

Technical manual for the Omron 3G3FV Flux vector inverter

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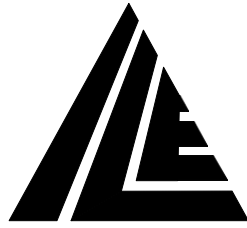
LONDON OFFICE
DNL House
17 Hickman Avenue
London E4 9JG
0208 527 9669

LEICESTER OFFICE
Unit 3, Wanlip Road
Syston, Leicester
LE7 1PD
0116 269 0900

KEIGHLEY OFFICE
Aireworth Distribution Centre
Aireworth Road, Keighley
West Yorkshire BD21 4DW
01535 609 311

ileweb.com

International Lift Equipment Ltd.
Registered in England No. 01236448.
Registered Office: Lynton House, 7-12
Tavistock Square, London WC1H 9BQ



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SECTION A

Introduction

The ILE Variable Frequency Control inverter for squirrel cage motors utilises state of the art electronics, to control an AC Induction Motor's speed and torque. In the lift application there is no need for a speed feedback element up to 1.0 m/s.

The system enhances single speed lifts with variable speed performance for new and existing lifts, whilst decreasing wasteful heat loss within the motor typical of Variable Voltage Thyristor Controlled regulator systems.

This manual will hopefully give a summarised version of the Omron control options and assist in setting up.

Further, more detailed information is available in the Omron 3G3FV programming and installation manual. We suggest that, for a first time user, this information is studied.

SECTION B

Sequence of Events

Starting

Starting is initiated by the receipt of either an UP or a DOWN direction signal.

Acknowledgement of the direction signal to the inverter, is given to the processor via the contact 25 and 27 making in the STR feedback line. The direction relays energise the STR relay, which energises the MC contactors that allow power to reach the motor. The direction combined with the STR relays also energise the BKC relay that lifts the mechanical brake and completes the STR feedback input on the processor board, the speed signals are then given to the drive via the processor pilot relays pulling in HSR and LSR. The lift then accelerates to high speed (or any other pre-selected speed). The Brake Control contact in the BKC line is energised when terminal 3 on the inverter is received. The FLT contact is a fault contact, which is energised when there is a fault condition on the inverter.

Stopping

Consider the lift is travelling at high speed. On receipt of a slowing signal the high speed signal HSR is removed from the regulator. The lift decelerates, and targets for levelling speed, under the influence of the deceleration and s-curve parameters until levelling speed is achieved. Upon reaching the stopping zone, MSU and MSD operate, either directly into the microprocessor board, or via relays, this removes LSR. The following sequence then occurs: -

- a) The regulator decelerates towards zero speed
- b) The mechanical brake is activated by terminal 9 and 10 of the Omron inverter, this time is adjustable via the parameter B4-02 delay off timer to give a smooth stop.
- c) When the STR relay is released, it cuts off the transistors in the inverter via terminal 8 which is configured as a baseblock. The STR relay has a delayed release built in via the release of UPR and DNR.
- c) The STR delayed contact also releases the MC and MC1 contactors, removing the 3 phase from the motor. This delay allows the current on both the contactor contacts and regulator transistors to decay to zero before switching. This sequence of events allows a smooth stop and prolongs both contactor and transistor life expectancy.

SECTION C

Input and output connections

The following is a list of the inverter inputs: -

<u>Terminal No.</u>	<u>Description</u>
1	Down enable
2	Up enable
3	Timed input
5	Multi-step speed reference 1
6	Multi-step speed reference 2
7	Multi-step speed reference 3
8	Baseblock (normally closed, when open circuit the transistors are switched off)
11	Common feed

