Nidec

All for dreams



Control User Guide

Unidrive M100/101

Variable Speed AC drive for induction motors

Part Number: 0478-0352-02
Issue: 2

Original Instructions

For the purposes of compliance with the EU Machinery Directive 2006/42/EC, the English version of this manual is the Original Instructions. Manuals in other languages are Translations of the Original Instructions.

Documentation

Manuals are available to download from the following locations:

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

http://www.emersonindustrial.com/en-EN/leroy-somer-motors-drives/downloads/Pages/manuals.aspx

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We operate an Environmental Management System (EMS) certified to the International Standard ISO 14001.

Further information on our Environmental Policy can be found at:

http://www.emersonindustrial.com/en-EN/controltechniques/aboutus/environment/environmentalpolicyctuk/Pages/environmentalpolicyctuk.aspx

Disposal and Recycling



When electronic products reach the end of their useful life, they must not be disposed of along with domestic waste but should be recycled by a specialist recycler of electronic equipment. The products are designed to be easily dismantled into their major component parts for efficient recycling. The majority of materials used in the product are suitable for recycling.

Product packaging is of good quality and can be re-used. Large products are packed in wooden crates. Smaller products are packaged in strong cardboard cartons which have a high recycled fibre content. Cartons can be re-used and recycled. Polythene, used in protective film and bags for wrapping the product, can be recycled. When preparing to recycle or dispose of any product or packaging, please observe local legislation and best practice.

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Further information on our compliance with REACH can be found at:

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Issue Number: 2

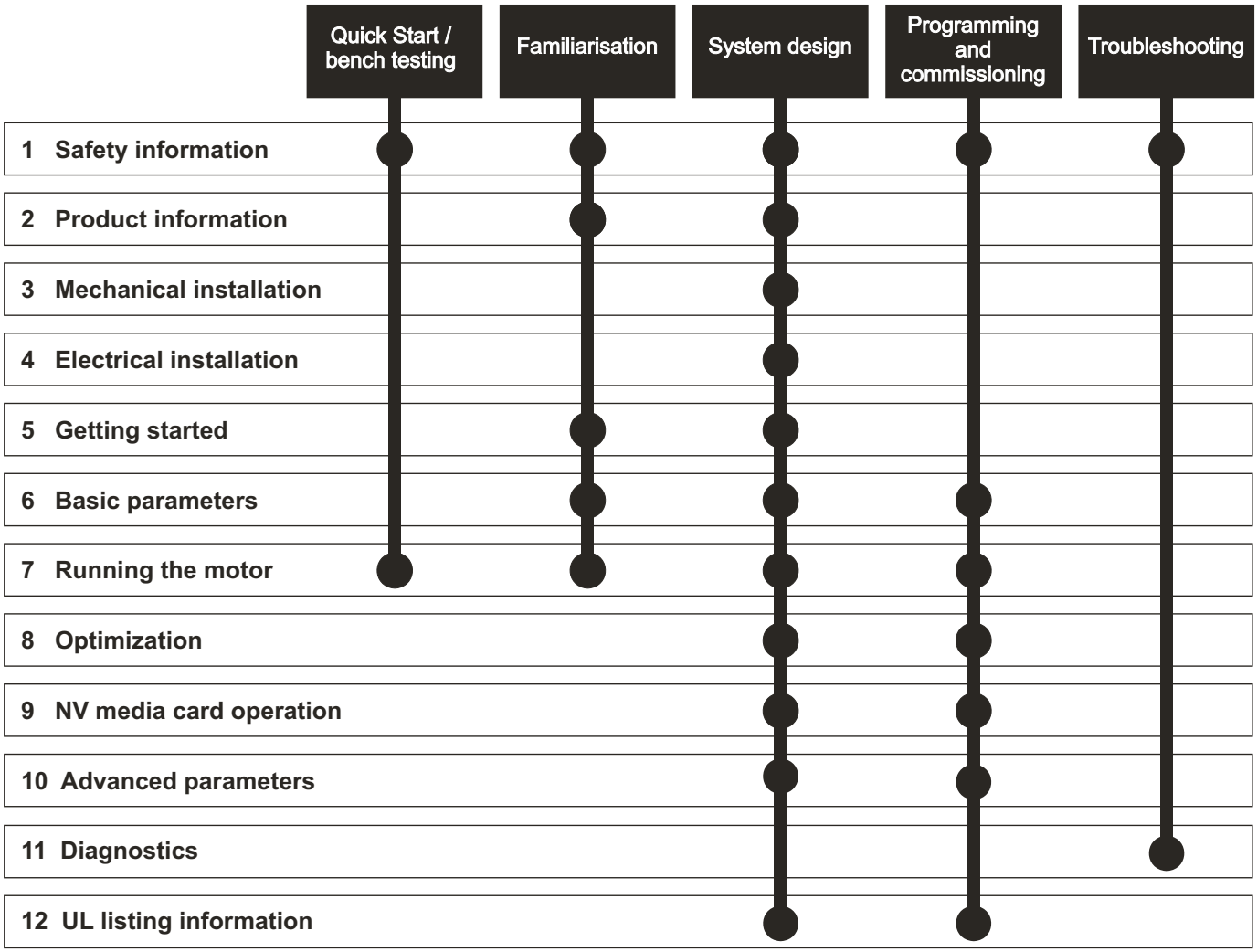
How to use this guide

This guide is intended to be used in conjunction with the appropriate Power Installation Guide. The Power Installation Guide gives information necessary to physically install the drive. This guide gives information on drive configuration, operation and optimization.

NOTE

There are specific safety warnings throughout this guide, located in the relevant sections. In addition, Chapter 1 *Safety information* on page 6 contains general safety information. It is essential that the warnings are observed and the information considered when working with or designing a system using the drive.

This map of the user guide helps to find the right sections for the task you wish to complete, but for specific information, refer to Contents on page 4:



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EU Declaration of Conformity

Nidec Control Techniques Ltd, The Gro, Newtown, Powys, UK. SY16 3BE.

This declaration is issued under the sole responsibility of the manufacturer. The object of the declaration is in conformity with the relevant Union harmonization legislation. The declaration applies to the variable speed drive products shown below:

Model number	Interpretation	Nomenclature aaaa - bbc ddddde
aaaa	Basic series	M100, M101, M200, M201, M300, M400, M600, M700, M701, M702, M708, M709, M750, M751, M753, M754, F300, H300, E200, E300, HS30, HS70, HS71, HS72, M000, RECT
bb	Frame size	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11
c	Voltage rating	1 = 100 V, 2 = 200 V, 4 = 400 V, 5 = 575 V, 6 = 690 V
ddddd	Current rating	Example 01000 = 100 A
e	Drive format	A = 6P Rectifier + Inverter (internal choke), D = Inverter, E = 6P Rectifier + Inverter (external choke), T = 12P Rectifier + Inverter (external choke)

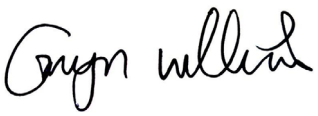
The model number may be followed by additional characters that do not affect the ratings.

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

EN 61800-5-1:2007	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
EN 61800-3: 2004+A1:2012	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-4: 2007+ A1:2011	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN 61000-3-2:2014	Electromagnetic compatibility (EMC) - Part 3-2: Limits for harmonic current emissions (equipment input current ≤16 A per phase)
EN 61000-3-3:2013	Electromagnetic compatibility (EMC) - Part 3-3: Limitation of voltage changes, voltage fluctuations and flicker in public, low voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection

EN 61000-3-2:2014 Applicable where input current < 16 A. No limits apply for professional equipment where input power ≥1 kW.

These products comply with the Restriction of Hazardous Substances Directive (2011/65/EU), the Low Voltage Directive (2014/35/EU) and the Electromagnetic Compatibility Directive (2014/30/EU).



G Williams

Vice President, Technology

Date: 25th April 2017

These electronic drive products are intended to be used with appropriate motors, controllers, electrical protection components and other equipment to form complete end products or systems. Compliance with safety and EMC regulations depends upon installing and configuring drives correctly, including using the specified input filters.

The drives must be installed only by professional installers who are familiar with requirements for safety and EMC. Refer to the Product Documentation. An EMC data sheet is available giving detailed information. 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.

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 Installation and Use

The information given in this publication is derived from tests and calculations on sample products. It is provided to assist in the correct application of the product, and is believed to correctly reflect the behaviour of the product when operated in accordance with the instructions. The provision of this data does not form part of any contract or undertaking. Where a statement of conformity is made with a specific standard, the manufacturer takes all reasonable measures to ensure that its products are in conformance. Where specific values are given these are subject to normal engineering variations between samples of the same product. They may also be affected by the operating environment and details of the installation arrangement.

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation of the equipment.



WARNING - This warning applies to products intended to be used with variable speed drives.
The adjustable speed drive uses high voltages and currents, carries a high level of stored electrical energy, and is used to control mechanical plant 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 and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and the instruction manual carefully.
Failure to observe the following instructions can cause physical injury or death, or damage to the equipment.

1.3 Enclosure

Unless stated otherwise in the installation instructions, the product 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.

1.4 Competence of the installer

Installation should be carried out by professional installers who are familiar with the requirements for safety and EMC. The installer 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.

1.5 Electric Shock and Fire Hazards



WARNING - Dangerous voltage
Where products are supplied by or connected to mains voltages, the voltages used 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 equipment. Refer to the relevant documentation.

1.5.1 AC supply

The AC supply must be isolated before any servicing work is performed, other than adjustments to the settings or parameters specified in the manual.

1.5.2 Live terminals

Some types of signal and control lines carry hazardous voltages (120/240 V) and can cause severe electric shock and may be lethal.

1.5.3 Stored charge

Some products contain capacitors that remain charged to a potentially lethal voltage after the power supply has been disconnected. It is recommended that the power supply is isolated at least ten minutes before working on the equipment.

1.6 Electrical installation

1.6.1 Protective Ground (Earth) connection

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

1.6.2 Fuses

The supply to the equipment must be installed with suitable protection against overload and short-circuits. The tables in the relevant documentation show recommended fuse ratings. Failure to observe these installation instructions could result in fire.

1.6.3 Cables

The cable sizes in the relevant documentation are only a guide. The mounting and grouping of cables affects their current-carrying capacity, in some cases smaller cables may be acceptable but in other cases a larger cable is required to avoid excessive temperature or voltage drop. Refer to local wiring regulations for the correct size of cables. Failure to observe these installation instructions could result in fire.

1.6.4 Terminal connections and torque settings

Loose power connections can be a fire risk. Always ensure that terminals are tightened to the specified torques. Refer to the tables in the relevant documentation.

1.6.5 High voltage insulation (flash) testing

High voltage insulation (flash) testing should not be carried out on the equipment.

1.6.6 ELV terminals

The ELV terminals are insulated from the mains supply by a single isolation barrier.

These terminals must be prevented from human contact by an additional isolation barrier, for example a terminal cover.

1.6.7 SELV terminals

SELV terminals can be safely connected to other SELV equipment and further protection against human contact is not required.

If an ELV terminal is connected directly to a SELV circuit (on the drive or other equipment), the combined circuit is ELV.

For this reason, ELV terminals should not be connected to SELV circuits unless it is acceptable to compromise the SELV circuit.

1.6.8 Products connected by plug and socket

An electric shock hazard exists if mains-supplied equipment is supplied via a plug and socket. When unplugged, the pins of the plug may carry a potentially lethal voltage until the internal capacitors have discharged. This can take up to 10 minutes.

It is recommended that a shrouded plug is used that prevents contact with the pins.

1.7 Setting up, commissioning and maintenance



It is essential that changes to the settings are given careful consideration. Depending on the application, a change could have an impact on safety. Appropriate precautions must be taken against inadvertent changes or tampering. Some specific settings which require particular care are listed below. This is not an exclusive list. Other settings may have an impact on safety in specific applications.

1.7.1 Lifting and handling

Some items of equipment weigh in excess of 15 kg (33 lb). Use appropriate safeguards when lifting these models. A full list of weights can be found in the installation instructions.

1.7.2 Output circuit and motor protection

Control parameters that are related to motor overload and protection must be set correctly to avoid a risk of overheating and fire in the event of motor overload. In some applications motor temperature protection may also be required.

1.7.3 STOP, Enable and Safe Torque Off functions (where applicable)

These functions do not remove dangerous voltages from the equipment or any external option unit, nor do they isolate the motor from dangerous voltages.

Automatic start
Some parameter settings may cause the motor to start unexpectedly.

Restore default parameter set
Depending on the application, this may cause unpredictable or hazardous operation.

1.8 Safety of machinery, safety-critical applications

Within the European Union all machinery in which this product is used must comply with Machinery Directive 2006/42/EC.

The design of safety-related control systems must only be done by personnel with the required training and experience. The Safe Torque Off function will only ensure the safety of a machine if it is correctly incorporated into a complete safety system. The system must be subject to a risk assessment to confirm that the residual risk of an unsafe event is at an acceptable level for the application.

1.9 Electromagnetic compatibility (EMC)

The product is designed to comply with international standards in a typical installation. Installation instructions are provided in the User Guide. If the installation is poorly designed or other equipment does not comply with international standards for EMC, the product might cause or suffer from disturbance due to electromagnetic interaction with other equipment. It is the responsibility of the installer to ensure that the equipment or system into which the product is incorporated complies with the relevant EMC legislation in the country of use.

Within the European Union, equipment into which this product is incorporated must comply with the Electromagnetic Compatibility Directive 2014/30/EU.

1.10 Copyright

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2 Product information

2.1 Introduction

Open loop AC drive

Unidrive M100 and Unidrive M101 deliver maximum machine performance with open loop vector and V/Hz induction motor control, for dynamic and efficient machine operation.

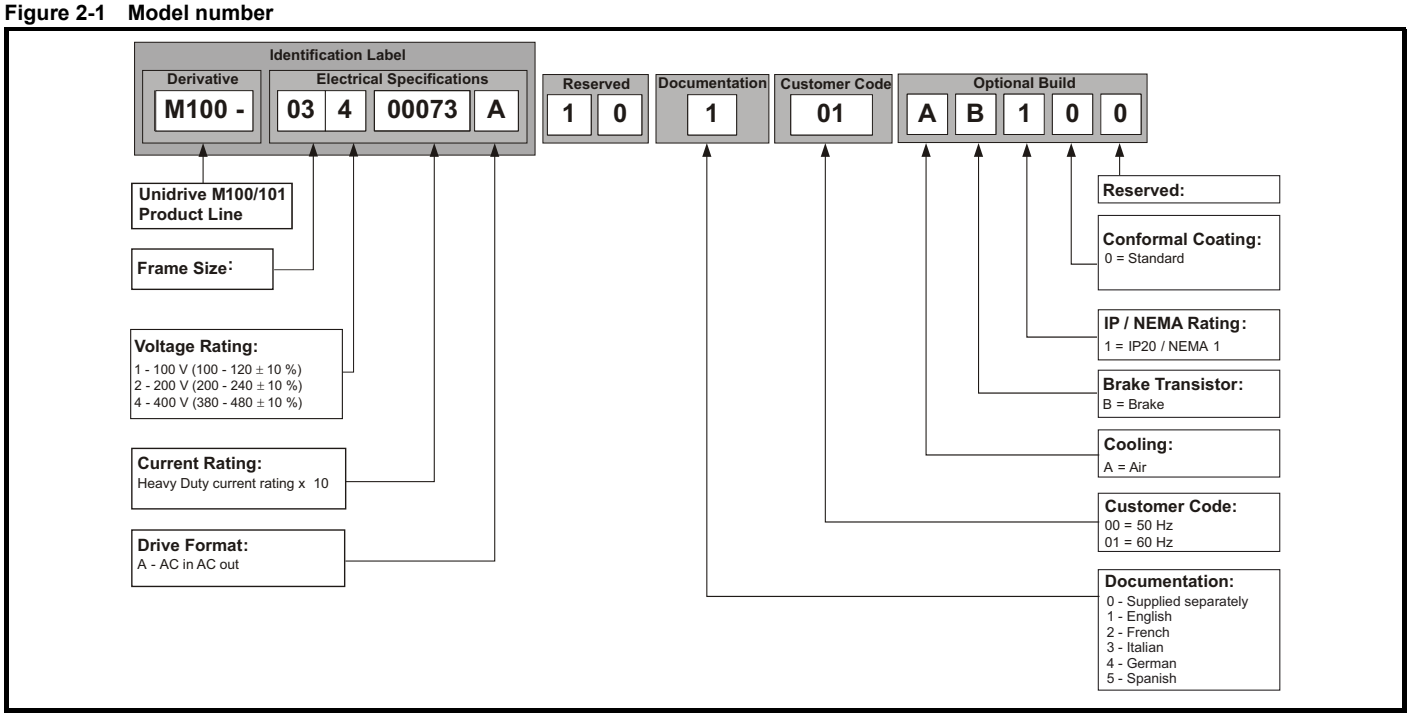
Features

- Value drive with quality and performance for open loop applications
- NV Media Card for parameter copying and data storage
- 24 Vdc backup supply (optional)

2.2 Model number

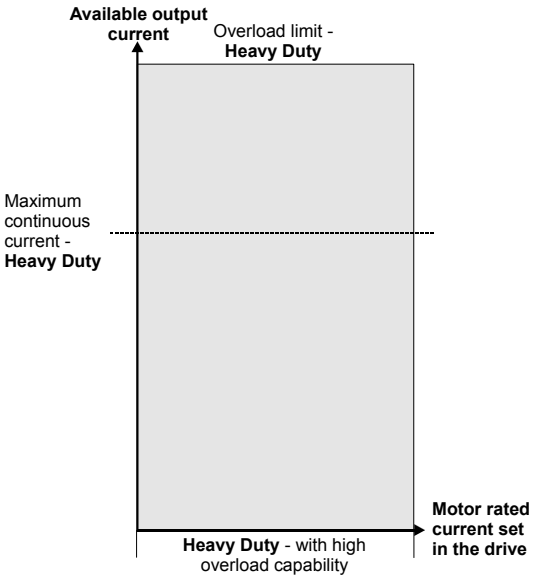
The way in which the model numbers for the Unidrive M range are formed is illustrated below:

Figure 2-1 Model number



2.3 Ratings

The drive is single rated.
The rating is compatible with motors designed to IEC60034.
The graph on the right illustrates Heavy Duty with respect to continuous current rating and short term overload limits.



Heavy Duty

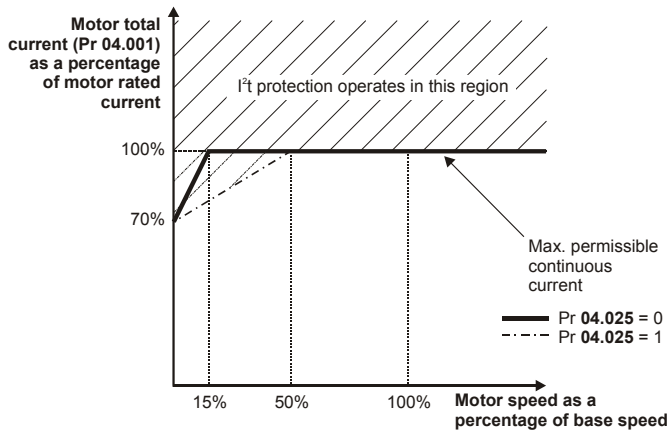
For constant torque applications or applications which require a high overload capability, or full torque is required at low speeds (e.g. winders, hoists).
The thermal protection is set to protect force ventilated induction motors by default.

NOTE

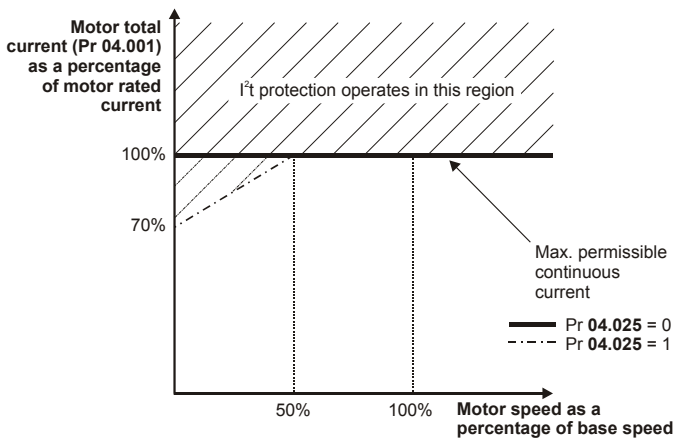
If the application uses a self ventilated (TENV/TEFC) induction motor and increased thermal protection is required for speeds below 50 % base speed, then this can be enabled by setting *Low Speed Thermal Protection Mode* (04.025) = 1.

Operation of motor I^2t protection

Motor I^2t protection is fixed as shown below and is compatible with:
- Self ventilated (TENV/TEFC) induction motors



Motor I^2t protection defaults to be compatible with:
- Forced ventilation induction motors



2.4 Operating modes

The drive is designed to operate in any of the following modes:

1. Open loop mode
Open loop vector mode
Fixed V/F mode (V/Hz)
Square V/F mode (V/Hz)

2.4.1 Open loop mode

The drive applies power to the motor at frequencies varied by the user. The motor speed is a result of the output frequency of the drive and slip due to the mechanical load. The drive can improve the speed control of the motor by applying slip compensation. The performance at low speed depends on whether V/F mode or open loop vector mode is selected.

Open loop vector mode
The voltage applied to the motor is directly proportional to the frequency except at low speed where the drive uses motor parameters to apply the correct voltage to keep the flux constant under varying load conditions.

Typically 100 % torque is available down to 1 Hz for a 50 Hz motor.

Fixed V/F mode
The voltage applied to the motor is directly proportional to the frequency except at low speed where a voltage boost is provided which is set by the user. This mode can be used for multi-motor applications.

Typically 100 % torque is available down to 4 Hz for a 50 Hz motor.

Square V/F mode
The voltage applied to the motor is directly proportional to the square of the frequency except at low speed where a voltage boost is provided which is set by the user. This mode can be used for running fan or pump applications with quadratic load characteristics or for multi-motor applications. This mode is not suitable for applications requiring a high starting torque.

2.5 Keypad and display

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

Figure 2-2 Unidrive M100 keypad detail

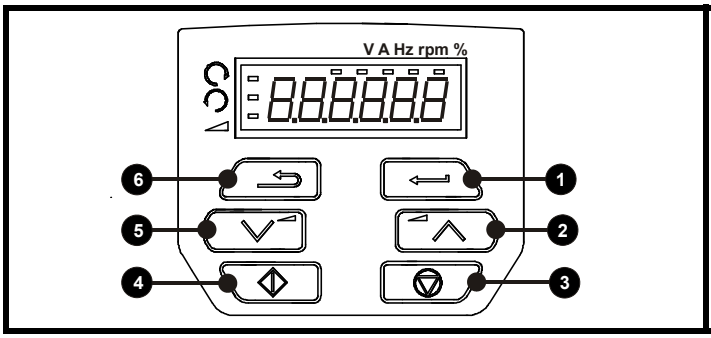
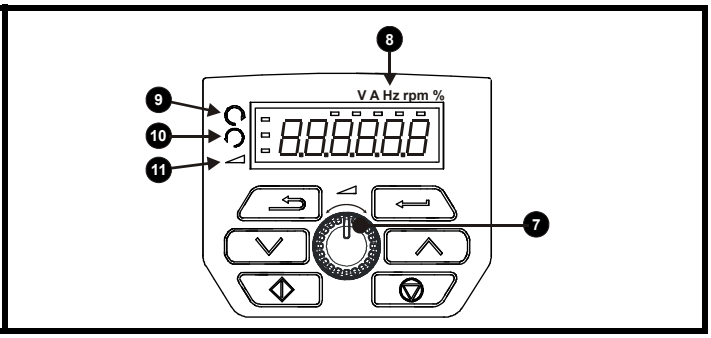


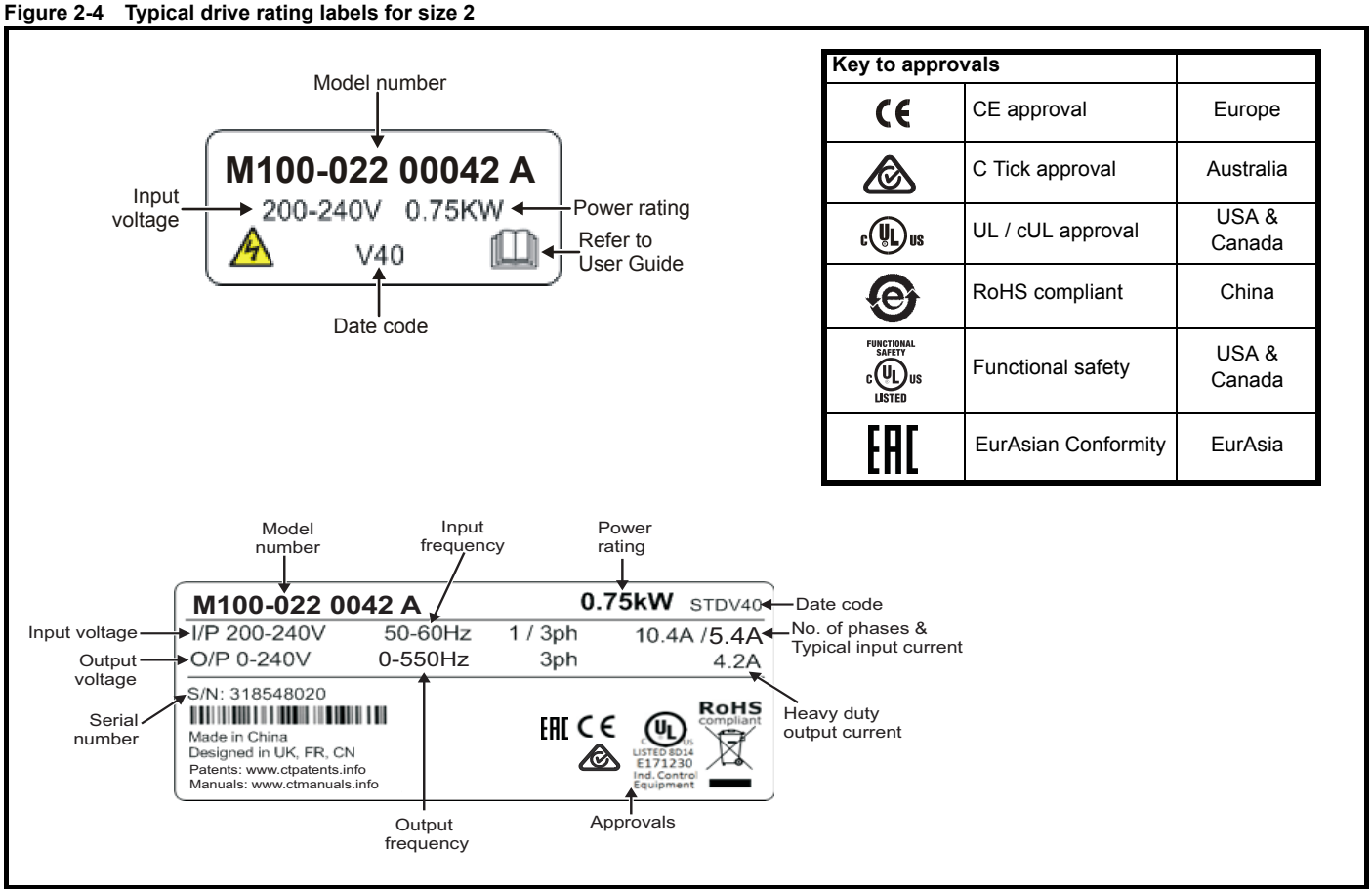
Figure 2-3 Unidrive M101 keypad detail



(1) The *Enter* button is used to enter parameter view or edit mode, or to accept a parameter edit.
(2 / 5) The *Navigation* button can be used to select individual parameters or to edit parameter values.
(3) The *Stop / Reset* button is used to stop and reset the drive in keypad mode. It can also be used to reset the drive in terminal mode.
(4) The *Start* button is used to start the drive in keypad mode.
(6) The *Escape* button is used to exit from the parameter edit / view mode.
(7) The *Speed Reference Potentiometer* is used to control the speed reference in keypad mode (only on *Unidrive M101*).
(8) Units.
(9) Run forward indicator.
(10) Run reverse indicator.
(11) Keypad reference indicator.

2.6 Nameplate description

Figure 2-4 Typical drive rating labels for size 2



Refer to Figure 2-1 *Model number* on page 8 for further information relating to the labels.

NOTE

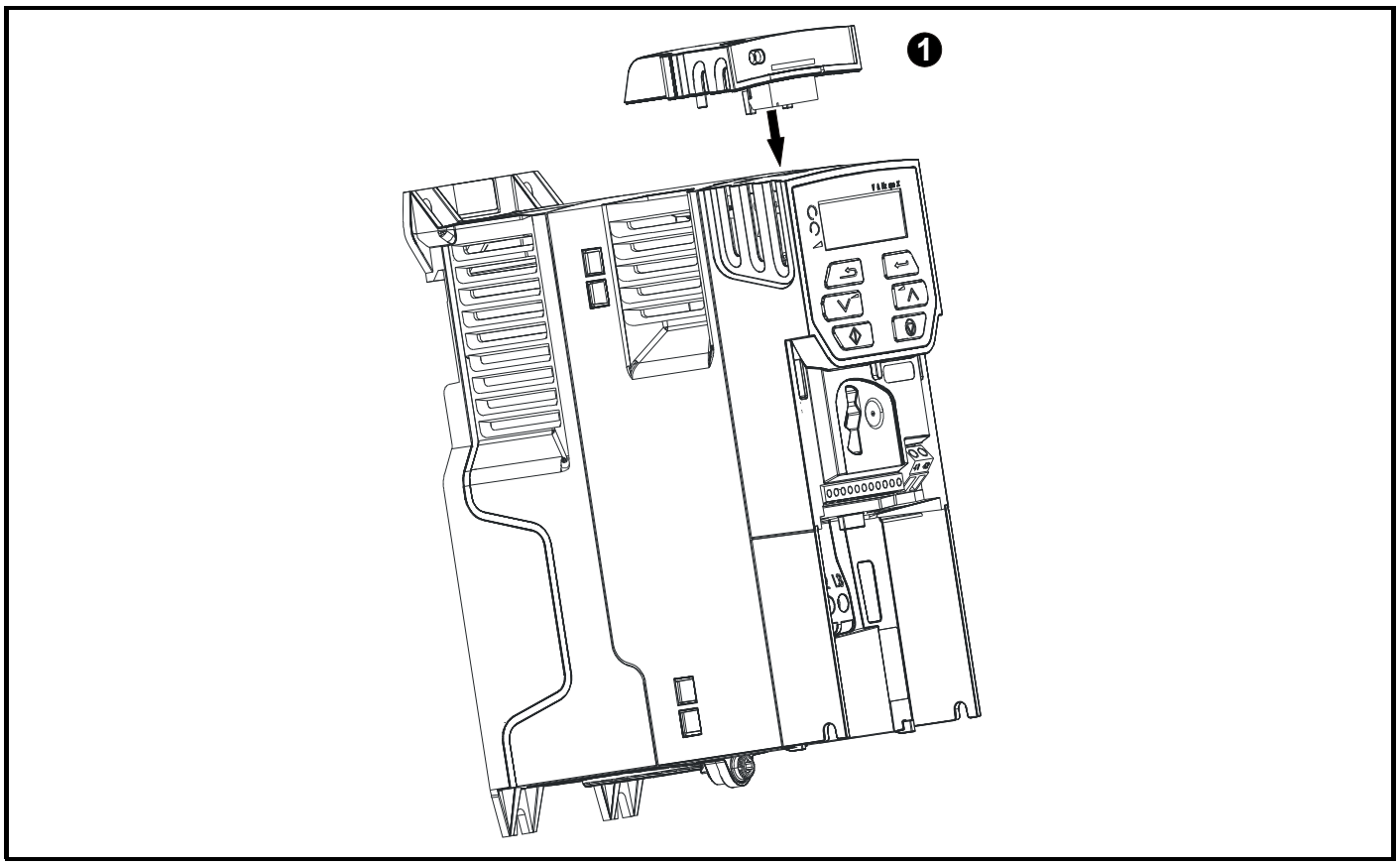
Date code format

The date code is four numbers. The first two numbers indicate the year and the remaining numbers indicate the week of the year in which the drive was built. This new format started in 2017.

Example:
A date code of **1710** would correspond to week 10 of year 2017.

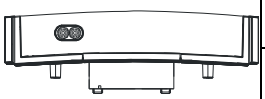
2.7 Options

Figure 2-5 Options available with the drive



1. AI-Backup Adaptor

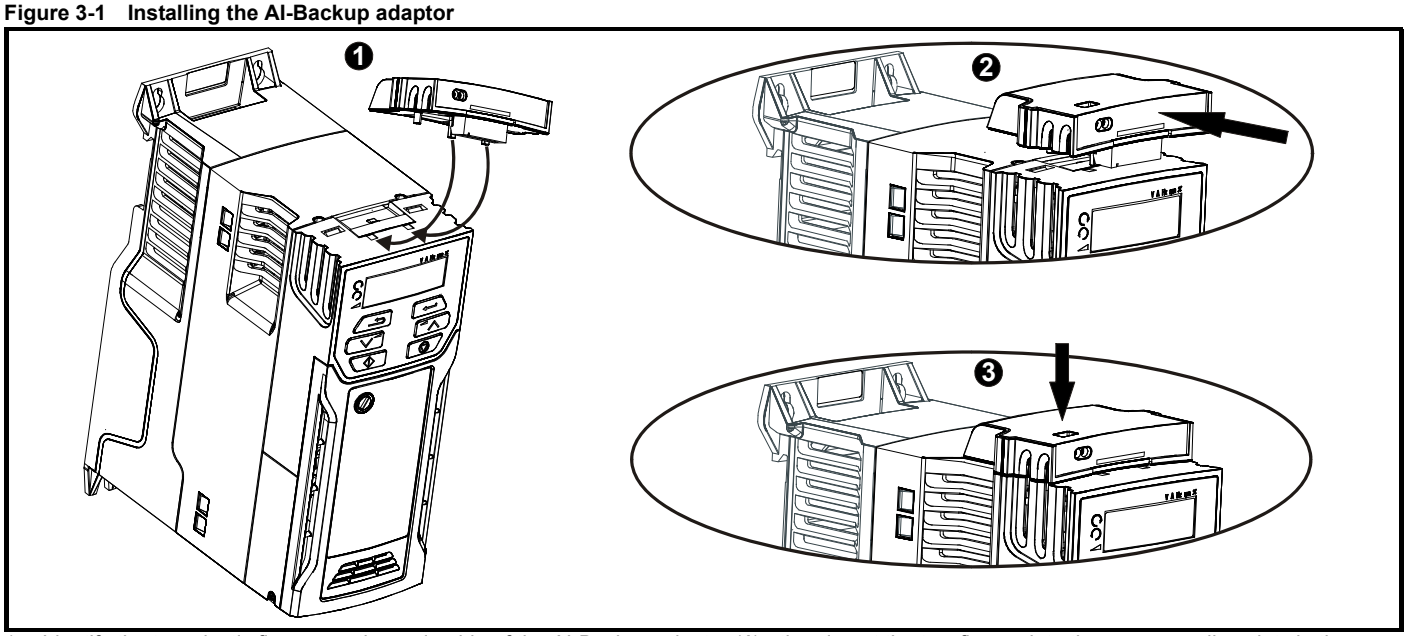
Table 2-1 Adaptor Interface (AI) option module identification

Type	Option module	Name	Further Details
Backup		AI-Backup adaptor	**+24 V Backup and SD card interface** Provides a +24 V Backup supply input and SD card interface
		AI-Smart adaptor	**+24 V Backup and SD card interface** Supplied with 4 GB SD card for parameter copying and an input for 24 V Backup

3 Mechanical installation

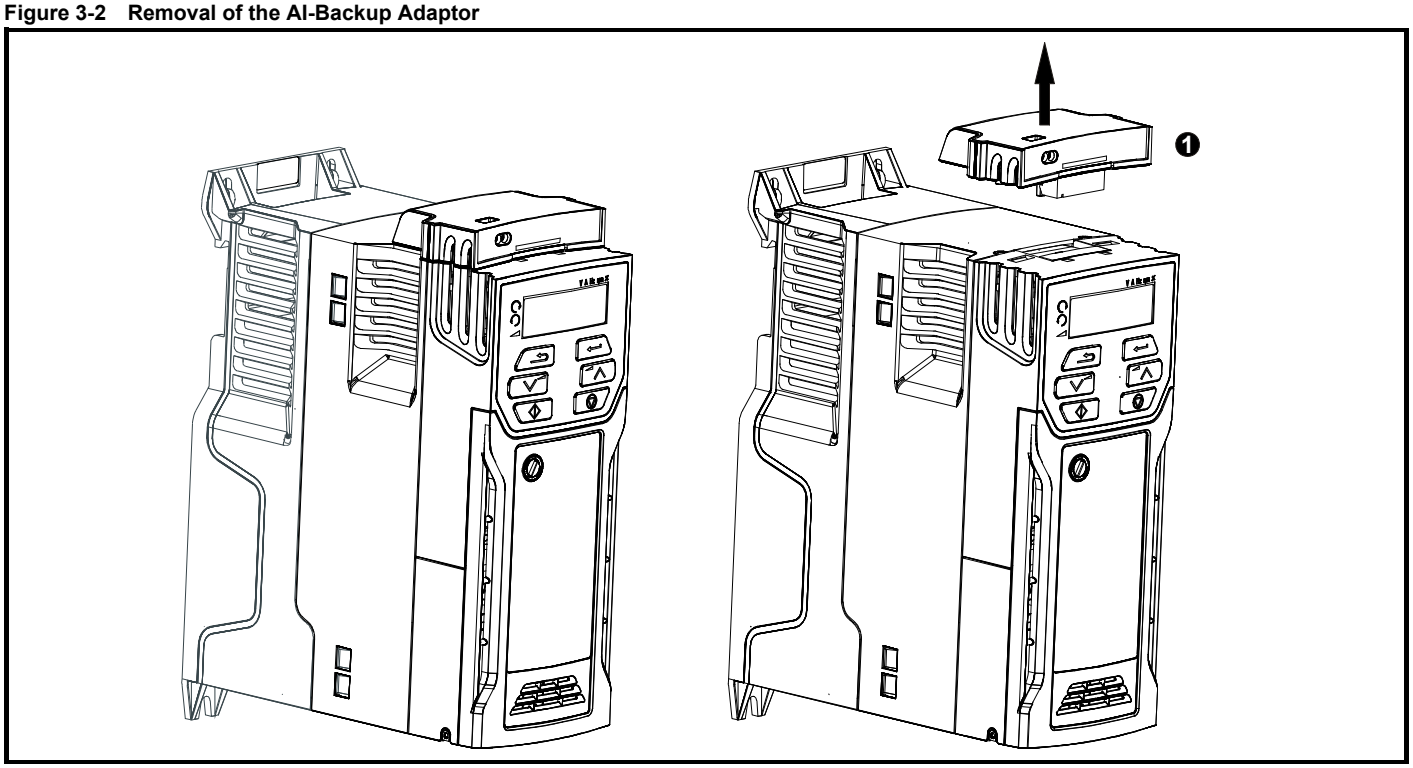
3.1 Installing / removing option

Figure 3-1 Installing the AI-Backup adaptor



1. Identify the two plastic fingers on the underside of the AI-Backup adaptor (**1**) - then insert the two fingers into the corresponding slots in the spring-loaded sliding cover on the top of the drive.
2. Hold the adaptor firmly and push the spring loaded protective cover towards the back of the drive to expose the connector block (**2**) below.
3. Press the adaptor downwards (**3**) until the adaptor connector locates into the drive connection below.

