



Getting Started Guide

Unidrive M700 Unidrive M701

Model sizes 3 to 10

Part Number: 0478-0001-07
Issue: 7



www.controltechniques.com

Original Instructions

For the purposes of compliance with the EU Machinery Directive 2006/42/EC.

General Information

This guide covers the basic information that is required to set-up and run the drive, in applications where a drive malfunction does not result in a mechanical hazard. When the drive is used in a safety related application, i.e. where a malfunction might result in a hazard, it is essential to refer to the full user guide. The *Drive User Guide* is available for download from www.controltechniques.com/userguides.

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation or adjustment of the optional operating parameters of the equipment or from mismatching the variable speed drive with the motor.

The contents of this guide are believed to be correct at the time of printing. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance, or the contents of the guide, without notice.

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Drive firmware version

This product is supplied with the latest firmware version. If this drive is to be connected to an existing system or machine, all drive firmware versions should be verified to confirm the same functionality as drives of the same model already present. This may also apply to drives returned from a Control Techniques Service Centre or Repair Centre. If there is any doubt please contact the supplier of the product.

The firmware version of the drive can be checked by looking at Pr **11.029**

The firmware version of the Ethernet interface can be checked by looking at Pr **24.002**

Environmental statement

Control Techniques is committed to minimising the environmental impacts of its manufacturing operations and of its products throughout their life cycle. To this end, we operate an Environmental Management System (EMS) which is certified to the International Standard ISO 14001. Further information on the EMS, our Environmental Policy and other relevant information is available on request, or can be found at www.greendrives.com.

The electronic variable-speed drives manufactured by Control Techniques have the potential to save energy and (through increased machine/process efficiency) reduce raw material consumption and scrap throughout their long working lifetime. In typical applications, these positive environmental effects far outweigh the negative impacts of product manufacture and end-of-life disposal.

Nevertheless, when the products eventually reach the end of their useful life, they must not be discarded but should instead be recycled by a specialist recycler of electronic equipment. Recyclers will find the products easy to dismantle into their major component parts for efficient recycling. Many parts snap together and can be separated without the use of tools, while other parts are secured with conventional fasteners. Virtually all parts of the product are suitable for recycling.

Product packaging is of good quality and can be re-used. Large products are packed in wooden crates, while smaller products come in strong cardboard cartons which themselves have a high recycled fibre content. If not re-used, these containers can be recycled. Polythene, used on the protective film and bags for wrapping product, can be recycled in the same way. Control Techniques' packaging strategy prefers easily-recyclable materials of low environmental impact, and regular reviews identify opportunities for improvement.

When preparing to recycle or dispose of any product or packaging, please observe local legislation and best practice.

REACH legislation

EC Regulation 1907/2006 on the Registration, Evaluation, Authorisation and restriction of Chemicals (REACH) requires the supplier of an article to inform the recipient if it contains more than a specified proportion of any substance which is considered by the European Chemicals Agency (ECHA) to be a Substance of Very High Concern (SVHC) and is therefore listed by them as a candidate for compulsory authorisation.

For current information on how this requirement applies in relation to specific Control Techniques products, please approach your usual contact in the first instance. Control Techniques position statement can be viewed at:

<http://www.controltechniques.com/REACH>

For patent and intellectual property related information please go to: www.ctpatents.info

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Drive Firmware: 01.06.00.00 onwards
Ethernet Firmware: 01.02.02.06 onwards

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1 Safety information

1.1 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.

1.2 Electrical safety - general warning

The voltages used in the drive can cause severe electrical shock and/or burns, and could be lethal. Extreme care is necessary at all times when working with or adjacent to the drive. Specific warnings are given at the relevant places in this guide.

1.3 System design and safety of personnel

The drive is intended as a component for professional incorporation into complete equipment or a system. If installed incorrectly, the drive may present a safety hazard.

The drive uses high voltages and currents, carries a high level of stored electrical energy, and is used to control equipment which can cause injury.

Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning/start-up and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this User Guide carefully.

The STOP and SAFE TORQUE OFF functions of the drive do not isolate dangerous voltages from the output of the drive or from any external option unit. The supply must be disconnected by an approved electrical isolation device before gaining access to the electrical connections.

With the sole exception of the SAFE TORQUE OFF function, none of the drive functions must be used to ensure safety of personnel, i.e. they must not be used for safety-related functions.

Careful consideration must be given to the functions of the drive which might result in a hazard, either through their intended behavior or through incorrect operation due to a fault. In any application where a malfunction of the drive or its control system could lead to or allow damage, loss or injury, a risk analysis must be carried out, and where necessary, further measures taken to reduce the risk - for example, an over-speed protection device in case of failure of the speed control, or a fail-safe mechanical brake in case of loss of motor braking.

The SAFE TORQUE OFF function may be used in a safety-related application. The system designer is responsible for ensuring that the complete system is safe and designed correctly according to the relevant safety standards.

1.4 Environmental limits

Instructions in this guide regarding transport, storage, installation and use of the drive must be complied with, including the specified environmental limits. Drives must not be subjected to excessive physical force.

1.5 Access

Drive access must be restricted to authorized personnel only. Safety regulations which apply at the place of use must be complied with.

1.6 Fire protection

The drive enclosure is not classified as a fire enclosure. A separate fire enclosure must be provided. For further information, refer to the *Drive User Guide*.

1.7 Compliance with regulations

The installer is responsible for complying with all relevant regulations, such as national wiring regulations, accident prevention regulations and electromagnetic compatibility (EMC) regulations. Particular attention must be given to the cross-sectional areas of conductors, the selection of fuses or other protection, and protective ground (earth) connections.

This guide contains instruction for achieving compliance with specific EMC standards.

Within the European Union, all machinery in which this product is used must comply with the following directives:

2006/42/EC: Safety of machinery.

2004/108/EC: Electromagnetic Compatibility.

1.8 Motor

Ensure the motor is installed in accordance with the manufacturer's recommendations. Ensure the motor shaft is not exposed.

Standard squirrel cage induction motors are designed for single speed operation. If it is intended to use the capability of the drive to run a motor at speeds above its designed maximum, it is strongly recommended that the manufacturer is consulted first.

Low speeds may cause the motor to overheat because the cooling fan becomes less effective. The motor should be installed with a protection thermistor. If necessary, an electric forced vent fan should be used.

The values of the motor parameters set in the drive affect the protection of the motor. The default values in the drive should not be relied upon.

It is essential that the correct value is entered in Pr **00.046** motor rated current. This affects the thermal protection of the motor.

1.9 Mechanical brake control

The brake control functions are provided to allow well co-ordinated operation of an external brake with the drive. While both hardware and software are designed to high standards of quality and robustness, they are not intended for use as safety functions, i.e. where a fault or failure would result in a risk of injury. In any application where the incorrect operation of the brake release mechanism could result in injury, independent protection devices of proven integrity must also be incorporated.

1.10 Adjusting parameters

Some parameters have a profound effect on the operation of the drive. They must not be altered without careful consideration of the impact on the controlled system. Measures must be taken to prevent unwanted changes due to error or tampering.

1.11 Electrical installation

1.11.1 Electric shock risk

The voltages present in the following locations can cause severe electric shock and may be lethal:

- AC supply cables and connections
- Output cables and connections
- Many internal parts of the drive, and external option units

Unless otherwise indicated, control terminals are single insulated and must not be touched.

1.11.2 Stored charge

The drive contains capacitors that remain charged to a potentially lethal voltage after the AC supply has been disconnected. If the drive has been energized, the AC supply must be isolated at least ten minutes before work may continue.

2 Product information

This guide covers the Unidrive M700 and Unidrive M701 products.

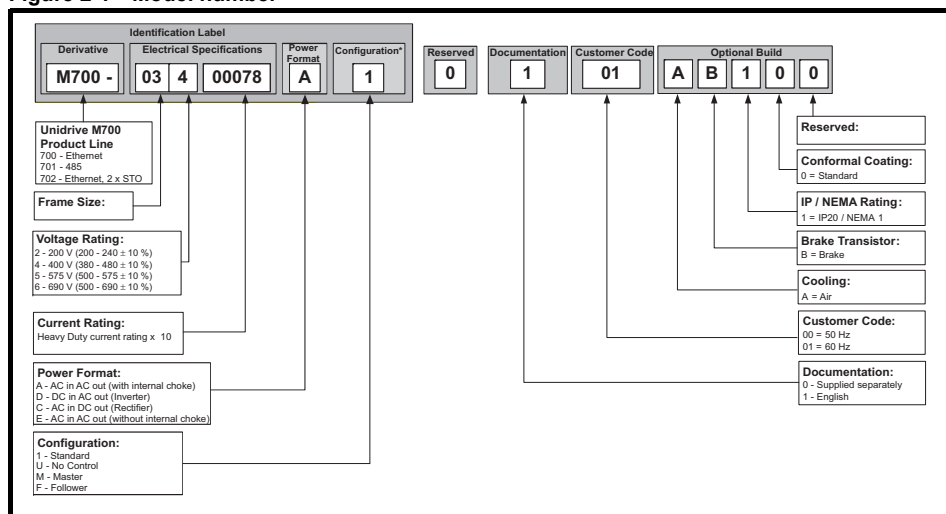
Unidrive M700 / Unidrive M701 features

- Analog and digital I/O with single channel SAFE TORQUE OFF input
- NV Media Card for parameter copying and data storage
- Universal high performance drive for induction, servo, permanent magnet and liners motors
- Flexibility with speed and position measurement, supporting multiple devices and all common interfaces
- Ethernet fieldbus communication (*Unidrive M700*)
- Provides an equivalent for *Unidrive SP* (*Unidrive M701*)
- 485 serial communication interface (*Unidrive M701*)

2.1 Model number

The way in which the model numbers for the Unidrive M product range is formed is illustrated below:

Figure 2-1 Model number



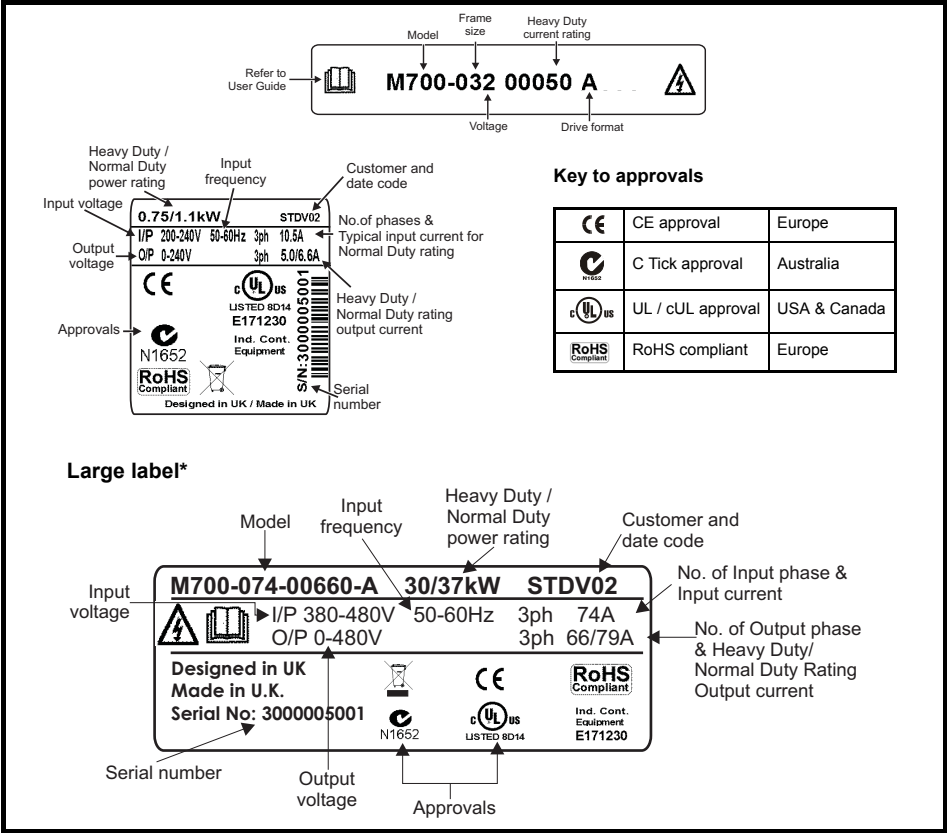
* Only shown on frame size 9E and 10 identification label.

NOTE

For simplicity a Frame 9 drive with no internal choke (i.e. Model 09xxxxxxE) is referred to as a Frame 9E and a Frame 9 drive with an internal choke (i.e. Model 09xxxxxxA) is referred to as a Frame 9A. Any reference to Frame 9 is applicable to both sizes 9E and 9A.

2.2 Nameplate description

Figure 2-2 Typical drive rating labels



* This label is only applicable to size 7 and above.

Refer to Figure 2-1 *Model number* on page 7 for further information relating to the labels.

2.3 Ratings



Fuses

The AC supply to the drive must be installed with suitable protection against overload and short-circuits. The following section shows recommended fuse ratings. Failure to observe this requirement will cause risk of fire.

NOTE

Nominal cables sizes below are based on the cable installation method B2 (ref: IEC60364-5-52:2001) unless otherwise specified, and are provided as a guide only. Ensure cables used suit local wiring regulations.

Table 2-1 200 V drive ratings, cable sizes and fuse ratings

| Model | Max. cont. input current | Fuse | | | | | Nominal cable size | | | | Normal Duty | | | Heavy Duty | | |
|----------|-----------------------------------|------|-----|-------|-----------------|-----------------|--------------------|---------|---------|---------|------------------------------------|----------------------------|------------------------------|------------------------------------|----------------------------|------------------------------|
| | | | | | | | European | | USA | | | | | | | |
| | | IEC | | UL | | | Input | Output | Input | Output | Max. cont. output current | Nom power @ 230 V | Motor power @ 230 V | Max. cont. output current | Nom power @ 230 V | Motor power @ 230 V |
| | | 3ph | Nom | Class | Nom | Class | | | | | | | | | | |
| A | A | A | A | | mm ² | | | | | | | | | | | |
| 03200050 | 10.7 | 16 | gG | 16 | CC or J | 1.5 | 1.5 | 14 | 14 | 6.6 | 1.1 | 1.5 | 5 | 0.75 | 1 | |
| 03200066 | 13 | 20 | | 20 | | 1.5 | 1.5 | 14 | 14 | 8 | 1.5 | 2 | 6.6 | 1.1 | 1.5 | |
| 03200080 | 17.8 | 25 | | 25 | | 4 | 4 | 12 | 12 | 11 | 2.2 | 3 | 8 | 1.5 | 2 | |
| 03200106 | 20.6 | 25 | | 25 | | 4 | 4 | 12 | 12 | 12.7 | 3 | 3 | 10.6 | 2.2 | 3 | |
| 04200137 | 20.1 | 25 | gG | 25 | CC or J | 6 | 6 | 10 | 10 | 18 | 4 | 5 | 13.7 | 3 | 3 | |
| 04200185 | 26.8 | 32 | | 30 | | 8 | 8 | 8 | 8 | 25 | 5.5 | 7.5 | 18.5 | 4 | 5 | |
| 05200250 | 31 | 40 | gG | 40 | CC or J | 10 | 10 | 8 | 8 | 30 | 7.5 | 10 | 25 | 5.5 | 7.5 | |
| 06200330 | 48.8 | 63 | gG | 60 | CC or J | 16 | 16 | 4 | 4 | 50 | 11 | 15 | 33 | 7.5 | 10 | |
| 06200440 | 56.6 | 63 | | 70 | | 25 | 25 | 3 | 3 | 58 | 15 | 20 | 44 | 11 | 15 | |
| 07200610 | 67 | 80 | gG | 80 | CC or J | 35 | 35 | 2 | 2 | 75 | 18.5 | 25 | 61 | 15 | 20 | |
| 07200750 | 84 | 100 | | 100 | | 35 | 35 | 1 | 1 | 94 | 22 | 30 | 75 | 18.5 | 25 | |
| 07200830 | 105 | 125 | | 125 | | 70 | 70 | 1/0 | 1/0 | 117 | 30 | 40 | 83 | 22 | 30 | |
| 08201160 | 137 | 200 | gR | 200 | HSJ | 95 | 95 | 3/0 | 3/0 | 149 | 37 | 50 | 116 | 30 | 40 | |
| 08201320 | 166 | 200 | | 225 | | 2 x 70 | 2 x 70 | 2 x 1 | 2 x 1 | 180 | 45 | 60 | 132 | 37 | 50 | |
| 09201760 | 205 | 250 | gR | 250 | HSJ | 2 x 70 (B1) | 2 x 95 (B2) | 2 x 2/0 | | 216 | 55 | 75 | 176 | 45 | 60 | |
| 09202190 | 260 | 315 | | 300 | | 2 x 95 (B1) | 2 x 120 (B2) | 2 x 4/0 | | 266 | 75 | 100 | 219 | 55 | 75 | |
| 10202830 | 278 | 400 | gR | 400 | HSJ | 2 x 120 (B1) | 2 x 120 (B2) | 2 x 250 | | 325 | 90 | 125 | 283 | 75 | 100 | |
| 10203000 | 333 | 450 | | 450 | | 2 x 150 (C) | | | 2 x 300 | 2 x 250 | 360 | 110 | 150 | 300 | 90 | 125 |

Table 2-2 400 V drive ratings, cable sizes and fuse ratings

| Model | Max. cont. input current | Fuse | | | | Nominal cable size | | | | Normal Duty | | | Heavy Duty | | | |
|----------|--------------------------|------|-----|-------|------------|--------------------|--------------|---------|---------|-------------|---------------------------|-------------------|---------------------|---------------------------|-------------------|---------------------|
| | | IEC | | | UL | | European | | USA | | Max. cont. output current | Nom power @ 400 V | Motor power @ 460 V | Max. cont. output current | Nom power @ 400 V | Motor power @ 460 V |
| | | 3ph | Nom | Class | Nom | Class | Input | Output | Input | Output | | | | | | |
| | | | | | | | | | | | | | | | | |
| 03400025 | 5 | 6 | gG | 10 | CC or J | 1.5 | 1.5 | 18 | 18 | 3.4 | 1.1 | 1.5 | 2.5 | 0.75 | 1.0 | |
| 03400031 | 6.6 | 10 | | 10 | | 1.5 | 1.5 | 16 | 16 | 4.5 | 1.5 | 2 | 3.1 | 1.1 | 1.5 | |
| 03400045 | 9.1 | 10 | | 10 | | 1.5 | 1.5 | 14 | 14 | 6.2 | 2.2 | 3 | 4.5 | 1.5 | 2.0 | |
| 03400062 | 13.1 | 20 | | 20 | | 2.5 | 2.5 | 14 | 14 | 7.7 | 3 | 5 | 6.2 | 2.2 | 3.0 | |
| 03400078 | 13.4 | 20 | | 20 | | 2.5 | 2.5 | 14 | 14 | 10.4 | 4 | 5 | 7.8 | 3 | 5.0 | |
| 03400100 | 15.8 | 20 | | 20 | | 2.5 | 2.5 | 12 | 12 | 12.3 | 5.5 | 7.5 | 10 | 4 | 5.0 | |
| 04400150 | 18.7 | 25 | gG | 25 | CC or J | 6 | 6 | 10 | 10 | 18.5 | 7.5 | 10 | 15 | 5.5 | 10.0 | |
| 04400172 | 24.3 | 32 | | 30 | | 8 | 8 | 8 | 8 | 24 | 11 | 15 | 17.2 | 7.5 | 10.0 | |
| 05400270 | 29 | 40 | gG | 35 | CC or J | 6 | 6 | 8 | 8 | 30 | 15 | 20 | 27 | 11 | 20 | |
| 05400300 | | 35 | | 6 | | 6 | 8 | 8 | 31 | 30 | | | 15 | | | |
| 06400350 | 36 | 63 | gR | 40 | HSJ or DFL | 10 | 10 | 6 | 6 | 38 | 18.5 | 25 | 35 | 15 | 25 | |
| 06400420 | 46 | 63 | | 50 | | 16 | 16 | 4 | 4 | 48 | 22 | 30 | 42 | 18.5 | 30 | |
| 06400470 | 60 | 63 | | 70 | | 25 | 25 | 3 | 3 | 63 | 30 | 40 | 47 | 22 | 30 | |
| 07400660 | 74 | 100 | gG | 80 | CC or J | 35 | 35 | 1 | 1 | 79 | 37 | 50 | 66 | 30 | 50 | |
| 07400770 | 88 | 100 | | 100 | | 50 | 50 | 2 | 2 | 94 | 45 | 60 | 77 | 37 | 60 | |
| 07401000 | 105 | 125 | | 125 | | 70 | 70 | 1/0 | 1/0 | 112 | 55 | 75 | 100 | 45 | 75 | |
| 08401340 | 155 | 250 | gR | 225 | HSJ | 2 x 50 | 2 x 50 | 2 x 1 | 2 x 1 | 155 | 75 | 100 | 134 | 55 | 100 | |
| 08401570 | 177 | 250 | | 225 | | 2 x 70 | 2 x 70 | 2 x 1/0 | 2 x 1/0 | 184 | 90 | 125 | 157 | 75 | 125 | |
| 09402000 | 232 | 315 | gR | 300 | HSJ | 2 x 70 (B1) | 2 x 95 (B2) | 2 x 3/0 | 2 x 2/0 | 221 | 110 | 150 | 180 | 90 | 150 | |
| 09402240 | 267 | | | 350 | | 2 x 95 (B1) | 2 x 120 (B2) | 2 x 4/0 | 2 x 4/0 | 266 | 132 | 200 | 224 | 110 | 150 | |
| 10402700 | 332 | 400 | gR | 400 | HSJ | 2 x 120 (C) | 2 x 120 (B2) | 2 x 300 | 2 x 250 | 320 | 160 | 250 | 270 | 132 | 200 | |
| 10403200 | 397 | 450 | | 450 | | 2 x 150 (C) | 2 x 150 (B2) | 2 x 350 | 2 x 300 | 361 | 200 | 300 | 320 | 160 | 250 | |

