



STARTING GUIDE ***FRENIC-Multi LM-1***

High performance compact
inverter for lift applications

3 ph 400 V 0.4 kW – 15 kW
3 ph 200 V 0.1 kW – 15 kW



Index	Version	Date	Written	Checked	Approved
1.1.0	- First Lift version	05.09.07	J.Alonso	S.Ureña	S.Ureña
1.2.0	- Second version (RESTILING)	05.02.08	J.Alonso	S.Ureña	S.Ureña
1.2.1	- 1ph 200 V series removed - Information of S-curves corrected - New parameters added in chapter 9 - Keypad menus information added	26.06.08	J.Alonso	S.Ureña	S.Ureña
1.2.2	- EMC standard compliance updated.	05.09.08	J.Alonso	S.Ureña	S.Ureña
1.3.0	- Formula for calculate no-load current is added. - Information about parameters P09 and P11 is added. -Information of how to adjust experimentally P12 is removed. - Chapter "7.3 Torque boost gain" is added. - Chapter "7.4 Compensation response time" is added.	11.11.08	J.Alonso	S.Ureña	S.Ureña
1.4.1	- Version updated from –LM to –LM1. - Header changed from –LM to –LM1. - Small text corrections. - Over-rating table for 400 V is added. - Factory setting is changed (updated). - Auto tuning mode 2 is static (updated). - Table 7.1 Sentence is added (*).	28.04.2011	S.Ureña	S.Ureña	S.Ureña
1.4.2	- Table 6.2 Modified (ramps deleted). - Table 6.3 Added. - Small text corrections. - Speed selection according o47 is added.	18.05.2011	S.Ureña	S.Ureña	S.Ureña
1.4.3	- Figure 4.7 Modified (Rescue is added). - Table 4.2 Modified. - Small text corrections. - Figure 7.1 Modified (MC1 & MC2) is added.	30.05.2012	S.Ureña	S.Ureña	S.Ureña



CONTENTS

Chapter	Page
1. SAFETY INFORMATION AND CONFORMITY TO STANDARDS	5
1.1 Safety information	5
1.2 Conformity to European standards	7
2. TECHNICAL DATA	8
2.1 Three-phase 400 V class series	8
2.2 Three-phase 200 V class series	8
2.3 Over-rating table for 400 V class series	9
3. MECHANICAL INSTALLATION	10
3.1 Operating Environment	10
3.2 Installing the inverter	10
4. WIRING	11
4.1 Removing the terminal cover and the main circuit terminal block cover	11
4.2 Wiring for main circuit terminals and grounding terminals	13
4.3 Wiring for control circuit terminals	14
4.4 Control terminal description	14
4.5 Setting up the slide switches	17
5. OPERATION USING THE KEYPAD	18
6. SETTING	21
6.1 Basic setting for induction motor	21
6.2 Quick start commissioning (auto tuning)	21
6.3 Additional setting	22
6.4 Setting the speed profile	23
6.5 Complete time diagram for normal travel	24
7. SPECIAL OPERATIONS	25
7.1 Rescue operation	25
7.2 Auto-resetting operation	26
7.3 Torque boost gain	27
7.4 Compensation response time	27
8. FUNCTION CODES (PARAMETERS)	28
9. TROUBLESHOOTING	31

Preface

Thank you for purchasing our FRENIC-Multi LM1 series of inverters.

This product is designed to drive a three-phase induction motor for lift applications. Read through this manual and be familiar with correct handling and operation of this product.

Improper handling may result in incorrect operation, a short life, or even a failure of this product as well as the motor.

Deliver this manual to the end user of this product. Keep this manual in a safe place until this product is discarded.

Listed below are the other materials related to the use of the FRENIC-Multi LM1. Read them in conjunction with this manual if necessary.

- FRENIC-Multi User's Manual (MEH457)
- FRENIC-Multi Instruction Manual (INR-SI47-1094a-E)

The materials are subject to change without notice. Be sure to obtain the latest editions for use.

☞ Inputs and outputs can be set to different functions using the corresponding functions. By factory defaults these settings are already suitable for lift applications. In this manual only the functions related to lift applications are described.



☞ Special functions are not described which are only used in special applications. For questions please contact our technical staff.

1. SAFETY INFORMATION AND CONFORMITY TO STANDARDS

1.1 Safety information


Read this manual thoroughly before proceeding with installation, connections (wiring), operation, or maintenance and inspection. Ensure you have sound knowledge of the device and familiarize yourself with all safety information and precautions before proceeding to operate the inverter.

Safety precautions are classified into the following two categories in this manual.


 WARNING	Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in death or serious bodily injuries.
 CAUTION	Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in minor or light bodily injuries and/or substantial property damage.


Failure to heed the information contained under the CAUTION title can also result in serious consequences. These safety precautions are of utmost importance and must be observed at all times.

Application

 WARNING
<ul style="list-style-type: none"> FRENIC-Multi LM1 is designed to drive a three-phase induction motor. Do not use it for single-phase motors or for other purposes. Fire or an accident could occur. FRENIC-Multi LM1 may not be used for a life-support system or other purposes directly related to the human safety. Though FRENIC-Multi LM1 is manufactured under strict quality control, install safety devices for applications where serious accidents or material losses are foreseen in relation to the failure of it. An accident could occur.

Installation

 WARNING
<ul style="list-style-type: none"> Install the inverter on a non-flammable material such as metal. Otherwise fire could occur. Do not place flammable object nearby. Doing so could cause fire.

 CAUTION
<ul style="list-style-type: none"> Do not support the inverter by its terminal block cover during transportation. Doing so could cause a drop of the inverter and injuries. Prevent lint, paper fibbers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter or from accumulating on the heat sink. Otherwise, a fire or an accident might result. Do not install or operate an inverter that is damaged or lacking parts. Doing so could cause fire, an accident or injuries. Do not stand on a shipping box. Do not stack shipping boxes higher than the indicated information printed on those boxes. Doing so could cause injuries.

Wiring

⚠ WARNING

- When wiring the inverter to the power supply, insert a recommended moulded case circuit breaker (MCCB) or residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) (with overcurrent protection) in the path of power lines. Use the devices within the recommended current range.
- Use wires of the specified size.
- When wiring the inverter to the power supply that is 500 kVA or more, be sure to connect an optional DC reactor (DCR).
Otherwise, fire could occur.
- Do not use one multicore cable in order to connect several inverters with motors.
- Do not connect a surge killer to the inverter's output (secondary) circuit.
Doing so could cause fire.
- Ground the inverter in compliance with the national or local electric code.
Otherwise, electric shock could occur.
- Qualified electricians should carry out wiring.
- Disconnect power before wiring.
Otherwise, electric shock could occur.
- Install inverter before wiring.
Otherwise, electric shock or injuries could occur.
- Ensure that the number of input phases and the rated voltage of the product match the number of phases and the voltage of the AC power supply to which the product is to be connected.
Otherwise fire or an accident could occur.
- Do not connect the power supply wires to output terminals (U, V, and W).
- Do not insert a braking resistor between terminals P (+) and N (-), P1 and N (-), P (+) and P1, DB and N (-), or P1 and DB.
Doing so could cause fire or an accident.
- Generally, control signal wires are not reinforced insulation. If they accidentally touch any of live parts in the main circuit, their insulation coat may break for any reasons. In such a case, ensure the signal control wire is protected from making contact with any high voltage cables.
Doing so could cause an accident or electric shock.

⚠ CAUTION

- Connect the three-phase motor to terminals U, V, and W of the inverter.
Otherwise injuries could occur.
- The inverter, motor and wiring generate electric noise. Ensure preventative measures are taken to protect sensors and sensitive devices from RFI noise.
Otherwise an accident could occur.

Operation

⚠ WARNING

- Be sure to install the terminal cover before turning the power ON. Do not remove the covers while power is applied.
Otherwise electric shock could occur.
- Do not operate switches with wet hands.
Doing so could cause electric shock.
- If the auto-reset function has been selected, the inverter may automatically restart and drive the motor depending on the cause of tripping.
(Design the machinery or equipment so that human safety is ensured after restarting.)
- If the stall prevention function (current limiter), automatic deceleration, and overload prevention control have been selected, the inverter may operate at an acceleration/deceleration time or frequency different from the commanded ones. Design the machine so that safety is ensured even in such cases.
Otherwise an accident could occur.

Maintenance and inspection, and parts replacement

⚠ WARNING
<ul style="list-style-type: none"> • Turn the power OFF and wait for at least five minutes before starting inspection. Further, check that the LED monitor is unlit and that the DC link bus voltage between the P (+) and N (-) terminals is lower than 25 VDC. Otherwise, electric shock could occur. • Maintenance, inspection, and parts replacement should be made only by qualified persons. • Take off the watch, rings and other metallic objects before starting work. • Use insulated tools. Otherwise, electric shock or injuries could occur.

Disposal

⚠ CAUTION
<ul style="list-style-type: none"> • Treat the inverter as an industrial waste when disposing of it. Otherwise injuries could occur.

Others

⚠ WARNING
<ul style="list-style-type: none"> • Never attempt to modify the inverter. Doing so could cause electric shock or injuries.

1.2 Conformity to European standards

The CE marking on Fuji Electric products indicates that they comply with the essential requirements of the Electromagnetic Compatibility (EMC) Directive 89/336/EEC issued by the Council of the European Communities and the Low Voltage Directive 73/23/EEC.

Inverters with built-in EMC filter that bear a CE marking are in conformity with EMC directives. Inverters having no built-in EMC filter can be in conformity with EMC directives if an optional EMC compliant filter is connected to them.

General purpose inverters are subject to the regulations set forth by the Low Voltage Directive in the EU. Fuji Electric declares the inverters bearing a CE marking are compliant with the Low Voltage Directive.

