  |
| OL              | ↕ | CoASt (0), rP (1), rP.dc l (2),<br>dc l (3), td.dc l (4), dis (5)            |  |  | ⇒ | rP (1) |  |    |  |
| RFC-A           |   | CoASt (0), rP (1), rP.dc l (2),<br>dc l (3), td.dc l (4), dis (5), No.rP (6) |  |  |   |        |  |    |  |

Defines how the motor is controlled when the run signal is removed from the drive.

| Value | Text   | Description                                         |
|-------|--------|-----------------------------------------------------|
| 0     | Coast  | Coast stop                                          |
| 1     | rp     | Ramp stop                                           |
| 2     | rP.dcl | Ramp stop + 1 second dc injection                   |
| 3     | dc I   | Injection braking stop with detection of zero speed |
| 4     | td.dcl | Timed injection braking stop                        |
| 5     | Dis    | Disable                                             |
| 6     | No.rP  | No ramp (RFC-A mode only)                           |

See the *Drive User Guide* for further information.

| 00.032 {05.013} |   | Dynamic V To F Select / Flux Optimisation Select |  |  |   |   |  |    |  |
|-----------------|---|--------------------------------------------------|--|--|---|---|--|----|--|
| RW              |   | Num                                              |  |  |   |   |  | US |  |
| OL              | ↕ | 0 to 1                                           |  |  | ⇒ | 0 |  |    |  |
| RFC-A           |   |                                                  |  |  |   |   |  |    |  |

Set to 1 to enable Dynamic V to F mode.

**0:** Fixed linear voltage to frequency ratio (constant torque - standard load)

**1:** Voltage to frequency ratio dependant on load current. This gives a higher motor efficiency.

| 00.033 {06.009} |   | Catch a Spinning Motor                           |  |  |   |         |  |    |  |
|-----------------|---|--------------------------------------------------|--|--|---|---------|--|----|--|
| RW              |   | Txt                                              |  |  |   |         |  | US |  |
| OL              | ↕ | dis (0), Enable (1), Fr.Only (2),<br>Rv.Only (3) |  |  | ⇒ | dis (0) |  |    |  |
| RFC-A           |   |                                                  |  |  |   |         |  |    |  |

If the drive is to be configured in fixed boost mode (Pr **00.041** = Fd or SrE) with catch a spinning motor software enabled, an autotune (see **Pr 00.038** on page 42) must be carried out to measure the motor's stator resistance beforehand. If a stator resistance is not measured, the drive may trip on 0 V or OL.AC while trying to catch a spinning motor.

| Pr 00.033 | Text    | Function                         |
|-----------|---------|----------------------------------|
| 0         | Dis     | Disabled                         |
| 1         | Enable  | Detect all frequencies           |
| 2         | Fr.Only | Detect positive frequencies only |
| 3         | Rv.Only | Detect negative frequencies only |

| 00.034 {08.005} |     | Digital Input 5 Mode                               |  |  |   |           |  |    |  |
|-----------------|-----|----------------------------------------------------|--|--|---|-----------|--|----|--|
| RW              | Txt |                                                    |  |  |   |           |  | US |  |
| OL              | ↕   | Input (0), th.Sct (1), th (2), th.Notr (3), Fr (4) |  |  | ⇒ | Input (0) |  |    |  |
| RFC-A           |     |                                                    |  |  |   |           |  |    |  |

This parameter selects the function of Digital Input 5.

| Value | Text        | Function                                                                       |
|-------|-------------|--------------------------------------------------------------------------------|
| 0     | Input (0)   | Digital input                                                                  |
| 1     | th.Sct (1)  | Temperature measurement input with short circuit detection (Resistance <50 Ω ) |
| 2     | th (2)      | Temperature measurement input without short circuit detection but with th trip |
| 3     | th.Notr (3) | Temperature measurement input with no trips                                    |
| 4     | Fr (4)      | Frequency input                                                                |

| 00.035 {08.091} |     | DO1 Control (terminal 10) |  |  |   |   |  |    |  |
|-----------------|-----|---------------------------|--|--|---|---|--|----|--|
| RW              | Num |                           |  |  |   |   |  | US |  |
| OL              | ↕   | 0-21                      |  |  | ⇒ | 0 |  |    |  |
| RFC-A           |     |                           |  |  |   |   |  |    |  |

Defines the behaviour of digital output 1.

| Value | Description                                                                                                                                              |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0     | User defined by Digital IO1 Source/Destination A, Digital IO2 Source/Destination A, <i>Relay 1 Output Source A</i> , or <i>Relay 2 Output Source A</i> . |
| 1     | Drive running signal (RUN)                                                                                                                               |
| 2     | Frequency arrived signal (FAR)                                                                                                                           |
| 3     | Frequency level detection signal (FDT1)                                                                                                                  |
| 4     | Frequency level detection signal (FDT2)                                                                                                                  |
| 5     | Overload detection signal (OL)                                                                                                                           |
| 6     | Power off state (LU)                                                                                                                                     |
| 7     | External fault stop (EXT)                                                                                                                                |
| 8     | Frequency upper limit (FHL)                                                                                                                              |
| 9     | Frequency lower limit (FLL)                                                                                                                              |
| 10    | Drive running at zero frequency                                                                                                                          |
| 14    | Drive (RDY)                                                                                                                                              |
| 15    | Drive OK                                                                                                                                                 |
| 18    | Brake release                                                                                                                                            |
| 19    | Torque limiting (Valid while the torque is limited by torque limiting value 1/2)                                                                         |
| 20    | Forward or reverse                                                                                                                                       |
| 21    | Motor 1 or 2                                                                                                                                             |



| 00.036 {07.055} |   | Analog Output 1 Control |  |  |   |   |  |    |  |
|-----------------|---|-------------------------|--|--|---|---|--|----|--|
| RW              |   | Txt                     |  |  |   |   |  | US |  |
| OL              | ⇕ | 0 to 14                 |  |  | ⇒ | 0 |  |    |  |
| RFC-A           |   |                         |  |  |   |   |  |    |  |

Defines the functionality of Analog Output 1.

| Value | Description                              |
|-------|------------------------------------------|
| 0     | User defined by Analog Output 1 Source A |
| 1     | Frequency output                         |
| 2     | Frequency reference                      |
| 3     | Motor speed                              |
| 4     | Current Magnitude                        |
| 6     | Torque output                            |
| 7     | Torque current output                    |
| 8     | Voltage output                           |
| 9     | DC bus voltage (0~800 V)                 |
| 10    | Analog Input 1                           |
| 11    | Analog Input 2                           |
| 12    | Power output (0~2 x Pe)                  |
| 13    | Torque limitation                        |
| 14    | Torque reference (0~300 %)               |

| 00.037 {05.018} |   | Maximum Switching Frequency                                                |  |  |  |   |           |  |    |
|-----------------|---|----------------------------------------------------------------------------|--|--|--|---|-----------|--|----|
| RW              |   | Txt                                                                        |  |  |  |   |           |  | US |
| OL              | ⇕ | 0.667 (0), 1 (1), 2 (2), 3 (3), 4 (4),<br>6 (5), 8 (6), 12 (7), 16 (8) kHz |  |  |  | ⇒ | 3 (3) kHz |  |    |
| RFC-A           |   | 2 (2), 3 (3), 4 (4), 6 (5), 8 (6), 12 (7),<br>16 (8) kHz                   |  |  |  |   |           |  |    |

Defines the maximum switching frequency that can be used by the drive.

| Pr 00.037 | Text  | Description                |
|-----------|-------|----------------------------|
| 0         | 0.667 | 667 Hz switching frequency |
| 1         | 1     | 1 kHz switching frequency  |
| 2         | 2     | 2 kHz switching frequency  |
| 3         | 3     | 3 kHz switching frequency  |
| 4         | 4     | 4 kHz switching frequency  |
| 5         | 6     | 6 kHz switching frequency  |
| 6         | 8     | 8 kHz switching frequency  |
| 7         | 12    | 12 kHz switching frequency |
| 8         | 16    | 16 kHz switching frequency |

See the *Drive User Guide* for drive derating data.

| 00.038 {05.012} |   |        | Autotune |  |   |   |    |  |    |  |
|-----------------|---|--------|----------|--|---|---|----|--|----|--|
| RW              |   | Num    |          |  |   |   | NC |  | US |  |
| OL              | ↕ | 0 to 2 |          |  | ⇒ | 0 |    |  |    |  |
| RFC-A           |   | 0 to 3 |          |  |   |   |    |  |    |  |

Defines the auto-tune test to be performed.

