Nidec
All for dreams

Open Loop Mode
Setup Guide

Elevator Drive

Induction motors

Part Number: 0479-0041-01
Issue: 1

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.drive-setup.com/ctdownloads**

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Contents

1 Safety information

1.1 Warnings, Cautions and Notes

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

WARNING

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

CAUTION

NOTE

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

1.2 Important safety information. Hazards. Competence of designers and installers

This guide applies to products which control electric motors either directly (drives) or indirectly (controllers, option modules and other auxiliary equipment and accessories). In all cases the hazards associated with powerful electrical drives are present, and all safety information relating to drives and associated equipment must be observed.

Specific warnings are given at the relevant places in this guide.

Drives and controllers are intended as components for professional incorporation into complete systems. If installed incorrectly they may present a safety hazard. The drive uses high voltages and currents, carries a high level of stored electrical energy, and is used to control equipment which can cause injury. Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction.
System design, installation, commissioning/start-up and maintenance must be carried out by personnel who have the necessary training and competence. They must read this safety information and this guide carefully.

1.3 Responsibility

It is the responsibility of the installer to ensure that the equipment is installed correctly with regard to all instructions given in this guide. They must give due consideration to the safety of the complete system, so as to avoid the risk of injury both in normal operation and in the event of a fault or of reasonably foreseeable misuse.

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

1.4 Compliance with regulations

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

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

All machinery to be supplied within the European Union in which this product is used must comply with the following directives:

2006/42/EC Safety of machinery.

2014/30/EU: Electromagnetic Compatibility.

1.5 Electrical hazards

The voltages used in the drive can cause severe electrical shock and/or burns, and could be lethal. Extreme care is necessary at all times when working with or adjacent to the drive. Hazardous voltage may be present in any of the following locations:

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

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

The supply must be disconnected by an approved electrical isolation device before gaining access to the electrical connections.

The STOP and Safe Torque Off functions of the drive do not isolate dangerous voltages from the output of the drive or from any external option unit.

The drive must be installed in accordance with the instructions given in this guide. Failure to observe the instructions could result in a fire hazard.

1.6 Stored electrical charge

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

1.7 Mechanical hazards

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

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

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

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.

1.8 Access to equipment

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

1.9 Environmental limits

Instructions in this guide regarding transport, storage, installation and use of the equipment must be complied with, including the specified environmental limits. This includes temperature, humidity, contamination, shock and vibration. Drives must not be subjected to excessive physical force.

1.10 Hazardous environments

The equipment must not be installed in a hazardous environment (i.e. a potentially explosive environment).

1.11 Motor

The safety of the motor under variable speed conditions must be ensured.

To avoid the risk of physical injury, do not exceed the maximum specified speed of the motor.

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

The values of the motor parameters set in the drive affect the protection of the motor. The default values in the drive must not be relied upon. It is essential that the correct value is entered in the Motor Rated Current parameter.

1.12 Mechanical brake control

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

1.13 Adjusting parameters

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

1.14 Electromagnetic compatibility (EMC)

Installation instructions for a range of EMC environments are provided in the E300 Elevator drive Installation and System Design guide. If the installation is poorly designed or other equipment does not comply with suitable 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 place of use.

2 Introduction

Before reading this Setup guide it is assumed that the user is familiar with the Elevator drive and user documentation Installation and System Design Guide and Parameter Reference Guide. This Setup guide contains the required detail for setup and commissioning of the Elevator drive for Open loop mode operation within a geared Lift system. Detail does not include detailed parameter listings, for full descriptions refer to the Installation and System Design Guide, Parameter Reference Guide.

3 Elevator Drive Keypad

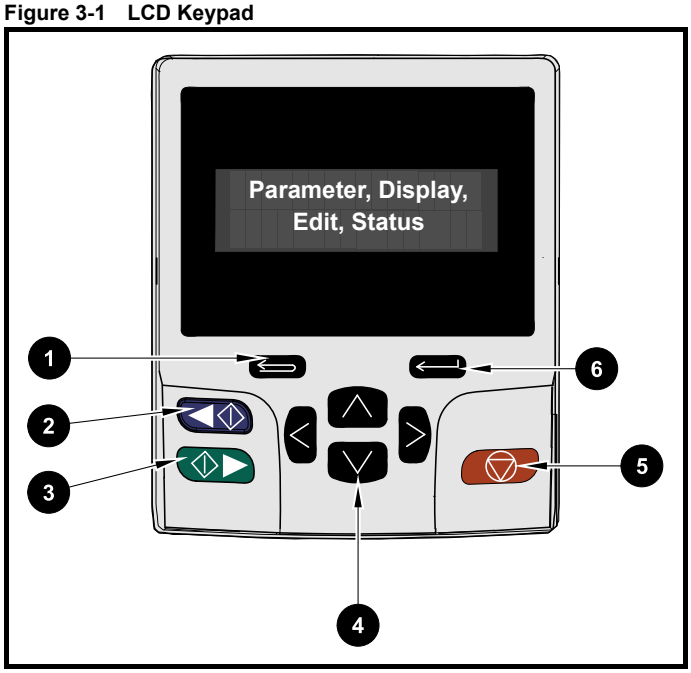
For setting the Elevator drive parameters there are the following options

- Parameters can be setup directly on the Elevator drive using the LCD keypad. The LCD Keypad can be fitted or removed with the drive powered up and operating. The Elevator drive can also be operated without the LCD keypad.
- It is also possible to setup the Elevator drive using serial communications and Elevator Connect. The parameters can also be displayed on the LCD keypad of the drive if required.

3.1 Elevator Drive Display

The parameter display on the Elevator drives LCD keypad is as follows.

Figure 3-1 LCD Keypad



1. Escape button - Used to exit from parameter edit or view mode In edit mode, if parameter values are edited and exit button pressed, the value will be restored to the value it had on entry to edit mode.

2. Start reverse (Auxiliary) button - Not used.

3. Start forward button - Not used.

4. Navigation keys (x4) - Used to navigate through menu and parameters and edit values.

5. Reset button - Used to Reset the drive.

6. Enter / Mode button - Used to toggle between parameter edit and view mode.

The Elevator drive has a full set of menus from Menu A up to Z. Menus and parameters are defined as, Menu number = mm, Parameter number = nnn

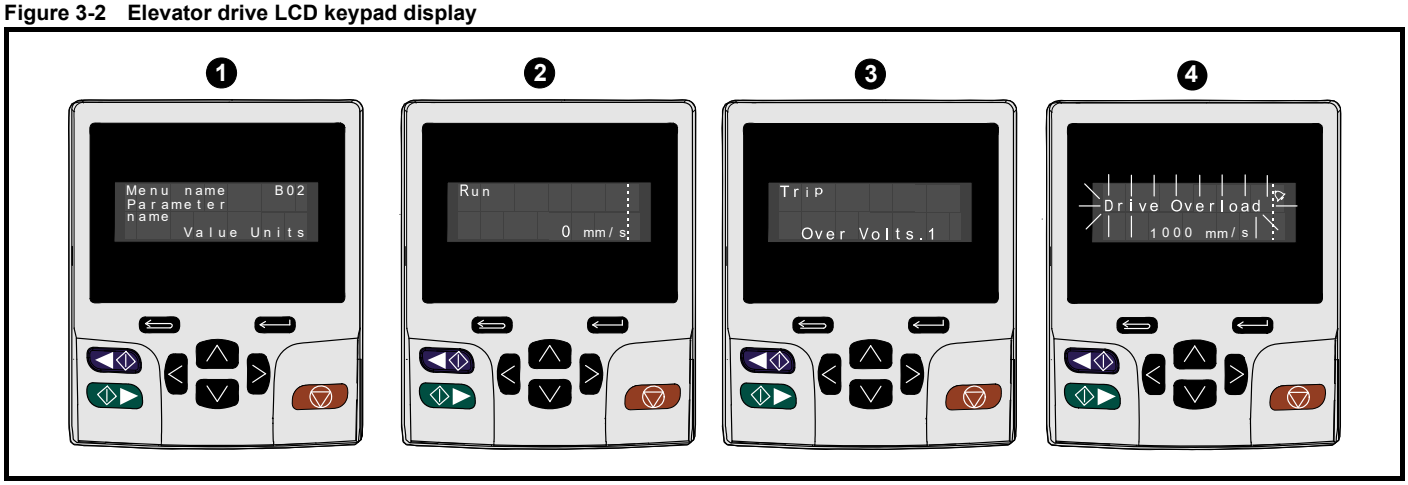
Table 3-1 Elevator drive LCD keypad functions

Key	Function in Display Mode (Static display	Function in Edit Mode (Blinking number)
	Drive State	-- : --
M	Change to Edit Mode	Change to Display Mode
⇑	Increase Parameter number	Increase Parameter value
⇓	Decrease Parameter number	Decrease Parameter value
⇐	Decrease Menu number	Increase Decimal place
⇒	Increase Menu number	Decrease Decimal place

Four display modes can be seen during operation as shown following:

1. **Parameter view mode**
   Menu and parameter view mode, read write (RW) or read only (RO)
2. **Status mode**
   If the drive is OK and parameters are not being edited or viewed, the upper row of the display will show one of the following Inhibit or Run.
3. **Trip status mode**
   When the drive is in a trip condition the upper row of the display will indicate that the drive has tripped and the lower row of the display will show the trip code.
4. **Alarm status mode**
   During an 'alarm' condition the upper row of the display flashes between the drive status Inhibit or Run (drive not in parameter view or edit mode) and the alarm condition

Figure 3-2 Elevator drive LCD keypad display



4 Open Loop Setup, Configuration

4.1 SMARTCARD, NV Media Card Setup

The most effective was to setup the Elevator drive parameter set is to use the SMARTCARD, NV Media Card as follows with the required parameter set defined.