FRENIC-Multi LM1 inverters are in accordance with the regulations of following council directives and their amendments:

- EMC Directive 89/336/EEC (Electromagnetic Compatibility)
- Low Voltage Directive 73/23/EEC (LVD)

For assessment of conformity the following relevant standards have been taken into consideration:

- EN61800-3:2004
- EN50178:1997

⚠ CAUTION
<p>The FRENIC-Multi LM1 inverters are categorized as category C2 according to the EN61800-3:2004. When you use these products in the domestic environment, you may need to take appropriate countermeasures to reduce or eliminate any noise emitted from these products.</p>

2. TECHNICAL DATA

2.1 Three-phase 400 V class series

Items		Specifications										
Type (FRN□□□E1E/S-4LM1)		0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15		
Nominal applied motor [kW]		0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15		
Output ratings	Rated capacity [kVA]	1.1	1.9	2.8	4.1	6.8	9.9	13	18	22		
	Rated voltage [V]	Three-phase 380 to 480 V (With AVR)										
	Rated current [A] (*1)	1.5	2.5	3.7	5.5	9.0	13	18	24	30		
	Overload capability	150 % of rated current for 1min or 200 % of rated current for 0.5 s										
	Rated frequency	50/60 Hz										
Input ratings	Main power supply	Three-phase 380 to 480 V, 50/60 Hz										
	Voltage/frequency variations		Voltage: +10 to -15 % (Voltage unbalance: 2 % or less), Frequency: +5 to -5 %									
	Rated current [A]	With DCR	0.85	1.6	3.0	4.4	7.3	10.6	14.4	21.1	28.8	
		Without DCR	1.7	3.1	5.9	8.2	13.0	17.3	23.2	33.0	43.8	
	Required power supply capacity [kVA]		0.6	1.1	2.0	2.9	4.9	7.4	10	15	20	
Braking	Braking torque [%]	100		70	40			20				
	DC braking	Starting frequency: 0.1 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 100 %										
	Transistor for braking resistor	Built-in										
Applicable safety standards		UL508C, C22.2No.14, EN50178: 1997										
Enclosure		IP20 (IEC60529) / UL open type (UL50)										
Cooling method		Natural cooling					Fan cooling					
Mass [kg]		1.1	1.2	1.7	1.7	2.3	3.4	3.6	6.1	7.1		
EMC filter built-in (E1E) (*2)												
EMC standard compliance	Emission	Category C2 (EN 61800-3: 2004)					Category C3 (EN 61800-3: 2004)					
	Immunity	2nd Env. (EN 61800-3: 2004)										
Mass [kg]		1.5	1.6	2.5	2.5	3.0	4.8	5.0	8.1	9.1		

(*1) Rated current for Ta= 50 °C, Cf= 8 kHz, ED=40 %

(*2) Available only in 4.0 kW (400 V)

2.2 Three-phase 200 V class series

Items		Specifications												
Type (FRN□□□E1S-2LM1)		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15		
Nominal applied motor [kW]		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15		
Output ratings	Rated capacity [kVA]	0.30	0.57	1.1	1.9	3.0	4.1	6.4	9.5	12	17	22		
	Rated voltage [V]	Three-phase 200 to 240 V (With AVR)												
	Rated current [A] (*1) (*2)		0.8	1.5	3.0	5.0	8.0	11	17	25	33	47	60	
			(0.7)	(1.4)	(2.5)	(4.2)	(7.0)	(10)	(16.5)	(23.5)	(31)	(44)	(57)	
	Overload capability	150 % of rated current for 1min or 200 % of rated current for 0.5 s												
Rated frequency	50/60 Hz													
Input ratings	Main power supply	Three-phase 200 to 240 V, 50/60 Hz												
	Voltage/frequency variations		Voltage: +10 to -15 % (Voltage unbalance: 2 % or less), Frequency: +5 to -5 %											
	Rated current [A]	With DCR	0.57	0.93	1.6	3.0	5.7	8.3	14.0	21.1	28.8	42.2	57.6	
		Without DCR	1.1	1.8	3.1	5.3	9.5	13.2	22.2	31.5	42.7	60.7	80.0	
	Required power supply capacity [kVA]		0.2	0.3	0.6	1.1	2.0	2.9	4.9	7.4	10	15	20	
Braking	Braking torque [%]	150			100			70		40			20	
	DC braking	Starting frequency: 0.1 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 100 %												
	Transistor for braking resistor	Built-in												
Applicable safety standards		UL508C, C22.2No.14, EN50178: 1997												
Enclosure		IP20 (IEC60529) / UL open type (UL50)												
Cooling method		Natural cooling						Fan cooling						
Mass [kg]		0.6	0.6	0.7	0.8	1.7	1.7	2.3	3.4	3.6	6.1	7.1		
Mass [kg]		0.7	0.7	0.8	0.9	2.4	2.4	2.9	5.1	5.3	10.3	11.3		

(*1) Rated current for Ta= 40 °C, Cf= 8 kHz, ED=40 %

(*2) Rated current (in brackets) for Ta= 50 °C, Cf= 8 kHz, ED=40 %

2.3 Over-rating table for 400 V series

Inverter Size	Maximum motor POWER	I rated (A)	Overload (%)	Time (s)	Overload (%)	Time (s)
4.0	4 kW	10.4	130	60	173	0.5
5.5	5.5 kW	15	130	60	173	0.5
7.5	7.5 kW	20.8	130	60	173	0.5
11	11 kW	27.6	130	60	174	0.5
15	15 kW	34.5	130	60	174	0.5

Rated current for Ta= 45 °C, Cf= 8 kHz, ED=40 %

3. MECHANICAL INSTALLATION

3.1 Operating Environment

Install the inverter in an environment that satisfies the requirements listed in Table 3.1.

Item	Specifications
Site location	Indoors
Ambient temperature	-10 to +50°C (Note 1)
Relative humidity	5 to 95% (No condensation)
Atmosphere	The inverter must not be exposed to dust, direct sunlight, corrosive gases, flammable gas, oil mist, vapor or water drops. (Note 2) The atmosphere must contain only a low level of salt. (0.01 mg/cm ² or less per year) The inverter must not be subjected to sudden changes in temperature that will cause condensation to form.
Altitude	1000 m max. (Note 3)
Atmospheric pressure	86 to 106 kPa
Vibration	3 mm (Max. amplitude) 2 to less than 9 Hz 9.8 m/s ² 9 to less than 20 Hz 2 m/s ² 20 to less than 55 Hz 1 m/s ² 55 to less than 200 Hz

Altitude	Output current derating factor
1000 m or lower	1.00
1000 to 1500 m	0.97
1500 to 2000 m	0.95
2000 to 2500 m	0.91
2500 to 3000 m	0.88

(Note 1) When inverters are mounted side-by-side without any gap between them (less than 5.5 kW), the ambient temperature should be within the range from -10 to +40°C.

(Note 2) Do not install the inverter in an environment where it may be exposed to cotton waste or moist dust or dirt which will clog the heat sink in the inverter. If the inverter is to be used in such an environment, install it in the panel of your system or other dustproof containers.

(Note 3) If you use the inverter in an altitude above 1000 m, you should apply an output current derating factor as listed in Table 3.2.

3.2 Installing the Inverter

(1) Mounting base

The temperature of the heat sink will rise up to approx. 90°C during operation of the inverter, so the inverter should be mounted on a base made of material that can withstand temperatures of this level.

⚠ WARNING
Install the inverter on a base constructed from metal or other non-flammable material. A fire may result with other material.

(2) Clearances

Ensure that the minimum clearances indicated in Figure 3.1 are maintained at all times. When installing the inverter in the panel of your system, take extra care with ventilation inside the panel as the temperature around the inverter will tend to increase. Do not install the inverter in a small panel with poor ventilation.

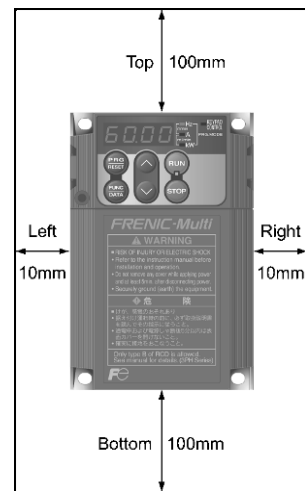


Figure 3.1 Mounting Direction and Required Clearances

⚠ CAUTION
Prevent lint, paper fibers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter or from accumulating on the heat sink. This may result in a fire or accident.

4. WIRING

Follow the below procedure (In the following description, the inverter has already been installed).

4.1 Removing the terminal cover and the main circuit terminal block cover

(1) For inverters with a capacity of less than 5.5 kW

- ① To remove the terminal cover, put your finger in the dimple of the terminal cover (labelled "PULL"), and then pull it up toward you.
- ② To remove the main circuit terminal block cover, hold its right and left ends with your fingers and slide it toward you (Refer to figure 4.1)

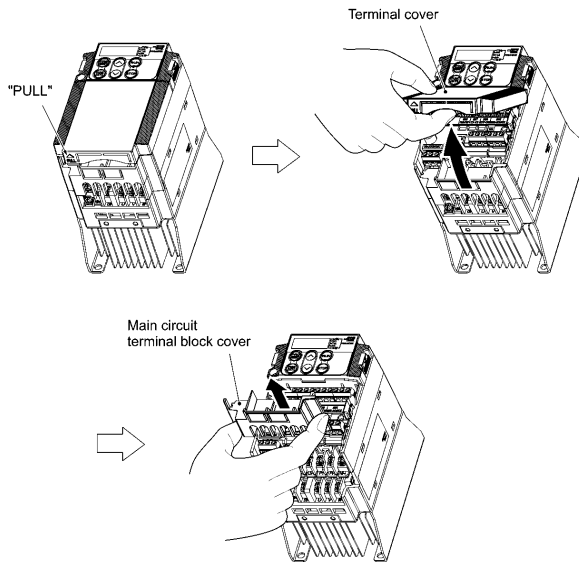


Figure 3.1 Removing the Covers (For Inverters with a Capacity of Less than 5.5 kW)

(2) For inverters with a capacity of 5.5 and 7.5 kW

- ① To remove the terminal cover, first loosen the terminal cover fixing screw, put your finger in the dimple of the terminal cover (labelled "PULL"), and then pull it up towards you.
- ② To remove the main circuit terminal block cover, put your thumbs on the handles of the main circuit terminal block cover, and push it up while supporting it with your fingers (Refer to Figure 4.2).