Figure 3-2 Removal of the AI-Backup Adaptor



- To remove the AI-Backup adaptor, pull it up away from the drive in the direction shown (1)

4 Electrical installation

4.1 24 Vdc supply

The 24 Vdc supply connected to the +24 V supply terminals on the AI-Backup adaptor provides the following functions:

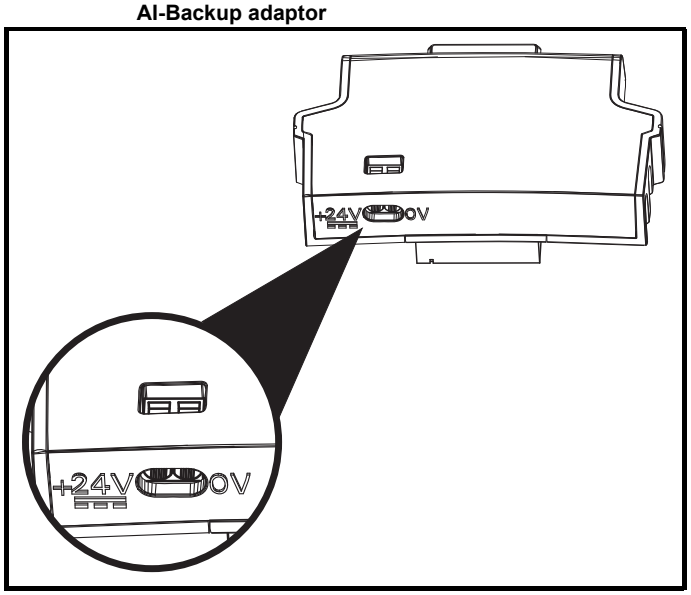
- It can be used to clone or load parameters in order to pre-configure drives when the line power supply is not available. The keypad can be used to setup parameters if required. However, the drive will be in the Under Voltage state unless the line power supply is enabled, therefore diagnostics may not be possible. (Power down save parameters are not saved when using the 24 V back-up power supply input).

The working voltage range of the 24 V back-up power supply is as follows:

0V	**0V (connected internally to 0V common - Control terminal 1)**
+ 24 V	**+ 24 V Backup supply input**
Nominal operating voltage	24.0 Vdc
Minimum continuous operating voltage	19.2 V
Maximum continuous operating voltage	30.0 V
Minimum start up voltage	12.0 V
Minimum power supply requirement at 24 V	20 W
Maximum power supply continuous current	3 A
Recommended fuse	1 A, 50 Vdc

Minimum and maximum voltage values include ripple and noise. Ripple and noise values must not exceed 5 %.

Figure 4-1 Location of the 24 Vdc power supply connection on the AI-Backup adaptor



NOTE

The 24 Vdc Backup supply can be used on all frame sizes.

4.2 Control connections

4.2.1 General

Table 4-1 The control connections consist of:

Function	Qty	Control parameters available	Terminal number
Single ended analog input	1	Mode, offset, invert, scaling, destination	2
Digital input	3	Destination, invert	11, 12, 13
Digital input / output	1	Input / output mode select, destination / source, invert	10
PWM or frequency output	1	Source, scaling, maximum output frequency, mode	10
Relay	1	Source, invert	41, 42
Drive enable	1		11
+10 V User output	1		4
+24 V User output	1		9
0V common	1		1

Key:

Destination parameter:	Indicates the parameter which is being controlled by the terminal / function
Source parameter:	Indicates the parameter being output by the terminal
Mode parameter:	Analog - indicates the mode of operation of the terminal, i.e. voltage 0-10 V, current 4-20 mA etc. Digital - indicates the mode of operation of the terminal, (the Drive Enable terminal is fixed in positive logic).

All analog terminal functions can be programmed in menu 7.

All digital terminal functions (including the relay) can be programmed in menu 8.

WARNING

The control circuits are isolated from the power circuits in the drive by basic insulation (single insulation) only. The installer must ensure that the external control circuits are insulated from human contact by at least one layer of insulation (supplementary insulation) rated for use at the AC supply voltage.

WARNING

If the control circuits are to be connected to other circuits classified as Safety Extra Low Voltage (SELV) (e.g. to a personal computer), an additional isolating barrier must be included in order to maintain the SELV classification.

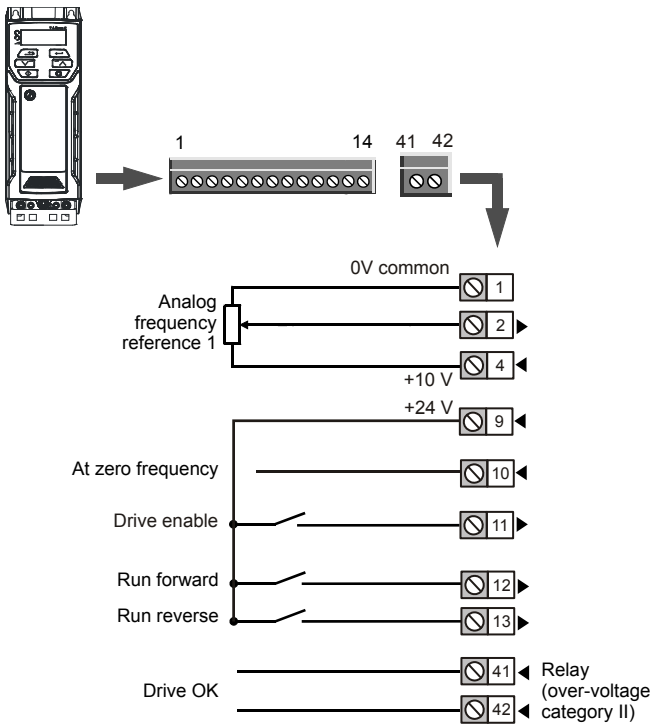
CAUTION

If any of the digital inputs (including the drive enable input) are connected in parallel with an inductive load (i.e. contactor or motor brake) then suitable suppression (i.e. diode or varistor) should be used on the coil of the load. If no suppression is used then over voltage spikes can cause damage to the digital inputs and outputs on the drive.

NOTE

Any signal cables which are carried inside the motor cable (i.e. motor thermistor, motor brake) will pick up large pulse currents via the cable capacitance. The shield of these signal cables must be connected to ground close to the point of exit of the motor cable, to avoid this noise current spreading through the control system.

Figure 4-2 Default terminal functions



4.2.2 Control terminal specification

1	0V common
Function	**Common connection for all external devices**

2	Analog input 1
Default function	**Frequency reference**
Type of input	Unipolar single-ended analog voltage or unipolar current
Mode controlled by…	Pr **07.007**
Operating in voltage mode (default)	
Full scale voltage range	0V to +10 V ±3 %
Maximum offset	±30 mV
Absolute maximum voltage range	-18 V to +30 V relative to 0V
Input resistance	100 kΩ
Operating in current mode	
Current ranges	0 to 20 mA ±5 %, 20 to 0 mA ±5 %, 4 to 20 mA ±5 %, 20 to 4 mA ±5 %
Maximum offset	250 µA
Absolute maximum voltage (reverse bias)	-18 V to +30 V relative to 0V
Absolute maximum current	25 mA
Equivalent input resistance	165 Ω
Common to all modes	
Resolution	11 bits
Sample rate	4 ms

4	+10 V user output
Default function	**Supply for external analog devices**
Nominal voltage	10.2 V
Voltage tolerance	±3 %
Maximum output current	5 mA

9	**+24 V user output**
Default function	**Supply for external digital devices**
Voltage tolerance	±20 %
Maximum output current	100 mA
Protection	Current limit and trip

10	**Digital I/O 1**
Default function	**AT ZERO FREQUENCY output**
Type	Positive logic digital input, positive logic voltage source output. PWM or frequency output modes can be selected.
Input / output mode controlled by …	Pr **08.031**
Operating as in input	
Absolute maximum applied voltage range	-8 V to +30 V relative to 0V
Impedance	6.8 kΩ
Input threshold	10 V ±0.8 V (IEC 61131-2)
Operating as an output	
Nominal maximum output current	50 mA
Maximum output current	100 mA (total including +24 Vout)
Common to all modes	
Voltage range	0V to +24 V
Sample rate	1 ms when routed to destinations Pr **06.035** or Pr **06.036**, otherwise 4 ms

11	**Digital Input 2**
12	**Digital Input 3**
13	**Digital Input 4**
Terminal 11 default function	**DRIVE ENABLE input**
Terminal 12 default function	**RUN FORWARD input**
Terminal 13 default function	**RUN REVERSE input**
Type	Positive logic only digital inputs
Voltage range	0V to +24 V
Absolute maximum applied voltage range	-18 V to +30 V relative to 0V
Impedance	6.8 kΩ
Input threshold	10 V ±0.8 V (IEC 61131-2)
Sample rate	1 ms when routed to destinations Pr **06.035** or Pr **06.036**, otherwise 4 ms.

41 42	**Relay contacts**
Default function	**Drive OK indicator**
Contact voltage rating	240 Vac, Installation over-voltage category II
Contact maximum current rating	2 A AC 240 V 4 A DC 30 V resistive load 0.5 A DC 30 V inductive load (L/R = 40 ms)
Contact minimum recommended rating	12 V 100 mA
Contact type	Normally open
Default contact condition	Closed when power applied and drive OK
Update rate	1 ms



To prevent the risk of a fire hazard in the event of a fault, a fuse or other over-current protection must be installed in the relay circuit.

5 Getting started

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

5.1 Understanding the display

5.1.1 Keypad

The keypad display consists of a 6 digit LED display. The display shows the drive status or the menu and parameter number currently being edited.

The mm.ppp signifies the menu parameter number of the drive's menus and parameter.

The display also includes LED indicators showing units and status as shown in Figure 5-1.

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

NOTE

The values in the *Status Mode Parameters* (Pr **22** and Pr **23**) shown on the display when the drive is running, can be toggled by using the escape button.

Figure 5-1 Unidrive M100 keypad detail

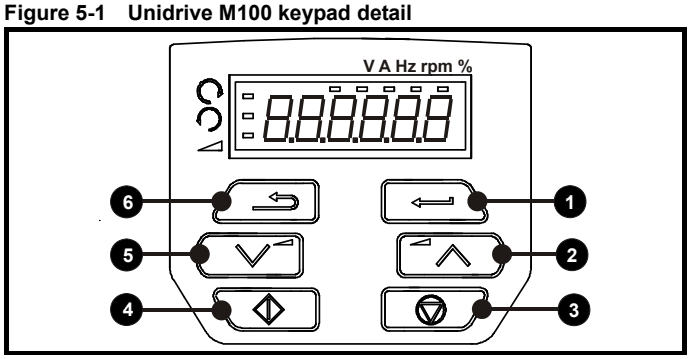


Table 5-1 Key to Figure 5-1

1: Enter button	**4:** Start button (green)
2: Up button	**5:** Down button
3: Stop/Reset button (red)	**6:** Escape button

Figure 5-2 Unidrive M101 keypad detail

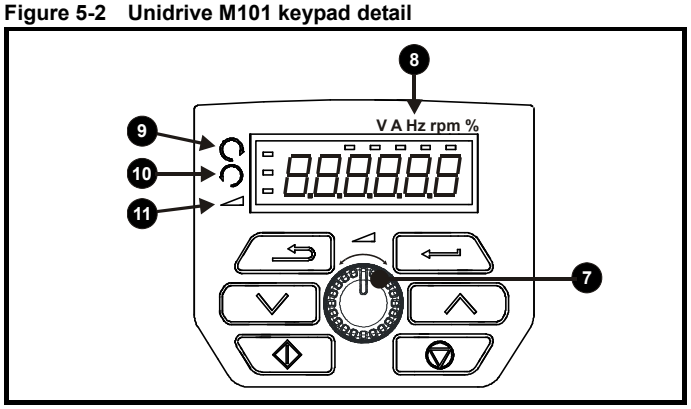


Table 5-2 Key to Figure 5-2

7: Speed reference potentiometer	**10:** Run reverse indicator
8: Unit indicators	**11:** Keypad reference indicator
9: Run forward indicator	

NOTE

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

On the Unidrive M101, the speed reference potentiometer is used to adjust the keypad reference.

The parameter value is correctly displayed on the keypad display as shown in Table 5-3 below.

Table 5-3 Keypad display formats

Display formats	Value
Standard	100.99
Date	31.12.11 or 12.31.11
Time	12.34.56
Character	ABCDEF
Binary	5
Version number	01.23.45

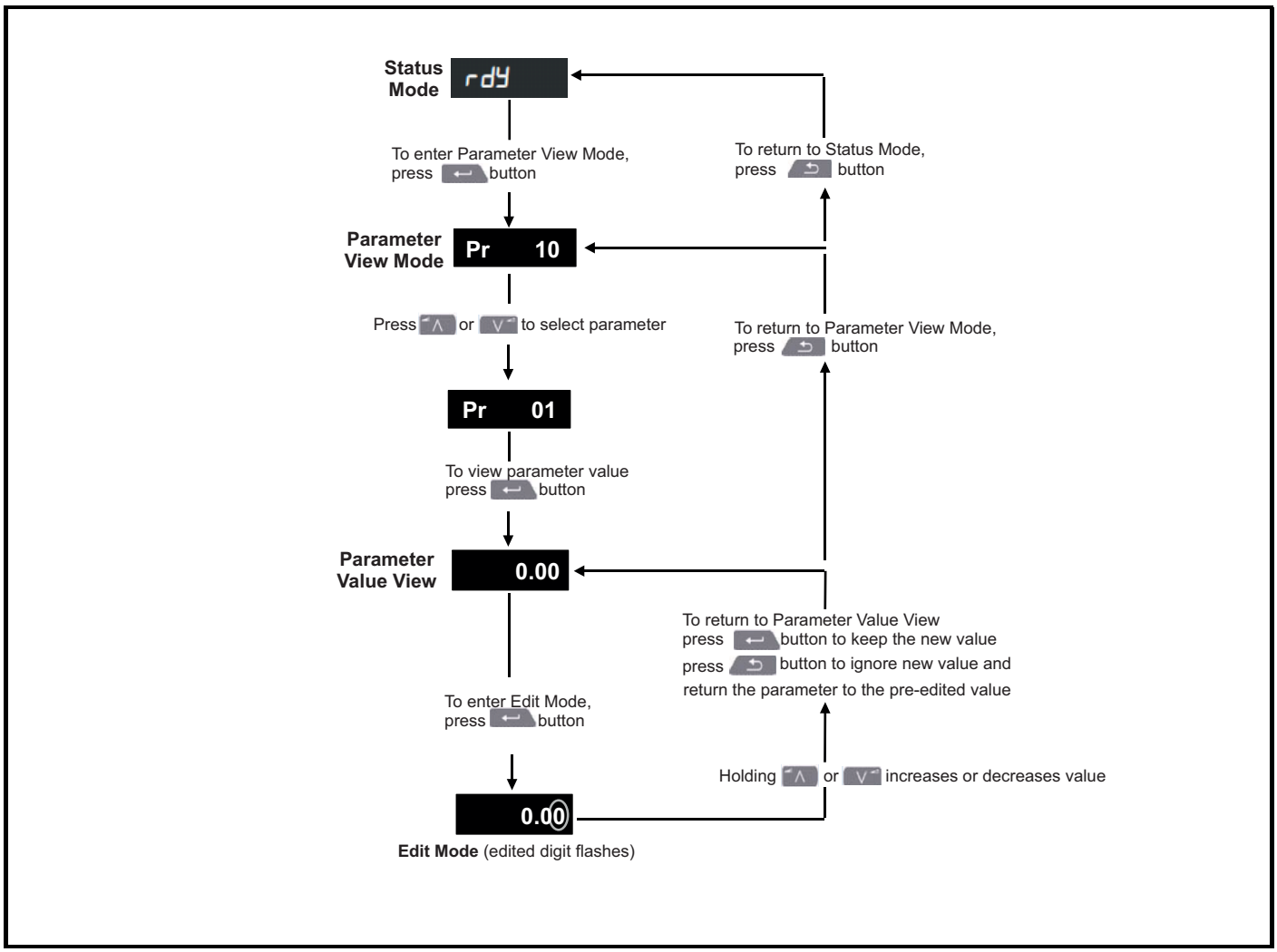
5.2 Keypad operation

5.2.1 Control buttons

The keypad consists of:

- Up and down button - Used to navigate the parameter structure and change parameter values.
- Enter button - Used to change between parameter edit and view mode, as well as entering data.
- Escape button - Used to exit from parameter edit or view mode. In parameter edit mode, if parameter values are edited and the escape button pressed, the parameter value will be restored to the value it had on entry to edit mode.
- Start button - Used to provide a 'Run' command if keypad mode is selected.
- Stop / Reset button - Used to reset the drive. In keypad mode can be used for 'Stop'.

Figure 5-3 Display modes



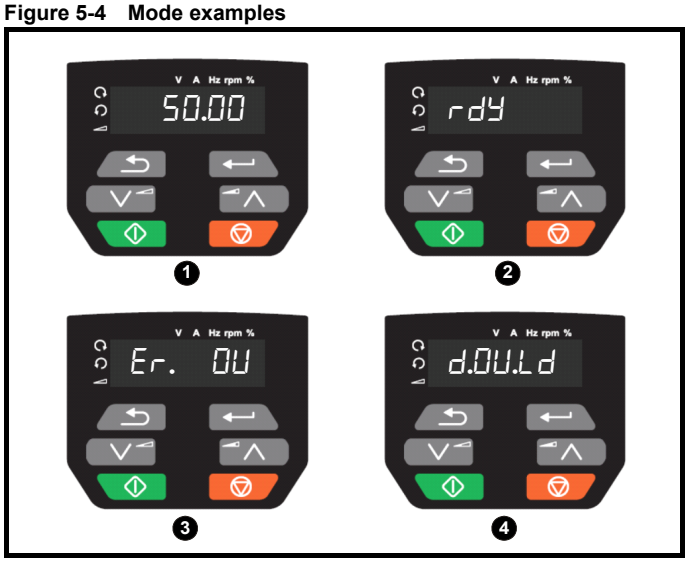
NOTE

The up and down buttons can only be used to move between menus if Pr **10** has been set to show 'ALL'. Refer to section 5.8 *Parameter access level and security* on page 21.

NOTE

The up and down buttons can only be used to move between menus if Pr **10** has been set to show 'ALL'. Refer to section 5.8 *Parameter access level and security* on page 21.

Figure 5-4 Mode examples



1 Parameter view mode: Read write or Read only

2 Status mode: Drive OK status

If the drive is ok and the parameters are not being edited or viewed, the display will show one of the following:

inh', 'rdy' or status mode parameter value.

3 Status mode: Trip status

When the drive is in trip condition, the display will indicate that the drive has tripped and the display will show the trip code. For further information regarding trip codes, refer to section 11.4 *Trips, Sub-trip numbers* on page 81.

4 Status mode: Alarm status

During an 'alarm' condition the display flashes between the drive status parameter value and the alarm.

WARNING

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

New parameter values must be saved to ensure that the new values apply after the drive has been power cycled. Refer to section 5.6 *Saving parameters* on page 20.

5.3 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 **10** has been set to 'All' the up and down buttons are used to navigate between menus.

For further information refer to section 5.8 *Parameter access level and security* on page 21.

The menus and parameters rollover 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.

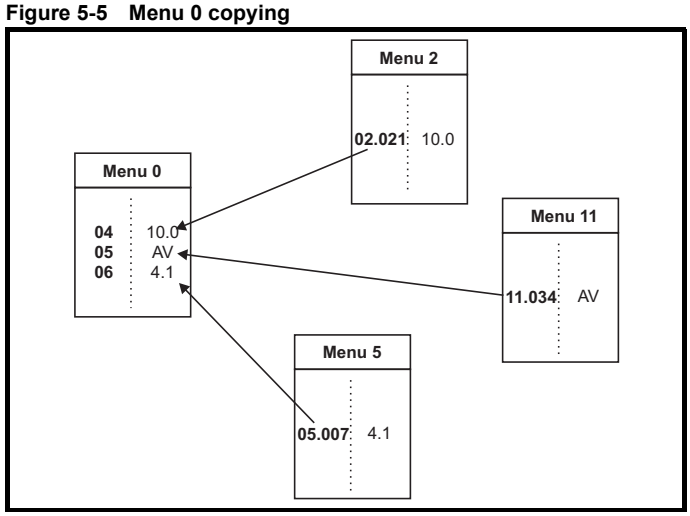
5.4 Menu 0

Menu 0 is used to bring together various commonly used parameters for basic easy set up of the drive. The parameters displayed in Menu 0 can be configured in Menu 22.

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* on page 22.

Figure 5-5 Menu 0 copying



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 22 can be viewed on the Keypad.

Table 5-4 Advanced menu descriptions

Menu	Description
0	Commonly used basic set up parameters for quick / easy programming
1	Frequency reference
2	Ramps
3	Frequency control
4	Torque and current control
5	Motor control
6	Sequencer and clock
7	Analog I/O
8	Digital I/O
10	Status and trips
11	Drive set-up and identification
22	Menu 0 set-up

5.5.1 Display messages

The following tables indicate the various possible mnemonics which can be displayed by the drive and their meaning.

Table 5-5 Status indications

String	Description	Drive output stage
inh	The drive is inhibited and cannot be run. The Drive Enable signal is not applied to the drive enable terminal or Pr **06.015** is set to 0. The other conditions that can prevent the drive from enabling are shown as bits in *Enable Conditions* (06.010)	Disabled
rdy	The drive is ready to run. The drive enable is active, but the drive inverter is not active because the final drive run is not active	Disabled
StoP	The drive is stopped / holding zero speed.	Enabled
S.Loss	Supply loss condition has been detected	Enabled
dc inj	The drive is applying dc injection braking	Enabled
Er	The drive has tripped and no longer controlling the motor. The trip code appears on the display.	Disabled
UV	The drive is in the under voltage state either in low voltage or high voltage mode.	Disabled
HEAt	The motor pre-heat function is active.	Enabled

5.5.2 Alarm indications

An alarm is an indication given on the display by alternating the alarm string with the drive status string on the display. Alarms strings are not displayed when a parameter is being edited.

Table 5-6 Alarm indications

Alarm string	Description
br.res	Brake resistor overload. *Braking Resistor Thermal Accumulator* (10.039) in the drive has reached 75.0 % of the value at which the drive will trip.
OV.Ld	*Motor Protection Accumulator* (04.019) in the drive has reached 75.0 % of the value at which the drive will trip and the load on the drive is >100 %.
d.OV.Ld	Drive over temperature. *Percentage Of Drive Thermal Trip Level* (07.036) in the drive is greater than 90 %.
tuning	The autotune procedure has been initialized and an autotune in progress.
LS	Limit switch active. Indicates that a limit switch is active and that is causing the motor to be stopped.
Lo.AC	Low voltage mode. See *Low AC Alarm* (10.107).
I.AC.Lt	Current limit active. See *Current Limit Active* (10.009).
24.LoSt	24 V backup not present. See 24V Alarm Loss Enable (11.098).

5.6 Saving parameters

When changing a parameter in Menu 0, the new value is saved when pressing the Enter button  to return to parameter view mode from parameter edit mode.

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

Procedure

1. Select 'Save' in Pr **00** or Pr **mm.000** (alternatively enter a value of 1001 in Pr **00** or Pr **mm.000**)

- Press the red  reset button

5.7 Restoring parameter defaults

Restoring parameter defaults by this method saves the default values in the drives memory. *User security status* (Pr **10**) and *User security code* (Pr **25**) are not affected by this procedure).

Procedure

1. Ensure the drive is not enabled, i.e. drive is in inhibit or under voltage state.
2. Select 'Def.50' or 'Def.60' in Pr **00** or Pr **mm.000**. (alternatively, enter 1233 (50 Hz settings) or 1244 (60 Hz settings) in Pr **00** or Pr **mm.000**).

- Press the red  reset button

5.8 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 22) 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 5-7.

Table 5-7 Parameter access level and security

User security status (Pr 10)	Access level	Menu 0 status	Advanced menu status
0	LEVEL.1	RW	Not visible
1	LEVEL.2	RW	Not visible
2	ALL	RW	RW
3	StAtUS	RW	Not visible
4	no.Acc	RW	Not visible

The default settings of the drive are Parameter Access Level LEVEL.1 and user Security Open i.e. read / write access to Menu 0 with the advanced menus not visible.

5.8.1 User Security Level / Access Level

The drive provides a number of different levels of security that can be set by the user via *User Security Status* (Pr **10**); these are shown in the table below.

User Security Status (Pr 10)	Description
LEVEL.1 (0)	Access to first 10 parameters in Menu 0 only.
LEVEL.2 (1)	Access to all parameters in Menu 0.
ALL (2)	Access to all menus.
StAtUS (3)	The keypad remains in status mode and only first 10 parameters in Menu 0 can be viewed or edited.
no.Acc (4)	The keypad remains in status mode and only first 10 parameters in Menu 0 can be viewed or edited. Drive parameters cannot be accessed via a comms interface.

5.8.2 Changing the User Security Level /Access Level

The security level is determined by the setting of Pr **10** or Pr **11.044**. The Security Level can be changed through the keypad even if the User Security Code has been set.

5.8.3 User Security Code

The User Security Code, when set, prevents write access to any of the parameters in any menu.

Setting User Security Code

Enter a value between 1 and 9999 in Pr **25** and press the button; the security code has now been set to this value. In order to activate the security, the Security level must be set to desired level in Pr **10**. When the drive is reset, the security code will have been activated and the drive returns to LEVEL.1. The value of Pr **25** will return to 0 in order to hide the security code.

Unlocking User Security Code

Select a parameter that need to be edited and press the button, the display will now show ‘Co’. Use the arrow buttons to set the security code and press the button. With the correct security code entered, the display will revert to the parameter selected in edit mode.

If an incorrect security code is entered, the following message ‘Co.Err’ is displayed, and the display will revert to parameter view mode.

Disabling User Security

Unlock the previously set security code as detailed above. Set Pr **25** to 0 and press the button. The User Security has now been disabled, and will not have to be unlocked each time the drive is powered up to allow read / write access to the parameters.

5.9 Displaying parameters with non-default values only

By selecting 'diff.d' in Pr **00** (Alternatively, enter 12000 in Pr **00**), 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 **00** and select 'none' (alternatively enter a value of 0). Please note that this function can be affected by the access level enabled, refer to section 5.8 *Parameter access level and security* on page 21 for further information regarding access level.

5.10 Displaying destination parameters only

By selecting 'dest' in Pr **00** (Alternatively enter 12001 in Pr **00**), 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 **00** and select 'none' (alternatively enter a value of 0).

Please note that this function can be affected by the access level enabled, refer to section 5.8 *Parameter access level and security* on page 21 for further information regarding access level.

6 Basic parameters

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

6.1 Parameter ranges and Variable minimum/maximums:

Some parameters in the drive have a variable range with a variable minimum and a variable maximum value which is dependent on one of the following:

- The settings of other parameters
- The drive rating
- The drive mode
- Combination of any of the above

For more information please see section 10.1 *Parameter ranges and Variable minimum/maximums:* on page 45.

6.2 Menu 0: Basic parameters

Parameter			Range (⇳)	Default (⇨)	Type					
			OL	OL						
01	Minimum Speed	**{01.007}**	0.00 to Pr **02** Hz	0.00 Hz	RW	Num				US
02	Maximum Speed	**{01.006}**	0.00 to 550.00 Hz	50 Hz default: 50.00 Hz 60 Hz default: 60.00 Hz	RW	Num				US
03	Acceleration Rate 1	**{02.011}**	0.0 to 32000.0 s / 100 Hz	5.0 s / 100 Hz	RW	Num				US
04	Deceleration Rate 1	**{02.021}**	0.0 to 32000.0 s / 100 Hz	10.0 s / 100 Hz	RW	Num				US
05	Drive Configuration	**{11.034}**	AV (0), AI (1), AV.Pr (2), AI.Pr (3), PrESEt (4), PAd (5), PAd.rEF (6), torquE (8)	AV (0)*	RW	Txt			PT	US
06	Motor Rated Current	**{05.007}**	0.00 to Drive Rating A	Maximum Heavy Duty Rating (11.032) A	RW	Num		RA		US
07	Motor Rated Speed**	**{05.008}**	0.0 to 33000.0 rpm	50 Hz default: 1500.0 rpm 60 Hz default: 1800.0 rpm	RW	Num				US
08	Motor Rated Voltage	**{05.009}**	0 to 240 V or 0 to 480 V	110 V drive: 230 V 200 V drive: 230 V 400 V drive 50 Hz: 400 V 400 V drive 60 Hz: 460 V	RW	Num		RA		US
09	Motor Rated Power Factor***	**{05.010}**	0.00 to 1.00	0.85	RW	Num		RA		US
10	User Security Status	**{11.044}**	LEVEL.1 (0), LEVEL.2 (1), ALL (2), StAtUS (3), no.Acc (4)	LEVEL.1 (0)	RW	Num	ND		PT	
11	Start/Stop Logic Select	**{06.004}**	0 to 6	0	RW	Num				US
15	Jog Reference	**{01.005}**	0.00 to 300.00 Hz	1.50 Hz	RW	Num				US
16	Analog Input 1 Mode	**{07.007}**	4-20.S (-6), 20-4.S (-5), 4-20.L (-4), 20-4.L (-3), 4-20.H (-2), 20-4.H (-1), 0-20 (0), 20-0 (1), 4-20.tr (2), 20-4.tr (3), 4-20 (4), 20-4 (5), Volt (6)	Volt (6)	RW	Txt				US
17	Bipolar Reference Enable	**{01.010}**	Off (0) or On (1)	Off (0)	RW	Bit				US
18	Preset Reference 1	**{01.021}**	0.00 to Pr **02** Hz	0.00 Hz	RW	Num				US
19	Preset Reference 2	**{01.022}**	0.00 to Pr **02** Hz	0.00 Hz	RW	Num				US
20	Preset Reference 3	**{01.023}**	0.00 to Pr **02** Hz	0.00 Hz	RW	Num				US
21	Preset Reference 4	**{01.024}**	0.00 to Pr **02** Hz	0.00 Hz	RW	Num				US
22	Status Mode Parameter 2	**{11.019}**	0.000 to 30.999	4.020	RW	Num			PT	US
23	Status Mode Parameter 1	**{11.018}**	0.000 to 30.999	2.001	RW	Num			PT	US
24	Customer Defined Scaling	**{11.021}**	0.000 to 10.000	1.000	Rw	Num				US
25	User Security Code	**{11.030}**	0 to 9999	0	RW	Num	ND		PT	US
27	Power-up Keypad Control Mode Reference	**{01.051}**	Reset (0), Last (1), Preset (2)	Reset (0)	RW	Txt				US
28	Ramp Mode Select	**{02.004}**	Fast (0), Std (1), Std.bst (2), Fst.bst (3)	Std (1)	RW	Txt				US
30	Parameter Cloning	**{11.042}**	NonE (0), rEAd (1), Prog (2), Auto (3), boot (4)	NonE (0)	RW	Txt		NC		US
31	Stop Mode	**{06.001}**	Coast (0), rp (1), rp.dc I (2), dc I (3), td.dc I (4),dis (5)	rp (1)	RW	Txt				US
32	Dynamic V to F Select	**{05.013}**	0 to 1	0	RW	Num				US
33	Catch A Spinning Motor	**{06.009}**	dis (0), Enable (1), Fr.Only (2), Rv.Only (3)	dis (0)	RW	Txt				US
35	Digital Output 1 Control	**{08.091}**	0 to 21	0	RW					US

Parameter			Range (⇳) OL	Default (⇨) OL	Type					
37	Maximum Switching Frequency	**{05.018}**	0.667 (0), 1 (1), 2 (2), 3 (3), 4 (4), 6 (5), 8 (6), 12 (7), 16 (8) kHz	3 (3) kHz	RW	Txt				US
38	Autotune	**{05.012}**	0 to 2	0	RW	Num		NC		US
39	Motor Rated Frequency	**{05.006}**	0.0 to 550.00 Hz	50 Hz: 50.00 Hz 60 Hz: 60.00 Hz	RW	Num		RA		US
40	Number of Motor Poles	**{05.011}**	Auto (0) to 32 (16)	Auto 0	RW	Num				US
41	Control Mode	**{05.014}**	Ur.S (0), Ur (1), Fd (2), Ur.Auto (3), Ur.I (4), SrE (5), Fd.tAP (6)	Ur.I (4)	RW	Txt				US
42	Low Frequency Voltage Boost	**{05.015}**	0.0 to 25.0 %	3.0 %	RW	Num				US
56	Trip 0	**{10.020}**	0 to 255		RO	Txt	ND	NC	PT	PS
57	Trip 1	**{10.021}**	0 to 255		RO	Txt	ND	NC	PT	PS
58	Trip 2	**{10.022}**	0 to 255		RO	Txt	ND	NC	PT	PS
69	Spin Start Boost	**{05.040}**	0.0 to 10.0	1.0	RW					US
76	Action on Trip Detection	**{10.037}**	0 to 31	0	RW					US
77	Maximum Heavy Duty Current Rating	**{11.032}**	0.00 to Drive HD Current Rating A		RO	Num	ND	NC	PT	
78	Software Version	**{11.029}**	0 to 99.99.99		RO		ND	NC	PT	
79	User Drive Mode	**{11.031}**	OPEn.LP (1)	OPEn.LP (1)	RW	Txt	ND	NC	PT	US
81	Reference Selected	**{01.001}**	-Pr **02** to Pr **02** or Pr **01** to Pr **02** Hz		RO	Num	ND	NC	PT	
82	Pre-ramp Reference	**{01.003}**	-Pr **02** to Pr **02** or Pr **01** to Pr **02** Hz		RO	Num	ND	NC	PT	
83	Final Demand Reference	**{03.001}**	-Pr **02** to Pr **02** or Pr **01** to Pr **02** Hz		RO	Num	ND	NC	PT	FI
84	D.C. Bus Voltage	**{05.005}**	0 to 415 V or 0 to 830 V		RO	Num	ND	NC	PT	FI
85	Output Frequency	**{05.001}**	± 550.00 Hz		RO	Num	ND	NC	PT	FI
86	Output Voltage	**{05.002}**	0 to 325 V or 0 to 650 V		RO	Num	ND	NC	PT	FI
87	Motor Rpm	**{05.004}**	± 33000.0 rpm		RO	Num	ND	NC	PT	FI
88	Current Magnitude	**{04.001}**	0 to Drive Maximum Current A		RO	Num	ND	NC	PT	FI
89	Torque Producing Current	**{04.002}**	± Drive Maximum Current A		RO	Num	ND	NC	PT	FI
90	Digital I/O Read Word	**{08.020}**	0 to 2047		RO	Bin	ND	NC	PT	
91	Reference On	**{01.011}**	Off (0) or On (1)		RO	Bit	ND	NC	PT	
92	Reverse Select	**{01.012}**	Off (0) or On (1)		RO	Bit	ND	NC	PT	
93	Jog Select	**{01.013}**	Off (0) or On (1)		RO	Bit	ND	NC	PT	
94	Analog Input 1	**{07.001}**	± 100.00 %		RO	Num	ND	NC	PT	FI

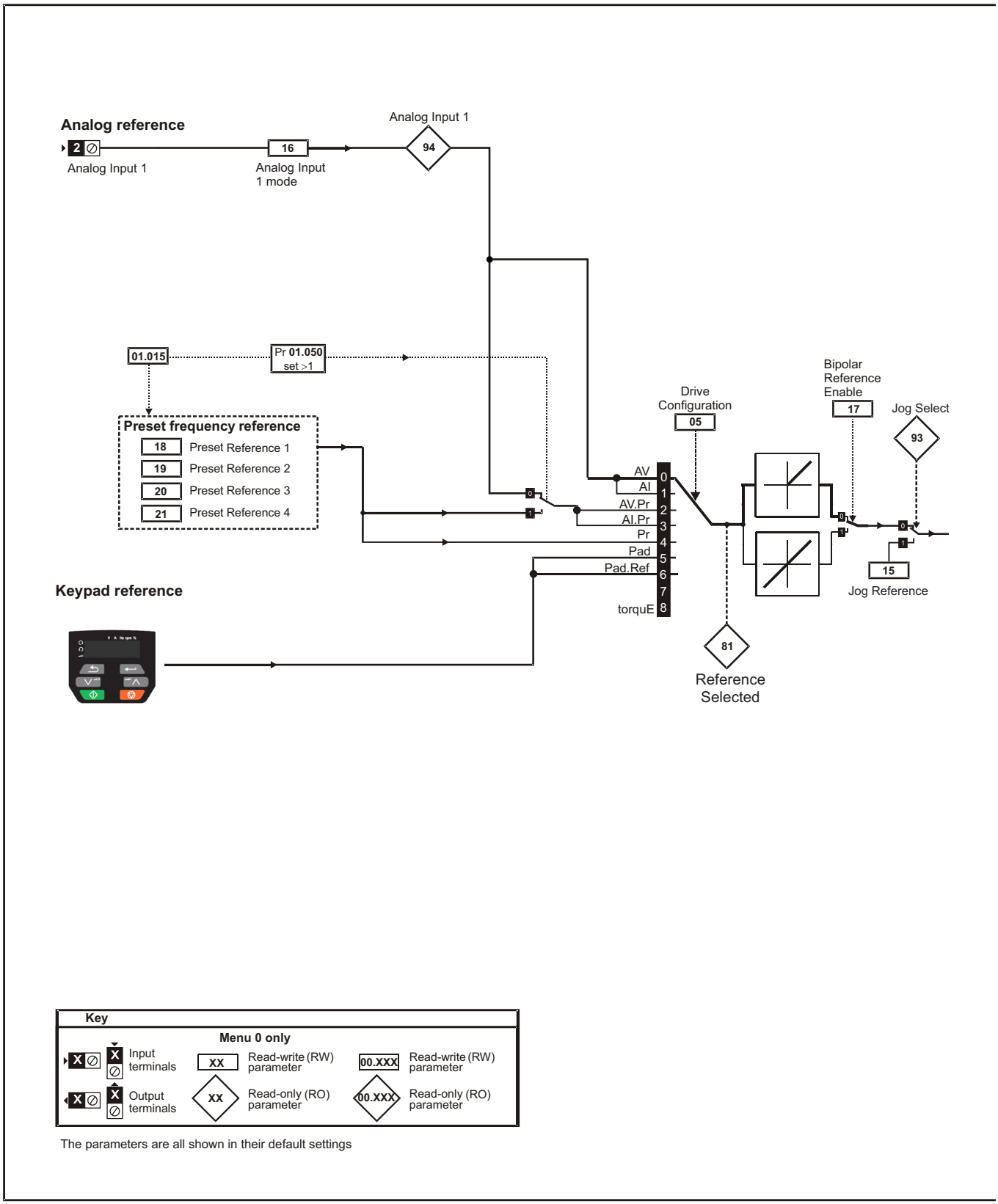
* With Unidrive M101, the default is PAd (5).