There are two autotune tests available in open loop mode, a stationary and a rotating test. A rotating autotune should be used whenever possible so the measured value of power factor of the motor is used by the drive.

#### Open Loop and RFC-A:

1. A stationary autotune can be used when the motor is loaded and it is not possible to remove the load from the motor shaft. To perform a Stationary autotune, set Pr **00.038** to 1,
2. A rotating autotune should only be used if the motor is unloaded. A rotating autotune first performs a stationary autotune, as above, then a rotating test is performed in which the motor is accelerated with currently selected ramps up to a frequency of *Rated Frequency* (00.039) x 2/3, and the frequency is maintained at that level for 4 seconds. To perform a Rotating autotune, set Pr **00.038** to 2.

#### RFC-A only:

3. This test measures the mechanical characteristic of the motor and load by rotating the motor. This test should only be used provided all the basic control parameters have been set-up correctly. The test measures the motor and load inertia, which can be used in automatic set-up of the frequency controller gains and in producing a torque feed-forward term. It also measures the load compensation parameters to cancel resonance effects.

Following the completion of an autotune test the drive will go into the inhibit state. The drive must be placed into a controlled disable condition before the drive can be made to run at the required reference. The drive can be put in to a controlled disable condition by removing the Safe Torque Off signal from terminals, setting the *Drive Enable* to Off (0) or disabling the drive via the *Control Word* and *Control Word Enable*



A rotating autotune will cause the motor to accelerate up to 2/3 base speed in the direction selected regardless of the reference provided. Once complete the motor will coast to a stop. The enable signal must be removed before the drive can be made to run at the required reference. The drive can be stopped at any time by removing the run signal or removing the drive enable.

| 00.039 {05.006} |   | Motor Rated Frequency                     |  |  |   |                                    |  |  |    |
|-----------------|---|-------------------------------------------|--|--|---|------------------------------------|--|--|----|
| RW              |   | Num                                       |  |  |   |                                    |  |  | US |
| OL              | ↕ | 0.00 to VM_SPEED_FREQ_REF_<br>UNIPOLAR Hz |  |  | ⇒ | 50 Hz: 50.00 Hz<br>60 Hz: 60.00 Hz |  |  |    |
| RFC-A           |   |                                           |  |  |   |                                    |  |  |    |

Enter the value from the rating plate of the motor. Defines the voltage to frequency ratio applied to the motor.

| 00.040 {05.011} |     | Number Of Motor Poles |  |  |   |          |  |    |  |
|-----------------|-----|-----------------------|--|--|---|----------|--|----|--|
| RW              | Num |                       |  |  |   |          |  | US |  |
| OL              | ⇅   | Auto (0) to 32 (16)   |  |  | ⇒ | Auto (0) |  |    |  |
| RFC-A           |     |                       |  |  |   |          |  |    |  |

Set to the number of poles of the motor. The auto mode calculates the number of motor poles from the settings of Pr **00.007** and Pr **00.039**.

| 00.041 {05.014} |     | Control Mode                                                            |  |  |   |          |  |    |  |
|-----------------|-----|-------------------------------------------------------------------------|--|--|---|----------|--|----|--|
| RW              | Txt |                                                                         |  |  |   |          |  | US |  |
| OL              | ⇅   | Ur.S (0), Ur (1), Fd (2), Ur.Auto (3),<br>Ur.I (4), SrE (5), Fd.tap (6) |  |  | ⇒ | Ur.I (4) |  |    |  |
| RFC-A           |     |                                                                         |  |  |   |          |  |    |  |

Defines the drive output mode, which can either be a voltage mode or a current mode.

| Value | Text       | Description                                                         |
|-------|------------|---------------------------------------------------------------------|
| 0     | Ur.S       | Stator resistance and voltage offset measured at each start         |
| 1     | Ur         | No measurements                                                     |
| 2     | Fd         | Fixed boost mode.                                                   |
| 3     | Ur.Auto    | Stator resistance and voltage offset measured at first drive enable |
| 4     | Ur.I       | Stator resistance and voltage offset measured at each power-up      |
| 5     | SrE        | Square law characteristic                                           |
| 6     | Fd.tap (6) | Fixed boost with taper                                              |

**NOTE**

The drive default setting is Ur I mode which means that the drive will carry out an autotune every time the drive is powered-up and enabled. If the load is not going to be stationary when the drive is powered-up and enabled, then one of the other modes should be selected. Not selecting another mode could result in poor motor performance or OI.AC, It.AC or 0 V trips.

| 00.042 {05.015} |     | Low Frequency Voltage Boost |  |  |   |     |  |    |  |
|-----------------|-----|-----------------------------|--|--|---|-----|--|----|--|
| RW              | Num |                             |  |  |   |     |  | US |  |
| OL              | ⇅   | 0.0 to 25.0 %               |  |  | ⇒ | 3 % |  |    |  |
| RFC-A           |     |                             |  |  |   |     |  |    |  |

Determines the boost level when Pr **00.041** is set to Fd, SrE or Fd.tap modes.

| 00.043 {11.025} |   | Serial Baud Rate                                                                                                              |  |  |   |           |  |    |  |
|-----------------|---|-------------------------------------------------------------------------------------------------------------------------------|--|--|---|-----------|--|----|--|
| RW              |   | Txt                                                                                                                           |  |  |   |           |  | US |  |
| OL              | ↕ | 300 (0), 600 (1), 1200 (2),<br>2400 (3), 4800 (4), 9600 (5),<br>19200 (6), 38400 (7),<br>57600 (8), 76800 (9),<br>115200 (10) |  |  | ⇒ | 19200 (6) |  |    |  |
| RFC-A           |   |                                                                                                                               |  |  |   |           |  |    |  |

Defines the serial baud rate of the drive

Changing the parameters does not immediately change the serial communications settings. See *Reset Serial Communications* (00.045) for more details.

| 00.044 {11.023} |   | Serial Address |  |  |   |   |  |    |  |
|-----------------|---|----------------|--|--|---|---|--|----|--|
| RW              |   | Num            |  |  |   |   |  | US |  |
| OL              | ↕ | 1 to 247       |  |  | ⇒ | 1 |  |    |  |
| RFC-A           |   |                |  |  |   |   |  |    |  |

Used to define the unique address for the drive for the serial interface. The drive is always a slave address 0 is used to globally address all slaves, and so this address should not be set in this parameter.

Changing the parameters does not immediately change the serial communications settings. See *Reset Serial Communications* (00.045) for more details.

| 00.045 {11.020} |   | Reset Serial Communications |  |  |   |         |    |  |    |
|-----------------|---|-----------------------------|--|--|---|---------|----|--|----|
| RW              |   | Bit                         |  |  |   | ND      | NC |  | US |
| OL              | ↕ | Off (0) or On (1)           |  |  | ⇒ | Off (0) |    |  |    |
| RFC-A           |   |                             |  |  |   |         |    |  |    |

Set to On (1) to update communications set-up.