Figure 4-1 Elevator drive, Fitting SMARTCARD, NV Media Card

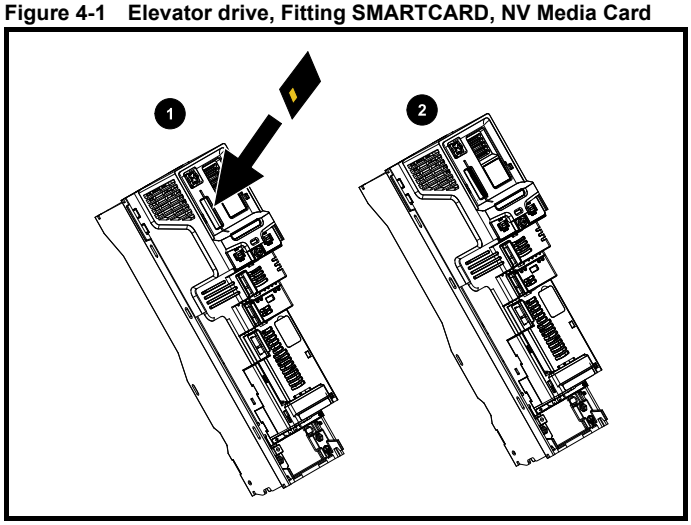


Figure 4-2 Elevator drive programming from SMARTCARD, NV Media Card

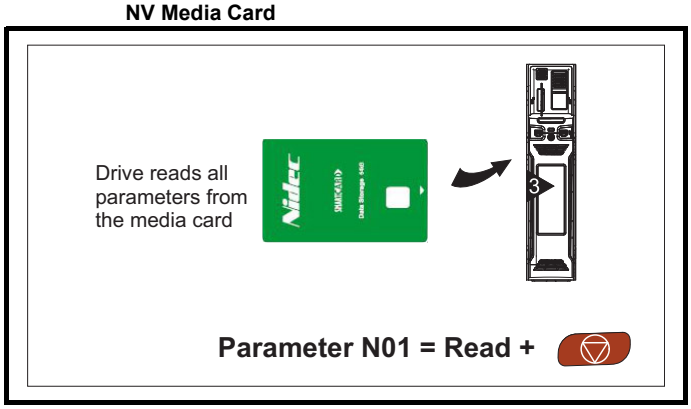
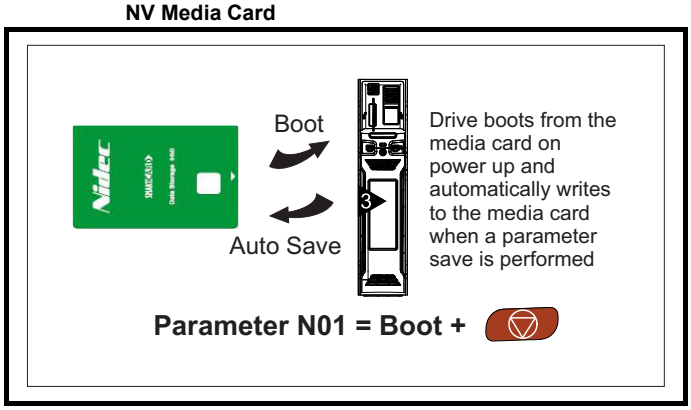


Figure 4-3 Elevator drive Boot and Auto save with SMARTCARD, NV Media Card



If a **Card Rating** trip (186) occurs parameters are being transferred from the SMARTCARD, NV Media Card, however the current and/or voltage ratings are different between source and destination drives.

This trip also applies if a compare (using Parameter **mm.000** = 8yyy) is attempted between the data block on a SMARTCARD, NV Media Card and the drive. The **Card Rating** trip (186) 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

After SMARTCARD, NV Media Card operation the setup can be continued with … **5.3 First Start**

4.2 Manual Setup

4.2.1 Selecting Motor Type

The default operating mode for the Elevator drive is A02 (B01) = RFC-S. To change to Open-loop operation set:

- **mm.000** = 1253
- **A02** (**B01**) = Open-loop
- Confirm change: = Reset button

When selecting Open-loop mode the drive by default operates in open loop vector control where **A23 (B09)** = Ur I, this can be changed if required to **A23 (B09)** = Fixed for fixed boost control

4.2.2 Selecting Interface control input mode

The control input mode can be selected as follows to suit the Lift (Elevator) controller, also refer section 7 *Connection Diagram*.

A10 (H11)	= Analog Run Permit	(0)
A10 (H11)	= Analog 2 Directions	(1)
A10 (H11)	= 1 Direction Priority	(2)
A10 (H11)	= 1 Direction Binary	(3)
A10 (H11)	= 2 Directions Priority	(4)
A10 (H11)	= 2 Directions Binary	(5)
A10 (H11)	= Control word, Modbus	(6)
A10 (H11)	= DCP 3	(7)
A10 (H11)	= DCP 4	(8)

Save operating mode

- **mm.000** = Save parameters
- Confirm change: = Reset button

4.2.3 Motor Data Setting

The following provides the default Motor settings for the induction Motor in open-loop for the Elevator drive. These parameters should be setup for the application with settings from the Motor datasheet, nameplate.

From default a Motor ***Thermistor*** trip will be present if no Motor thermistor is connected to the drives Analog input 3 this trip can be disabled setting **F74** = No Thermistor (0)

Table 4-1 Default Elevator drive Motor settings required for setup

Parameter	Description	Setting
A18 (B02)	Motor nominal current	**... A**
A19 (B03)	Motor nominal voltage	**... V**
B04	Motor power factor	**0.850**
A20 (B05)	Motor pole count	**Automatic**
A21 (B06)	Motor rated frequency	**50 Hz**
A22 (B07)	Motor nominal speed	**1500 rpm**
A23 (B09)	Open-loop control mode	**Ur I**
B10	Slip compensation enable	**On (1)**
A24 (B16)	Symmetrical current limit	**165.0 %**
A25 (B13)	Drive switching frequency	**8 kHz**
B12	Low frequency boost	**3.0 %**
A26 (B11)	Motor auto-tune	**None**

The default switching frequency for the Elevator drive is 8 kHz with the highest switching frequency being 16 kHz.

4.2.4 Adjusting Symmetrical Current Limit

The final setting for **A24 (B16)** Symmetrical Current Limit (default = 165 %) will be dependent upon a number of factors including the Motor, Drive rating, and Lift system profile.

Symmetrical current limit: A24 (B16) = … %

4.2.5 Auto-tune

Rotating Auto-tune

NOTE

From default the Elevator drive has a Fast disable **B27** configured, if this is not required disable setting **F21** T27 Dig Input 4 = **A00**

When carrying out a Stationary (1) or Rotating (2) auto-tune to setup the Motor, (Motor Auto-tune **A26 (B11)**) the following tests will be carried out and parameters automatically setup. For a Rotating (2) auto-tune the Motor should be unloaded and de-roped.

Parameter	Description	Auto-tune
B04	Motor Rated Power Factor	Rotating (2)
B35	Stator Inductance	
B33	Transient Inductance	Stationary (1) or Rotating (2)
B34	Drive switching frequency	
B46	Low frequency boost	
B47	Motor auto-tune	

NOTE

A rotating auto-tune will accelerate the Motor with the fixed acceleration rate of 5 s/100 Hz to a frequency of Motor Rated Frequency **B06** x 2/3, where the frequency is maintained for 4 s.

Stationary Auto-tune

Stationary auto tune setting up current loop gains. During this test the Motor will not rotate and the Motor brakes are not released

- **A26 (B11)** = Stationary (1)
  Inspection start and hold until complete (40 s)
- **A26 (B11)** = None (0)
  Inspection stop

Check auto-tune results for Motor data

Parameter	Description	Auto-tune
B33	Transient Inductance	Stationary (1)
B34	Stator Resistance	
B46	Maximum Deadtime Compensation	
B47	Current at Maximum Deadtime Compensation	

By default the Start and Run gains are used and it is recommended that the calculated gains are used unless the Motor becomes acoustically noisy in which case the current loop Kp can be reduced by up to 40 %.

Auto-tune Diagnostics

If a drive trip occurs during an auto-tune this could be due to a number of reasons e.g. the rotation of the Motor phases, the control signals to the drive during the auto-tune or the Motor characteristics. Refer to the following brief descriptions and diagnostics section for further details on drive auto-tune trips

Where the Motor phase rotation may be incorrect this can be rotated with parameter Reverse Motor Phase Sequence **B26**

- **Auto tune 1** - The Motor did not reach the required speed during the rotating auto-tune
- **Auto tune No Dir** - A direction signal was not given while attempting to perform an auto-tune. A direction signal must be given within 6 s of enabling the drive to prevent this trip while attempting to auto-tune
- **Auto tune Stopped** - The drive was prevented from completing an auto-tune, because either the Drive enable or the Drive run signal was removed.
- **Resistance** - This trip indicates that either the value being used for Motor stator resistance is too high or that an attempt to measure the Motor stator resistance has failed. If the value is the result of a measurement made by the drive then sub-trip 1 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 stator resistance is required for operation in Ur I open loop vector mode **A23 (B09)**.

4.2.6 Motor and Profile Speed, Mechanical Data

Speeds, acceleration and distance can be set in normal units (mm/s, mm, mm/s2). The scaling of these settings is done by setting the Mechanical data in the following parameters

Parameter	Description	Setting
A28 (E01)	Nominal Elevator speed mm/s	**1000 mm/s**
A29 (E02)	Sheave diameter	**400 mm**
A30 (E03)	Roping	**1:1 (1)**
A31 (E04)	Gear ratio numerator	**31**
A32 (E05)	Gear ratio denominator	**1**
A33 (E07)	Nominal Elevator speed rpm	**... rpm**
E09	Over Speed Threshold	**0.0 Hz**

If mechanical data is not available adjust **A33 (E07)** with the data sheet value or the Motor nominal rpm

The setting of Over Speed Threshold **E09** = 0.0 Hz equates to 1.2 x Motor rated frequency **A21 (B06)** which is suitable for most applications.

4.2.7 Motor Maximum Frequency Clamp

Motor Maximum Frequency Clamp **A34 (E08)** is automatically limited internally for both the speed set-point and Nominal Elevator Speed **A33 (E07)**. This is calculated to be the equivalent of 110 % of the nominal Elevator speed.

4.2.8 Direction Invert

By activating the control input to the drive, Direction Input Invert **A11 (H12)** the travel direction can be inverted without wiring changes

- Direction Input Invert
- **A11 (H12)** = Off (0) or On (1)

In addition the following parameter is also available to invert the output Motor phase rotation.

- Reverse Motor phase sequence
- **A27 (B26)** = Off (0) or On (1)

4.2.9 Speeds Reference Settings

The Elevator control software offers up to a maximum of 10 speed selections. V1 Speed Reference is the default Creep Speed (**G52**)

Parameter	Description	Setting
A43 (G01)	V1 Speed Reference	50 mm/s
A44 (G02)	V2 Speed Reference	400 mm/s
A45 (G03)	V3 Speed Reference	600 mm/s
A46 (G04)	V4 Speed Reference	10 mm/s
G05	V5 Speed Reference	100 mm/s
G06	V6 Speed Reference	100 mm/s
G07	V7 Speed Reference	1000 mm/s

4.2.10 Start Optimiser, Boost

Start Optimiser

This feature can be used to overcome starting friction for Elevators fitted with a gearbox, or systems fitted with guide rail pads rather than rollers resulting in a jerk during the start. For Open-loop operation only the speed is adjustable by the user.

Parameter	Description	Setting
N/A	Start optimiser time	500 ms
N/A	Start optimiser jerk	10 mm/s³ x 10
A60 (G46)	Start optimiser speed	100 mm/s
N/A	Start optimiser enable	On (1)

During operation in Open-loop mode the Motor brake will not be released if Start Optimizer Speed **G46** < Brake Release Frequency **D08**. For adjustment of Start Optimizer Speed **G46** the following calculation can be used:

G46 > (Nominal Elevator Speed / Motor Rated Frequency) x Brake Release Frequency

G46 > (E01 / B06) x D08

G46 > (1000 / 50) x 1.0 = 20 mm/s

Fixed boost operation, Low speed boost

If during the start there is roll back in Fixed boost mode **A23 (B09)** = Fixed and on brake release Low Frequency Voltage Boost **B12** can be optimised.

Motor rated speed, slip frequency

It is assumed that the correct Motor Rated Speed **A22 (B07)**, slip frequency has been setup for the Motor being used ensuring maximum torque is generated for both a Hot and Cold Motor.