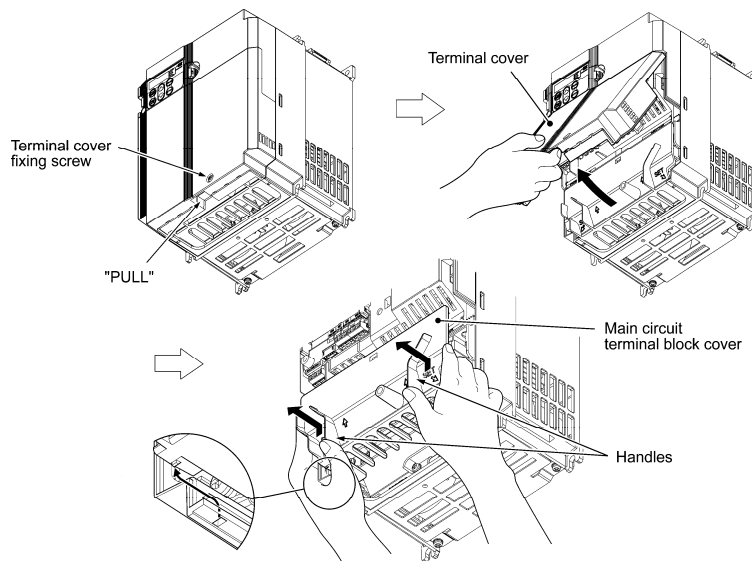


Figure 4.2 Removing the Covers (For Inverters with a Capacity of 5.5 and 7.5 kW)

When mounting the main circuit terminal block cover, fit it according to the guide on the inverter.

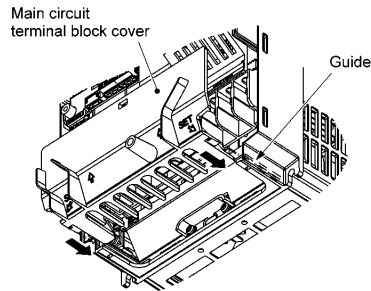


Figure 4.3 Mounting the main circuit terminal block cover
(For Inverters with a Capacity of 5.5 and 7.5 kW)

(3) For inverters with a capacity of 11 and 15 kW

- ① To remove the terminal cover, first loosen the terminal cover fixing screw, put your finger in the dimple of the terminal cover (labelled "PULL"), and then pull it up towards you.
- ② To remove the main circuit terminal block cover, hold the handles on the both sides of the main circuit terminal block cover, and pull it up (Refer to figure 4.4)

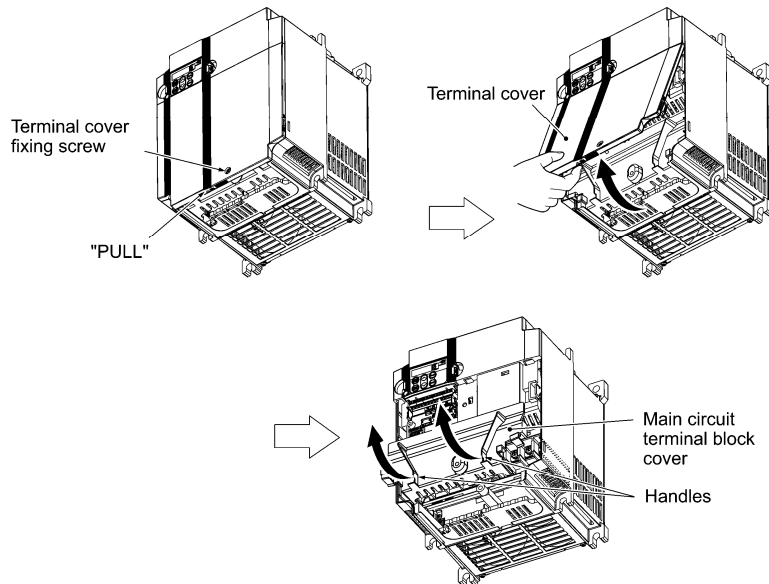


Figure 4.4 Removing the Covers (For Inverters with a Capacity of 11 and 15 kW)

Note When mounting the main circuit terminal block cover, fit it according to the guide on the inverter.

- ① Insert the main circuit terminal block cover by fitting the part labelled "GUIDE" according to the guide on the inverter.
- ② Push where "PUSH" are labelled to snap it into the inverter.

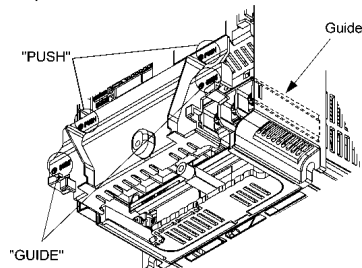


Figure 4.5 Mounting the Main Circuit Terminal Block Cover
(For inverters with a capacity of 11 and 15 kW)

4.2 Wiring for main circuit terminals and grounding terminals

The diagram below shows main circuit and grounding terminals connexion

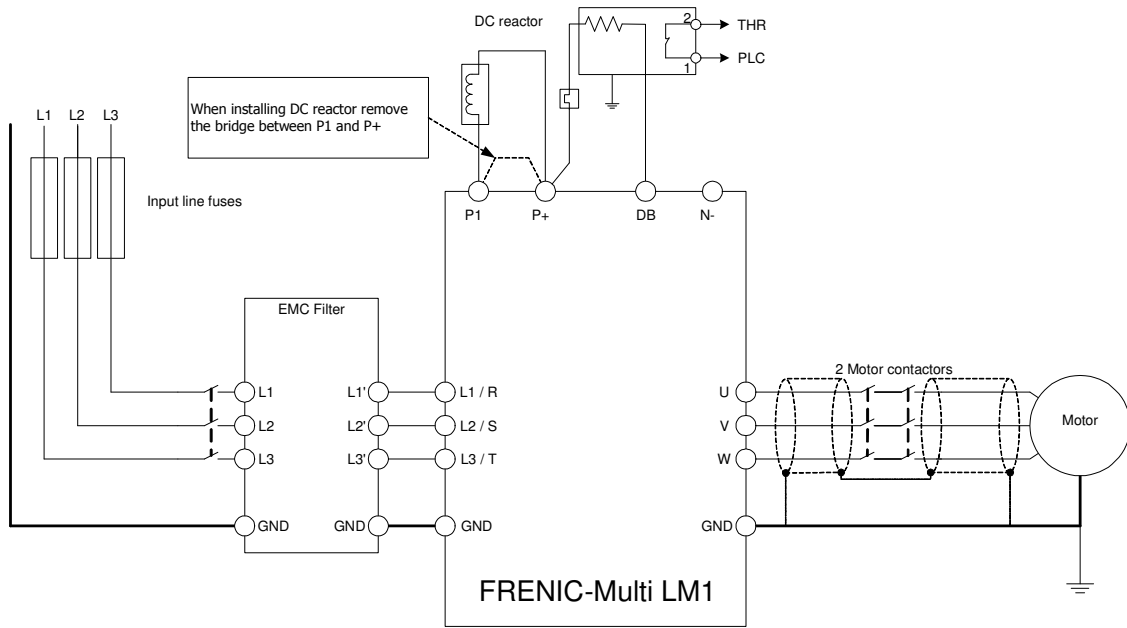


Figure 4.6 Main circuit terminal connexions

Symbol	Name	Functions
L1/R, L2/S, L3/T	Main circuit power inputs	Connect the three-phase input power lines
U, V, W	Inverter outputs	Connect a three-phase motor.
P1, P(+)	DC reactor connection	Connect an optional DC reactor (DCRE) for improving power factor. In that case, remove the bridge already installed.
P(+), DB	DC braking resistor	Connect an optional braking resistor.
G	Grounding for inverter and motor	Grounding terminals for the inverter's chassis (or case) and motor. Earth one of the terminals and connect the grounding terminal of the motor. Inverters provide a pair of grounding terminals that function equivalently.

Table 4.1 Symbols, names and functions of the main circuit power terminals

- ☞ Please connect the screen in both motor and inverter sides. Ensure that the screen is continued also through the contactors.
- ☞ It is recommended to use a braking resistor with clixon and connect the fault signal to the controller and also to the inverter, configuring a digital input with External alarm function (THR). To do so, set the related function (E01 to E05) to 9.
- ☞ It is recommended the use of a thermal relay in the braking resistor circuit. This relay should be set up that it only trips in the case that there is a short circuit in the braking transistor.

4.3 Wiring for control circuit terminals

The diagram below shows a basic connection example for running the inverter with terminal commands.

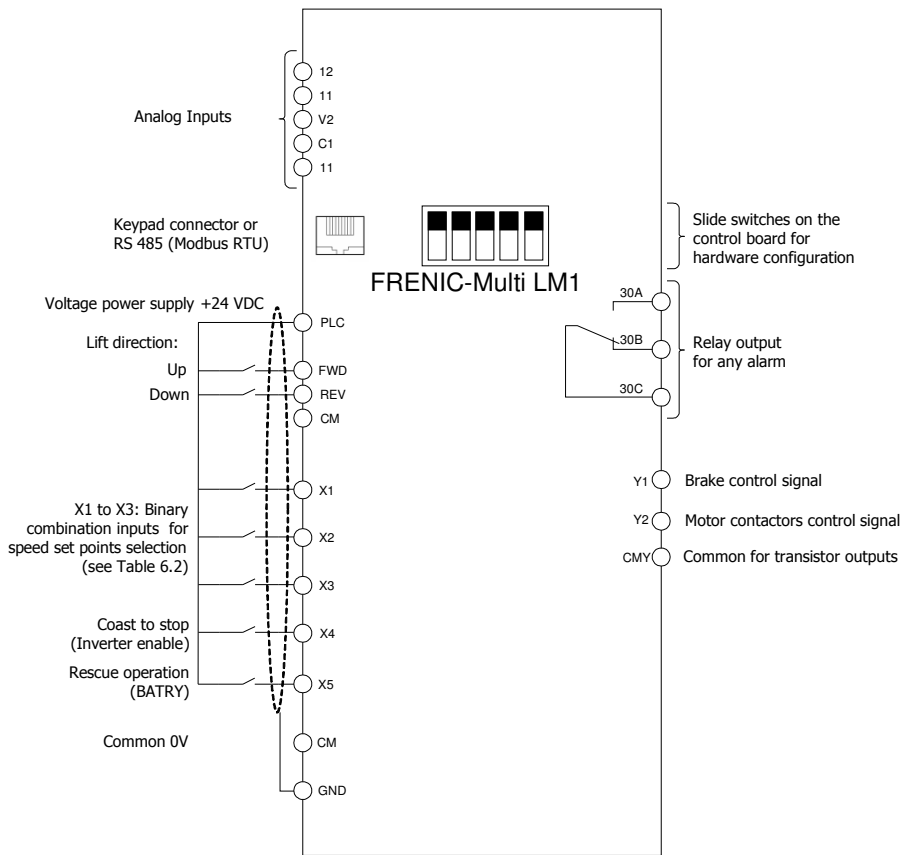


Figure 4.7 Control terminal connexions

4.4 Control terminals description

a. Analog inputs

Using analog inputs the motor speed can be set without steps (stageless).

b. Digital Inputs

The digital inputs can operate using NPN or PNP logic. The selection of the logic is set using slide switch SW1 located on the control PCB. **Factory setting is PNP (Source) Logic.**

Connection example using PNP Logic:



Figure 4.8: Normal connection using free potential contacts of the lift controller.