**NOTE** The display will briefly display On and return to Off on reset.

| 00.046 {12.042} |   | Brake Controller Upper Current Threshold |  |  |   |      |  |    |  |
|-----------------|---|------------------------------------------|--|--|---|------|--|----|--|
| RW              |   | Num                                      |  |  |   |      |  | US |  |
| OL              | ⇅ | 0 to 200 %                               |  |  | ⇒ | 50 % |  |    |  |
| RFC-A           |   |                                          |  |  |   |      |  |    |  |

Defines the upper current threshold for the brake. See Brake Controller Brake Release in *Drive User Guide*.

| 00.047 {12.043} |   | Brake Controller Lower Current Threshold |  |  |   |      |  |    |  |
|-----------------|---|------------------------------------------|--|--|---|------|--|----|--|
| RW              |   | Num                                      |  |  |   |      |  | US |  |
| OL              | ⇅ | 0 to 200 %                               |  |  | ⇒ | 10 % |  |    |  |
| RFC-A           |   |                                          |  |  |   |      |  |    |  |

Defines the lower current limit for the brake. See Brake Controller Brake Release in *Drive User Guide*.

| 00.048 {12.044} |   | Brake Controller Brake Release Frequency |  |  |   |         |  |    |  |
|-----------------|---|------------------------------------------|--|--|---|---------|--|----|--|
| RW              |   | Num                                      |  |  |   |         |  | US |  |
| OL              | ⇅ | 0.00 to 20.00 Hz                         |  |  | ⇒ | 1.00 Hz |  |    |  |
| RFC-A           |   |                                          |  |  |   |         |  |    |  |

Defines the Brake Release Frequency. See Brake Controller Brake Release in *Drive User Guide*.

| 00.049 {12.045} |   | Brake Controller Brake Apply Frequency |  |  |   |         |  |    |  |
|-----------------|---|----------------------------------------|--|--|---|---------|--|----|--|
| RW              |   | Num                                    |  |  |   |         |  | US |  |
| OL              | ⇅ | 0.00 to 20.00 Hz                       |  |  | ⇒ | 2.00 Hz |  |    |  |
| RFC-A           |   |                                        |  |  |   |         |  |    |  |

Defines the Brake Apply Frequency. See Brake Controller Brake Release in *Drive User Guide*.

| 00.050 {12.046} |   | Brake Controller Brake Delay |  |  |   |       |  |    |  |
|-----------------|---|------------------------------|--|--|---|-------|--|----|--|
| RW              |   | Num                          |  |  |   |       |  | US |  |
| OL              | ⇅ | 0.0 to 25.0 s                |  |  | ⇒ | 1.0 s |  |    |  |
| RFC-A           |   |                              |  |  |   |       |  |    |  |

Defines the pre-brake release delay. See Brake Controller Brake Release in *Drive User Guide*.

| 00.051 {12.047} |     | Brake Controller Post-brake Release Delay |  |  |   |       |  |    |  |
|-----------------|-----|-------------------------------------------|--|--|---|-------|--|----|--|
| RW              | Num |                                           |  |  |   |       |  | US |  |
| OL              | ⇕   | 0.0 to 25.0 s                             |  |  | ⇒ | 1.0 s |  |    |  |
| RFC-A           |     |                                           |  |  |   |       |  |    |  |

Defines the post-brake release delay.

| 00.053 {12.047} |     | Brake Controller Initial Direction |  |  |   |         |  |    |  |
|-----------------|-----|------------------------------------|--|--|---|---------|--|----|--|
| RW              | Txt |                                    |  |  |   |         |  | US |  |
| OL              | ⇕   | Ref (0), For (1), Rev (2)          |  |  | ⇒ | Ref (0) |  |    |  |
| RFC-A           |     |                                    |  |  |   |         |  |    |  |

Defines the initial direction of the brake.

| Value | Text |
|-------|------|
| 0     | reF  |
| 1     | For  |
| 2     | Rev  |

See Brake Controller Brake Release in *Drive User Guide*.

| 00.054 {12.051} |     | Brake Controller Brake Apply Through Zero Threshold |  |  |   |         |  |    |  |
|-----------------|-----|-----------------------------------------------------|--|--|---|---------|--|----|--|
| RW              | Num |                                                     |  |  |   |         |  | US |  |
| OL              | ⇕   | 0.00 to 25.00 Hz                                    |  |  | ⇒ | 0.00 Hz |  |    |  |
| RFC-A           |     |                                                     |  |  |   |         |  |    |  |

Defines if the brake is applied through zero threshold. See Brake Controller Brake Release in *Drive User Guide*.

| 00.055 {12.041} |     | Brake Controller Enable                  |  |  |   |         |  |    |  |
|-----------------|-----|------------------------------------------|--|--|---|---------|--|----|--|
| RW              | Txt |                                          |  |  |   |         |  | US |  |
| OL              | ⇕   | dis (0), Relay (1), dig IO (2), User (3) |  |  | ⇒ | dis (0) |  |    |  |
| RFC-A           |     |                                          |  |  |   |         |  |    |  |

| Value | Text   |
|-------|--------|
| 0     | Dis    |
| 1     | Relay  |
| 2     | dig IO |
| 3     | USEr   |

If *Brake Controller Enable* (00.055) = 0, the brake controller is disabled.

If *Brake Controller Enable* (00.055) = 1, the brake controller is enabled with I/O set up to control the brake via the relay output. Drive ok is re-routed to digital I/O.

If *Brake Controller Enable* (00.055) = 2, the brake controller is enabled with I/O set up to control the brake via digital I/O. Drive ok is routed to the relay output.

If *Brake Controller Enable* (00.055) = 3, the brake controller is enabled, but no parameters are set up to select the brake output.

| 00.065 {03.010} |   | Frequency Controller Proportional Gain Kp1 |  |  |  |   |             |  |    |  |
|-----------------|---|--------------------------------------------|--|--|--|---|-------------|--|----|--|
| RW              |   | Num                                        |  |  |  |   |             |  | US |  |
| OL              | ↕ |                                            |  |  |  | ⇒ |             |  |    |  |
| RFC-A           |   | 0.000 to 200.000 s/rad                     |  |  |  |   | 0.100 s/rad |  |    |  |

Defines the proportional gain for frequency controller 1.

#### RFC modes only.

The controller includes a feed forward proportional gain (Kp), a feed forward integral gain (Ki), and a differential feedback gain (Kd).

#### Proportional gain (Kp)

If Kp is non-zero and Ki is zero the controller will only have a proportional term, and there must be a frequency error to produce a torque reference. Therefore as the motor load increases there will be a difference between the reference and actual frequencies.

#### Integral gain (Ki)

The integral gain is provided to prevent frequency regulation. The error is accumulated over a period of time and used to produce the necessary torque reference without any frequency error. Increasing the integral gain reduces the time taken for the frequency to reach the correct level and increases the stiffness of the system, i.e. it reduces the positional displacement produced by applying a load torque to the motor.