4.2.11 Profile Parameters

For the Elevator system profile there are a number of different settings including acceleration, deceleration and jerk settings along with Creep stop deceleration and jerk as detailed following. These settings are typically defined by the Lift system

Parameter	Description	Setting
A40 (G11)	Acceleration rate	800 mm/s²
A41 (G12)	Deceleration rate	500 mm/s²
A35 (G13)	Run jerk 1	50 mm/s³ x 10
A36 (G14)	Run jerk 2	100 mm/s³ x 10
A37 (G15)	Run jerk 3	100 mm/s³ x 10
A38 (G16)	Run jerk 4	50 mm/s³ x 10
A42 (G17)	Creep stop deceleration rate	1000 mm/s²
A39 (G18)	Creep stop jerk	1000 mm/s³ x 10

4.2.12 Brake Control

Using the drives adjustable brake control delays the brake operation can be optimized. The target is to have a continuous and fast transition from standstill to travel and onto stop without any jerk impacting on the ride quality during start and stop

Parameter	Description	Setting
D08	Brake Release Frequency	1.0 Hz
D06	Upper Current Threshold	10 %
A47 (D04)	Brake control release delay	500 ms
D09	Brake Apply Frequency	2.0 Hz
D07	Lower Current Threshold	10 %
A48 (D05)	Brake control apply delay	500 ms

Brake release

Optimise the brake control to achieve a smooth start where the Motors brake is opened on-time, not too early, or too late for both generating torque at the Motor and lifting the Motor brakes without a jerk and roll back

- Adjust the Brake Release Frequency **D08** > Motor rated slip where maximum torque can be generated. Setting **D08** < Motor rated slip will result in limited torque on brake release

Optimise Brake Control Release Delay **A47 (D04)** to ensure a smooth start

- Motor Magnetized **D01** = On (1)
- Torque Producing Current **J24** is generated to overcome Lift system load
- Ensure brake control release delay is not excessive as this can lead to a jerk on brake release where tension builds against the brake

Ensure Start Optimizer Speed **G46** > Brake Release Frequency **D08**

Brake apply

Optimise the brake control to achieve stopping at floor where the Motors brake is closed on-time, not too early resulting in a harsh stop, or too late resulting in roll back

- Adjust the Brake Apply Frequency **D09** > Motor rated slip where maximum torque is available to bring the Motor to stop with the car at floor. Setting **D08** < Motor rated slip will result in limited torque and roll back or overshooting the floor level

Optimise Brake Control Apply Delay **A48 (D05)** to ensure a smooth stop

- Adjust Lower Current Threshold **D07** to ensure sufficient current is present for the Motor brake apply
- Ensure brake control apply delay is not excessive as this can lead to roll back or overshooting the floor level due to insufficient Torque Producing Current **J24** nearing zero speed

In addition to the brake control release and apply delays above there is an additional parameter which defines the time taken to build torque during the start (prior to brake release), and release torque during the stop (following brake apply). The torque ramps manage the transfer of load between the Motor and mechanical brakes.

Parameter	Description	Setting
D02	Motor torque ramp time	100 ms
D32	Motor torque ramp down time	100 ms

4.2.13 Current Control Loop Gains

The current loop normally operates with an integral I gain only. The proportional P gain is inherent in the current loop.

- The integral I gain should be increased enough to counter the effect of the profile ramp which is active in current limit.
- If the integral I gain is increased too far signs of instability will occur, this instability can be reduced by increasing the proportional P gain.

Parameter	Description	Setting
I03	Start Current Loop Kp	20
I04	Start Current Loop Ki	40
I08	Run Current Loop Kp	20
I09	Run Current Loop Ki	40

4.3 First Test

NOTE

For applications where induced noise may affect the control signals to the drive, a filter is available for the speed and direction input signals through with parameter **F68**.

To check the control of the Lift and the direction of movement of the Lift car carry out a travel with Inspection speed, or a suitable low speed and observe the direction of movement

- Display **J23** Percentage load
  Start Inspection travel
  Check **D01** Motor magnetised = On (1)
  Check **J23** Percentage load > 0
  Check correct direction of Motor and Lift car
- Display “Run” does not occur
  Check speed selection on either control terminal T29 (**F08**), T26 (**F05**), T7 (**F36**), T5 (**F35**)
  Check direction input on control terminal T28 (**F0&**)
  Check T31 (**F10**) Safe Torque Off (STO), Drive enable input
  Check control interface to Elevator drive and settings

No movement of the Motor during the start

- Check **J09** Reference parameter selected
  J09 Reference parameter selected = 0
  No reference selected
  Check control interface to Elevator drive and settings
  Ensure Start Optimizer Speed **G46** > Brake Release Frequency **D08**
- Percentage load **J23** = 0
  Check output Motor contactor control from the Elevator drive (**B31**) or Lift (Elevator controller
- Elevator drive trips **Motor Too Hot** (20)
  Check Motor load, balance

If Motor rotates in the opposite direction with respect to the direction demanded for the travel

- Set Direction input invert **A11 (H12)** = Off (0) or On (1)

For Elevator drive trips refer to the diagnostics section. If no Elevator drive trips are generated with stable operation in the correct direction at the selected speed continue with optimisation of the Elevator drive

Diagnostic Parameters which are available for the first test

Parameter	Description	Setting
G39	Direction input 1	Off (0) or On (1)
G40	Direction input 2 (Dual direction inputs)	Off (0) or On (1)
J09	Reference parameter selected	… V1 – V7
F10	Safe Torque Off (STO), Drive enable	Off (0) or On (1)
J25	Magnetising current	… A
D03	Brake control output	Off (0) or On (1)
G01 to **G10**	V1 to V10 speed reference	… mm/s
A06 (J39)	Profile speed	… mm/s
A06 / J40	Actual speed	… mm/s
J22	Total output current	… A
A08 (J60)	Output frequency	… Hz
A09 (J61)	Output voltage	… V
L15	Current limit reached	Off (0) or On (1)
B16	Symmetrical current limit	... %
J03	Software State	… 0 - 14

Tests should be carried out with a range of travels, including single and multiple floors with both an empty and full Lift car.

4.3.1 Further Optimisation

Further optimisation can be carried out to achieve a fast, smooth travel meeting the ride quality of the customer based upon their Lift system. Measurements can be carried out using an Accelerometer (PMT) and CT Scope to further examine the Elevator travel and control.

4.3.2 Current Loop Gains, Current Limit Operation

The current loop normally operates with an integral I gain only. The proportional P gain is inherent in the current loop.

- The integral I gain should be increased enough to counter the effect of the profile ramp which is active in current limit.
- If the integral I gain is increased too far signs of instability will occur, this instability can be reduced by increasing the proportional P gain.

Parameter	Description	Setting
I03	Start Current Loop Kp	20
I04	Start Current Loop Ki	40
I08	Run Current Loop Kp	20
I09	Run Current Loop Ki	40

4.3.3 Brake Release & Controlled Start

Jerk during start following Motor brake release

- Decrease **A35 (G13)** Run Jerk 1 to introduce a softer, slower start profile.
- If the profile has starting against the Motors brakes, increase **A47 (D04)** Brake Control Release Delay.
- If the Motor is at standstill following the Motor brake release reduce **A47 (D04)** Brake Control Release Delay
- The Brake Release Frequency **D08** for optimum operation should be above the slip frequency of the Motor

4.3.4 Start Optimiser

This feature can be used to overcome starting friction for Elevators with a gearbox, or systems fitted with guide rail pads rather than rollers resulting in a jerk during the start. For Open-loop operation only the speed is adjustable by the user.

Parameter	Description	Setting
N/A	Start optimiser time	500 ms
N/A	Start optimiser jerk	10 mm/s³ x 10
A60 (G46)	Start optimiser speed	100 mm/s
N/A	Start optimiser enable	On (1)

During operation in Open-loop mode the Motor brake will not be released if Start Optimizer Speed **G46** < Brake Release Frequency **D08**. For adjustment of Start Optimizer Speed **G46** the following calculation can be used:

G46 > (Nominal Elevator Speed / Motor Rated Frequency) x Brake Release Frequency

G46 > (**E01** / **B06**) x **D08**

G46 > (1000 / 50) x 1.0 = 20 mm/s

To increase breakaway torque where the Motor gearbox and mechanical system result in high levels of stiction resulting in a jerk on start

- Increase the Start Optimizer Speed **G46** in steps of 5

To soften the breakaway on Motor brake release for low stiction applications

- Reduce Start Optimizer Speed **G46** in steps of 5
- Ensure Start Optimizer Speed **G46** > Brake Release Frequency **D08** using the above calculation

Fixed boost operation, Low speed boost

If during the start there is roll back in Fixed boost mode (**A23 (B09)** = Fixed) and on brake release optimise the following

- Low Frequency Voltage Boost **B12** can be optimized to generate a higher level of torque on brake release

CAUTION

Modifying the profile parameters during further optimisation can lead to the Lift not reaching maximum speed or overshooting the floor levels and reaching the limit switches, end stops.

4.3.5 Start & Acceleration

Overshoot or undershoot following start to acceleration to profile speed

- Decrease **A36 (G14)** Run Jerk 2 for a soft controlled transition from acceleration to end of acceleration and travel.
- Increase **A36 (G14)** Run Jerk 2 for a harder transition from acceleration to end of acceleration and travel.

Vibrations during constant acceleration

- Check to see if the drive is operating in current limit, **L15** Current Limit Reached = On (1)

If the drive is operating in current limit

- Increase **A24 (B16)** Symmetrical Current Limit where to low and still possible to increase
- Reduce acceleration rate in **A40 (G11)** Acceleration Rate

Optimise Motor Rated Speed **A22 (B07)**

- Ensure correct slip frequency for maximum torque where Enable Slip Compensation **B10** = On (1)
- Adjust slip by the running lift under constant load, with a long travel, optimising **E07** Elevator speed rpm to get the maximum Torque producing current in **J24**

4.3.6 Constant Speed

Vibrations present in the Lift car during constant speed, travel with full load up to deceleration

- Optimise Motor Rated Speed **A22 (B07)** ensuring correct slip, and maximum torque for Motor where Enable Slip Compensation **B10** = On (1)

4.3.7 Deceleration

Adjusting the deceleration distance to achieve floor accuracy

Increase the deceleration distance by

- Reducing **A40 (G11)** Acceleration Rate to be slower
- And/or reduce **A36 (G14)** Run Jerk 2 to be softer

Decrease deceleration distance by

- Increasing **A40 (G11)** Acceleration Rate to be faster
- And/or reduce **A36 (G14)** Run Jerk 2 to be harder

4.3.8 Approaching Stop

Stopping with a jerk at the end of the profile

- Reduce **A38 (G16)** Run Jerk 4 to provide a softer transition to stop at the end of travel

Movement of the Motor sheave during stopping and Motor brake apply

- Check the drives enable state in the Lift (Elevator) controller and ensure this is not being removed too soon

L06 Drive Active

- Increase **A48 (D05)** Brake Control Apply Delay to maintain Motor torque whilst Motor brakes are fully closing

Brake Apply Frequency **D09**

- Adjust to ensure the output frequency is greater than the Motors slip frequency when the brake apply begins

BC Lower Current Threshold **D07**

- Adjust to ensure the output current is sufficient to control the Motor to a stop during brake apply

Current limit (Current Limit Reached **L15** = On (1)) during transient operation

- Increase **A24 (B16)** Symmetrical Current Limit where to low and still possible to increase
- Optimise Motor Rated Speed **A22 (B07)** ensuring correct slip, and maximum torque for Motor where Enable Slip Compensation **B10** = On (1)