** Setting Pr **07** to 0.0 will disable slip compensation.

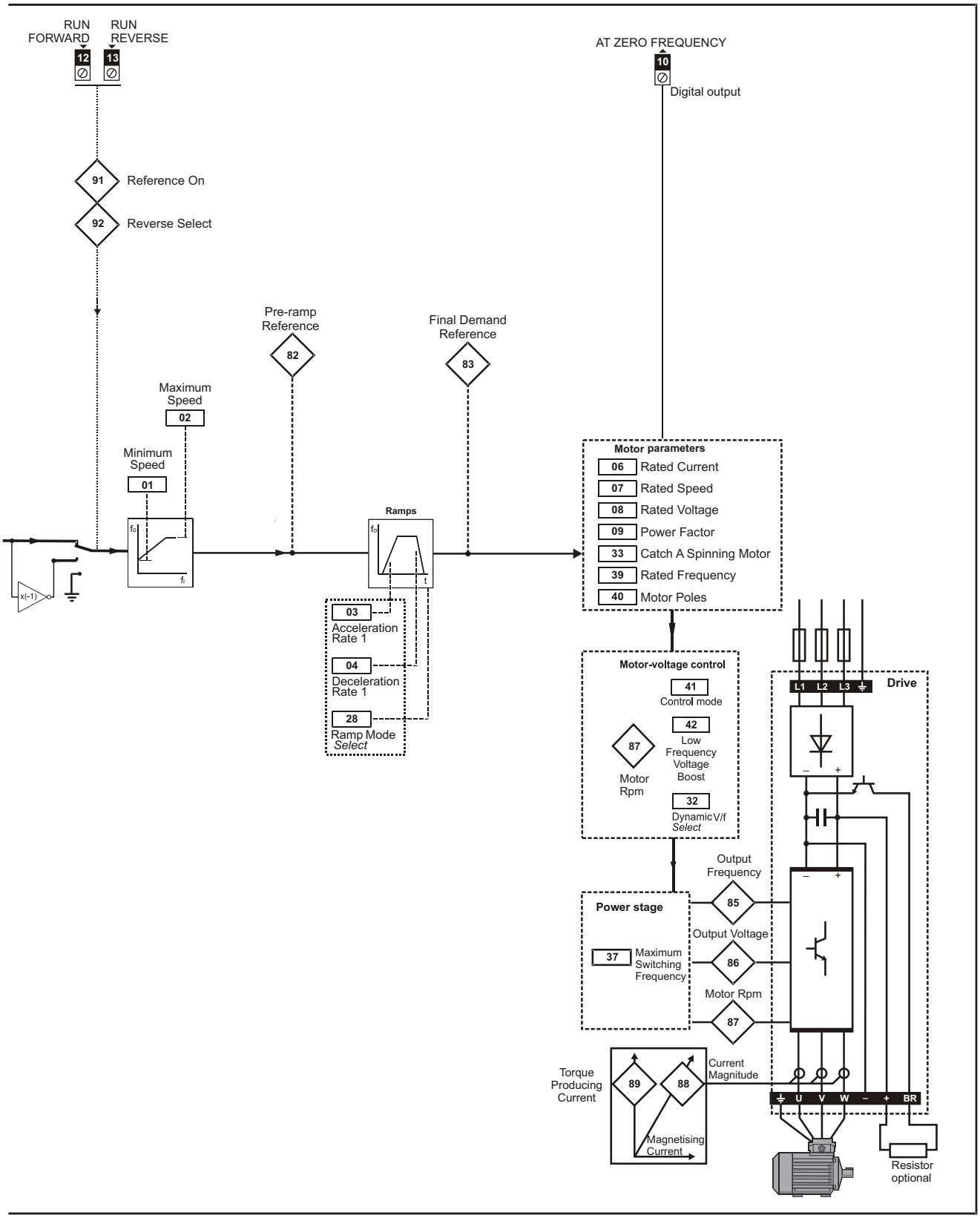
*** Following a rotating autotune Pr **09** {05.010} is continuously written by the drive, calculated from the value of *Stator Inductance* (Pr **05.025**). To manually enter a value into Pr **09** {05.010}, Pr **05.025** will need to be set to 0. Refer to the description of Pr **05.010** in the *Parameter Reference Guide* for further details.

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

Figure 6-1 Menu 0 logic diagram



The parameters are all shown in their default settings


RUN FORWARD
RUN REVERSE
12
13
AT ZERO FREQUENCY
10
Digital output
91
Reference On
92
Reverse Select
Pre-ramp Reference
82
Final Demand Reference
83
Maximum Speed
02
Minimum Speed
01
Ramps
Motor parameters
06 Rated Current
07 Rated Speed
08 Rated Voltage
09 Power Factor
33 Catch A Spinning Motor
39 Rated Frequency
40 Motor Poles
03 Acceleration Rate 1
04 Deceleration Rate 1
28 Ramp Mode Select
Motor-voltage control
41 Control mode
42 Low Frequency Voltage Boost
32 Dynamic V/f Select
87 Motor Rpm
Drive
L1 L2 L3
Output Frequency
85
Power stage
37 Maximum Switching Frequency
Output Voltage
86
Motor Rpm
87
Torque Producing Current
89
88
Current Magnitude
Magnetising Current
U V W BR
Resistor optional

6.3 Parameter descriptions

6.3.1 Pr 00

Pr **00** is available in all menus, commonly used functions are provided as text strings in Pr **00** 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 **00**. For example, enter 4001 in Pr **00** to store drive parameters on an NV media card.

Table 6-1 Commonly used functions in Pr 00

Value	Equivalent value	String	Action
0	0	**None**	No action
1001	1	**SAVE**	Save drive parameters to non-volatile memory
6001	2	**LOAd.1**	Load the data from file 1 on a non-volatile media card into the drive provided it is a parameter file
4001	3	**SAVE.1**	Store the drive parameters in file 1 on a non-volatile media card
6002	4	**LOAd.2**	Load the data from file 2 on a non-volatile media card into the drive provided it is a parameter file
4002	5	**SAVE.2**	Store the drive parameters in file 2 on a non-volatile media card
6003	6	**LOAd.3**	Load the data from file 3 on a non-volatile media card into the drive provided it is a parameter file
4003	7	**SAVE.3**	Store the drive parameters in file 3 on a non-volatile media card
12000	8	**diff.d**	Only display parameters that are different from their default value
12001	9	**dest**	Only display parameters that are used to set-up destinations
1233	10	**def.50**	Load 50 Hz defaults
1244	11	**def.60**	Load 60 Hz defaults

Table 6-2 Functions in Pr 00

Value	Action
1000	Save parameters when *Under Voltage Active* (Pr **10.016**) is not active.
1001	Save parameters under all conditions
1233	Load standard (50 Hz) defaults
1244	Load US (60 Hz) defaults
1299	Reset {St.HF} trip.
2001*	Create a boot file on a non-volatile media card based on the present drive parameters
4yyy*	NV media card: Transfer the drive parameters to parameter file yyy
6yyy*	NV media card: Load the drive parameters from parameter file yyy
7yyy*	NV media card: Erase file yyy
8yyy*	NV Media card: Compare the data in the drive with file yyy
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
12000**	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.

* See Chapter 9 *NV Media Card* on page 38 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. Equivalent values and strings are also provided in the table above.

6.4 Control terminal configurations and wiring

05		Drive Configuration							
RW		Txt						PT	US
OL	⇳	AV (0), AI (1), AV.Pr (2), AI.Pr (3), PrESEt (4), PAd (5), PAd.rEF (6), torquE (8)			⇨	AV (0)*			

* With *Unidrive M101*, the default is PAd (5). The setting of Pr **05** automatically sets the drive configuration.

Table 6-3 Parameter changes when drive configuration is changed

Parameter number	Description	Drive configuration							
		AV	**AI**	**AV.Pr**	**AI.Pr**	**PrESEt**	**PAd**	**PAd.rEF**	**torquE**
01.014	Reference select	0	0	1	1	3	4	6	4
06.004	Start/stop logic	0	0	0	0	0	0	0	0
07.007	Analog input 1 mode	6	4	6	4	6	6	6	6
07.010	Analog input 1 destination	01.036	01.036	01.036	01.036	01.036	01.036	01.036	04.008
07.051	Analog input 1 control	0	0	0	0	0	0	0	0
08.021	Digital IO 1 source/ destination	10.003	10.003	01.046	01.046	01.046	10.003	10.003	10.003
08.022	Digital input 2 destination	06.038	06.038	06.038	06.038	06.038	06.038	06.038	06.038
08.024	Digital input 4 destination	06.032	06.032	01.045	01.045	01.045	06.032	06.032	04.011
08.031	Digital I/O 1 mode	1	1	0	0	0	1	1	1
08.081	Digital input 1 control	0	0	0	0	0	0	0	0
08.082	Digital input 2 control	0	0	0	0	0	0	0	0
08.084	Digital input 4 control	0	0	0	0	0	0	0	0
08.091	Digital output 1 control	0	0	0	0	0	0	0	0

Value	Text	Description
0	AV	Analog input 1 (voltage)
1	AI	Analog input 1 (current)
2	AV.Pr	Analog input 1 (voltage) or 3 presets selected by terminal
3	AI.Pr	Analog input 1 (current) or 3 presets selected by terminal
4	PrESEt	Four presets selected by terminal
5	PAd	Keypad reference
6	PAd.rEF	Keypad reference with terminal control
8	torquE	Torque mode, Analog input 1 (voltage torque reference) selected by terminal

Action will only occur if the drive is inactive and no User Actions are running. Otherwise, the parameter will return to its pre altered value on exit from edit mode. All parameters are saved if this parameter changes.

Figure 6-2 Pr 05 = AV

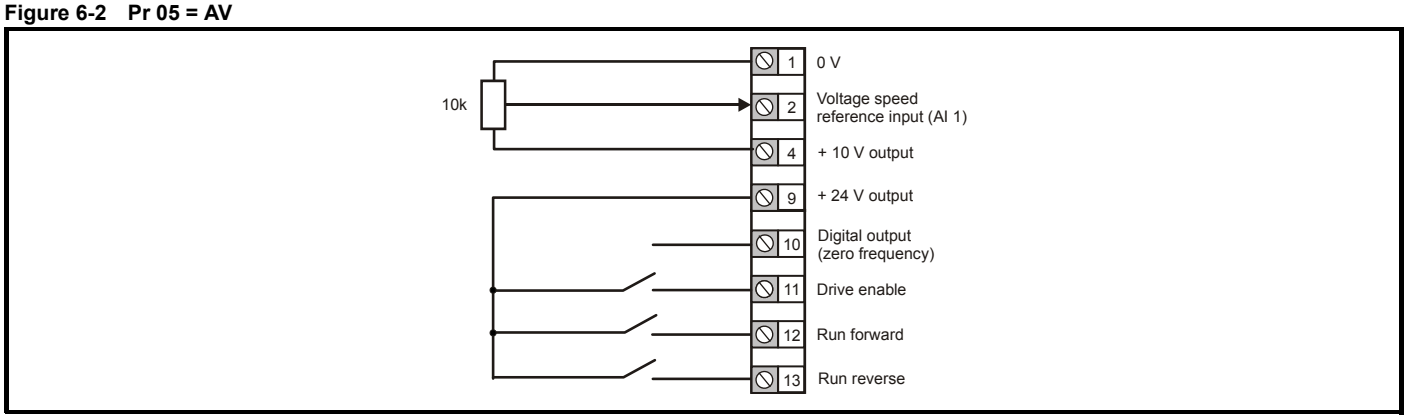


Figure 6-3 Pr 05 = AI

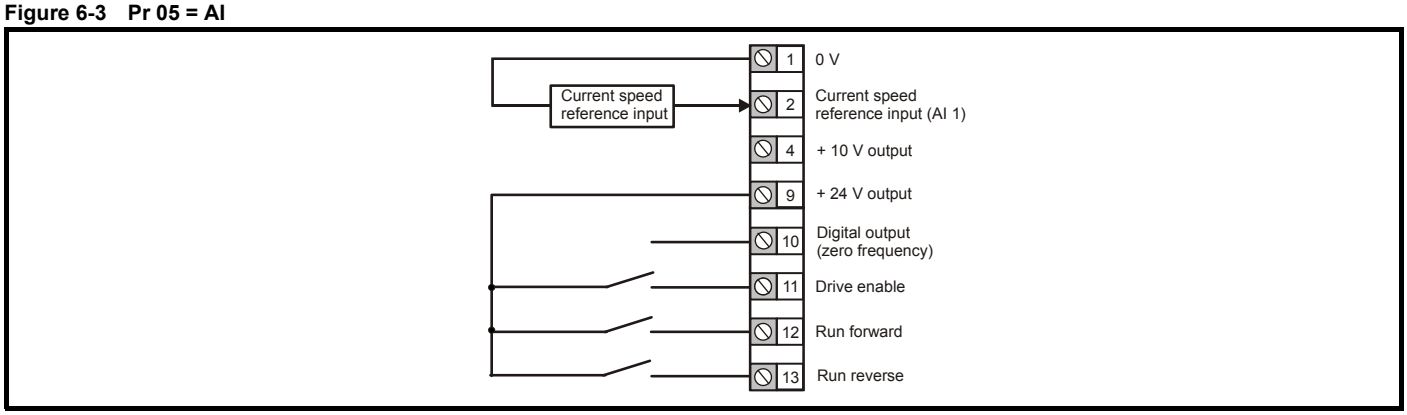
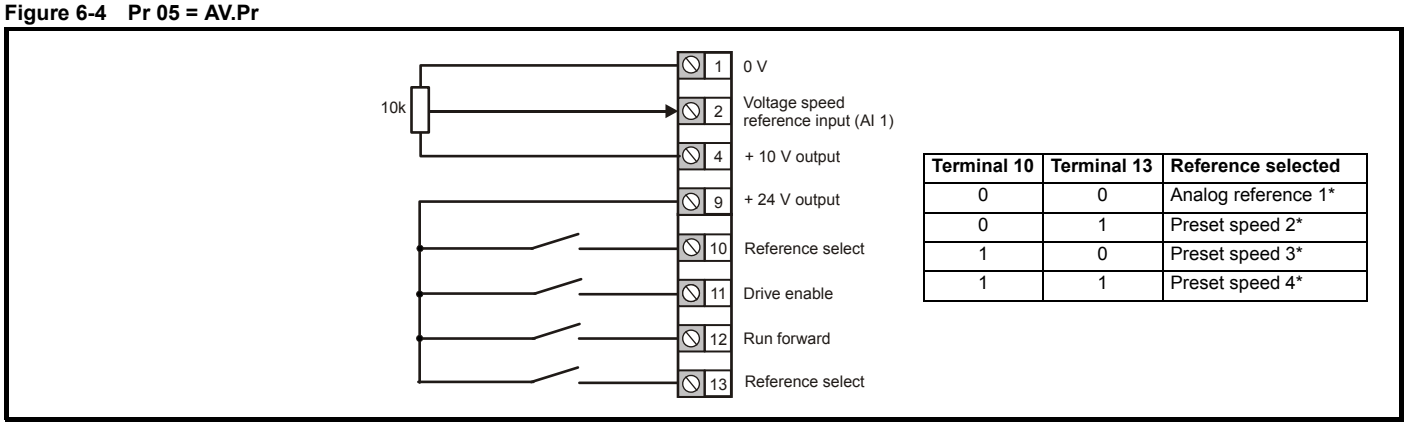
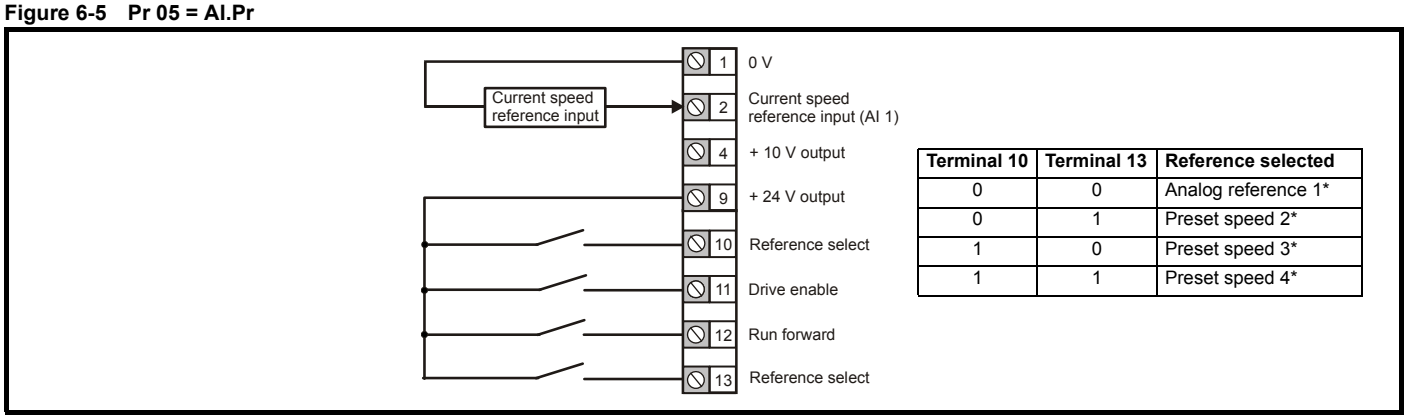


Figure 6-4 Pr 05 = AV.Pr



Terminal 10	Terminal 13	Reference selected
0	0	Analog reference 1*
0	1	Preset speed 2*
1	0	Preset speed 3*
1	1	Preset speed 4*

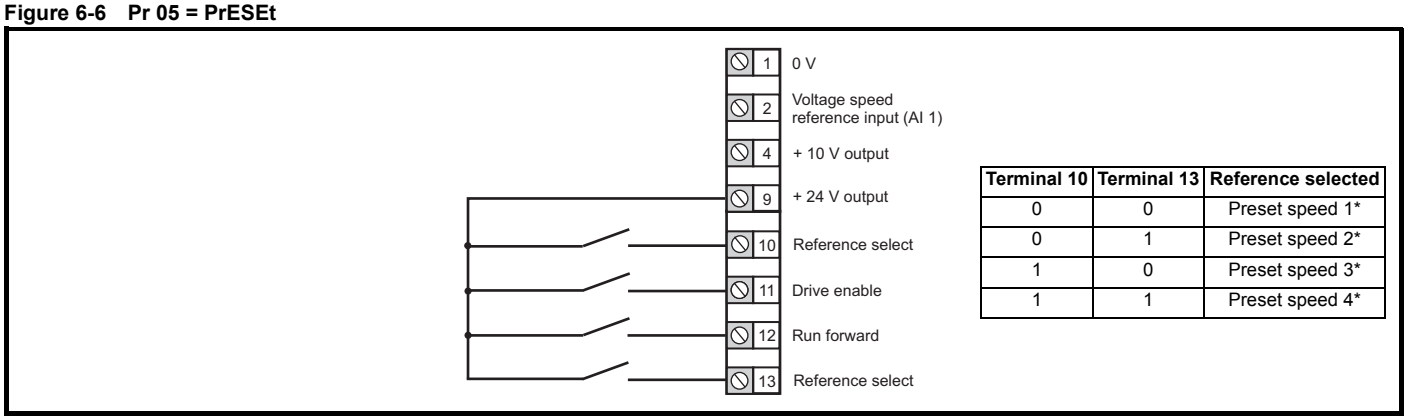
Figure 6-5 Pr 05 = AI.Pr



Terminal 10	Terminal 13	Reference selected
0	0	Analog reference 1*
0	1	Preset speed 2*
1	0	Preset speed 3*
1	1	Preset speed 4*

* Refer to section 10.2 *Menu 1: Frequency reference* on page 52.

Figure 6-6 Pr 05 = PrESEt



Terminal 10	Terminal 13	Reference selected
0	0	Preset speed 1*
0	1	Preset speed 2*
1	0	Preset speed 3*
1	1	Preset speed 4*

* Refer to section 10.2 *Menu 1: Frequency reference* on page 52.

Figure 6-7 Pr 05 = PAd

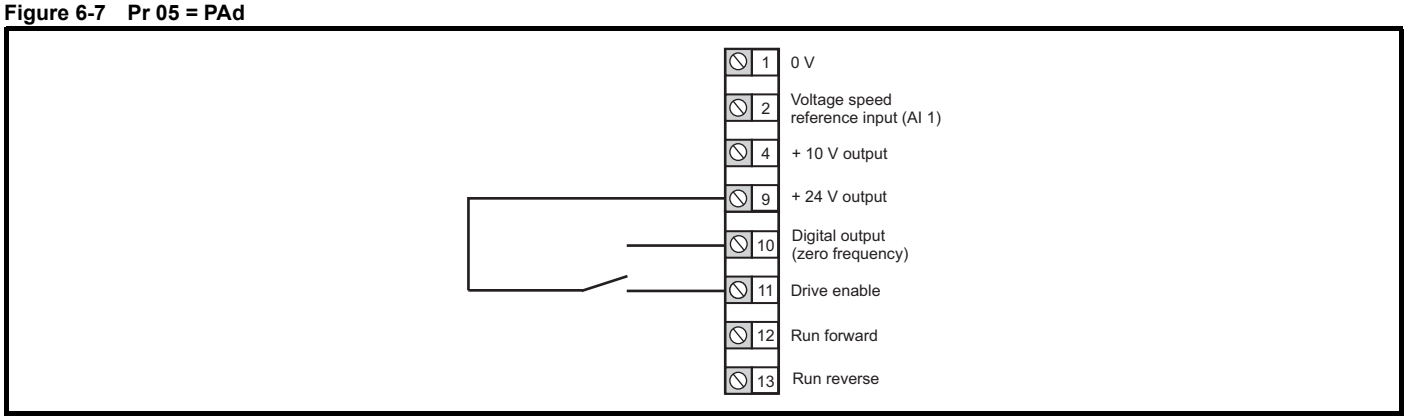


Figure 6-8 Pr 05 = PAd.rEF

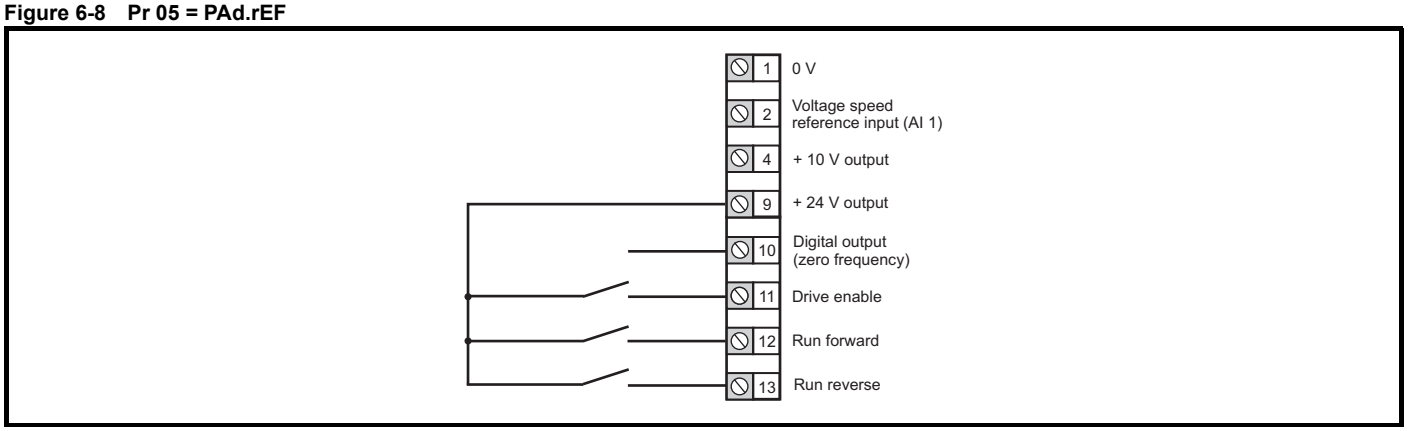
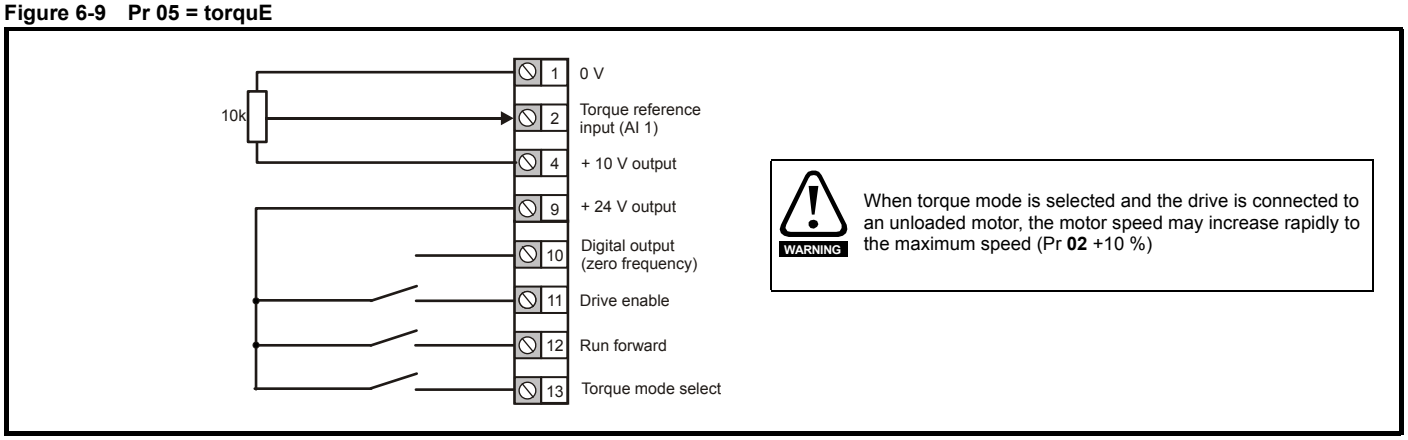


Figure 6-9 Pr 05 = torquE



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.

For information on tuning the drive for the best performance, see *Chapter 8 Optimization on page 33*.

WARNING

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

CAUTION

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 **06** *Motor Rated Current*. This affects the thermal protection of the motor.

CAUTION

If the drive is started using the keypad it will run to the speed defined by the keypad reference (Pr **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.

WARNING

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

7.1 Quick start connections

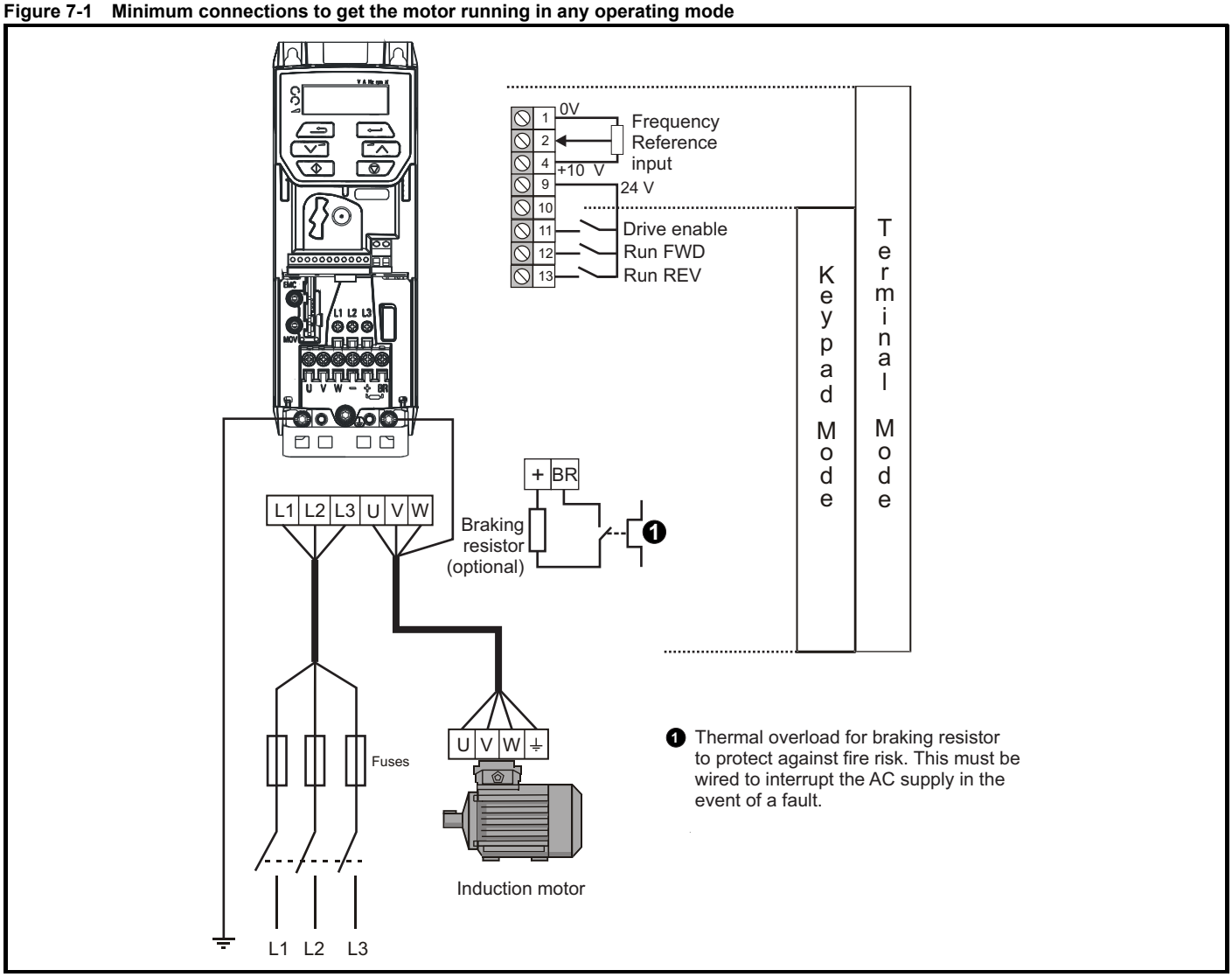
7.1.1 Basic requirements

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 7.2 *Quick start commissioning / start-up* on page 32.

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

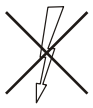
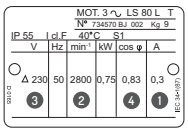
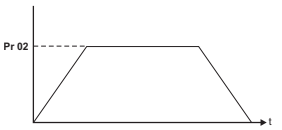
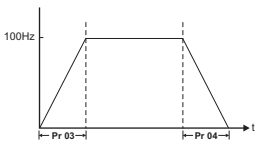
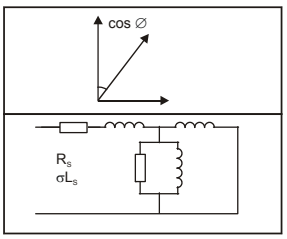
Drive control method	Requirements
Terminal mode	Drive enable Speed / Torque reference Run forward / Run reverse
Keypad mode	Drive enable

Figure 7-1 Minimum connections to get the motor running in any operating mode



7.2 Quick start commissioning / start-up

7.2.1 Open loop

Action	Detail	
Before power-up	Ensure: • The drive enable signal is not given, terminal 11 is open. • Run signal is not given, terminal 12/13 is open. • Motor is connected to the drive. • The motor connection is correct for the drive ⅄ or Δ • The correct supply voltage is connected to the drive.	
Power-up the drive	Ensure: • Drive displays 'inh' (enable terminal is open). If the drive trips, see Chapter 11 *Diagnostics* on page 80.	
Enter motor nameplate details	❶ Motor rated current in Pr **06** (Amps) ❷ Motor rated speed in Pr **07** (rpm / min^{-1}) ❸ Motor rated voltage in Pr **08** (Volts) ❹ Motor rated power factor (cos ϕ) in Pr **09**	
Set maximum speed	Enter: • Maximum speed in Pr **02** (Hz)	
Set acceleration / deceleration rates	Enter: • Acceleration rate in Pr **03** (s/100 Hz) • Deceleration rate in Pr **04** (s/100 Hz) (If braking resistor is installed, set Pr **28** = FAST. Also ensure Pr **10.030** and Pr **10.031** and Pr **10.061** are set correctly, otherwise premature 'It.br' trips may be seen).	
Autotune	The drive is able to perform either a stationary or a rotating autotune. The motor must be at a standstill before an autotune is enabled. A rotating autotune should be used whenever possible so the measured value of power factor of the motor is used by the drive. **WARNING** A rotating autotune will cause the motor to accelerate up to $^2/_3$ base speed in the direction selected regardless of the reference provided. Once complete the motor will coast to a stop. The enable signal must be removed before the drive can be made to run at the required reference. The drive can be stopped at any time by removing the run signal or removing the drive enable. • A stationary autotune can be used when the motor is loaded and it is not possible to uncouple the load from the motor shaft. A stationary autotune measures the stator resistance of the motor and the dead time compensation for the drive. These are required for good performance in vector control modes. A stationary autotune does not measure the power factor of the motor so the value on the motor nameplate must be entered into Pr **09**. • A rotating autotune should only be used if the motor is uncoupled. A rotating autotune first performs a stationary autotune before rotating the motor at $^2/_3$ base speed in the direction selected. The rotating autotune measures the power factor of the motor. To perform an autotune: • Set Pr **38** = 1 for a stationary autotune or set Pr **38** = 2 for a rotating autotune • Close the Drive Enable signal (apply +24 V to terminal 11). The drive will display 'rdy'. • Give a run command (apply +24 V to terminal 12 - Run forward or terminal 13 - Run reverse on Unidrive M100; press keypad start button on M101). The display will flash 'tuning' while the drive is performing the autotune. • Wait for the drive to display 'inh' and for the motor to come to a standstill. If the drive trips, see Chapter 11 *Diagnostics* on page 80. • Remove the drive enable and run signal from the drive.	
Save parameters	Select 'Save' in Pr **00** or Pr **mm.000** (alternatively enter a value of 1001) and press the red reset button.	
Run	Drive is now ready to run	

8 Optimization

This chapter takes the user through methods of optimizing the drive set-up and maximize the performance. The auto-tuning features of the drive simplify the optimization tasks.

8.1 Motor map parameters

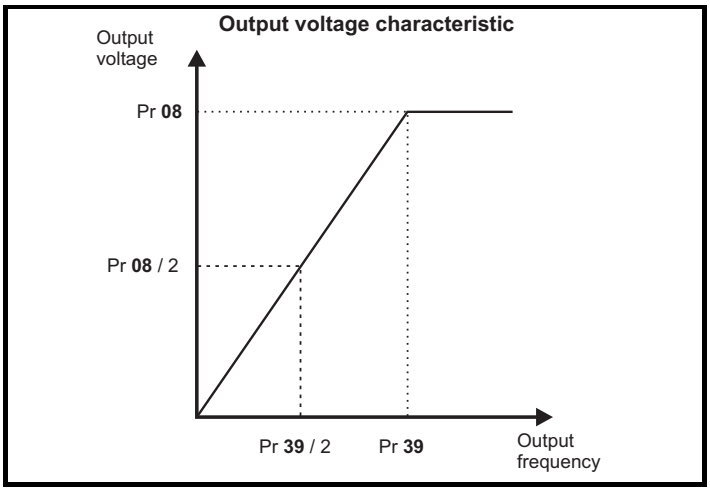
8.1.1 Open loop motor control

Pr 06 {05.007} *Motor Rated Current*	**Defines the maximum continuous motor current**

- The rated current parameter must be set to the maximum continuous current of the motor. The motor rated current is used in the following:
- Current limits (see section section 8.3 *Current limits* on page 36, for more information)
- Motor thermal overload protection (see section section 8.4 *Motor thermal protection* on page 36, for more information)
- Vector mode voltage control (see *Control Mode* later in this table)
- Slip compensation (see *Enable Slip Compensation* (05.027), later in this table)
- Dynamic V/F control

Pr 08 {05.009} *Motor Rated Voltage*	**Defines the voltage applied to the motor at rated frequency**
Pr 39 {05.006} *Motor Rated Frequency*	**Defines the frequency at which rated voltage is applied**

The *Motor Rated Voltage* (Pr **08**) and the *Motor Rated Frequency* (Pr **39**) are used to define the voltage to frequency characteristic applied to the motor (see *Control Mode*, later in this table). The *Motor Rated Frequency* is also used in conjunction with the motor rated speed to calculate the rated slip for slip compensation (see *Motor Rated Speed*, later in this table).



Pr 07 {05.008} *Motor Rated Speed*	**Defines the full load rated speed of the motor**
Pr 40 {05.011} *Number of Motor Poles*	**Defines the number of motor poles**

The motor rated speed and the number of poles are used with the motor rated frequency to calculate the rated slip of induction machines in Hz.

Rated slip (Hz) = Motor rated frequency - (Number of pole pairs x [Motor rated speed / 60]) = $\mathbf{Pr39} = \left(\frac{\mathbf{Pr40}}{\mathbf{2}} \times \frac{\mathbf{Pr07}}{\mathbf{60}}\right)$

If Pr **07** is set to 0 or to synchronous speed, slip compensation is disabled. If slip compensation is required this parameter should be set to the nameplate value, which should give the correct rpm for a hot machine. Sometimes it will be necessary to adjust this when the drive is commissioned because the nameplate value may be inaccurate. Slip compensation will operate correctly both below base speed and within the field-weakening region. Slip compensation is normally used to correct for the motor speed to prevent speed variation with load. The rated load rpm can be set higher than synchronous speed to deliberately introduce speed droop. This can be useful to aid load sharing with mechanically coupled motors.

Pr **40** is also used in the calculation of the motor speed display by the drive for a given output frequency. When Pr **40** is set to 'Auto', the number of motor poles is automatically calculated from the rated frequency Pr **39**, and the motor rated speed Pr **07**.

Number of poles = 120 x (*Rated Frequency* (Pr **39**) / *Rated Speed* (Pr **07**)) rounded to the nearest even number.

Pr 43 {05.010} *Motor Rated Power Factor*	**Defines the angle between the motor voltage and current**

The power factor is the true power factor of the motor, i.e. the angle between the motor voltage and current. The power factor is used in conjunction with the *Motor Rated Current* (Pr **06**), to calculate the rated active current and magnetising current of the motor. The rated active current is used extensively to control the drive, and the magnetising current is used in vector mode stator resistance compensation. It is important that this parameter is set up correctly. The drive can measure the motor rated power factor by performing a rotating autotune (see Autotune (Pr **38**), overleaf).

Pr 38 {05.012} *Autotune*

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

- A stationary autotune can be used when the motor is loaded and it is not possible to remove the load from the motor shaft. The stationary test measures the *Stator Resistance* (05.017), *Transient Inductance* (05.024), *Maximum Deadtime Compensation* (05.059) and *Current At Maximum Deadtime Compensation* (05.060) which are required for good performance in vector control modes (see *Control Mode* later in this table). The stationary autotune does not measure the power factor of the motor so the value on the motor nameplate must be entered into Pr **09**. To perform a Stationary autotune, set Pr **38** to 1, and provide the drive with both an enable signal (on terminal 11) and a run signal (on terminals 12 or 13).

- A rotating autotune should only be used if the motor is unloaded. A rotating autotune first performs a stationary autotune, as above, then a rotating test is performed in which the motor is accelerated with currently selected ramps up to a frequency of *Motor Rated Frequency* (Pr **39**) x 2/3, and the frequency is maintained at that level for 4 seconds. *Stator Inductance* (05.025) is measured and this value is used in conjunction with other motor parameters to calculate *Motor Rated Power Factor* (Pr **09**). To perform a Rotating autotune, set Pr **38** to 2, and provide the drive with both an enable signal (on terminal 11) and a run signal (on terminals 12 or 13).

Following the completion of an autotune test the drive will go into the inhibit state. The drive must be placed into a controlled disable condition before the drive can be made to run at the required reference. The drive can be put in to a controlled disable condition by removing the signal from terminal 11, setting the *Drive Enable* (06.015) to OFF (0).

Pr 41 {05.014} *Control Mode*

There are several voltage modes available which fall into two categories, vector control and fixed boost.