<u>Terminal 7</u>	<u>6</u>	<u>5</u>	<u>Speed</u>	<u>Speed Reference</u>
0	0	0	0rpm	d1-01 Frequency ref1
0	0	1	Levelling speed	d1-02 Frequency ref2
0	1	0	0rpm	d1-03 Frequency ref3
0	1	1	Test speed	d1-04 Frequency ref4
1	0	0	0rpm	d1-05 Frequency ref5
1	0	1	High speed	d1-06 Frequency ref6
1	1	0	0rpm	d1-07 Frequency ref7
1	1	1	0rpm	d1-08 Frequency ref8

SECTION D

Control panel

The removable keypad is the device used for controlling and programming the Omron 3G3FV. The control panel has 11 keys and the display has 2 lines. The Control Panel can be attached directly to the inverter or it can be mounted externally. To change a parameter, enter the group where the parameter you wish to change is then step up or down to the parameter. Then press the enter key, and the far left hand unit will flash, by pressing the reset key you can move along the units to the one you wish to change the value of. Then by using the arrow keys the value can be adjusted to the new value required, press the enter button again to enter the new value and 'entry accepted' will be displayed.

Menu button

Up arrow

Enter button

The following is the sequence of events for changing the access level and then how to enter the programming mode.

To enter the programming section, programming is selected from the menu and then you can step through the groups and enter the one you want to access.

SECTION E

Parameters and description

The following table is the list of all the default parameter settings for the Omron inverter. Use these tables as reference when you are customising macros for your Omron application. The modified constants section at the end of the manual is a list of all the parameters that have been changed from this default list for each individual application.

Key: -

(D) Shows this parameter stays as factory default and there is no need to modify it

(Varies) This parameter can vary according to drive size the if needed it can be found in the Omron programming manual.

(User set) This shows the parameter is set according to the motor data plate.

<u>PARAMETERS</u>	<u>FACTORY SETTING</u>	<u>UNIT</u>
<u>INITIALISE</u>		
A: -		
1.00 LANGUAGE	English (D)	1
1.01 CONSTANT ACCESS LEVEL	Advanced	2
1.02 INITIALIZE PARAMETERS	No initialise(D)	0
1.03 CONTROL METHOD	Open loop vector	2
1.04 ENTER PASSWORD	0000(D)	
1.05 SELECT PASSWORD	No(D)	0
<u>PROGRAMMING</u>		
B: - APPLICATIONS		
1.00 SEQUENCE		
1.01 REFERENCE SOURCE	Terminals	1
1.02 RUN SOURCE	Terminals (D)	1
1.03 STOPPING METHOD	Ramp to Stop (D)	0
1.04 REVERSE OPER	Enabled (D)	0
1.06 CNTL INPUT SCANS	5ms-2scans (D)	1
1.07 LOC/REM RUN SEL	Cycle ext Run (D)	0
2.00 DC BRAKING		
2.01 DC INJ START FREQ	0.5	
2.02 DC INJ CURRENT	50%	
2.03 DC INJ TIME @ START	0.0 (D)	
2.04 DC INJ TIME @ STOP	0.5	