Table 2-3 575 V drive ratings, cable sizes and fuse ratings

| Model | Max. cont. input current | Fuse | | | | | Nominal cable size | | | | Normal Duty | | | Heavy Duty | | |
|-----------------|--------------------------|------|-----|-------|---------|-------------|--------------------|---------|-------------|-------------|---------------------------|-------------------|---------------------|---------------------------|-------------------|---------------------|
| | | | | | | | European | | USA | | | | | | | |
| | | IEC | | | UL | | Input | Output | Input | Output | Max. cont. output current | Nom power @ 575 V | Motor power @ 575 V | Max. cont. output current | Nom power @ 575 V | Motor power @ 575 V |
| | | 3ph | Nom | Class | Nom | Class | | | | | | | | | | |
| | | A | A | | A | | | | | | | | | | | |
| mm ² | mm ² | AWG | AWG | A | kW | hp | A | kW | hp | | | | | | | |
| 05500030 | 4.3 | 10 | gG | 10 | CC or J | 0.75 | 0.75 | 16 | 16 | 3.9 | 2.2 | 3 | 3 | 1.5 | 2 | |
| 05500040 | 5.7 | 10 | | 10 | | 1 | 1 | 14 | 14 | 6.1 | 4 | 5 | 4 | 2.2 | 3 | |
| 05500069 | 9.3 | 20 | | 20 | | 1.5 | 1.5 | 14 | 14 | 10 | 5.5 | 7.5 | 6.9 | 4 | 5 | |
| 06500100 | 13.2 | 20 | gG | 20 | CC or J | 2.5 | 2.5 | 14 | 14 | 12 | 7.5 | 10 | 10 | 5.5 | 7.5 | |
| 06500150 | 18.7 | 32 | | 25 | | 4 | 4 | 10 | 10 | 17 | 11 | 15 | 15 | 7.5 | 10 | |
| 06500190 | 24.3 | 40 | | 30 | | 6 | 6 | 10 | 10 | 22 | 15 | 20 | 19 | 11 | 15 | |
| 06500230 | 29.4 | 50 | | 35 | | 10 | 10 | 8 | 8 | 27 | 18.5 | 25 | 23 | 15 | 20 | |
| 06500290 | 37.1 | 50 | | 40 | | 10 | 10 | 6 | 6 | 34 | 22 | 30 | 29 | 18.5 | 25 | |
| 06500350 | 46.9 | 63 | gG | 50 | CC or J | 16 | 16 | 6 | 6 | 43 | 30 | 40 | 35 | 22 | 30 | |
| 07500440 | 45 | 50 | | 50 | | 16 | 16 | 4 | 4 | 53 | 45 | 50 | 44 | 30 | 40 | |
| 07500550 | 62 | 80 | | 80 | | 25 | 25 | 3 | 3 | 73 | 55 | 60 | 55 | 37 | 50 | |
| 08500630 | 83 | 125 | gR | 100 | HSJ | 35 | 35 | 1 | 1 | 86 | 75 | 75 | 63 | 45 | 60 | |
| 08500860 | 104 | 160 | | 150 | | 50 | 50 | 1 | 1 | 108 | 90 | 100 | 86 | 55 | 75 | |
| 09501040 | 166 | 150 | gR | 150 | 150 | 2 x 70 (B2) | 2 x 35 (B2) | 2 x 1 | 2 x 3 | 125 | 110 | 125 | 104 | 75 | 100 | |
| 09501310 | 166 | 200 | | 175 | 175 | | | | 2 x 50 (B2) | 2 x 1 | 150 | 110 | 150 | 131 | 90 | 125 |
| 10501520 | 197 | 250 | gR | 250 | 250 | 2 x 70 (B2) | 2 x 70 (B2) | 2 x 2/0 | 2 x 2/0 | 200 | 130 | 200 | 152 | 110 | 150 | |
| 10501900 | 218 | | | | | | | | | 2 x 95 (B2) | 200 | 150 | 200 | 190 | 132 | 200 |

Table 2-4 690 V drive ratings, cable sizes and fuse ratings

| Model | Max. cont. input current | Fuse | | | | Nominal cable size | | | | Normal Duty | | | Heavy Duty | | |
|----------|--------------------------|------|-----|-----------------|-----------------|--------------------|-------------|---------|---------|---------------------------|-------------------|---------------------|---------------------------|-------------------|---------------------|
| | | | | | | European | | USA | | | | | | | |
| | | IEC | | UL | | Input | Output | Input | Output | Max. cont. output current | Nom power @ 690 V | Motor power @ 690 V | Max. cont. output current | Nom power @ 690 V | Motor power @ 690 V |
| | | 3ph | Nom | Class | Nom | | | | | | | | | | |
| A | A | | | mm ² | mm ² | AWG | AWG | A | kW | hp | A | kW | hp | | |
| 07600190 | 20 | 25 | gG | 25 | CC or J | 10 | 10 | 8 | 8 | 23 | 18.5 | 25 | 19 | 15 | 20 |
| 07600240 | 26 | 32 | | 30 | | 10 | 10 | 6 | 6 | 30 | 22 | 30 | 24 | 18.5 | 25 |
| 07600290 | 31 | 40 | | 35 | | 10 | 10 | 6 | 6 | 36 | 30 | 40 | 29 | 22 | 30 |
| 07600380 | 39 | 50 | | 50 | | 16 | 16 | 4 | 4 | 46 | 37 | 50 | 38 | 30 | 40 |
| 07600440 | 44 | 50 | | 50 | | 16 | 16 | 4 | 4 | 52 | 45 | 60 | 44 | 37 | 50 |
| 07600540 | 62 | 80 | | 80 | | 25 | 25 | 3 | 3 | 73 | 55 | 75 | 54 | 45 | 60 |
| 08600630 | 83 | 125 | gR | 100 | HSJ | 50 | 50 | 2 | 2 | 86 | 75 | 100 | 63 | 55 | 75 |
| 08600860 | 104 | 160 | | 150 | | 70 | 70 | 1/0 | 1/0 | 108 | 90 | 125 | 86 | 75 | 100 |
| 09601040 | 149 | 150 | gR | 150 | HSJ | 2 x 50 (B2) | 2 x 35 (B2) | 2 x 1 | 2 x 3 | 125 | 110 | 150 | 104 | 90 | 125 |
| 09601310 | 171 | 200 | | 200 | | 2 x 70 (B2) | 2 x 50 (B2) | 2 x 1/0 | 2 x 1 | 155 | 132 | 175 | 131 | 110 | 150 |
| 10601500 | 202 | 225 | gR | 250 | HSJ | 2 x 70 (B2) | 2 x 70 (B2) | 2 x 2/0 | 2 x 1/0 | 172 | 160 | 200 | 150 | 132 | 175 |
| 10601780 | 225 | 250 | aR | | | 2 x 95 (B2) | | 2 x 3/0 | 2 x 2/0 | 197 | 185 | 250 | 178 | 160 | 200 |

Table 2-5 Protective ground cable ratings

| Input phase conductor size | Minimum ground conductor size |
|---|---|
| ≤ 10 mm ² | Either 10 mm ² or two conductors of the same cross-sectional area as the input phase conductor (an additional ground connection is provided on sizes 3, 4 and 5 for this purpose). |
| > 10 mm ² and ≤ 16 mm ² | The same cross-sectional area as the input phase conductor |
| > 16 mm ² and ≤ 35 mm ² | 16 mm ² |
| > 35 mm ² | Half of the cross-sectional area of the input phase conductor |

Typical short term overload limits

The maximum percentage overload limit changes depending on the selected motor. Variations in motor rated current, motor power factor and motor leakage inductance all result in changes in the maximum possible overload. Typical values are shown in the table below:

Table 2-6 Typical overload limits

| Operating mode | RFC from cold | RFC from 100 % | Open loop from cold | Open loop from 100 % |
|---|-----------------|----------------|---------------------|----------------------|
| Normal Duty overload with motor rated current = drive rated current | 110 % for 165 s | 110 % for 9 s | 110 % for 165 s | 110 % for 9 s |
| Heavy Duty overload with motor rated current = drive rated current (size 8 and below) | 200 % for 28 s | 200 % for 3 s | 150 % for 60 s | 150 % for 7 s |
| Heavy Duty overload with motor rated current = drive rated current (size 9E and 10) | 170 % for 42 s | 170 % for 5 s | 150 % for 60 s | 150 % for 7 s |

Generally the drive rated current is higher than the matching motor rated current allowing a higher level of overload than the default setting. The time allowed in the overload region is proportionally reduced at very low output frequency on some drive ratings.

NOTE The maximum overload level which can be attained is independent of the speed.

Output current

The continuous output current ratings given on the rating label are for maximum 40 °C (104 °F), 1000 m altitude and 3.0 kHz switching frequency. Derating is required for higher switching frequencies, ambient temperatures >40 °C (104 °F) and higher altitude. For derating information, refer to the *Drive User Guide*.

Input current

The input current is affected by the supply voltage and impedance. The input current given on the rating label is the typical input current and is stated for a balanced supply.

Input line reactor (Frame 9E and 10)

A line reactor must be used with Frame 9E and 10. Failure to provide sufficient reactance could damage or reduce the service life of the drive. Refer to Table 2-7 below.

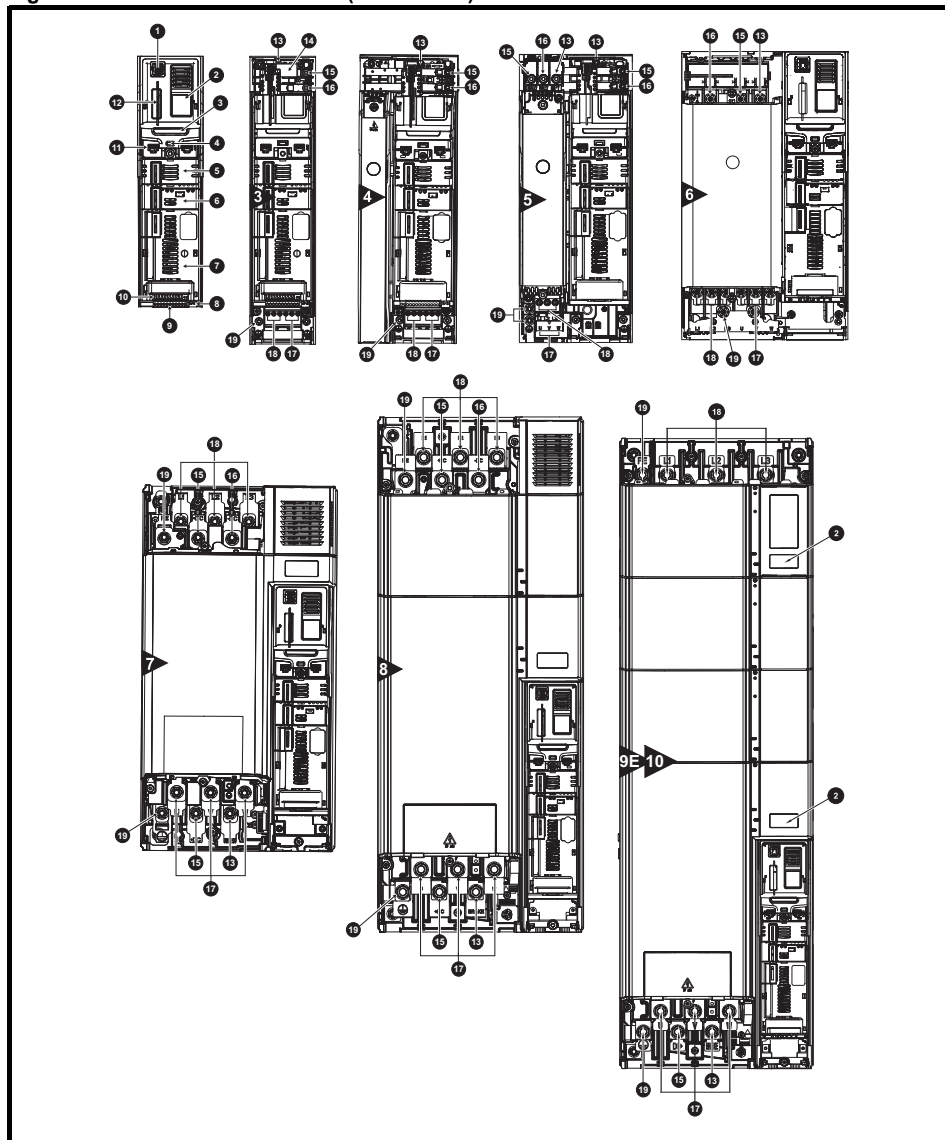
Table 2-7 Size 9E and 10 model and line reactor part number

| Size | Drive model | Inductor model | Line reactor part number |
|------|--|----------------|--------------------------|
| 9 | 09201760, 09202190, 09402000, 09402240 | INL 401 | 4401-0181 |
| | | INL 401W* | 4401-0208 |
| | 09501040, 09501310, 09601040, 09601310 | INL 601 | 4401-0183 |
| 10 | 10202830, 10203000, 10402700, 10403200 | INL 402 | 4401-0182 |
| | | INL 402W* | 4401-0209 |
| | 10501520, 10501900, 10601500, 10601780 | INL 602 | 4401-0184 |

* This may represent a more economical solution where operating temperature and cooling requirements are observed. Refer to the *Drive User Guide* for further information.

2.4 Drive features

Figure 2-3 Features of the drive (size 3 to 10)

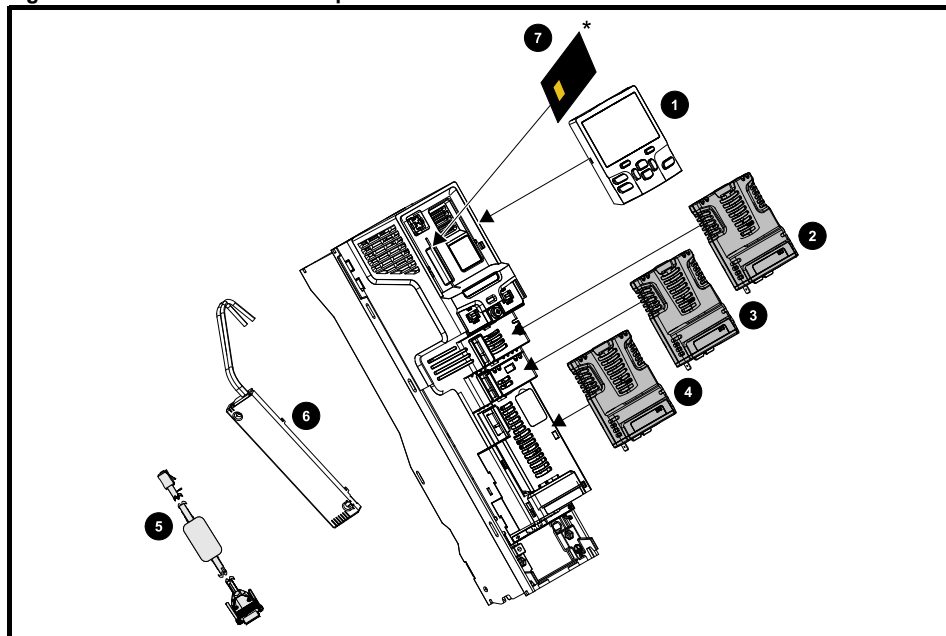


Key

- | | | | |
|-------------------------|----------------------------------|-------------------------|---------------------------|
| 1. Keypad connection | 6. Option module slot 2 | 11. Communications port | 16. DC bus - |
| 2. Rating label | 7. Option module slot 3 | 12. NV media card slot | 17. Motor connections |
| 3. Identification label | 8. Relay connections | 13. Braking terminal | 18. AC supply connections |
| 4. Status LED | 9. Position feedback connections | 14. Internal EMC filter | 19. Ground connections |
| 5. Option module slot 1 | 10. Control connections | 15. DC bus + | |

2.5 Options / Accessories

Figure 2-4 Drive features and options



1. Keypad

2. Option module slot 1

3. Option module slot 2

4. Option module slot 3

5. CT Comms cable

6. Internal braking resistor

7. NV media card

Table 2-8 Option modules, Keypad and additional options available

| Type | Name | Further details |
|----------------------------|---|--|
| Feedback | 15-way D-type converter | Drive encoder input converter Provides screw terminal interface for encoder wiring and spade terminal for shield. |
| | Single ended encoder interface (15 V or 24 V) | Single ended encoder interface Provides an interface for single ended ABZ encoder signals, such as those from hall effect sensors. 15 V and 24 V versions are available. |
| Fieldbus | KI-485 Adaptor | 485 Comms Adaptor 485 Comms adaptor provides 485 communication interface. This adaptor supports 115 k Baud, node addresses between 1 to 16 and 8 1 NP M serial mode. |
| | SI-PROFIBUS | Profibus option PROFIBUS adapter for communications with the drive. |
| | SI-DeviceNet | DeviceNet option DeviceNet adapter for communications with the drive. |
| | SI-CANopen | CANopen option CANopen adapter for communications with the drive. |
| Automation (I/O expansion) | SI-I/O | Extended I/O Increases the I/O capability by adding the following combinations: Digital I/O, Digital Inputs, Analog Inputs (differential or single ended), Analog Output, Relays. |
| Automation (Applications) | MCi200 | Machine Control Studio Compatible Applications Processor 2nd processor for running pre-defined and/or customer created application software. |
| | MCi210 | Machine Control Studio Compatible Applications Processor (with Ethernet communications) 2nd processor for running pre-defined and/or customer created application software with Ethernet communications. |
| | SI-Applications Plus | SyPTPro Compatible Applications Processor (with CTNet) 2nd processor for running pre-defined and/or customer created application software with CTNet support. (Can be used in slot 3 only). |
| | SI-Register | SyPTPro Compatible Applications Processor 2nd processor for running position capture functionality with CTNet support. (Can be used in slot 3 only). |
| Keypad | KI-Keypad | LCD keypad option Keypad with a LCD display. |
| | KI-Keypad RTC | LCD keypad option Keypad with a LCD display and real time clock. |
| Back-up | SD Card Adaptor | SD Card Adaptor Allows the drive to use an SD card for drive back-up. |
| | SMARTCARD | SMARTCARD Used for parameter back-up with the drive. |

For more information refer to the *Drive User Guide* and the relevant option module user guide.

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2.5.1 Parts supplied with the drive

Items such as control terminals, relay connector, 24 V power supply connector, grounding bracket, surface mount brackets, grounding clamp, DC terminal cover grommets, terminal nuts, supply and motor connector and finger guard grommets are provided with the drive. For more information refer to the label on the accessory kit box supplied with the drive.

3 Mechanical installation

3.1 Safety information



WARNING

Follow the instructions

The mechanical and electrical installation instructions must be adhered to. Any questions or doubt should be referred to the supplier of the equipment. It is the responsibility of the owner or user to ensure that the installation of the drive and any external option unit, and the way in which they are operated and maintained, comply with the requirements of the Health and Safety at Work Act in the United Kingdom or applicable legislation and regulations and codes of practice in the country in which the equipment is used.



WARNING

Stored charge

The drive contains capacitors that remain charged to a potentially lethal voltage after the AC supply has been disconnected. If the drive has been energized, the AC supply must be isolated at least ten minutes before work may continue.

Normally, the capacitors are discharged by an internal resistor. Under certain, unusual fault conditions, it is possible that the capacitors may fail to discharge, or be prevented from being discharged by a voltage applied to the output terminals. If the drive has failed in a manner that causes the display to go blank immediately, it is possible the capacitors will not be discharged. In this case, consult Control Techniques or their authorized distributor.



WARNING

Competence of the installer

The drive must be installed by professional assemblers who are familiar with the 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.



WARNING

Enclosure

The drive is intended to be mounted in an enclosure which prevents access except by trained and authorized personnel, and which prevents the ingress of contamination. It is designed for use in an environment classified as pollution degree 2 in accordance with IEC 60664-1. This means that only dry, non-conducting contamination is acceptable.

3.2 Fire protection

The drive enclosure is not classified as a fire enclosure. A separate fire enclosure must be provided.

For installation in the USA, a NEMA 12 enclosure is suitable.

For installation outside the USA, refer to the *Drive User Guide*.

3.3 Mounting methods

All drive sizes can be either surface or through-panel mounted using the appropriate brackets.

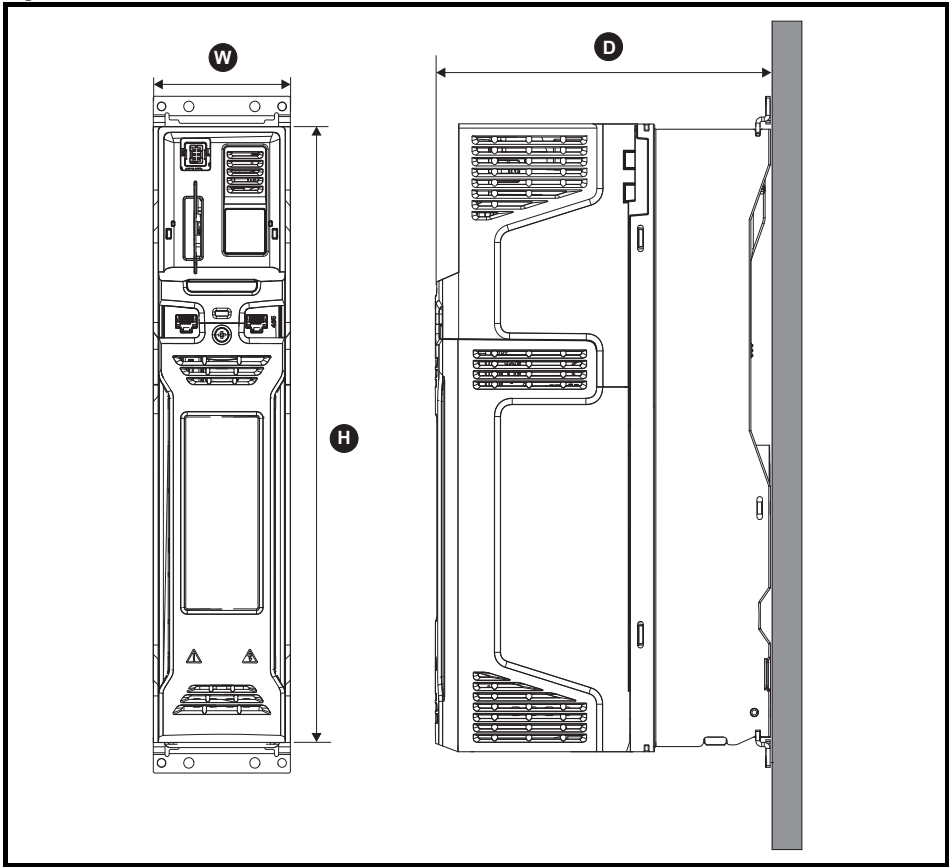


WARNING

If the drive has been used at high load levels for a period of time, the heatsink can reach temperatures in excess of 70 °C (158 °F). Human contact with the heatsink should be prevented.