Vector control

Vector control mode provides the motor with a linear voltage characteristic from 0 Hz to *Motor Rated Frequency*, and then a constant voltage above motor rated frequency. When the drive operates between motor rated frequency/50 and motor rated frequency/4, full vector based stator resistance compensation is applied. When the drive operates between motor rated frequency/4 and motor rated frequency/2 the stator resistance compensation is gradually reduced to zero as the frequency increases. For the vector modes to operate correctly the *Motor Rated Power Factor (*Pr **09***)*, *Stator Resistance* (05.017), *Maximum Deadtime Compensation* (05.059) and current at *Maximum Deadtime Compensation* (05.060) are all required to be set up accurately. The drive can be made to measure these by performing an autotune (see Pr **38** *Autotune*). The drive can also be made to measure the stator resistance automatically every time the drive is enabled or the first time the drive is enabled after it is powered up, by selecting one of the vector control voltage modes.

(0) **Ur S** = The stator resistance is measured and the parameters for the selected motor map are over-written each time the drive is made to run. This test can only be done with a stationary motor where the flux has decayed to zero. Therefore this mode should only be used if the motor is guaranteed to be stationary each time the drive is made to run. To prevent the test from being done before the flux has decayed there is a period of 1 second after the drive has been in the ready state during which the test is not done if the drive is made to run again. In this case, previously measured values are used. Ur S mode ensures that the drive compensates for any change in motor parameters due to changes in temperature. The new value of stator resistance is not automatically saved to the drive's EEPROM.

(4) **Ur I** = The stator resistance is measured when the drive is first made to run after each power-up. This test can only be done with a stationary motor. Therefore this mode should only be used if the motor is guaranteed to be stationary the first time the drive is made to run after each power-up. The new value of stator resistance is not automatically saved to the drive's EEPROM.

(1) **Ur** = The stator resistance and voltage offset are not measured. The user can enter the motor and cabling resistance into the *Stator Resistance* (05.017). However this will not include resistance effects within the drive inverter. Therefore if this mode is to be used, it is best to use an autotune test initially to measure the stator resistance.

(3) **Ur_Auto=** The stator resistance is measured once, the first time the drive is made to run. After the test has been completed successfully the *Control Mode* (Pr **41**) is changed to Ur mode. The *Stator Resistance* (05.017) parameter is written to, and along with the *Control Mode* (Pr **41**), are saved in the drive's EEPROM. If the test fails, the voltage mode will stay set to Ur Auto and the test will be repeated next time the drive is made to run.

Fixed boost

The stator resistance is not used in the control of the motor, instead a fixed characteristic with low frequency voltage boost as defined by Pr **42**, is used. Fixed boost mode should be used when the drive is controlling multiple motors. There are three settings of fixed boost available:

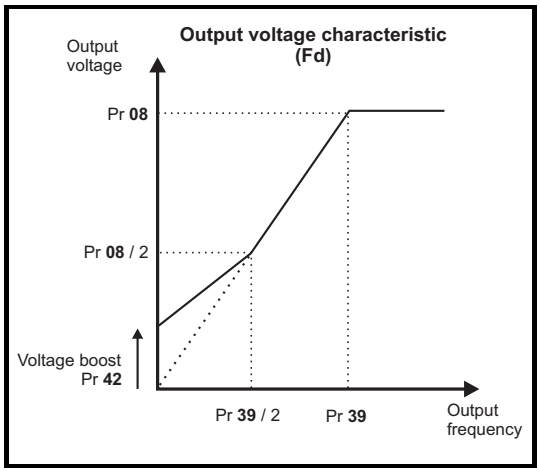
(2) **Fixed** = This mode provides the motor with a linear voltage characteristic from 0 Hz to *Motor Rated Frequency* (Pr **39**), and then a constant voltage above rated frequency.

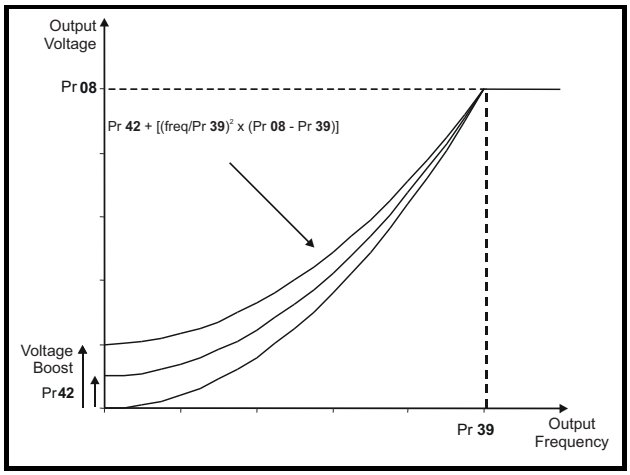
(5) **Square** = This mode provides the motor with a square law voltage characteristic from 0 Hz to *Motor Rated Frequency* (Pr **39**), and then a constant voltage above rated frequency. This mode is suitable for variable torque applications like fans and pumps where the load is proportional to the square of the speed of the motor shaft. This mode should not be used if a high starting torque is required.

(6) **Fixed Tapered** = This mode provides the motor with a linear voltage characteristic with a tapered slip limit.

Pr 41 {05.014} *Control Mode (cont)*

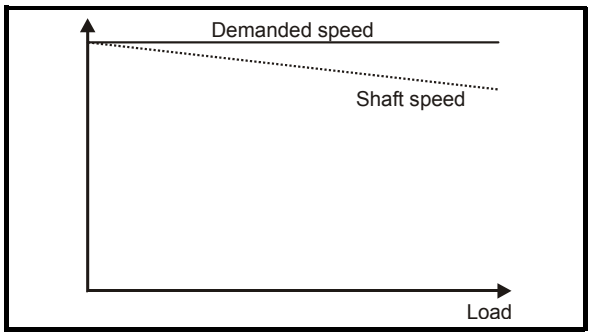
For mode 2 and 5, at low frequencies (from 0 Hz to ½ x Pr **39**) a voltage boost is applied as defined by Pr **42** as shown below:





Pr 05.027 *Enable Slip Compensation*

When a motor, being controlled in open loop mode, has load applied a characteristic of the motor is that the output speed droops in proportion to the load applied as shown:



In order to prevent the speed droop shown above slip compensation should be enabled. To enable slip compensation Pr **05.027** must be set to a 100 % (this is the default setting), and the motor rated speed must be entered in Pr **07** (Pr **05.008**).

The motor rated speed parameter should be set to the synchronous speed of the motor minus the slip speed. This is normally displayed on the motor nameplate, i.e. for a typical 18.5 kW, 50 Hz, 4 pole motor, the motor rated speed would be approximately 1465 rpm. The synchronous speed for a 50 Hz, 4 pole motor is 1500 rpm, so therefore the slip speed would be 35 rpm. If the synchronous speed is entered in Pr **07**, slip compensation will be disabled. If too small a value is entered in Pr **07**, the motor will run faster than the demanded frequency. The synchronous speeds for 50 Hz motors with different numbers of poles are as follows:

2 pole = 3000 rpm, 4 pole = 1500 rpm, 6pole =1000 rpm, 8 pole = 750 rpm

8.2 Maximum motor rated current

The maximum motor rated current is the *Maximum Heavy Duty Current Rating* (Pr **77**).

The values for the Heavy Duty rating can be found in the *Power Installation Guide*.

8.3 Current limits

The default setting for the current limit parameters for size 1 to 4 is:

- 165 % x motor rated torque producing current for open loop mode

There are three parameters which control the current limits:

- Motoring current limit: power flowing from the drive to the motor
- Regen current limit: power flowing from the motor to the drive
- Symmetrical current limit: current limit for both motoring and regen operation

The lowest of either the motoring and regen current limit, or the symmetrical current limit applies.

The maximum setting of these parameters depends on the values of motor rated current, drive rated current and the power factor.

The drive can be oversized to permit a higher current limit setting to provide higher accelerating torque as required up to a maximum of 1000 %.

8.4 Motor thermal protection

A time constant thermal model is provided to estimate the motor temperature as a percentage of its maximum allowed temperature.

The motor thermal protection is modelled using losses in the motor. The losses in the motor are calculated as a percentage value, so that under these conditions the *Motor Protection Accumulator* (04.019) would eventually reach 100 %.

Percentage losses = 100 % x [Load related losses]

Where:

Load related losses = $[I / (K_1 \times I_{Rated})]^2$

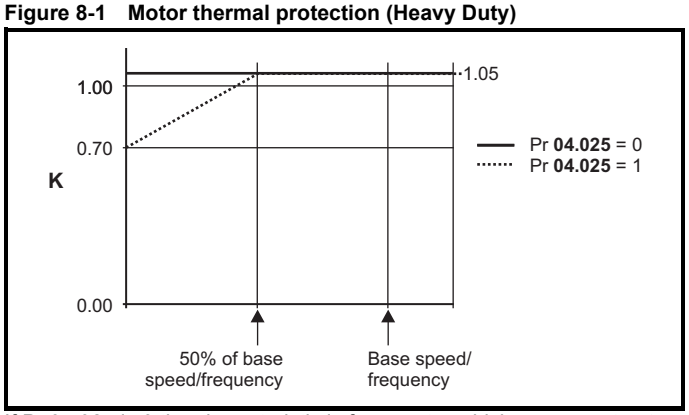
Where:

I = *Current Magnitude* (Pr **88**)

I_{Rated} = *Motor Rated Current* (Pr **06**)

If *Motor Rated Current* (Pr **06**) ≤ *Maximum Heavy Duty Current* (Pr **77**)

Figure 8-1 Motor thermal protection (Heavy Duty)



If Pr **04.025** is 0 the characteristic is for a motor which can operate at rated current over the whole speed range. Induction motors with this type of characteristic normally have forced cooling. If Pr **04.025** is 1 the characteristic is intended for motors where the cooling effect of motor fan reduces with reduced motor speed below 50 % of base speed/ frequency. The maximum value for K1 is 1.05, so that above the knee of the characteristics the motor can operate continuously up to 105 % current.

When the estimated temperature in Pr **04.019** reaches 100 % the drive takes some action depending on the setting of Pr **04.016**. If Pr **04.016** is 0, the drive trips when Pr **04.019** reaches 100 %. If Pr **04.016** is 1, the current limit is reduced to (K - 0.05) x 100 % when Pr **04.019** reaches 100 %.

The current limit is set back to the user defined level when Pr **04.019** falls below 95 %. The thermal model temperature accumulator accumulates the temperature of the motor while the drive remains powered-up. By default, the accumulator is set to the power down value at power up. If the rated current defined by Pr **06** is altered, the accumulator is reset to zero.

The default setting of the thermal time constant (Pr **04.015**) is 179 s which is equivalent to an overload of 150 % for 120 s from cold.

8.5 Switching frequency

The default switching frequency is 3 kHz, however this can be increased up to a maximum of 16 kHz by Pr **37**.

If switching frequency is increased from 3 kHz the following apply:

1. Increased heat loss in the drive, which means that derating to the output current must be applied.
   See the derating tables for switching frequency and ambient temperature in the *Power Installation Guide*.
2. Reduced heating of the motor - due to improved output waveform quality.
3. Reduced acoustic noise generated by the motor.
4. Increased sample rate on the speed and current controllers. A trade off must be made between motor heating, drive heating and the demands of the application with respect to the sample time required.

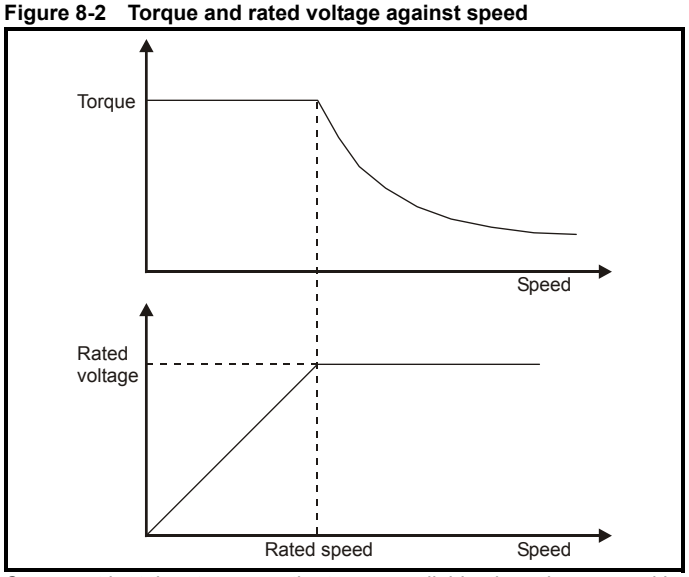
Table 8-1 Sample rates for various control tasks at each switching frequency

	0.667, 1 kHz	3, 6, 12 kHz	2, 4, 8, 16 kHz	Open loop
Level 1	250 µs	167 µs	2 kHz = 250 µs 4 kHz = 125 µs 8 kHz = 125 µs 16 kHz = 125 µs	Peak limit
Level 2	250 µs			Current limit and ramps
Level 3	1 ms			Voltage controller
Level 4	4 ms			Time critical user interface
Background				Non-time critical user interface

8.5.1 Field weakening (constant power) operation

The drive can be used to run an induction machine above synchronous speed into the constant power region. The speed continues to increase and the available shaft torque reduces. The characteristics below show the torque and output voltage characteristics as the speed is increased above the rated value.

Figure 8-2 Torque and rated voltage against speed



Care must be taken to ensure the torque available above base speed is sufficient for the application to run satisfactorily.

8.5.2 Maximum frequency

In all operating modes the maximum output frequency is limited to 550 Hz.

8.5.3 Over-modulation

The maximum output voltage level of the drive is normally limited to an equivalent of the drive input voltage minus voltage drops within the drive (the drive will also retain a few percent of the voltage in order to maintain current control). If the motor rated voltage is set at the same level as the supply voltage, some pulse deletion will occur as the drive output voltage approaches the rated voltage level. If Pr **05.020** (Over-modulation enable) is set to 1 the modulator will allow over modulation, so that as the output frequency increases beyond the rated frequency the voltage continues to increase above the rated voltage.

This can be used for example:

- To obtain high output frequencies with a low switching frequency which would not be possible with space vector modulation limited to unity modulation depth,

or

- In order to maintain a higher output voltage with a low supply voltage.

The disadvantage is that the machine current will be distorted as the modulation depth increases above unity, and will contain a significant amount of low order odd harmonics of the fundamental output frequency. The additional low order harmonics cause increased losses and heating in the motor.

8.5.4 Switching frequency/Output frequency ratio

With a default switching frequency of 3 kHz, the maximum output frequency should be limited to 250 Hz. Ideally, a minimum ratio of 12:1 should be maintained between the switching frequency and the output frequency. This ensures the number of switchings per cycle is sufficient to ensure the output waveform quality is maintained at a minimum level.

9 NV Media Card

9.1 Introduction

The Non-Volatile Media Card feature enables simple configuration of parameters, parameter back-up and drive cloning using an SD card.

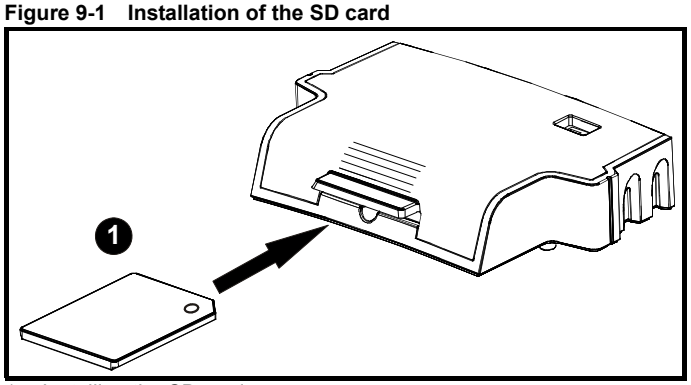
The SD card can be used for:

- Parameter copying between drives
- Saving drive parameter sets

The NV Media Card (SD card) is located in the AI-Backup Adaptor.

The card is not hot swappable, but the AI-Backup Adaptor is “hot swapped” only when the five unit LEDs on the display are not flashing. The unit LEDs flash during the data transfer.

Figure 9-1 Installation of the SD card



1. Installing the SD card

NOTE

A flat bladed screwdriver or similar tool is required in order to insert/ remove the SD card fully into/ remove from the AI-Backup Adaptor.

To insert/remove the SD card into/from the AI-Backup Adaptor, the AI-Backup Adaptor will need to be removed from the drive.

NOTE

The drive supports SD cards formatted with the FAT32 file system only.

9.2 SD card support

An SD memory card can be inserted in the AI-Backup Adaptor in order to transfer data to the drive, however the following limitations should be noted:

If a parameter from the source drive does not exist in the target drive then no data is transferred for that parameter.

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.

If the target drive has a different rating to the source drive then the normal rules for this type of transfer apply as described later.

No checking is possible to determine if the source and target product types are the same, and so no warning is given if they are different.

If an SD card is used then the drive will recognise the following file types through the drive parameter interface.

File Type	Description
Parameter file	A file that contains all clonable user save parameters from the drive menus (1 to 22) in difference from default format
Macro file	The same as a parameter file, but defaults are not loaded before the data is transferred from the card

These files can be created on a card by the drive and then transferred to any other drive including derivatives. If the Drive Derivative (11.028) is different between the source and target drives then the data is transferred but a {C.Pr} trip is initiated.

It is possible for other data to be stored on the card, but this should not be stored in the <MCDF> folder and it will not be visible via the drive parameter interface.

9.2.1 Changing the drive mode

If the source drive mode is different from the target drive mode then the mode will be changed to the source drive mode before the parameters are transferred. If the required drive mode is outside the allowed range for the target then a {C.typ} trip is initiated and no data is transferred.

9.2.2 Different voltage ratings

If the voltage rating of the source and target drives is different then all parameters except those that are rating dependent (i.e. attribute RA=1) are transferred to the target drive. The rating dependent parameters are left at their default values. After the parameters have been transferred and saved to non-volatile memory a {C.rtg} trip is given as a warning. The table below gives a list of the rating dependent parameters.

Parameters
Standard Ramp Voltage (02.008)
Motoring Current Limit (04.005)
Regenerating Current Limit (04.006)
Symmetrical Current Limit (04.007)
User Current Maximum Scaling (04.024)
Motor Rated Current (05.007)
Motor Rated Voltage (05.009)
Motor Rated Power Factor (05.010)
Stator Resistance (05.017)
Maximum Switching Frequency (05.018)
Transient Inductance /Ld (05.024)
Stator Inductance (05.025)
Injection Braking Level (06.006)
Supply Loss Detection Level (06.048)

9.2.3 Different current ratings

If any of the current rating parameters (Maximum Heavy Duty Rating (Pr **77**), Maximum Rated Current (11.060) or Full Scale Current Kc (11.061)) are different between the source and target then all parameters are still written to the target drive, but some may be limited by their allowed range. To give similar performance in the target compared to the source drive the current controller gains are modified as shown below. Note that this does not apply if the file identification number is larger than 500.

Gains	Multiplier
Current Controller Kp Gain (04.013) *Current Controller Ki Gain* (04.014)	[Source *Full Scale Current Kc* (11.061)] / [Target *Full Scale Current Kc* (11.061)]

9.2.4 Different variable maximums

It should be noted that if ratings of the source and target drives are different, it is possible that some parameters with variable maximums may be limited and not have the same values as in the source drive.

9.2.5 Macro files

Macro files are created in the same way as parameter files except that *NV Media Card Create Special File* (11.072) must be set to 1 before the file is created on the NV media card. *NV Media Card Create Special File* (11.072) is set to zero after the file has been created or the transfer fails. When a macro file is transferred to a drive the drive mode is not changed even if the actual mode is different to that in the file and defaults are not loaded before the parameters are copied from the file to the drive.

Table 9-1 Functions in Pr 00

Value	Action
2001	Transfer the drive parameters to parameter file 001 and sets the block as bootable.
4yyy	Transfer the drive parameters to parameter file yyy.
6yyy	Load the drive parameters from parameter file yyy
7yyy	Erase file yyy.
8yyy	Compare the data in the drive with the file yyy. The data in the drive is compared to the data in the file yyy. If the files are the same then Pr **00** 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.

9.2.6 Writing to the NV Media Card

4yyy - Writes defaults differences to the NV Media Card

The data block only contains the parameter differences from the last time default settings were loaded.

All parameters except those with the NC (Not copied) coding bit set are transferred to the NV Media Card.

Writing a parameter set to the NV Media Card (Pr 30 = Prog (2))

Setting Pr **30** to Prog (2) and resetting the drive will save the parameters to the NV Media Card, i.e. this is equivalent to writing 4001 to Pr **00**. All NV Media Card trips apply. If the data block already exists it is automatically overwritten. When the action is complete this parameter is automatically reset to NonE (0).

9.2.7 Reading from the NV Media Card

6yyy - Reading from NV Media Card

When the data is transferred back to the drive, using 6yyy in Pr **00**, it is transferred to the drive RAM and the EEPROM. A parameter save is not required to retain the data after-power down.

If the data is being transferred to the drive with different voltage or current rating a

'C.rtg' trip will occur.

The following drive rating dependant parameters (RA coding bit set) will not be transferred to the destination drive by a NV Media Card when the voltage rating of the destination drive is different from the source drive and the file is a parameter file.

However, drive rating dependent parameters will be transferred if only the current rating is different. If drive rating dependant parameters are not transferred to the destination drive they will contain their default values.

Pr **02.008** Standard Ramp Voltage
Pr **04.005** to Pr **04.007** Motoring Current Limits
Pr **04.024**, User Current Maximum Scaling
Pr **04.041** User Over Current Trip Level
Pr **05.007** Rated Current
Pr **05.009** Rated Voltage
Pr **05.010** Rated Power Factor
Pr **05.017** Stator Resistance
Pr **05.018** Maximum Switching Frequency
Pr **05.024** Transient Inductance
Pr **05.025** Stator Inductance
Pr **06.006** Injection Braking Level
Pr **06.048** Supply Loss Detection Level
Pr **06.073** Braking IGBT Lower Threshold
Pr **06.074** Braking IGBT Upper Threshold
Pr **06.075** Low Voltage Braking IGBT Threshold

Reading a parameter set from the NV Media Card (Pr 30 = rEAd (1))

Setting Pr **30** to rEAd (1) and resetting the drive will transfer the parameters from the card into the drive parameter set and the drive EEPROM, i.e. this is equivalent to writing 6001 to Pr **00**.

All NV Media Card trips apply. Once the parameters are successfully copied this parameter is automatically reset to NonE (0). Parameters are saved to the drive EEPROM after this action is complete.

9.2.8 Auto saving parameter changes (Pr 30 = Auto (3))

This setting causes the drive to automatically save any changes made to menu 0 parameters on the drive to the NV Media Card. The latest menu 0 parameter set in the drive is therefore always backed up on the NV Media Card. Changing Pr **30** to Auto (3) and resetting the drive will immediately save the complete parameter set from the drive to the card, i.e. all parameters except parameters with the NC coding bit set. Once the whole parameter set is stored only the individual modified menu 0 parameter setting is updated.

Advanced parameter changes are only saved to the NV Media Card when Pr **00** is set to 'SAVE' or a 1001 and the drive

reset.

All NV Media Card trips apply. If the data block already contains information it is automatically overwritten.

If the card is removed when Pr **30** is set to 3, Pr **30** is then automatically set to NonE (0).

When a new NV Media Card is installed Pr **30** must be set back to Auto (3) by the user and the drive reset so the complete parameter set is rewritten to the new NV Media Card if auto mode is still required.

When Pr **30** is set to Auto (3) and the parameters in the drive are saved, the NV Media Card is also updated, and therefore the NV Media Card becomes a copy of the drives stored configuration.

At power up, if Pr **30** is set to Auto (3), the drive will save the complete parameter set to the NV Media Card. The 5 unit LEDs will flash during this operation. This is done to ensure that if a user puts a new NV Media Card in during power down the new NV Media Card will have the correct data.

NOTE

When Pr **30** is set to Auto (3) the setting of Pr **30** itself is saved to the drive EEPROM but not the NV Media Card.

9.2.9 Booting up from the NV Media Card on every power up (Pr 30 = boot (4))

When Pr **30** is set to boot (4) the drive operates the same as Auto mode except when the drive is powered-up. The parameters on the NV Media Card will be automatically transferred to the drive at power up if the following are true:

- A card is inserted in the drive
- Parameter data block 1 exists on the card
- The data in block 1 is type 1 to 4 (as defined in Pr **11.038**)
- Pr **30** on the card set to boot (4)

The 5 unit LEDs will flash during this operation. If the drive mode is different from that on the card, the drive gives a 'C.tyP' trip and the data is not transferred.

If 'boot' mode is stored on the copying NV Media Card this makes the copying NV Media Card the master device. This provides a very fast and efficient way of re-programming a number of drives.

'boot' mode is saved to the card, but when the card is read, the value of Pr **30** is not transferred to the drive.

9.2.10 Booting up from the NV Media Card on every power up (Pr 00 = 2001)

It is possible to create a bootable parameter data block by setting Pr **00** to 2001 and initiating a drive reset. This data block is created in one operation and is not updated when further parameter changes are made.

Setting Pr **00** to 2001 will overwrite the data block 1 on the card if it already exists.

9.2.11 8yyy - Comparing the drive full parameter set with the NV Media Card values

Setting 8yyy in Pr **00**, will compare the NV Media Card file with the data in the drive. If the compare is successful Pr **00** is simply set to 0. If the compare fails a 'C.cPr' trip is initiated.

9.2.12 7yyy - Erasing data from the NV Media Card values

Data can be erased from the NV Media Card either one block at a time or all blocks in one go.

- Setting 7yyy in Pr **00** will erase NV Media Card data block yyy

9.2.13 9666 / 9555 - Setting and clearing the NV Media Card warning suppression flag

If the data is being transferred to a drive of a different voltage or current rating a 'C.rtg' trip will occur. It is possible to suppress these trips by setting the warning suppression flag. If this flag is set the drive will not trip if the drive ratings are different between the source and destination drives.

The rating dependent parameters will not be transferred.

- Setting 9666 in Pr **00** will set the warning suppression flag
- Setting 9555 in Pr **00** will clear the warning suppression flag

9.2.14 9888 / 9777 - Setting and clearing the NV Media Card read only flag

The NV Media Card may be protected from writing or erasing by setting the read only flag. If an attempt is made to write or erase a data block when the read only flag is set, a 'C.rdo' trip is initiated. When the read only flag is set only codes 6yyy or 9777 are effective.

- Setting 9888 in Pr **00** will set the read only flag
- Setting 9777 in Pr **00** will clear the read only flag

9.3 NV Media Card parameters

Table 9-2 Key to parameter table coding

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

11.036	NV Media Card File Previously Loaded					
RO	Num		NC	PT		
⇳	0 to 999			⇨	0	

This parameter shows the number of the data block last transferred from an SD card to the drive. If defaults are subsequently reloaded this parameter is set to 0.

11.037	NV Media Card File Number					
RW	Num					
⇳	0 to 999			⇨	0	

This parameter should have the data block number which the user would like the information displayed in Pr **11.038**, Pr **11.039**.

11.038	NV Media Card File Type					
RO	Txt	ND	NC	PT		
⇳	0 to 1			⇨	0	

Displays the type/mode of the data block selected with Pr **11.037**.

Pr 11.038	String	Type / mode
0	None	No file selected
1	Open-loop	Open-Loop mode parameter file

11.039	NV Media Card File Version					
RO	Num	ND	NC	PT		
⇳	0 to 9999			⇨	0	

Displays the version number of the file selected in Pr **11.037**.

11.042 {30}	Parameter Cloning					
RW	Txt		NC			US
⇳	NonE (0), rEAd (1), Prog (2), Auto (3), boot (4)			⇨	0	

9.4 NV Media Card trips

After an attempt to read, write or erase data from a NV Media Card a trip is initiated if there has been a problem with the command.

See Chapter 11 *Diagnostics* on page 80 for more information on NV Media Card trips.

9.5 Data block header information

Each data block stored on a NV Media Card has header information detailing the following:

- NV Media Card File Number (11.037)
- NV Media Card File Type (11.038)
- NV Media Card File Version (11.039)

The header information for each data block which has been used can be viewed in Pr **11.038** to Pr **11.039** by increasing or decreasing the data block number set in Pr **11.037**. If there is no data on the card Pr **11.037** can only have a value of 0.

10 Advanced parameters

Full descriptions of the parameters can be found in the *Parameter Reference Guide*.

WARNING

These advanced parameters are listed for reference purposes only. The lists in this chapter do not include sufficient information for adjusting these parameters. Incorrect adjustment can affect the safety of the system, and damage the drive and or external equipment. Before attempting to adjust any of these parameters, refer to the *Parameter reference guide*.

Table 10-1 Menu descriptions

Menu	Description
0	Commonly used basic set up parameters for quick / easy programming
1	Frequency reference
2	Ramps
3	Frequency control
4	Torque and current control
5	Motor control
6	Sequencer and clock
7	Analog I/O
8	Digital I/O
10	Status and trips
11	Drive set-up and identification
22	Menu 0 set-up

Operation mode abbreviations:

Open-loop: Sensorless control for induction motors

Default abbreviations:

Standard default value (50 Hz AC supply frequency)

USA default value (60 Hz AC supply frequency)

NOTE

Parameter numbers shown in brackets {...} are the equivalent Menu 0 parameters. Some Menu 0 parameters appear twice since their function depends on the operating mode.

In some cases, the function or range of a parameter is affected by the setting of another parameter. The information in the lists relates to the default condition of any parameters affected in this way.

Table 10-2 Key to parameter table coding

Coding	Attribute
RW	Read/Write: can be written by the user
RO	Read only: can only be read by the user
Bit	1 bit parameter. 'On' or 'Off' on the display
Num	Number: can be uni-polar or bi-polar
Txt	Text: the parameter uses text strings instead of numbers.
Bin	Binary parameter
Date	Date parameter
Time	Time parameter
FI	Filtered: some parameters which can have rapidly changing values are filtered when displayed on the drive keypad for easy viewing.
DE	Destination: This parameter selects the destination of an input or logic function.
RA	Rating dependent: this parameter is likely to have different values and ranges with drives of different voltage and current ratings. Parameters with this attribute will be transferred to the destination drive by non-volatile storage media when the rating of the destination drive is different from the source drive and the file is a parameter file. However, the values will be transferred if only the current rating is different and the file is a difference from default type file.
ND	No default: The parameter is not modified when defaults are loaded
NC	Not copied: not transferred to or from non-volatile media during copying.
PT	Protected: cannot be used as a destination.
US	User save: parameter saved in drive EEPROM when the user initiates a parameter save.
PS	Power-down save: parameter automatically saved in drive EEPROM when the under volts (UV) trip occurs.

Table 10-3 Feature look-up table

Features	Related parameters (Pr)												
Acceleration rates	02.010	02.011 to 02.019		02.032	02.033	02.034							
Analog I/O	Menu 7												
Analog input 1	07.001	07.007	07.008	07.009	07.010	07.028	07.051	07.030	07.061	07.062	07.063	07.064	
Analog reference 1	01.036	07.01	07.001	07.007	07.008	07.009	07.028	07.051	07.03	07.061	07.062	07.063	07.064
At frequency indicator bit	03.006	03.007	03.009	10.006	10.005	10.007							
Auto reset	10.034	10.035	10.036	10.001									
Autotune	05.012		05.017		05.024	05.025	05.010					05.059	05.060
Bipolar reference	01.010												
Braking	10.011	10.010	10.030	10.031	6.001	02.004		10.012	10.039	10.040	10.061		
Catch a spinning motor	06.009	05.040											
Coast to stop	06.001												
Copying	11.042	11.036 to 11.039											
Cost - per kWh electricity	06.016	06.017	06.024	06.025	06.026		06.027						
Current controller	04.013	04.014											
Current feedback	04.001	04.002	04.017	04.003	04.004	04.020		04.024	04.026	10.008	10.009	10.017	
Current limits	04.005	04.006	04.007	04.018	04.015	04.019	04.016	05.007	05.010	10.008	10.009	10.017	
DC bus voltage	05.005	02.008											
DC injection braking	06.006	06.007	06.001										
Deceleration rates	02.020	02.021 to 02.029		02.004	02.035 to 02.037			02.008	06.001	10.030	10.031	10.039	02.009
Defaults	11.043	11.046											
Digital I/O	Menu 8												
Digital I/O read word	08.020												
Digital I/O T10	08.001	08.011	08.021	08.031	08.081	08.091	08.121						
Digital I/O T11	08.002	08.012	08.022		08.082	08.122							
Digital I/O T12	08.003	08.013	08.023		08.083	08.123							
Digital input T13	08.004	08.014	08.024	08.084	08.124								
Direction	10.013	06.030	06.031	01.003	10.014	02.001		08.003	08.004	10.040			
Drive active	10.002	10.040											
Drive derivative	11.028												
Drive OK	10.001	08.028	08.008	08.018	10.036	10.040							
Dynamic V/F	05.013												
Enable	06.015				06.038								
External trip	10.032												
Fan speed	06.045												
Field weakening - induction motor			01.006										
Filter change	06.019	06.018	06.021	06.022	06.023								
Firmware version	11.029	11.035											
Frequency reference selection	01.014	01.015											
Frequency slaving	03.001												
Hard frequency reference	03.022	03.023											
Heavy duty rating	05.007	11.032											
High stability space vector modulation	05.019												
I/O sequencer	06.004	06.030	06.031	06.032	06.033	06.034	06.042	06.043	06.041				
Jog reference	01.005	02.019	02.029										
Keypad reference	01.017	01.014	01.043	01.051	06.012								

Features	Related parameters (Pr)												
Limit switches	06.035	06.036											
Line power supply loss	05.005	06.003	06.046	06.048	06.051	10.015	10.016						
Maximum speed	01.006												
Menu 0 set-up				Menu 22									
Minimum speed	01.007	10.004											
Motor map	05.006	05.007	05.008	05.009	05.010	05.011							
NV media card	11.036 to 11.039			11.042									
Offset reference	01.004	01.038	01.009										
Open loop vector mode	05.014	05.017	05.088										
Operating mode		11.031		05.014									
Output	05.001	05.002	05.003	05.004									
Over frequency threshold	03.008												
Over modulation enable	05.020												
Power up parameter	11.022												
Preset speeds	01.015	01.021 to 01.028				01.014	01.042	01.045 to 01.047			01.050		
Ramp (accel / decel) mode	02.004	02.008	06.001		02.003	10.030	10.031	10.039					
Reference selection	01.014	01.015	01.049	01.050	01.001								
Regenerating	10.010	10.011	10.030	10.031	06.001	02.004		10.012	10.039	10.040			
Relay output	08.008	08.018	08.028										
Reset	10.033			10.034	10.035	10.036	10.001						
S ramp	02.006	02.007											
Sample rates	05.018												
Security code	11.030	11.044											
Skip speeds	01.029	01.030	01.031	01.032	01.033	01.034	01.035						
Slip compensation	05.008	05.027	05.033	05.036	05.084								
Status word	10.040												
Supply	05.005	06.003	06.046	06.048	06.051	06.058	06.059						
Switching frequency	05.018	05.035	07.034	07.035									
Thermal protection - drive	05.018	05.035	05.038	07.004	07.005		07.035	10.018					
Thermal protection - motor	04.015	05.007	04.019	04.016	04.025								
Time - filter change	06.019	06.018	06.021	06.022	06.023								
Time - powered up log	06.020			06.019	06.017	06.018	06.084						
Time - run log				06.019	06.017	06.018	06.084						
Torque	04.003	04.026											
Torque mode	04.008	04.011											
Trip detection	10.037	10.038	10.020 to 10.029										
Trip log	10.020 to 10.029			10.041 to 10.060				10.070 to 10.079					
Under voltage	05.005	10.016	10.015	10.068									
V/F mode	05.015	05.014											
Voltage controller	05.031												
Voltage mode	05.014	05.017		05.015									
Voltage rating	11.033	05.009	05.005										
Voltage supply		06.046	05.005										
Warning	10.019	10.012	10.017	10.018	10.040								
Zero frequency indicator bit	03.005	10.003											

10.1 Parameter ranges and Variable minimum/maximums:

Some parameters in the drive have a variable range with a variable minimum and a variable maximum value which is dependent on one of the following:

- The settings of other parameters
- The drive rating
- The drive mode
- Combination of any of the above

The tables below give the definition of variable minimum/maximum and the maximum range of these.

VM_AC_VOLTAGE	Range applied to parameters showing AC voltage
Units	V
Range of [MIN]	0
Range of [MAX]	0 to 930
Definition	VM_AC_VOLTAGE[MAX] is drive voltage rating dependent. See Table 10-4 VM_AC_VOLTAGE[MIN] = 0

VM_AC_VOLTAGE_SET	Range applied to the AC voltage set-up parameters
Units	V
Range of [MIN]	0
Range of [MAX]	0 to 765
Definition	VM_AC_VOLTAGE_SET[MAX] is drive voltage rating dependent. See Table 10-4 VM_AC_VOLTAGE_SET[MIN] = 0

VM_ACCEL_RATE	Maximum applied to the ramp rate parameters
Units	s / 100 Hz, s/1000 Hz, s/Max Frequency
Range of [MIN]	Open-loop: 0.0
Range of [MAX]	Open-loop: 0.0 to 32000.0
Definition	A maximum needs to be applied to the ramp rate parameters because the units are a time for a change of speed from zero to a defined level or to maximum speed. If the change of speed is to the maximum speed then changing the maximum speed changes the actual ramp rate for a given ramp rate parameter value. The variable maximum calculation ensures that longest ramp rate (parameter at its maximum value) is not slower than the rate with the defined level, i.e. 32000.0 s/100 Hz. The maximum frequency is taken from *Maximum Speed* (01.006) VM_ACCEL_RATE[MIN] = 0.0 If Ramp Rate Units (02.039) = 0: VM_ACCEL_RATE[MAX] = 32000.0 Otherwise: VM_ACCEL_RATE[MAX] = 32000.0 x Maximum frequency / 100.00

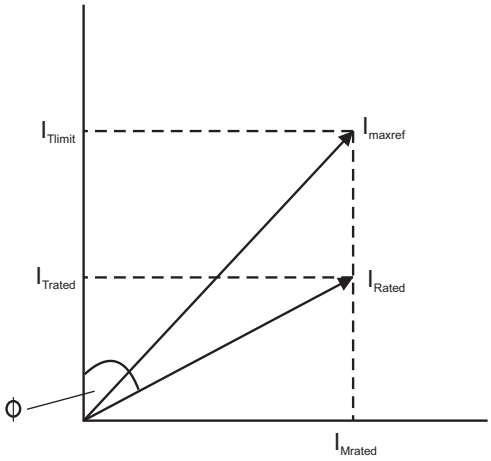
VM_DC_VOLTAGE	Range applied to DC voltage reference parameters
Units	V
Range of [MIN]	0
Range of [MAX]	0 to 1190
Definition	VM_DC_VOLTAGE[MAX] is the full scale DC bus voltage feedback (over voltage trip level) for the drive. This level is drive voltage rating dependent. See Table 10-4 VM_DC_VOLTAGE[MIN] = 0

VM_DC_VOLTAGE_SET	Range applied to DC voltage reference parameters
Units	V
Range of [MIN]	0
Range of [MAX]	0 to 1150
Definition	VM_DC_VOLTAGE_SET[MAX] is drive voltage rating dependent. See Table 10-4 VM_DC_VOLTAGE_SET[MIN] = 0

VM_DRIVE_CURRENT	Range applied to parameters showing current in A
Units	A
Range of [MIN]	-9999.99 to 0.00
Range of [MAX]	0.00 to 9999.99
Definition	VM_DRIVE_CURRENT[MAX] is equivalent to the full scale (over current trip level) for the drive and is given by *Full Scale Current Kc* (11.061). VM_DRIVE_CURRENT[MIN] = - VM_DRIVE_CURRENT[MAX]

VM_FREQ	Range applied to parameters showing frequency
Units	Hz
Range of [MIN]	-1100.00
Range of [MAX]	1100.00
Definition	This variable minimum/maximum defines the range of speed monitoring parameters. To allow headroom for overshoot the range is set to twice the range of the speed references. VM_FREQ[MIN] = 2 x VM_SPEED_FREQ_REF[MIN] VM_FREQ[MAX] = 2 x VM_SPEED_FREQ_REF[MAX]

VM_MAX_SWITCHING_FREQUENCY	Range applied to the maximum switching frequency parameters
Units	User units
Range of [MIN]	Open-loop: 0 (0.667 kHz)
Range of [MAX]	Open-loop: 8 (16kHz)
Definition	VM_SWITCHING_FREQUENCY[MAX] = Power stage dependent VM_SWITCHING_FREQUENCY[MIN] = 0 This variable maximum is used by the *Minimum Switching Frequency* (05.038) to define the minimum frequency limit used if the inverter thermal model is actively reducing the switching frequency due to temperature. Note that parameter *Maximum Switching Frequency* (05.018) takes priority over parameter *Minimum Switching Frequency* (05.038) so is not limited by parameter *Minimum Switching Frequency* (05.038). The actual minimum switching frequency limit used is the lower of *Maximum Switching Frequency* (05.018) and *Minimum Switching Frequency* (05.038).