4.4 Save Parameter Settings

4.4.1 Save Elevator Drive Parameter Settings

To save parameters in the Elevator drive use the following procedure

Save parameter settings

- **mm.000** = Save parameters
- **Confirm change:** = Reset button

… or alternatively

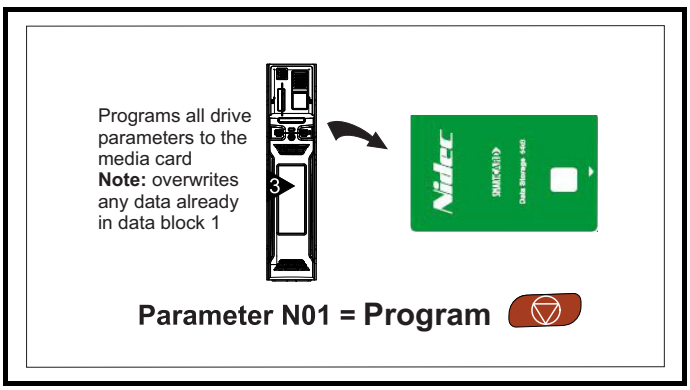
- **mm.000** = 1001
- **Confirm change:** = Reset button

4.4.2 Save Elevator Drive Parameter Settings to SMARTCARD, NV Media Card

To save the Elevator drive parameters to the SMARTCARD, NV Media Card the following two options are available

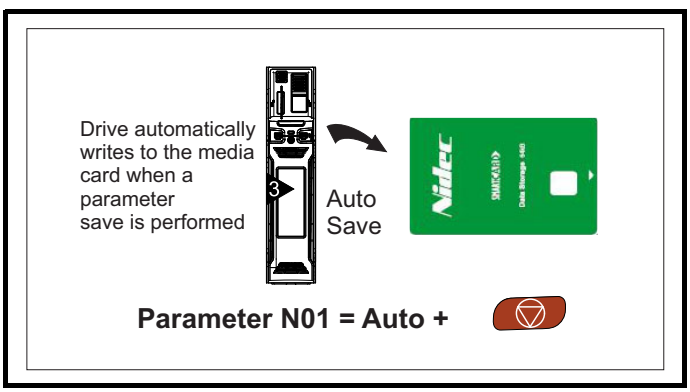
A save can be carried out setting

- **A03 (N01) Cloning** = Program
- **Confirm change**: = Reset button



An Auto save can be carried out setting

- **A03 (N01) Cloning** = Auto
- **Confirm change:** = Reset button



5 User Menu A

Parameter		Parameter Description	Range	Comments
A00		Parameter 00 for code entry	No Action (0), Save parameters (1), Load file 1 (2), Save to file 1 (3), Load file 2 (4), Save to file 2 (5), Load file 3 (6), Save to file 3 (7), Show non-default (8), Destinations (9), Reset 50 Hz defs (10), Reset 60 Hz defs (11), Reset modules (12), Read enc. NP P1 (13), Read enc. NP P2 (14)	
A01	H02	User Security Status	Menu A (0), All Menus (1), Read-only Menu A (2), Read-only (3), Status-only (4), No-Access (5)	
A02	B02	Drive Control Mode	Open loop (1), RFC-A (2), RFC-S (3)	
A03	N01	Parameter Cloning	None (0), Read (1), Program (2), Auto (3), Boot (4)	
A04	J22	Total Output Current	± VM_DRIVE_CURRENT_UNIPOLAR A	
A05	J23	Percentage Load	± VM_USER_CURRENT %	
A06	J39	Profile Speed	0 to 1000 mm/s	
A07	J59	Output Power	± VM_POWER kW	
A08	J60	Output Frequency	± VM_SPEED_FREQ_REF Hz	
A09	J61	Output Voltage	± VM_AC_VOLTAGE V	
A10	H11	Control Input Mode	Analog Run Prmit (0), Analog 2 Dir (1), Priority 1 Dir (2), Binary 1 Dir (3), Priority 2 Dir (4), Binary 2 Dir (5), Control Word (6), DCP3 (7), DCP4 (8)	DCP4 not available in Open loop mode
A11	H12	Direction Input Invert	Off (0) or On (1)	
A16	B10	Enable Slip Compensation	Off (0) or On (1)	
A17	B12	Low Frequency Voltage Boost	0.0 % to 25.0 %	Default setting = 3.0 % high values will result in Motor heating during start, low speed
A18	B02	Motor Rated Current	± VM_RATED_CURRENT A	
A19	B03	Motor Rated Voltage	± VM_AC_VOLTAGE_SET V	
A20	B05	Number Of Motor Poles	Automatic (0) to 480 Poles (240)	
A21	B06	Motor Rated Frequency	0.0 to 550.0 Hz	
A22	B07	Rated Speed	0.00 to 33000.00 rpm	To ensure maximum torque accurate values of Motor rated speed should be used
A23	B09	Open-loop Control Mode	Ur S (0), Ur (1), Fixed (2), Ur Auto (3), Ur I (4)	Only Fixed (2) and Ur I (4) options for Elevator
A24	B16	Symmetrical Current Limit	± VM_MOTOR1_CURRENT_LIMIT %	
A25	B13	Maximum Switching Frequency	3 kHz (1), 4 kHz (2), 6 kHz (3), 8 kHz (4), 12 kHz (5), 16 kHz (6)	Default 8 kHz
A26	B11	Motor Auto tune	None (0), Static (1), Rotating (2)	For rotating auto-tune de-rope the Motor
A27	B26	Reverse Motor Phase Sequence	Off (0) or On (1)	
A28	E01	Nominal Elevator Speed mm/s	0 to 4000 mm/s	
A29	E02	Sheave Diameter	1 to 32,767 mm	
A30	E03	Roping	1:1 (1), 2:1 (2), 3:1 (3), 4:1 (4)	
A31	E04	Gear Ratio Numerator	1 to 32767	
A32	E05	Gear Ratio Denominator	1 to 32767	
A33	E07	Nominal Elevator Speed rpm	1.00 to 4000.00 rpm	
A34	E08	Motor Maximum Frequency Clamp	= 1.1 x **A33 (E07)**	
A35	G13	Run Jerk 1	1 to 65535 mm/s³ x10	
A36	G14	Run Jerk 2	1 to 65535 mm/s³ x10	
A37	G15	Run Jerk 3	1 to 65535 mm/s³ x10	
A38	G16	Run Jerk 4	1 to 65535 mm/s³ x10	
A39	G18	Creep Stop Jerk	1 to 65535 mm/s³ x10	
A40	G11	Acceleration Rate	0 to 10000 mm/s²	
A41	G12	Deceleration Rate	0 to 10000 mm/s²	
A42	G17	Creep Stop Deceleration	0 to 10000 mm/s²	
A43	G01	V1 Speed Reference	0 to *Nominal Elevator Speed* **A28 (E01)**	
A44	G02	V2 Speed Reference	0 to *Nominal Elevator Speed* **A28 (E01)**	
A45	G03	V3 Speed Reference	0 to *Nominal Elevator Speed* **A28 (E01)**	
A46	G04	V4 Speed Reference	0 to *Nominal Elevator Speed* **A28 (E01)**	
A47	D04	Brake Control Release Delay	0 to 10000 ms	
A48	D05	Brake Control Apply Delay	0 to 10000 ms	
A60	G46	Start Optimiser Speed	0 to 10000 mm/s	

6 Diagnostics

6.1 Trip Codes & Corrective Actions

The Elevator protects itself, the control environment and Motor by many monitoring functions and operating levels. If the monitor system detects a problem, a trip is initiated. To identify the causes of a trip refer to the following diagnostics section and the Installation and System Design Guide for further detailed information.

<table>
<tr><th>Trip</th><th>Description / Recommended action</th></tr>
<tr><td>An Input 1 Loss</td><td>Analog input 1 current loss</td></tr>
<tr><td>28</td><td>An Input 1 Loss trip indicates that a current loss was detected in current mode on Analog input 1 (T5, T6). In 4-20 mA and 20-4 mA modes loss of input is detected if the current < 3 mA.
Recommended actions:
• Check control wiring is correct.
• Check control wiring is undamaged.
• Check the Analog Input 1 Mode F38.
• Current signal is present and greater than 3 mA.</td></tr>
<tr><td>An Input 2 Loss</td><td>Analog input 2 current loss</td></tr>
<tr><td>29</td><td>An Input 2 Loss indicates that a current loss was detected in current mode on Analog input 2 (T7). In 4-20 mA and 20-4 mA modes loss of input is detected if the current < 3 mA.
Recommended actions:
• Check control wiring is correct.
• Check control wiring is undamaged.
• Check the Analog Input 2 Mode F45.
• Current signal is present and greater than 3 mA.</td></tr>
<tr><td>An Output Calib</td><td>Analog input 2 current loss</td></tr>
<tr><td>29</td><td>The zero offset calibration of one or both the Analog outputs has failed. This indicates that the drive hardware has failed or a voltage has been applied to the output via low impedance.
<table><tr><th>Sub-trip</th><th>Reason</th></tr><tr><td>1</td><td>Output 1 failed</td></tr><tr><td>2</td><td>Output 2 failed</td></tr></table>Recommended actions:
• Check the wiring associated with Analog outputs.
• Remove all the wiring that is connected to Analog outputs and perform the calibration.</td></tr>
<tr><td>Analog No Dir</td><td>Run signal not received when starting in Analog control input mode</td></tr>
<tr><td>79</td><td>A direction signal or run permit was not provided within 1 s of the brake release time elapsing in Analog control input mode, Control Input Mode H11 = Analog Run Prmit (0) or Analog 2 Dir (1).
Recommended actions:
• Check Direction Input 1 G39 and Direction Input 2 G40 ensuring a direction signal is received.
• Check control wiring is correct.
• Check control wiring is undamaged.</td></tr>
<tr><td>Autotune 1</td><td>Required speed could not be reached</td></tr>
<tr><td>11</td><td>The drive has tripped during a rotating auto tune.
Recommended actions:
• Ensure the Motor is free to turn i.e. mechanical brake was released.</td></tr>
<tr><td>Autotune No Dir</td><td>Direction signal not received when starting an auto tune</td></tr>
<tr><td>78</td><td>Direction signal not given while attempting to perform auto tune. A direction signal must be given within 6 s of drive enable.
Recommended actions:
• Check Direction Input 1 G39 and Input 2 G40 ensuring a direction signal is received.
• Check control wiring is correct.
• Check control wiring is undamaged.
• Check control sequence from Lift (Elevator) controller.</td></tr>
<tr><td>Autotune Stopped</td><td>Auto tune test stopped before completion</td></tr>
<tr><td>18</td><td>The drive was prevented from completing an auto tune test, because the Safe Torque Off (STO), Drive enable, Fast Disable or the Run command were removed.
Recommended actions:
• Check the Safe Torque Off (STO), Drive enable signal on T31 is active F10.
• Check the Fast stop is active, where used.
• Check the direction command is active G39, G40.</td></tr>
</table>