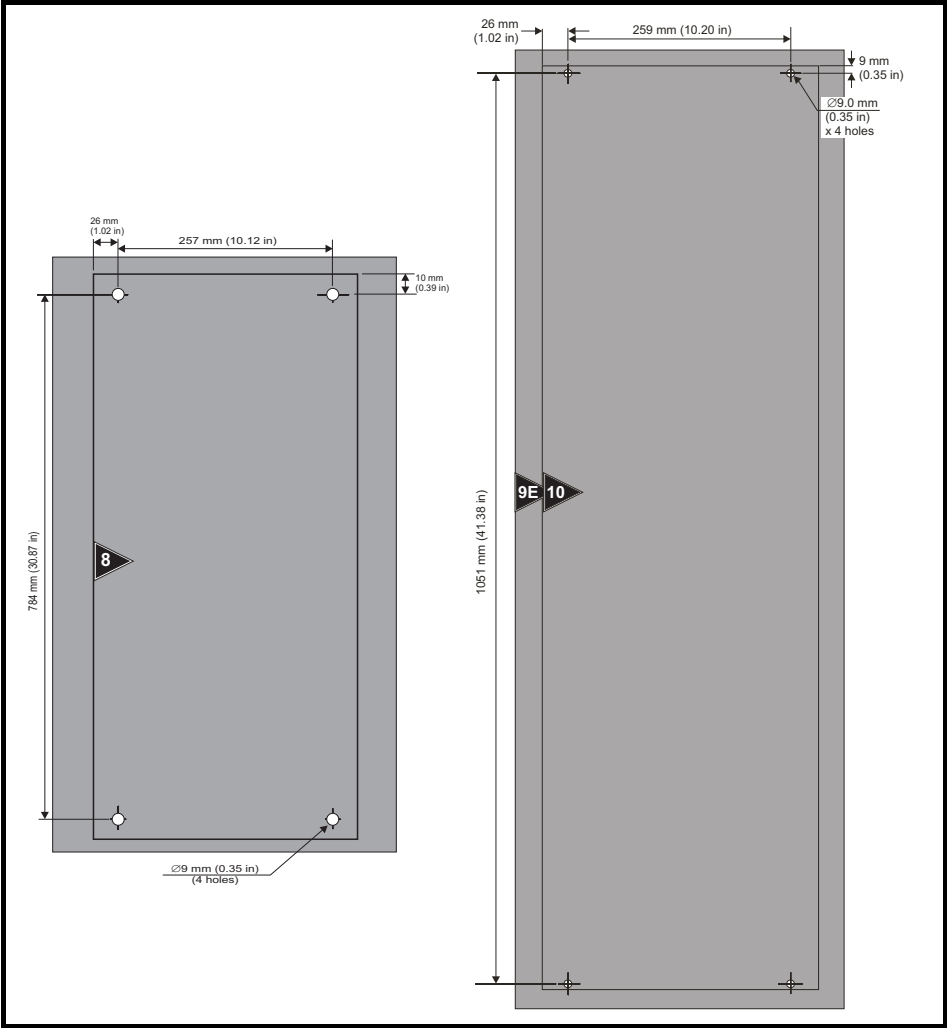
3.4 Drive dimensions

Figure 3-1 Drive dimensions



| Size | H | | W | | D | |
|-----------|------|-------|-----|-------|-----|-------|
| | mm | in | mm | in | mm | in |
| 3 | 365 | 14.37 | 83 | 3.27 | 200 | 7.87 |
| 4 | | | 124 | 4.88 | | |
| 5 | | | 143 | 5.63 | | |
| 6 | | | 210 | 8.27 | | |
| 7 | 508 | 20 | 270 | 10.63 | 279 | 11 |
| 8 | 753 | 29.65 | 310 | 12.21 | 290 | 11.42 |
| 9E and 10 | 1069 | 42.09 | 310 | 12.21 | 289 | 11.38 |

Figure 3-3 Surface mounting dimensions (size 8 to 10)



3.6 Terminal size and torque settings

Table 3-1 Drive control and relay terminal data

| Model | Connection type | Torque setting |
|-------|------------------------|---------------------|
| All | Plug-in terminal block | 0.5 N m (0.4 lb ft) |

Table 3-2 Drive power terminal data

| Model size | AC terminals | DC and braking | Ground terminal |
|------------|---|-------------------------------------|-------------------------------------|
| | Recommended | | |
| 3 and 4 | Plug-in terminal block | T20 Torx (M4) | T20 Torx (M4) / M4 Nut (7 mm AF) |
| | 0.7 N m (0.5 lb ft) | 2.0 N m (1.47 lb ft) | 2.0 N m (1.47 lb ft) |
| 5 | Plug-in terminal block 1.8 N m (1.3 lb ft) | T20 Torx (M4) / M4 Nut (7 mm AF) | M5 Nut (8 mm AF) |
| | 1.5 N m (1.1 lb ft) | 1.5 N m (1.1 lb ft) | 2.0 N m (1.47 lb ft) |
| 6 | M6 Nut (10 mm AF) | | |
| | 6.0 N m (4.42 lb ft) | | |
| 7 | M8 Nut (13 mm AF) | | |
| | 12.0 N m (8.85 lb ft) | | |
| 8 to 10 | M10 Nut (17 mm AF) | | |
| | 15.0 N m (11.1 lb ft) | | |

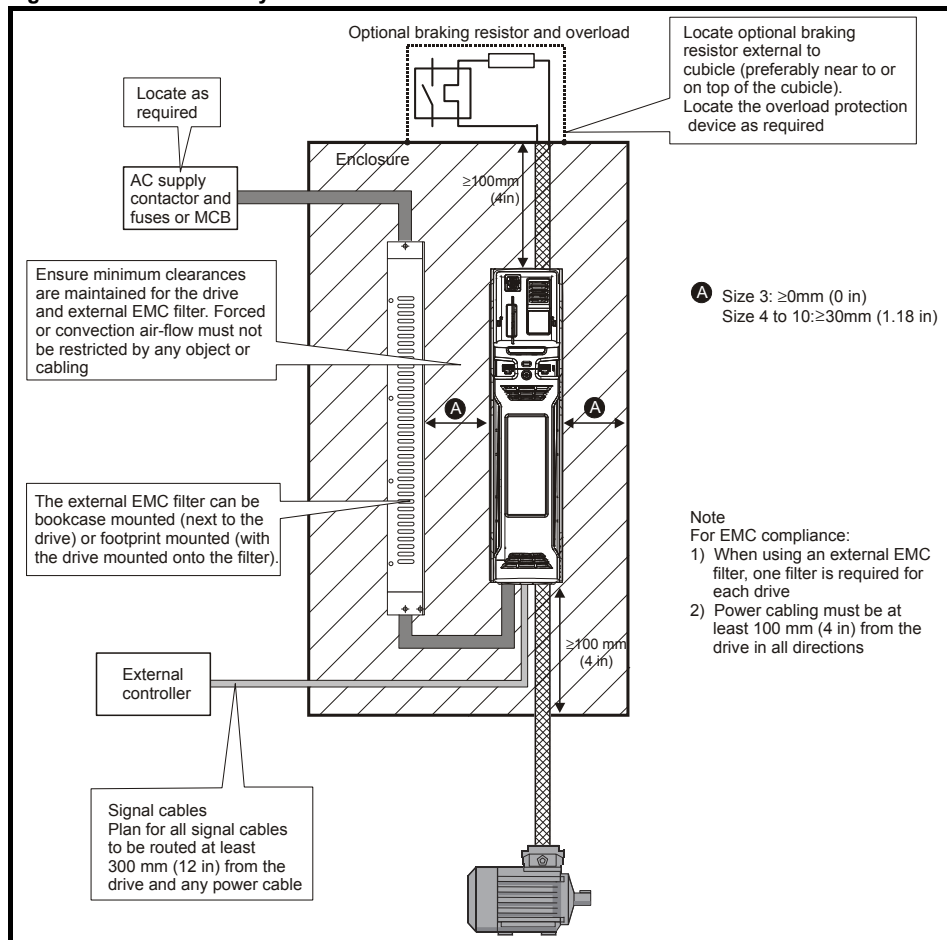
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3.7 Enclosure

Enclosure Layout

Please observe the clearances in the diagram below taking into account any appropriate notes for other devices / auxiliary equipment when planning the installation.

Figure 3-4 Enclosure layout

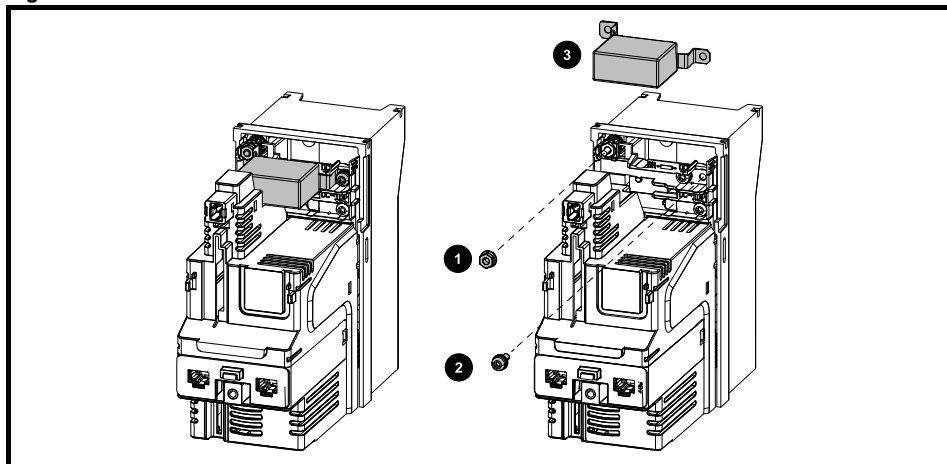


3.8 EMC filters

3.8.1 Internal 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 part of a regen system or it is connected to an IT supply then the internal EMC filter must be removed. The internal EMC filter reduces radio-frequency emission into the line power supply. Where the motor cable is short, it permits the requirements of EN 61800-3:2004 to be met for the second environment - for further information see the *Drive User Guide*. For longer motor cables the filter continues to provide a useful reduction in emission level, 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 the ground leakage current of the drive is unacceptable.

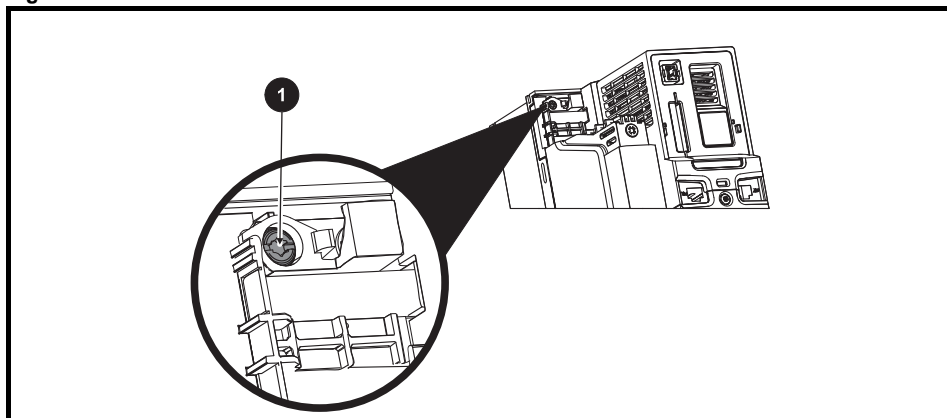
Figure 3-5 Removal of Size 3 internal EMC filter



Loosen / remove the screw and nut as shown (1) and (2).

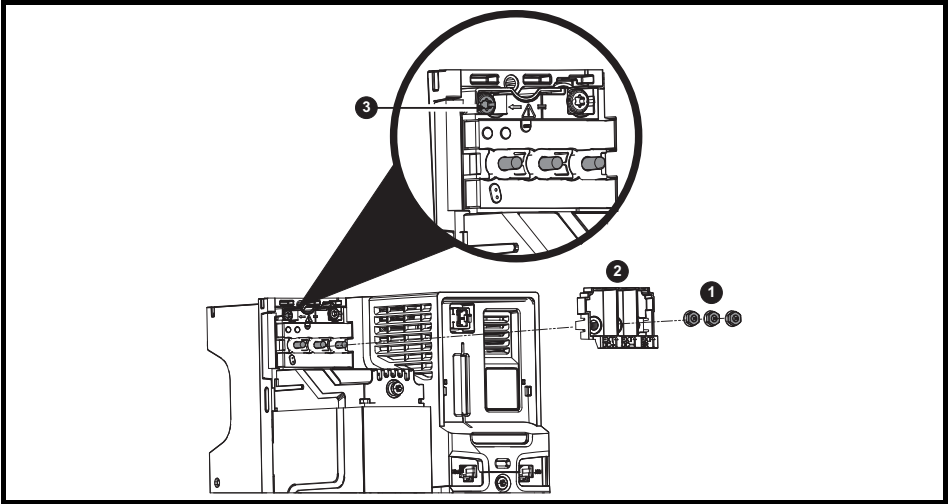
Lift away from securing points and then rotate away from the drive. Ensure the screw and nut are replaced and re-tightened with a maximum torque of 2 N m (1.47 lb ft).

Figure 3-6 Removal of the size 4 internal EMC filter



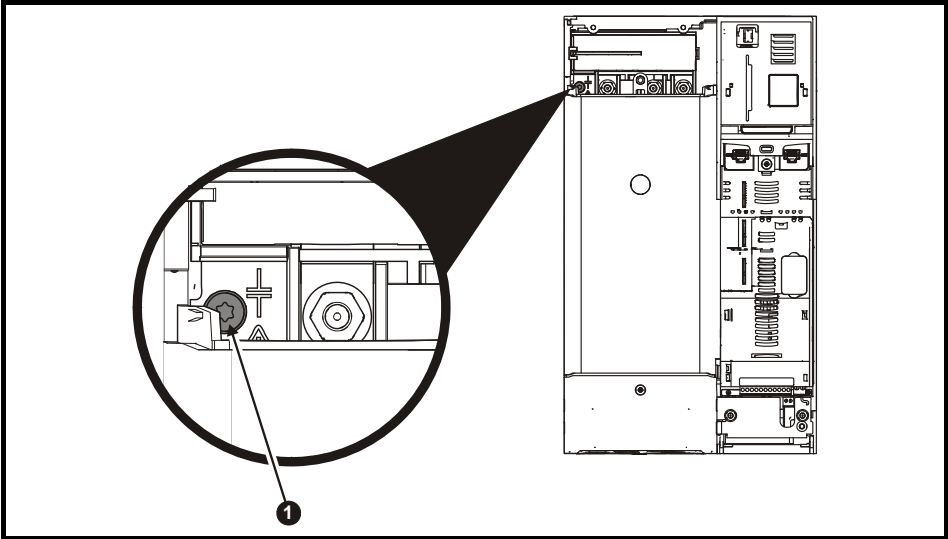
To electrically disconnect the Internal EMC filter, remove the screw (1) as highlighted above.

Figure 3-7 Removal of the size 5 internal EMC filter



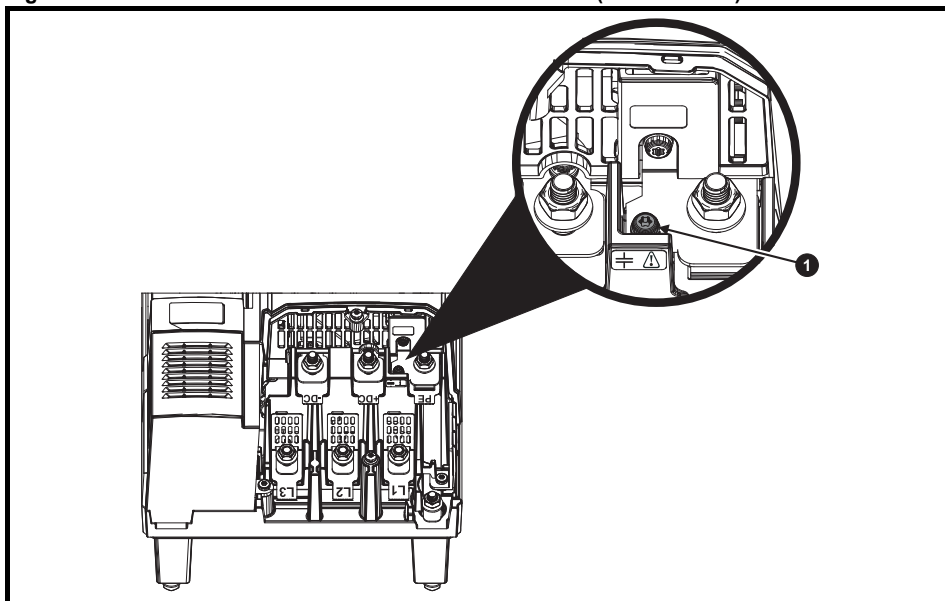
Remove the three M4 terminal nuts (1). Lift away the cover (2) to expose the M4 Torx internal EMC filter removal screw (3) to electrically disconnect the internal EMC filter.

Figure 3-8 Removal of the size 6 internal EMC filter



To electrically disconnect the Internal EMC filter, remove the screw (1) as highlighted above.

Figure 3-9 Removal of the size 7 to 10 internal EMC filter (size 7 shown)



To electrically disconnect the Internal EMC filter, remove the screw (1) as highlighted above.

3.8.2 External filter

The external EMC filter for size 3, 4, 5 and 6 can be footprint or bookcase mounted.

For information on drive and EMC filter cross reference, refer to the *Drive User Guide*.



To avoid a fire hazard and maintain validity of the UL listing, adhere to the specified tightening torques for the power and ground terminals.

For further information refer to the *Drive User Guide*.

4 Electrical installation



WARNING

Electric shock risk

The voltages present in the following locations can cause severe electric shock and may be lethal:

AC supply cables and connections

DC and brake cables, and connections

Output cables and connections

Many internal parts of the drive, and external option units

Unless otherwise indicated, control terminals are single insulated and must not be touched.



WARNING

Isolation device

The AC and / or DC power supply must be disconnected from the drive using an approved isolation device before any cover is removed from the drive or before any servicing work is performed.



WARNING

STOP function

The STOP function does not remove dangerous voltages from the drive, the motor or any external option units.



WARNING

SAFE TORQUE OFF function

The SAFE TORQUE OFF function does not remove dangerous voltages from the drive, the motor or any external option units.



WARNING

Stored charge

The drive contains capacitors that remain charged to a potentially lethal voltage after the AC and / or DC power supply has been disconnected. If the drive has been energized, the AC and / or DC power supply must be isolated at least ten minutes before work may continue. Normally, the capacitors are discharged by an internal resistor. Under certain, unusual fault conditions, it is possible that the capacitors may fail to discharge, or be prevented from being discharged by a voltage applied to the output terminals. If the drive has failed in a manner that causes the display to go blank immediately, it is possible the capacitors will not be discharged. In this case, consult Control Techniques or their authorized distributor.



WARNING

Equipment supplied by plug and socket

Special attention must be given if the drive is installed in equipment which is connected to the AC supply by a plug and socket. The AC supply terminals of the drive are connected to the internal capacitors through rectifier diodes which are not intended to give safety isolation. If the plug terminals can be touched when the plug is disconnected from the socket, a means of automatically isolating the plug from the drive must be used (e.g. a latching relay).



WARNING

Permanent magnet motors


Permanent magnet motors generate electrical power if they are rotated, even when the supply to the drive is disconnected. If that happens then the drive will become energized through its motor terminals. If the motor load is capable of rotating the motor when the supply is disconnected, then the motor must be isolated from the drive before gaining access to any live parts.

4.1 Supply types

All drives are suitable for use on any supply type i.e TN-S, TN-C-S, TT and IT.

Supplies with voltage up to 600 V may have grounding at any potential, i.e. neutral, centre or corner ("grounded delta")

Supplies with voltage above 600 V may not have corner grounding



If an SI-Applications Plus or SI-Register module is installed in the drive, then the drive must not be used on a corner-grounded or centre-grounded delta supply if the supply voltage is above 300 V. If this is required, please contact the supplier of the drive for more information.

Drives are suitable for use on supplies of installation category III and lower, according to IEC 60664-1. This means they may be connected permanently to the supply at its origin in a building, but for outdoor installation additional over-voltage suppression (transient voltage surge suppression) must be provided to reduce category IV to category III.

NOTE If the drive is to be used on an IT (ungrounded) supply, refer to the *Drive User Guide* for more information.

4.2 Ratings

See section 2.3 *Ratings* on page 9.


Maximum continuous input current

The values of maximum continuous input current are given to aid the selection of cables and fuses. These values are stated for the worst case condition with the unusual combination of stiff supply with high imbalance. The value stated for the maximum continuous input current would only be seen in one of the input phases. The current in the other two phases would be significantly lower.

The values of maximum input current are stated for a supply with a 2 % negative phase-sequence imbalance and rated at the maximum supply fault current given in section 2.3 *Ratings* on page 9.

The nominal cable sizes given in section 2.3 *Ratings* on page 9 are only a guide. Refer to local wiring regulations for the correct size of cables. In some cases a larger cable is required to avoid excessive voltage drop.

NOTE The nominal output cable sizes in section 2.3 *Ratings* on page 9 assume that the motor maximum current matches that of the drive. Where a motor of reduced rating is used the cable rating may be chosen to match that of the motor. To ensure that the motor and cable are protected against over-load, the drive must be programmed with the correct motor rated current.



Fuses
The AC supply to the drive must be installed with suitable protection against overload and short-circuits. Nominal fuse ratings are shown in section 2.3 *Ratings* on page 9. Failure to observe this requirement will cause risk of fire.

A fuse or other protection must be included in all live connections to the AC supply.

An MCB (miniature circuit breaker) or MCCB (moulded-case circuit-breaker) with type C may be used in place of fuses for size 3 under the following conditions:

- The fault-clearing capacity must be sufficient for the installation

Fuse types

The fuse voltage rating must be suitable for the drive supply voltage.