<u>PARAMETERS</u>	<u>FACTORY SETTING</u>	<u>UNIT</u>
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3.00	SPEED SEARCH		
3.01	SPDSRCH AT START	Disabled (D)	0
3.02	SPDSRCH CURRENT	150 (D)	
3.03	SPDSRCH DEC TIME	2 (D)	
4.00	DELAY TIMERS		
4.01	DELAY-ON TIMER	0.0 (D)	
4.02	DELAY-OFF TIMER	0.0	
5.00	PID CONTROL		
5.01	PID MODE	Disabled (D)	0
5.02	PID GAIN	1 (D)	
5.03	PID 1 TIME	1 (D)	
5.04	PID 2 LIMIT	100 (D)	
5.05	PID D TIME	0 (D)	
5.06	PID LIMIT	100 (D)	
5.07	PID OFFSET	0 (D)	
5.08	PID DELAY TIME	0 (D)	
6.00	REFERENCE HOLD		
6.01	DWELL FREQ @ START	0(D)	
6.02	DWELL TIME @ START	0(D)	
6.03	DWELL FREQ @ STOP	0(D)	
6.04	DWELL TIME @ STOP	0(D)	
8.00	ENERGY SAVING		
8.01	ENERGY SAVING GAIN	80(D)	
8.02	ENERGY SAVING START FREQ	0(D)	
C: -	TUNING		
1.00	ACCEL/DECEL		
1.01	ACCEL TIME 1	10	
1.02	DECEL TIME 1	10	
1.03	ACCEL TIME 2	10(D)	
1.04	DECEL TIME 2	10(D)	
1.05	ACCEL TIME 3	10(D)	
1.06	DECEL TIME 3	10(D)	
1.07	ACCEL TIME 4	10(D)	
1.08	DECEL TIME 4	10(D)	
1.09	FAST STOP TIME	10(D)	
1.10	ACC/DEC UNITS	0.1(D)	
1.11	ACC/DEC SW FREQ	0(D)	
2.00	S-CURVE ACC/DEC		
2.01	SCRV ACC @ START	0.2	
2.02	SCRV ACC @ END	0.2	
2.03	SCRV DEC @ START	0.2	
2.04	SCRV DEC @ END	0.0	
<u>PARAMETERS</u>		<u>FACTORY</u>	<u>UNIT</u>
		<u>SETTING</u>	

3.00	MOTOR COMP SLIP		
3.01	SLIP COMP GAIN	0	
3.02	SLIP COMP TIME DELAY	2000	
3.03	SLIP COMP LIMIT	200	
3.04	SLIP COMP REGEN	Disabled	0
4.00	TORQUE COMP		
4.01	TORQ COMP GAIN	1.0 (D)	
4.02	TORQ COMP TIME	200 (D)	
6.00	CARRIER FREQ		
6.01	CARRIER FREQ MAX	10 (D)	(Varies)
6.02	CARRIER FREQ MIN	10 (D)	(Varies)
6.03	CARRIER FREQ GAIN	0 (D)	
7.00	HUNTING PREV		
7.01	HUNT PREV SELECT	Enabled (D)	1
7.02	HUNT PREV GAIN	1 (D)	
D: -	REFERENCE		
1.00	PRESET REFERENCE		
1.01	REFERENCE 1	0 (D)	
1.02	REFERENCE 2	0	
1.03	REFERENCE 3	0 (D)	
1.04	REFERENCE 4	0	
1.05	REFERENCE 5	0 (D)	
1.06	REFERENCE 6	0	
1.07	REFERENCE 7	0 (D)	
1.08	REFERENCE 8	0 (D)	
1.09	JOG REFERENCE	6.0 (D)	
2.00	REFERENCE LIMITS		
2.01	REF UPPER LIMIT	100 (D)	
2.02	REF LOWER LIMIT	0 (D)	
3.00	JUMP FREQUENCIES		
3.01	JUMP FREQ 1	0 (D)	
3.02	JUMP FREQ 2	0 (D)	
3.03	JUMP FREQ 3	0 (D)	
3.04	JUMP BANDWIDTH	1.0 (D)	
4.00	SEQUENCE		
4.01	MOP REF MEMORY	Disabled (D)	0
4.02	TRIM CONTROL LVL	25 (D)	