Trip	Description / Recommended action
Brk Ctrl Release	**Conditions not met for Motor brake release during start**
68	The brake release control conditions were not met within 6 s to transition from state 3 to 4. **Recommended actions:** • Check Motor torque ramp time in Motor Torque Ramp Time **D02**. • Check correct Motor map settings. • Check Motor Magnetized Indication **D01**. • Check Motor contactor control. • Check Motor electrical connections. • Check the Brake release threshold set by Upper Current Threshold D06, Lower Current Threshold **D07** and Brake Release Frequency **D08**. • Check Start Optimiser Speed **G46** this should be > Brake Release Frequency **D08** for Open Loop operation.
Brake Contact	**Motor brake contacts detected in the incorrect state**
72	This trip indicates that there has been a brake contact error. This trip can only happen when brake monitoring is enabled, where Brake contact monitoring select **D11** > None (0). This trip is detected where the brake monitoring feedback does not follow the Brake Control Output **D03** for the Brake Contact Monitoring Time **D14** seconds. This is a delayed trip where the travel will complete before the drive trips where possible. If a fault has been detected during travel Global Warning **L04** = On (1) indicating the delayed trip at end of the travel. Once a Brake Contact trip has occurred and Brake Contact Monitoring has been selected for Unintended Car Movement (UCM) Brake Contact Monitoring Select **D11** = 1 + UCM to 1, 2, 3 & 4 + UCM the trip can only be cleared by setting mm.000 to 1298 in line with the requirements of EN 81-20 and EN 81-50. **Recommended actions:** • Check Motor brake contact feedback is connected as required from inputs 1 to 4. • Check monitoring is configured correctly in Brake Contact Monitoring Select **D11**. • Check correct Motor brake contact operation at Motor brakes. • Check operating times for Motor brake contacts, Brake Contact Monitoring Time **D14**.
Brake R Too Hot	**Braking resistor overload timed out (I^2t)**
19	The Brake R Too Hot indicates that braking resistor overload has timed out. The value in Braking Resistor Thermal Accumulator **D17** is calculated using Braking Resistor Rated Power **D15**, Braking Resistor Thermal Time Constant **D16** and Braking Resistor Resistance **D18**. The Brake R Too Hot trip is initiated when Braking Resistor Thermal Accumulator **D17** reaches 100 %. **Recommended actions:** • Ensure the values entered are correct • If an external thermal protection device is being used and the braking resistor software overload protection is not required, set **D15**, **D16** or **D18** = 0 to disable the function.
Card Access	**NV Media Card Write fail**
185	The Card Access trip indicates that the drive was unable to access the NV Media Card. If the trip occurs during the data transfer to the card the file being written may be corrupted. If the trip occurs when the data is being transferred to the drive 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.
Card Data Exists	**NV Media Card data location already contains data**
179	The Card Data Exists 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.
Card Compare	**NV Media Card file/data is different to the one in the drive**
188	A compare has been carried out between a file on the NV Media Card, a Card Compare trip is initiated if the parameters on the NV Media Card are different to the drive. **Recommended actions:** • Set parameter **mm.000** = 0 and Reset the trip • Check to ensure the correct data block on the NV Media Card has been used to compare.

Trip	Description / Recommended action
Card Drive Mode	**NV Media Card parameter set not compatible with current drive mode**
187	The Card Drive Mode 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. **Recommended actions:** • Ensure the destination drive supports the drive operating mode in the parameter file. • Clear the value in parameter **mm.000** and Reset the drive. • Ensure destination drive operating mode is the same as the source parameter file.
Card Full	**NV Media Card full**
184	The Card Full 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. **Recommended actions:** • Delete a data block or the entire NV Media Card to create space • Use a different NV Media Card.
Card No Data	**NV Media Card data not found**
183	The Card No Data trip indicates that an attempt has been made to access non-existent file or block on a NV Media Card. **Recommended actions:** • Ensure data block number is correct.
Card Product	**NV Media Card data blocks are not compatible with the drive derivative**
175	The Card Product trip is initiated either at power-up or when the card is accessed, If Drive Derivative **J96** is 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. **Recommended actions:** • Use a different NV Media Car • • This trip can be suppressed by setting parameter **mm.000** to 9666 and Reset the drive.
Card Rating	**NV Media Card voltage, or current rating of source and destination drive are different**
186	The Card Rating trip indicates that parameter data is being transferred from a NV Media Card to the drive, but the current and, or voltage are different between source and destination drive. This trip also applies if a compare (using parameter **mm.000** set to 8yyy) is attempted between the data block on a NV Media Card and the drive. The Card Rating 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.
Card Read Only	**NV Media Card has the Read Only bit set**
181	The Card Read Only trip indicates that an attempt has been made to modify a read-only NV Media Card or a read-only data block. An NV Media Card is RO when the RO flag is set. **Recommended actions:** • Clear the read only flag by setting parameter **mm.000** to 9777 and Reset the drive. This will clear the read-only flag for all data blocks in the NV Media Card.
Current On Stop	**Current flowing at drives output at end of travel, prior to opening Motor contactors**
67	The current at the drives output has not decayed after a stop. Total Output Current **J22** ≥ 25 % of the Motor rated current after 4 s in State 14 (end of travel and Motor contactor control). **Recommended actions:** • Check control signals from Elevator controller to Elevator drive ensuring travel complete. • Check Motor brakes applied as requested, correct Motor brake operation.
Destination	**Direction signal not received when starting an auto tune**
190	The Destination trip indicates that multiple parameters are writing to the same parameter. **Recommended actions:** • Set parameter **mm.000** to 'Destinations' or 12001 and check all visible parameters in all menus for parameter write conflicts.
Dir Changed	**Direction signal from elevator controller changed during travel**
76	The direction input signal has changed from the original selection in either single or dual direction input modes, and a controlled stop occurs. This is a delayed trip where the travel will complete. If a delayed trip has been scheduled during travel then Global Warning **L04** = On (1) indicating a trip will be generated on travel complete. **Recommended actions:** • Check drive control connections and sequence from Lift (Elevator) controller to Elevator drive. • Check control from Lift (Elevator) controller to Elevator drive during operation. • Check correct setup of the drive control for the Lift (Elevator) controller, Control Input Mode **H11**.

Trip	Description / Recommended action
Fast Disable Err	**Fast disable control sequence error**
65	The Fast disable input sequence is incorrect i.e. the Fast disable input does not become active, On (1) following brake apply and after 4 s, or the Fast disable input failed to turn Off (0) after 6 s during the start whilst waiting for the Safe Torque Off (STO), Drive enable. **Recommended actions:** • Check the control wiring arrangement (default T27) Fast disable input. • Check T27 Digital Input 04 State **F06** during operation and sequence Off (0) or On (1). • Disable the Fast disable input by setting Fast Disable **B27** to **A00**.
Freeze Protect	**Freeze protection limit exceeded**
60	Freeze Protection Threshold **H28** has been exceeded. This parameter is provided to prevent operation of the drive is sub-zero temperatures. This is a delayed trip, where the travel will complete before the drive will trip. If a delayed trip has been scheduled during the travel Global Warning **L04** = On (1) indicating trip scheduled at end of travel. **Recommended actions:** • Check the temperature setting in Freeze Protection Threshold **H28**. • Check the actual temperature in Monitored Temperature 3 **J73**. • Provide heating, air conditioning, ventilation to support allowable operating temperature.
I Limit Timeout	**Drive has been in current limit (Open-loop mode) for an excessive time**
82	In Open loop mode the drive has exceeded Maximum Time In Current Limit **H50** ms. This could be the result of a Mechanical fault, Excessive Elevator system load or Motor brake fault. **Recommended actions:** • Check that the Elevator car is free to move and there are no mechanical issues. • Check the Motor brakes are releasing during start and not applying during operation. • Check the elevator system is correctly balanced (counter balance is correct) and the drive is not being forced into current limit.
I/O Overload	**Digital output overload**
26	The I/O Overload trip indicates the total current drawn from 24 V user supply or the digital output has exceeded the limit. A trip is initiated if one or more of the following conditions is true: **Date Code < 1724** • Maximum output current from one digital output is > 100 mA. • The combined maximum output current from outputs 1 and 2 is > 100 mA. • The combined maximum output current from output 3 and +24 V output is > 100 mA. **Date Code ≥ 1724** • Maximum output current from one digital output is > 200 mA. • The combined maximum output current from outputs 1 and 2 is > 200 mA. • The combined maximum output current from output 3 and +24 V output is > 200 mA. **Recommended actions:** • Check total loading on digital circuit supplied from drives 24 V user supply. • Check control configuration is correct along with drive setup. • Check control output wiring is terminated correctly and undamaged.
Motor Contactor	**Motor contactor**
70	The Motor contactors have been detected open or closed when they should be closed or open using the Motor contactor monitoring when enabled, and the feedback is connected to the drive from the Motor contactors. This is a delayed trip, where travel will complete and then the drive will trip. If a delayed trip has been scheduled during a travel Global Warning **L04** = On (1) indicating a delayed trip when travel completes. **Recommended actions:** • Check control wiring from Motor contactor monitoring to the drives control terminal. • Check correct signal from Motor feedback during operation (Default configuration, Motor contactors open, feedback = +24 V, Motor contactors closed feedback = 0 V). • Disable Motor contactor monitoring with Motor Contactor Monitoring Enable **B29**.
Motor Too Hot	**Output current overload timed out (I^2t)**
20	The Motor Too Hot trip indicates Motor thermal overload based on the Rated Current **B02** and Motor Thermal Time Constant **B20**. **J26** displays the Motor temperature as a percentage of maximum value. The drive will trip when Motor Too Hot **J26** reaches 100 %. **Recommended actions:** • Ensure there is no mechanical issue resulting in stiction or increased loading. • Check the load on the Motor has not changed. • If seen during an auto-tune ensure the Motor Rated Current in **B02** ≤ Heavy duty current rating of the drive. • Optimise the Motor Rated Speed **B07**. • Ensure the Motor rated current is not zero. • Check the Motor Thermal Protection Mode setting in **B19** is as required.