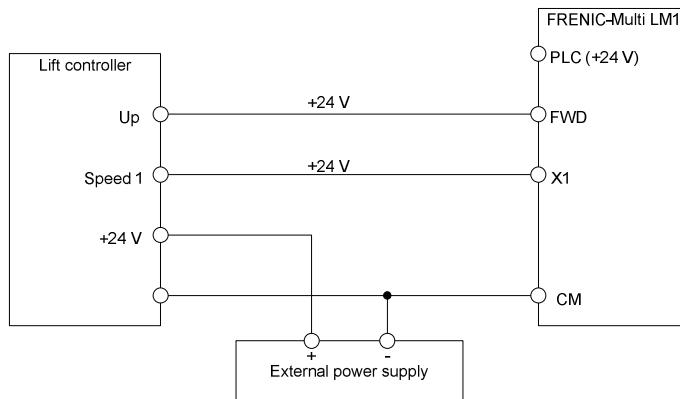


Figure 4.9: Connection using external power supply

Terminal	Function description of the digital inputs
FWD	Left rotation direction of the motor seen from the shaft side. Depending on the mechanical set up this can be UP or DOWN direction of the cabin
REV	Right rotation direction of the motor seen from the shaft side. Depending on the mechanical set up this can be DOWN or UP direction of the cabin.
CM	Common 0V
X1 to X3	Digital inputs for speed selection. From binary combination 7 different speeds can be selected.
X4	Inverter output stage enable. Cancellation of the signal during travel stops immediately the motor (brake signal is turned OFF).
X5	Configured from factory as "BATRY" for UPS operation.

Table 4.2: Description of transistor inputs (optocoupled inputs)

Electrical specification of digital inputs using PNP (Source) Logic

Voltage	ON	22 to 27 V
	OFF	0 to 2 V
Current	ON	Min. 2.5 mA Max. 5.0 mA

c. Relay output

Terminals 30A, 30B and 30C are configured from factory with the functions described in the table below. Other functions can be set using functions E27.

Terminals	Function description of the relay outputs
30A, 30B and 30C	Inverter alarm. Switching contact. In case of fault, the motor stops and the contact 30C-30A switches. Contact rating: 250 VAC; 0.3 A / 48 VDC; 0.5 A

d. Transistor outputs

Terminals Y1 to Y2 are configured from factory with the functions described in the table below. Other functions can be set using functions E20 to E21.

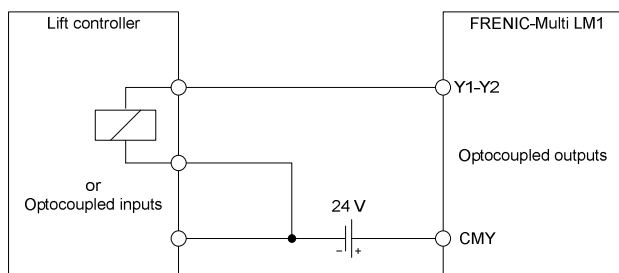


Figure 4.10: Connection using PNP (Source) Logic

Terminal	Function description of the transistor outputs
Y1	Motor brake control. Normally the lift controller will also determine the status of the motor brake (depending on the safety chain status).
Y2	Motor contactors control. Normally the lift controller will also determine the status of the motor contactors (depending on the safety chain status).
CMY	Common for transistor outputs

Table 4.3: Description of transistor outputs (optocoupled outputs)

Electrical specification of transistor outputs

Voltage	ON	2 to 3 V
	OFF	24 to 27 V
Operation current	ON	Max. 50 mA
	OFF	0.1 mA

Maximum connectable voltage is 27 VDC – inductive loads should not be connected directly (they should be connected through a relay or optocoupler)

e. Communication connections (keypad and PC)

FRENIC-Multi LM1 has one RS485 port available for communication. The RS485 port (through a RJ-45 connector) makes possible the connection of the FRENIC-Multi LM standard and multifunctional keypad or a PC. Only one communication is possible at the same time.

i. Keypad

The keypad can be remotely connected up to 20m

Pin Nr.	Signal	Function	Comments
1 and 8	VDC	Keypad power supply	5 V
2 and 7	GND	Common for VDC	Ground (0 V)
3 and 6	None	Free	Not used
4	DX-	RS485 data (-)	When the keypad is connected, SW3 switch on the control board must be set to OFF position (Factory set).
5	DX+	RS485 data (+)	

Table 4.4: RJ-45 connector pin assignment.

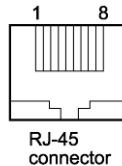


Figure 4.11: RJ-45 connector (inverter)

ii. Connection with PC

FRENIC LOADER2 is a PC program available, giving a comfortable tool for the inverter set up and diagnosis. The connection is done through the RS 485 port (on the RJ-45 connector).

For the connection through the USB port of a PC, a USB-RS485 converter is needed, like for example EX9530 (Expert).

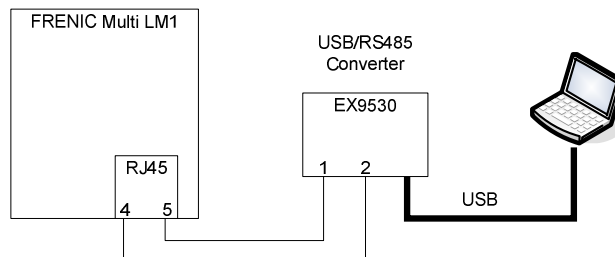




Figure 4.12: Connection of FRENIC Loader2 with PC

4.5 Setting up the slide switches

 WARNING
<p>Before changing the switches, turn OFF the power and wait more than five minutes. Make sure that the LED monitor is turned OFF. Also, make sure, using a multimeter or a similar instrument, that the DC link bus voltage between the terminals P (+) and N (-) has dropped below the safe voltage (+25 VDC).</p> <p>An electric shock may result if this warning is not heeded as there may be some residual electric charge in the DC bus capacitor even after the power has been turned off.</p>

Switching the slide switches located on the control PCB and interface PCB allows you to customize the operation mode of the analogue output terminals, digital I/O terminals, and communications ports. The locations of those switches are shown in Figure 4.13.

To access the slide switches, remove the terminal cover and keypad. Table 4.5 lists function of each slide switch.

 For details on how to remove the terminal cover, refer to Section 4.1, "Removing the terminal cover and main circuit terminal block cover."

Slide Switch	Function
① SW1	Switches the service mode of the digital input terminals between SINK and SOURCE. <ul style="list-style-type: none"> To make the digital input terminal [X1] to [X5], [FWD] or [REV] serve as a current sink, turn SW1 to the SINK position. To make them serve as a current source, turn SW1 to the SOURCE position. Factory default: SOURCE
② SW3	Switches the terminating resistor of RS-485 communications port on the inverter on and off. <ul style="list-style-type: none"> To connect a keypad to the inverter, turn SW3 to OFF. (Factory default) If the inverter is connected to the RS-485 communications network as a terminating device, turn SW3 to ON.
③ SW6	Normally not used for lift applications
④ SW7 SW8	Switching SW7 to C1 and SW8 to ON we are able to protect the motor by means of thermistor. The thermistor has to be connected between terminals C1 and 11. See functions H26 and H27.

Table 4.5 Function of Each Slide Switch

The following figure shows the location of slide switches for the input/output terminal configuration.

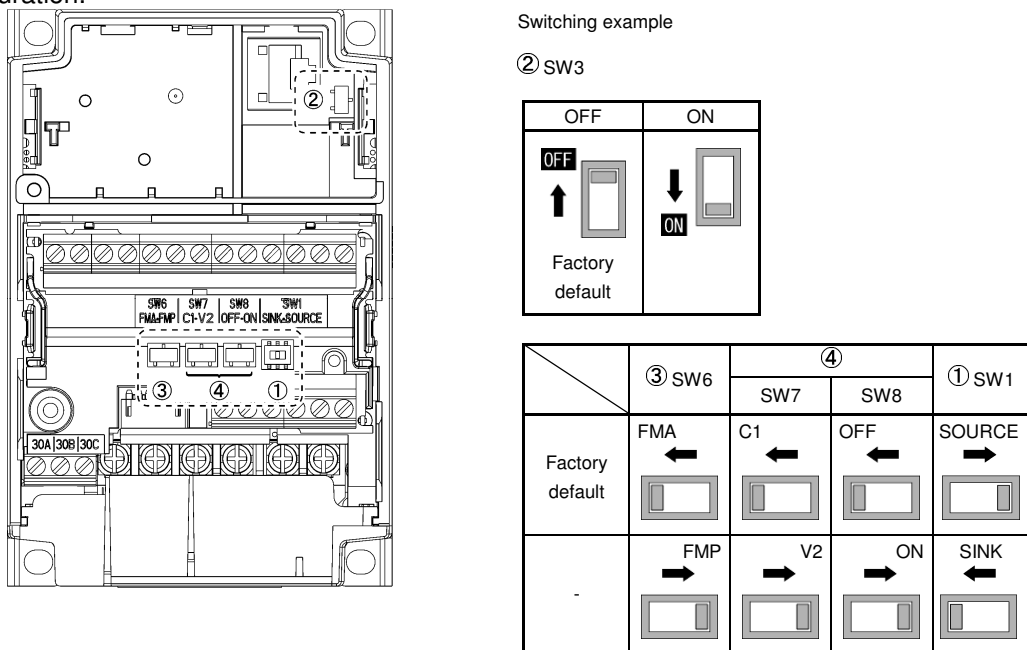
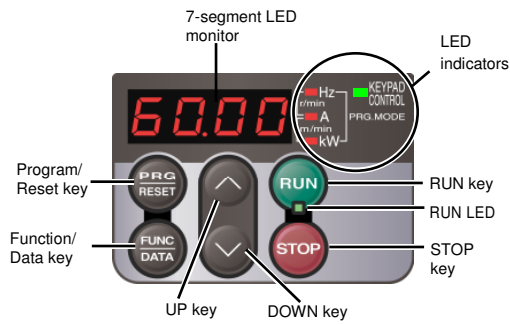