VM_MOTOR1_CURRENT_LIMIT	Range applied to current limit parameters (motor 1)
Units	%
Range of [MIN]	0.0
Range of [MAX]	0.0 to 1000.0
Definition	 VM_MOTOR1_CURRENT_LIMIT[MAX] is dependent on the drive rating and motor set-up parameters. VM_MOTOR1_CURRENT_LIMIT[MIN] = 0.0 **Open-loop** VM_MOTOR1_CURRENT_LIMIT[MAX] = (I_{Tlimit} / I_{Trated}) x 100 % Where: I_{Tlimit} = I_{MaxRef} x cos($\sin^{-1}$(I_{Mrated} / I_{MaxRef})) I_{Mrated} = Pr **05.007** sin ϕ I_{Trated} = Pr **05.007** x cos ϕ cos ϕ = Pr **05.010** I_{MaxRef} is 0.7 x Pr **11.061** when the motor rated current set in Pr **05.007** is less than or equal to Pr **11.032** (i.e. Heavy duty). $$\textbf{MOTOR1_CURRENT_LIMIT_MAX} = \frac{\sqrt{\left[\left[\frac{\textbf{Maximum current}}{\textbf{Motor rated current}}\right]^2 + (\textbf{PF})^2 - \textbf{1}\right]}}{\textbf{PF}} \times \textbf{100\%}$$ Where: Motor rated current is given by Pr **05.007** PF is motor rated power factor given by Pr **05.010** The Maximum current is (1.5 x Rated drive current) when the rated current set by Pr **05.007** is less than or equal to the Maximum Heavy Duty current rating specified in Pr **11.032**. For example, with a motor of the same rating as the drive and a power factor of 0.85, the maximum current limit is 165.2%. The rated active and rated magnetising currents are calculated from the power factor (Pr **05.010**) and motor rated current (Pr **05.007**) as: rated active current = power factor x motor rated current rated magnetising current = $\sqrt{}$(1 - power factor^2) x motor rated current

VM_NEGATIVE_REF_CLAMP1	Limits applied to the negative frequency clamp (motor 1)
Units	Hz
Range of [MIN]	-550.00 to 0.00
Range of [MAX]	0.00 to 550.00
Definition	This variable maximum/minimum defines the range of the negative frequency clamp associated with motor map 1 (*Minimum Speed* (01.007)). The minimum and maximum are affected by the settings of the *Negative Reference Clamp Enable* (01.008), *Bipolar Reference Enable* (01.010) and *Maximum Speed* (01.006) as shown in the table below.

***Negative Reference Clamp Enable* (01.008)**	***Bipolar Reference Enable* (01.010)**	**VM_NEGATIVE_REF_ CLAMP1[MIN]**	**VM_NEGATIVE_REF_ CLAMP1[MAX]**
0	0	0.00	Pr **01.006**
0	1	0.00	0.00
1	X	-VM_POSITIVE_REF_CLAMP[MAX]	0.00

VM_POSITIVE_REF_CLAMP	Limits applied to the positive frequency reference clamp
Units	Hz
Range of [MIN]	0.00
Range of [MAX]	550.00
Definition	VM_POSITIVE_REF_CLAMP[MAX] defines the range of the positive reference clamp, *Maximum Speed* (01.006), which in turn limit the references.

VM_POWER	Range applied to parameters that either set or display power
Units	kW
Range of [MIN]	-9999.99 to 0.00
Range of [MAX]	0.00 to 9999.99
Definition	VM_POWER[MAX] is rating dependent and is chosen to allow for the maximum power that can be output by the drive with maximum AC output voltage, at maximum controlled current and unity power factor. VM_POWER[MAX] = √3 x VM_AC_VOLTAGE[MAX] x VM_DRIVE_CURRENT[MAX] / 1000 VM_POWER[MIN] = -VM_POWER[MAX]

VM_RATED_CURRENT	Range applied to rated current parameters
Units	A
Range of [MIN]	0.00
Range of [MAX]	0.00 to 9999.99
Definition	VM_RATED_CURRENT [MAX] = *Maximum Rated Current* (11.060) and is dependent on the drive rating. VM_RATED_CURRENT [MIN] = 0.00

VM_SPEED_FREQ_REF	Range applied to the frequency reference parameters
Units	Hz
Range of [MIN]	-550.00 to 0.00
Range of [MAX]	0.00 to 550.00
Definition	This variable minimum/maximum is applied throughout the frequency and speed reference system so that the references can vary in the range from the minimum to maximum clamps.

***Negative Reference Clamp Enable* (01.008)**	**VM_SPEED_FREQ_REF[MAX]**
0	*Maximum Speed* (01.006)
1	*Maximum Speed* (01.006) or |*Minimum Speed* (01.007)| whichever the larger

VM_SPEED_FREQ_REF[MIN] = -VM_SPEED_FREQ_REF[MAX].

VM_SPEED_FREQ_REF_UNIPOLAR	Unipolar version of VM_SPEED_FREQ_REF
Units	Hz
Range of [MIN]	0.00
Range of [MAX]	0.00 to 550.00
Definition	VM_SPEED_FREQ_REF_UNIPOLAR[MAX] = VM_SPEED_FREQ_REF[MAX] VM_SPEED_FREQ_REF_UNIPOLAR[MIN] = 0.00

VM_SPEED_FREQ_USER_REFS	Range applied to analog reference parameters
Units	Hz
Range of [MIN]	-550.00 to 550.00
Range of [MAX]	0.00 to 550.00
Definition	This variable maximum is applied to *Analog Reference 1* (01.036) and *Keypad Reference* (01.017). The maximum applied to these parameters is the same as other frequency reference parameters. VM_SPEED_FREQ_USER_REFS [MAX] = VM_SPEED_FREQ_REF[MAX] However the minimum is dependent on *Negative Reference Clamp Enable* (01.008) and *Bipolar Reference Enable* (01.010).

***Negative Reference Clamp Enable* (01.008)**	***Bipolar Reference Enable* (01.010)**	**VM_SPEED_FREQ_USER_REFS[MIN]**
0	0	*Minimum Speed* (01.007)
0	1	-VM_SPEED_FREQ_REF[MAX]
1	0	0.00
1	1	-VM_SPEED_FREQ_REF[MAX]

VM_SUPPLY_LOSS_LEVEL	Range applied to the supply loss threshold
Units	V
Range of [MIN]	0 to 1150
Range of [MAX]	0 to 1150
Definition	VM_SUPPLY_LOSS_LEVEL[MAX] = VM_DC_VOLTAGE_SET[MAX] VM_SUPPLY_LOSS_LEVEL[MIN] is drive voltage rating dependent. See Table 10-4

VM_TORQUE_CURRENT	Range applied to torque and torque producing current parameters
Units	%
Range of [MIN]	-1000.0 to 0.0
Range of [MAX]	0.0 to 1000.0
Definition	VM_TORQUE_CURRENT[MAX] = VM_MOTOR1_CURRENT_LIMIT[MAX] VM_TORQUE_CURRENT[MIN] = VM_TORQUE_CURRENT[MAX]

VM_TORQUE_CURRENT_UNIPOLAR	Unipolar version of VM_TORQUE_CURRENT
Units	%
Range of [MIN]	0.0
Range of [MAX]	0.0 to 1000.0
Definition	VM_TORQUE_CURRENT_UNIPOLAR[MAX] = VM_TORQUE_CURRENT[MAX] VM_TORQUE_CURRENT_UNIPOLAR[MIN] =0.0 *User Current Maximum Scaling* (04.024) defines the variable maximum/minimums VM_USER_CURRENT which is applied to *Percentage Load* (04.020) and *Torque Reference* (04.008). This is useful when routing these parameters to an analog output as it allows the full scale output value to be defined by the user. This maximum is subject to a limit of MOTOR1_CURRENT_LIMIT. The maximum value (VM_TORQUE_CURRENT_UNIPOLAR [MAX]) varies between drive sizes with default parameters loaded. For some drive sizes the default value may be reduced below the value given by the parameter range limiting.

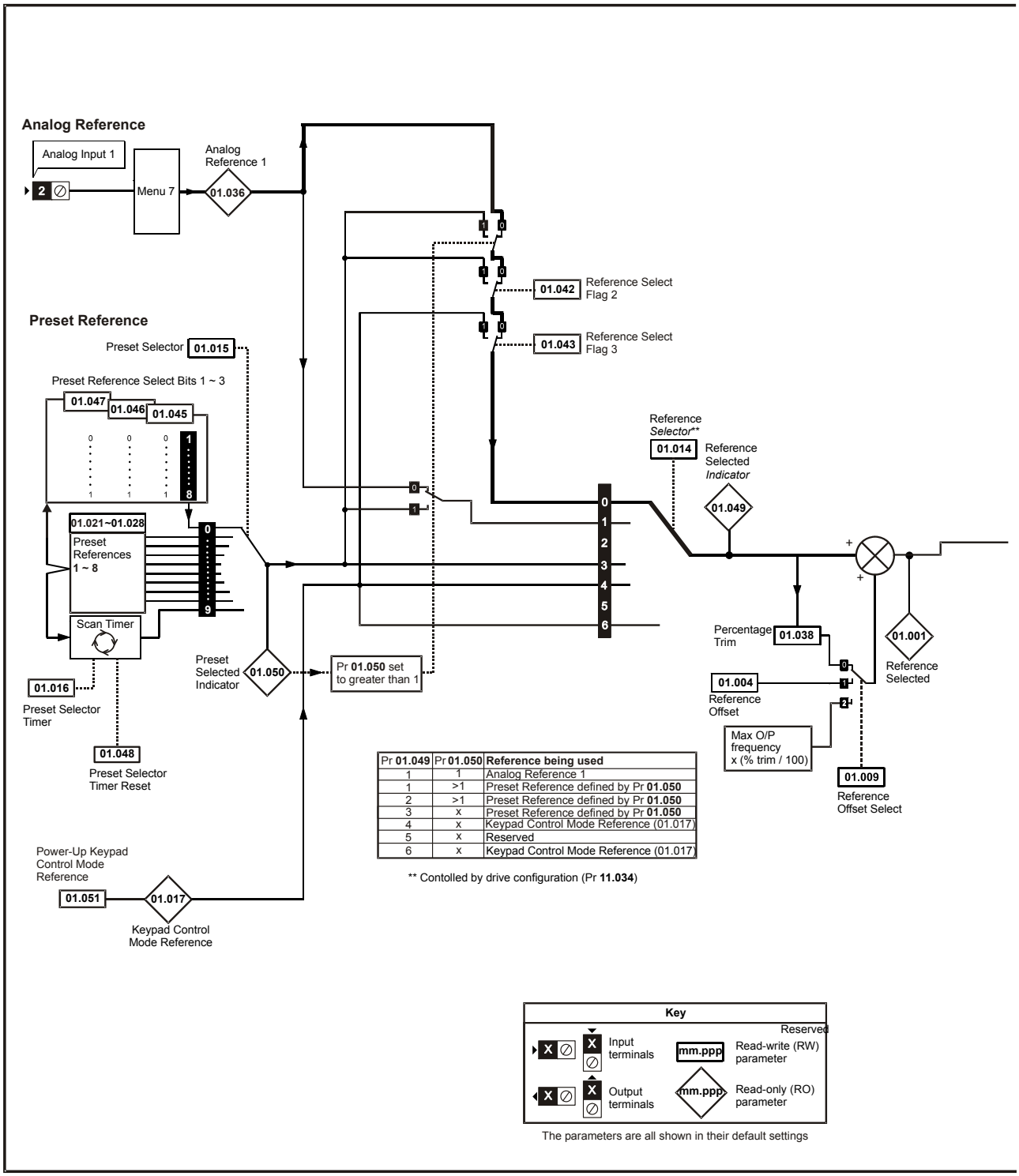
VM_USER_CURRENT	Range applied to torque reference and percentage load parameters with one decimal place
Units	%
Range of [MIN]	-1000.0 to 0.0
Range of [MAX]	0.0 to 1000.0
Definition	VM_USER_CURRENT[MAX] = *User Current Maximum Scaling* (04.024) VM_USER_CURRENT[MIN] = -VM_USER_CURRENT[MAX] *User Current Maximum Scaling* (04.024) defines the variable maximum/minimums VM_USER_CURRENT which is applied to *Percentage Load* (04.020) and *Torque Reference* (04.008). This is useful when routing these parameters to an analog output as it allows the full scale output value to be defined by the user. This maximum is subject to a limit of MOTOR1_CURRENT_LIMIT. The maximum value (VM_TORQUE_CURRENT_UNIPOLAR [MAX]) varies between drive sizes with default parameters loaded. For some drive sizes the default value may be reduced below the value given by the parameter range limiting.

Table 10-4 Voltage ratings dependant values

Variable min/max	Voltage level		
	100 V	**200 V**	**400 V**
VM_DC_VOLTAGE_SET(MAX]	400		800
VM_DC_VOLTAGE(MAX] Frame 1 to 4	510		870
VM_AC_VOLTAGE_SET(MAX] Frame 1 to 4	240		480
VM_AC_VOLTAGE[MAX]	325		650
VM_STD_UNDER_VOLTS[MIN]	175		330
VM_SUPPLY_LOSS_LEVEL{MIN]	205		410

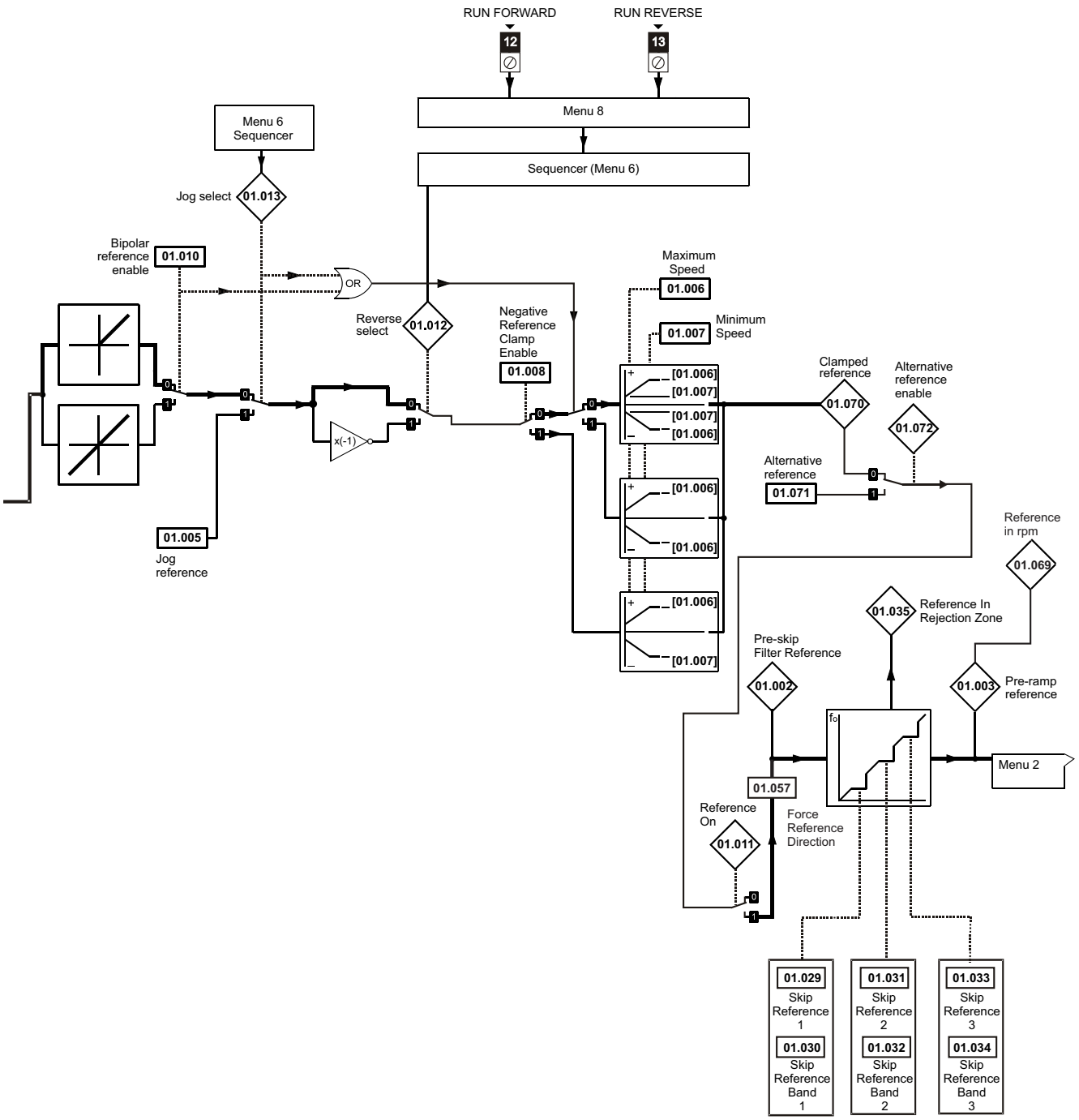
10.2 Menu 1: Frequency reference

Figure 10-1 Menu 1 logic diagram



Pr **01.049**	Pr **01.050**	**Reference being used**
1	1	Analog Reference 1
1	>1	Preset Reference defined by Pr **01.050**
2	>1	Preset Reference defined by Pr **01.050**
3	x	Preset Reference defined by Pr **01.050**
4	x	Keypad Control Mode Reference (01.017)
5	x	Reserved
6	x	Keypad Control Mode Reference (01.017)

** Contolled by drive configuration (Pr **11.034**)


RUN FORWARD
RUN REVERSE
12
13
Menu 8
Sequencer (Menu 6)
Menu 6 Sequencer
Jog select 01.013
Bipolar reference enable 01.010
OR
Reverse select 01.012
Negative Reference Clamp Enable 01.008
Maximum Speed 01.006
Minimum Speed 01.007
[01.006]
[01.007]
[01.007]
[01.006]
Clamped reference 01.070
Alternative reference enable 01.072
Alternative reference 01.071
x(-1)
01.005 Jog reference
Reference in rpm 01.069
01.035 Reference In Rejection Zone
Pre-skip Filter Reference 01.002
01.003 Pre-ramp reference
fo
Menu 2
01.057 Force Reference Direction
Reference On 01.011
01.029 Skip Reference 1
01.030 Skip Reference Band 1
01.031 Skip Reference 2
01.032 Skip Reference Band 2
01.033 Skip Reference 3
01.034 Skip Reference Band 3

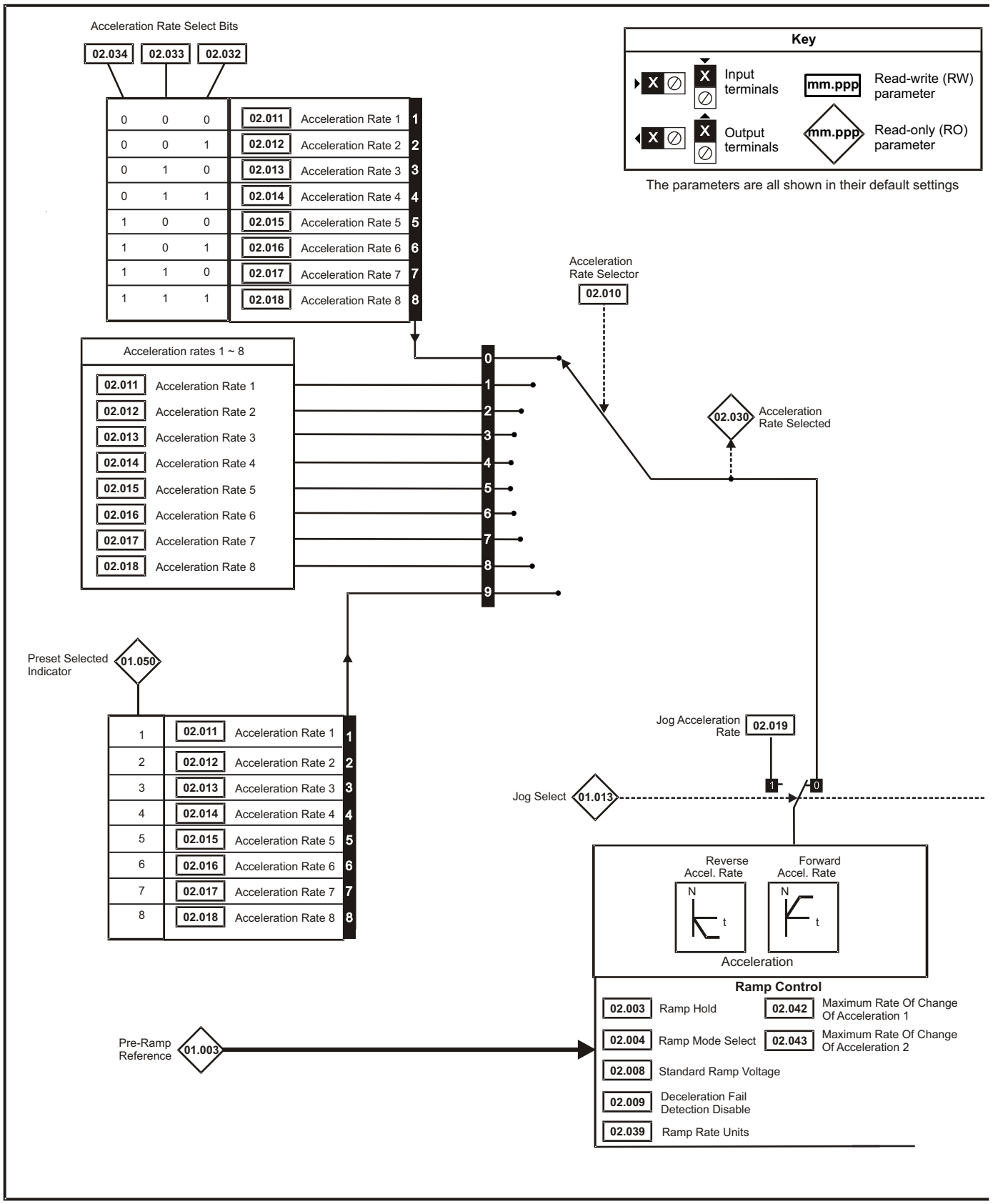
Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
01.001	Reference Selected	0.00 to Pr **01.006** Hz		RO	Num	ND	NC	PT	
01.002	Pre-skip Filter Reference	0.00 to Pr **01.006** Hz		RO	Num	ND	NC	PT	
01.003	Pre-ramp Reference	0.00 to Pr **01.006** Hz		RO	Num	ND	NC	PT	
01.004	Reference Offset	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.005	Jog Reference	0.00 to 300.00 Hz	1.50 Hz	RW	Num				US
01.006	Maximum Speed	0.00 to 550.00 Hz	50 Hz: 50.00 Hz 60 Hz: 60.00 Hz	RW	Num				US
01.007	Minimum Speed	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.008	Negative Reference Clamp Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
01.009	Reference Offset Select	0 to 2	0	RW	Num				US
01.010	Bipolar Reference Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
01.011	Reference On	Off (0) or On (1)		RO	Bit	ND	NC	PT	
01.012	Reverse Select	Off (0) or On (1)		RO	Bit	ND	NC	PT	
01.013	Jog Select	Off (0) or On (1)		RO	Bit	ND	NC	PT	
01.014	Reference Selector	A1.A2 (0), A1.Pr (1), rES (2), PrESEt (3), PAd (4), rES (5), PAd.rEF (6)	A1.A2 (0)*	RW	Txt				US
01.015	Preset Selector	0 to 9	0	RW	Num				US
01.016	Preset Selector Timer	0 to 400.0 s	10.0s	RW	Num				US
01.017	Keypad Control Mode Reference	VM_SPEED_FREQ_USER_REFS Hz		RO	Num		NC	PT	PS
01.021	Preset Reference 1	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.022	Preset Reference 2	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.023	Preset Reference 3	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.024	Preset Reference 4	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.025	Preset Reference 5	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.026	Preset Reference 6	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.027	Preset Reference 7	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.028	Preset Reference 8	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
01.029	Skip Reference 1	0.00 to 550.00 Hz	0.00 Hz	RW	Num				US
01.030	Skip Reference Band 1	0.00 to 25.00 Hz	0.50 Hz	RW	Num				US
01.031	Skip Reference 2	0.00 to 550.00 Hz	0.00 Hz	RW	Num				US
01.032	Skip Reference Band 2	0.00 to 25.00 Hz	0.50 Hz	RW	Num				US
01.033	Skip Reference 3	0.00 to 550.00 Hz	0.00 Hz	RW	Num				US
01.034	Skip Reference Band 3	0.00 to 25.00 Hz	0.50 Hz	RW	Num				US
01.035	Reference In Rejection Zone	Off (0) or On (1)		RO	Bit	ND	NC	PT	
01.036	Analog Reference 1	VM_SPEED_FREQ_USER_REFS Hz	0.00 Hz	RO	Num		NC		
01.038	Percentage Trim	± 100.00 %	0.00 %	RW	Num		NC		
01.041	Reference Select Flag 1	Off (0) or On (1)	Off (0)	RW	Bit		NC		
01.042	Reference Select Flag 2	Off (0) or On (1)	Off (0)	RW	Bit		NC		
01.043	Reference Select Flag 3	Off (0) or On (1)	Off (0)	RW	Bit		NC		
01.045	Preset Select Flag 1	Off (0) or On (1)	Off (0)	RW	Bit		NC		
01.046	Preset Select Flag 2	Off (0) or On (1)	Off (0)	RW	Bit		NC		
01.047	Preset Select Flag 3	Off (0) or On (1)	Off (0)	RW	Bit		NC		
01.048	Preset Selector Timer Reset	Off (0) or On (1)	Off (0)	RW	Bit		NC		
01.049	Reference Selected Indicator	1 to 6		RO	Num	ND	NC	PT	
01.050	Preset Selected Indicator	1 to 8		RO	Num	ND	NC	PT	
01.051	Power-up Keypad Control Mode Reference	rESEt (0), LASt (1), PrESEt (2)	rESEt (0)	RW	Txt				US
01.057	Force Reference Direction	NonE (0), For (1), rEv (2)	NonE (0)	RW	Txt				
01.069	Reference in rpm	± 33000.0 rpm		RO	Num	ND	NC	PT	
01.070	Clamped Reference	0.00 to Pr **01.006** Hz		RO	Num	ND	NC	PT	
01.071	Alternative Reference	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num		NC	PT	
01.072	Alternative Reference Enable	Off (0) or On (1)		RO	Bit	ND	NC	PT	

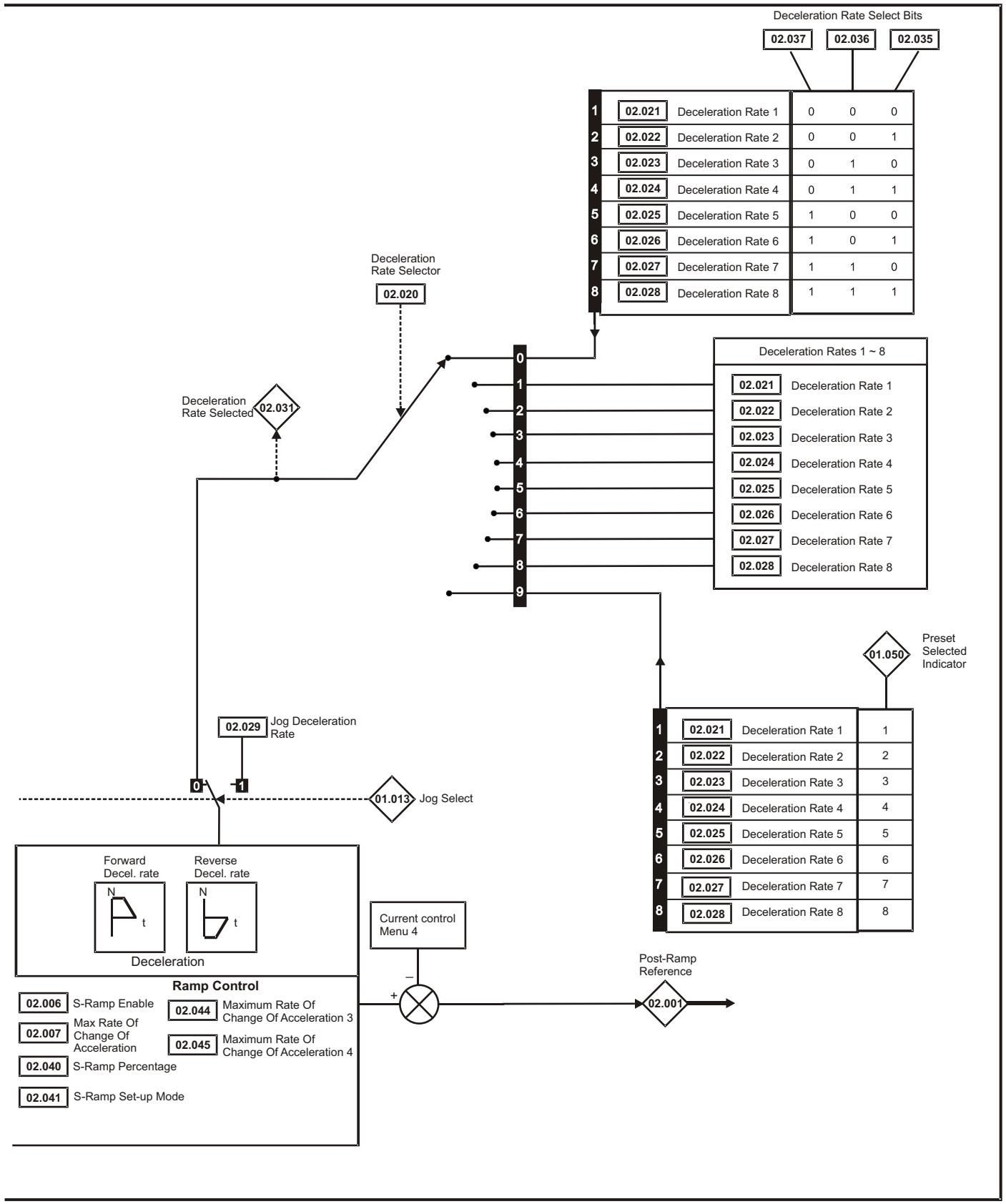
* Keypad mode for the *Unidrive M101*.

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

10.3 Menu 2: Ramps

Figure 10-2 Menu 2 logic diagram




Deceleration Rate Select Bits
02.037
02.036
02.035
1 02.021 Deceleration Rate 1 0 0 0
2 02.022 Deceleration Rate 2 0 0 1
3 02.023 Deceleration Rate 3 0 1 0
4 02.024 Deceleration Rate 4 0 1 1
5 02.025 Deceleration Rate 5 1 0 0
6 02.026 Deceleration Rate 6 1 0 1
7 02.027 Deceleration Rate 7 1 1 0
8 02.028 Deceleration Rate 8 1 1 1
Deceleration Rate Selector
02.020
Deceleration Rate Selected
02.031
0 1 2 3 4 5 6 7 8 9
Deceleration Rates 1 ~ 8
02.021 Deceleration Rate 1
02.022 Deceleration Rate 2
02.023 Deceleration Rate 3
02.024 Deceleration Rate 4
02.025 Deceleration Rate 5
02.026 Deceleration Rate 6
02.027 Deceleration Rate 7
02.028 Deceleration Rate 8
01.050
Preset Selected Indicator
1 02.021 Deceleration Rate 1 1
2 02.022 Deceleration Rate 2 2
3 02.023 Deceleration Rate 3 3
4 02.024 Deceleration Rate 4 4
5 02.025 Deceleration Rate 5 5
6 02.026 Deceleration Rate 6 6
7 02.027 Deceleration Rate 7 7
8 02.028 Deceleration Rate 8 8
02.029 Jog Deceleration Rate
0 1
01.013 Jog Select
Forward Decel. rate
Reverse Decel. rate
N t
Deceleration
Ramp Control
02.006 S-Ramp Enable
02.007 Max Rate Of Change Of Acceleration
02.040 S-Ramp Percentage
02.041 S-Ramp Set-up Mode
02.044 Maximum Rate Of Change Of Acceleration 3
02.045 Maximum Rate Of Change Of Acceleration 4
Current control Menu 4
Post-Ramp Reference
02.001

Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
02.001	Post Ramp Reference	0.00 to Pr **01.006** Hz		RO	Num	ND	NC	PT	
02.003	Ramp Hold	Off (0) or On (1)	Off (0)	RW	Bit				US
02.004	Ramp Mode Select	FASt (0), Std (1), Std.bSt (2), FSt.bSt (3)	Std (1)	RW	Txt				US
02.006	S Ramp Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
02.007	Max Rate Of Change Of Acceleration	0.0 to 300.0 s²/100Hz	3.1 s²/100 Hz	RW	Num				US
02.008	Standard Ramp Voltage	0 to 800 V	110 V drive: 375 V 200 V drive: 375 V 400 V drive 50 Hz: 750 V 400 V drive 60 Hz: 775 V	RW	Num		RA		US
02.009	Deceleration Fail Detection Disable	Off (0) or On (1)	Off (0)	RW	Bit				US
02.010	Acceleration Rate Selector	0 to 9	0	RW	Num				US
02.011	Acceleration Rate 1	0.0 to 32000.0 s / 100 Hz	5.0 s / 100 Hz	RW	Num				US
02.012	Acceleration Rate 2			RW	Num				US
02.013	Acceleration Rate 3			RW	Num				US
02.014	Acceleration Rate 4			RW	Num				US
02.015	Acceleration Rate 5			RW	Num				US
02.016	Acceleration Rate 6			RW	Num				US
02.017	Acceleration Rate 7			RW	Num				US
02.018	Acceleration Rate 8			RW	Num				US
02.019	Jog Acceleration Rate	0.0 to 32000.0 s / 100 Hz	0.2 s / 100 Hz	RW	Num				US
02.020	Deceleration Rate Selector	0 to 9	0	RW	Num				US
02.021	Deceleration Rate 1	0.0 to 32000.0 s / 100 Hz	10.0 s / 100 Hz	RW	Num				US
02.022	Deceleration Rate 2			RW	Num				US
02.023	Deceleration Rate 3			RW	Num				US
02.024	Deceleration Rate 4			RW	Num				US
02.025	Deceleration Rate 5			RW	Num				US
02.026	Deceleration Rate 6			RW	Num				US
02.027	Deceleration Rate 7			RW	Num				US
02.028	Deceleration Rate 8			RW	Num				US
02.029	Jog Deceleration Rate	0.0 to 32000.0 s / 100 Hz	0.2 s / 100 Hz	RW	Num				US
02.030	Acceleration Rate Selected	0 to 8		RO	Num	ND	NC	PT	
02.031	Deceleration Rate Selected	0 to 8		RO	Num	ND	NC	PT	
02.032	Acceleration Rate Select Bit 0	Off (0) or On (1)	Off (0)	RW	Bit		NC		
02.033	Acceleration Rate Select Bit 1	Off (0) or On (1)	Off (0)	RW	Bit		NC		
02.034	Acceleration Rate Select Bit 2	Off (0) or On (1)	Off (0)	RW	Bit		NC		
02.035	Deceleration Rate Select Bit 0	Off (0) or On (1)	Off (0)	RW	Bit		NC		
02.036	Deceleration Rate Select Bit 1	Off (0) or On (1)	Off (0)	RW	Bit		NC		
02.037	Deceleration Rate Select Bit 2	Off (0) or On (1)	Off (0)	RW	Bit		NC		
02.039	Ramp Rate Units	0 (s/100 Hz), 1 (s/Maximum Frequency), 2 (s/1000 Hz)	0 (s/100 Hz)	RW	Num				US
02.040	S Ramp Percentage	0.0 to 50.0 %	0.0 %	RW	Num				US
02.041	S Ramp Set-up Mode	0 to 2	0	RW	Num				US
02.042	Maximum Rate Of Change Of Acceleration 1	0.0 to 300.0 s²/100 Hz	0.0 s²/100 Hz	RW	Num				US
02.043	Maximum Rate Of Change Of Acceleration 2	0.0 to 300.0 s²/100 Hz	0.0 s²/100 Hz	RW	Num				US
02.044	Maximum Rate Of Change Of Acceleration 3	0.0 to 300.0 s²/100 Hz	0.0 s²/100 Hz	RW	Num				US
02.045	Maximum Rate Of Change Of Acceleration 4	0.0 to 300.0 s²/100 Hz	0.0 s²/100 Hz	RW	Num				US