PARAMETERS

**FACTORY
SETTING**

UNIT

E: -	MOTOR		
1.00	V/F PATTERN		
1.01	INPUT VOLTAGE	400	
1.02	MOTOR SELECTION	Standard fan cooled (D)	0
1.03	V/F SELECTION	Custom user-set patterns (D)	F
1.04	MAX FREQUENCY	50 (D)	
1.05	MAX VOLTAGE	400	
1.06	BASE FREQUENCY	60	(User set)
1.07	MID FREQUENCY A	2.5 (D)	(Varies)
1.08	MID VOLTAGE A	30 (D)	(Varies)
1.09	MIN FREQUENCY	1.2 (D)	(Varies)
1.10	MIN VOLTAGE	18 (D)	(Varies)
1.11	MID FREQUENCY B	0 (D)	
1.12	MID VOLTAGE B	0 (D)	
1.13	BASE VOLTAGE	0	(User set)
2.00	MOTOR SETUP		
2.01	MOTOR RATED FLA	31	(User set)
2.02	MOTOR RATED SLIP	2.5	(User set)
2.03	NO LOAD CURRENT	14	(User set)
2.05	TERM RESISTANCE	10.1	(User Set)
3.00	MOTOR 2 CTL METH		
3.01	CONTROL METHOD	Open loop vector	2
4.00	V/F PATTERN 2		
4.01	V/F 2 MAX FREQ	60 (D)	
4.02	V/F 2 MAX VOLTAGE	400 (D)	
4.03	V/F 2 BASE FREQ	60 (D)	
4.04	V/F 2 MID FREQ	2.5 (D)	(Varies)
4.05	V/F 2 MID VOLTAGE	22 (D)	(Varies)
4.06	V/F 2 MIN FREQ	0.4 (D)	(Varies)
4.07	V/F 2 MIN VOLTAGE	4 (D)	
5.00	MOTOR 2 SETUP		
5.01	MOTOR 2 RATED FLA	31.1 (D)	(Varies)
5.02	MOTOR 2 SLIP FREQ	2.5 (D)	(Varies)
5.03	MOTOR 2 NO-LOAD 1	14.1 (D)	(Varies)
5.05	MOTOR 2 TERM OHMS	10.1 (D)	(Varies)
F: -	OPTIONS		
2.00	AI-14 SETUP		
2.01	AI-14 INPUT SEL	3 channel individual (D)	0
3.00	DI-08, 16 SETUP		
3.01	PDI INPUT	BCD 1% unit (D)	0

PARAMETERS

**FACTORY
SETTING**

UNIT

4.00	AO-08, 12 SETUP		
4.01	A0 CH1 SELECT	2 (D)	
4.02	A0 CH1 GAIN	1.00 (D)	
4.03	A0 CH2 SELECT	3 (D)	
4.04	A0 CH2 GAIN	0.5 (D)	
5.00	DO-02 SETUP		
5.01	DO-02 CH1 SELECT	0 (D)	
5.02	DO-02 CH2 SELECT	1 (D)	
6.00	DO-08 SETUP		
6.01	DO-08 SELECTION	0 (D)	
7.00	PO-36F SETUP		
7.01	PO-36F SELECTION	1 (D)	
8.00	E-15 SETUP		
8.01	E-15 DET SEL	1 (D)	
9.00	EFO SETUP		
9.01	EFO SELECTION	0 (D)	
9.02	FO DTCT SEL	0 (D)	
9.03	EFO FAULT SEL	1 (D)	
9.04	TRACE SAMPLE TIM	0 (D)	
H: -	TERMINALS		
1.00	DIGITAL INPUTS		
1.01	TERMINAL 3 SEL	External fault	24
1.02	TERMINAL 4 SEL	Fault reset	14
1.03	TERMINAL 5 SEL	Multi-step speed ref 1 (D)	3
1.04	TERMINAL 6 SEL	Multi-step speed ref 2 (D)	4
1.05	TERMINAL 7 SEL	Jog frequency ref	6
1.06	TERMINAL 8 SEL	Baseblock NO	8
2.00	DIGITAL OUTPUTS		
2.01	TERMINAL 9-10	During run 1	0
2.02	TERMINAL 25-27	Excitation	1
2.03	TERMINAL 26-27	Frequency agree 1 (D)	2