#### Differential gain (Kd)

The differential gain is provided in the feedback of the frequency controller to give additional damping.

| 00.066 {03.011} |   | Frequency Controller Integral Gain Ki1 |  |  |  |   |                          |  |    |  |
|-----------------|---|----------------------------------------|--|--|--|---|--------------------------|--|----|--|
| RW              |   | Num                                    |  |  |  |   |                          |  | US |  |
| OL              | ↕ |                                        |  |  |  | ⇒ |                          |  |    |  |
| RFC-A           |   | 0.00 to 655.35 s <sup>2</sup> /rad     |  |  |  |   | 0.10 s <sup>2</sup> /rad |  |    |  |

Defines the integral gain for frequency controller 1. See *Frequency Controller Proportional Gain Kp1* (00.065).

| 00.067 {03.079} |   | Sensorless Mode Filter                           |  |  |  |   |          |  |    |  |
|-----------------|---|--------------------------------------------------|--|--|--|---|----------|--|----|--|
| RW              |   | Txt                                              |  |  |  |   |          |  | US |  |
| OL              | ⇕ |                                                  |  |  |  | ⇒ |          |  |    |  |
| RFC-A           |   | 4 (0), 5 (1), 6 (2), 8 (3), 12 (4),<br>20 (5) ms |  |  |  |   | 4 (0) ms |  |    |  |

Defines the time constant for the filter applied to the output of the frequency estimator system.

| 00.069 {05.040} |   | Spin Start Boost |  |  |  |   |     |    |  |
|-----------------|---|------------------|--|--|--|---|-----|----|--|
| RW              |   | Num              |  |  |  |   |     | US |  |
| OL              | ⇕ | 0.0 to 10.0      |  |  |  | ⇒ | 1.0 |    |  |
| RFC-A           |   |                  |  |  |  |   |     |    |  |

*Spin Start Boost* (00.069) is used by the algorithm that detects the frequency of a spinning motor when the drive is enabled and *Catch A Spinning Motor* (00.033)  $\geq 1$ . For smaller motors the default value of 1.0 is suitable, but for larger motors *Spin Start Boost* (00.069) may need to be increased. If *Spin Start Boost* (00.069) is too small the drive will detect zero speed whatever the frequency of the motor, and if *Spin Start Boost* (00.069) is too large the motor may accelerate away from standstill when the drive is enabled.

| 00.076 {10.037} |   | Action On Trip Detection |  |  |  |    |    |    |    |
|-----------------|---|--------------------------|--|--|--|----|----|----|----|
| RW              |   | Num                      |  |  |  | ND | NC | PT | US |
| OL              | ⇕ | 0 - 31                   |  |  |  | ⇒  | 0  |    |    |
| RFC-A           |   |                          |  |  |  |    |    |    |    |

**Bit 0:** Stop on defined non-important trips

**Bit 1:** Disable braking resistor overload detection

**Bit 2:** Disable phase loss stop

**Bit 3:** Disable braking resistor temperature monitoring

**Bit 4:** Disable parameter freeze on trip. Refer to *Drive User Guide*.

| 00.077 {11.032} |   | Maximum Heavy Duty Rating |  |  |  |    |    |    |  |
|-----------------|---|---------------------------|--|--|--|----|----|----|--|
| RO              |   | Num                       |  |  |  | ND | NC | PT |  |
| OL              | ⇕ | 0.00 to 9999.99 A         |  |  |  | ⇒  |    |    |  |
| RFC-A           |   |                           |  |  |  |    |    |    |  |

Displays the maximum heavy duty current rating of the drive.



| 00.078 {11.029} |   | Software Version |  |  |  |    |    |    |  |  |
|-----------------|---|------------------|--|--|--|----|----|----|--|--|
| RO              |   | Num              |  |  |  | ND | NC | PT |  |  |
| OL              | ⇅ | 0 to 999999      |  |  |  | ⇒  |    |    |  |  |
| RFC-A           |   |                  |  |  |  |    |    |    |  |  |

Displays the software version in the drive.

| 00.079 {11.031} |   | User Drive Mode        |  |  |  |    |             |    |    |  |
|-----------------|---|------------------------|--|--|--|----|-------------|----|----|--|
| RW              |   | Txt                    |  |  |  | ND | NC          | PT | US |  |
| OL              | ⇅ | OPEn.LP (1), RFC-A (2) |  |  |  | ⇒  | OPEn.LP (1) |    |    |  |
| RFC-A           |   |                        |  |  |  |    | RFC-A (2)   |    |    |  |

Defines the mode of the drive.

## 7 Running the motor

This section takes a new user through all the essential steps to running a motor for the first time.

**Table 7-1 Open Loop and RFC-A**

| Action                                                 | Detail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Before power up                                        | Ensure: <ul style="list-style-type: none"> <li>The drive enable signal is not given, terminal 11 is open</li> <li>The run signal is not given, terminal 12/13 is open</li> <li>The motor is connected to the drive</li> <li>The motor connection is correct for the drive <math>\Delta</math> or Y</li> <li>The correct supply voltage is connected to the drive</li> </ul>                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Power up the drive                                     | The default setting is Open Loop vector mode. For RFC-A mode set Pr <b>00.079</b> to RFC-A, then press the  stop/reset button to save the parameters.<br>Ensure: <ul style="list-style-type: none"> <li>The drive displays: Inh</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Enter minimum and maximum speeds                       | Enter: <ul style="list-style-type: none"> <li>Minimum speed Pr <b>00.001</b> (Hz)</li> <li>Maximum speed Pr <b>00.002</b> (Hz)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Enter accel and decel rates                            | Enter: <ul style="list-style-type: none"> <li>Acceleration rate Pr <b>00.003</b> (s/100 Hz)</li> <li>Deceleration rate Pr <b>00.004</b> (s/100 Hz)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Enter motor nameplate details                          | Enter: <ul style="list-style-type: none"> <li>Motor rated current in Pr <b>00.006</b> (A)</li> <li>Motor rated speed in Pr <b>00.007</b> (rpm)</li> <li>Motor rated voltage in Pr <b>00.008</b> (V)</li> <li>Motor rated power factor in Pr <b>00.009</b></li> <li>If the motor is not a standard 50/60 Hz motor, set Pr <b>00.039</b> accordingly</li> </ul>                                                                                                                                                                                                                                                                                                                                                                          | <div>             Mot X XXXXXXXXXXXX<br/>             No XXXXXXXXXXXX kg<br/>             50 Hz 60 Hz<br/>             V 230 50 1440 1220 0.80 0.80<br/>             A 400 50 1440 1220 0.80 0.80<br/>             Ck = 14.400<br/>             A 240 50 1440 1220 0.76 0.80<br/>             A 415 50 1440 1220 0.80 0.80<br/>             Ck = 14.400<br/>             100% 100% 100% 100% 100% 100%<br/>             100% 100% 100% 100% 100% 100%           </div> |
| <b>Ready to autotune</b>                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Autotune                                               | The drive is able to perform either a stationary or a rotating autotune. The motor must be at a standstill before an autotune is enabled.<br>To perform an autotune: <ul style="list-style-type: none"> <li>Set Pr <b>00.038</b> = 1 for a stationary autotune or set Pr <b>00.038</b> = 2 for a rotating autotune</li> <li>Close the drive enable signal (apply +24 V to terminal 11). The drive will display 'Rdy'.</li> <li>Close the run signal (apply +24 V to terminal 12 or 13). 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> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Autotune complete                                      | When the autotune has been completed, Pr <b>00.038</b> will be set to 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Tuning of frequency controller gains (RFC-A mode only) | Depending on the application, the frequency controller gains (Pr <b>00.065</b> and Pr <b>00.066</b> ) may need to be adjusted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Save parameters</b>                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Save parameters                                        | Select 'SAVE' in Pr <b>mm.000</b> (alternatively enter a value of 1001) and press the  Stop / Reset button to save parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Ready to run</b>                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Run                                                    | The drive is now ready to run the motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Increasing and decreasing speed                        | Turning the speed potentiometer will increase and decrease the speed of the motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Stopping                                               | To stop the motor under ramp control, open either the run forward or run reverse terminal. If the enable terminal is opened while the motor is running, the motor will coast to a stop.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 8 Diagnostics



Users must not attempt to repair a drive if it is faulty, nor carry out fault diagnosis other than through the use of the diagnostic features described in this chapter.

If a drive is faulty, it must be returned to the supplier of the drive for repair.