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

10.4 Menu 3: Frequency control

Figure 10-3 Menu 3 Open-loop logic diagram

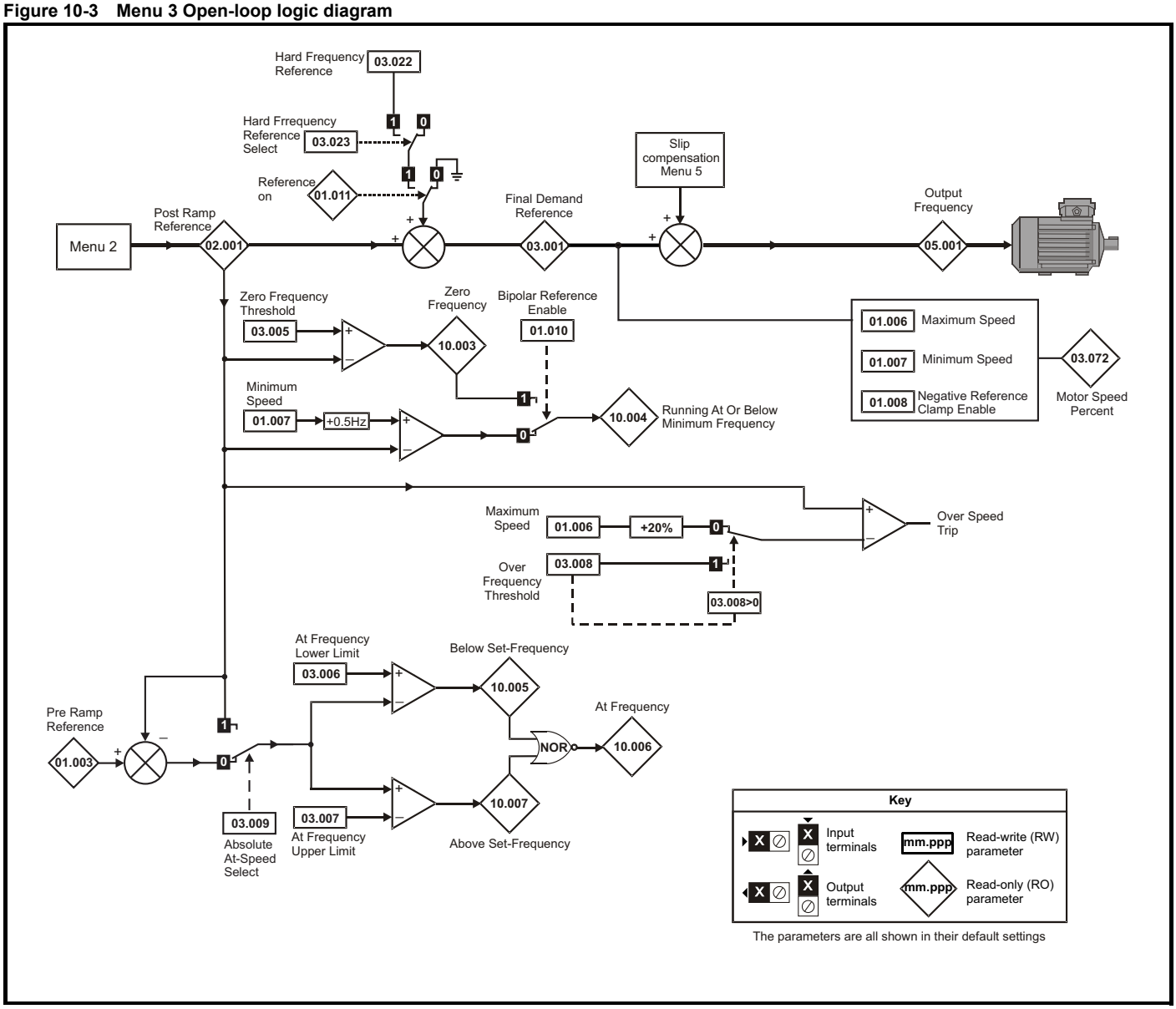
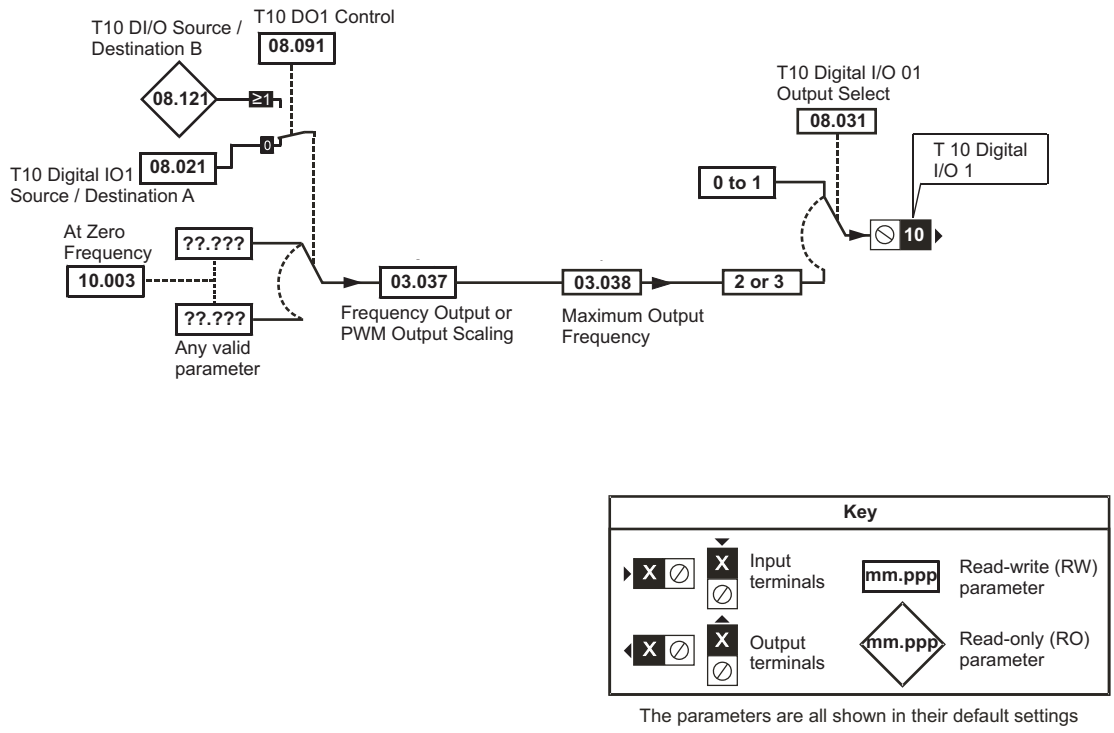


Figure 10-4 Menu 3 Logic diagram



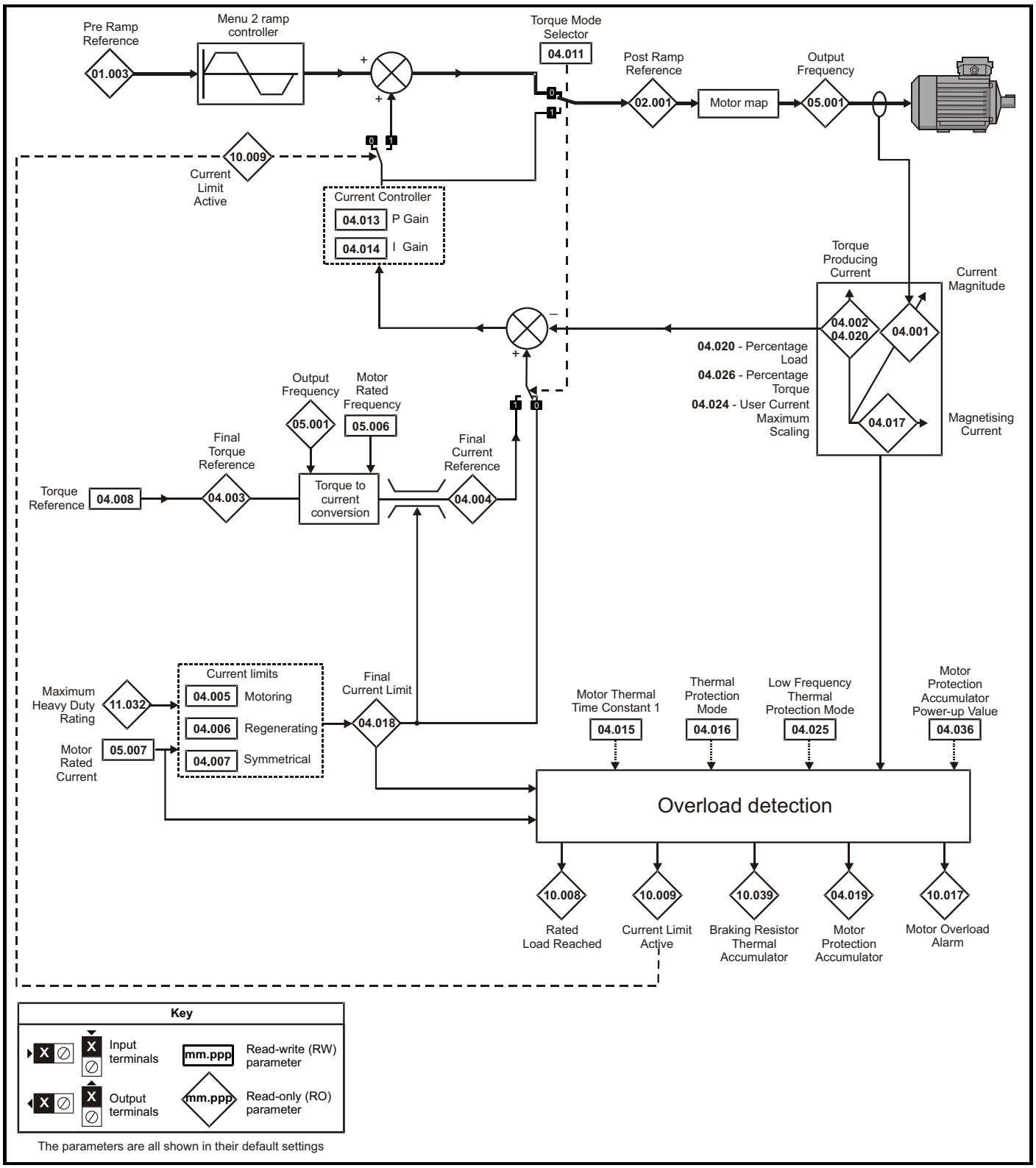
The parameters are all shown in their default settings

Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
03.001	Final Demand Reference	-Pr **01.006** to Pr **01.006** or Pr **01.007** to Pr **01.006** Hz		RO	Num	ND	NC	PT	FI
03.005	Zero Frequency Threshold	0.00 to 20.00 Hz	2.00 Hz	RW	Num				US
03.006	At Frequency Lower Limit	0.00 to 550.00 Hz	1.00 Hz	RW	Num				US
03.007	At Frequency Upper Limit	0.00 to 550.00 Hz	1.00 Hz	RW	Num				US
03.008	Over Frequency Threshold	0.00 to 550.00 Hz	0.00 Hz	RW	Num				US
03.009	Absolute At Frequency Select	Off (0) or On (1)	Off (0)	RW	Bit				US
03.022	Hard Frequency Reference	0.00 to Pr **01.006** Hz	0.00 Hz	RW	Num				US
03.023	Hard Frequency Reference Select	Off (0) or On (1)	Off (0)	RW	Bit				US
03.037	Frequency Output or PWM Output Scaling (T10)	0.000 to 4.000	1.000	RW	Num				US
03.038	Maximum Output Frequency (T10)	1 (0), 2 (1), 5 (2), 10 (3) kHz	5 (2) kHz	RW	Txt				US
03.072	Motor Speed Percent	± 150.0 %		RO		ND	NC	PT	FI

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

10.5 Menu 4: Torque and current control

Figure 10-5 Menu 4 Open loop logic diagram



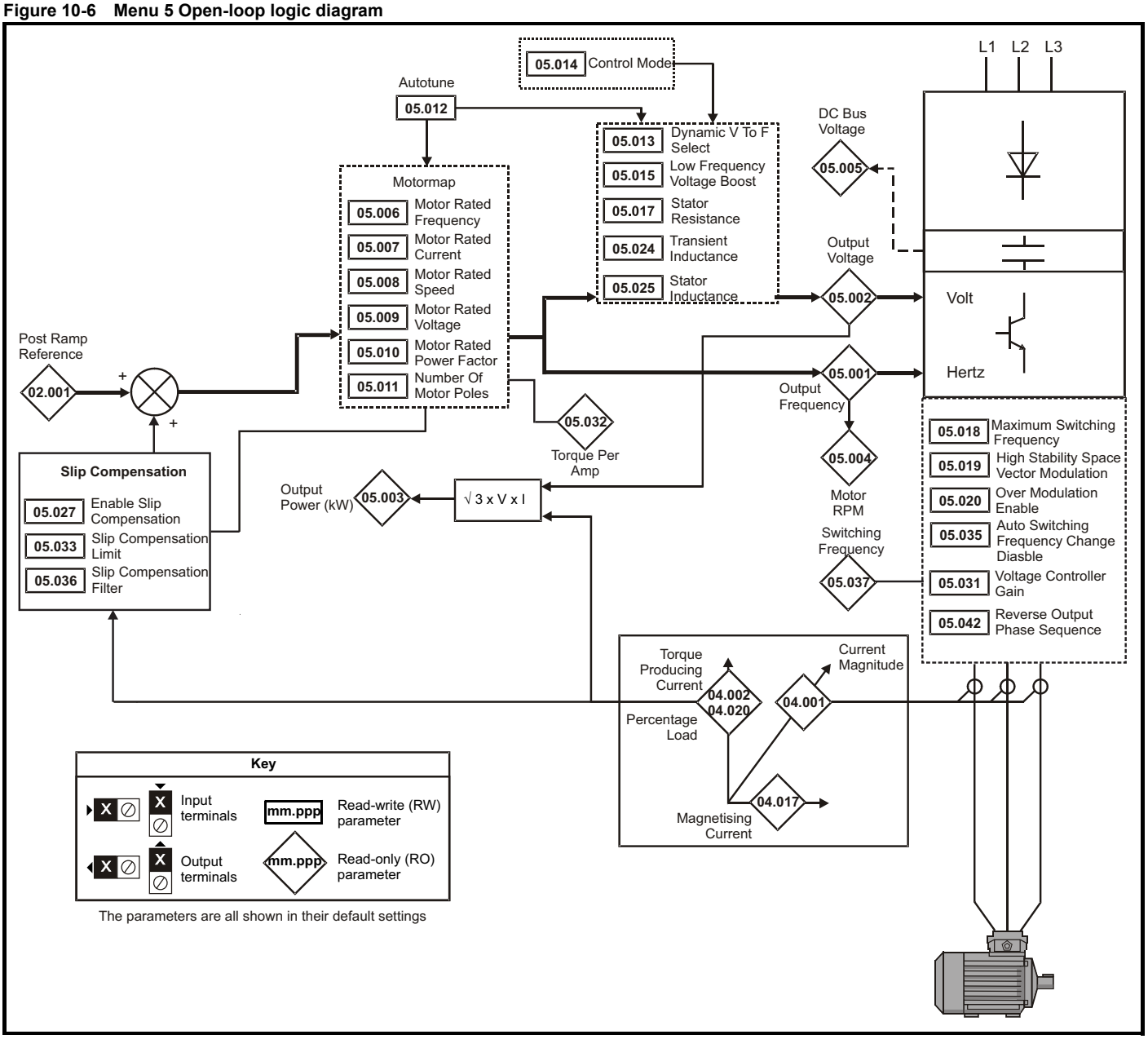
The parameters are all shown in their default settings

Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
04.001	Current Magnitude	0 to Drive Maximum Current A		RO	Num	ND	NC	PT	FI
04.002	Torque Producing Current	± Drive Maximum Current A		RO	Num	ND	NC	PT	FI
04.003	Final Torque Reference	VM_TORQUE_CURRENT %		RO	Num	ND	NC	PT	FI
04.004	Final Current Reference	VM_TORQUE_CURRENT %		RO	Num	ND	NC	PT	FI
04.005	Motoring Current Limit	0.0 to VM_MOTOR1_CURRENT_LIMIT %	165.0 %	RW	Num		RA		US
04.006	Regenerating Current Limit	0.0 to VM_MOTOR1_CURRENT_LIMIT %	165.0 %	RW	Num		RA	US	
04.007	Symmetrical Current Limit	0.0 to VM_MOTOR1_CURRENT_LIMIT %	165.0 %	RW	Num		RA		US
04.008	Torque Reference	VM_USER_CURRENT %	0.0 %	RW	Num				US
04.011	Torque Mode Selector	0 to 1	0	RW	Num				US
04.013	Current Controller Kp Gain	0.00 to 4000.00	20.00	RW	Num				US
04.014	Current Controller Ki Gain	0.000 to 600.000	40.000	RW	Num				US
04.015	Motor Thermal Time Constant 1	1 to 3000 s	179 s	RW	Num				US
04.016	Thermal Protection Mode	0 (0) to 3 (3)	0 (0)	RW	Bin				US
04.017	Magnetising Current	0 to Drive Maximum Current A		RO	Num	ND	NC	PT	FI
04.018	Final Current Limit	VM_TORQUE_CURRENT %		RO	Num	ND	NC	PT	
04.019	Motor Protection Accumulator	0.0 to 100.0 %		RO	Num	ND	NC	PT	PS
04.020	Percentage Load	VM_USER_CURRENT %		RO	Num	ND	NC	PT	FI
04.024	User Current Maximum Scaling	0.0 to VM_TORQUE_CURRENT_UNIPOLAR %	165.0 %	RW	Num		RA		US
04.025	Low Frequency Thermal Protection Mode	0 to 1	0	RW	Num				US
04.026	Percentage Torque	VM_USER_CURRENT %		RO	Num	ND	NC	PT	FI
04.036	Motor Protection Accumulator Power-up Value	Pr.dn (0), 0 (1)	Pr.dn (0)	RW	Txt				US
04.041	User Over Current Trip Level	0 to 100 %	100 %	RW	Num		RA		US

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

10.6 Menu 5: Motor control

Figure 10-6 Menu 5 Open-loop logic diagram

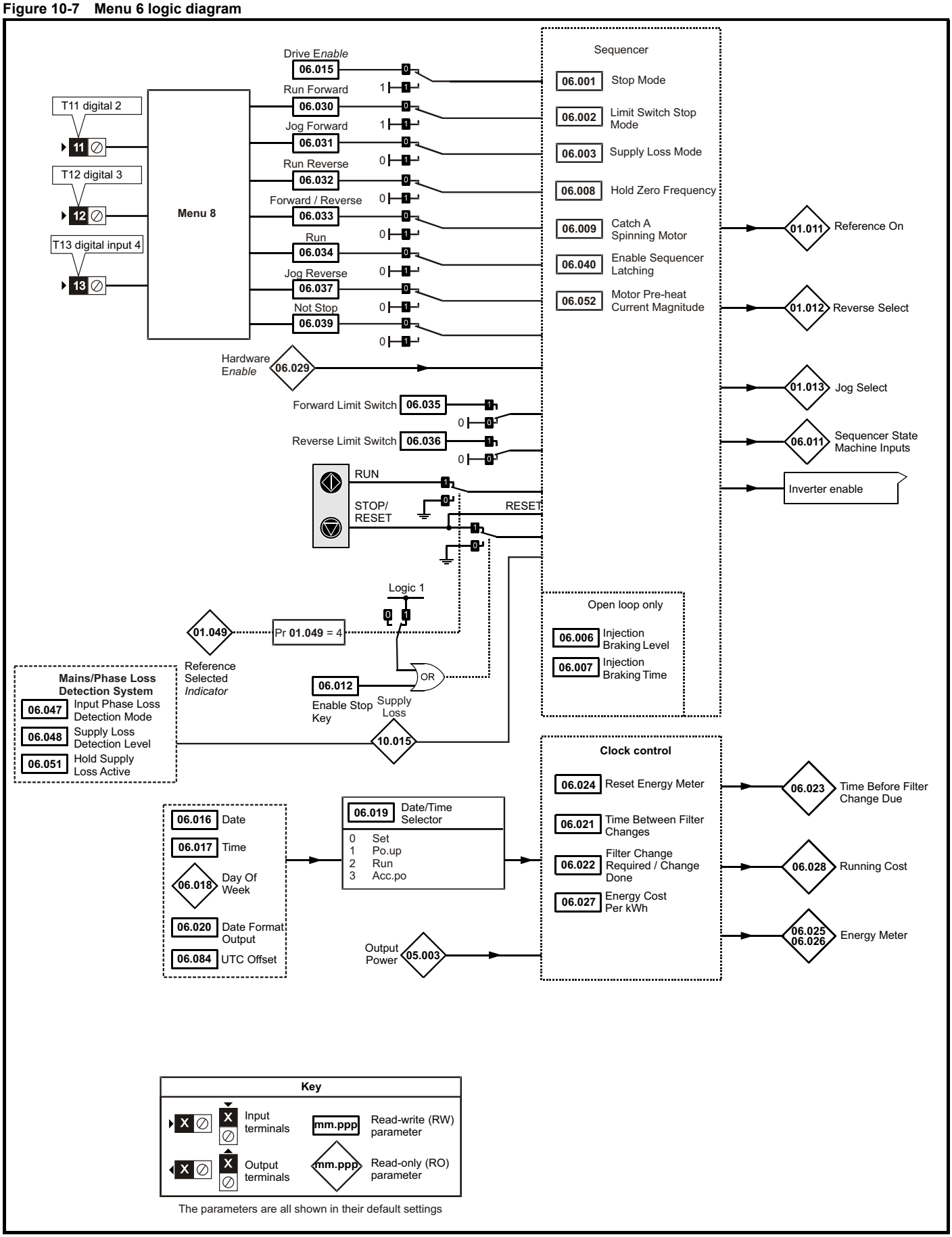


Parameter		Range (⇕)	Default (⇨)	Type					
		OL	OL						
05.001	Output Frequency	± 550.00 Hz		RO	Num	ND	NC	PT	FI
05.002	Output Voltage	0 to 650 V		RO	Num	ND	NC	PT	FI
05.003	Output Power	VM_POWER kW		RO	Num	ND	NC	PT	FI
05.004	Motor Rpm	± 33000.0 rpm		RO	Num	ND	NC	PT	FI
05.005	D.C. Bus Voltage	0 to 870 V		RO	Num	ND	NC	PT	FI
05.006	Motor Rated Frequency	0.00 to 550.00 Hz	50 Hz: 50.00 Hz, 60 Hz: 60.00 Hz	RW	Num		RA		US
05.007	Motor Rated Current	0.00 to Drive Rating A	Maximum Heavy Duty Rating (11.032)	RW	Num		RA		US
05.008	Motor Rated Speed	0.0 to 33000.0 rpm	50 Hz: 1500.0 rpm 60 Hz: 1800.0 rpm	RW	Num				US
05.009	Motor Rated Voltage	0 to 480 V	110V drive: 230 V 200V drive: 230 V 400V drive 50Hz: 400 V 400V drive 60Hz: 460 V	RW	Num		RA		US
05.010	Motor Rated Power Factor	0.00 to 1.00	0.85	RW	Num		RA		US
05.011	Number Of Motor Poles	Auto (0) to 32 (16)	Auto (0)	RW	Num				US
05.012	Autotune	0 to 2	0	RW	Num		NC		
05.013	Dynamic V To F Select	0 to 1	0	RW	Num				US
05.014	Control Mode	Ur.S (0), Ur (1), Fd (2), Ur.Auto (3), Ur.I (4), SrE (5), Fd.tAP (6)	Ur.I (4)	RW	Txt				US
05.015	Low Frequency Voltage Boost	0.0 to 25.0 %	3.0 %	RW	Num				US
05.017	Stator Resistance	0.0000 to 99.9999 Ω	0.0000 Ω	RW	Num		RA		US
05.018	Maximum Switching Frequency	0.667 (0), 1 (1), 2 (2), 3 (3), 4 (4), 6 (5), 8 (6), 12 (7), 16 (8) kHz	3 (3) kHz	RW	Txt		RA		US
05.019	High Stability Space Vector Modulation	Off (0) or On (1)	Off (0)	RW	Bit				US
05.020	Over Modulation Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
05.024	Transient Inductance	0.000 to 500.000 mH	0.000 mH	RW	Num		RA		US
05.025	Stator Inductance	0.00 to 5000.00 mH	0.00 mH	RW	Num		RA		US
05.027	Enable Slip Compensation	±150.0 %	100.0 %	RW	Num				US
05.031	Voltage Controller Gain	1 to 30	1	RW	Num				US
05.033	Slip Compensation Limit	0.00 to 10.00 Hz	10.00 Hz	RW	Num				US
05.035	Auto-switching Frequency Change Disable	0 to 1	0	RW	Num				US
05.036	Slip Compensation Filter	64 (0), 128 (1), 256 (2), 512 (3) ms	128 (1) ms	RW	Txt				US
05.037	Switching Frequency	0.667 (0), 1 (1), 2 (2), 3 (3), 4 (4), 6 (5), 8 (6), 12 (7), 16 (8) kHz		RO	Txt	ND	NC	PT	
05.038	Minimum Switching Frequency	0 to VM_MAX_SWITCHING_ FREQUENCY kHz	0.667 (0) kHz	RW	Txt		RA		
05.040	Spin Start Boost	0.0 to 10.0	1.0	RW	Num				US
05.042	Reverse Output Phase Sequence	Off (0) or On (1)	Off (0)	RW	Bit				US
05.059	Maximum Deadtime Compensation	0.000 to 10.000 µs		RO	Num		NC	PT	US
05.060	Current At Maximum Deadtime Compensation	0.00 to 100.00 %		RO	Num		NC	PT	US
05.061	Disable Deadtime Compensation	Off (0) or On (1)	Off (0)	RW	Bit				US
05.074	Boost End Voltage	0.0 to 100.0 %	50.0 %	RW	Num				US
05.075	Boost End Frequency	0.0 to 100.0 %	50.0 %	RW	Num				US
05.076	Second Point Voltage	0.0 to 100.0 %	55.0 %	RW	Num				US
05.077	Second Point Frequency	0.0 to 100.0 %	55.0 %	RW	Num				US
05.078	Third point voltage	0.0 to 100.0 %	75.0 %	RW	Num				US
05.079	Third point frequency	0.0 to 100.0 %	75.0 %	RW	Num				US
05.080	Low acoustic noise enable	Off (0) or On (1)	Off (0)	RW	Bit				US
05.081	Change to maximum drive switching frequency at low output current	Off (0) or On (1)	Off (0)	RW	Bit				US
05.083	Voltage Shelving Disable	Off (0) or On (1)	Off (0)	RW	Bit				US
05.084	Low Frequency Slip Boost	0.0 to 100.0 %	0.0 %	RW	Num				US
05.088	Ur Mode Pre-Flux Delay	0.0 to 0.7 s	0.1 s	RW	Num				US

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

10.7 Menu 6: Sequencer and clock

Figure 10-7 Menu 6 logic diagram



The parameters are all shown in their default settings

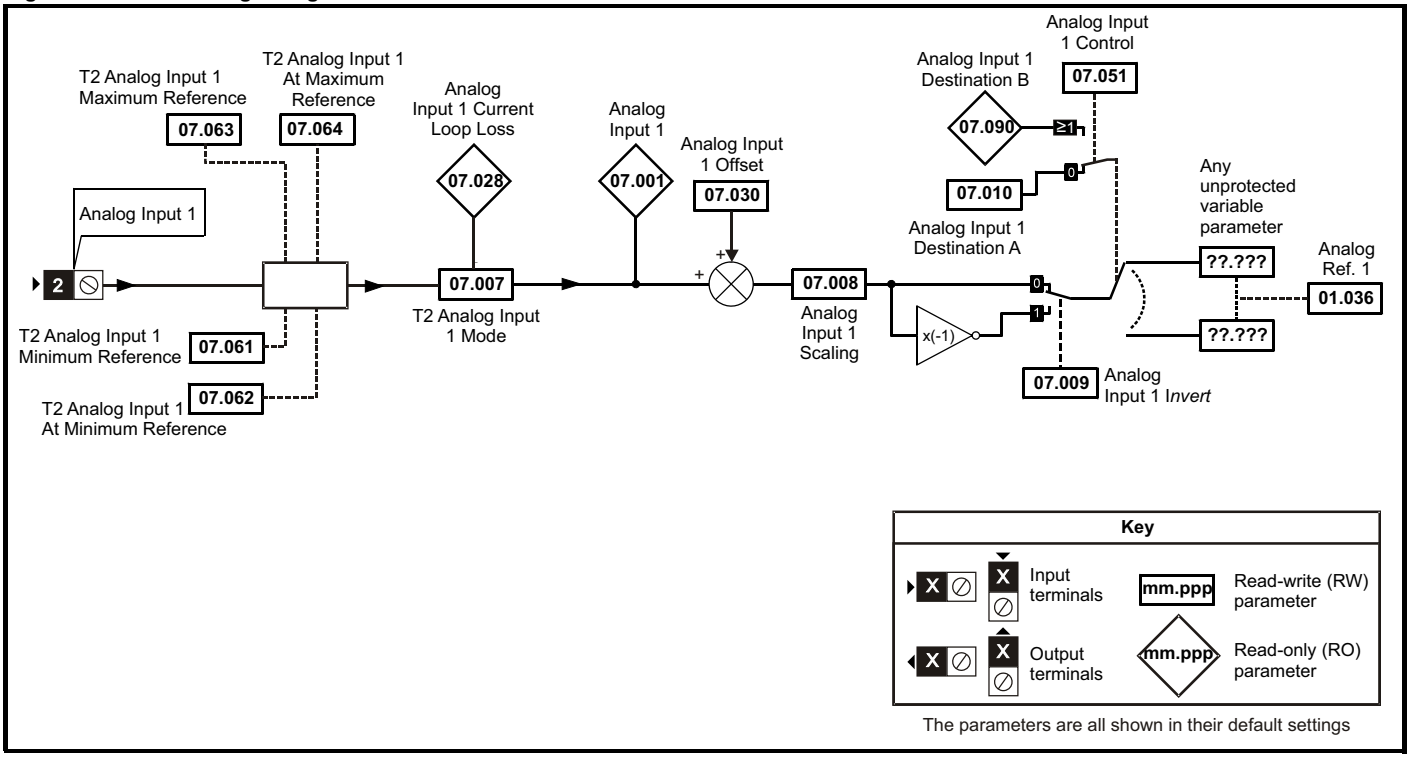
Parameter		Range (⇳)	Default(⇨)	Type					
		OL	OL						
06.001	Stop Mode	CoASt (0), rP (1), rP.dc I (2), dc I (3), td.dc I (4), diS (5)	rP (1)	RW	Txt				US
06.002	Limit Switch Stop Mode	StoP (0) or rP (1),	rP (1)	RW	Txt				US
06.003	Supply Loss Mode	diS (0), rP.StoP (1), ridE.th (2)	diS (0)	RW	Txt				US
06.004	Start/Stop Logic Select	0 to 6	0	RW	Num				US
06.006	Injection Braking Level	0.0 to 150.0 %	100.0 %	RW	Num		RA		US
06.007	Injection Braking Time	0.0 to 100.0 s	1.0 s	RW	Num				US
06.008	Hold Zero Frequency	Off (0) or On (1)	Off (0)	RW	Bit				US
06.009	Catch A Spinning Motor	diS (0), EnAbLE (1), Fr.OnLy (2), rv.OnLy (3)	diS (0)	RW	Txt				US
06.010	Enable Conditions	0 to 4087		RO	Bin	ND	NC	PT	
06.011	Sequencer State Machine Inputs	0 to 127		RO	Bin	ND	NC	PT	
06.012	Enable Stop Key	Off (0) or On (1)	Off (0)	RW	Bit				US
06.014	Disable Auto Reset On Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
06.015	Drive Enable	Off (0) or On (1)	On (1)	RW	Bit		NC		US
06.016	Date	00-00-00 to 31-12-99		RW	Date	ND	NC	PT	
06.017	Time	00:00:00 to 23:59:59		RW	Time	ND	NC	PT	
06.018	Day Of Week	Sun (0), Non (1), tuE (2), UEd (3), thu (4), Fri (5), SAt (6)		RO	Txt	ND	NC	PT	
06.019	Date/Time Selector	Po.uP (1), run (2), Acc.Po (3)	Po.uP (1)	RW	Txt				US
06.020	Date Format	Std (0), US (1)	Std (0)	RW	Txt				US
06.021	Time Between Filter Changes	0 to 30000 Hours	0 Hours	RW	Num				US
06.022	Filter Change Required / Change Done	Off (0) or On (1)		RW	Bit	ND	NC		
06.023	Time Before Filter Change Due	0 to 30000 Hours		RO	Num	ND	NC	PT	PS
06.024	Reset Energy Meter	Off (0) or On (1)	Off (0)	RW	Bit				
06.025	Energy Meter: MWh	±999.9 MWh		RO	Num	ND	NC	PT	PS
06.026	Energy Meter: kWh	±99.99 kWh		RO	Num	ND	NC	PT	PS
06.027	Energy Cost Per kWh	0.0 to 600.0	0.0	RW	Num				US
06.028	Running Cost	±32000		RO	Num	ND	NC	PT	
06.029	Hardware Enable	Off (0) or On (1)		RO	Bit	ND	NC	PT	
06.030	Run Forward	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.031	Jog Forward	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.032	Run Reverse	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.033	Forward/Reverse	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.034	Run	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.035	Forward Limit Switch	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.036	Reverse Limit Switch	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.037	Jog Reverse	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.038	User Enable	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.039	Not Stop	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.040	Enable Sequencer Latching	Off (0) or On (1)	Off (0)	RW	Bit				US
06.041	Drive Event Flags	0 to 3	0	RW	Bin		NC		
06.045	Cooling Fan control	0 to 5	2	RW	Num				US
06.047	Input Phase Loss Detection Mode	FuLL (0), rIPPLE (1), diS (2)	FuLL (0)	RW	Txt				US
06.048	Supply Loss Detection Level	0 to VM_SUPPLY_LOSS_LEVEL V	110 V drive: 205 V 200 V drive: 205 V 400 V drive: 410 V	RW	Num		RA		US
06.051	Hold Supply Loss Active	Off (0) or On (1)	Off (0)	RW	Bit		NC		
06.052	Motor Pre-heat Current Magnitude	0 to 100 %	0 %	RW	Num				US
06.058	Output Phase Loss Detection Time	0.5 (0) to 4 (3) s	0.5 (0) s	RW	Txt				US
06.059	Output Phase Loss Detection Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
06.060	Standby Mode Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
06.061	Standby Mode Mask	0 to 3	0	RW	Bin				US

Parameter		Range (⇳)	Default(⇨)	Type					
		OL	OL						
06.071	Slow Rectifier Charge Rate Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
06.073	Braking IGBT Lower Threshold	0 to VM_DC_VOLTAGE_SET V	110 V drive: 390 V 200 V drive: 390 V 400 V drive: 780 V	RW	Num		RA		US
06.074	Braking IGBT Upper Threshold	0 to VM_DC_VOLTAGE_SET V	110 V drive: 390 V 200 V drive: 390 V 400 V drive: 780 V	RW	Num		RA		US
06.075	Low Voltage Braking IGBT Threshold	0 to VM_DC_VOLTAGE_SET V	0 V	RW	Num		RA		US
06.076	Low Voltage Braking IGBT Threshold Select	Off (0) or On (1)	Off (0)	RW	Bit				
06.077	Low DC Link Operation	Off (0) or On (1)	Off (0)	RW	Bit				US
06.084	UTC Offset	± 24.00 Hours	0.00 Hours	RW	Num				US
06.089	DC Injection Active	Off (0) or On (1)		RO	Bit	ND	NC	PT	US

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

10.8 Menu 7: Analog I/O

Figure 10-8 Menu 7 logic diagram



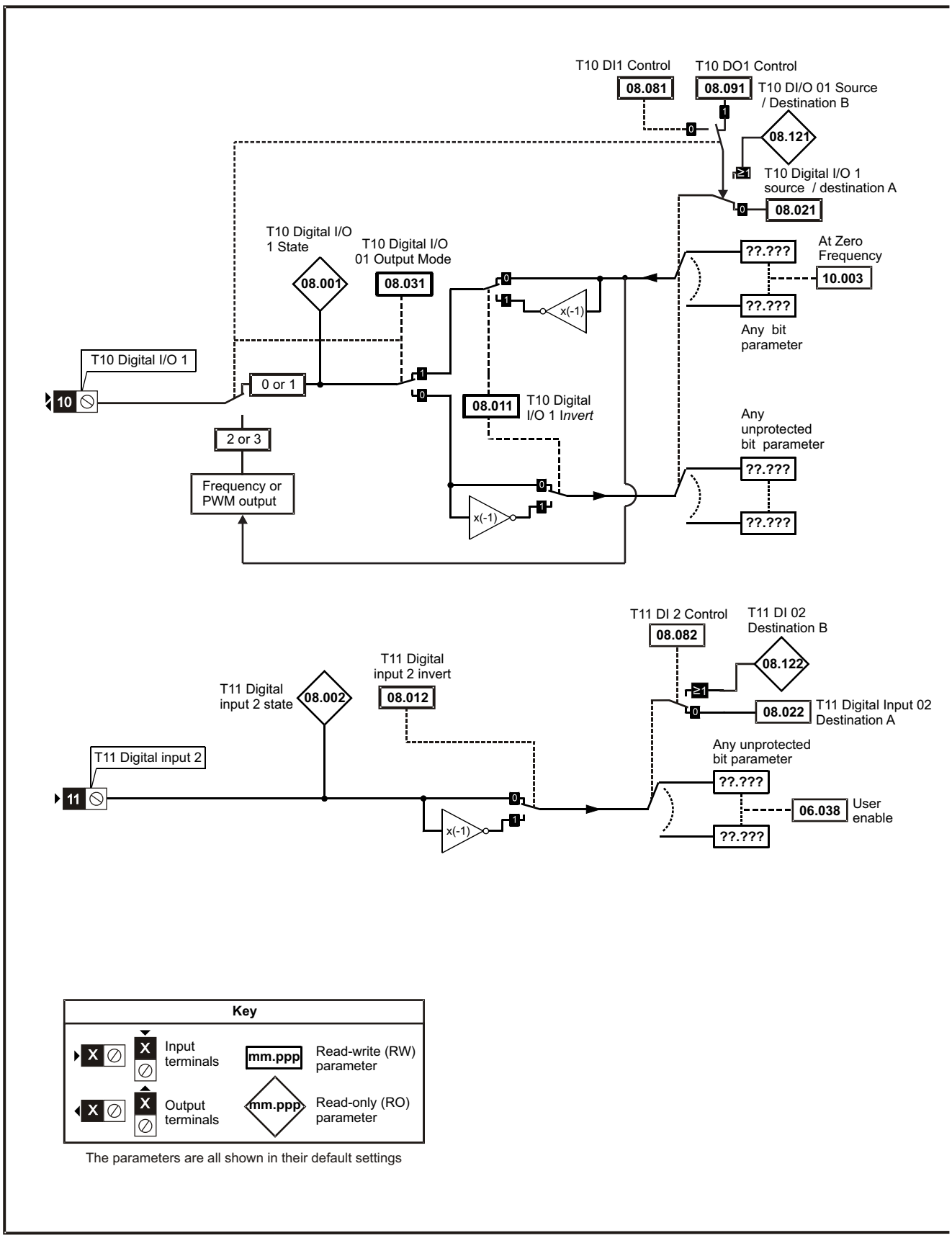
The parameters are all shown in their default settings

Parameter		Range (⇳)	Default(⇨)	Type					
		OL	OL						
07.001	Analog Input 1 (T2)	0.00 to 100.00 %		RO	Num	ND	NC	PT	FI
07.004	Stack Temperature	± 250 °C		RO	Num	ND	NC	PT	
07.005	Auxiliary Temperature	± 250 °C		RO	Num	ND	NC	PT	
07.007	Analog Input 1 Mode (T2)	4-20.S (-6), 20-4.S (-5), 4-20.L (-4), 20-4.L (-3), 4-20.H (-2), 20-4.H (-1), 0-20 (0), 20-0 (1), 4-20.tr (2), 20-4.tr (3), 4-20 (4), 20-4 (5), VoLt (6)	VoLt (6)	RW	Txt				US
07.008	Analog Input 1 Scaling (T2)	0.000 to 10.000	1.000	RW	Num				US
07.009	Analog Input 1 Invert (T2)	Off (0) or On (1)	Off (0)	RW	Bit				US
07.010	Analog Input 1 Destination A (T2)	0.000 to 30.999	1.036	RW	Num	DE		PT	US
07.026	Analog Input 1 Preset on Current Loss (T2)	4.00 to 20.00	4.00	RW	Num				US
07.028	Analog Input 1 Current Loop Loss (T2)	Off (0) or On (1)		RO	Bit	ND	NC	PT	
07.030	Analog Input 1 Offset (T2)	± 100.00 %	0.00 %	RW	Num				US
07.034	Inverter Temperature	± 250 °C		RO	Num	ND	NC	PT	
07.035	Percentage Of d.c. Link Thermal Trip Level	0 to 100 %		RO	Num	ND	NC	PT	
07.036	Percentage Of Drive Thermal Trip Level	0 to 100 %		RO	Num	ND	NC	PT	
07.037	Temperature Nearest To Trip Level	0 to 1999		RO	Num	ND	NC	PT	
07.051	Analog Input 1 Control (T2)	0 to 5	0	RW	Num				US
07.061	Analog Input 1 Minimum Reference (T2)	0.00 to 100.00 %	0.00 %	RW	Num				US
07.062	Analog Input 1 At Minimum Reference (T2)	± 100.00 %	0.00 %	RW	Num				US
07.063	Analog Input 1 Maximum Reference (T2)	0.00 to 100.00 %	100.00 %	RW	Num				US
07.064	Analog Input 1 At Maximum Reference (T2)	± 100.00 %	100.00 %	RW	Num				US
07.090	Analog Input 1 Destination B (T2)	0.000 to 30.999		RO	Num	DE	NC	PT	US