PARAMETERS

**FACTORY
SETTING**

UNIT

3.00	ANALOGUE INPUTS		
3.01	TERM 13 SIGNAL	0 (D)	
3.02	TERM 13 GAIN	100 (D)	
3.03	TERM 13 BIAS	0 (D)	
3.04	TERM 16 SIGNAL	0(D)	
3.05	TERM 16 SEL	Auxiliary frequency ref	0
3.06	TERM 16 GAIN	100 (D)	
3.07	TERM 16 BIAS	0 (D)	
3.08	TERM 14 SIGNAL	2 (D)	
3.09	TERM 14 SEL	Not used (D)	1F
3.10	TERM 14 GAIN	100 (D)	
3.11	TERM 14 BIAS	0 (D)	
3.12	FILTER AVG TIME	0 (D)	
4.00	ANALOG OUTPUTS		
4.01	TERMINAL 21 SEL	2 (D)	
4.02	TERMINAL 21 GAIN	1 (D)	
4.03	TERMINAL 21 BIAS	0 (D)	
4.04	TERMINAL 23 SEL	3 (D)	
4.05	TERMINAL 23 GAIN	0.5 (D)	
4.06	TERMINAL 23 BIAS	0 (D)	
4.07	AO LEVEL SELECT	0 (D)	
5.00	SERIAL COM SETUP		
5.01	SERIAL COMM ADR	1F (D)	
5.02	SERIAL BAUD RATE	3 (D)	
5.03	SERIAL COM SEL	0 (D)	
5.04	SERIAL FAULT SEL	3 (D)	
5.05	SERIAL FLT DTCT	1 (D)	
L: -	PROTECTION		
1.00	MOTOR OVERLOAD PROTECTION		
1.01	MOL FAULT SEL	Enabled (D)	1
1.02	MOL TIME CONST	1.0	
2.00	POWER LOSS RIDE-THROUGH PARAMETERS		
2.01	PWRL SELECTION	0 (D)	
2.02	PWRL RIDETHRU T	1 (D)	(Varies)
2.03	PWRL BASEBLOCK T	0.5 (D)	(Varies)
2.04	PWRL V/F RAMP T	0.3 (D)	(Varies)
2.05	PUV DET LEVEL	380 (D)	
2.06	KEB FREQUENCY	0 (D)	

PARAMETERS

**FACTORY
SETTING**

UNIT

3.00	STALL PREVENTION		
3.01	STALLP ACCEL SEL	Enabled (D)	1
3.02	STALLP ACCEL LVL	150 (D)	
3.03	STALLP CHP LEVEL	50 (D)	
3.04	STALLP DECEL SEL	Enabled	1
3.05	STALLP RUN SEL	1 (D)	
3.06	STALLP RUN LVL	160 (D)	
4.00	SPEED/FREQUENCY DETECTION		
4.01	SPD AGREE LEVEL	0 (D)	
4.02	SPD AGREE WIDTH	2 (D)	
4.03	SPD AGREE LEVEL+/-	0(D)	
4.04	SPD AGREE WIDTH +/-	2(D)	
4.05	REF LOSS SEL	0(D)	
5.00	FAULT RESET/RESTART		
5.01	NUM OF RESTARTS	0	
5.02	RESTART SEL	Not active	0
6.00	OVERTORQUE DETECTION		
6.01	TORQ DET 1 SEL	Disabled	0
6.02	TORQ DET 1 LVL	150 (D)	
6.03	TORQ DET 1 TIME	0.1	
6.04	TORQ DET 2 SEL	Disabled (D)	0
6.05	TORQ DET 2 LVL	150 (D)	
6.06	TORQ DET 2 TIME	0.1 (D)	
8.00	HARDWARE PROTECTION		
8.01	DB RESIST PROT	Disabled (D)	0
8.02	OH PRE-ALARM LVL	95 (D)	
8.03	OH PRE-ALARM SEL	Continue operation	3
8.05	PH LOSS IN SEL	Disabled	0
8.07	PH LOSS OUT SEL	Disabled	0
8.10	GF FAULT SEL	Enabled (D)	1
O: -	OPERATOR		
1.00	DISPLAY SELECTION		
1.01	MONITOR SELECT	6 (D)	
1.02	POWER-ON MONITOR	Frequency reference (D)	1
1.03	DISPLAY SCALING	0 (D)	
1.05	ADDRESS DISPLAY	0 (D)	