**Table 8-1 Trip indications**

| Trip code    | Condition                                                                                                  | Description                                                                                                                                                                                                                                         |
|--------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>C.Acc</b> | NV Media Card Write fail                                                                                   | Unable to access the NV Media Card.                                                                                                                                                                                                                 |
| <b>C.bt</b>  | The Menu 0 parameter modification cannot be saved to the NV Media Card                                     | The necessary boot file has not been created on the NV media card fitted to the drive to take the new parameter value. This occurs when <i>Parameter Cloning</i> (00.030) is changed to auto or boot mode, but the drive is not subsequently reset. |
| <b>C.by</b>  | NV Media Card cannot be accessed as it is being accessed by an option module                               | An attempt has been made to access a file on NV Media Card, but the NV Media Card is already being accessed by an option module. No data is transferred.                                                                                            |
| <b>C.cPr</b> | NV Media Card file/data is different to the one in the drive                                               | A C.cPr trip is initiated if the parameters on the NV Media Card are different to the drive.                                                                                                                                                        |
| <b>C.d.E</b> | NV Media Card data location already contains data                                                          | Attempt has been made to store data on a NV Media Card in a data block which already contains data.                                                                                                                                                 |
| <b>C.dAt</b> | NV Media Card data not found                                                                               | Attempt has been made to access non-existent file or block on the NV Media Card.                                                                                                                                                                    |
| <b>C.Err</b> | NV Media Card data structure error                                                                         | Attempt has been made to access the NV Media Card but an error has been detected in the data structure on the card. Resetting the trip will cause the drive to erase and create the correct folder structure.                                       |
| <b>C.FuL</b> | NV Media Card full                                                                                         | There is not enough space left on the card.                                                                                                                                                                                                         |
| <b>C.Opt</b> | NV Media Card trip; option modules installed are different between source drive and destination drive      | The parameter data or default difference data is being transferred from the NV Media Card to the drive, but the option module category is different between the source and destination drives.                                                      |
| <b>C.Pr</b>  | NV Media Card data blocks are not compatible with the drive derivative                                     | If <i>Drive Derivative</i> is different between the source and target drives. Refer to <i>Drive User Guide</i> .                                                                                                                                    |
| <b>C.rdo</b> | NV Media Card has the Read Only bit set                                                                    | Attempt has been made to modify a read-only NV Media Card or a read-only data block.                                                                                                                                                                |
| <b>C.rtg</b> | NV Media Card Trip; The voltage and / or current rating of the source and destination drives are different | The current and / or voltage ratings are different between source and destination drives.                                                                                                                                                           |
| <b>C.SI</b>  | NV Media Card trip; Option module file transfer has failed                                                 | The C.SI trip is initiated, if the transfer of an option module file to or from a module failed because the option module does not respond correctly.                                                                                               |
| <b>C.tyP</b> | NV Media Card parameter set not compatible with current drive mode                                         | The drive mode in the data block on the NV Media Card is different from the current drive mode.                                                                                                                                                     |
| <b>cL.A1</b> | Analog input 1 current loss                                                                                | Current loss was detected in current mode on Analog input 1 (Terminal 2).                                                                                                                                                                           |
| <b>CL.bt</b> | Trip initiated from the <i>Control Word</i>                                                                | Initiated by setting bit 12 on the control word when the control word is enabled. Refer to <i>Drive User Guide</i>                                                                                                                                  |
| <b>Cur.c</b> | Current calibration range                                                                                  | Current calibration range error.                                                                                                                                                                                                                    |
| <b>Cur.O</b> | Current feedback offset error                                                                              | Current offset is too large to be trimmed.                                                                                                                                                                                                          |
| <b>d.Ch</b>  | Drive parameters are being changed                                                                         | A user action or a file system write is active that is changing the drive parameters and the drive has been commanded to enable.                                                                                                                    |
| <b>dEr.E</b> | Derivative file error                                                                                      | Contact the supplier of the drive.                                                                                                                                                                                                                  |
| <b>dEr.I</b> | Derivative product image error                                                                             | Contact the supplier of the drive                                                                                                                                                                                                                   |

| Trip code                          | Condition                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          |        |   |                          |
|------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------|---|--------------------------|
| dEst                               | Two or more parameters are writing to the same destination parameter | The <i>dEst</i> trip indicates that destination output parameters of two or more logic functions (Menus 7 and 8) within the drive are writing to the same parameter.                                                                                                                                                                                                                                                                                                                                                                |                          |        |   |                          |
| dr.CF                              | Drive configuration                                                  | Contact the supplier of the drive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                          |        |   |                          |
| EEF                                | Default parameters have been loaded                                  | The <i>EEF</i> trip indicates that default parameters have been loaded. The exact cause/reason of the trip can be identified from the sub-trip number (see <i>Drive User Guide</i> ).                                                                                                                                                                                                                                                                                                                                               |                          |        |   |                          |
| Et                                 | An External trip is initiated                                        | The cause of the trip can be identified from the sub trip number displayed after the trip string.                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |        |   |                          |
|                                    |                                                                      | <table><tr><th>Sub-trip</th><th>Reason</th></tr><tr><td>1</td><td><i>External Trip = 1</i></td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                        | Sub-trip                 | Reason | 1 | <i>External Trip = 1</i> |
|                                    |                                                                      | Sub-trip                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reason                   |        |   |                          |
|                                    |                                                                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <i>External Trip = 1</i> |        |   |                          |
| Refer to <i>Drive User Guide</i> . |                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |        |   |                          |
|                                    |                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |        |   |                          |
| FAN.F                              | Fan fail                                                             | Indicates the fan or fan circuitry has failed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |        |   |                          |
| Fi.Ch                              | File changed                                                         | A file has been changed, power cycle to clear the trip                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                          |        |   |                          |
| FI.In                              | Firmware Incompatibility                                             | The user firmware is incompatible with the power firmware.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |        |   |                          |
| HFxx trip                          | Hardware faults                                                      | Internal drive hardware fault (see <i>Drive User Guide</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |        |   |                          |
| It.Ac                              | Output current overload timed out (I <sup>2</sup> t)                 | <p>The It.Ac trip indicates a motor thermal overload based on the output current and motor thermal time constant. The drive will trip on It.Ac when the accumulator gets to 100 %.</p> <p>This can occur when:</p> <ul style="list-style-type: none"><li>• There is excessive mechanical load</li><li>• Ensure the load is not jammed / sticking</li><li>• Check the load on the motor has not changed</li><li>• Ensure the motor rated current is not zero</li></ul>                                                               |                          |        |   |                          |
| It.br                              | Braking resistor overload timed out (I <sup>2</sup> t)               | Braking resistor overload has timed out. This can be caused by excessive braking resistor energy.                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |        |   |                          |
| no.PS                              | No power board                                                       | No communication between the power and control boards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                          |        |   |                          |
| O.Ld1                              | Digital output overload                                              | The total current drawn from 24 V user supply or from the digital output has exceeded the limit.                                                                                                                                                                                                                                                                                                                                                                                                                                    |                          |        |   |                          |
| O.SPd                              | Motor frequency has exceeded the over frequency threshold            | Excessive motor speed (typically caused by mechanical load driving the motor).                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                          |        |   |                          |
| Oh.br                              | Braking IGBT over-temperature                                        | Braking IGBT over-temperature. Detected by thermal model                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |        |   |                          |
| Oh.dc                              | DC bus over temperature                                              | DC bus component over temperature based on a software thermal model.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |        |   |                          |
| Oht.C                              | Control stage over-temperature                                       | Control stage over-temperature detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |        |   |                          |
| Oht.I                              | Inverter over temperature based on thermal model                     | IGBT junction over-temperature has been detected based on a software thermal model.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                          |        |   |                          |
| Oht.P                              | Power stage over temperature                                         | This trip indicates that a power stage over-temperature has been detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |        |   |                          |
| Oht.r                              | Rectifier over temperature                                           | The Oht.r trip indicates that a rectifier over-temperature has been detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |        |   |                          |
| OI.A1                              | Analog input 1 over-current                                          | Current input on analog input 1 exceeds 24 mA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                          |        |   |                          |
| OI.AC                              | Instantaneous output over current detected                           | <p>The instantaneous drive output current has exceeded.The set limit.</p> <p>Possible solutions:</p> <ul style="list-style-type: none"><li>• Increase acceleration/deceleration rate</li><li>• If seen during autotune reduce the voltage boost</li><li>• Check for short circuit on the output cabling</li><li>• Check integrity of the motor insulation using an insulation tester</li><li>• Is the motor cable length within limits for the frame size</li><li>• Reduce the values in the current loop gain parameters</li></ul> |                          |        |   |                          |