<table>
<tr><th>Trip</th><th>Description / Recommended action</th></tr>
<tr><td>OHt Control</td><td>Control stage over temperature</td></tr>
<tr><td>23</td><td>This OHt Control trip indicates that a control stage over-temperature has been detected. From the sub-trip ‘xx y zz’, 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>Control system</td><td>00</td><td>0</td><td>01</td><td>Control board thermistor 1 over temperature</td></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>02</td><td>Control board thermistor 2 over temperature</td></tr>
<tr><td>Control system</td><td>00</td><td>0</td><td>03</td><td>I/O board thermistor over temperature</td></tr>
</table>
Recommended actions:
• Check enclosure / drive fans are still functioning correctly.
• Check enclosure ventilation paths.
• Check enclosure door filters.
• Increase ventilation.
• Reduce the drive switching frequency.
• Check ambient temperature.</td></tr>
<tr><td>OHt DC Bus</td><td>DC bus over temperature</td></tr>
<tr><td>27</td><td>The OHt dc bus trip indicates a DC bus over temperature based on a software thermal model. 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 J78. If this parameter reaches 100 % then an OHt dc bus trip with sub-trip 200 is initiated.
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 Motor map settings with nameplate (B06, B02, B07, B03, B04, B05), all modes
Disable slip compensation B10 = 0
Select fixed boost B09 = Fixed, Open loop
Disconnect the load and complete a rotating auto-tune.</td></tr>
<tr><td>OHt Inverter</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 sub-trip indicates which model has initiated the trip in the form xx y zz as given below:
<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</td></tr>
<tr><td>Control system</td><td>00</td><td>3</td><td>00</td><td>Braking IGBT thermal model</td></tr>
</table>
Recommended actions with sub-trip 100:
• Check and ensure extended operation is not carried out at zero speed e.g. crash stop.
• Check Motor loading, reduce if excessive.
• Check counter balance loading.
• Reduce maximum drive switching frequency.
• Increase acceleration / deceleration rates.
• Reduce settings for Run and Creep Stop Jerks.
• Reduce duty cycle.
• Check DC bus ripple.
• Ensure all three input phases are present and balanced.
Recommended actions with sub-trip 300:
• Reduce the braking load.</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 10 s after the trip was initiated.
Recommended actions:
• If seen during auto-tune reduce the voltage boost.
• Check for short circuit on the output cabling.
• Check integrity of the Motor insulation using an insulation tester.</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Description / Recommended action</th></tr>
<tr><td>OI Brake</td><td>Braking IGBT over current: short circuit protection for the braking IGBT activated</td></tr>
<tr><td>4</td><td>OI Brake trip indicates an over current detected in the braking IGBT or braking IGBT protection has been activated. This trip cannot be reset until 10 s 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 dc</td><td>Power module over current detected from IGBT on state voltage monitoring</td></tr>
<tr><td>109</td><td>An OI dc trip indicates short circuit protection for the inverter stage has been activated.
Recommended actions:
• Disconnect the Motor from the drive, and check both Motor and cable insulation.
• Check and ensure any output Motor contactor shorting contactor is not being applied whilst the Elevator drive is enabled.
• Replace the drive.</td></tr>
<tr><td>Out Phase Loss</td><td>Output phase loss detected</td></tr>
<tr><td>98</td><td>Out Phase Loss trip indicates a Motor phase loss detected. If Reverse Output Phase Sequence B26 = On (1) the output phases to the Motor U, V, W are reversed, and so sub-trip 3 refers to physical output phase V and sub-trip 2 refers to physical output phase W.
<table><tr><th>Sub-trip</th><th>Reason</th></tr><tr><td>1</td><td>U phase detected as disconnected when drive enabled to run.</td></tr><tr><td>2</td><td>V phase detected as disconnected when drive enabled to run.</td></tr><tr><td>3</td><td>W phase detected as disconnected when drive enabled to run.</td></tr><tr><td>4</td><td>Output phase loss detected when the drive is running.</td></tr></table>Recommended actions:
• Check Motor and drive connections.
• To disable the trip set Output Phase Loss Detection Enable H06 = Disabled (0).</td></tr>
<tr><td>Over Speed</td><td>Motor speed has exceeded the over speed threshold</td></tr>
<tr><td>7</td><td>In open loop mode, if Output Frequency J60 exceeds the threshold set in Motor Over Speed Threshold E09 in either direction an Over speed trip is produced.
Recommended actions:
• Check the Motor is not being driven by another part of the system.
• Check drive selection and operation in current limit, unable to deliver required torque.</td></tr>
<tr><td>Over Volts</td><td>DC bus voltage has exceeded the peak level or maximum continuous level for 15 s</td></tr>
<tr><td>2</td><td>The Over Volts trip indicates the DC bus voltage has exceeded + VM_DC_VOLTAGE[MAX] for 15 s. The trip threshold varies based on drive voltage rating as below.
<table><tr><th>Voltage rating</th><th>VM_DC_VOLTAGE[MAX]</th><th>VM_DC_VOLTAGE_SET[MAX]</th></tr><tr><td>200</td><td>415</td><td>410</td></tr><tr><td>400</td><td>830</td><td>815</td></tr><tr><td>575</td><td>990</td><td>970</td></tr><tr><td>690</td><td>1190</td><td>1175</td></tr></table>Recommended actions:
• Check the AC power supply and disturbances which could cause the DC bus to rise.
• Check external braking resistor circuit is connected.
• Check operation of external braking resistor protection.
• Check Elevator balanced correctly.
• Decrease the braking resistor value staying above the minimum value for drive model).
• Increase the deceleration rate.
• Check Motor insulation using a insulation tester.</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Description / Recommended action</th></tr>
<tr><td>Phase Loss</td><td>Supply phase loss</td></tr>
<tr><td>32</td><td>
The Phase Loss trip indicates that the drive has detected an input phase loss or large supply imbalance. Phase loss can be detected directly from the supply where the drive has a thyristor based charge system (Frame size 8 and above). If phase loss is detected using this method the drive trips immediately and the xx part of the sub-trip is set to 01.

In all sizes of drive phase loss is also detected by monitoring the ripple in the DC bus voltage in which case the drive attempts to stop before tripping. When phase loss is detected by monitoring the ripple in the DC bus voltage the xx part of the sub-trip is zero.

Input phase loss detection can be disabled when the drive is operating from a DC supply or single phase UPS Input Phase Loss Detection Mode H08.
<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.</td></tr>
<tr><td>Power system</td><td>01</td><td>Rectifier number</td><td>00: Phase loss has been detected by the rectifier module.</td></tr>
</table>
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.
</td></tr>
<tr><td>PSU 24</td><td>24V internal power supply overload</td></tr>
<tr><td>9</td><td>
The total user load of the drive and option modules have exceeded the internal user + 24 V power supply limit. The user load consists of the drive digital outputs.

Recommended actions:
• Reduce the user load and Reset the drive.
• Remove control connections from the drive and perform a Reset.
• Remove any option modules and perform a Reset.
• Provide an external + 24 V power supply on Control Terminal 2 of the drive.
• Permanent trip, hardware fault within the drive – return the drive to the supplier.
</td></tr>
<tr><td>Resistance</td><td>Measured resistance has exceeded the parameter range</td></tr>
<tr><td>33</td><td>
The Resistance trip indicates that the measured Motor stator resistance during an auto-tune has exceeded the maximum value allowable for the drive in Stator Resistance B34. The maximum for the stator resistance parameters is generally higher than the maximum value that can be used in the control algorithms. If the value exceeds (VFS / v2) / Full Scale Current Kc J06, where VFS is the full scale DC bus voltage then this trip is initiated.

Recommended actions:
• Check the value entered in Stator resistance B34.
• Ensure the stator resistance of the Motor falls within the allowable range of the drive model.
• Check the Motor cable / connections.
• Check the Motor phase to phase resistance at the drive terminals, including Motor cables.
• Check the Motor phase to phase resistance at the Motor terminals.
• Check the integrity of the Motor stator winding using a insulation tester.
• Select fixed boost mode, B09 = Fixed and verify output current waveforms with oscilloscope.
• Replace the Motor.
</td></tr>
<tr><td>SlotX Different</td><td>Option module fitted in Slot X has changed between power cycles</td></tr>
<tr><td>204
209
214</td><td>
If the option module fitted in option module Slot X is different to the option module present at the last power-down then this trip is produced. The sub-trip number gives the identification code of the option module that was originally fitted. Drive user parameters must be saved to prevent this trip on the next power-up if the module has changed.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>No option module was fitted previously.</td></tr>
<tr><td>2</td><td>An option module with the same identifier is fitted, but the set-up menu has been changed, and so default parameters have been loaded for this menu.</td></tr>
<tr><td>3</td><td>An option module with the same identifier is fitted, but the applications menu for this option slot has been changed, and so default parameters have been loaded for this menu.</td></tr>
<tr><td>4</td><td>An option module with the same identifier is fitted, but the set-up and applications menu have been changed, and so default parameters have been loaded for these menus.</td></tr>
<tr><td>>99</td><td>Shows the identifier of the module previously fitted.</td></tr>
</table>
Recommended actions:
• Turn off the power, ensure correct option module installed and re-apply power.
• Confirm currently installed option module is correct, ensure option module parameters are set correctly and perform a user save in mm.000.
</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Description / Recommended action</th></tr>
<tr><td>SlotX Error</td><td>Slot X option module error</td></tr>
<tr><td>202
207
212</td><td>The option module in Slot X has indicated an error. The option module can give the reason for the error and is shown in the sub-trip number. As default the sub-trip number is shown as a number on the display, however it is possible for the option module to supply sub-trip number strings which will be displayed instead of the number if available.
Recommended actions:
• See relevant Option Module User Guide for details of the trip.</td></tr>
<tr><td>SlotX HF</td><td>Option module in Slot X has Hardware fault</td></tr>
<tr><td>200
205
210</td><td>This trip indicates that there is a fault with the option module in option Slot X that means that this module cannot operate. The possible causes of the trip are given by the sub-trip value.
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>The option module category cannot be identified.</td></tr>
<tr><td>2</td><td>All the required customisable menu table information has not been supplied or the tables supplied are corrupt.</td></tr>
<tr><td>3</td><td>Insufficient memory available to allocate the comms buffers for this module.</td></tr>
<tr><td>4</td><td>Option module has not indicated it is running correctly during drive power-up.</td></tr>
<tr><td>5</td><td>The option module has been removed after power-up or it has ceased to indicate to the drive processor that it is still active.</td></tr>
<tr><td>6</td><td>The option module has not indicated that it has stopped accessing drive parameters during a drive mode change.</td></tr>
<tr><td>7</td><td>The option module has failed to acknowledge that a request has been made to reset the drive processor.</td></tr>
<tr><td>8</td><td>Drive failed to read the menu table from the option module during power-up.</td></tr>
<tr><td>9</td><td>Drive failed to upload menu tables from option module and timed-out (5 s).</td></tr>
<tr><td>10</td><td>Menu table CRC invalid.</td></tr>
</table>
Recommended actions:
• Turn off the power, ensure correct option module installed and re-apply power.
• Confirm currently installed option module is correct, ensure option module parameters are set correctly and perform a user save in mm.000.</td></tr>
<tr><td>SlotX Not Fitted</td><td>Option module in Slot X no longer fitted</td></tr>
<tr><td>203
208
213</td><td>Each option module fitted in the drive is identified at power-up and the option fitted is stored by the drive in its non-volatile memory. If an option module was fitted in Slot X at power-down, but that option module has subsequently been removed before power up then this trip is produced. The sub-trip number gives the identification code of the option module that has been removed. The priority order for the option module not fitted trips is Slot1 Not Fitted highest, then Slot2 Not Fitted, then Slot3 Not Fitted then Slot4 Not Fitted. Drive user parameters must be saved to prevent this trip on the next power-up.
Recommended actions:
• Ensure the option module is installed correctly in Slot 4.
• Re-install the option module.
• To confirm removed option module is no longer required perform save in mm.000.</td></tr>
<tr><td>Soft Start</td><td>Soft start relay fault</td></tr>
<tr><td>226</td><td>This trip indicates that the soft start relay in the drive (Drive frame sizes 3 to 6) has failed to close or the soft start monitoring circuit has failed.
Recommended actions:
• Hardware fault - contact the supplier of the driver.</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Description / Recommended action</th></tr>
<tr><td>Spd / Dir Select</td><td>Control sequence speed and direction signals to the Elevator drive</td></tr>
<tr><td>81</td><td>This trip is related to speed reference or direction selection timing issues:
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>There is no speed reference or direction selected at the end of State 4 Release Motor Brakes.
- There is a 3 s delay after Brake Control Release Delay D04 to activate this trip.
There is no speed reference or direction selected in the end of State 5 Load Measurement when Load measurement time O04 > 0 ms.
- There is a 3 s delay after Load measurement time O04 to activate this trip.</td></tr>
<tr><td>2</td><td>The direction and speed are still selected at the end of travel in State 14 Contactor Control after 4 s. Remove the speed or direction signals to Reset the trip.
- When Control Input mode H11 = Analog Run Prmit (0), the Run Permit signal using Direction Input 1 G39 must be removed at the end of travel.
- When Control Input mode H11 = Analog 2 Dir (0), Priority 2 Dir (4) or Binary 2 Dir (5) the direction signals (Direction Input 1 G39 or Direction Input 2 G40) OR the speed selection (Reference Select Bit 0 Input G32 to Reference Select Bit 6 Input G38) must be removed at the end of travel.
- When Control Input mode H11 = Priority 1 Dir (2) or Binary 1 Dir (3) the speed selection (Reference Select Bit 0 Input G32 to Reference Select Bit 6 Input G38) must be removed at the end of travel.
- When Control Input mode H11 = Control Word (6), the direction signals (Control Word G51 Bit 10 or Bit 11) OR the speed selection (Control Word G51 Bit 0 to Bit 9) must be removed at the end of travel.</td></tr>
</table>
Recommended actions:
• Check control sequence from Lift (Elevator) controller and drive setup (Control mode selection and control input logic).
• Check control wiring from Lift (Elevator) controller to drive, and through external components.</td></tr>
<tr><td>Speed Err</td><td>Excessive following speed error</td></tr>
<tr><td>62</td><td>For Open loop mode excessive following speed error is detected, and a trip generated, when the drive enters and operates in current limit for the time defined in Maximum Speed Error Threshold H15, the allowable time to operate in current limit prior to the trip being generated, selecting very high values disables the Speed err detection. The speed error during a travel is displayed in Maximum Speed Error J57 independent of the activation of the speed error detection and this is reset to 0 at each start.
Recommended actions:
• Possible causes for the speed error trip can be due to the following
Motor
Check Motor power connections and phase rotation
Check Motor brake control
Check Lift safety gear
Drive set-up
Check Motor details and parameter set-up, including current limit
• Increase the Maximum Speed Error Threshold H15.
• Maximum Speed Error Threshold H15 = 0 disables speed error detection.</td></tr>
<tr><td>STO Ctrl Err</td><td>Safe Torque Off (STO), Drive enable control sequence error</td></tr>
<tr><td>66</td><td>The Safe Torque Off (STO), Drive enable input sequence is incorrect i.e. the Safe Torque Off (STO), Drive enable was not removed at the end of the travel following Motor contactor control and within 4 s, or applied during the start following Motor contactor control within 6 s.
Recommended actions:
• Check control connection of Safe Torque Off (STO), Drive enable to T31 on the drive.
• Check parameter T31 STO Input 1 State F10 the Safe Torque Off (STO), Drive enable input for the correct sequence during start / stop.
• Check correct operation of output Motor contactors and auxiliary contacts.
• Check Open / Close delay time of output Motor contactors.
• Check Motor contactor delay in Motor Contactor Measured Delay Time B32.</td></tr>
</table>