PARAMETERS

**FACTORY
SETTING**

UNIT

2.00	OPERATOR KEY FUNCTION SELECTION		
2.01	LOCAL/REMOTE KEY	Enabled (D)	1
2.02	OPERATOR STOP KEY	Enabled (D)	1
2.03	USER DEFAULT	Store not set (D)	0
2.04	INVERTER MODEL #	22 (D)	(Varies)
2.05	OPERATOR M.O.P	Enter key needed (D)	0
2.06	OPER DETECTION	Disabled (D)	0
2.07	ELAPSED TIME SET	0 (D)	
2.08	ELAPSED TIME RUN	Cumulative power on (D)	0
2.09	INIT MODE SEL	2 (D)	

SECTION F

Monitoring

The following describes the Monitoring Signals. To put the Omron inverter in the ready to run state whereby the unit is controlled by the ILE controller the MENU button is pressed and 'MAIN MENU OPERATION' is displayed then the ENTER button is pressed. The monitoring section is entered by pressing the up arrow until you come to FUNCTION U1 MONITOR then press the enter button to enter this mode.

U1-05 SPEED	Displays the actual speed of the motor, as calculated by the inverter. The speed is displayed in Hz.
U1-02 FREQUENCY	Displays the output frequency (Hz) applied to the motor, as calculated by the inverter.
U1-03 CURRENT	Displays the motor current, as measured by the inverter.
U1-09 TORQUE	Displays the motor torque in per cent of the rated motor torque, as calculated by the inverter.
U1-08 POWER	Displays the motor power.
U1-07 DC BUS VOLTAGE V	Displays the DC bus voltage, as measured in the inverter. The voltage is displayed in Volts DC.
U1-06 OUTPUT VOLTAGE	Displays the motor voltage, as calculated by the inverter.
U1-13 OP HOUR COUNTER	This Actual Signal is an elapsed-time indicator. It counts the time the inverter has a run command, and is not in a fault state. The counted time cannot be reset.
U1-10 I/P Terminals	Status of the digital inputs. If the input is energised the display will indicate 1. If the input is not energised, the display will be 0.
U1-11 O/P STATUS	Status of the three outputs. 1 indicates that the O/P is energised and 0 indicates that the O/P is de-energised.

SECTION G

Tuning

In VF mode the Omron inverter is manually tuned to give the desired performance from the inverter. The parameters to set are: -

E 1-04 Maximum Frequency	50Hz
E 1-05 Maximum Voltage	415V
E 1-06 Base Frequency	As motor data plate
E 1-13 Base Voltage	As motor data plate
E 2-01 Motor Rated FLA	As motor data plate
E 2-02 Motor Rated Slip	$((\text{Rated RPM} - \text{Nameplate RPM}) / \text{Rated RPM}) * 50$ in Hz
E 2-03 No Load Current	Measure empty car up current and set 1 Amp higher
E 2-05 Term Resistance phases	Set to 75% of measured resistance between two of the motor phases

SECTION H

Commissioning procedure

N.B Commissioning procedure is to be carried out by competent personnel only.

WARNING : DO NOT TURN POWER ON & OFF MORE THAN 5 TIMES EVERY 15 MINUTES OR INTERNAL COMPONENTS MAY BE DAMAGED !!!

Equipment Required.

1. A Tachometer.
2. An A.C current meter. (Moving coil, not digital)

Pre Switch On Checks.

1. Check all site wiring and mains cable rating are correct.
2. Check the installation is in conformance with the EMC standards.
3. Ensure the lift is counter balanced correctly.
4. Ensure the lift doors cannot open.

Speed settings.

NOTE: ALL SPEED SETTINGS ARE IN Hz NOT RPM.