| Trip code     | Condition                                                                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OI.br</b>  | Braking IGBT over current detected: short circuit protection for the braking IGBT activated | Over current has been detected in braking IGBT or braking IGBT protection has been activated.<br>Possible cause: <ul style="list-style-type: none"> <li>• Check brake resistor wiring</li> <li>• Check braking resistor value is greater than or equal to the minimum resistance value</li> <li>• Check braking resistor insulation</li> </ul>                                                                                                                                      |
| <b>OI.SC</b>  | Output phase short-circuit                                                                  | Over-current detected on drive output when enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>OPT.d</b>  | Option module does not acknowledge during drive mode changeover                             | Option module did not acknowledge notifying the drive that communications with the drive has been stopped during the drive mode changeover within the allocated time.                                                                                                                                                                                                                                                                                                               |
| <b>Out.P</b>  | Output phase loss detected                                                                  | Phase loss has been detected at the drive output.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>OV</b>     | DC bus voltage has exceeded the peak level or maximum continuous level for 15 seconds       | The OV trip indicates that the DC bus voltage has exceeded the maximum limit.<br>Possible solutions: <ul style="list-style-type: none"> <li>• Increase <i>Deceleration Rate 1</i> (Pr <b>00.004</b>)</li> <li>• Decrease the braking resistor value (staying above the minimum value)</li> <li>• Check nominal AC supply level</li> <li>• Check for supply disturbances which could cause the DC bus to rise</li> <li>• Check motor insulation using a insulation tester</li> </ul> |
| <b>P.dAt</b>  | Power system configuration data error                                                       | Contact the supplier of the drive.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Pb.bt</b>  | Power board is in bootloader mode                                                           | Power board is in bootloader mode                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Pb.Er</b>  | Communication has been lost / errors detected between power control                         | Communications loss between power and control.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Pb.HF</b>  | Power board HF                                                                              | Power processor hardware fault - contact the supplier of the drive                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Pd.S</b>   | Power down save error                                                                       | Error has been detected in the power down save parameters saved in non-volatile memory.                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>PH.Lo</b>  | Supply phase loss                                                                           | The drive has detected an input phase loss or large supply imbalance.                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>PSU</b>    | Internal power supply fault                                                                 | One or more internal power supply rails are outside limits or overloaded.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>r.ALL</b>  | RAM allocation error                                                                        | Option module derivative image has requested more parameter RAM than is allowed.                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>r.b.ht</b> | Hot rectifier/brake                                                                         | Over-temperature detected on input rectifier or braking IGBT.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>rS</b>     | Measured resistance has exceeded the parameter range                                        | The measured stator resistance during an autotune test has exceeded the maximum possible value of <i>Stator Resistance</i> . Refer to the <i>Drive User Guide</i> .                                                                                                                                                                                                                                                                                                                 |
| <b>SCL</b>    | Control word watchdog has timed out                                                         | The control word has been enabled and has timed out                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>SL.dF</b>  | Option module in option slot 1 has changed                                                  | Option slot 1 on the drive is a different type to that installed when parameters were last saved on the drive.                                                                                                                                                                                                                                                                                                                                                                      |
| <b>SL.Er</b>  | Option module in option slot 1 has detected a fault                                         | Option module in option slot 1 on the drive has detected an error.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>SL.HF</b>  | Option module 1 hardware fault                                                              | Option slot 1 on the drive has indicated a hardware fault.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>SL.nF</b>  | Option module in option slot 1 has been removed                                             | The option module in option slot 1 on the drive has been removed since the last power up.                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>SL.to</b>  | Option module watchdog function service error                                               | The option module installed in Slot 1 has started the option watchdog function and then failed to service the watchdog correctly.                                                                                                                                                                                                                                                                                                                                                   |

| Trip code                              | Condition                                                                          | Description                                                                                                                                                                                       |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|----------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------|
| So.St                                  | Soft start relay failed to close, soft start monitor failed                        | Soft start relay in the drive failed to close or the soft start monitoring circuit has failed.                                                                                                    |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| St.HF                                  | Hardware trip has occurred during last power down                                  | Hardware trip (HF01 –HF19) has occurred and the drive has been power cycled. Enter 1299 to <b>xx.000</b> to clear trip                                                                            |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| th                                     | Motor thermistor over-temperature                                                  | The motor thermistor connected to terminal 14 (digital input 5) on the control connections has indicated a motor over temperature.                                                                |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| th.br                                  | Brake resistor over temperature                                                    | The th.br trip is initiated if the hardware based braking resistor thermal monitoring is connected and the resistor overheats.                                                                    |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| th.Fb                                  | Internal thermistor has failed                                                     | Internal thermistor has failed.                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| thS                                    | Motor thermistor short circuit                                                     | The motor thermistor connected to terminal 14 (digital input 5) on the control connections, is short circuit or low impedance (<50 Ω).                                                            |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| tun.S                                  | Autotune test stopped before completion                                            | The drive was prevented from completing an autotune test, because either the drive enable or the drive run signals were removed.                                                                  |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| tunE.1                                 | Autotune 1                                                                         | The drive has tripped during a rotating autotune. The cause of the trip can be identified from the sub-trip number.                                                                               |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    | Sub-trip                                                                                                                                                                                          | Reason                                                                                               | 1 | Reserved                                                                                | 2 | The motor did not reach the required speed during rotating auto-tune or mechanical load measurement. |   |                                                                                    |
|                                        |                                                                                    | Sub-trip                                                                                                                                                                                          | Reason                                                                                               |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    | 1                                                                                                                                                                                                 | Reserved                                                                                             |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    | 2                                                                                                                                                                                                 | The motor did not reach the required speed during rotating auto-tune or mechanical load measurement. |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| Refer to the <i>Drive User Guide</i> . |                                                                                    |                                                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    |                                                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    |                                                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| tunE.3                                 | Autotune 3                                                                         | <b>RFC-A mode only.</b><br>The drive has tripped during a rotating auto-tune or mechanical load measurement. The cause of the trip can be identified from the associated sub-trip number.         |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    | Sub-trip                                                                                                                                                                                          | Reason                                                                                               | 1 | Measured inertia has exceeded the parameter range during a mechanical load measurement. | 2 | Reserved                                                                                             | 3 | The commutation signals changed in the wrong direction during a rotating autotune. |
|                                        |                                                                                    | Sub-trip                                                                                                                                                                                          | Reason                                                                                               |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    | 1                                                                                                                                                                                                 | Measured inertia has exceeded the parameter range during a mechanical load measurement.              |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    | 2                                                                                                                                                                                                 | Reserved                                                                                             |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| 3                                      | The commutation signals changed in the wrong direction during a rotating autotune. |                                                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| Refer to the <i>Drive User Guide</i> . |                                                                                    |                                                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    |                                                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
|                                        |                                                                                    |                                                                                                                                                                                                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| U.OI                                   | User OI ac                                                                         | The <i>U.OI</i> trip is initiated if the output current of the drive exceeds the trip level set by <i>User Over Current Trip Level</i> . Refer to the <i>Drive User Guide</i> .                   |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| U.S                                    | User Save error / not completed                                                    | The U.S trip indicates that an error has been detected in the user save parameters saved in non-volatile memory.                                                                                  |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |
| US.24                                  | User 24 V supply is not present on the adaptor interface terminals (1,2)           | A <i>US.24</i> trip is initiated if the User Supply Select is set to 1 and no user 24 V supply is present on the user 24 V input on the AI-Backup adaptor. Refer to the <i>Drive User Guide</i> . |                                                                                                      |   |                                                                                         |   |                                                                                                      |   |                                                                                    |