4.3 Power connections

Figure 4-1 Size 3 power and ground connections

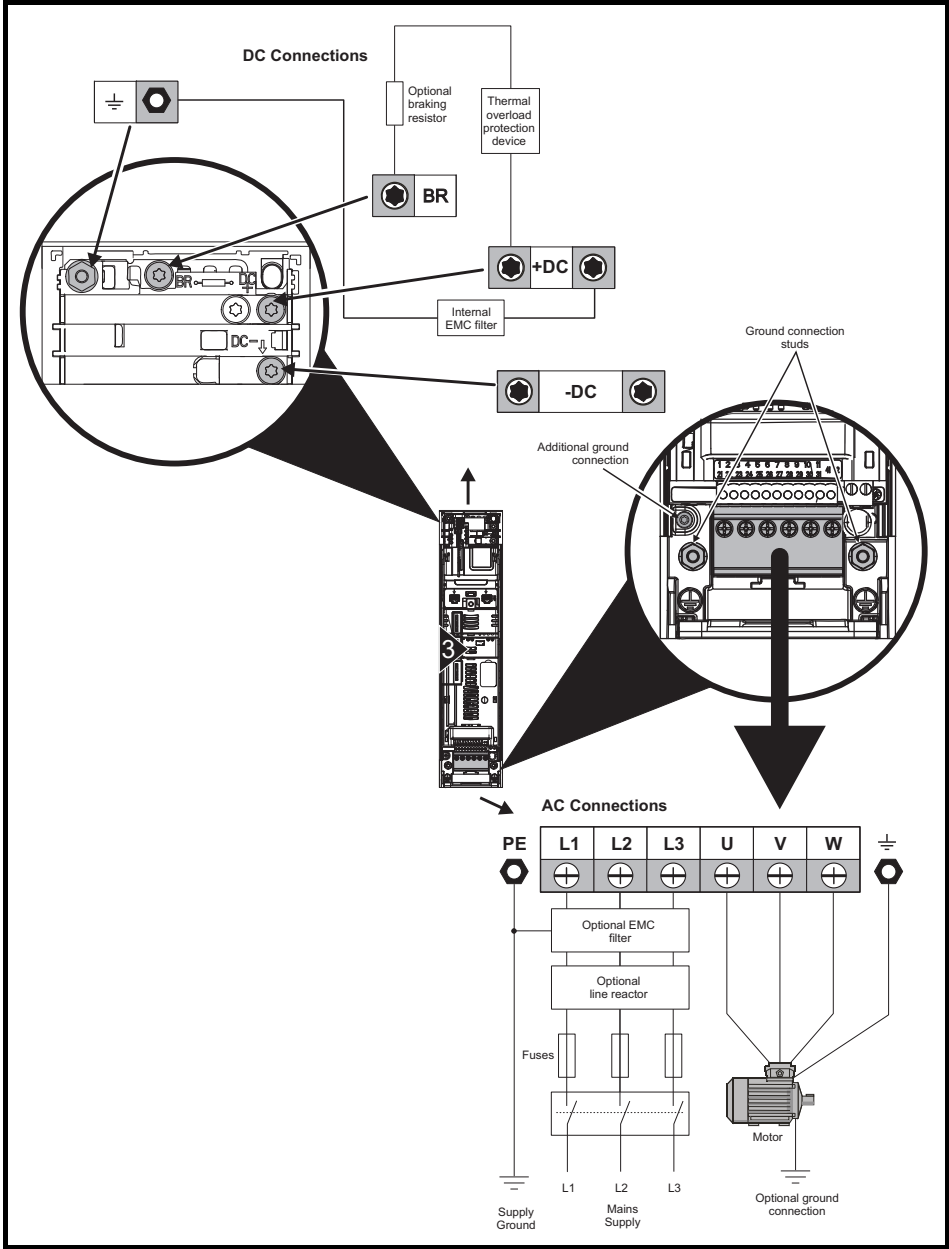


Figure 4-2 Size 4 power and ground connections

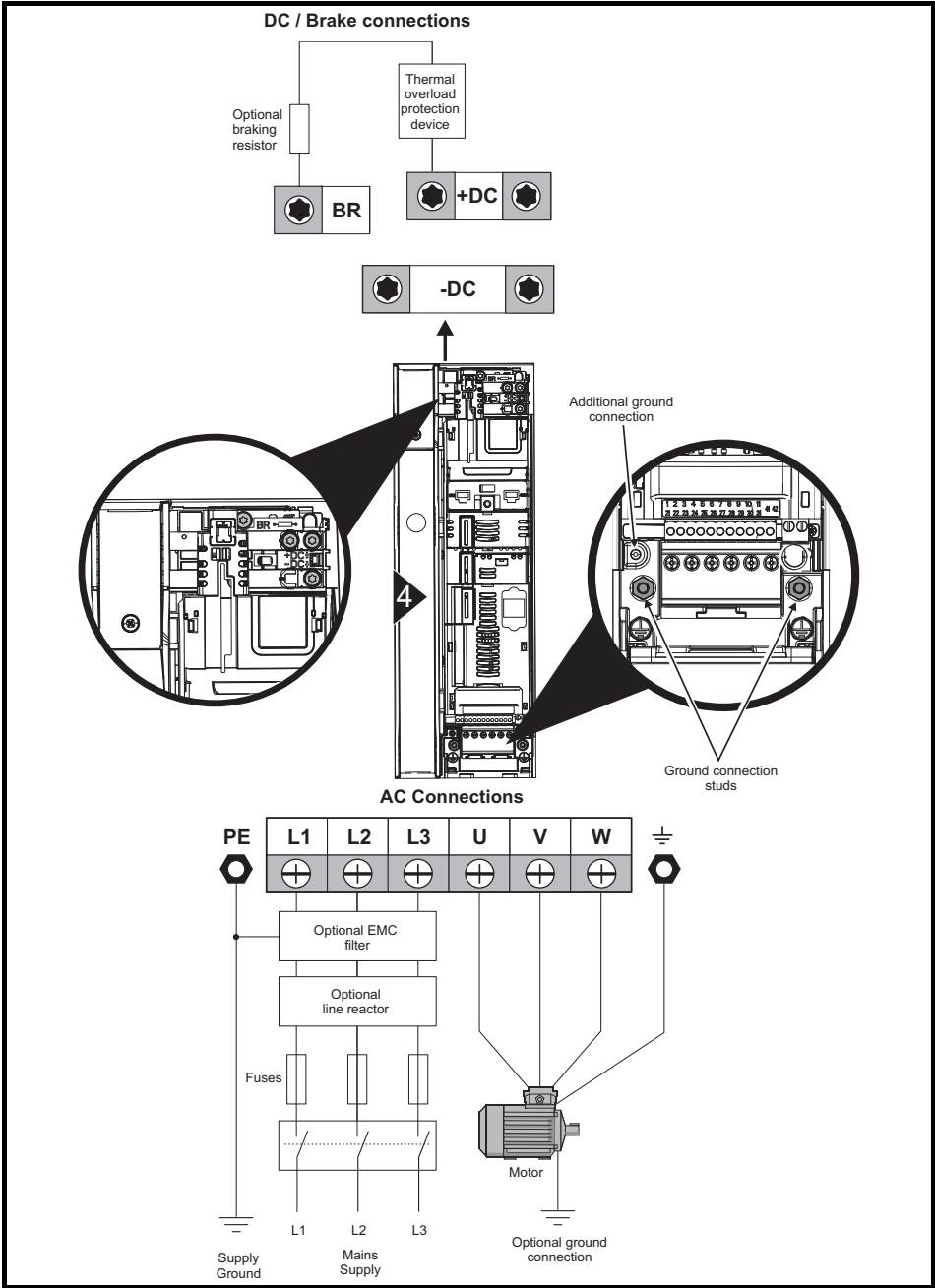
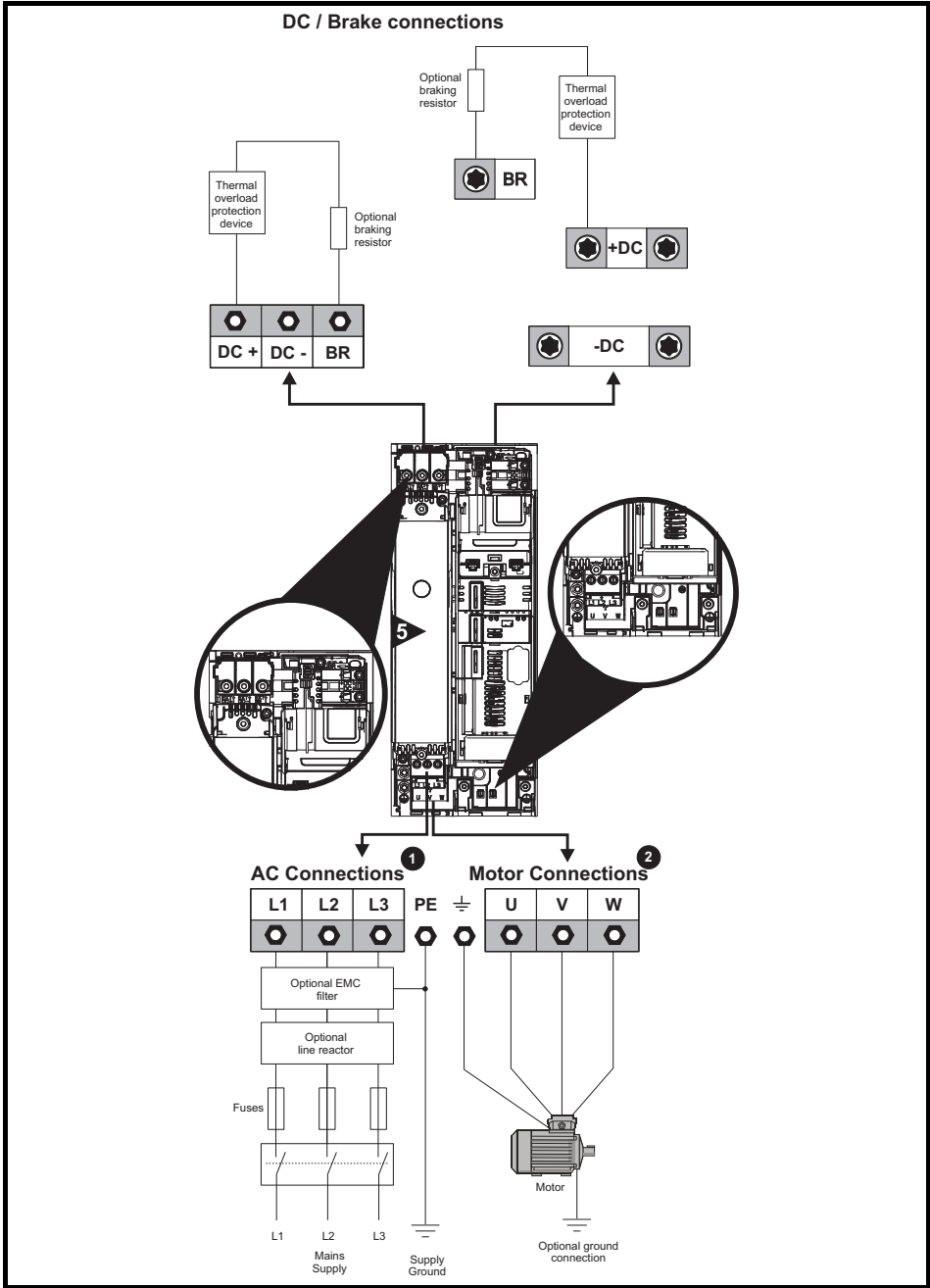


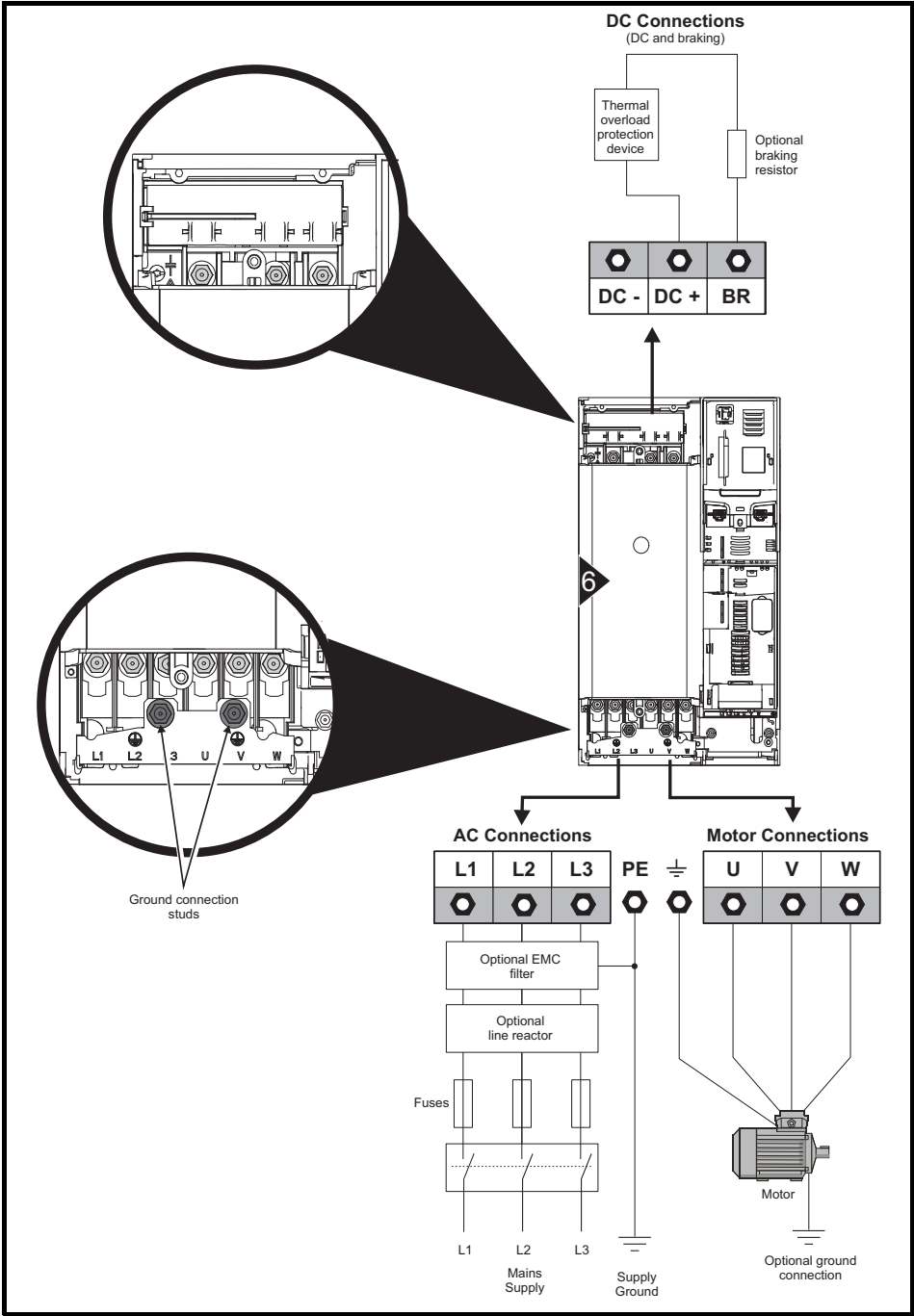
Figure 4-3 Size 5 power and ground connections



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

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

Figure 4-4 Size 6 power and ground connections



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Figure 4-5 Size 7 and 8 power and ground connections (size 7 shown)

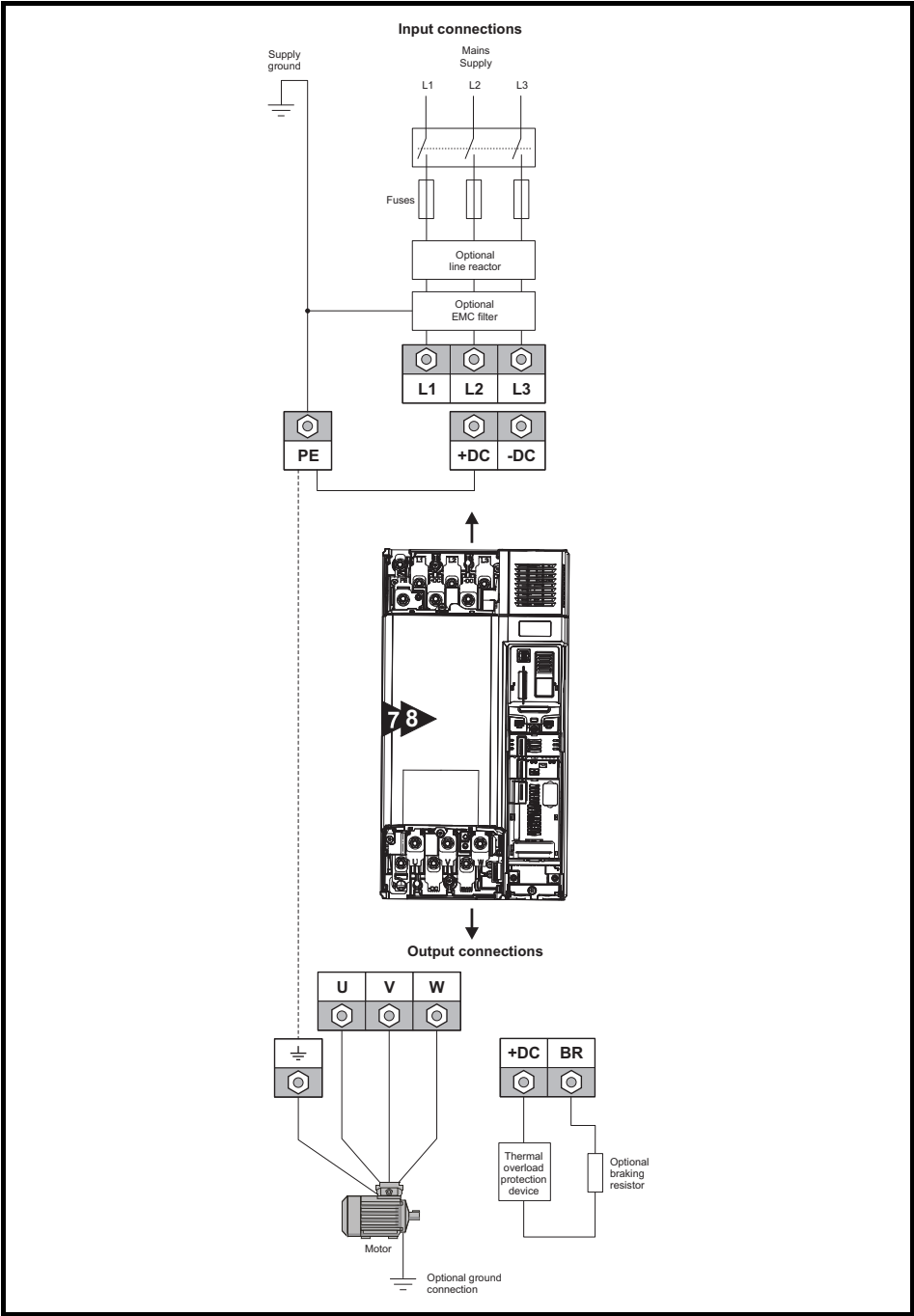
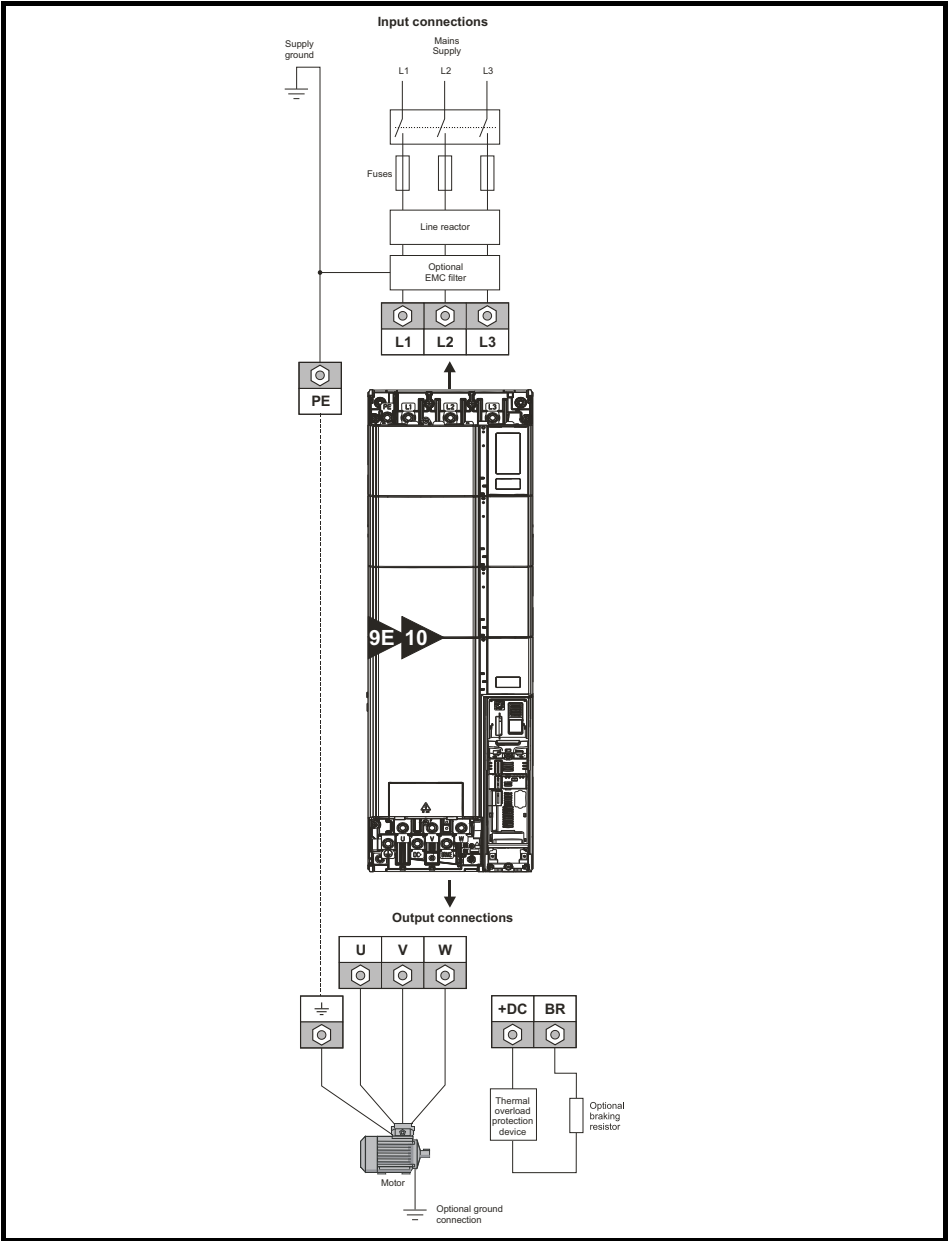


Figure 4-6 Size 9E and 10 power and ground connections



A separate line reactor (INLXXX) must be used for size 9E and 10. Failure to provide sufficient reactance could damage or reduce the service life of the drive. Refer to Table 2-7 *Size 9E and 10 model and line reactor part number* on page 12.

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4.4 Ground connections



Electrochemical corrosion of grounding terminals

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

The drive must be connected to the system ground of the AC supply. The ground wiring must conform to local regulations and codes of practice. For further information on ground cable sizes, refer to Table 2-5 *Protective ground cable ratings* on page 11.

On size 3 and 4, the supply and motor ground connections are made using the M4 studs located either side of the drive near the plug-in power connectors. See Figure 4-1 and Figure 4-2 for details. On size 5, the supply and motor ground connections are made using the M5 studs located near the plug-in power connector. Refer to Figure 4-3 for details.

On a size 6, the supply and motor ground connections are made using the M6 studs located above the supply and motor terminals. Refer to Figure 4-4 above.

On size 7, the supply and motor ground connections are made using the M8 studs located by the supply and motor connection terminals. Refer to Figure 4-5 above.

On size 8 and above, the supply and motor ground connections are made using the M10 studs located by the supply and motor connection terminals. Refer to Figure 4-5 above.