Figure 4.13 Location of the Slide Switches

5. OPERATION USING THE KEYPAD

As shown on the right, the keypad consists of a four-digit LED monitor, six keys, and five LED indicators. The keypad allows you to run and stop the motor, monitor running status, and switch to the menu mode. In the menu mode, you can set the function code data, monitor I/O signal states, maintenance information, and alarm information.



Item	LED Monitor, Keys, and LED Indicators	Functions
LED Monitor		Four-digit, 7-segment LED monitor which displays the following according to the operation modes. <ul style="list-style-type: none"> ■ In Running mode: Running status information (e.g., output frequency, current, and voltage) ■ In Programming mode: Menus, function codes and their data ■ In Alarm mode: Alarm code, which identifies the alarm factor if the protective function is activated.
Operation Keys		Program/Reset key which switches the operation modes of the inverter. <ul style="list-style-type: none"> ■ In Running mode: Pressing this key switches the inverter to Programming mode. ■ In Programming mode: Pressing this key switches the inverter to Running mode. ■ In Alarm mode: Pressing this key after removing the alarm factor will switch the inverter to Running mode.
		Function/Data key which switches the operation you want to do in each mode as follows: <ul style="list-style-type: none"> ■ In Running mode: Pressing this key switches the information to be displayed concerning the status of the inverter (output frequency (Hz), output current (A), output voltage (V), etc.). ■ In Programming mode: Pressing this key displays the function code and sets the data entered with and keys. ■ In Alarm mode: Pressing this key displays the details of the problem indicated by the alarm code that has come up on the LED monitor.
		RUN key. Press this key to run the motor.
		STOP key. Press this key to stop the motor.
		UP and DOWN keys. Press these keys to select the setting options and change the function code data displayed on the LED monitor.

Item	LED Monitor, Keys, and LED Indicators	Functions
LED Indicators	RUN LED	Illuminates when any run command to the inverter is active.
	KEYPAD CONTROL LED	Illuminates when the inverter is ready to run with a run command entered by the key (F02 = 0, 2, or 3). In Programming and Alarm modes, you cannot run the inverter even if the indicator lights.
	Unit and mode expression by the three LED indicators	The three LED indicators identify the unit of numeral displayed on the LED monitor in Running mode by combination of lit and unlit states of them. Unit: kW, A, Hz, r/min and m/min ----- While the inverter is in Programming mode, the LEDs of Hz and kW illuminate. <ul style="list-style-type: none"> ■ Hz □ A ■ kW

Simultaneous keying

Simultaneous keying means: pressing two keys at the same time. The FRENIC-Multi LM1 supports simultaneous keying as listed below. The simultaneous keying operation is expressed by a "+" letter between the keys throughout this manual.

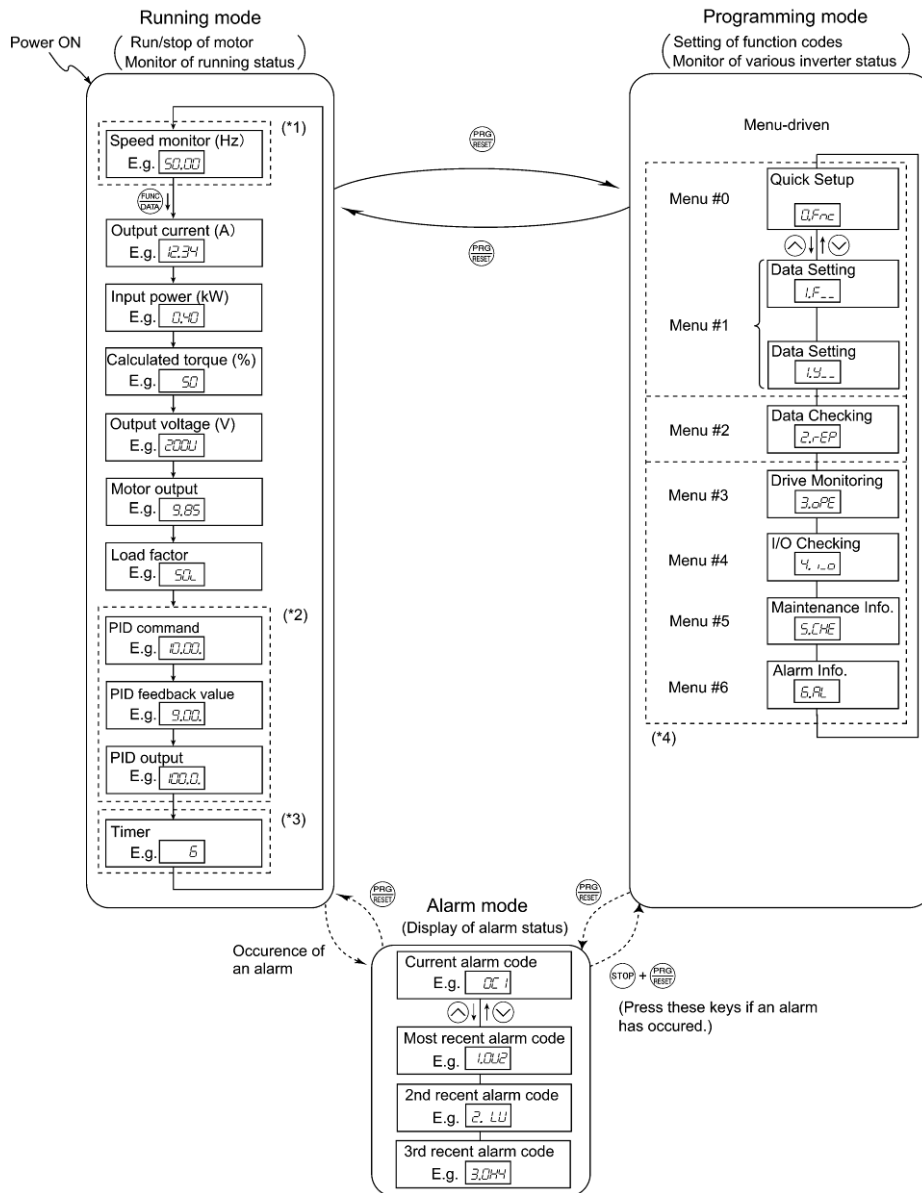
(For example, the expression " + keys" stands for pressing the key while holding down the key.)

Operation mode	Simultaneous keying	Used to:
Programming mode	+ keys	Change certain function code data (Refer to codes F00, H03, and H97 in Chapter 8 "Function codes").
	+ keys	
Alarm mode	+ keys	Switch to Programming mode without resetting alarms currently occurred.

FRENIC-Multi LM1 features the following three operation modes:

- Running mode: This mode allows you to enter run/stop commands in regular operation. You can also monitor the running status in real time.
- Programming mode: This mode allows you to configure function code data and check a variety of information relating to the inverter status and maintenance.
- Alarm mode: If an alarm condition arises, the inverter automatically enters Alarm mode. In this mode, you can view the corresponding alarm code* and its related information on the LED monitor.

* Alarm code: Indicates the cause of the alarm condition that has triggered a protective function. For details, refer to Chapter 9, "Troubleshooting".



(*1) The speed monitor allows you to select the desired one from the seven speed monitor items by using function code E48.
 (*2) Not used in lift applications.
 (*3) Not used in lift applications.
 (*4) Applicable only when the full-menu mode is selected (E52 = 2).

Figure 5.1 Transitions between Basic Screens in Individual Operation Mode

6. SETTING

6.1 Basic setting for induction motors

Set the following function codes according to motor ratings and application values. For the motor, check the rated values printed on the nameplate of the motor.

Function	Meaning	Factory setting	Basic Setting
F03	Maximum rotating speed (Hz)	50 Hz	Depends on the motor
F04	Motor rated speed from name plate (Hz)	50 Hz	Depends on the motor
F05	Motor rated voltage from name plate (V)	Depends on the input voltage	Depends on the motor
F09	Torque boost for torque vector control (%)	Depends on the inverter capacity	Only used in V/f control (F42=0 or 2)
F11	Overload detection level	Depends on the range	Same as P03
F20	DC – Braking (Start frequency)	0.50 Hz	0.5 Hz
F21	DC – Braking (Level)	80 %	80 %
F22	DC – Braking (Time)	1.50 s	1.5 s
F23	Starting frequency	0.5 Hz	0.5 Hz
F24	Starting frequency (Hold time)	0.80 s	0.50 s
F25	Stop frequency	0.2 Hz	0.2 Hz
F42	Control type selection 1: Dynamic torque vector control 2: V/f control with slip compensation active	1	1
E03	Terminal [X3] Function	2	2
E04	Terminal [X4] Function	1007	1007
E46	Language setting (clear text function description)	1	Depends on the country
P01	Motor number of poles from manufacturer data sheet or motor name plate	4	Depends on the motor
P02	Motor rated capacity (power) from name plate (kW)	Depends on the inverter capacity	Depends on the motor
P03	Motor rated current from name plate (A)	Depends on the inverter capacity	Depends on the motor
P06	Motor no-load current (A) <i>The Auto tuning procedure measures the value of this function (when P04=2)</i>	Depends on the inverter capacity	See chapter 6.3
P07	Motor stator resistance (R1) in %. <i>The Auto tuning procedure measures the value of this function (when P04=1 or 2)</i>	Depends on the inverter capacity	Automatic
P08	Motor stator reactance (X1) in %. <i>The Auto tuning procedure measures the value of this function (when P04=1 or 2)</i>	Depends on the inverter capacity	Automatic
P12	Slip frequency (Hz). <i>The Auto tuning procedure measures the value of this function (when P04=2)</i>	Depends on the inverter capacity	See chapter 6.3
o40	Torque Boost gain for normal operation	1.06	1.06

Table 6.1 Basic settings for induction motors

⚠ CAUTION

Main power supply of the inverter is required when you want to change function codes. In other cases the inverter protects itself and change function codes is not possible.