## 8.1 Alarm indications

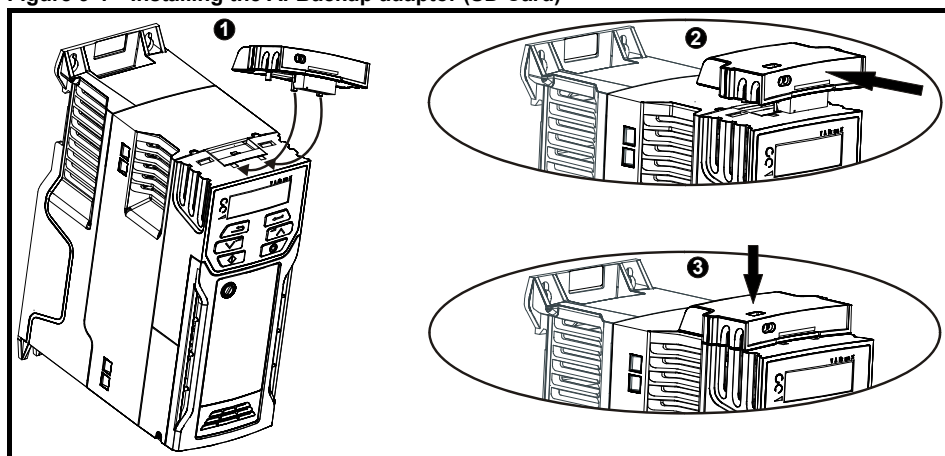
In any mode, an alarm is an indication given on the display by alternating the alarm string with the drive status string display. If an action is not taken to eliminate any alarm except "tuning and LS" the drive may eventually trip. Alarms are not displayed when a parameter is being edited.

**Table 8-2 Alarm indications**

| Alarm string   | Description                                                                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>br.res</b>  | Brake resistor overload. <i>Braking Resistor Thermal Accumulator</i> in the drive has reached 75.0 % of the value at which the drive will trip.Refer to the <i>Drive User Guide</i>                                  |
| <b>OV.Ld</b>   | <i>Motor Protection Accumulator</i> in the drive has reached 75.0 % of the value at which the drive will trip and the load on the drive is >100 %, reduce motor current (load). Refer to the <i>Drive User Guide</i> |
| <b>d.OV.Ld</b> | Drive over temperature. <i>Percentage Of Drive Thermal Trip Level</i> in the drive is greater than 90 %. Refer to the <i>Drive User Guide</i>                                                                        |
| <b>tuning</b>  | The autotune procedure has been initialized and an autotune in progress.                                                                                                                                             |
| <b>LS</b>      | Limit switch active. Indicates that a limit switch is active and that is causing the motor to be stopped.                                                                                                            |
| <b>Lo.AC</b>   | Low voltage mode. See <i>Low AC Alarm</i> in <i>Drive User Guide</i> .                                                                                                                                               |
| <b>I.AC.Lt</b> | Current limit active. See <i>Current Limit Active</i> in <i>Drive User Guide</i> .                                                                                                                                   |

## 9 NV Media Card Operation

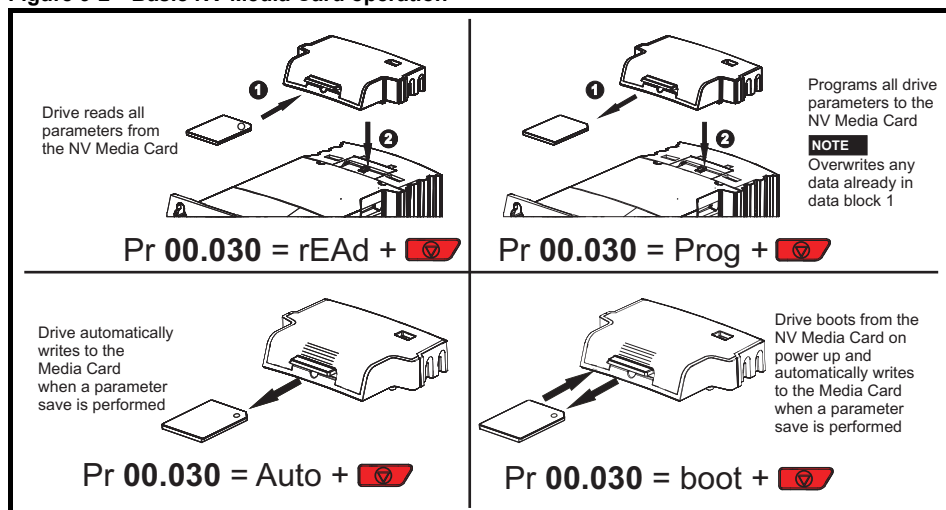
Figure 9-1 Installing the AI-Backup adaptor (SD Card)



1. Identify the two plastic fingers on the underside of the AI-Backup adaptor (1) - then insert the two fingers into the corresponding slots in the spring-loaded sliding cover on the top of the drive.
2. Hold the adaptor firmly and push the spring loaded protective cover towards the back of the drive to expose the connector block (2) below.

Press the adaptor downwards (3) until the adaptor connector locates into the drive connection below.

Figure 9-2 Basic NV Media Card operation



The whole card may be protected from writing or erasing by setting the read-only flag, refer to the *Drive User Guide* for further information. The card should not be removed during data transfer, as the drive will produce a trip. If this occurs then either the transfer should be re-attempted or in the case of a card to drive transfer, default parameters should be loaded.



## 10 UL listing information

### 10.1 General

Drive sizes 1 to 4 have been assessed to meet both UL and cUL requirements.

UL listings can be viewed online at [www.UL.com](http://www.UL.com). The UL file number is E171230.

### 10.2 Mounting

Drives can be installed in the following configurations:

- Standard or surface mounted. Refer to the *Drive User Guide* for further information.
- Bookcase mounted. Drives are mounted side by side with no space between them. This configuration minimizes the overall width of the installation.

### 10.3 Environment

Drives are able to meet the following UL/NEMA environmental ratings:

- Type 1. The drive must either be installed with a UL Type 1 kit or be installed in a Type 1 enclosure.
- Type 12. The drive must be installed in a Type 12 enclosure.
- The remote keypad is rated to both UL Type 1 and UL Type 12.
- Drives must be installed in a pollution degree 2 environment or better.

### 10.4 Electrical ratings

Suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, at the rated maximum AC voltage.

For information on power and current ratings, see the *Drive User Guide*.

Fuse and circuit breaker (size 1 only with short circuit rating of 10 kA) ratings are given in the *Drive User Guide*.

Unless indicated otherwise in the *Drive User Guide*, fuses may be any UL listed Class J or CC with a voltage rating of at least 600 Vac.

Unless indicated otherwise in the *Drive User Guide*, circuit breakers may be any UL listed type, category control number: DIVQ or DIVQ7, with a voltage rating of at least 600 Vac.

### 10.5 Opening of branch circuit

The 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 may 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 and any additional local "codes", or the equivalent.

### 10.6 Electrical installation

The following precautions must be observed:

- Drives are rated for use at 40 °C and 50 °C surrounding air temperature.
- Field wiring terminals are suitable for copper wire only, which must have a temperature rating of at least 75 °C.
- If the drive control stage is powered from an external power supply (+24 V), the power supply must be listed or recognized to UL class 2 with appropriate fusing.
- Ground connections must use UL listed closed loop (ring) terminals.