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

10.9 Menu 8: Digital I/O

Figure 10-9 Menu 8 logic diagram



The parameters are all shown in their default settings

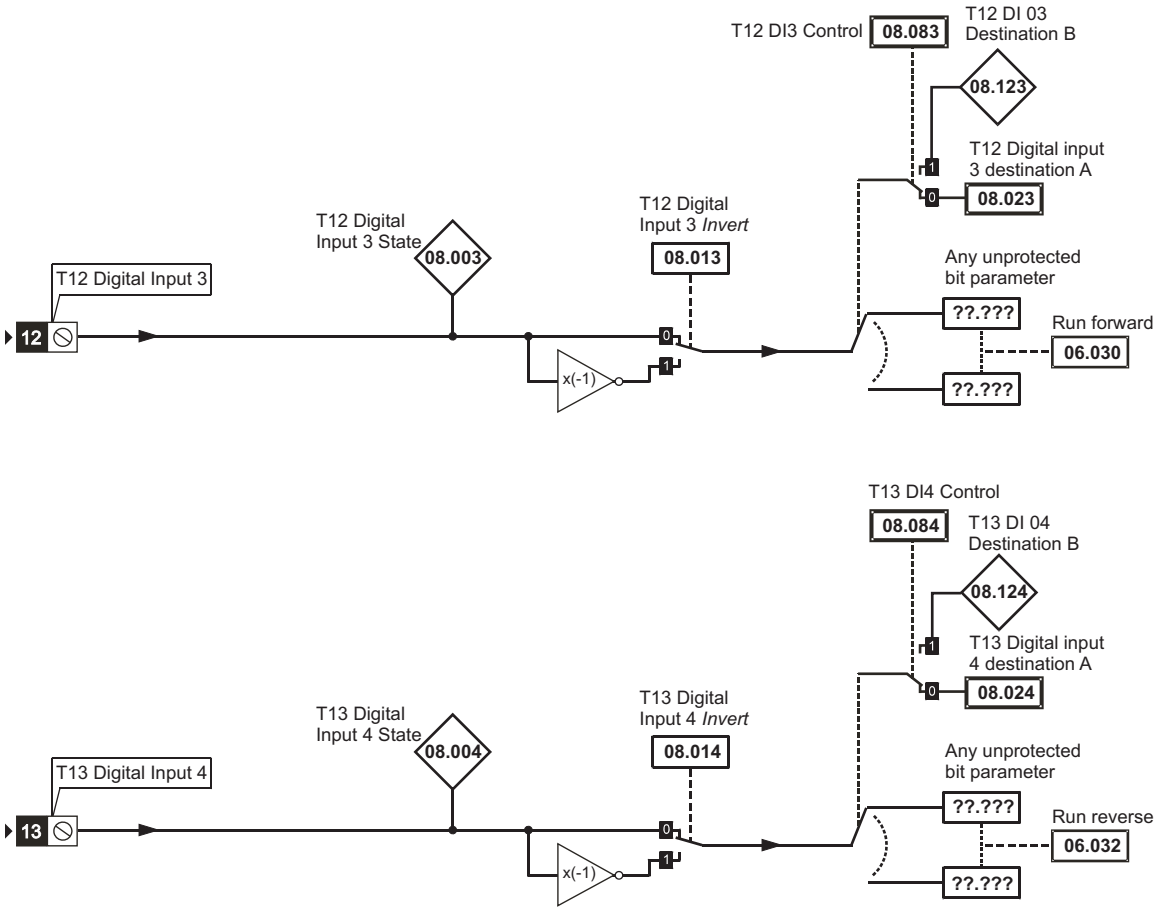
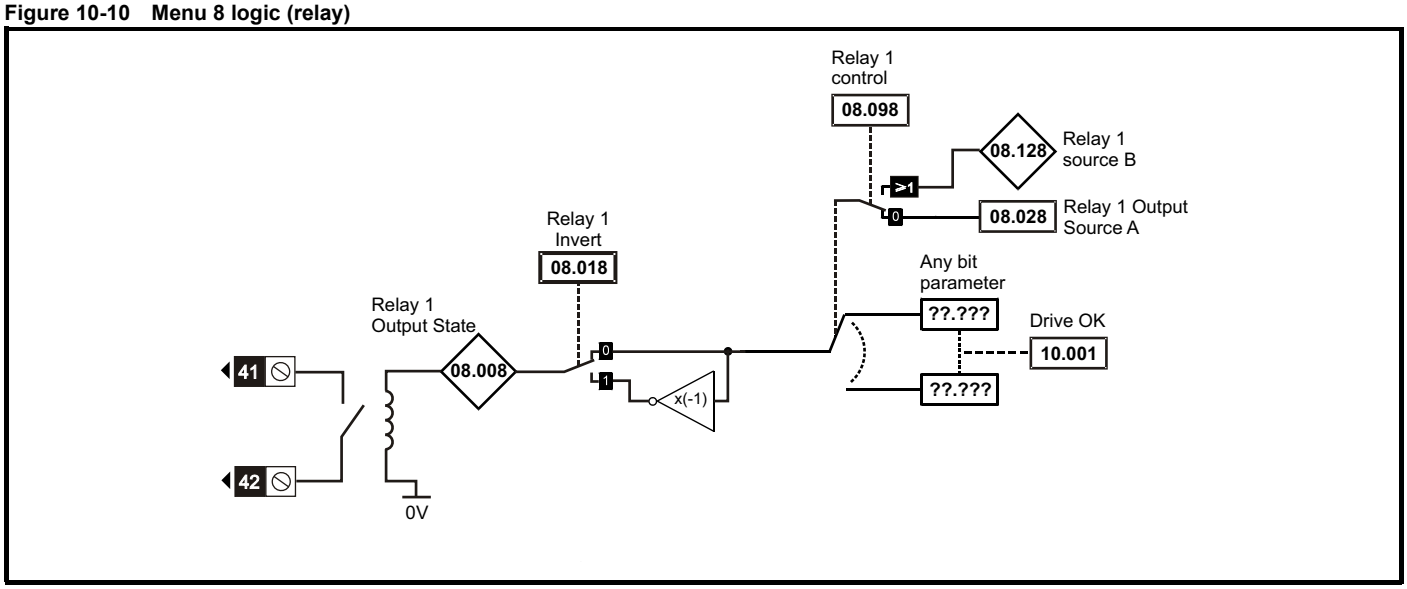

T12 DI3 Control
08.083
T12 DI 03 Destination B
08.123
T12 Digital input 3 destination A
08.023
T12 Digital Input 3 State
08.003
T12 Digital Input 3 Invert
08.013
T12 Digital Input 3
12
x(-1)
Any unprotected bit parameter
??.???
??.???
Run forward
06.030
T13 DI4 Control
08.084
T13 DI 04 Destination B
08.124
T13 Digital input 4 destination A
08.024
T13 Digital Input 4 State
08.004
T13 Digital Input 4 Invert
08.014
T13 Digital Input 4
13
x(-1)
Any unprotected bit parameter
??.???
??.???
Run reverse
06.032

Figure 10-10 Menu 8 logic (relay)



Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
08.001	Digital I/O 1 State (T10)	Off (0) or On (1)		RO	Bit	ND	NC	PT	
08.002	Digital Input 2 State(T11)	Off (0) or On (1)		RO	Bit	ND	NC	PT	
08.003	Digital Input 3 State (T12)	Off (0) or On (1)		RO	Bit	ND	NC	PT	
08.004	Digital Input 4 State (T13)	Off (0) or On (1)		RO	Bit	ND	NC	PT	
08.008	Relay 1 Output State	Off (0) or On (1)		RO	Bit	ND	NC	PT	
08.011	Digital I/O 1 Invert (T10)	Not.Inv (0), InvErt (1)	Not.Inv (0)	RW	Txt				US
08.012	Digital Input 2 Invert (T11)	Not.Inv (0), InvErt (1)	Not.Inv (0)	RW	Txt				US
08.013	Digital Input 3 Invert (T12)	Not.Inv (0), InvErt (1)	Not.Inv (0)	RW	Txt				US
08.014	Digital Input 4 Invert (T13)	Not.Inv (0), InvErt (1)	Not.Inv (0)	RW	Txt				US
08.018	Relay 1 Invert	Not.Inv (0), InvErt (1)	Not.Inv (0)	RW	Txt				US
08.020	Digital I/O Read Word	0 to 2048		RO	Num	ND	NC	PT	
08.021	Digital IO1 Source / Destination A (T10)	0.000 to 30.999	10.003	RW	Num	DE		PT	US
08.022	Digital Input 2 Destination A (T11)	0.000 to 30.999	6.038	RW	Num	DE		PT	US
08.023	Digital Input 03 Destination A (T12)	0.000 to 30.999	6.030	RW	Num	DE		PT	US
08.024	Digital Input 04 Destination A (T13)	0.000 to 30.999	6.032	RW	Num	DE		PT	US
08.028	Relay 1 Output Source A	0.000 to 30.999	10.001	RW	Num			PT	US
08.031	Digital I/O 01 Output Mode (T10)	InPut (0), OutPut (1), Fr (2), PuLSE (3)	OutPut (1)	RW	Txt				US
08.043	24 V Supply Input State	Off (0) or On (1)		RO	Bit	ND	NC	PT	
08.053	24 V Supply Invert	Not.Inv (0), InvErt (1)	Not.Inv (0)	RW	Txt				US
08.063	24 V Supply Input Destination	0.000 to 30.999	0.000	RW	Num	DE		PT	US
08.081	DI1 Control (T10)	0 to 21	0	RW	Num				US
08.082	DI2 Control (T11)	0 to 21	0	RW	Num				US
08.083	DI3 Control (T12)	0 to 21	0	RW	Num				US
08.084	DI4 Control (T13)	0 to 21	0	RW	Num				US
08.091	DO1 Control	0 to 20	0	RW	Num				US
08.098	Relay 1 Control	0 to 20	0	RW	Num				US
08.121	DI/O 01 Source / Destination B (T10)	0.000 to 30.999		RO	Num	DE	NC	PT	US
08.122	Digital Input 2 Destination B (T11)	0.000 to 30.999		RO	Num	DE	NC	PT	US
08.123	DI 03 Destination B (T12)	0.000 to 30.999		RO	Num	DE	NC	PT	US
08.124	DI 04 Destination B (T13)	0.000 to 30.999		RO	Num	DE	NC	PT	US
08.128	Relay 01 Source B	0.000 to 30.999	0.000	RO	Num		NC	PT	US

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

10.10 Menu 10: Status and trips

Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
10.001	Drive OK	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.002	Drive Active	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.003	Zero Frequency	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.004	Running At or Below Minimum Frequency	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.005	Below Set Frequency	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.006	At Frequency	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.007	Above Set Frequency	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.008	Rated Load Reached	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.009	Current Limit Active	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.010	Regenerating	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.011	Braking IGBT Active	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.012	Braking Resistor Alarm	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.013	Reverse Direction Commanded	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.014	Reverse Direction Running	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.015	Supply Loss	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.016	Under Voltage Active	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.017	Motor Overload Alarm	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.018	Drive Over-temperature Alarm	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.019	Drive Warning	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.020	Trip 0	0 to 255		RO	Txt	ND	NC	PT	PS
10.021	Trip 1	0 to 255		RO	Txt	ND	NC	PT	PS
10.022	Trip 2	0 to 255		RO	Txt	ND	NC	PT	PS
10.023	Trip 3	0 to 255		RO	Txt	ND	NC	PT	PS
10.024	Trip 4	0 to 255		RO	Txt	ND	NC	PT	PS
10.025	Trip 5	0 to 255		RO	Txt	ND	NC	PT	PS
10.026	Trip 6	0 to 255		RO	Txt	ND	NC	PT	PS
10.027	Trip 7	0 to 255		RO	Txt	ND	NC	PT	PS
10.028	Trip 8	0 to 255		RO	Txt	ND	NC	PT	PS
10.029	Trip 9	0 to 255		RO	Txt	ND	NC	PT	PS
10.030	Braking Resistor Rated Power	0.0 to 99999.9 kW	0.0 kW	RW	Num				US
10.031	Braking Resistor Thermal Time Constant	0.00 to 1500.00 s	0.00 s	RW	Num				US
10.032	External Trip	Off (0) or On (1)	Off (0)	RW	Bit		NC		
10.033	Drive Reset	Off (0) or On (1)	Off (0)	RW	Bit		NC		
10.034	Number Of Auto-reset Attempts	NonE (0), 1 (1), 2 (2), 3 (3), 4 (4), 5 (5),inF (6)	NonE (0)	RW	Txt				US
10.035	Auto-reset Delay	0.0 to 600.0 s	1.0 s	RW	Num				US
10.036	Auto-reset Hold Drive Healthy	Off (0) or On (1)	Off (0)	RW	Bit				US
10.037	Action On Trip Detection	0 to 31	0	RW	Num				US
10.038	User Trip	0 to 255		RW	Num	ND	NC		
10.039	Braking Resistor Thermal Accumulator	0.0 to 100.0 %		RO	Num	ND	NC	PT	
10.040	Status Word	0 to 32767		RO	Num	ND	NC	PT	
10.041	Trip 0 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.042	Trip 0 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.043	Trip 1 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.044	Trip 1 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.045	Trip 2 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.046	Trip 2 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.047	Trip 3 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.048	Trip 3 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.049	Trip 4 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.050	Trip 4 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.051	Trip 5 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS

Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
10.052	Trip 5 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.053	Trip 6 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.054	Trip 6 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.055	Trip 7 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.056	Trip 7 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.057	Trip 8 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.058	Trip 8 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.059	Trip 9 Date	00-00-00 to 31-12-99		RO	Date	ND	NC	PT	PS
10.060	Trip 9 Time	00:00:00 to 23:59:59		RO	Time	ND	NC	PT	PS
10.061	Braking Resistor Resistance	0.00 to 10000.00 Ω	0.00 Ω	RW	Num				US
10.065	Autotune Active	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.066	Limit Switch Active	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.068	Hold Drive Healthy On Under Voltage	Off (0) or On (1)	Off (0)	RW	Bit				US
10.069	Additional Status Bits	0 to 2047		RO	Num	ND	NC	PT	
10.070	Trip 0 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.071	Trip 1 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.072	Trip 2 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.073	Trip 3 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.074	Trip 4 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.075	Trip 5 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.076	Trip 6 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.077	Trip 7 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.078	Trip 8 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.079	Trip 9 Sub-trip Number	0 to 65535		RO	Num	ND	NC	PT	PS
10.080	Stop Motor	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.081	Phase Loss	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.090	Drive Ready	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.101	Drive Status	Inh (0), rdy (1), StoP (2), ScAn (3), rES (4), S.LoSS (5), rES (6), dc.inJ (7), rES (8), Error (9), ActivE (10), rES (11), rES (12), rES (13), HEAt (14), UU (15)		RO	Txt	ND	NC	PT	
10.102	Trip Reset Source	0 to 1023		RO	Num	ND	NC	PT	PS
10.103	Trip Time Identifier	-2147483648 to 2147483647 ms		RO	Num	ND	NC	PT	
10.104	Active Alarm	NonE (0), br.rES (1), OV.Ld (2), rES (3), d.OV.Ld (4), tuning (5), LS (6), rES (7), rES (8), rES (9), rES (10), rES (11), rES(12), Lo.AC (13), I.AC.Lt (14), 24.LoSt (15)		RO	Txt	ND	NC	PT	
10.106	Potential Drive Damage Conditions	0 to 3		RO	Bin	ND	NC	PT	PS
10.107	Low AC Alarm	Off (0) or On (1)		RO	Bit	ND	NC	PT	
10.108	Reversed cooling fan detected	Off (0) or On (1)		RO	Bit	ND	NC	PT	

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

10.11 Menu 11: General drive set-up

Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
11.018	Status Mode Parameter 1	0.000 to 30.999	2.001	RW	Num			PT	US
11.019	Status Mode Parameter 2	0.000 to 30.999	4.020	RW	Num			PT	US
11.021	Customer Defined Scaling	0.000 to 10.000	1.000	RW	Num				US
11.022	Parameter Displayed At Power-up	0.000 to 0.094	0.010	RW	Num			PT	US
11.028	Drive Derivative	0 to 255		RO	Num	ND	NC	PT	
11.029	Software Version	00.00.00 to 99.99.99		RO	Ver	ND	NC	PT	
11.030	User Security Code	0 to 9999		RW	Num	ND		PT	US
11.031	User Drive Mode	OPEn.LP (1)		RW	Txt	ND	NC	PT	US
11.032	Maximum Heavy Duty Rating	0.00 to Drive HD Current Rating A		RO	Num	ND	NC	PT	
11.033	Drive Rated Voltage	110V (0), 200V (1), 400V (2),		RO	Txt	ND	NC	PT	
11.034	Drive Configuration	AV (0), AI (1), AV.Pr (2), AI.Pr (3), PrESEt (4), PAd (5), PAd.rEF (6), torquE (8)	AV (0)*	RW	Txt			PT	US
11.035	Power Software Version	00.00.00 to 99.99.99		RO	Ver	ND	NC	PT	
11.036	NV Media Card File Previously Loaded	0 to 999	0	RO	Num		NC	PT	
11.037	NV Media Card File Number	0 to 999	0	RW	Num				
11.038	NV Media Card File Type	NonE (0), OPEn.LP (1)		RO	Txt	ND	NC	PT	
11.039	NV Media Card File Version	0 to 9999		RO	Num	ND	NC	PT	
11.042	Parameter Cloning	NonE (0), rEAd (1), Prog (2), Auto (3), boot (4)	NonE (0)	RW	Txt		NC		US
11.043	Load Defaults	NonE (0), Std (1), US (2)	NonE (0)	RW	Txt		NC		
11.044	User Security Status	LEVEL.1 (0), LEVEL.2 (1), ALL (2), StAtUS (3), no.Acc (4)	LEVEL.1 (0)	RW	Txt	ND		PT	
11.046	Defaults Previously Loaded	0 to 2000		RO	Num	ND	NC	PT	US
11.052	Serial Number LS	0 to 999999		RO	Num	ND	NC	PT	
11.053	Serial Number MS	0 to 999999		RO	Num	ND	NC	PT	
11.054	Drive Date Code	0 to 9999		RO	Num	ND	NC	PT	
11.060	Maximum Rated Current	0.00 to 17.00 A		RO	Num	ND	NC	PT	
11.061	Full Scale Current Kc	0.00 to 37.40 A		RO	Num	ND	NC	PT	
11.063	Product Type	0 to 255		RO	Num	ND	NC	PT	
11.064	Product Identifier Characters	100 / 101		RO	Chr	ND	NC	PT	
11.065	Frame size and voltage code	0 to 999		RO	Num	ND	NC	PT	
11.066	Power Stage Identifier	0 to 255		RO	Num	ND	NC	PT	
11.067	Control Board Identifier	0 to 255		RO	Num	ND	NC	PT	
11.068	Drive current rating	0 to 170		RO	Num	ND	NC	PT	
11.070	Core Parameter Database Version	0.00 to 99.99		RO	Num	ND	NC	PT	
11.072	NV Media Card Create Special File	0 to 1	0	RW	Num		NC		
11.073	NV Media Card Type	NonE(0), rES(1), Sd.CArd(2)		RO	Num	ND	NC	PT	
11.075	NV Media Card Read-only Flag	Off (0) or On (1)		RO	Bit	ND	NC	PT	
11.076	NV Media Card Warning Suppression Flag	Off (0) or On (1)		RO	Bit	ND	NC	PT	
11.077	NV Media Card File Required Version	0 to 9999		RW	Num	ND	NC	PT	
11.079	Drive Name Characters 1-4	□□□□ (-2147483648) to □□□□ (2147483647)	- - - - (757935405)	RW	Chr			PT	US
11.080	Drive Name Characters 5-8	□□□□ (-2147483648) to □□□□ (2147483647)	- - - - (757935405)	RW	Chr			PT	US
11.081	Drive Name Characters 9-12	□□□□ (-2147483648) to □□□□ (2147483647)	- - - - (757935405)	RW	Chr			PT	US
11.082	Drive Name Characters 13-16	□□□□ (-2147483648) to □□□□ (2147483647)	- - - - (757935405)	RW	Chr			PT	US
11.084	Drive Mode	OPEn.LP (1)		RO	Txt	ND	NC	PT	
11.085	Security Status	NonE (0), r.onLy.A (1), StAtUS (2), no.Acc (3)		RO	Txt	ND	NC	PT	PS
11.086	Menu Access Status	LEVEL.1 (0), LEVEL.2 (1), ALL (2)		RO	Txt	ND	NC	PT	PS
11.091	Additional Identifier Characters 1	□□□□ (-2147483648) to □□□□ (2147483647)		RO	Chr	ND	NC	PT	
11.092	Additional Identifier Characters 2	□□□□ (-2147483648) to □□□□ (2147483647)		RO	Chr	ND	NC	PT	

Parameter		Range (⇳)	Default (⇨)	Type					
		OL	OL						
11.093	Additional Identifier Characters 3	□□□□ (-2147483648) to □□□□ (2147483647)		RO	Chr	ND	NC	PT	
11.094	Disable String Mode	Off (0) or On (1)	Off (0)	RW	Bit			PT	US
11.097	AI ID Code	NonE (0), Sd.CArd (1)		RO	Txt	ND	NC	PT	
11.098	24V Alarm Loss Enable	Off (0) or On (1)	Off (0)	RW	Bit				US

* With Unidrive M101, the default is PAd (5).

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

10.12 Menu 22: Additional Menu 0 set-up

Parameter		Range(⇕)	Default(⇨)	Type					
		OL	OL						
22.011	Parameter 00.011 Set-up	0.000 to 30.999	6.004	RW	Num			PT	US
22.012	Parameter 00.012 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.013	Parameter 00.013 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.014	Parameter 00.014 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.015	Parameter 00.015 Set-up	0.000 to 30.999	1.005	RW	Num			PT	US
22.016	Parameter 00.016 Set-up	0.000 to 30.999	7.007	RW	Num			PT	US
22.017	Parameter 00.017 Set-up	0.000 to 30.999	1.010	RW	Num			PT	US
22.018	Parameter 00.018 Set-up	0.000 to 30.999	1.021	RW	Num			PT	US
22.019	Parameter 00.019 Set-up	0.000 to 30.999	1.022	RW	Num			PT	US
22.020	Parameter 00.020 Set-up	0.000 to 30.999	1.023	RW	Num			PT	US
22.021	Parameter 00.021 Set-up	0.000 to 30.999	1.024	RW	Num			PT	US
22.022	Parameter 00.022 Set-up	0.000 to 30.999	11.019	RW	Num			PT	US
22.023	Parameter 00.023 Set-up	0.000 to 30.999	11.018	RW	Num			PT	US
22.024	Parameter 00.024 Set-up	0.000 to 30.999	11.021	RW	Num			PT	US
22.025	Parameter 00.025 Set-up	0.000 to 30.999	11.030	RW	Num			PT	US
22.026	Parameter 00.026 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.027	Parameter 00.027 Set-up	0.000 to 30.999	1.051	RW	Num			PT	US
22.028	Parameter 00.028 Set-up	0.000 to 30.999	2.004	RW	Num			PT	US
22.029	Parameter 00.029 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.030	Parameter 00.030 Set-up	0.000 to 30.999	11.042	RW	Num			PT	US
22.031	Parameter 00.031 Set-up	0.000 to 30.999	6.001	RW	Num			PT	US
22.032	Parameter 00.032 Set-up	0.000 to 30.999	5.013	RW	Num			PT	US
22.033	Parameter 00.033 Set-up	0.000 to 30.999	6.009	RW	Num			PT	US
22.034	Parameter 00.034 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.035	Parameter 00.035 Set-up	0.000 to 30.999	8.091	RW	Num			PT	US
22.036	Parameter 00.036 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.037	Parameter 00.037 Set-up	0.000 to 30.999	5.018	RW	Num			PT	US
22.038	Parameter 00.038 Set-up	0.000 to 30.999	5.012	RW	Num			PT	US
22.039	Parameter 00.039 Set-up	0.000 to 30.999	5.006	RW	Num			PT	US
22.040	Parameter 00.040 Set-up	0.000 to 30.999	5.011	RW	Num			PT	US
22.041	Parameter 00.041 Set-up	0.000 to 30.999	5.014	RW	Num			PT	US
22.042	Parameter 00.042 Set-up	0.000 to 30.999	5.015	RW	Num			PT	US
22.043	Parameter 00.043 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.044	Parameter 00.044 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.045	Parameter 00.045 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.046	Parameter 00.046 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.047	Parameter 00.047 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.048	Parameter 00.048 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.049	Parameter 00.049 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.050	Parameter 00.050 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.051	Parameter 00.051 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.052	Parameter 00.052 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.053	Parameter 00.053 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.054	Parameter 00.054 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.055	Parameter 00.055 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.056	Parameter 00.056 Set-up	0.000 to 30.999	10.020	RW	Num			PT	US
22.057	Parameter 00.057 Set-up	0.000 to 30.999	10.021	RW	Num			PT	US
22.058	Parameter 00.058 Set-up	0.000 to 30.999	10.022	RW	Num			PT	US
22.059	Parameter 00.059 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.060	Parameter 00.060 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.061	Parameter 00.061 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.062	Parameter 00.062 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.063	Parameter 00.063 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.064	Parameter 00.064 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US

Parameter		Range(⇳)	Default(⇨)	Type					
		OL	OL						
22.065	Parameter 00.065 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.066	Parameter 00.066 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.067	Parameter 00.067 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.068	Parameter 00.068 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.069	Parameter 00.069 Set-up	0.000 to 30.999	5.040	RW	Num			PT	US
22.070	Parameter 00.070 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.071	Parameter 00.071 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.072	Parameter 00.072 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.073	Parameter 00.073 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.074	Parameter 00.074 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.075	Parameter 00.075 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US
22.076	Parameter 00.076 Set-up	0.000 to 30.999	10.037	RW	Num			PT	US
22.077	Parameter 00.077 Set-up	0.000 to 30.999	11.032	RW	Num			PT	US
22.078	Parameter 00.078 Set-up	0.000 to 30.999	11.029	RW	Num			PT	US
22.079	Parameter 00.079 Set-up	0.000 to 30.999	11.031	RW	Num			PT	US
22.080	Parameter 00.080 Set-up	0.000 to 30.999	0.000	RW	Num			PT	US

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

11 Diagnostics

The keypad display on the drive gives various information about the status of the drive. The keypad display provides information on the following categories:

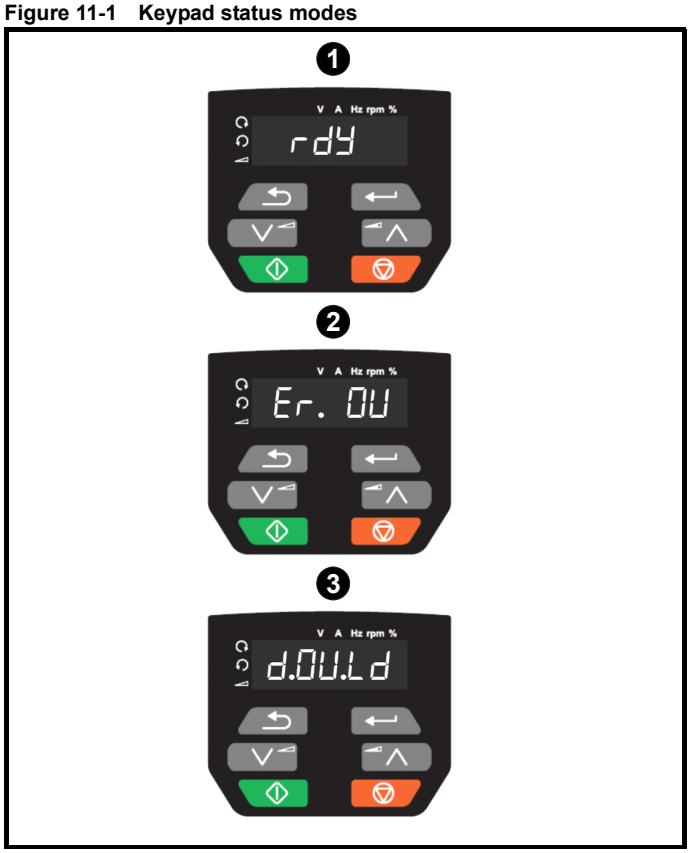
- Trip indications
- Alarm indications
- Status indications

WARNING

Users must not attempt to repair a drive if it is faulty, nor carry out fault diagnosis other than through the use of the diagnostic features described in this chapter.
If a drive is faulty, it must be returned to an authorized Control Techniques distributor for repair.

11.1 Status modes

Figure 11-1 Keypad status modes



1 Drive OK status

2 Trip status

3 Alarm status

11.2 Trip indications

The output of the drive is disabled under any trip condition so that the drive stops controlling the motor. If the motor is running when the trip occurs it will coast to a stop.

During a trip condition, the display indicates that a trip has occurred and the keypad will display the trip string. Some trips have a sub-trip number to provide additional information about the trip. If a trip has a sub-trip number, the sub-trip number is flashed alternately with the trip string.

Trips are listed alphabetically in Table 11-2 based on the trip indication shown on the drive display.

11.3 Identifying a trip / trip source

Some trips only contain a trip string whereas some other trips have a trip string along with a sub-trip number which provides the user with additional information about the trip.

A trip can be generated from a control system or from a power system. The sub-trip number associated with the trips listed in Table 11-1 is in the form xxyzz and used to identify the source of the trip.

Table 11-1 Trips associated with xxyzz sub-trip number

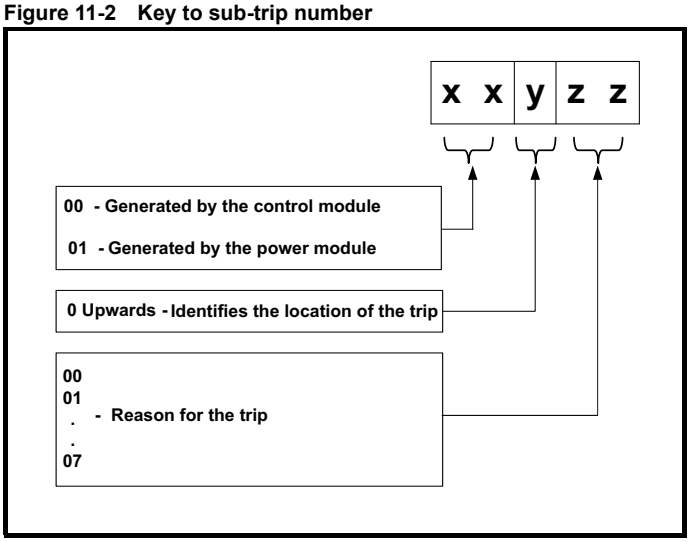
OV	OI.Sn
PSU	PH.Lo
Oht.I	tH.Fb
Oht.P	P.dAt
Oh.dc	

The digits xx are 00 for a trip generated by the control system. For a drive, if the trip is related to the power system then xx will have a value of 01, when displayed the leading zeros are suppressed.

For a control system trip (xx is zero), the y digit where relevant is defined for each trip. If not relevant, the y digit will have a value of zero.

The zz digits give the reason for the trip and are defined in each trip description.

Figure 11-2 Key to sub-trip number



11.4 Trips, Sub-trip numbers

Table 11-2 Trip indications

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>C.Acc</td><td>NV Media Card Write fail</td></tr>
<tr><td>185</td><td>The C.Acc trip indicates that the drive was unable to access the NV Media Card. If the trip occurs during the data transfer to the card then the file being written may be corrupted. If the trip occurs when the data being transferred to the drive then the data transfer may be incomplete. If a parameter file is transferred to the drive and this trip occurs during the transfer, the parameters are not saved to non-volatile memory, and so the original parameters can be restored by powering the drive down and up again.
Recommended actions:
• Check NV Media Card is installed / located correctly
• Replace the NV Media Card</td></tr>
<tr><td>C.cPr</td><td>NV Media Card file/data is different to the one in the drive</td></tr>
<tr><td>188</td><td>A compare has been carried out between a file on the NV Media Card and the drive, a C.cPr trip is initiated if the parameters on the NV Media Card are different to the drive.
Recommended actions:
• Set Pr 00 to 0 and reset the trip
• Check to ensure the correct data block on the NV Media Card has been used for the compare</td></tr>
<tr><td>C.d.E</td><td>NV Media Card data location already contains data</td></tr>
<tr><td>179</td><td>The C.d.E trip indicates that an attempt has been made to store data on a NV Media Card in a data block which already contains data.
Recommended actions:
• Erase the data in data location
• Write data to an alternative data location</td></tr>
<tr><td>C.dAt</td><td>NV Media Card data not found</td></tr>
<tr><td>183</td><td>The C.dAt trip indicates that an attempt has been made to access a non-existent file on the NV Media Card.
No data is transferred.
Recommended actions:
• Ensure data file number is correct</td></tr>
<tr><td>C.Err</td><td>NV Media Card data structure error</td></tr>
<tr><td>182</td><td>The C.Err trip indicates that an attempt has been made to access the NV Media Card but an error has been detected in the data structure on the card. Resetting the trip will cause the drive to erase and create the correct folder structure. On an SD card, whilst this trip is present, missing directories will be created and if the header file is missing it will be created. The cause of the trip can be identified by the sub-trip.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>The required folder and file structure is not present</td></tr>
<tr><td>2</td><td>The 000.DAT file is corrupted</td></tr>
<tr><td>3</td><td>Two or more files in the <MCDF\> folder have the same file identification number</td></tr>
</table>
Recommended actions:
• Erase all the data block and re-attempt the process
• Ensure the card is located correctly
• Replace the NV Media Card</td></tr>
<tr><td>C.FuL</td><td>NV Media Card full</td></tr>
<tr><td>184</td><td>The C.FuL trip indicates that an attempt has been made to create a data block on a NV Media Card, but there is not enough space left on the card. No data is transferred.
Recommended actions:
• Delete a data block or the entire NV Media Card to create space
• Use a different NV Media Card</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>C.Pr</td><td>NV Media Card data blocks are not compatible with the drive derivative</td></tr>
<tr><td>175</td><td>The C.Pr trip is initiated either at power-up or when the card is accessed, If Drive Derivative (11.028) or Product Type (11.063) are different between the source and target drives. This trip can be reset and data can be transferred in either direction between the drive and the card.
<table><tr><th>Sub-trip</th><th>Reason</th></tr><tr><td>1</td><td>If Drive Derivative (11.028) is different between the source and target drives. This trip is initiated either at power-up or when the SD card is accessed. This trip can be reset and data can be transferred in either direction between the drive and the card.</td></tr><tr><td>2</td><td>If Product Type (11.063) is different between the source and target drives or the file is corrupted or incompatible. This trip is initiated either at power-up or when the SD card is accessed. This trip can be reset but no data are transferred in either direction between the drive and the card.</td></tr></table>Recommended actions:
• Use a different NV Media Card
• This trip can be suppressed by setting Pr 00 to 9666 and resetting the drive
• Choose a file compatible between the source and target drives, if sub-trip 2.</td></tr>
<tr><td>C.rdo</td><td>NV Media Card has the Read Only bit set</td></tr>
<tr><td>181</td><td>The C.rdo trip indicates that an attempt has been made to modify data on a read-only NV Media Card or to modify a read-only data block. A NV Media Card is read-only if the read-only flag has been set.
Recommended actions:
• Clear the read only flag by setting Pr 00 to 9777 and reset the drive. This will clear the read-only flag for all data blocks in the NV Media Card</td></tr>
<tr><td>C.rtg</td><td>NV Media Card Trip; The voltage and / or current rating of the source and destination drives are different</td></tr>
<tr><td>186</td><td>The C.rtg trip indicates that parameter data is being transferred from the NV Media Card to the drive, but the current and / or voltage ratings are different between source and destination drives. This trip also applies if a compare (using Pr 00 set to 8yyy) is performed between the data block on a NV Media Card and the drive. The C.rtg trip does not stop the data transfer but is a warning that rating specific parameters with the RA attribute may not be transferred to the destination drive.
Recommended actions:
• Reset the drive to clear the trip
• Ensure that the drive rating dependent parameters have transferred correctly
• This trip can be suppressed by setting Pr mm.000 to 9666 and resetting the drive.</td></tr>
<tr><td>C.tyP</td><td>NV Media Card parameter set not compatible with current drive mode</td></tr>
<tr><td>187</td><td>The C.tyP trip is produced during a compare if the drive mode in the data block on the NV Media Card is different from the current drive mode. This trip is also produced if an attempt is made to transfer parameters from a NV Media Card to the drive if the operating mode in the data block is outside the allowed range of operating modes, for the target drive.
Recommended actions:
• Ensure the destination drive supports the drive operating mode in the parameter file.
• Clear the value in Pr 00 and reset the drive
• Ensure destination drive operating mode is the same as the source parameter file</td></tr>
<tr><td>cL.A1</td><td>Analog input 1 current loss</td></tr>
<tr><td>28</td><td>The cL.A1 trip indicates that a current loss was detected in current mode on Analog input 1 (Terminal 2). In 4-20 mA and 20-4 mA modes loss of input is detected if the current falls below 3 mA.
Recommended actions:
• Check control wiring is correct
• Check control wiring is undamaged
• Check the Analog Input 1 Mode (07.007)
• Current signal is present and greater than 3 mA</td></tr>
<tr><td>Cur.c</td><td>Current calibration range</td></tr>
<tr><td>231</td><td>Current calibration range error.
Recommended actions:
• Hardware fault - contact the supplier of the drive.</td></tr>
<tr><td>Cur.O</td><td>Current feedback offset error</td></tr>
<tr><td>225</td><td>The Cur.O trip indicates that the current offset is too large to be trimmed.
Recommended actions:
• Ensure that there is no possibility of current flowing in the output phases of the drive when the drive is not enabled
• Hardware fault – contact the supplier of the drive</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>d.Ch</td><td>Drive parameters are being changed</td></tr>
<tr><td>97</td><td>A user action or a file system write is active that is changing the drive parameters and the drive has been commanded to enable, i.e. Drive Active (10.002) = 1.
Recommended actions:
• Ensure the drive is not enabled when defaults are being loaded</td></tr>
<tr><td>dEr.E</td><td>Derivative file error</td></tr>
<tr><td>246</td><td>Derivative file error with sub-trips:
<table>
<tr><th>Sub-trip</th><th>Reason</th><th>Comments</th></tr>
<tr><td>1</td><td>The derivative file is missing or is invalid</td><td>Occurs when the drive powers-up. Load valid derivative file matching the control board hardware.</td></tr>
<tr><td>2</td><td>The derivative file does not match the control board hardware</td><td>Occurs when the drive powers-up. Load valid derivative file matching the control board hardware.</td></tr>
<tr><td>3</td><td>The derivative file has been changed for a file with a different derivative number.</td><td>Occurs when the drive powers-up or the file is programmed. The file tasks will not run.</td></tr>
</table>
Recommended actions:
• Contact the supplier of the drive.</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>dEr.I</td><td>Derivative product image error</td></tr>
<tr><td>248</td><td>The dEr.I trip indicates that an error has been detected in the derivative product image. The reason for the trip can be identified by the sub-trip number.
<table>
<tr><th>Sub-trip</th><th>Reason</th><th>Comments</th></tr>
<tr><td>1</td><td>Divide by zero</td><td></td></tr>
<tr><td>2</td><td>Undefined trip</td><td></td></tr>
<tr><td>3</td><td>Attempted fast parameter access set-up with non-existent parameter</td><td></td></tr>
<tr><td>4</td><td>Attempted access to non-existent parameter</td><td></td></tr>
<tr><td>5</td><td>Attempted write to read-only parameter</td><td></td></tr>
<tr><td>6</td><td>Attempted an over-range write</td><td></td></tr>
<tr><td>7</td><td>Attempted read from write-only parameter</td><td></td></tr>
<tr><td>30</td><td>The image has failed because either its CRC is incorrect, or there are less than 6 bytes in the image or the image header version is less than 5</td><td>Occurs when the drive powers-up or the image is programmed. The image tasks will not run</td></tr>
<tr><td>31</td><td>The image requires more RAM for heap and stack than can be provided by the drive.</td><td>As 30</td></tr>
<tr><td>32</td><td>The image requires an OS function call that is higher than the maximum allowed.</td><td>As 30</td></tr>
<tr><td>33</td><td>The ID code within the image is not valid</td><td>As 30</td></tr>
<tr><td>34</td><td>The derivative image has been changed for an image with a different derivative number</td><td>As 30</td></tr>
<tr><td>40</td><td>The timed task has not completed in time and has been suspended</td><td>Reduce code in timed task or power down repeat rate</td></tr>
<tr><td>41</td><td>Undefined function called, i.e. a function in the host system vector table that has not been assigned</td><td>As 40</td></tr>
<tr><td>51</td><td>Core menu customization table CRC check failed</td><td>As 30</td></tr>
<tr><td>52</td><td>Customizable menu table CRC check failed</td><td>As 30</td></tr>
<tr><td>53</td><td>Customizable menu table changed</td><td>Occurs when the drive powers-up or the image is programmed and the table has changed. Defaults are loaded for the derivative menu and the trip will keep occurring until drive parameters are saved.</td></tr>
<tr><td>80</td><td>Image is not compatible with the control board</td><td>Initiated from within the image code</td></tr>
<tr><td>81</td><td>Image is not compatible with the control board serial number</td><td>As 80</td></tr>
</table>
Recommended actions:
• Contact the supplier of the drive</td></tr>
<tr><td>dESt</td><td>Two or more parameters are writing to the same destination parameter</td></tr>
<tr><td>199</td><td>The dESt trip indicates that destination parameters of two or more functions (Menus 7 and 8) within the drive are writing to the same parameter.
Recommended actions:
• Set Pr 00 to ‘dest’ or 12001 and check all visible parameters in all menus for parameter write conflicts</td></tr>
<tr><td>dr.CF</td><td>Drive configuration</td></tr>
<tr><td>232</td><td>The hardware ID does not match the user software ID.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>Reserved</td></tr>
<tr><td>2</td><td>Invalid hardware ID</td></tr>
<tr><td>3</td><td>The hardware ID does not match the user software ID (Size 1-4)</td></tr>
</table>
Recommended actions:
Hardware fault – contact the supplier of the drive</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>EEF</td><td>Default parameters have been loaded</td></tr>
<tr><td>31</td><td>The EEF trip indicates that default parameters have been loaded. The exact cause/reason of the trip can be identified from the sub-trip number.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>The most significant digit of the internal parameter database version number has changed</td></tr>
<tr><td>2</td><td>The CRC's applied to the parameter data stored in internal non-volatile memory indicate that a valid set of parameters cannot be loaded</td></tr>
<tr><td>3</td><td>The drive mode restored from internal non-volatile memory is outside the allowed range for the product or the derivative image does not allow the previous drive mode</td></tr>
<tr><td>4</td><td>The drive derivative image has changed</td></tr>
<tr><td>5</td><td>The power stage hardware has changed</td></tr>
<tr><td>6</td><td>Reserved</td></tr>
<tr><td>7</td><td>Reserved</td></tr>
<tr><td>8</td><td>The control board hardware has changed</td></tr>
<tr><td>9</td><td>The checksum on the non-parameter area of the EEPROM has failed</td></tr>
</table>
The drive holds two banks of user save parameters and two banks of power down save parameters in non-volatile memory. If the last bank of either set of parameters that was saved is corrupted a U.S or Pd.S trip is produced. If one of these trips occurs the parameters values that were last saved successfully are used. It can take some time to save parameters when requested by the user and if the power is removed from the drive during this process it is possible to corrupt the data in the non-volatile memory.
If both banks of user save parameters or both banks of power down save parameters are corrupted or one of the other conditions given in the table above occurs EEF.xxx trip is produced. If this trip occurs it is not possible to use the data that has been saved previously, and so the drive will be loaded with default parameters. The trip can only be reset if Parameter 00 (mm.000) is set to 10, 11, 1233 or 1244 or if Load Defaults (11.043) is set to a non-zero value.
Recommended actions:
• Default the drive and perform a reset
• Allow sufficient time to perform a save before the supply to the drive is removed
• If the trip persists - return drive to supplier</td></tr>
<tr><td>Et</td><td>An External trip is initiated</td></tr>
<tr><td>6</td><td>An Et trip has occurred. The cause of the trip can be identified from the sub trip number displayed after the trip string. See table below.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>3</td><td>External Trip (10.032) = 1</td></tr>
</table>
Recommended actions:
• Check the value of Pr 10.032.
• Select ‘dest’ (or enter 12001) in Pr 00 and check for a parameter controlling Pr 10.032.</td></tr>
<tr><td>FAn.F</td><td>Fan fail</td></tr>
<tr><td>173</td><td>This trip cannot be reset until 10s after the trip was initiated.
Recommended actions:
• Check that the fan is installed and connected correctly.
• Check that the fan is not obstructed.
• Contact the supplier of the drive to replace the fan.</td></tr>
<tr><td>Fi.Ch</td><td>File changed</td></tr>
<tr><td>247</td><td>Recommended action:
• Power cycle the drive.</td></tr>
<tr><td>FI.In</td><td>Firmware Incompatibility</td></tr>
<tr><td>237</td><td>The FI.In trip indicates that the user firmware is incompatible with the power firmware.
Recommended actions:
• Contact the supplier of the drive.</td></tr>
<tr><td>HF01</td><td>Data processing error: CPU hardware fault</td></tr>
<tr><td></td><td>The HF01 trip indicates that a CPU address error has occurred. This trip indicates that the control PCB on the drive has failed.
Recommended actions:
• Hardware fault – Contact the supplier of the drive</td></tr>
</table>