The ground loop impedance must conform to the requirements of local safety regulations.

The drive must be grounded by a connection capable of carrying the prospective fault current until the protective device (fuse, etc.) disconnects the AC supply.

The ground connections must be inspected and tested at appropriate intervals.

4.5 Position feedback connections

The following functions are provided via the 15-way high density D-type connector on the drive:

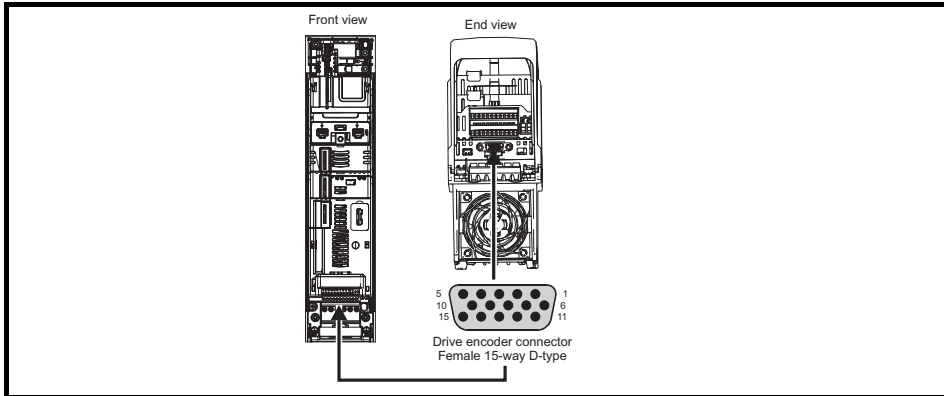
- Two position feedback interfaces (P1 and P2).
- One encoder simulation output.
- Two freeze trigger inputs (marker inputs).
- One thermistor input.

The P1 position interface is always available but the availability of the P2 position interface and the encoder simulation output depends on the position feedback device used on the P1 position interface.

NOTE

Refer to the *Drive User Guide* for information regarding the supported feedback devices on the P1 and P2 position interface and the encoder stimulation output.

Figure 4-7 Location of position feedback connection



4.5.1 Position feedback connection details

Table 4-1 P1 position feedback connection details

| P1 Position feedback interface Pr 03.038 | Connections | | | | | | | | | | | | | | |
|---|-------------|--------------|------------|--------------|-------------------|--------------------|-----------------|------------------|-----------------|------------------|--------------------|---------------------|------------------|-----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| AB (0) | A | A\ | B | B\ | Z | Z\ | | | | | | | +V ^{*4} | 0 V | Th |
| FD (1) | F | F\ | D | D\ | Z | Z\ | | | | | | | | | |
| FR (2) | F | F\ | R | R\ | Z | Z\ | | | | | | | | | |
| AB Servo (3) | A | A\ | B | B\ | Z | Z\ | U | U\ | V | V\ | W | W\ | | | |
| FD Servo (4) | F | F\ | D | D\ | Z | Z\ | U | U\ | V | V\ | W | W\ | | | |
| FR Servo (5) | F | F\ | R | R\ | Z | Z\ | U | U\ | V | V\ | W | W\ | | | |
| SC (6) | A (Cos) | A\ (Cos\) | B (Sin) | B\ (Sin\) | Z | Z\ | | | | | | | | | |
| SC Hiperface (7) | Cos | Cosref | Sin | Sinref | DATA | DATA\ | | | | | | | | | |
| EnDat (8) | DATA | DATA\ | CLK | CLK\ | Frz ^{*3} | Frz\ ^{*3} | | | | | | | | | |
| SC EnDat (9) | A | A\ | B | B\ | DATA | DATA\ | | | | | CLK | CLK\ | | | |
| SSI (10) | DATA | DATA\ | CLK | CLK\ | Frz ^{*3} | Frz\ ^{*3} | | | | | | | | | |
| SC SSI (11) | A (Cos) | A\ (Cos\) | B (Sin) | B\ (Sin\) | DATA | DATA\ | | | | | CLK | CLK\ | | | |
| SC Servo (12) | A (Cos) | A\ (Cos\) | B (Sin) | B\ (Sin\) | Z | Z\ | U | U\ | V | V\ | W | W\ | | | |
| BiSS (13) | DATA | DATA\ | CLK | CLK\ | Frz ^{*3} | Frz\ ^{*3} | | | | | | | | | |
| Resolver (14) | Cos H | Cos L | Sin H | Sin L | Ref H | Ref L | | | | | | | | | |
| SC SC (15) | A (Cos) | A\ (Cos\) | B (Sin) | B\ (Sin\) | Z | Z\ | C ^{*1} | C\ ^{*1} | D ^{*2} | D\ ^{*2} | Frz2 ^{*3} | Frz2\ ^{*3} | | | |
| Commutation Only (16) | | | | | | | U | U\ | V | V\ | W | W\ | | | |

*1 - One sine wave per revolution

*2 - One cosine wave per revolution

*3 - Freeze inputs are shown in the table above as 'Frz'.

*4 - The encoder power supply is selectable through parameter configuration to 5 Vdc, 8 Vdc and 15 Vdc.

Greyed cells are for P2 position feedback connections or simulated encoder outputs. Refer to the *Drive User Guide* for further information.

NOTE Frz and Frz\ on terminals 5 and 6 are for Freeze input 1. Frz2 and Frz2\ on terminals 11 and 12 are for Freeze input 2.

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4.6 Braking resistor values

Table 4-2 Minimum resistance values and peak power rating for the braking resistor at 40 °C (104 °F)

| Model | | Minimum resistance * | Instantaneous power rating | Continuous power rating | Model | | Minimum resistance * | Instantaneous power rating | Continuous power rating |
|----------|------|-------------------------|----------------------------|------------------------------|----------|-------|-------------------------|----------------------------|-------------------------|
| | | Ω | kW | kW | | | Ω | kW | kW |
| 200 V | | | | | 575 V | | | | |
| 03200050 | 20 | 8.5 | 1.5 | 05500030 | 80 | 12.1 | 2.6 | | |
| 03200066 | | | 1.9 | 05500040 | | | 4.6 | | |
| 03200080 | | | 2.8 | 05500069 | | | 6.5 | | |
| 03200106 | | | 3.6 | 06500100 | | | 8.7 | | |
| 04200137 | 18 | 9.4 | 4.6 | 06500150 | 13 | 74 | 12.3 | | |
| 04200185 | | | 6.3 | 06500190 | | | 16.3 | | |
| 05200250 | 16.5 | 10.3 | 8.6 | 06500230 | | | 19.9 | | |
| 06200330 | 8.6 | 19.7 | 12.6 | 06500290 | | | 24.2 | | |
| 06200440 | | | 16.4 | 06500350 | 31.7 | | | | |
| 07200610 | 6.1 | 27.8 | 20.5 | 07500440 | 8.5 | 113.1 | 39.5 | | |
| 07200750 | | | 24.4 | 07500550 | | | 47.1 | | |
| 07200830 | 4.5 | 37.6 | 32.5 | 08500630 | 5.5 | 174.8 | 58.6 | | |
| 08201160 | 2.2 | 76.9 | 41 | 08500860 | | | 78.1 | | |
| 08201320 | | | 47.8 | 09501040 | 3.3 | 291.3 | 97.7 | | |
| 09201760 | 1.2 | 144.5 | 59.4 | 09501310 | | | 116.7 | | |
| 09202190 | | | 79.7 | 10501520 | 3.3 | 291.3 | 155.6 | | |
| 10202830 | 1.3 | 130 | 98.6 | 10501900 | 2.5 | 384.4 | 155.6 | | |
| 10203000 | | | 116.7 | 690 V | | | | | |
| 400 V | | | | | 07600190 | 11.5 | 121.2 | 20.6 | |
| 03400025 | 74 | 9.2 | 1.5 | 07600240 | 23.9 | | | | |
| 03400031 | | | 2.0 | 07600290 | 32.5 | | | | |
| 03400045 | | | 2.8 | 07600380 | 41.5 | | | | |
| 03400062 | | | 4.6 | 07600440 | 47.8 | | | | |
| 03400078 | 50 | 13.6 | 5.0 | 07600540 | 60.5 | | | | |
| 03400100 | | | 6.6 | 08600630 | 5.5 | 253.5 | 79.7 | | |
| 04400150 | 34 | 19.9 | 9.0 | 08600860 | | | 95.2 | | |
| 04400172 | | | 12.6 | 09601040 | 4.2 | 331.9 | 116.3 | | |
| 05400270 | 31.5 | 21.5 | 16.2 | 09601310 | | | 139.1 | | |
| 05400300 | 18 | 37.5 | 19.6 | 10601500 | 4.2 | 331.9 | 166.7 | | |
| 06400350 | 17 | 39.8 | 21.6 | 10601780 | 3.3 | 422.4 | 193 | | |
| 06400420 | | | 25 | * Resistor tolerance: ±10 %. | | | | | |
| 06400470 | | | 32.7 | | | | | | |
| 07400660 | 9.0 | 75.2 | 41.6 | | | | | | |
| 07400770 | | | 50.6 | | | | | | |
| 07401000 | 7.0 | 96.6 | 60.1 | | | | | | |
| 08401340 | 4.8 | 140.9 | 81 | | | | | | |
| 08401570 | | | 98.6 | | | | | | |
| 09402000 | 2.4 | 282.9 | 118.6 | | | | | | |
| 09402240 | | | 156.9 | | | | | | |
| 10402700 | 2.6 | 260 | 198.2 | | | | | | |
| 10403200 | | | 237.6 | | | | | | |

4.7 Communications connections

The *Unidrive M700* product offers Ethernet fieldbus communications and the *Unidrive M701* offers a 2 wire 485 serial interface. This enables the drive set-up, operation and monitoring to be carried out with a PC or controller if required.

4.7.1 Ethernet Fieldbus communications (*Unidrive M700* only)

The *Unidrive M700* provides two RJ45 connections with an Ethernet switch for easy network creation.

4.7.2 485 Serial communications (*Unidrive M701* only)

The *Unidrive M701* provides two parallel RJ45 connectors allowing easy daisy chaining. The drive supports the Modbus RTU protocol. See Table 4-3 for the connection details.

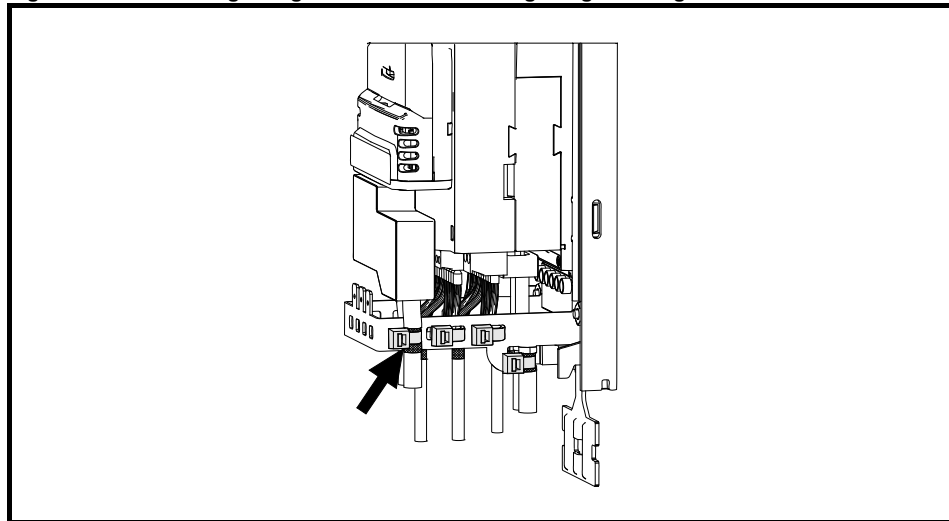
Table 4-3 Serial communication port pin-outs

| Pin | Function |
|-------|--|
| 1 | 120 Ω Termination resistor |
| 2 | RX TX |
| 3 | Isolated 0 V |
| 4 | +24 V (100 mA) |
| 5 | Isolated 0 V |
| 6 | TX enable |
| 7 | RX\ TX\ |
| 8 | RX\ TX\ (if termination resistors are required, link to pin 1) |
| Shell | Isolated 0 V |

4.8 Shield connections

The following guidelines should be followed to ensure suppression of radio-frequency emission and good noise immunity. It is particularly recommended that the guidelines for the encoder cable be followed closely in order to avoid disturbance to the encoder operation from electrical noise. Use the grounding bracket and grounding clamp supplied with the drive to terminate the shields at the drive.

Figure 4-8 Grounding of signal cable shields using the grounding bracket



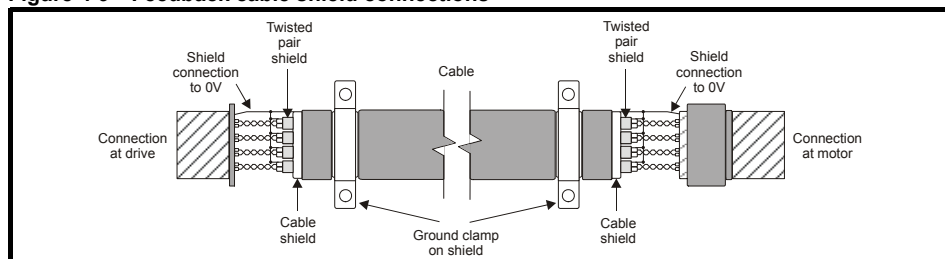
Motor cable: Use a motor cable with an overall shield. Connect the shield of the motor cable to the ground terminal of the motor frame using a link that is as short as possible and not exceeding 50 mm (2 in) long. A full 360 ° termination of the shield to the terminal housing of the motor is beneficial.

Encoder cable: For best shielding use cable with an overall shield and individual shields on twisted pairs, connect the cable as illustrated in Figure 4-9. Clamp the overall shield to grounded metallic surfaces at both the encoder and the drive.

Brake resistor cable: The optional braking resistor should also be wired with shielded cable. If unshielded wire is required refer to the *Drive User Guide* for guidance.

Control cables: If the control wiring is to leave the enclosure, it must be shielded and the shield(s) clamped to the drive using the grounding bracket. Remove the outer insulating cover of the cable to ensure the shield(s) make contact with the bracket, but keep the shield(s) intact until as close as possible to the terminals.

Figure 4-9 Feedback cable shield connections



4.9 Control connections

For information on control connections, refer to the back cover of this guide.

5 Getting started

This chapter introduces the user interfaces, menu structure and security level of the drive.

5.1 Understanding the display

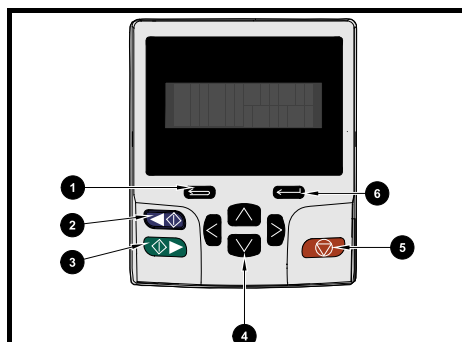
The keypad can only be mounted on the drive.

5.1.1 KI-Keypad

The KI-Keypad display consists of two rows of text. The upper row shows the drive status or the menu and parameter number currently being viewed. The lower row of the display line shows the parameter value or the specific trip type. The last two characters on the first row may display special indications. If more than one of these indications is active then the indications are prioritized as shown in Table 5-1.

When the drive is powered up the lower row will show the power up parameter defined by *Parameter Displayed At Power-up* (11.022).










Figure 5-1 KI-Keypad



1. Escape button
2. Start reverse (Auxiliary button)
3. Start forward
4. Navigation keys (x4)
5. Stop / Reset (red) button
6. Enter button

NOTE The red stop  button is also used to reset the drive.

Table 5-1 Active action icon

| Active action icon | Description | Priority |
|--|--|---|
|  | Alarm active |  |
|  | Keypad real-time clock battery low | |
|  | Accessing non-volatile media card | |
|  or  | Drive security active and locked or unlocked | |
|  | Motor map 2 active | |
|  | User program running | |
|  | Keypad reference active | |

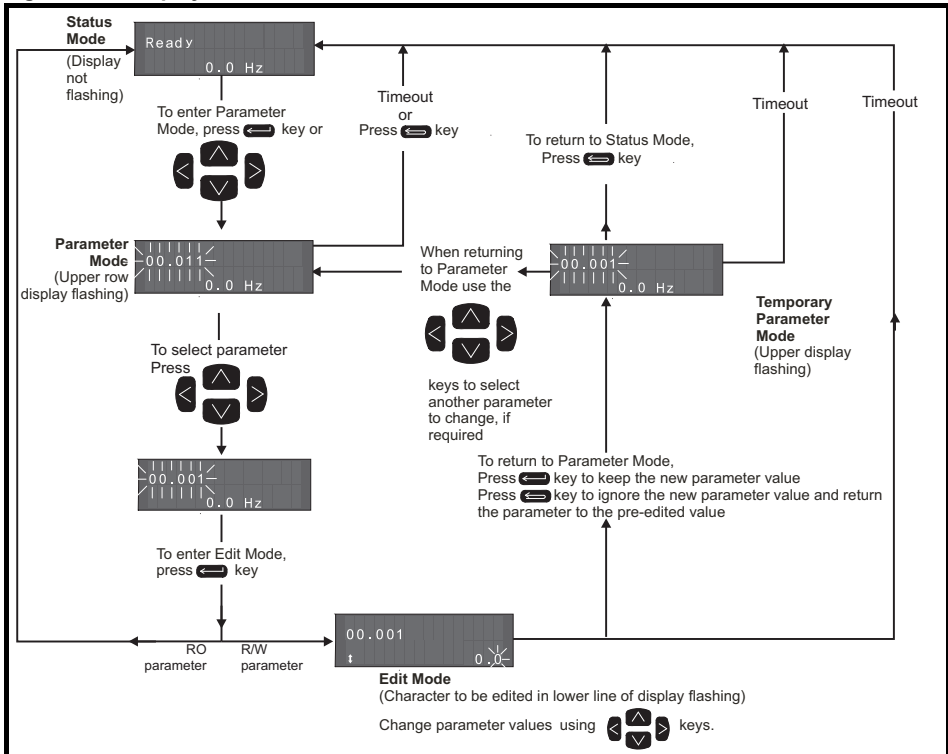
5.2 Keypad operation

5.2.1 Control buttons

The keypad consists of:

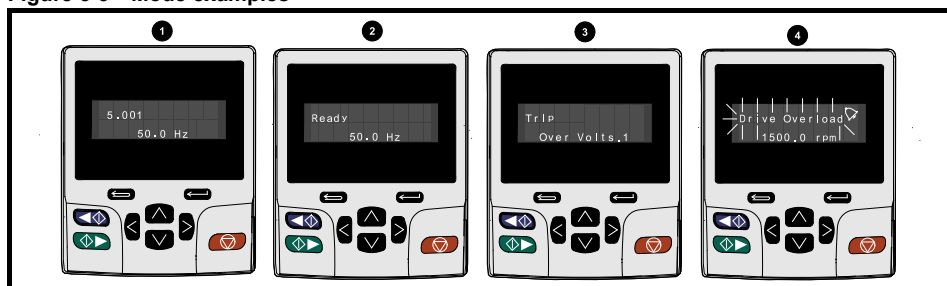
- Navigation Keys - Used to navigate the parameter structure and change parameter values.
- Enter / Mode button - Used to toggle between parameter edit or view mode.
- Escape / Exit button - Used to exit from parameter edit or view mode. In parameter edit mode, if parameter values are edited and the exit button pressed the parameter value will be restored to the value it had on entry to edit mode.
- Start forward button - Use to provide a 'Run' command if keypad mode is selected.
- Start reverse button - Used to control the drive if keypad mode is selected and the reverse button is activated.
- Stop / Reset button - Used to reset the drive. In keypad mode can be used for 'Stop'.

Figure 5-2 Display modes



The navigation keys can only be used to move between menus if Pr **00.049** has been set to show 'All Menus'

Figure 5-3 Mode examples



Do not change parameter values without careful consideration; incorrect values may cause damage or a safety hazard.

NOTE

When changing the values of parameters, make a note of the new values in case they need to be entered again.

NOTE

For new parameter-values to apply after the AC supply to the drive is interrupted, new values must be saved. Refer to section 5.7 *Saving parameters* on page 44.

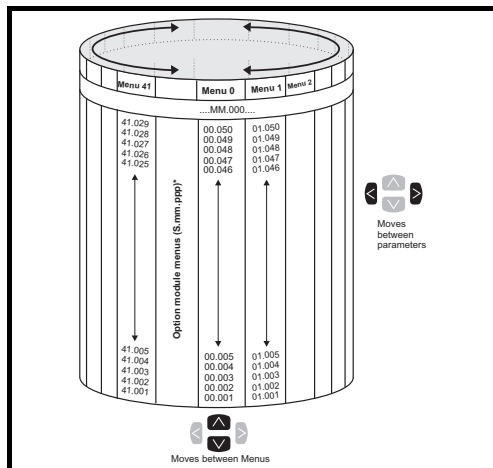
5.3 Menu 0

Menu 0 is used to bring together various commonly used parameters for basic easy set up of the drive. Appropriate parameters are copied from the advanced menus into menu 0 and thus exist in both locations. For further information, refer to Chapter 6 *Basic parameters (Menu 0)* on page 46.

5.4 Menu structure

The drive parameter structure consists of menus and parameters. The drive initially powers up so that only Menu 0 can be viewed. The up and down arrow buttons are used to navigate between parameters and once Pr **00.049** has been set to 'All Menus' the left and right buttons are used to navigate between menus. For further information, refer to section 5.11 *Parameter access level and security* on page 45.

Figure 5-4 Menu structure



The menus and parameters roll over in both directions. i.e. if the last parameter is displayed, a further press will cause the display to rollover and show the first parameter.

When changing between menus the drive remembers which parameter was last viewed in a particular menu and thus displays that parameter.

* The option module menus (S.mm.ppp) are only displayed if option modules are installed. Where S signifies the option module slot number and the mm.ppp signifies the menu and the parameter number of the option module's internal menus and parameter.

5.5 Advanced menus

The advanced menus consist of groups or parameters appropriate to a specific function or feature of the drive. Menus 0 to 41 can be viewed on the KI-Keypad. The option module menus are displayed as S.mm.ppp. Where S signifies the option module slot number and the mm.ppp signifies the menu and parameter number of the option module's internal menus and parameter. Menu 4.00.xxx is the same as menu 24.xxx.