6.2 Quick start commissioning (auto tuning)

It is recommended to perform the auto tuning procedure before running the motor for the first time. There are two auto tuning modes: auto tuning mode 1 and mode 2 (both static).

Auto tuning mode 1 (P04 = 1): Values of function codes P07 and P08 are measured.

Auto tuning mode 2 (P04 = 2): Values of function codes P07 and P08 are measured as well as the value of function code P06 (no load current) and the value of function code P12 (rated slip frequency).

Auto tuning procedure

1. Is the motor correctly connected?
2. Turn on inverter mains supply.
3. Switch the operation mode from remote to local (setting F02 = 2 or 3).
4. **Please, set the functions described in the previous table (6.1).**
5. If there are any kind of contactors between the motor and the inverter, please close them manually. If the contactors are controlled by the inverter it will be closed automatically.
6. Active inverters enable (Terminal X4).
7. Set P04 to 1 (Auto tuning mode 1), press FUNC/DATA and press RUN (the current flowing through the motor windings will generate a sound). The auto tuning takes a few seconds until it finishes by itself.
8. P07 and P08 will be measured (also P06 and P12 if Auto tuning mode 2 has been selected) and stored automatically in the inverter.
9. The auto tuning procedure has been finished.

6.3 Additional setting

No-load current (function P06)

The no-load current (function P06) defines the value of the current of the motor when no load is applied to the motor (exciting current).

Typical values of the no-load current range are from 30 % of P03 up to 70 % of P03. In the majority of the cases the value measured by the auto tuning procedure will be correct (when P04=2). In some cases the auto tuning procedure can not be finished correctly (due to special behaviour of the motor). In this later case the value of P03 must be set manually. For calculate

no-load current you can use the formula
$$P06 = \sqrt{(P03)^2 - \left(\frac{P02 * 1000}{1.47 * F05}\right)^2}$$

Too low values in P03 will make that the motor does not have enough torque. Too high values will make that the motor oscillates (this oscillation will cause a vibration in the motor that is transmitted to the cabin).

Slip frequency (function P12)

The slip frequency function defines the value of the slip frequency of the motor. Is the key function for a good slip compensation by the inverter; this means that this function is very important in open loop control of induction motors for a good landing accuracy because it will ensure that the rotating frequency of the motor is the same regardless of the load condition of the motor.

In the majority of the cases the value measured by the auto-tuning procedure will be correct. In some cases the auto-tuning procedure can not be finished correctly (due to special behaviour of the motor). In this later case the value of P12 must be set manually.

To set function P12 manually we can calculate it from the following formula:

$$P12 = \frac{(\text{Synchronous speed(rpm)} - \text{Rated speed(rpm)}) \times \text{Nom Frequency}}{\text{Synchronous speed(rpm)}} \times 0.7$$

Slip compensation gains (functions P09 for driving mode and P11 for braking mode)

The slip frequency can be also compensated in both driving and braking mode. The experimental method for adjust these values is following. You need to test one floor level with cabin empty going up and down:

- If the cabin speed going up is smaller than the desired speed (the cabin don't reach the floor level) decrease 10 % the value of P11 (braking mode).
- If the cabin speed going down is higher than the desired speed (the cabin pass the floor level) decrease 10 % the value of P09 (driving mode).

6.4 Setting the speed profile

The setting of the speed profile includes:

- Travelling speed
- Acceleration and deceleration times
- S-curves
- Soft start

For the high speed, each intermediate speed and creep speed the acceleration, deceleration times and S-curves can be set according the table 6.3 (below). The setting of the S-curve means the speed change in terms of percentage of the maximum speed (F03) used for the acceleration change.

The setting ranges of the acceleration/deceleration times and reference speeds are determined according to the switching of digital input functions SS4, SS2 and SS1 (please, see functions E01-E05) as described below.

FWD/REV	X3 (SS4)	X2 (SS2)	X1 (SS1)	Reference speed selected
OFF	OFF	OFF	OFF	0.00 Hz
ON	OFF	OFF	OFF	F01*
ON	OFF	OFF	ON	C05
ON	OFF	ON	OFF	C06
ON	OFF	ON	ON	C07
ON	ON	OFF	OFF	C08
ON	ON	OFF	ON	C09
ON	ON	ON	OFF	C10
ON	ON	ON	ON	C11

Table 6.2 Speed selection table

* Setting F01=0 an extra speed on the keypad is available

After Change Before Change	Stop	Zero Speed	High Speed Maintenance Speed	Creep Speed	UPS operation Speed
Stop	-	Dec: o65 / o66 / E10	Acc: o61 / o62 / F07	Acc: o65 / o65 / E10	Acc: - / - / E11
Zero Speed	Dec: o65 / o66 / E10	-	Acc: o61 / o62 / F07	Acc: o65 / o65 / E10	-
High Speed Maintenance Speed	Dec: o65 / o66 / E10	Dec: o65 / o66 / E10	Acc: o61 / o62 / F07 Dec: o63 / o64 / F08	Dec: o63 / o64 / F08	-
Creep Speed	Dec: o65 / o66 / E10	Dec: o65 / o66 / E10	Acc: o61 / o62 / F07	Acc: o65 / o65 / E10 Dec: o65 / o65 / E10	-
UPS operation Speed	Dec: - / - / E11	-	-	-	-

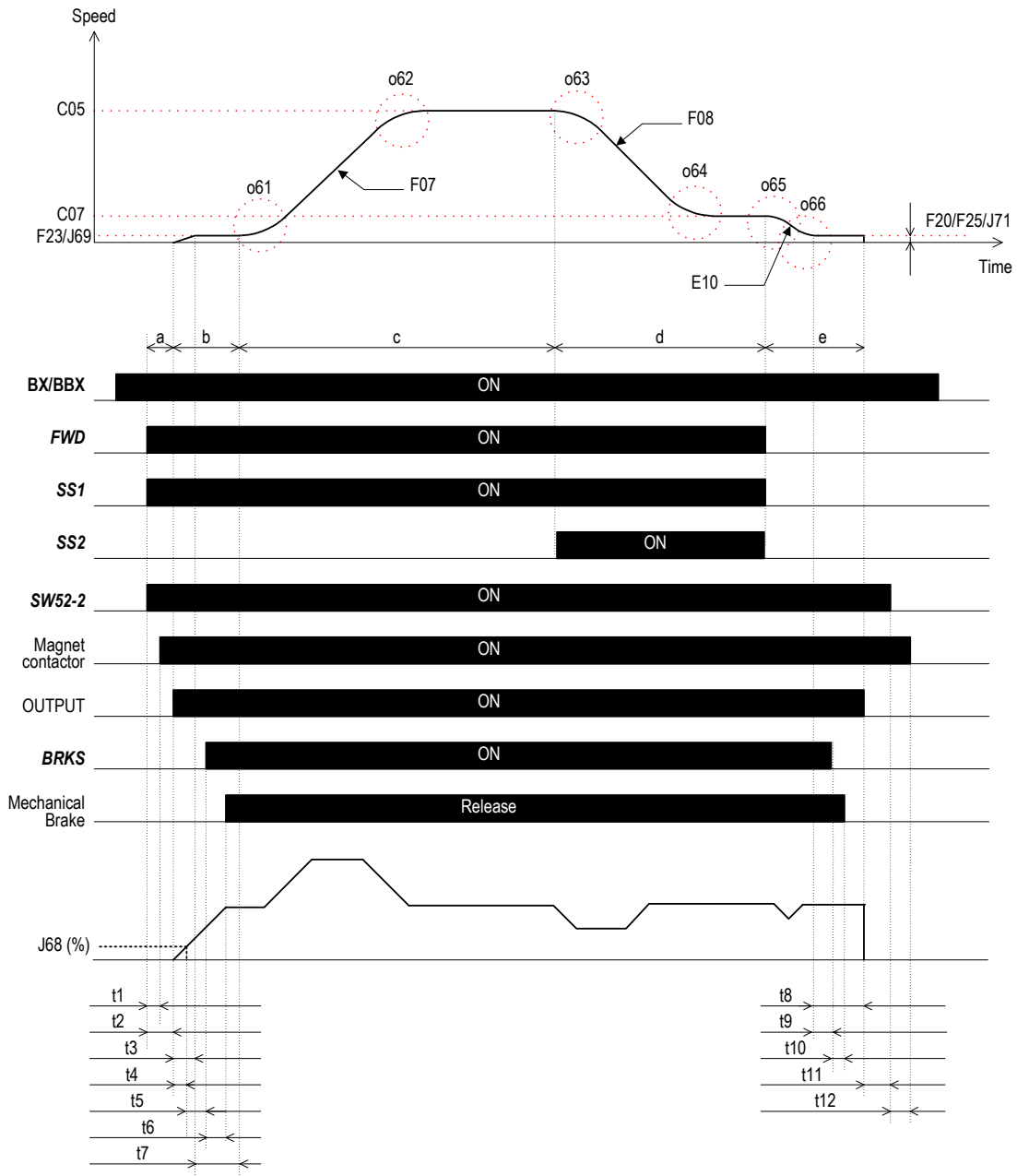
Table 6.3 S-curves and linear ramp selection table

S-curve setting of Start period / S-curve setting of End period / Acceleration time or Deceleration time

High Speed Maintenance Speed	>	o47=10.00 Hz	>=	Creep Speed
-------------------------------------	---	---------------------	----	--------------------

The setting of soft-start is the time of accelerating from zero speed to starting speed (function H65). This function may be used to obtain a soft start in lift installations with high friction. The factory setting is 0.25 s and the setting range is from 0.00 to 60.00 s. We recommend among 0.25 and 0.50 s to start.