## 10.7 cUL requirements for frame size 4

For frame size 4, models Mxxx-042 00133A, Mxxx-042 00176A, Mxxx-044 00135A and Mxxx-044 00170A, transient surge suppression shall be installed on the line side of this equipment and shall be rated 480 Vac (phase to ground), 480 Vac (phase to phase), suitable for overvoltage category III, and shall provide protection for a rated impulse withstand voltage peak of 6 kV and a clamping voltage of maximum 2400 V.

### NOTE

Mxxx denotes M100, M101, M200, M201, M300 or M400.

## 10.8 Motor overload protection

All models incorporate internal overload protection for the motor load that does not require the use of an external or remote overload protection device. The protection level is adjustable and the method of adjustment is provided within instructions/manual for the product. Maximum current overload is dependent on the values entered into the current limit parameters (*Motoring Current Limit* (04.005), *Regenerative Current Limit* (04.006) and *Symmetrical Current Limit* (04.007) entered as percentage) and the *Motor Rated Current* (00.006) entered in amperes). The duration of the overload is dependent on *Motor Thermal Time Constant* (04.015) variable up to a maximum of 3000 seconds. The default overload protection is set such that the product is capable of 150 % of the current value entered into the motor rated current parameter for 60 seconds. The product can be connected to a motor thermistor to protect the motor, in the event of a motor cooling fan failure.

## 10.9 Motor overspeed protection

The drive is installed with solid state motor overspeed protection.

However, this feature does not provide the level of protection provided by an independent, high-integrity overspeed protection device and should not be considered as a safety function.

## 10.10 Thermal memory retention

Drives incorporate thermal memory retention that complies fully with the requirements of UL508C.

The drive is provided with motor load and speed sensitive overload protection with thermal memory retention that complies with the US National Electrical Code (NFPA 70) clause 430.126 and Underwriters Laboratories Standard UL508C, clause 20.1.11 (a). The purpose of this protection is to protect both drive and motor from dangerous overheating in the event of repeated overload or failure to start, even if the power to the drive is removed between overload events.

For full explanation of the thermal protection system, refer to the *Drive User Guide* for further information.

In order to comply with UL requirements for thermal memory retention, it is necessary to set the *Thermal Protection Mode* (04.016) to zero; and the *Low Frequency Thermal Protection Mode* (04.025) must be set to 1 if the drive is operated in Heavy Duty mode.

Alternatively, an external thermal sensor or switch may be used as a means of motor and drive overload protection that complies with the requirements of UL508C, clause 20.1.11 (b). This protection method is particularly recommended where independent forced cooling of the motor is used, because of the risk of overheating if the cooling is lost.

### External thermal sensor

The drive is provided with a means to accept and act upon a signal from a thermal sensor or switch imbedded in the motor or from an external protective relay. Refer to the *Drive User Guide* for further information.

## **10.11 Group installation**

### **10.11.1 Definition**

Group Installation Definition: A motor branch circuit for two or more motors, or one or more motors with other loads, protected by a circuit breaker or a single set of fuses.

### **10.11.2 Limitations on use**

#### **All motors rated less than 1 hp**

The drives may be used in group installations where each of the motors is rated 1 hp or less. The full-load current rating of each motor must not exceed 6 A. The motor drive provides individual overload protection in accordance with the NEC clause 430.32.

#### **Smallest motor protected**

The drives may be used in group installations where the smallest motor is protected by the branch fuses or circuit breaker. Limits on the current rating of branch circuit protective fuses and circuit breakers are given in the NEC Table: 430.52.

#### **Other installations**

The motor drives described in this user guide are not UL listed for group installation.

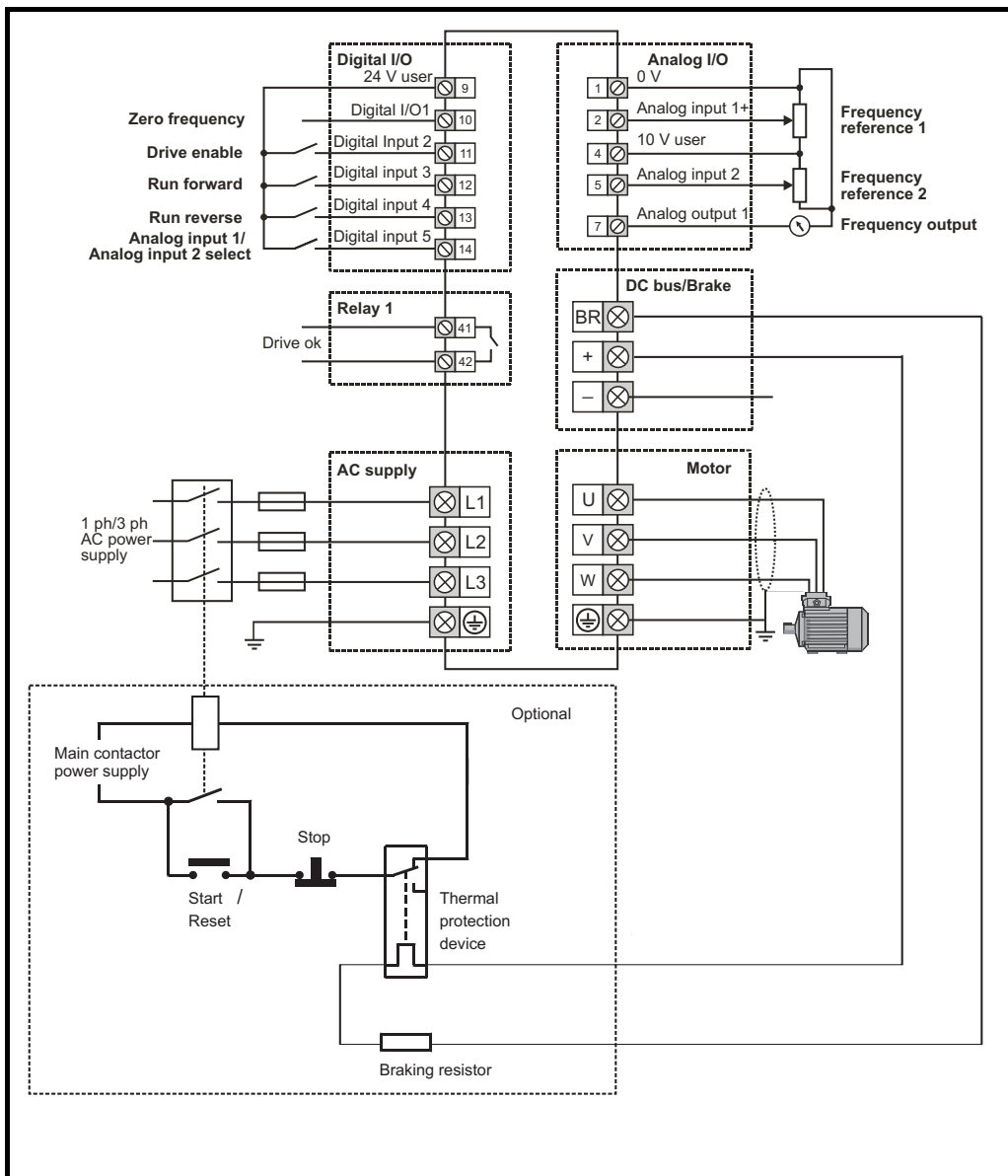
## **10.12 UL listed accessories**

The following options are UL listed:

- AI-485 Adaptor
- AI-Backup Adaptor
- Remote Keypad
- UL Type 1 kit
- NV Media card
- SI-PROFIBUS
- SI-DeviceNet
- SI-CANopen
- SI-Ethernet
- SI-EtherCAT
- SI-I/O







**NOTE** On the size 2 110 V drives or when connecting single phase to a dual rated 200 V unit, the supply should be connected to L1 and L3.



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