Table 5-2 Advanced menu descriptions

| Menu | Description |
|--------|--|
| 0 | Commonly used basic set-up parameters for quick / easy programming |
| 1 | Frequency / speed reference |
| 2 | Ramps |
| 3 | Frequency slaving, speed feedback and speed control |
| 4 | Torque and current control |
| 5 | Motor control |
| 6 | Sequencer and clock |
| 7 | Analog I/O, Temperature monitoring |
| 8 | Digital I/O |
| 9 | Programmable logic, motorized pot, binary sum, timers and scope |
| 10 | Status and trips |
| 11 | Drive set-up and identification, serial communications |
| 12 | Threshold detectors and variable selectors |
| 13 | Standard motion control |
| 14 | User PID controller |
| 15 | Option module slot 1 set-up menu |
| 16 | Option module slot 2 set-up menu |
| 17 | Option module slot 3 set-up menu |
| 18 | General option module application menu 1 |
| 19 | General option module application menu 2 |
| 20 | General option module application menu 3 |
| 21 | Second motor parameters |
| 22 | Menu 0 set-up |
| 23 | Not allocated |
| 24 | Ethernet module (slot 4) set-up menu* |
| 25 | Option module slot 1 application parameters |
| 26 | Option module slot 2 application parameters |
| 27 | Option module slot 3 application parameters |
| 28 | Option module slot 4 application parameters |
| 29 | Reserved menu |
| 30 | Onboard user programming application menu |
| 31-41 | Advanced motion controller setup parameters |
| Slot 1 | Slot 1 option menus** |
| Slot 2 | Slot 2 option menus** |
| Slot 3 | Slot 3 option menus** |
| Slot 4 | Ethernet menus* |

* Only applicable to *Unidrive M700*.

** Only displayed when the option modules are installed.

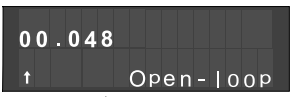

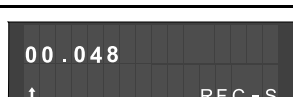
5.6 Changing the operating mode

Changing the operating mode returns all parameters to their default value, including the motor parameters. *User security status* (00.049) and *User security code* (00.034) are not affected by this procedure).


Procedure

Use the following procedure only if a different operating mode is required:

1. Ensure the drive is not enabled, i.e. terminal 31 is open or Pr **06.015** is OFF (0)
2. Enter either of the following values in Pr **mm.000**, as appropriate:
1253 (50Hz AC supply frequency)
1254 (60Hz AC supply frequency)
3. Change the setting of Pr **00.048** as follows:


| Pr 00.048 setting | | Operating mode |
|---|---|---|
|  | 1 | Open-loop (Induction motor) |
|  | 2 | RFC-A (Induction motor with or without position feedback) |
|  | 3 | RFC-S (Permanent magnet motor with or without position feedback) |

The figures in the second column apply when serial communications are used.

4. Either:
 - Press the red  reset button
 - Toggle the reset digital input
 - Carry out a drive reset through serial communications by setting Pr **10.038** to 100.

NOTE Entering 1253 or 1254 in Pr **mm.000** will only load defaults if the setting of Pr **00.048** has been changed.


5.7 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 Parameters'* in Pr **mm.000** (alternatively enter a value of 1000* in Pr **mm.000**)
2. Either:


- Press the red  reset button
- Toggle the reset digital input, or
- 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 control terminal 1 & 2 are being supplied from a low voltage DC supply) a value of 1001 must be entered into Pr **mm.000** to perform a save function.

5.8 Restoring parameter defaults

Restoring parameter defaults by this method saves the default values in the drives memory. *User security status* (00.049) and *User security code* (00.034) are not affected by this procedure).

Procedure

1. Ensure the drive is not enabled, i.e. terminal 31 is open or Pr **06.015** is OFF (0)
 2. Select 'Reset 50 Hz Defs' or 'Reset 60 Hz Defs' 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
 - Toggle the reset digital input
 - Carry out a drive reset through serial communications by setting Pr **10.038** to 100

5.9 Displaying parameters with non-default values only

By selecting 'Show non-default' in Pr **mm.000** (Alternatively, enter 12000 in Pr **mm.000**), the only parameters that will be visible to the user will be those containing a non-default value. This function does not require a drive reset to become active. In order to deactivate this function, return to Pr **mm.000** and select 'No action' (alternatively enter a value of 0). Please note that this function can be affected by the access level enabled, refer to section 5.8 *Restoring parameter defaults* on page 44 for further information regarding access level.

5.10 Displaying destination parameters only

By selecting 'Destinations' in Pr **mm.000** (Alternatively enter 12001 in Pr **mm.000**), the only parameters that will be visible to the user will be destination parameters. This function does not require a drive reset to become active. In order to deactivate this function, return to Pr **mm.000** and select 'No action' (alternatively enter a value of 0).

Please note that this function can be affected by the access level enabled, refer to section 5.11 *Parameter access level and security* on page 45 for further information regarding access level.

5.11 **Parameter access level and security**

The parameter access level determines whether the user has access to Menu 0 only or to all the advanced menus (Menus 1 to 41) in addition to Menu 0. The User Security determines whether the access to the user is read only or read write. Both the User Security and Parameter Access Level can operate independently of each other as shown in Table 5-3.

Table 5-3 Parameter access level and security

| User security status (11.044) | Access level | User security | Menu 0 status | Advanced menu status |
|-------------------------------|------------------|---------------|---------------|----------------------|
| 0 | Menu 0 | Open | RW | Not visible |
| | | Closed | RO | Not visible |
| 1 | All Menus | Open | RW | RW |
| | | Closed | RO | RO |
| 2 | Read-only Menu 0 | Open | RO | Not visible |
| | | Closed | RO | Not visible |
| 3 | Read-only | Open | RO | RO |
| | | Closed | RO | RO |
| 4 | Status only | Open | Not visible | Not visible |
| | | Closed | Not visible | Not visible |
| 5 | No access | Open | Not visible | Not visible |
| | | Closed | Not visible | Not visible |

The default settings of the drive are Parameter Access Level Menu 0 and User Security Open i.e. read / write access to Menu 0 with the advanced menus not visible.

6 Basic parameters (Menu 0)

| Parameter | | Range | | | Default | | | Type ¹ |
|-----------|--|--|------------------------------------|-------|---|--|--------------------------|-------------------|
| | | OL | RFC-A | RFC-S | OL | RFC-A | RFC-S | |
| 00.001 | Minimum Reference Clamp | ±VM_NEGATIVE_REF_CLAMP1 Hz / rpm | | | 0.0 Hz | 0.0 rpm | | RW |
| 00.002 | Maximum Reference Clamp | ±VM_POSITIVE_REF_CLAMP Hz / rpm | | | 50Hz default: 50.0 Hz 60Hz default: 60.0 Hz | 50Hz default: 1500.0 Hz 60Hz default: 1800.0 Hz | 3000.0 rpm | RW |
| 00.003 | Acceleration Rate 1 | ±VM_ACCEL_RATE s /100 Hz | ±VM_ACCEL_RATE s /1000 rpm | | 5.0 s/100 Hz | 2.000 s/1000 rpm | 0.200 s/1000 | RW |
| 00.004 | Deceleration Rate 1 | ±VM_ACCEL_RATE s /100 Hz | ±VM_ACCEL_RATE s /1000 rpm | | 10.0 s/100 Hz | 2.000 s/1000 rpm | 0.200 s/1000 | RW |
| 00.005 | Reference Selector | A1 A2 (0), A1 Preset (1), A2 Preset (2), Preset (3), Keypad (4), Precision (5), Keypad Ref (6) | | | A1 A2 (0) | | | RW |
| 00.006 | Symmetrical Current Limit | ±VM_MOTOR1_CURRENT_LIMIT % | | | 0.0 % | | | RW |
| 00.007 | Open-loop Control Mode | Ur S (0), Ur (1), Fixed (2), Ur Auto (3), Ur I (4), Square (5), Current 1P (6) | | | Ur I (4) | | | RW |
| | Speed Controller Proportional Gain Kp1 | | 0.0000 to 200.000 s/rad | | | 0.0300 s/rad | 0.0100 s/rad | RW |
| 00.008 | Low Frequency Voltage Boost | 0.0 to 25.0 % | | | Size 3 to 6: 3.0 % Size 7 & 8: 2.0 % Size 9≥: 1.0 % | | | RW |
| | Speed Controller Integral Gain Ki1 | | 0.00 to 655.35 s ² /rad | | | 0.10 s ² /rad | 1.00 s ² /rad | RW |
| 00.009 | Dynamic V to F Select | Off (0) or On (1) | | | OFF (0) | | | RW |
| | Speed Controller Differential Feedback Gain Kd 1 | | 0.00000 to 0.65535 1/rad | | | 0.00000 1/rad | | RW |
| 00.010 | Motor Rpm | ±180000 rpm | | | 0 rpm | | | RW |
| | Speed Feedback | | ±VM_SPEED rpm | | | | | RO |
| 00.011 | Output Frequency | ±VM_SPEED_FREQ_REF Hz | | | | | | RO |
| | P1 Position | | 0 to 65535 | | | | | RO |
| 00.012 | Current Magnitude | ±VM_DRIVE_CURRENT_UNIPOLAR A | | | | | | RO |
| 00.013 | Torque Producing Current | ±VM_DRIVE_CURRENT A | | | | | | RO |
| 00.014 | Torque Mode Selector | 0 or 1 | 0 to 5 | | 0 | | | RW |
| 00.015 | Ramp Mode Select | Fast (0), Standard (1), Std boost (2) | Fast (0), Standard (1) | | Standard (1) | | | RW |
| 00.016 | Ramp Enable | | OFF (0) or On (1) | | | On (1) | | RW |
| 00.017 | Digital Input 6 Destination | 00.000 to 30.999 | | | 06.031 | | | RW |
| | Current Reference Filter Time Constant | | 0.0 to 25.0 ms | | | 0.0 ms | | RW |

| Parameter | | Range | | | Default | | | Type ¹ |
|-----------|--------------------------------------|--|-------------------|--------|----------------|-------|-------------|-------------------|
| | | OL | RFC-A | RFC-S | OL | RFC-A | RFC-S | |
| 00.019 | Analog Input 2 Mode | 4-20 mA Low (-4), 20-4 mA Low (-3), 4-20 mA Hold (-2), 20-4 mA Hold (-1), 0-20 mA (0), 20-0 mA (1), 4-20 mA Trip (2), 20-4 mA Trip (3), 4-20 mA (4), 20-4 mA (5), Volt (6) | | | Volt (6) | | | RW |
| 00.020 | Analog Input 2 Destination | 00.000 to 30.999 | | | 01.037 | | | RW |
| 00.021 | Analog Input 3 Mode | Volt (6), Therm Short Cct (7), Thermistor (8), Therm No Trip (9) | | | Volt (6) | | | RW |
| 00.022 | Bipolar Reference Enable | Off (0) or On (1) | | | OFF(0) | | | RW |
| 00.023 | Jog Reference | 0.0 to 400.0 Hz | 0.0 to 4000.0 rpm | | 0.0 | | | RW |
| 00.024 | Preset Reference 1 | ±VM_SPEED_FREQ_REF rpm | | | 0.0 | | | RW |
| 00.025 | Preset Reference 2 | ±VM_SPEED_FREQ_REF rpm | | | 0.0 | | | RW |
| 00.026 | Preset Reference 3 | ±VM_SPEED_FREQ_REF Hz | | | 0.0 | | | RW |
| | Overspeed Threshold | | 0 to 40000 rpm | | | 0.0 | | RW |
| 00.027 | Preset Reference 4 | ±VM_SPEED_FREQ_REF Hz | | | 0.0 | | | RW |
| | P1 Rotary Lines Per Revolution | | 1 to 100000 | | | 1024 | 4096 | RW |
| 00.028 | Enable Auxiliary Key | 0 to 2 | | | 0 | | | RW |
| 00.029 | NV Media Card Data Previously Loaded | 0 to 999 | | | | | | RO |
| 00.030 | Parameter copying | None (0), Read (1), Program (2), Auto (3), Boot (4) | | | None (0) | | | RW |
| 00.031 | Drive Rated Voltage | 200 V (0), 400 V (1), 575 V (2), 690 V (3) | | | | | | RO |
| 00.032 | Maximum Heavy Duty Rating | 0.000 to 99999.999 A | | | | | | RO |
| 00.033 | Catch A Spinning Motor | Disable (0), Enable (1), Fwd Only (2), Rev Only (3) | | | Disable (0) | | | RW |
| | Motor Parameter Adaptive Control | | 0 to 2 | | | 0 | | RW |
| 00.034 | User Security Code | 0 to 2 ³¹ -1 | | | 0 | | | RW |
| 00.035 | Serial Mode* | 8 2 NP (0), 8 1 NP (1), 8 1 EP (2), 8 1 OP (3), 8 2 NP M (4), 8 1 NP M (5), 8 1 EP M (6), 8 1 OP M (7), 7 2 NP (8), 7 1 NP (9), 7 1 EP (10), 7 1 OP (11), 7 2 NP M (12), 7 1 NP M (13), 7 1 EP M (14), 7 1 OP M (15) | | | 8 2 NP (0) | | | RW |
| 00.036 | 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 |
| 00.037 | Serial Address* | 1 to 247 | | | 1 | | | RW |
| 00.037 | Active IP Address** | 000.000.000.000 to 255.255.255.255 | | | | | | RO |
| 00.038 | Current Controller Kp Gain | 0 to 30000 | | | 20 | 150 | | RW |
| 00.039 | Current Controller Ki Gain | 0 to 30000 | | | 40 | 2000 | | RW |
| 00.040 | Auto-tune | 0 to 2 | 0 to 3 | 0 to 4 | 0 | | | RW |
| 00.041 | Maximum Switching Frequency | 2 kHz (0), 3 kHz (1), 4 kHz (2), 6 kHz (3), 8 kHz (4), 12 kHz (5), 16 kHz (6) | | | 3 kHz (1) | | 6 kHz (3) | RW |
| 00.042 | Number Of Motor Poles | Automatic (0) to 480 Poles (240) | | | Automatic (0) | | 6 Poles (3) | RW |

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| Parameter | | Range | | | Default | | | Type ¹ |
|-----------|-------------------------------|--|----------------------|-------|--|---|-----------|-------------------|
| | | OL | RFC-A | RFC-S | OL | RFC-A | RFC-S | |
| 00.043 | Rated Power Factor | 0.000 to 1.000 | | | 0.850 | | | RW |
| | Position Feedback Phase Angle | 0.0 to 359.9 ° | | | | | | RW |
| 00.044 | Rated Voltage | ±VM_AC_VOLTAGE_SET | | | 200 V drive: 230 V 50 Hz default 400 V drive: 400 V 60 Hz default 400 V drive: 460 V 575 V drive: 575 V 690 V drive: 690 V | | | RW |
| 00.045 | Rated Speed | 0 to 33000 rpm | 0.00 to 33000.00 rpm | | 50Hz default: 1500 rpm 60Hz default: 1800rpm | 50Hz default: 1450 rpm 60Hz default: 1750rpm | | RW |
| | Motor Thermal Time Constant 1 | 1.0 to 3000.0 s | | | 89.0 s | | | RW |
| 00.046 | Rated Current | ±VM_RATED_CURRENT | | | Maximum Heavy Duty Rating (11.032) | | | RW |
| 00.047 | Rated Frequency | 0.0 to 550.0 Hz | | | 50Hz default: 50.0 Hz 60Hz default: 60.0 Hz | | | RW |
| 00.048 | Drive Mode | Open-loop (1), RFC-A (2), RFC-S (3), Regen (4) | | | Open-loop (1) | RFC-A (2) | RFC-S (3) | RW |
| 00.049 | User Security Status | Menu 0 (0), All Menus (1), Read-only Menu 0 (2), Read-only (3), Status Only (4), No Access (5) | | | Menu 0 (0) | | | RW |
| 00.050 | Software Version | 0 to 99999999 | | | | | | RO |
| 00.051 | Action On Trip Detection | 0 to 31 | | | 0 | | | RW |
| 00.052 | Reset Serial Communications* | Off (0) or On (1) | | | Off (0) | | | RW |

¹ RW = Read Write, RO = Read Only.

* Only applicable to *Unidrive M701*.

** Only applicable to *Unidrive M700*.

6.1 Parameter descriptions

6.1.1 Pr mm.000

Pr **mm.000** is available in all menus, commonly used functions are provided as text strings in Pr **mm.000** shown in Table 6-1. The functions in Table 6-1 can also be selected by entering the appropriate numeric values (as shown in Table 6-2) in Pr **mm.000**. For example, enter 7001 in Pr **mm.000** to erase the file in NV media card location 001.

Table 6-1 Commonly used functions in Pr mm.000

| String | Action |
|------------------|--|
| Save parameters | Save parameters when under voltage is not active and low voltage threshold is not active |
| Load file 1 | Load the drive parameters or user program file from NV media card file 001 |
| Save to file 1 | Transfer the drive parameters to parameter file 001 |
| Load file 2 | Load the drive parameters or user program file from NV media card file 002 |
| Save to file 2 | Transfer the drive parameters to parameter file 002 |
| Load file 3 | Load the drive parameters or user program file from NV media card file 003 |
| Save to file 3 | Transfer the drive parameters to parameter file 003 |
| Show non-default | Displays parameters that are different from defaults |
| Destinations | Displays parameters that are set |
| Reset 50 Hz Defs | Load parameters with standard (50 Hz) defaults |
| Reset 60 Hz Defs | Load parameters with US (60 Hz) defaults |
| Reset modules | Reset all option modules |
| Read Enc.NP P1 | Transfer electronic nameplate motor parameters to the drive from the P1 encoder |
| Read Enc.NP P2 | Transfer electronic nameplate motor parameters to the drive from the P2 encoder |

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Table 6-2 Functions in Pr mm.000

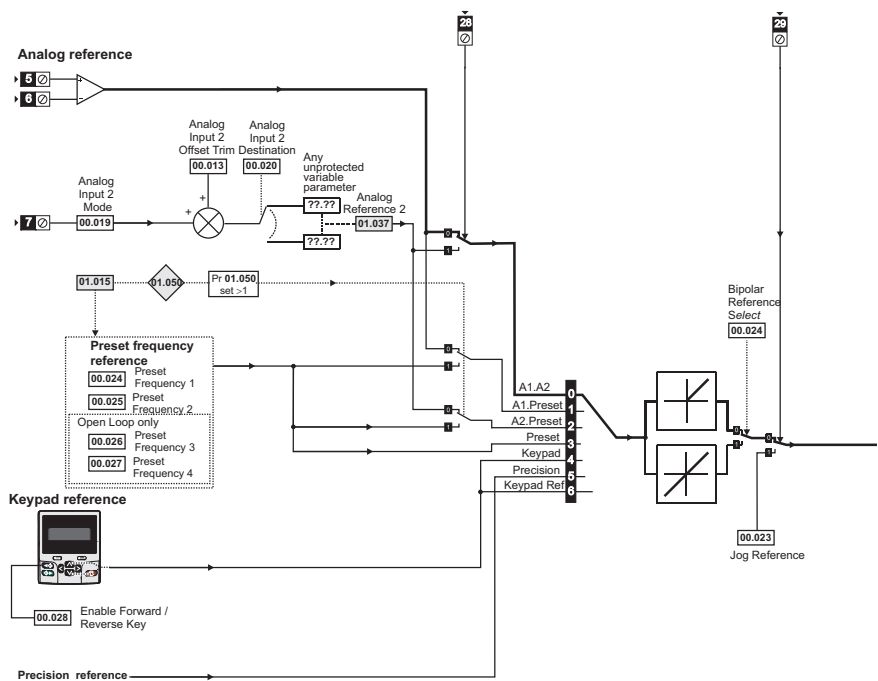
| Value | Action |
|---------|--|
| 1000 | Save parameters when <i>Under Voltage Active</i> (Pr 10.016) is not active and <i>Low Under Voltage Threshold Select</i> mode (Pr 06.067 = Off) is not active. |
| 1001 | Save parameter under all conditions |
| 1070 | Reset all option modules |
| 1233 | Load standard (50 Hz) defaults |
| 1234 | Load standard (50 Hz) defaults to all menus except option module menus (i.e 15 to 20 and 24 to 28) |
| 1244 | Load US (60 Hz) defaults |
| 1245 | Load US (60 Hz) defaults to all menus except option module menus (i.e 15 to 20 and 24 to 28) |
| 1253 | Change drive mode and load standard (50 Hz) defaults |
| 1254 | Change drive mode and load US (60 Hz) defaults |
| 1255 | Change drive mode and load standard (50 Hz) defaults except for menus 15 to 20 and 24 to 28 |
| 1256 | Change drive mode and load US (60 Hz) defaults except for menus 15 to 20 and 24 to 28 |
| 1299 | Reset {Stored HF} trip. |
| 2001* | Create a boot file on a non-volatile media card based on the present drive parameters including all Menu 20 parameters |
| 4yyy* | NV media card: Transfer the drive parameters to parameter file xxx |
| 5yyy* | NV media card: Transfer the onboard user program to onboard user program file xxx |
| 6yyy* | NV media card: Load the drive parameters from parameter file xxx or the onboard user program from onboard user program file xxx |
| 7yyy* | NV media card: Erase file xxx |
| 8yyy* | NV Media card: Compare the data in the drive with file xxx |
| 9555* | NV media card: Clear the warning suppression flag |
| 9666* | NV media card: Set the warning suppression flag |
| 9777* | NV media card: Clear the read-only flag |
| 9888* | NV media card: Set the read-only flag |
| 9999* | NV media card: Erase and format the NV media card |
| 110S0 | Transfer electronic nameplate motor object parameters from the drive to an encoder connected to the drive or an option module. |
| 110S1 | Transfer electronic nameplate motor objects parameters from an encoder connected to the drive or option module to the drive parameters. |
| 110S2 | As 110S0, but for performance object 1 |
| 110S3 | As 110S1, but for performance object 1 |
| 110S4 | As 110S0, but for performance object 2 |
| 110S5 | As 110S1, but for performance object 2 |
| 110S6 | Transfer electronic nameplate motor object parameters from the drive to an encoder connected to the drive or an option module in the Unidrive SP format. |
| 1200** | Only display parameters that are different from their default value. This action does not require a drive reset. |
| 12001** | Only display parameters that are used to set-up destinations (i.e. DE format bit is 1). This action does not require a drive reset. |
| 15xxx* | Transfer the user program in an option module installed in slot 1 to a non-volatile media card file xxx |
| 16xxx* | Transfer the user program in an option module installed in slot 2 to a non-volatile media card file xxx |
| 17xxx* | Transfer the user program in an option module installed in slot 3 to a non-volatile media card file xxx |
| 18xxx* | Transfer the user program from file xxx in a non-volatile media card to an option module installed in slot 1. |
| 19xxx* | Transfer the user program from file xxx in a non-volatile media card to an option module installed in slot 2. |
| 20xxx* | Transfer the user program from file xxx in a non-volatile media card to an option module installed in slot 3. |
| 21xxx* | Transfer the user program in an option module installed in slot 4 to a non-volatile media card file xxx. |
| 22xxx* | Transfer the user program from file xxx in a non-volatile media card to an option module installed in slot 4. |

* See section 8 *NV Media Card Operation* on page 66 for more information on these functions.