1. Simulate the Test Up button, check the lift runs in the UP Direction on test speed and the UP contactor is energised. If the lift runs DN reverse two of the motor phases and retest.
2. Simulate a Test Dn button and check the lift moves DN at test speed and the speed is the desired value, if not adjust speed D1-04 to suit.
3. Place the lift empty car at the bottom floor, Switch the lift to NORMAL and run the lift UP in high speed, and ensure the lift slows into floor correctly.
4. If the speeds are incorrect adjust the parameters after the lift has stopped and repeat step 3.
5. Place the lift empty car at the top floor and run the lift DN, ensure the high speed is the same as the UP direction, if not refer to Section I.
6. Check high speed in the UP direction and set to contract speed ensuring the lift slows and levels OK.
7. If the lift overshoots floor level or has a long levelling time into floor then adjust the slowing distance combined with deceleration rate C1-02 and the s curves C2-03,4 to acquire a reasonable comfort level with a minimum levelling time.
8. The parameter B4-02 Delay off timer can be increased to give a longer delay on the brake releasing or reduced to release it earlier.
9. Place the lift empty car at the top floor and run the lift DN in high speed, ensure when the lift slows the lift levelling speed is equal in the UP and DN direction, if not refer to Section I.

Setting the acceleration and starting.

1. Run the lift and note the acceleration rate.
2. Adjust the Acceleration rate C1-01 and s-curve C2-01,2 parameters for the desired acceleration that is required, as illustrated overleaf.

Stall test

1. Disconnect the brake and isolate. Switch the lift to test and switch on the controller.
2. Place the clamp meter on a phase of the incoming mains.
3. Simulate the test up push and the meter should be showing more than $1.75 * flc$. If the meter is showing $1.75 * flc$ or more, the regulator trips in the time specified in parameter L6-03. To reset switch the controller off then on.
4. Repeat in the DN direction.
5. Reconnect the brake.

N.B. To reset the regulator after a fault press the RESET or switch the panel off for at least 30 sec then on again.

After commissioning run the lift for at least 1 hour and ensure floor levels are consistent and the lift performs correctly.

SECTION I

Ride quality adjustments

The following parameters show how the performance of the inverter can be improved to suit individual applications.

Slip Comp Gain C3-01 can be adjusted in steps of 0.1 to equalise the levelling speeds in the up and down direction and remove vibrations, there is a desired maximum setting of 1.2 and a minimum setting of 0.4 setting this value too high will lead to vibration.

Adjusting the slip-compensation delay time C3-02 will influence the time taken before the drive compensates its output frequency under increasing slip, thereby minimising under-speeding (particularly during empty car down conditions). Reducing this value gives more response to load changes; increasing will directly dampen the response of the slip compensation circuit within the inverter overcoming additional torque pulsation resulting from slip comp during regeneration enabled C3-04. Adjust in 10mS steps, adjusting too low will give oscillations empty car up.

C3-03 can be adjusted to ensure car up and down speeds are matched.

Torque Comp Gain C4-01 can be adjusted to a maximum of 1.2 if absolutely necessary. This adjusts levels of starting torque. Reduce value to overcome vibration during accel / decel, particularly during car up running

Torque Comp Time C4-02 Increase this value if hunting occurs at low-speed (maximum value 200).

Motor Rated slip E2-02 can be increased to induce more slip and hence more current.

Increasing the Min / Mid Voltage E1-10 / E1-08 settings will reduce the requirements of slip compensation acting upon output frequency, thus reducing the possibility of speed oscillation. The settings can be adjusted in 2V steps improving the levels of low / medium speed running torque, thereby minimising undershoot.

No-load current E2-03 can also be adjusted for up to 50% of Motor nameplate rated full load current E2-01. This will ensure tighter control under empty car down conditions again minimising undershoot.

SECTION J

Fault Finding

The following section shows the common fault codes with a description of the fault and cause.

SECTION K

Modified constants

The following sheet is a print out of all the parameters that have been changed from the factory default values for this application.