6.5 Complete time diagram for normal travel



Sign	Contents	Function
t1	Magnet contactor operation delay time	-
t2	Magnet contactor operation delay waiting time	o75
t3	Soft Start ramp time	H65
t4	J68 reach delay time	-
t5	Brake control ON delay time	J70
t6	Mechanical brake release delay time	-
t7	Starting speed operation time	F24
t8	DC braking injection time	F22
t9	Brake control OFF delay time	J72
t10	Mechanical brake close delay time	-
t11	Magnet contactor control OFF delay time	o76
t12	Magnet contactor operation delay time	-

	Explanation of inverter status	Inverter status
a	The inverter waits to begin the output from operation command ON to turning on magnet contactor	Inverter stopped
b	The inverter is driven by starting speed until mechanical brake is released.	Inverter operate starting speed
c	The inverter accelerates to high speed. Afterwards, the inverter is driven at a constant speed.	Inverter in operation
d	The inverter decelerates to the creep speed.	Inverter in operation
e	The inverter decelerates to the stopping speed. The inverter keeps driving at stopping speed from less than DC brake starting frequency to the time of F22 passes.	The inverter shifts from the operating state to the stopped state.

7. SPECIAL FUNCTIONS

7.1 Rescue operation

The rescue operation enables the inverter (during undervoltage situation) to move the elevator cage to the nearest floor. The rescue is done by means of a UPS power supply.

Requirements for rescue operation:

- The **BATRY** function (63) must be assigned to any digital input terminal. From factory setting this function is set in terminal X5.
- An AC voltage must be supplied from the UPS to the main circuit (R-T). The voltage level will differ depending on the operation speed, load, motor and type of installation.
- The **BATRY** function must be turned on.

The UPS will be connected as follow:

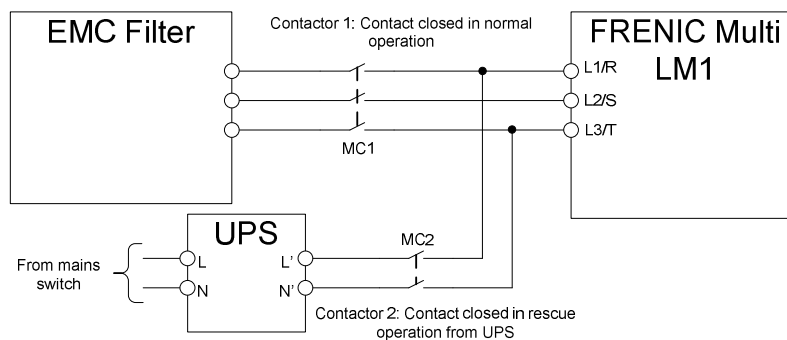


Figure 7.1 Basic Wiring Diagram

This is only a schematic drawing. This is for information only and without responsibility. The start of rescue operation, enable signal activation and contactors control is handled by the lift controller and is not in the range of the responsibility of the inverter.

Specifications of rescue operation:

- The inverter can run the elevator starting from the voltage level specified in o80.
- The RDY ("Inverter ready to run" signal) is forced to OFF.
- **During rescue operation, the inverter runs the elevator at the speed specified by C19**
- **In rescue operation, the acceleration/deceleration time are specified by E11. The S-curves during acceleration/deceleration are disabled.**

The sequence of signals has to be done as is shown in following diagram:

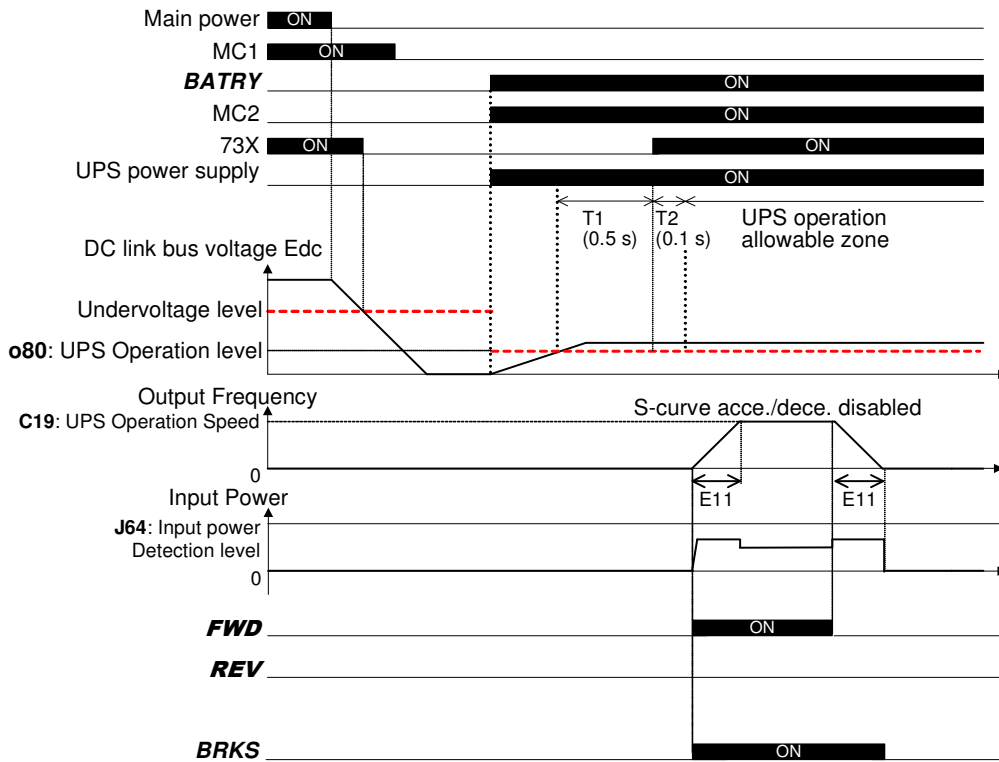


Figure 7.2 Rescue operation Timing diagram

7.2 Auto-resetting operation

Functions H04 and H05 specify the auto-resetting operation. When the following requirements are met, the inverter will automatically reset the tripped state:

- RUN command goes to OFF
- Auto-resetting reset time interval (H05) is elapsed
- Auto-resetting times (H04) not equal 0
- Auto-resetting times (interval counter) < H04 setting value

Note Even if any alarm subject to auto-resetting is activated, the inverter issues an alarm (for any fault).

The alarms that can be auto-reset are shown below:

Alarm status	Alarm code on led monitor
Instantaneous overcurrent protection*	OC 1, OC2, OC3
Overtoltage protection	OU 1, OU2, OU3
Heat sink overheated	OH 1
Undervoltage detected	LU
Motor overheated	OH4
Motor overloaded	OL 1, OL2
Inverter overloaded	OLU

Table 7.1 The recoverable alarm codes

* Only "OCx (SUB=3)" will be recoverable by Auto-resetting operation. For example, over current detection due to overload.

7.3 Torque boost gain

A torque boost gain can be set in FRENIC-Multi lift. Torque boost is used to adjust output voltage in order to guarantee a sufficient torque.

A different torque boost gain can be adjusted for both normal and rescue operation.

Function Code	Drive mode	Default setting	Recommended setting
o40	Normal operation	1.06	1.06
o81	UPS operation	1.50	1.06

Table 7.2 Torque boost gain

Torque boost gain (o40 and o81) is only effective in dynamic torque vector control (F42=1) and in auto-torque boost mode (F37=2). Minimum value of torque boost gain is 0.01. If 0.00 is set to torque boost gain it means o40=1.20 and o81=1.00.

⚠ CAUTION
A high value in torque boost gain can cause over current trips (OC) on the inverter especially at starting and in creep speed. Use a different value than recommended only if it is necessary.

7.4 Compensation response time

The voltage compensation response time and the slip compensation response time can be adjusted separately depending on the speed (soft start, high and creep speed) and the operation mode (normal and rescue mode). The following diagrams show effective period for each one.

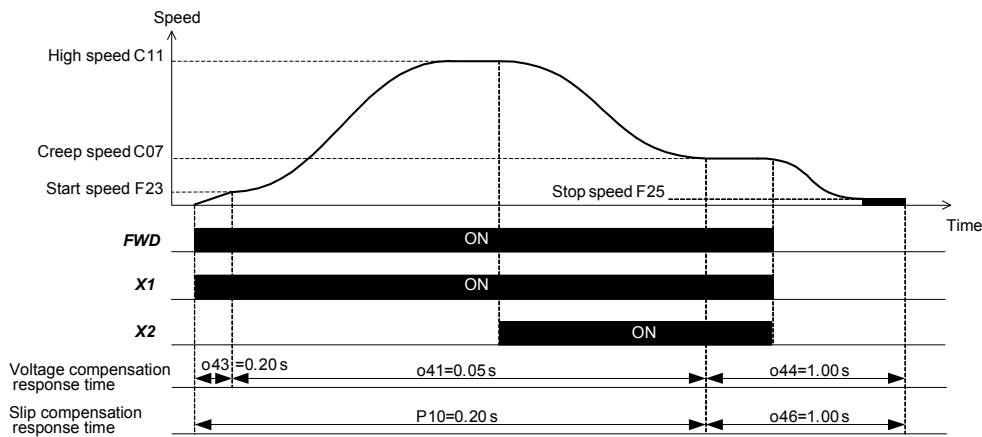


Figure 7.3 Normal operation

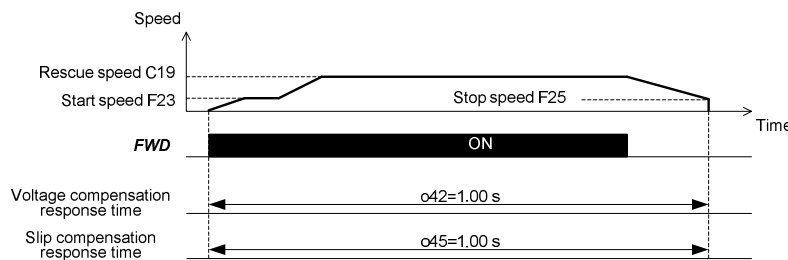


Figure 7.4 Rescue operation

8. FUNCTION CODES (PARAMETERS)

Function codes enable the FRENIC-Multi LM1 series of inverters to be set up to match your system requirements.