** These functions do not require a drive reset to become active. All other functions require a drive reset to initiate the function.

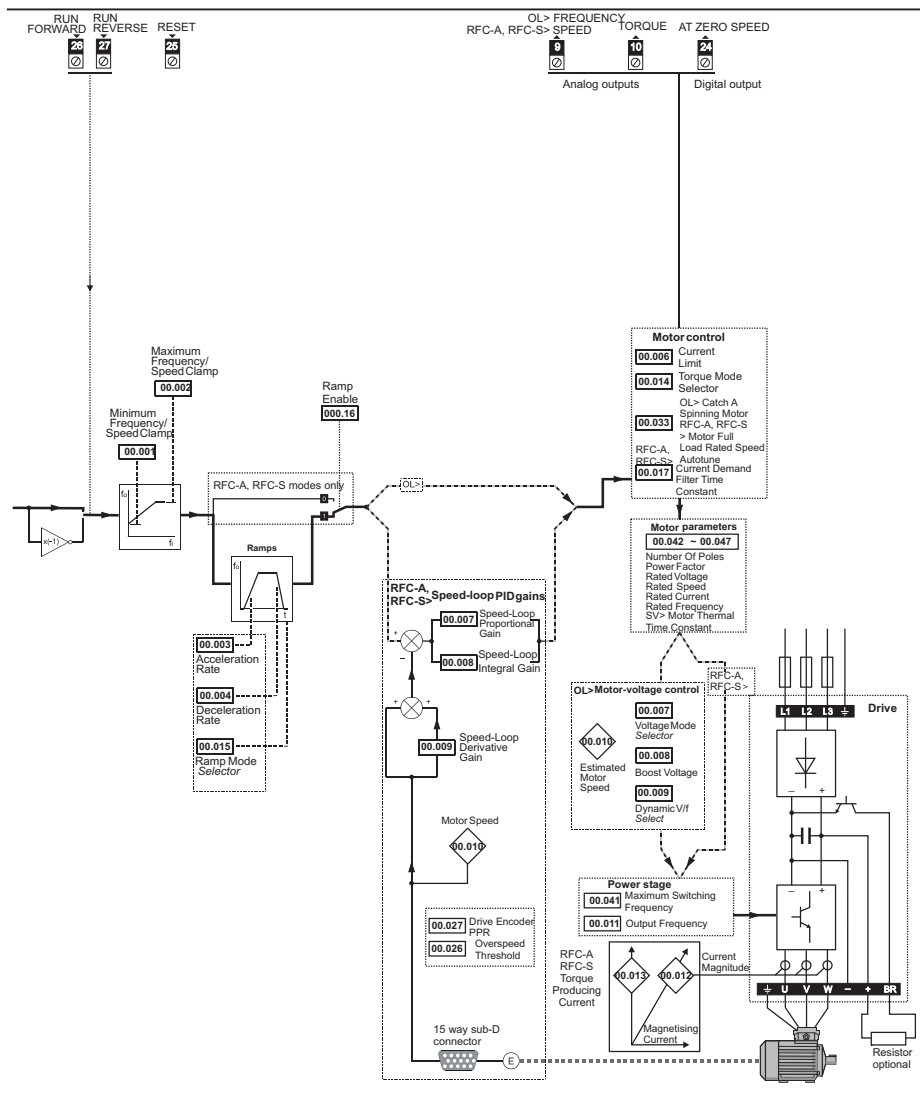
| | | | | | | | | |
|--------------------|---------------------|-------------------------|-------------------------|-----------------|-------------------------|-------------------|-------------------------|---------------------|
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|--------------------|---------------------|-------------------------|-------------------------|-----------------|-------------------------|-------------------|-------------------------|---------------------|

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



7 Running the motor

This chapter takes the new user through all the essential steps to running a motor for the first time, in each of the possible operating modes.



Ensure that no damage or safety hazard could arise from the motor starting unexpectedly.



The values of the motor parameters affect the protection of the motor.

The default values in the drive should not be relied upon.

It is essential that the correct value is entered in Pr **00.046 Rated Current**. This affects the thermal protection of the motor.



If the drive is started using the keypad it will run to the speed defined by the *Keypad Control Mode Reference* (01.017). This may not be acceptable depending on the application. The user must check in Pr **01.017** and ensure that the keypad reference has been set to 0.



If the intended maximum speed affects the safety of the machinery, additional independent over-speed protection must be used.

7.1 Quick start Connections

7.1.1 Basic requirements

This section shows the basic connections which must be made for the drive to run in the required mode. For minimal parameter settings to run in each mode please see the relevant part of section 7-4 *Minimum connections to get the motor running in any operating mode (size 7 onwards)* on page 58.

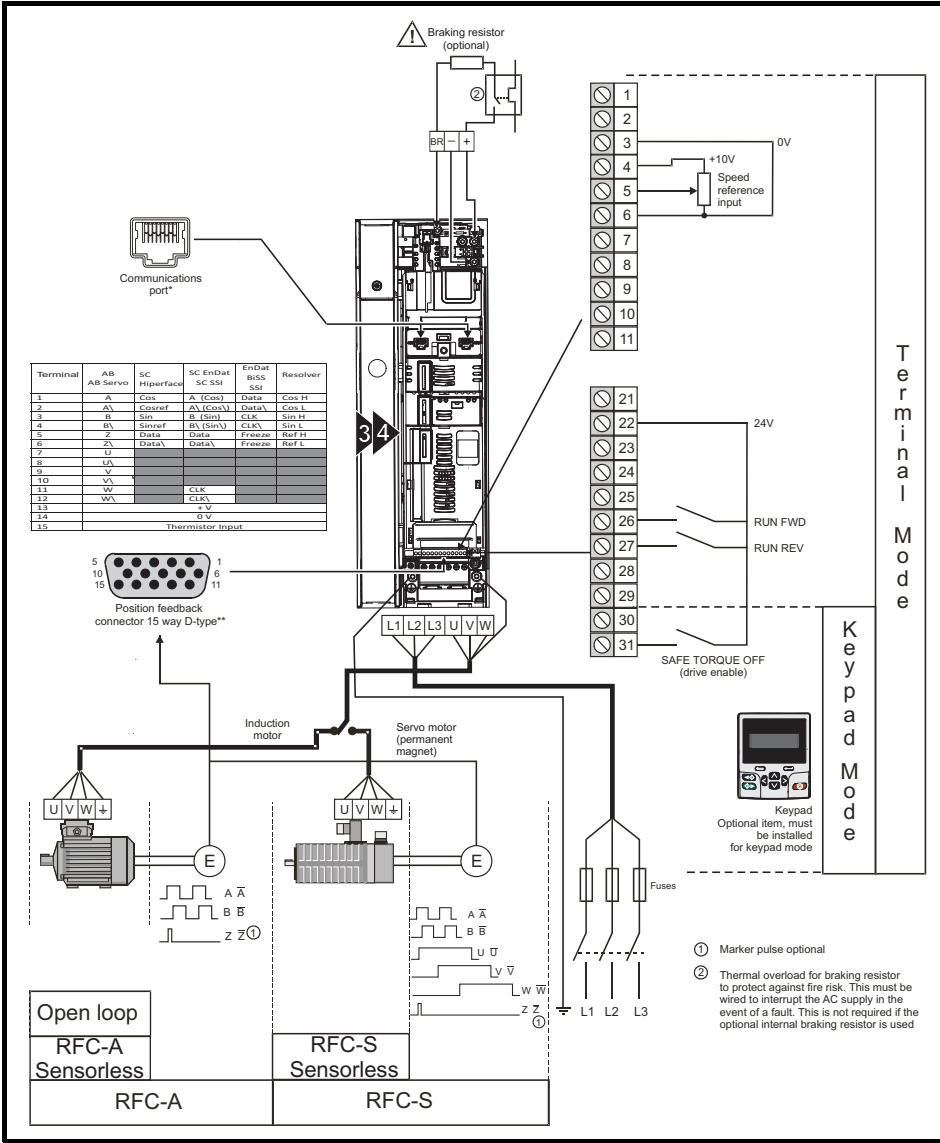
Table 7-1 Minimum control connection requirements for each control mode

| Drive control method | Requirements |
|----------------------|---|
| Terminal mode | Drive enable Speed / Torque reference Run forward / Run reverse |
| Keypad mode | Drive enable |
| Communications | Drive enable Communications link |

Table 7-2 Minimum control connection requirements for each mode of operation

| Operating mode | Requirements |
|-------------------------------------|---|
| Open loop mode | Induction motor |
| RFC-A mode (with position feedback) | Induction motor with position feedback |
| RFC-S mode (with position feedback) | Permanent magnet motor with position feedback |

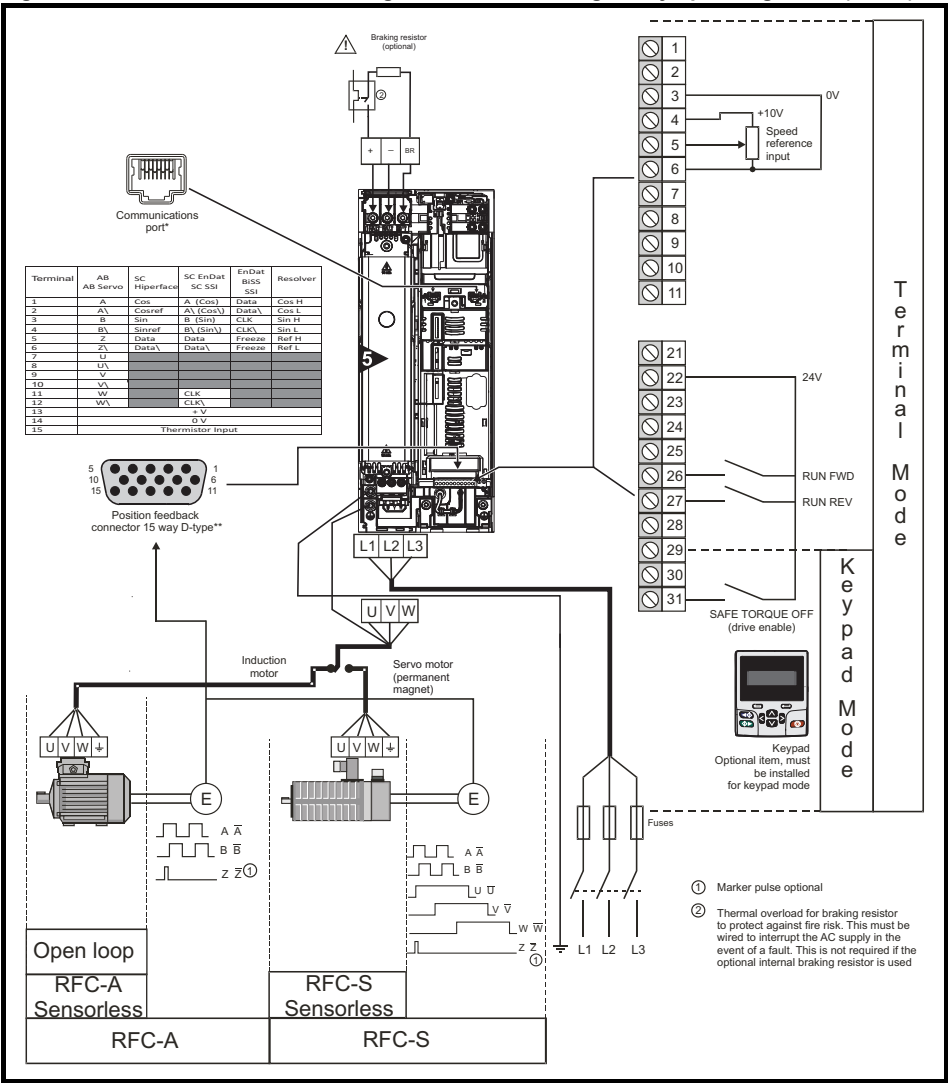
Figure 7-1 Minimum connections to get the motor running in any operating mode (size 3 and 4)



* Ethernet fieldbus communication ports on *Unidrive M700* and 485 serial communication ports on *Unidrive M701*.

** Position feedback port.

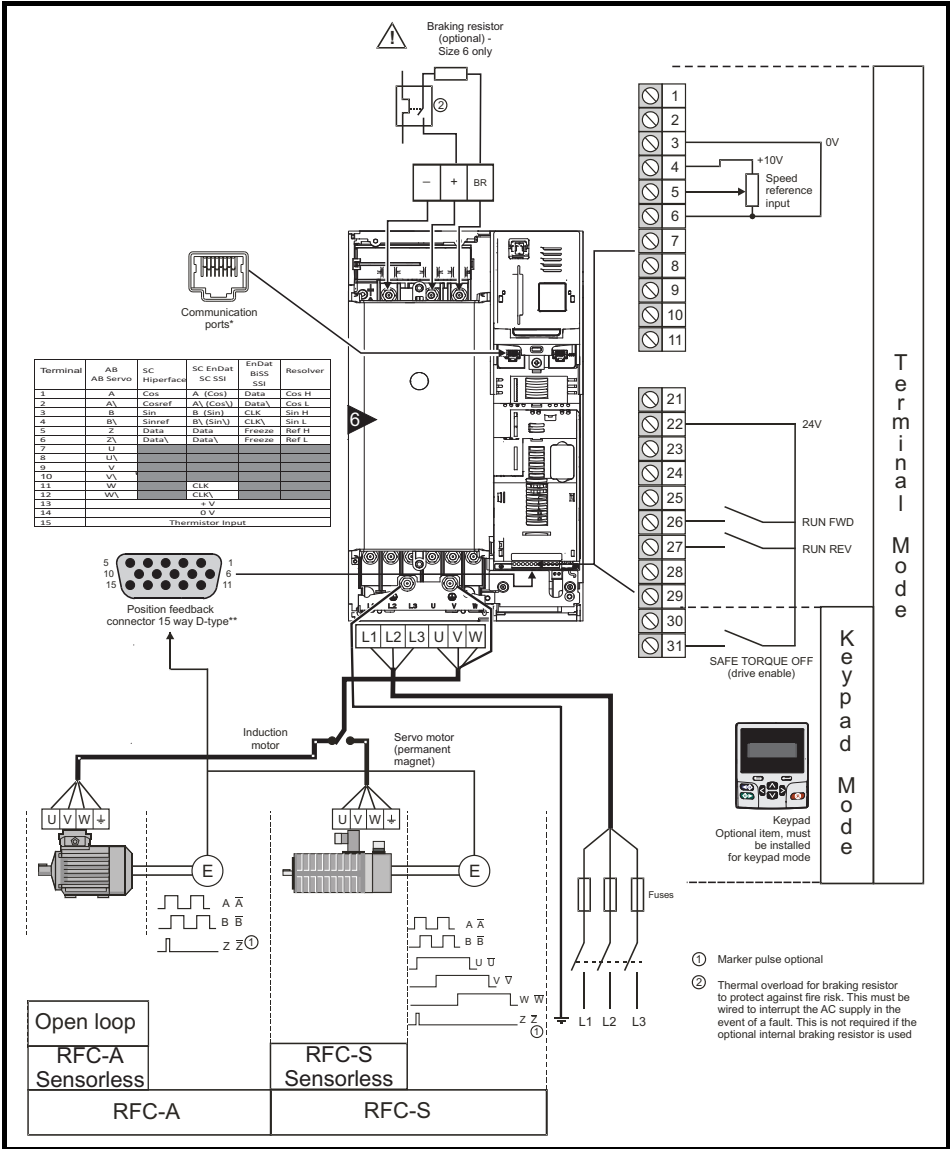
Figure 7-2 Minimum connections to get the motor running in any operating mode (size 5)



* Ethernet fieldbus communication ports on *Unidrive M700* and 485 serial communication ports on *Unidrive M701*.

** Position feedback port.

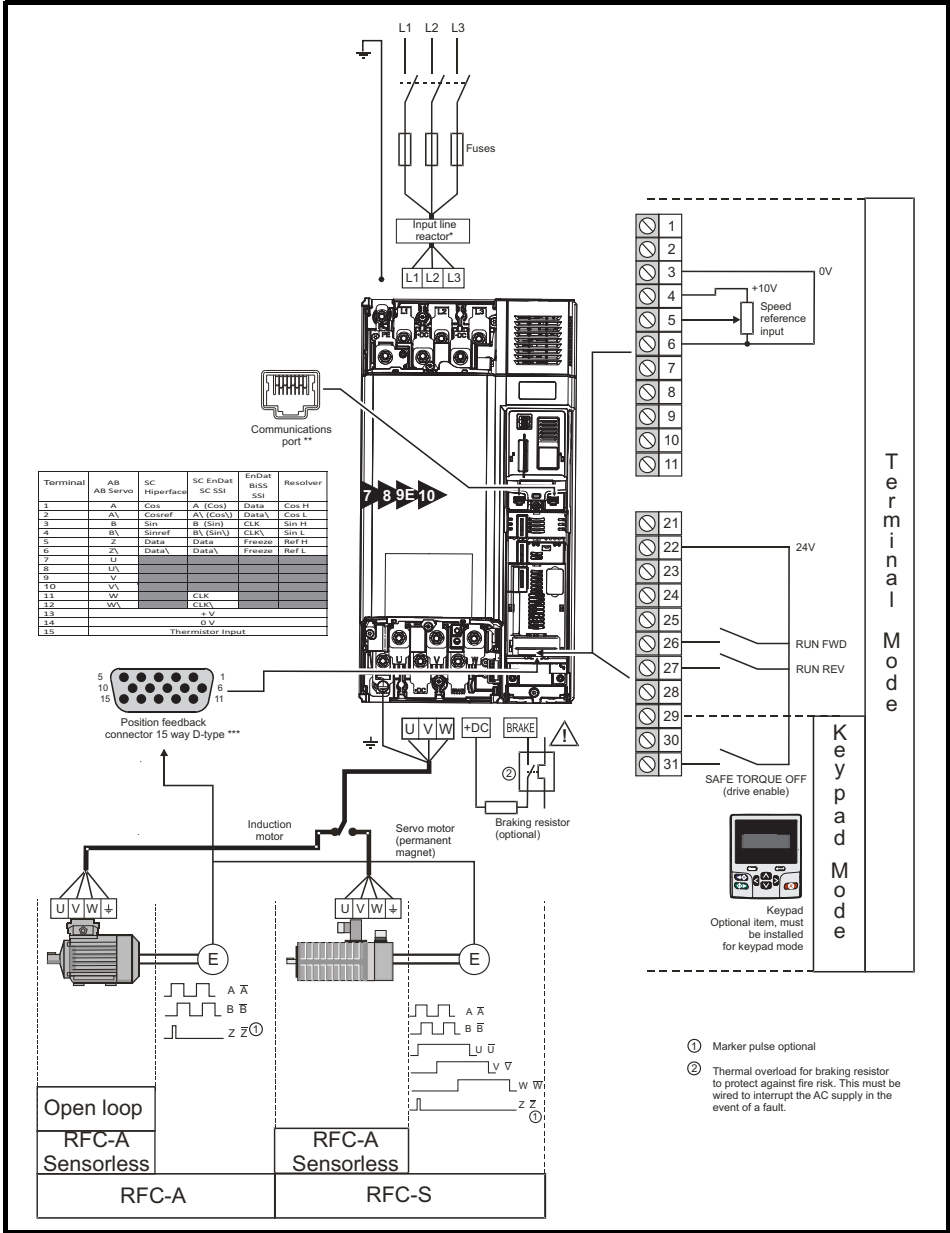
Figure 7-3 Minimum connections to get the motor running in any operating mode (size 6)



* Ethernet fieldbus communication ports on *Unidrive M700* and 485 serial communication ports on *Unidrive M701*.

** Position feedback port.

Figure 7-4 Minimum connections to get the motor running in any operating mode (size 7 onwards)





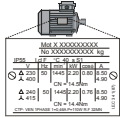
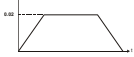
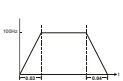


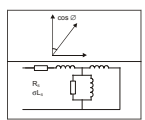


* Required for size 10

** Ethernet fieldbus communication ports on *Unidrive M700* and 485 serial communication ports on *Unidrive M701*.

*** Position feedback port

7.2 Quick Start / start-up

7.2.1 Open loop

| Action | Detail | |
|-------------------------------|---|--|
| Before power-up | Ensure: <ul style="list-style-type: none"> The drive enable signal is not given (terminal 31) Run signal is not given Motor is connected |  |
| Power-up the drive | Verify that Open Loop mode is displayed as the drive powers up. Ensure: Drive displays 'Inhibit' |  |
| Enter motor nameplate details | Enter: <ul style="list-style-type: none"> Motor rated frequency in Pr 00.047 (Hz) Motor rated current in Pr 00.046 (A) Motor rated speed in Pr 00.045 (rpm) Motor rated voltage in Pr 00.044 (V) - check if Δ or Y connection |  |
| Set max frequency | Enter: <ul style="list-style-type: none"> Maximum frequency in Pr 00.002 (Hz) |  |
| Set accel. / decel. rates | <ul style="list-style-type: none"> Acceleration rate in Pr 00.003 (s /100 Hz) Deceleration rate in Pr 00.004 (s /100 Hz) (If braking resistor installed, set Pr 00.015 = FAST. Also ensure Pr 10.030, Pr 10.031 and Pr 10.061 are set correctly, otherwise premature 'Brake R Too Hot' trips may be seen). |  |
| Motor thermistor set-up | If a thermistor is connected to terminal 8, then the <i>Analog Input 3 Mode</i> (07.015) parameter must be set to Thermistor Short Cct (7), Thermistor (8) or Therm No Trip (9). |  |
| Autotune | <p>The drive is able to perform either a stationary or a rotating autotune. The motor must be at a standstill before an auto-tune is enabled. A rotating autotune should be used whenever possible so the measured value of power factor of the motor is used by the drive</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;">  <p>A rotating autotune will cause the motor to accelerate up to $\frac{2}{3}$ 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.</p> </div> <p>To perform an autotune:</p> <ul style="list-style-type: none"> Set Pr 00.040 = 1 for a stationary autotune or set Pr 00.040 = 2 for a rotating autotune Close the Drive Enable signal (terminal 31). The drive will display 'Ready'. Close the run signal (terminal 26 or 27). The lower display will flash 'Autotune' while the drive is performing the autotune. Wait for the drive to display 'Ready' or 'Inhibit' and for the motor to come to a standstill. Remove the drive enable and run signal from the drive. |  |
| Save parameters | Select 'Save Parameters' in Pr mm.000 (alternatively enter a value of 1000 in Pr mm.000) and press red  reset button or toggle the reset digital input. | |
| Run | Drive is now ready to run |  |

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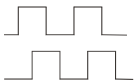

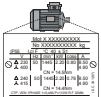
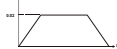
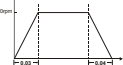
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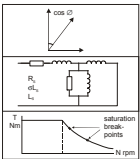


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7.2.2 RFC-A mode (with position feedback)

Induction motor with position feedback





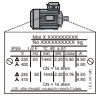
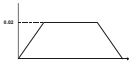
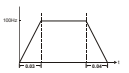
For simplicity only an incremental quadrature encoder will be considered here. For information on setting up one of the other supported speed feedback devices, refer to *Setting up a feedback device* in the *Drive User Guide*.