<table>
<tr><th>Trip</th><th>Description / Recommended action</th></tr>
<tr><td>Temp Feedback</td><td>Elevator drive internal temperature feedback error</td></tr>
<tr><td>218</td><td>This trip indicates an internal drive thermistor fault (i.e. open circuit or short circuit).
<table>
<tr><th>Source</th><th>xx</th><th>y</th><th>zz</th></tr>
<tr><td>Control board</td><td>01</td><td>00</td><td>01: Control board thermistor 1
02: Control board thermistor 2
03: I/O board thermistor</td></tr>
<tr><td>Power system</td><td>Power module number</td><td>0</td><td>Zero temperature feedback via power system comms 21, 22 and 23 for direct ELV temperature feedback.</td></tr>
<tr><td>Power system</td><td>01</td><td>Rectifier number</td><td>Always zero.</td></tr>
</table>
Recommended actions:
• Hardware fault - contact the supplier of the drive.</td></tr>
<tr><td>Th Brake Res</td><td>Brake resistor over temperature</td></tr>
<tr><td>10</td><td>If hardware based braking resistor thermal monitoring is provided and the resistor overheats this trip is initiated. If the braking resistor is not present then this trip must be disabled with bit 3 of Action On Trip Detection H45.
Recommended actions:
• Check braking resistor wiring.
• Check braking resistor value is greater than or equal to the minimum resistance value.
• Check braking resistor insulation.</td></tr>
<tr><td>TH Short Circuit</td><td>Motor thermistor short circuit</td></tr>
<tr><td>25</td><td>This trip indicates that a temperature sensor connected to an Analog input 3 or Terminal 15 on the position feedback interface has a low impedance (i.e. < 50 Ω). 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>3</td><td>Resistance of thermistor on Analog input 3 is < 50 Ω.</td></tr>
<tr><td>4</td><td>Resistance of thermistor on drive position feedback interface is < 50 Ω.</td></tr>
</table>
Recommended actions:
• Check thermistor connection at drive control terminal, encoder port connection.
• Check thermistor wiring, continuity and signs of damage.
• Replace Motor / Motor thermistor.</td></tr>
<tr><td>Thermistor</td><td>Motor thermistor over-temperature</td></tr>
<tr><td>24</td><td>This trip indicates that a temperature sensor connected to Analog input 3 or Terminal 15 on the position feedback interface has indicated an over-temperature. The cause of the trip can be identified by the sub-trip number, and checking Motor Thermistor Input Select F74. This is a delayed trip where the travel completes followed by a drive trip. If a delayed trip has been scheduled during the travel Global Warning L04 = On (1).
<table>
<tr><th>Sub-trip</th><th>Reason</th></tr>
<tr><td>1</td><td>Trip initiated from thermistor connected to position feedback interface.</td></tr>
<tr><td>2</td><td>Trip initiated from thermistor connected to Analog input 3.</td></tr>
</table>
Recommended actions:
• Check Motor thermistor wiring connections and continuity.
• Check Motor temperature.
• Check Motor ventilation, provide additional forced cooling.
• Replace Motor / Motor thermistor.</td></tr>
<tr><td>User 24V</td><td>User 24 V supply is not present on Control terminals 1 (0 V) and 2 (24 V)</td></tr>
<tr><td>91</td><td>A User 24 V trip is initiated, if User Supply Select O10 = On (1) for 24 V backup of the control PCB and no user 24 V supply is present on Control terminals 1 and 2.
Recommended actions:
• Ensure a + 24 V supply is connected to Control terminals 1 (0 V) and 2 (24 V).
• Ensure the + 24 V supply meets the specification of the + 24 V user input on the drive.
• Disable User Supply Select O10 = Off (0) if not required.</td></tr>
<tr><td>User Save</td><td>User Save error / not completed</td></tr>
<tr><td>36</td><td>This 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 mm.000 to ensure trip doesn't occur on next power up.
• Ensure the drive has enough time to complete the save before removing power.</td></tr>
</table>

Trip	Description / Recommended action
Watchdog	**Control word watching not serviced and timed out**
30	This trip indicates that the control word watchdog has been enabled and has timed out. Watchdog bit must be set = 1 at least every 500 ms or less during operation. A 10 s delay is implemented before calling a Ctrl Watchdog trip during power up and on enabling the Control Word function. If a travel is in progress when the fault occurs the Elevator drive will perform a controlled Stop and then trip. **Recommended actions:** • Check setting on Elevator controller to ensure Control word watchdog bit 12 is serviced.
550Hz Limit	**Drive output frequency exceeded the maximum allowed operating frequency**
83	The values used to configure the drive in the mechanical menu parameters **E01** to **E05** and motor map settings have resulted in the maximum output frequency being > 550 Hz which is not allowed. **Recommended actions:** • Adjust **E01** to **E05** mechanical system data to the correct settings to limit the output frequency. • Ensure motor map settings are correct to prevent excessive output frequencies.

6.2 Auto-Reset

The Auto- Reset function can be used to clear Elevator drive trips automatically.

The Auto- Reset is only active, if parameter **H46** Number Of Auto-reset Attempts > None (0) and parameter **H47** Auto-reset Delay is setup correctly. If the Auto-reset function is active, an attempt is made following every Elevator drive trip to reset the trip after the reset delay, which can range from its default of 1.0 s up to a maximum of 600.0 s

Value	Text
0	None
1	1
2	2
3	3
4	4
5	5
6	Infinite

If repeated trips occur, the reset will be repeated up to a maximum number of times as defined in **H46** Number Of Auto-reset Attempts (None (0) to Infinite (6)) using the programmed delay between the attempted trip resets as defined in **H47** Auto-reset Delay. If **H46** Number Of Auto-reset Attempts reaches the maximum where **H46** = 1 (1) 2 (2) 3 (3) 4 (4) or 5 (5), the next trip will not be reset.

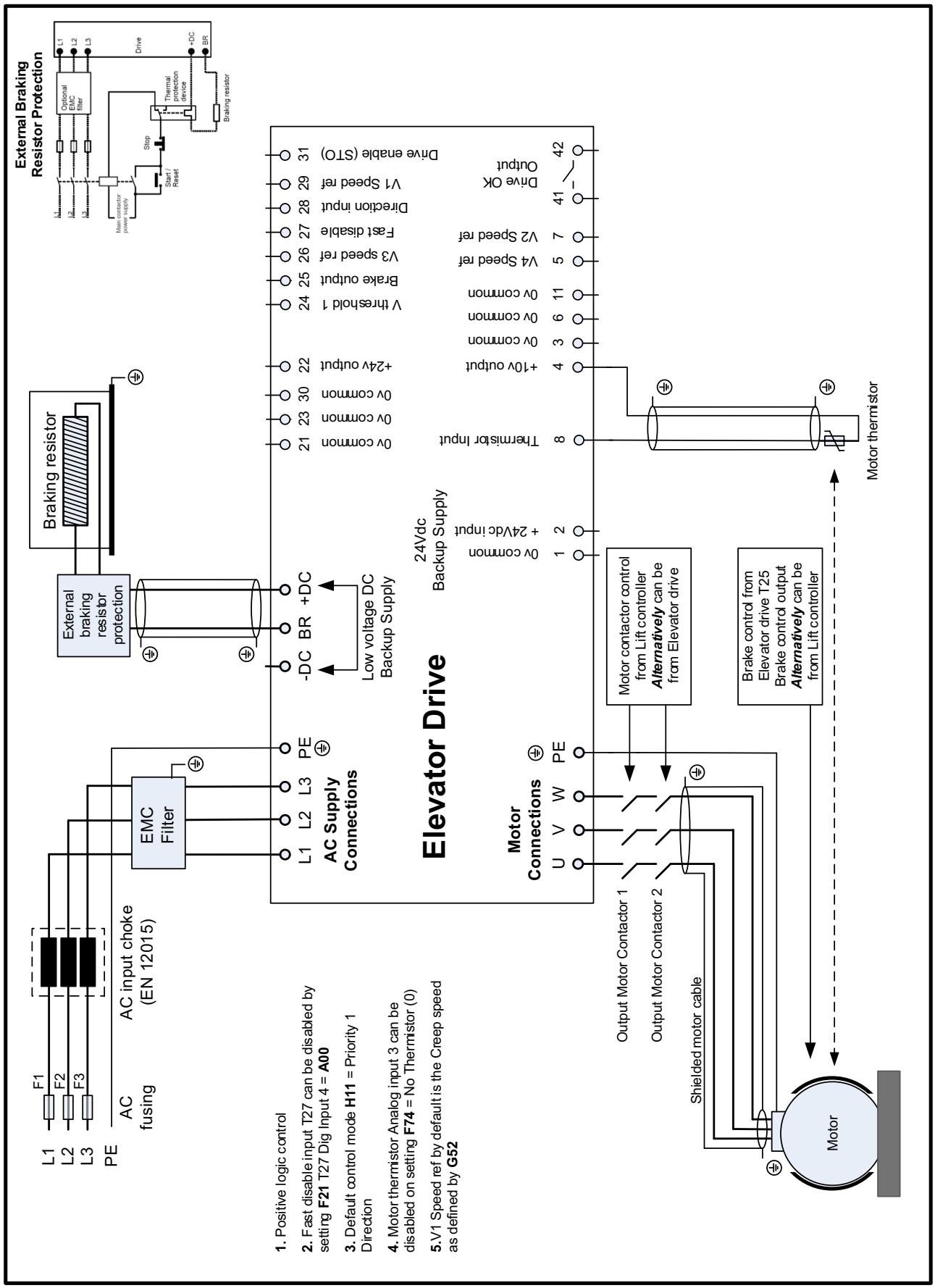
If no Elevator drive trip occurs for 5 minutes, the trip counter for **H46** Number Of Auto-reset Attempts will be cleared, or when a manual Elevator drive trip reset is carried out the auto-reset counter is also cleared.