Trip	Diagnosis
HF02	**Data processing error: CPU memory management fault**
	The *HF02* trip indicates that a DMAC address error has occurred. This trip indicates that the control PCB on the drive has failed. **Recommended actions:** • Hardware fault – Contact the supplier of the drive
HF03	**Data processing error: CPU has detected a bus fault**
	The *HF03* trip indicates that a bus fault has occurred. This trip indicates that the control PCB on the drive has failed. **Recommended actions:** • Hardware fault – Contact the supplier of the drive
HF04	**Data processing error: CPU has detected a usage fault**
	The *HF04* trip indicates that a usage fault has occurred.This trip indicates that the control PCB on the drive has failed. **Recommended actions:** • Hardware fault – Contact the supplier of the drive
HF05	**Reserved**
HF06	**Reserved**
HF07	**Data processing error: Watchdog failure**
	The *HF07* trip indicates that a watchdog failure has occurred. This trip indicates that the control PCB on the drive has failed. **Recommended actions:** • Hardware fault – Contact the supplier of the drive
HF08	**Data processing error: CPU Interrupt crash**
	The *HF08* trip indicates that a CPU interrupt crash has occurred. This trip indicates that the control PCB on the drive has failed. The crash level is indicated by the sub-trip number. **Recommended actions:** • Hardware fault – Contact the supplier of the drive
HF09	**Data processing error: Free store overflow**
	The *HF09* trip indicates that a free store overflow has occurred. This trip indicates that the control PCB on the drive has failed. **Recommended actions:** • Hardware fault – Contact the supplier of the drive
HF10	**Reserved**
HF11	**Data processing error: Non-volatile memory comms error**
	The *HF11* trip indicates that a non-volatile memory comms error has occurred. The crash level is indicated by the sub-trip number. This trip indicates that the control PCB on the drive has failed.

Sub-trip	Reason	Recommended action
1	Non-volatile memory comms error.	Hardware fault – contact the supplier of the drive.
2	EEPROM size is incompatible with the user firmware.	Contact the supplier of the drive.

Trip	Diagnosis
HF12	**Data processing error: main program stack overflow**
	The *HF12* trip indicates that the main program stack overflow has occurred. The stack can be identified by the sub-trip number. This trip indicates that the control PCB on the drive has failed.

Sub-trip	Reason
1	Derivative background stack overflow
2	Derivative timed stack overflow
3	Main system interrupt stack overflow
4	Main system background stack overflow

Trip	Diagnosis
	Recommended actions: • Hardware fault - Contact the supplier of the drive.
HF13	**Reserved**
HF14	**Reserved**

Trip	Diagnosis
HF15	**Reserved**
HF16	**Data processing error: RTOS error**
	The *HF16* trip indicates that a RTOS error has occurred. This trip indicates that the control PCB on the drive has failed. **Recommended actions:** • Hardware fault – Contact the supplier of the drive
HF17	**Reserved**
HF18	**Reserved**
HF19	**Data processing error: CRC check on the firmware has failed**
	The *HF19* trip indicates that the CRC check on the drive firmware has failed. **Recommended actions:** • If this trip occurs - contact the supplier of the drive
HF23	**Hardware fault**
	Recommended actions: • Hardware fault - Contact the supplier of the drive
It.Ac	**Output current overload timed out (I^2t)**
20	The *It.Ac* trip indicates a motor thermal overload based on the *Motor Rated Current* (Pr **05.007**) and *Motor Thermal Time Constant* (Pr **04.015**). Pr **04.019** displays the motor temperature as a percentage of the maximum value. The drive will trip on *It.Ac* when Pr **04.019** gets to 100 %. **Recommended actions:** • Ensure the load is not jammed / sticking • Check the load on the motor has not changed • Ensure the motor rated current is not zero
It.br	**Braking resistor overload timed out (I^2t)**
19	The *It.br* trip indicates that braking resistor overload has timed out. The value in *Braking Resistor Thermal Accumulator* (10.039) is calculated using *Braking Resistor Rated Power* (10.030), *Braking Resistor Thermal Time Constant* (10.031) and *Braking Resistor Resistance* (10.061). The *It.br* trip is initiated when the *Braking Resistor Thermal Accumulator* (10.039) reaches 100 %. **Recommended actions:** • Ensure the values entered in Pr **10.030**, Pr **10.031** and Pr **10.061** are correct. • Check resistor value and power rating. • If an external thermal protection device is being used and the braking resistor software overload protection is not required, set Pr **10.030**, Pr **10.031** or Pr **10.061** to 0 to disable the trip.
no.PS	**No power board**
236	No communication between the power and control boards. **Recommended actions**: • Hardware fault - Contact the supplier of the drive
O.Ld1	**Digital output overload**
26	This trip indicates that the total current drawn from the AI Adaptor 24 V or from the digital output has exceeded the limit. **Sub-trip** / **Reason** 1 – Digital output or 24 V supply load on control terminal is too high. 2 – AI Adaptor 24 V load is too high **Recommended actions:** • Check total loads on digital outputs and 24 V • Check control wiring is correct • Check output wiring is undamaged
O.SPd	**Motor frequency has exceeded the over frequency threshold**
7	In open-loop mode, if the *Post-ramp Reference* (02.001) exceeds the threshold set in the *Over Frequency Threshold* (03.008) in either direction, an *O.SPd* trip is produced. If Pr **03.008** is set to 0.00 the threshold is then equal to 1.2 x the value set in Pr **01.006**. **Recommended actions:** • Check that a mechanical load is not driving motor • Reduce *Current Controller Ki Gain* (04.014)

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>Oh.dc</td><td>DC bus over temperature</td></tr>
<tr><td>27</td><td>The Oh.dc trip indicates a DC bus component over temperature based on a software thermal model. The drive includes a thermal protection system to protect the DC bus components within the drive. This includes the effects of the output current and DC bus ripple. The estimated temperature is displayed as a percentage of the trip level in Pr 07.035. If this parameter reaches 100 % then an Oh.dc trip is initiated. The drive will attempt to stop the motor before tripping. If the motor does not stop in 10 seconds the drive trips immediately.
<table>
<tr><th>Source</th><th>xx</th><th>y</th><th>zz</th><th>Description</th></tr>
<tr><td>Control system</td><td>00</td><td>2</td><td>00</td><td>DC bus thermal model gives trip with sub-trip 0</td></tr>
</table>
Recommended actions:
• Check the AC supply voltage balance and levels
• Check DC bus ripple level
• Reduce duty cycle
• Reduce motor load
• Check the output current stability. If unstable;
Check the motor map settings with motor nameplate (Pr 05.006, Pr 05.007, Pr 05.008, Pr 05.009, Pr 05.010, Pr 05.011)
Disable slip compensation (Pr 05.027 = 0)
Disable dynamic V to F operation (Pr 05.013 = 0)
Select fixed boost (Pr 05.014 = Fixed)
Select high stability space vector modulation (Pr 05.019 = 1)
Disconnect the load and complete a rotating autotune (Pr 05.012)</td></tr>
<tr><td>Oht.C</td><td>Control stage over-temperature</td></tr>
<tr><td>219</td><td>This trip indicates that a control stage over-temperature has been detected if Cooling Fan control (06.045) = 0.
Recommended actions:
Increase ventilation by setting Cooling Fan control (06.045) > 0</td></tr>
<tr><td>Oht.I</td><td>Inverter over temperature based on thermal model</td></tr>
<tr><td>21</td><td>This trip indicates that an IGBT junction over-temperature has been detected based on a software thermal model.The Oht.I trip is initiated when the temperature based on the thermal model reaches 145 °C. The trip reset temperature is 139 °C.
<table>
<tr><th>Source</th><th>xx</th><th>y</th><th>zz</th><th>Description</th></tr>
<tr><td>Control system</td><td>00</td><td>1</td><td>00</td><td>Inverter thermal model gives {Oht.I} trip with sub-trip 100</td></tr>
</table>
Recommended actions:
• Reduce the selected drive switching frequency
• Ensure Auto-switching Frequency Change Disable (05.035) is set to OFF
• Reduce duty cycle
• Increase acceleration / deceleration rates
• Reduce motor load
• Check DC bus ripple
• Ensure all three input phases are present and balanced</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>Oht.P</td><td>Power stage over temperature</td></tr>
<tr><td>22</td><td>This trip indicates that a power stage over-temperature has been detected. From the sub-trip ‘xxyzz’, the Thermistor location is identified by ‘zz’.
<table>
<tr><th>Source</th><th>xx</th><th>y</th><th>zz</th><th>Description</th></tr>
<tr><td>Power system</td><td>01</td><td>0</td><td>zz</td><td>Thermistor location in the drive defined by zz</td></tr>
</table>
<table>
<tr><th>Drive size</th><th>Trip temperature (°C)</th><th>Trip reset temperature (°C)</th></tr>
<tr><td>1 to 4</td><td>95</td><td>90</td></tr>
</table>
Recommended actions:
• Check enclosure / drive fans are still functioning correctly
• Force the heatsink fans to run at maximum speed
• Check enclosure ventilation paths
• Check enclosure door filters
• Increase ventilation
• Reduce the drive switching frequency
• Reduce duty cycle
• Increase acceleration / deceleration rates
• Use S ramp (Pr 02.006)
• Reduce motor load
• Check the derating tables and confirm the drive is correctly sized for the application.
• Use a drive with larger current / power rating</td></tr>
<tr><td>OI.A1</td><td>Analog input 1 over-current</td></tr>
<tr><td>189</td><td>Current input on analog input 1 exceeds 24mA.</td></tr>
<tr><td>OI.AC</td><td>Instantaneous output over current detected</td></tr>
<tr><td>3</td><td>The instantaneous drive output current has exceeded VM_DRIVE_CURRENT_MAX.
This trip cannot be reset until 10s after the trip was initiated.
Recommended actions/checks:
• Increase acceleration/deceleration rate
• If seen during autotune reduce the voltage boost
• Check for short circuit on the output cabling
• Check integrity of the motor insulation using an insulation tester
• Is the motor cable length within limits for the frame size?
• Reduce the values in the current loop gain parameters</td></tr>
<tr><td>OI.br</td><td>Braking IGBT over current detected: short circuit protection for the braking IGBT activated</td></tr>
<tr><td>4</td><td>The OI.br trip indicates that over current has been detected in braking IGBT or braking IGBT protection has been activated.
This trip cannot be reset until 10s after the trip was initiated.
Recommended actions:
• Check brake resistor wiring
• Check braking resistor value is greater than or equal to the minimum resistance value
• Check braking resistor insulation</td></tr>
<tr><td>OI.SC</td><td>Output phase short-circuit</td></tr>
<tr><td>228</td><td>Over-current detected on drive output when enabled. Possible motor ground fault.
Recommended actions:
• Check for short circuit on the output cabling
• Check integrity of the motor insulation using an insulation tester
• Is the motor cable length within limits for the frame size?</td></tr>
</table>

Trip	Diagnosis
Out.P	**Output phase loss detected**
98	The *Out.P* trip indicates that phase loss has been detected at the drive output. **Sub-trip** / **Reason** 1 – U phase detected as disconnected when drive enabled to run. 2 – V phase detected as disconnected when drive enabled to run. 3 – W phase detected as disconnected when drive enabled to run. 4 – The drive output frequency is above 4 Hz and a phase is disconnected for the time specified by *Output Phase Loss Detection Time* (06.058). **NOTE** If Pr **05.042** = 1, the physical output phases are reversed, and so sub-trip 3 refers to physical output phase V and sub-trip 2 refers to physical output phase W. **Recommended actions:** • Check motor and drive connections • To disable the trip set *Output Phase Loss Detection Enable* (06.059) = 0
OV	**DC bus voltage has exceeded the peak level or maximum continuous level for 15 seconds**
2	The *OV* trip indicates that the DC bus voltage has exceeded the VM_DC_VOLTAGE[MAX] or VM_DC_VOLTAGE_SET[MAX] for 15 s. The trip threshold varies depending on voltage rating of the drive as shown below. **Voltage rating** / **VM_DC_VOLTAGE[MAX]** / **VM_DC_VOLTAGE_SET[MAX]** 100 / 510 / 400 200 / 510 / 400 400 / 870 / 800 **Sub-trip Identification** **Source** / **xx** / **y** / **zz** Control system / 00 / 0 / 01: Instantaneous trip when the DC bus voltage exceeds VM_DC_VOLTAGE[MAX]. Control system / 00 / 0 / 02: Time delayed trip indicating that the DC bus voltage is above VM_DC_VOLTAGE_SET[MAX]. Power system / 01 / 0 / 00: Instantaneous trip when the DC bus voltage exceeds VM_DC_VOLTAGE[MAX]. **Recommended actions:** • Increase deceleration ramp (Pr **04**) • Decrease the braking resistor value (staying above the minimum value) • Check nominal AC supply level • Check for supply disturbances which could cause the DC bus to rise • Check motor insulation using an insulation tester

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>P.dAt</td><td>Power system configuration data error</td></tr>
<tr><td>220</td><td>The P.dAt trip indicates that there is an error in the configuration data stored in the power system. This trip is generated from within the drive control system or from the power system. The trip is related to the table uploaded from the power system at power-up.
<table>
<tr><th>Source</th><th>xx</th><th>y</th><th>zz</th><th>Description</th></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>01</td><td>No data was obtained from the power board.</td></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>02</td><td>There is no data table.</td></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>03</td><td>The power system data table is bigger than the space available in the control pod to store it.</td></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>04</td><td>The size of the table given in the table is incorrect.</td></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>05</td><td>Table CRC error.</td></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>06</td><td>The version number of the generator software that produced the table is too low.</td></tr>
<tr><td>Control system</td><td>0</td><td>0</td><td>07</td><td>The power data table failed to be stored in the power board.</td></tr>
<tr><td>Power system</td><td>01</td><td>0</td><td>00</td><td>The power data table used internally by the power module has an error.</td></tr>
<tr><td>Power system</td><td>01</td><td>0</td><td>01</td><td>The power data table that is uploaded to the control system on power up has an error.</td></tr>
<tr><td>Power system</td><td>01</td><td>0</td><td>02</td><td>The power data table used internally by the power module does not match the hardware identification of the power module.</td></tr>
</table>
Recommended actions:
• Hardware fault – Contact the supplier of the drive</td></tr>
<tr><td>Pb.bt</td><td>Power board is in bootloader mode</td></tr>
<tr><td>245</td><td>Power board is in bootloader mode
Recommended actions:
• Contact the supplier of the drive.</td></tr>
<tr><td>Pb.Er</td><td>Communication has been lost / errors detected between control and power processor</td></tr>
<tr><td>93</td><td>The Pb.Er trip is initiated if there is no communications between the control board processor and the power board processor. The reason for the trip can be identified by the sub-trip number.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>PLL operating region out of lock</td></tr>
<tr><td>2</td><td>Power board lost communication with user board</td></tr>
<tr><td>3</td><td>User board lost communication with power board</td></tr>
<tr><td>4</td><td>Communication CRC error</td></tr>
</table>
Recommended actions:
• Hardware fault – Contact the supplier of the drive</td></tr>
<tr><td>Pb.HF</td><td>Power board HF</td></tr>
<tr><td>235</td><td>Power processor hardware fault. The sub-trip number is the HF code.
Recommended actions:
• Hardware fault - Contact the supplier of the drive</td></tr>
<tr><td>Pd.S</td><td>Power down save error</td></tr>
<tr><td>37</td><td>The Pd.S trip indicates that an error has been detected in the power down save parameters saved in non-volatile memory.
Recommended actions:
• Perform a 1001 save in Pr 00 to ensure that the trip doesn’t occur the next time the drive is powered up.</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>PH.Lo</td><td>Supply phase loss</td></tr>
<tr><td>32</td><td>The PH.Lo trip indicates that the drive has detected an input phase loss or large supply imbalance. The drive will attempt to stop the motor before this trip is initiated. If the motor cannot be stopped in 10 seconds the trip occurs immediately. The PH.Lo trip works by monitoring the ripple voltage on the DC bus of the drive, if the DC bus ripple exceeds the threshold, the drive will trip on PH.Lo. Potential causes of the DC bus ripple are input phase loss, Large supply impedance and severe output current instability.
<table>
<tr><th>Source</th><th>xx</th><th>y</th><th>zz</th></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>00: Phase loss detected based on control system feedback. The drive attempts to stop the drive before tripping unless bit 2 of Action On Trip Detection (10.037) is set to one.</td></tr>
</table>
Input phase loss detection can be disabled when the drive is required to operate from the DC supply or from a single phase supply in Input Phase Loss Detection Mode (06.047).
Recommended actions:
• Check the AC supply voltage balance and level at full load
• Check the DC bus ripple level with an isolated oscilloscope
• Check the output current stability
• Check for mechanical resonance with the load
• Reduce the duty cycle
• Reduce the motor load
• Disable the phase loss detection, set Pr 06.047 to 2.</td></tr>
<tr><td>PSU</td><td>Internal power supply fault</td></tr>
<tr><td>5</td><td>The PSU trip indicates that one or more internal power supply rails are outside limits or overloaded.
<table>
<tr><th>Source</th><th>xx</th><th>y</th><th>zz</th><th>Description</th></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td rowspan="2">00</td><td rowspan="2">Internal power supply overload.</td></tr>
<tr><td>Power system</td><td>01</td><td>1</td></tr>
</table>
Recommended actions:
• There is a hardware fault within the drive – return the drive to the supplier</td></tr>
<tr><td>r.b.ht</td><td>Hot rectifier/brake</td></tr>
<tr><td>250</td><td>Over-temperature detected on input rectifier or braking IGBT.
Recommended action:
• Increase ventilation by setting Cooling Fan Control (06.045) > 0.</td></tr>
<tr><td>Reserved</td><td>Reserved trips</td></tr>
<tr><td>01
09
12
14-17
23, 29
38, 39
90 - 91, 92, 94 - 96
99
101 - 109
111
168 - 172
176 - 177
190 - 198
205 - 217
222 - 224
229 - 230, 233
238 - 244
249, 251 - 254</td><td>These trip numbers are reserved trip numbers for future use.
<table>
<tr><th>Trip Number</th><th>Description</th></tr>
<tr><td>01, 09, 12, 14-17, 23, 29, 38, 39</td><td>Reserved resettable trip</td></tr>
<tr><td>90, 91, 92, 94-96, 99</td><td>Reserved resettable trip</td></tr>
<tr><td>101 - 109, 111</td><td>Reserved resettable trip</td></tr>
<tr><td>168-172, 176-177</td><td>Reserved resettable trip</td></tr>
<tr><td>190 – 198</td><td>Reserved resettable trip</td></tr>
<tr><td>205-217</td><td>Reserved resettable trip</td></tr>
<tr><td>222-224</td><td>Reserved non-resettable trip</td></tr>
<tr><td>229-230, 233</td><td>Reserved non-resettable trip</td></tr>
<tr><td>238 - 244, 249</td><td>Reserved non-resettable trip</td></tr>
<tr><td>251-254</td><td>Reserved non-resettable trip</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Trip</th><th>Diagnosis</th></tr>
<tr><td>rS</td><td>Measured resistance has exceeded the parameter range</td></tr>
<tr><td>33</td><td>
The rS trip indicates that the measured stator resistance of the motor during an autotune test has exceeded the maximum possible value of Stator Resistance (05.017).

If the measured value or a value written to this parameter by the user exceeds ($V_{FS}/\sqrt{2}$) / Full Scale Current Kc (11.061), where V_{FS} is the full scale DC bus voltage then this trip is initiated.

The stationary autotune is initiated using the autotune function (Pr 05.012) or in open loop vector mode (Pr 05.014) on the first run command after power up in mode 4 (Ur_I) or on every run command in modes 0 (Ur_S) or 3 (Ur_Auto). This trip can occur if the motor is very small in comparison to the rating of the drive.

If the value is the result of a measurement made by the drive then sub-trip 0 is applied, or if it is because the parameter has been changed by the user then sub-trip 3 is applied. During the stator resistance section of auto-tuning an additional test is performed to measure the drive inverter characteristics to provide the compensation necessary for dead-times. If the inverter characteristic measurement fails then sub-trip 2 is applied.

The reason for the trip can be identified by the sub-trip number.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>0</td><td>Stator resistance (5.017/21.012) is greater than (V_{FS} / √2) / Full Scale Current Kc (11.061), where V_{FS} is the full scale d.c. bus voltage; or the result is = 100 ohms.</td></tr>
<tr><td>2</td><td>The measured Transient Inductance (5.024/21.014) is greater than 500 mH or the measured Stator Inductance (05.025/21.024) is greater than 5000 mH.</td></tr>
<tr><td>3</td><td>A resistance value entered by the user is greater than (V_{FS} / √2) / Full Scale Current Kc (11.061), where V_{FS} is the full scale d.c. bus voltage. Clear this trip by setting Stator Resistance (05.017) to a value that is in range and resetting the drive.</td></tr>
<tr><td>4</td><td>The measured stator resistance is not greater than the sub-trip 0 check but is outside the firmware usable range for this drive size.</td></tr>
</table>
Recommended actions:
• Ensure the stator resistance of the motor falls within the range of the drive model. The most likely cause of this trip is trying to measure a motor much smaller than the drive rating. Ratio's of drive size to motor size of greater than 15:1 are likely to lead to a problem.
• Check that a value has not been entered in the stator resistance for the presently selected motor map that exceeds the allowed range.
• Check the motor cable / connections
• Check the integrity of the motor stator winding using a insulation tester
• Check the motor phase to phase resistance at the drive terminals
• Check the motor phase to phase resistance at the motor terminals
• Ensure the stator resistance of the motor falls within the range of the drive model
• Select fixed boost mode (Pr 05.014 = Fd) and verify the output current waveforms with an oscilloscope
• Replace the motor
</td></tr>
<tr><td>So.St</td><td>Soft start relay failed to close, soft start monitor failed</td></tr>
<tr><td>226</td><td>
The So.St trip indicates that the soft start relay in the drive failed to close or the soft start monitoring circuit has failed. The cause of the trip can be identified by the sub-trip number.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>Soft-start failure</td></tr>
<tr><td>2</td><td>DC bus capacitor failure on 110 V drive</td></tr>
</table>
Recommended actions:
• Hardware fault – Contact the supplier of the drive
</td></tr>
<tr><td>St.HF</td><td>Hardware trip has occurred during last power down</td></tr>
<tr><td>221</td><td>
The St.HF trip indicates that a hardware trip (HF01 –HF18) has occurred and the drive has been power cycled. The sub-trip number identifies the HF trip.

Recommended actions:
• Enter 1299 in Pr mm.000 and press reset to clear the trip
</td></tr>
<tr><td>Sto</td><td>No Safe Torque Off board fitted</td></tr>
<tr><td>234</td><td>
Internal STO board not fitted correctly

Recommended actions:
Hardware fault – Contact the supplier of the drive
</td></tr>
</table>

Trip	Diagnosis
th.br	**Brake resistor over temperature**
10	The *th.br* trip is initiated if the hardware based braking resistor thermal monitoring is connected and the resistor overheats. If the braking resistor is not used, then this trip must be disabled with bit 3 of Action *On Trip Detection* (10.037) to prevent this trip. **Recommended actions:** • Check brake resistor wiring • Check braking resistor value is greater than or equal to the minimum resistance value • Check braking resistor insulation
tH.Fb	**Internal thermistor has failed**
218	The *tH.Fb* trip indicates that an internal thermistor has failed in the drive (i.e. open circuit or short circuit). The thermistor location can be identified by the sub-trip number. **Source** / **xx** / **y** / **zz** Power system / 01 / 0 / Thermistor location defined by zz **Recommended actions:** • Hardware fault – Contact the supplier of the drive
tun.S	**Autotune test stopped before completion**
18	The drive was prevented from completing an autotune test, because either the drive enable or the drive run were removed. **Recommended actions:** • Check the drive enable signal (Terminal 11) was active during the autotune • Check the run command was active in digtal input 3 or 4 state (Pr **08.003** or Pr **08.004**) during the autotune.
tun.1	**Required speed could not be reached**
11	The drive has tripped during an autotune. The cause of the trip can be identified from the sub-trip number. **Sub-trip** / **Reason** 2 / The motor did not reach the required speed during rotating autotune. **Recommended actions:** • Ensure the motor is free to turn i.e. mechanical brake is released
U.OI	**User OI ac**
8	The U.OI trip is initiated if the output current of the drive exceeds the trip level set by *User Over Current Trip Level* (04.041).
U.S	**User Save error / not completed**
36	The *U.S* trip indicates that an error has been detected in the user save parameters saved in non-volatile memory. For example, following a user save command, If the power to the drive was removed when the user parameters were being saved. **Recommended actions:** • Perform a user save in Pr **00** to ensure that the trip doesn't occur the next time the drive is powered up. • Ensure that the drive has enough time to complete the save before removing the power to the drive.

The trips can be grouped into the following categories. It should be noted that a trip can only occur when the drive is not tripped or is already tripped but with a trip with a lower priority number.

Table 11-3 Trip categories

Priority	Category	Trips	Comments
1	Internal faults	HFxx	These indicate internal problems and cannot be reset. All drive features are inactive after any of these trips occur.
1	Stored HF trip	{St.HF}	This trip cannot be cleared unless 1299 is entered into *Parameter* **00** and a reset is initiated.
2	Non-resettable trips	Trip numbers 218 to 247	These trips cannot be reset.
3	Volatile memory failure	{EEF}	This can only be reset if Parameter **00** is set to 1233 or 1244, or if *Load Defaults* (11.043) is set to a non-zero value.
4	NV Media Card trips	Trip numbers 174, 175 and 177 to 188	These trips are priority 5 during power-up.
4	Internal 24V	{PSU}	
5	Trips with extended reset times	{OI.AC}, {OI.br}, and FAn.F.	These trips cannot be reset until 10 s after the trip was initiated.
5	Phase loss and d.c. jumper power circuit protection	{PH.Lo} and {Oh.dc}	The drive will attempt to stop the motor before tripping if a {PH.Lo} trip occurs unless this feature has been disabled (see *Action On Trip Detection* (10.037). The drive will always attempt to stop the motor before tripping if an {Oh.dc} occurs.
5	Standard trips	All other trips	

11.5 Internal / Hardware trips

Trips {HF01} to {HF23} are internal faults that do not have trip numbers except HF08, HF11, HF12 and HF18. If one of these trips occurs, the main drive processor has detected an irrecoverable error. All drive functions are stopped and the trip message will be displayed on the drive keypad. If a non permanent trip occurs this may be reset by power cycling the drive. On power up after it has been power cycled the drive will trip on St.HF (the sub-trip number indicates the HF fault code). Enter 1299 in Pr **00** to clear the Stored HF trip.

11.6 Alarm indications

In any mode, an alarm is an indication given on the display by alternating the alarm string with the drive status string display. If an action is not taken to eliminate any alarm except "tuning", “LS" and “24.LoSt” the drive may eventually trip. Alarms are not displayed when a parameter is being edited.

Table 11-4 Alarm indications

Alarm string	Description
br.res	Brake resistor overload. *Braking Resistor Thermal Accumulator* (10.039) in the drive has reached 75.0 % of the value at which the drive will trip.
OV.Ld	*Motor Protection Accumulator* (04.019) in the drive has reached 75.0 % of the value at which the drive will trip and the load on the drive is >100 %.
d.OV.Ld	Drive over temperature. *Percentage Of Drive Thermal Trip Level* (07.036) in the drive is greater than 90 %.
tuning	The autotune procedure has been initialized and an autotune in progress.
LS	Limit switch active. Indicates that a limit switch is active and that is causing the motor to be stopped.
Lo.AC	Low voltage mode. See *Low AC Alarm* (10.107).
I.AC.Lt	Current limit active. See *Current Limit Active* (10.009).
24.LoSt	24V backup not present. See *24V Alarm Loss Enable* (11.098).

11.7 Status indications

Table 11-5 Status indications

String	Description	Drive output stage
inh	The drive is inhibited and cannot be run. Either the drive enable signal is not applied to the drive enable terminals or Pr **06.015** is set to 0.	Disabled
rdy	The drive is ready to run. The drive enable is active, but the drive inverter is not active because the final drive run is not active.	Disabled
Stop	The drive is stopped / holding zero speed.	Enabled
S.Loss	Supply loss condition has been detected.	Enabled
dc.inj	The drive is applying dc injection braking.	Enabled
Er	The drive has tripped and no longer controlling the motor. The trip code appears in the display.	Disabled
UV	The drive is in the under voltage state either in low voltage or high voltage mode.	Disabled
HEAt	The motor pre-heat function is active.	Enabled

Table 11-6 Status indications at power-up

String	Status
PS.LOAD	Waiting for power stage
The drive is waiting for the processor in the power stage to respond after power-up	

11.8 Displaying the trip history

The drive retains a log of the last ten trips that have occurred. *Trip 0* (10.020) to *Trip 9* (10.029) store the most recent 10 trips that have occurred where *Trip 0* (10.020) is the most recent and *Trip 9* (10.029) is the oldest. When a new trip occurs it is written to *Trip 0* (10.020) and all the other trips move down the log, with oldest being lost. The date and time when each trip occurs are also stored in the date and time log, i.e. *Trip 0 Date* (10.041) to *Trip 9 Time* (10.060). The date and time are taken from *Date* (06.016) and *Time* (06.017). Some trips have sub-trip numbers which give more detail about the reason for the trip. If a trip has a sub-trip number its value is stored in the sub-trip log, i.e. *Trip 0 Sub-trip Number* (10.070) to *Trip 9 Sub-trip Number* (10.079). If the trip does not have a sub-trip number then zero is stored in the sub-trip log.

11.9 Behavior of the drive when tripped

If the drive trips, the output of the drive is disabled so the load coasts to a stop. If any trip occurs, the following read only parameters are frozen until the trip is cleared. This is to help diagnose the cause of the trip.

Parameter	Description
01.001	Frequency reference
01.002	Pre-skip filter reference
01.003	Pre-ramp reference
01.069	Reference in rpm
01.070	Clamped reference
02.001	Post-ramp reference
03.001	Final demand ref
04.001	Current magnitude
04.002	Active current
04.017	Reactive current
05.001	Output frequency
05.002	Output voltage
05.003	Power
05.005	DC bus voltage
07.001	Analog input 1

If the parameters are not required to be frozen then this can be disabled by setting bit 4 of Pr **10.037**.

12 UL Listing

12.1 UL file reference

All models are UL Listed to both Canadian and US requirements. The UL file reference is: NMMS/7.E171230.

12.2 Option modules, kits and accessories

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

12.3 Enclosure ratings

All models are Open Type as supplied.

The drive enclosure is not classified as a fire enclosure. A separate fire enclosure must be provided. A UL/ NEMA Type 12 enclosure is suitable.

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

When installed in a Type 1 or Type 12 enclosure, the drives may be operated in a compartment handling conditioned air.

12.4 Mounting

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

12.5 Environment

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

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

12.6 Electrical Installation

OVERVOLTAGE CATEGORY

OVC III

SUPPLY

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

TERMINAL TORQUE

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

WIRING TERMINALS

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

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

GROUND CONNECTION INSTRUCTIONS

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

BRANCH CIRCUIT PROTECTION

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

OPENING OF BRANCH CIRCUIT

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

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

DYNAMIC BRAKING

M100, M101, M200, M201, M300 or M400, frame sizes 1 to 4 have been evaluated for dynamic braking applications.

12.7 Motor overload protection and thermal memory retention

All drives incorporate internal overload protection for the motor load that does not require the use of an external or remote overload protection device.

The protection level is adjustable and the method of adjustment is provided in section 8.4 *Motor thermal protection* on page 36. Maximum current overload is dependent on the values entered into the current limit parameters (motoring current limit, regenerative current limit and symmetrical current limit entered as percentage) and the motor rated current parameter (entered in amperes).

The duration of the overload is dependent on motor thermal time constant. The maximum programmable time constant depends on the drive model. The method of adjustment of the overload protection is provided.

The drives are provided with user terminals that can be connected to a motor thermistor to protect the motor from high temperature, in the event of a motor cooling fan failure.

12.8 External Class 2 supply

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

12.9 Modular Drive Systems

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

Alternatively, the inverters may be supplied by converter models: Mentor MP25A, 45A, 75A, 105A, 155A or 210A.

Contact the supplier of the drive for more information.

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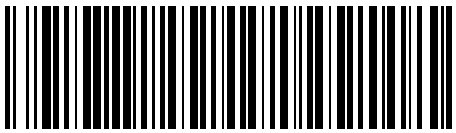
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