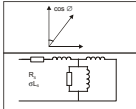


| Action | Detail | |
|-------------------------------|---|--|
| Before power-up | Ensure: <ul style="list-style-type: none"> Drive Enable signal is not given (terminal 31) Run signal is not given Motor and feedback device are connected |  |
| Power-up the drive | <ul style="list-style-type: none"> Verify that RFC-A mode is displayed as the drive powers up. If the mode is incorrect see section 5.6 <i>Changing the operating mode</i> on page 43. Ensure: Drive displays 'Inhibit' |  |
| Set motor feedback parameters | Incremental encoder basic set-up Enter: <ul style="list-style-type: none"> Drive encoder type in Pr 03.038 = AB (0): Quadrature encoder Encoder power supply in Pr. 03.036 = 5 V (0), 8 V (1) or 15 V (2). NOTE If output voltage from the encoder is >5 V, then the termination resistors must be disabled Pr 03.039 to 0. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  <p>Setting the encoder voltage supply too high for the encoder could result in damage to the feedback device.</p> <p>CAUTION</p> </div> <ul style="list-style-type: none"> Drive encoder Lines Per Revolution (LPR) in Pr 03.034 Drive encoder termination resistor setting in Pr 03.039: <ul style="list-style-type: none"> 0 = A-A\, B-B\, Z-Z\ termination resistors disabled 1 = A-A\, B-B\, termination resistors enabled, Z-Z\ termination resistors disabled 2 = A-A\, B-B\, Z-Z\ termination resistors enabled |  |
| Motor thermistor set-up | If a thermistor is connected to terminal 8, then the <i>Analog Input 3 Mode</i> (07.015) parameter must be set to Thermistor Short Cct (7), Thermistor (8) or Therm No Trip (9). NOTE The thermistor input will be disabled until Pr 07.015 is set to one of the above. |  |
| Enter motor nameplate details | <ul style="list-style-type: none"> Motor rated frequency in Pr 00.047 (Hz) Motor rated current in Pr 00.046 (A) Motor rated speed in Pr 00.045 (rpm) Motor rated voltage in Pr 00.044 (V) - check if Δ or Λ connection |  |
| Set max speed | Enter: <ul style="list-style-type: none"> Maximum speed in Pr 00.002 (rpm) |  |
| Set accel / decel rates | Enter: <ul style="list-style-type: none"> Acceleration rate in Pr 00.003 (s/1000 rpm) Deceleration rate in Pr 00.004 (s/1000 rpm) (If braking resistor installed, set Pr 00.015 = FAST. Also ensure Pr 10.030, Pr 10.031 and Pr 10.061 are set correctly, otherwise premature 'Brake R Too Hot' trips may be seen). |  |

| Action | Detail | | Safety information | Product information | Mechanical installation | Electrical installation | Getting started | Basic parameters | Running the motor | NV Media Card Operation | Further information |
|-----------------|--|--|--------------------|---------------------|-------------------------|-------------------------|-----------------|------------------|-------------------|-------------------------|---------------------|
| Autotune | <p>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. A stationary autotune will give moderate performance whereas a rotating autotune will give improved performance as it measures the actual values of the motor parameters required by the drive.</p> <div><div><p>A rotating autotune will cause the motor to accelerate up to $\frac{2}{3}$ 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.</p></div><p>To perform an autotune:</p><ul style="list-style-type: none">Set Pr 00.040 = 1 for a stationary autotune or set Pr 00.040 = 2 for a rotating autotuneClose the drive enable signal (terminal 31). The drive will display 'Ready'.Close the run signal (terminal 26 or 27). The lower display will flash 'Autotune' while the drive is performing the autotune.Wait for the drive to display 'Ready' or 'Inhibit' and for the motor to come to a standstillRemove the drive enable and run signal from the drive.</div> |  | | | | | | | | | |
| Save parameters | Select 'Save Parameters' in Pr mm.000 (alternatively enter a value of 1000 in Pr mm.000) and press red  reset button or toggle the reset digital input. | | | | | | | | | | |
| Run | Drive is now ready to run |  | | | | | | | | | |

7.2.3 RFC-A mode (Sensorless control)

Induction motor with sensorless control




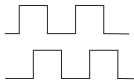

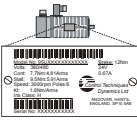
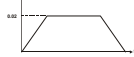
| Action | Detail | |
|--|--|--|
| Before power-up | Ensure: <ul style="list-style-type: none"> The drive enable signal is not given (terminal 31) Run signal is not given Motor is connected |  |
| Power-up the drive | Verify that RFC-A mode is displayed as the drive powers up. If the mode is incorrect see section 5.6 <i>Changing the operating mode</i> on page 43. Ensure: Drive displays 'Inhibit' |  |
| Select RFC-A (Sensorless control) mode | <ul style="list-style-type: none"> Set Pr 03.024 = 1 or 3 to select RFC-A Sensorless mode Set Pr 03.040 = 0000 to disable the wire break |  |
| Motor thermistor set-up | <p>If a thermistor is connected to terminal 8, then the <i>Analog Input 3 Mode</i> (07.015) parameter must be set to Thermistor Short Cct (7), Thermistor (8) or Therm No Trip (9).</p> <p>NOTE The thermistor input will be disabled until Pr 07.015 is set to one of the above.</p> |  |
| Enter motor nameplate details | <ul style="list-style-type: none"> Motor rated frequency in Pr 00.047 (Hz) Motor rated current in Pr 00.046 (A) Motor rated speed in Pr 00.045 (rpm) Motor rated voltage in Pr 00.044 (V) - check if Δ or Y connection |  |
| Set max speed | Enter: <ul style="list-style-type: none"> Maximum frequency in Pr 00.002 (rpm) |  |
| Set accel. / decel. rates | <ul style="list-style-type: none"> Acceleration rate in Pr 00.003 (s /1000 rpm) Deceleration rate in Pr 00.004 (s /1000 rpm) (If braking resistor installed, set Pr 00.015 = FAST. Also ensure Pr 10.030, Pr 10.031 and Pr 10.061 are set correctly). |  |
| Select or deselect catch a spinning motor mode | <p>If catch a spinning motor mode is not required then set Pr 06.009 to 0. If catch a spinning motor mode is required then leave Pr 06.009 at the default of 1, but depending on the size of the motor the value in Pr 05.040 may need to be adjusted.</p> <p>Pr 05.040 defines a scaling function used by the algorithm that detects the speed of the motor. The default value of Pr 05.040 is 1 which is suitable for small motors (<4 kW). For larger motors the value in Pr 05.040 will need to be increased.</p> | |

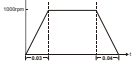

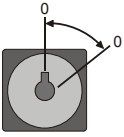
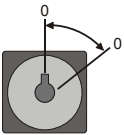


| Action | Detail | | Safety information | Product information | Mechanical installation | Electrical installation | Getting started | Basic parameters | Running the motor | NV Media Card Operation | Further information |
|-----------------|--|--|--------------------|---------------------|-------------------------|-------------------------|-----------------|------------------|-------------------|-------------------------|---------------------|
| Autotune | <p>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. A stationary autotune will give moderate performance whereas a rotating autotune will give improved performance as it measures the actual values of the motor parameters required by the drive.</p> <p>NOTE It is highly recommended that a rotating autotune is performed (Pr 00.040 set to 2).</p> <div><div><p>WARNING</p></div><p>A rotating autotune will cause the motor to accelerate up to $\frac{2}{3}$ 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.</p></div> <p>To perform an auto-tune:</p> <ul style="list-style-type: none">• Set Pr 00.040 = 1 for a stationary autotune or set Pr 00.040 = 2 for a rotating autotune.• Close the drive enable signal (terminal 31). The drive will display 'Ready' or 'Inhibit'.• Close the run signal (terminal 26 or 27). The lower display will flash 'Autotune' while the drive is performing the autotune.• Wait for the drive to display 'Ready' or 'Inhibit' and for the motor to come to a standstill.• Remove the drive enable and run signal from the drive. |  | | | | | | | | | |
| Save parameters | Select 'Save Parameters' in Pr mm.000 (alternatively enter a value of 1000 in Pr mm.000) and press red  reset button or toggle the reset digital input. | | | | | | | | | | |
| Run | Drive is now ready to run |  | | | | | | | | | |

7.2.4 RFC-S mode (with position feedback)

Permanent magnet motor with a position feedback

For simplicity only an incremental quadrature encoder with commutation outputs will be considered here. For information on setting up one of the other supported speed feedback devices, refer to *Setting up a feedback device* in the *Drive User Guide*.

| Action | Detail | |
|-------------------------------|--|--|
| Before power-up | Ensure: <ul style="list-style-type: none"> The drive enable signal is not given (terminal 31) Run signal is not given Motor and feedback device are connected |  |
| Power-up the drive | Verify that RFC-S mode is displayed as the drive powers up. If the mode is incorrect see section 5.6 <i>Changing the operating mode</i> on page 43 Ensure: Drive displays 'inhibit' |  |
| Set motor feedback parameters | Incremental encoder basic set-up Enter: <ul style="list-style-type: none"> Drive encoder type in Pr. 03.038 = AB Servo (3): Quadrature encoder with commutation outputs Encoder power supply in Pr. 03.036 = 5 V (0), 8 V (1) or 15 V (2). NOTE If output voltage from the encoder is >5 V, then the termination resistors must be disabled Pr 03.039 to 0. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;">  Setting the encoder voltage supply too high for the encoder could result in damage to the feedback device </div> <ul style="list-style-type: none"> Drive encoder Pulses Per Revolution in Pr 03.034 (set according to encoder) Drive encoder termination resistor setting in Pr 03.039: <ul style="list-style-type: none"> 0 = A-A\, B-B\, Z-Z\ termination resistors disabled 1 = A-A\, B-B\, termination resistors enabled, Z-Z\ termination resistors disabled 2 = A-A\, B-B\, Z-Z\ termination resistors enabled |  |
| Motor thermistor set-up | At factory default, terminal 8 is set-up for an analog voltage input. If a thermistor is connected to terminal 8, then the <i>Analog Input 3 Mode</i> (07.015) parameter must be set to Thermistor Short Cct (7), Thermistor (8) or Therm No Trip (9). NOTE The thermistor input will be disabled until Pr 07.015 is set to one of the above. |  |
| Enter motor nameplate details | Enter: <ul style="list-style-type: none"> Motor rated current in Pr 00.046 (A) Ensure that this equal to or less than the Heavy Duty rating of the drive otherwise 'Motor Too Hot' trips may occur during the autotune. Number of poles in Pr 00.042 Motor rated voltage in Pr 00.044 (V) |  |
| Set maximum speed | Enter: <ul style="list-style-type: none"> Maximum speed in Pr 00.002 (rpm) |  |

| Action | Detail | | Safety information |
|-------------------------|---|---|-------------------------|
| Set accel / decel rates | <ul style="list-style-type: none"> Acceleration rate in Pr 00.003 (s/1000 rpm) Deceleration rate in Pr 00.004 (s/1000 rpm) (If braking resistor installed, set Pr 00.015 = Fast. Also ensure Pr 10.030, Pr 10.031 and Pr 10.061 are set correctly, otherwise premature 'Brake R Too Hot' trips may be seen). |  | Product information |
| Autotune | <p>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. A stationary autotune will give moderate performance whereas a rotating autotune will give improved performance as it measures the actual values of the motor parameters required by the drive. The drive is able to perform a stationary, rotating, mechanical load measurement or locked rotor test autotune. The motor must be at a standstill before an autotune is enabled. It is suggested that a rotating autotune is used for accurate measurement for position feedback phase angle.</p> <div>  <p>WARNING</p> <p>The rotating autotune will rotate the motor by up to 2 mechanical revolutions in the direction selected, regardless of the reference provided. After a short delay, the motor is further rotated through a electrical revolution. 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.</p> </div> |  | Mechanical installation |
| Autotune (cont) | <p>To perform an autotune:</p> <ul style="list-style-type: none"> Set Pr 00.040 = 1 for a stationary autotune, Pr 00.040 = 2 for a rotating autotune. Close the run signal (terminal 26 or 27). Close the drive enable signal (terminal 31). The lower display will flash 'Autotune' while the drive is performing the test. Wait for the drive to display 'Ready' or 'Inhibit' and for the motor to come to a standstill. <p>If the drive trips it cannot be reset until the drive enable signal (terminal 31) has been removed.</p> <ul style="list-style-type: none"> Remove the drive enabled and run signal from the drive. |  | Electrical installation |
| Save parameters | <p>Select 'Save Parameters' in Pr mm.000 (alternatively enter a value of 1000 in Pr mm.000) and press red  reset button or toggle the reset digital input.</p> | | Getting started |
| Run | Drive is now ready to run |  | Basic parameters |
| | | | Running the motor |
| | | | NV Media Card Operation |
| | | | Further information |

8 NV Media Card Operation

8.1 Introduction

The Non-Volatile Media Card feature enables simple configuration of parameters, parameter back-up and drive cloning using a SMARTCARD or SD card. The drive offers backward compatibility for a Unidrive SP SMARTCARD.

The NV Media Card can be used for:

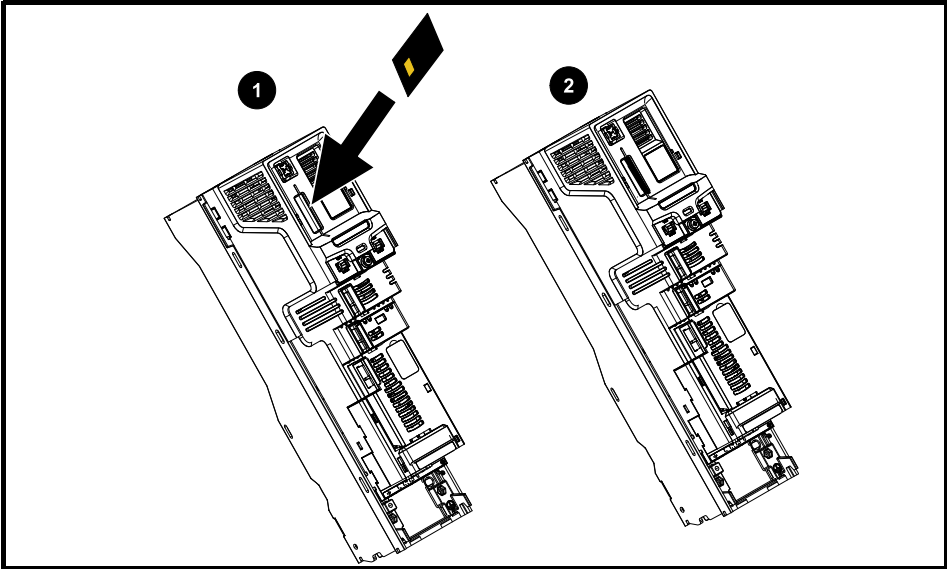
- Parameter copying between drives
- Saving drive parameter sets
- Saving a program

The NV Media Card is located at the top of the module under the drive display (if installed) on the left-hand side.

Ensure NV Media Card is inserted with the contacts facing the left-hand side of the drive.

The drive only communicates with the NV Media Card when commanded to read or write, meaning the card may be "hot swapped".

Figure 8-1 Installation of the NV Media Card



1. Installing the NV Media Card
2. NV Media Card installed

| NV Media Card | Part number |
|--|--------------|
| SD Card Adaptor (memory card not included) | 3130-1212-03 |
| 8 kB SMARTCARD | 2214-4246-03 |
| 64 kB SMARTCARD | 2214-1006-03 |

8.2 NV Media Card support

The NV Media Card can be used to store drive parameters and / or PLC programs set from the Unidrive M in data blocks 001 to 499.

The Unidrive M is compatible with a Unidrive SP SMARTCARD and is able to read and translate the Unidrive SP parameter set into a compatible parameter set for Unidrive M. This is only possible if the Unidrive SP parameter set was transferred to the SMARTCARD using the difference from defaults transfer method (i.e. 4yyy transfer). The Unidrive M is not able to read any other type of Unidrive SP data block on the card. Although it is possible to transfer difference from default data blocks from a Unidrive SP into the Unidrive M, the following should be noted:

- 1. If a parameter from the source drive does not exist in the target drive then no data is transferred for that parameter.
- 2. If the data for the parameter in the target drive is out of range then the data is limited to the range of the target parameter.
- 3. If the target drive has a different rating to the source drive then the normal rules for this type of transfer apply.

Figure 8-2 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 reattempted or in the case of a card to drive transfer, default parameters should be loaded.

8.3 Transferring data

Data transfer, erasing and protecting the information is performed by entering a code in **Pr mm.000** and then resetting the drive as shown in Table 8-1.

Table 8-1 SMARTCARD and SD card codes

| Code | Operation | SMARTCARD | SD card |
|-------|--|-----------|---------|
| 2001 | Transfer the drive parameters to parameter file 001 and sets the block as bootable. This will include the parameters from attached option modules. | ✓ | ✓ |
| 4yyy | Transfer the drive parameters to parameter file yyy. This will include the parameters from attached option modules. | ✓ | ✓ |
| 5yyy | Transfer the onboard user program to onboard user program file yyy. | ✓ | ✓ |
| 6yyy | Load the drive parameters from parameter file yyy or the onboard user program from onboard user program file yyy. | ✓ | ✓ |
| 7yyy | Erase file yyy. | ✓ | ✓ |
| 8yyy | Compare the data in the drive with file yyy. If the files are the same then Pr mm.000 (mm.000) is simply reset to 0 when the compare is complete. If the files are different a 'Card Compare' trip is initiated. All other NV media card trips also apply. | ✓ | ✓ |
| 9555 | Clear the warning suppression flag | ✓ | ✓ |
| 9666 | Set the warning suppression flag | ✓ | ✓ |
| 9777 | Clear the read-only flag | ✓ | ✓ |
| 9888 | Set the read-only flag | ✓ | ✓ |
| 9999 | Erase and format the NV media card | ✓ | ✓ |
| 15yyy | Transfer a program from an option module in slot 1 to an option module applications file | | ✓ |
| 16yyy | As 15yyy, but for slot 2 | | ✓ |
| 17yyy | As 15yyy, but for slot 3 | | ✓ |
| 18yyy | Load a program to the option module in slot 1 from an option module applications file | | ✓ |
| 19yyy | As 18yyy, but for slot 2 | | ✓ |
| 20yyy | As 18yyy, but for slot 3 | | ✓ |
| 21yyy | As 15yyy, but for slot 4 | | ✓ |
| 22yyy | As 18yyy, but for slot 4 | | ✓ |
| 40yyy | Backup all drive data (parameter differences from defaults, an onboard user program, applications programs and miscellaneous option data), including the drive name; the store will occur to the </MCDF/driveyyy/> folder; if it does not exist, it will be created. Because the name is stored, this is a backup, rather than a clone. The command code will be cleared when all drive and option data have been saved. | | ✓ |
| 60yyy | Load all drive data (parameter differences from defaults, an onboard user program, applications programs and miscellaneous option data); the load will come from the </MCDF/driveyyy/> folder. The command code will not be cleared until the drive and all option data have been loaded. | | ✓ |

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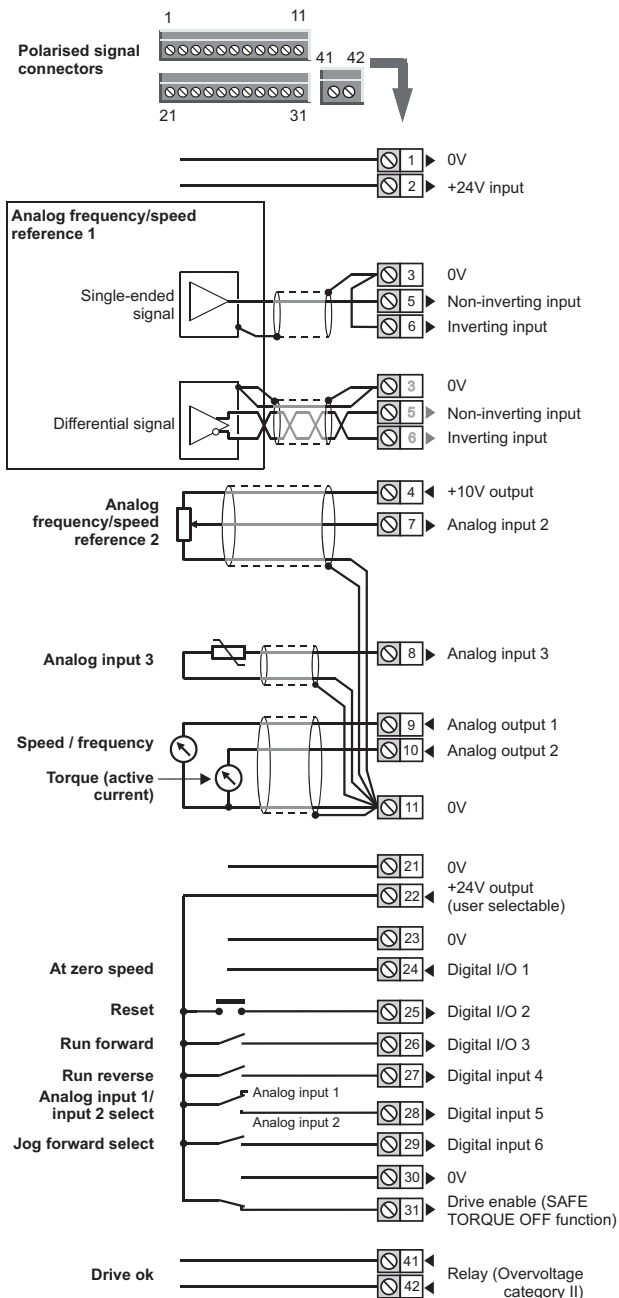
Further information

9.1

Diagnostics

For further information on diagnostics including trips and alarms, refer to the *Drive User Guide*.

| |
|-------------------------|
| Safety information |
| Product information |
| Mechanical installation |
| Electrical installation |
| Getting started |
| Basic parameters |
| Running the motor |
| NV Media Card Operation |
| Further information |



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