Auto reset will not occur after any trips with priority levels 1, 2 or 3.

Table 6-1 Trip categories

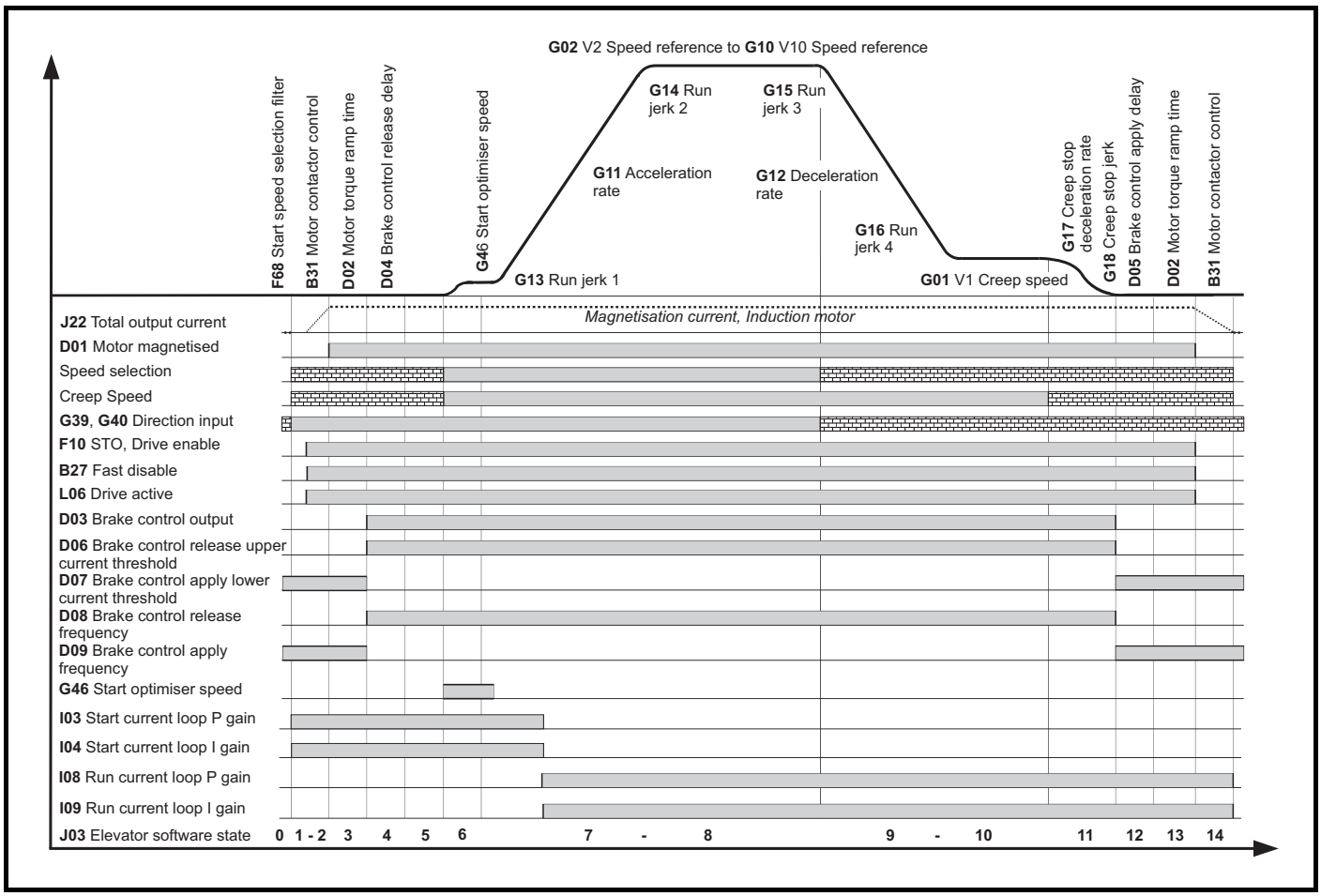
Priority	Category	Trips	Comments
1	Internal faults	HFxx	These indicate internal problems and cannot be reset. All drive features are inactive after any of these trips occur. If a Keypad is installed it will show the trip, but the Keypad will not function.
1	Stored HF trip	{Stored HF}	This trip cannot be cleared unless 1299 is entered into parameter (**mm.000**) and a reset is initiated.
2	Non-resettable trips	Trip numbers 218 to 247, {Slot1 HF}, {Slot2 HF}, {Slot3 HF} or {Slot4 HF}	These trips cannot be reset.
3	Volatile memory failure	{EEPROM Fail}	This can only be reset if Parameter **mm.000** is set to 1233 or 1244, or if Default Drive (**H04**) 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 and position feedback interface power supply	{PSU 24V} and {Encoder 1}	These trips can override {Encoder 2} to {Encoder 6} trips.
5	Trips with extended reset times	{OI ac}, {OI Brake}, and {OI dc}	These trips cannot be reset until 10 s after the trip was initiated.
5	Phase loss and d.c. link power circuit protection	{Phase Loss} and {Oht dc bus}	The drive will attempt to stop the Motor before tripping if a {Phase Loss} 000 trip occurs unless this feature has been disabled (see *Action On Trip Detection* (H46). The drive will attempt to finish the travel before tripping if an {Oht dc bus} occurs.
5	Standard trips	All other trips	

7 Connection Diagram



8 Timing Diagram

8.1 Open-loop operation



9 Re-Configuring Control Terminals

The default control terminal configuration for the Elevator drive is as follows. All of the control terminals are user configurable.

Terminal No	Function	IO Default Destination-Source	IO State	IO Invert
05	Input	**F41** = **G35** Speed select Bit 3 input	**F35**	**F40**
07	Input	**F48** = **G33** Speed select Bit 1 input	**F36**	**F47**
09	Input	**F55** = **A00** Unassigned	**F37**	**F54**
24	Input / Output **F24**	**F18** = **J48** Velocity threshold 1 output	**F03**	**F12**
25	Input / Output **F25**	**F19** = **D03** Brake output	**F04**	**F13**
26	Input / Output **F26**	**F20** = **G34** Speed select Bit 2 input	**F05**	**F14**
27	Input	**F21** = **B27** Fast disable input	**F06**	**F15**
28	Input	**F22** = **G39** Direction input 1	**F07**	**F16**
29	Input	**F23** = **G32** Speed select Bit 0 input	**F08**	**F17**
41, 42	Relay output	**F27** = **L05** Drive OK output	**F09**	**F28**

Control Mode		Description
H11 = 0	Analog Run Permit	Analog speed reference (T07 Analog input 1) with run permit, Direction Input 1 **G39** = On (1) to start the profile
H11 = 1	Analog 2 Dir	Analog speed reference (T07 Analog input 1) with dual direction inputs **G39** and **G40**
H11 = 2	Priority 1 Dir	Priority speed selection with single direction input **G39**
H11 = 3	Binary 1 Dir	Binary speed selection with single direction input **G39**
H11 = 4	Priority 2 Dir	Priority speed selection with dual direction inputs **G39** and **G40**
H11 = 5	Binary 2 Dir	Binary speed selection with dual direction inputs **G39** and **G40**
H11 = 6	Control Word	Control over on-board 485 Modbus port using Control word **G51** and Status Word **L74**

Binary Speed Selection	Bit 0 G32	Bit 1 G33	Bit 2 G34	Bit 3 G35	Speed reference
V0	–	–	–	–	–
V1	1	–	–	–	G01
V2	–	1	–	–	G02
V3	1	1	–	–	G03
V4	–	–	1	–	G04
V5	1	–	1	–	G05
V6	–	1	1	–	G06
V7	1	1	1	–	G07
V8	–	–	–	1	G08
V9	1	–	–	1	G09
V10	–	1	–	1	G10

Priority Speed Selection	Bit 0 G32	Bit 1 G33	Bit 2 G34	Bit 3 G35	Bit 4 G36	Bit 5 G37	Bit 6 G38	Speed reference
V0	–	–	–	–	–	–	–	–
V1	1	–	–	–	–	–	–	G01
V2	–	1	–	–	–	–	–	G02
V3	–	–	1	–	–	–	–	G03
V4	–	–	–	1	–	–	–	G04
V5	–	–	–	–	1	–	–	G05
V6	–	–	–	–	–	1	–	G06
V7	–	–	–	–	–	–	1	G07

Control Word G51			Status Word L74	
Bit	**Description**	**Priority**	**Bit**	**Description**
0	V1 speed reference by default Creep Speed (G52)	10 (Lowest)	0	Drive OK (**L05**)
1	V2 speed reference	9	1	Drive Active (**L06**)
2	V3 speed reference	8	2	At Zero Speed (**L08**)
3	V4 speed reference	7	3	Reserved
4	V5 speed reference	6	4	Reserved
5	V6 speed reference	5	5	Reserved
6	V7 speed reference	4	6	Reserved
7	V8 speed reference	3	7	Rated Load Reached (**L13**)
8	V9 speed reference	2	8	Current Limit Reached (**L15**)
9	V10 speed reference	1 (Highest)	9	Regenerating (**L14**)
10	Direction input 1 CCW		10	Braking IGBT Active (**L16**)
11	Direction input 2 CW		11	Braking Resistor Alarm (**L17**)
12	Watchdog bit Must be set to 1 at least every 500 ms. Failure to do so will result in a **Ctrl Watchdog** fault.		12	Reverse Direction Commanded (**L27**)
13	Control Word enable Must be set to 1 to allow travel. For a normal travel this bit is set to 1 when travel is requested i.e. following Speed / Direction / Enable and set to 0 when the travel has completed.		13	Reverse Direction Running (**L28**)
14	Reserved		14	Reserved
15	Reserved	N/A	15	N/A

Configuration Options		Notes
B31	Motor contactor control output	Can be routed via a digital output to the Elevator control system for control of the output motor contactors
D01	Motor magnetised indication, output	This motor magnetised indication can be routed via a digital output to the Elevator controller as an indication of when the motors brakes can be released
G39	Direction input 1 CCW	Direction counter clock wise
G40	Direction input 2 CW	Direction clock wise
E11	Load cell compensation input	The external load cell compensation uses the Elevator car load cell to generate a torque feed forward reference. Also refer to setup parameters **E10** Enable **E12** Filter **E13** Reference **E19** Offset and **E20** Scaling
H26	FAST stop enable	A FAST stop can be carried out using either Speed control or Direction control (dual direction inputs), once the FAST stop mode is enabled. Also refer to **G29** Deceleration rate

Index

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