The most important function codes are classified into seven groups: Fundamental Functions (F codes), Extension Terminal Functions (E codes), Control Functions of Frequency (C codes), Motor Parameters (P codes), High Performance Functions (H codes), Application Functions (J codes), and Option Functions (o codes).

For further information about the FRENIC-Multi LM1 function codes please refer to FRENIC-Multi user's manual.

F codes: Fundamental functions

Code	Name	Data setting range	Default setting
F00	Data Protection	0: Disable both data protection and digital reference protection 1: Enable data protection and disable digital reference protection 2: Disable data protection and enable digital reference protection 3: Enable both data protection and digital reference protection	0
F01	Frequency Command 1 (Speed 1)	0: UP/DOWN keys on keypad 1: Voltage input to terminal [12] (-10 to +10 VDC) 2: Current input to terminal [C1] (C1 function) (4 to 20 mA DC) 3: Sum of voltage and current inputs to terminals [12] and [C1] (C1 function) 5: Voltage input to terminal [C1] (V2 function) (0 to 10 VDC) 7: Terminal command UP/DOWN control 11: DIO interface card (option) 12: PG interface card (option)	0
F02	Operation Method	0: RUN/STOP keys on keypad (Motor rotational direction specified by terminal command FWD/REV) 1: Terminal command FWD or REV 2: RUN/STOP keys on keypad (forward) 3: RUN/STOP keys on keypad (reverse)	1
F03	Maximum Frequency 1	25.0 to 400.0 Hz	50.0 Hz
F04	Base Frequency 1	25.0 to 400.0 Hz	50.0 Hz
F05	Rated Voltage at Base Frequency 1	0: Output a voltage in proportion to input voltage 80 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	220 V 380 V
F06	Maximum Output Voltage 1	80 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	220 V 380 V
F07	Acceleration/Deceleration Time 1	0.00 to 3600 s Note: Entering 0.00 cancels the acceleration time, requiring external soft-start.	2.00 s
F08	Acceleration/Deceleration Time 2	0.00 to 3600 s Note: Entering 0.00 cancels the deceleration time, requiring external soft-start.	1.80 s
F09	Torque Boost 1	0.0 to 20.0 % (percentage with respect to "F05: Rated Voltage at Base Frequency 1")	Depending on the inverter capacity
F10	Electronic Thermal Overload Protection for Motor 1 (Select motor characteristics) (Overload detection level)	1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven motor, non-ventilated motor, or motor with separately powered cooling fan	1
F11	(Thermal time constant)	0.00: Disable 0.01 to 100.00 A 1 to 135 % of the rated current (allowable continuous drive current) of the motor	100% of the motor rated current
F12	(Thermal time constant)	0.5 to 75.0 min	5.0 min
F15	Frequency Limiter (High)	0.0 to 400.0 Hz	70.0 Hz
F16	(Low)	0.0 to 400.0 Hz	0.0 Hz
F20	DC Braking 1 (Braking starting frequency)	0.0 to 60.0 Hz	0.5 Hz
F21	(Braking level)	0 to 100 %	80 %
F22	(Braking time)	0.00 : Disable 0.01 to 30.00 s	1.50 s
F23	Starting Frequency 1	0.1 to 60.0 Hz	0.5 Hz
F24	(Holding time)	0.00 to 10.00 s	0.80 s
F25	Stop Frequency	0.1 to 60.0 Hz	0.2 Hz
F26	Motor Sound (Carrier frequency)	0.75 to 15 Hz	8 kHz
F40	Torque Limiter 1 (Limiting level for driving)	20 to 200 % 999: Disable	999
F41	(Limiting level for braking)	20 to 200 % 999: Disable	999
F42	Control Mode Selection 1	0: V/f control with slip compensation inactive 1: Dynamic torque vector control 2: V/f control with slip compensation active 3: V/f control with optional PG interface 4: Dynamic torque vector control with optional PG interface	1
F43	Current Limiter (Mode selection)	0: Disable (No current limiter works.) 1: Enable at constant speed (Disable during ACC/DEC) 2: Enable during ACC/constant speed operation	0
F44	(Level)	20 to 200 (The data is interpreted as the rated output current of the inverter for 100 %.)	200 %
F50	Electronic Thermal Overload Protection for Braking Resistor (Discharging capability)	1 to 900 kW 999: Disable 0: Reserved	999
F51	(Allowable average loss)	0.001 to 50.000 kW 0.000: Reserved	0.000

E codes: Extension terminal functions

Code	Name	Data setting range	Default setting
E01	Terminal [X1] Function	Selecting function code data assigns the corresponding function to terminals [X1] to [X5] as listed below.	0
E02	Terminal [X2] Function	0 (1000): Select multi-frequency (SS1)	1
E03	Terminal [X3] Function	1 (1001): Select multi-frequency (SS2)	2
E04	Terminal [X4] Function	2 (1002): Select multi-frequency (SS4)	1007
E05	Terminal [X5] Function	6 (1006): Enable 3-wire operation (HLD) 7 (1007): Coast to a stop (BX) 8 (1008): Reset alarm (RST) 9 (1009): Enable external alarm trip (THR) 10 (1010): Ready for jogging (JOG) 11 (1011): Select frequency command 2/1 (Hz2/Hz1) 13 : Enable DC braking (DCBRK) 14 (1014): Select torque limiter level (TL2/TL1) 17 (1017): UP (Increase output frequency) (UP) 18 (1018): DOWN (Decrease output frequency) (DOWN) 19 (1019): Enable data change with keypad (WE-KP) 21 (1021): Switch normal/inverse operation (IVS) 24 (1024): Enable communications link via RS-485 or field bus (LE) 25 (1025): Universal DI (U-DI) 30 (1030): Force to stop (STOP) 46 (1046): Enable overload stop (OLS) 63 (1063): Enable UPS(battery) operation (BATRY) Setting the value of 1000s in parentheses () shown above assigns a negative logic input to a terminal. Note: In the case of THR and STOP, data (1009) and (1030) are for normal logic, and "9" and "30" are for negative logic, respectively.	63
E10	Acceleration/Deceleration Time 3	0.00 to 3600 s Note: Entering 0.00 cancels the acceleration time, requiring external soft-start.	1.80 s
E11	Acceleration/Deceleration Time of UPS Operation	0.00 to 3600 s Note: Entering 0.00 cancels the acceleration time, requiring external soft-start.	1.80 s
E20	Terminal [Y1] Function	Selecting function code data assigns the corresponding function to terminals [Y1], [Y2], and [30A/B/C] as listed below.	57
E21	Terminal [Y2] Function	0 (1000): Inverter running (RUN)	12
E27	Terminal [30A/B/C] Function	1 (1001): Frequency arrival signal (FAR) 2 (1002): Frequency detected (FDT) 3 (1003): Undervoltage detected (Inverter stopped) (LU) 4 (1004): Torque polarity detected (B/D) 5 (1005): Inverter output limiting (IOL) 6 (1006): Auto-restarting after momentary power failure (IPF) 7 (1007): Motor overload early warning (OL) 10 (1010): Inverter ready to run (RDY) 12 (1012): MC control (SWS2-2) 21 (1021): Frequency arrival signal 2 (FAR2) 22 (1022): Inverter output limiting with delay (IOL2) 26 (1026): Auto-resetting (TRY) 28 (1028): Heat sink overheat early warning (OH) 30 (1030): Service lifetime alarm (LIFE) 33 (1033): Reference loss detected (REF OFF) 35 (1035): Inverter output on (RUN2) 36 (1036): Overload prevention control (OLP) 37 (1037): Current detected (ID) 38 (1038): Current detected 2 (ID2) 57 (1057): Brake signal (BRKS) 99 (1099): Alarm output (for any alarm) (ALM) Setting the value of 1000s in parentheses () shown above assigns a negative logic input to a terminal.	99
E43	LED Monitor (Item selection)	0: Speed monitor (select by E48) 3: Output current 4: Output voltage 8: Calculated torque 9: Input power 13: Timer 15: Load factor 16: Motor output	0
E45	LCD Monitor (Item selection)	0: Running status, rotational direction and operation guide 1: Bar charts for output frequency, current and calculated torque	0
E46	(Language selection)	0: Japanese 1: English 2: German 3: French 4: Spanish 5: Italian	1
E47	(Contrast control)	0 (Low) to 10 (High)	5
E48	LED Monitor (Speed monitor item)	0: Output frequency (Before slip compensation) 1: Output frequency (After slip compensation) 2: Reference frequency 3: Motor speed in r/min 4: Load shaft speed in r/min 5: Line speed in m/min 6: Constant feeding rate time	0

C codes: Control functions of frequency

Code	Name	Data setting range	Default setting
C05	Speed 2 (Run Speed)	0.00 to 400.0 Hz	50.00 Hz
C06	Speed 3 (Maintenance Speed)		25.00 Hz
C07	Speed 4 (Creep Speed)		5.00 Hz
C08	Speed 5 (Run Speed)		10.00 Hz
C09	Speed 6 (Run Speed)		10.00 Hz
C10	Speed 7 (Maintenance Speed)		10.00 Hz
C11	Speed 8 (Creep Speed)		10.00 Hz
C19	UPS Operation Speed		0.00 to 400.0 Hz
C20	Jogging Frequency	0.00 to 400.0 Hz	0.00 Hz

P codes: Motor parameters

Code	Name	Data setting range	Default setting
P01	Motor 1 (No. of poles)	2 to 22 poles	4
P02	(Rated capacity)	0.01 to 30.00 kW (where, P99 data is 0, 3, or 4.) 0.01 to 30.00 HP (where, P99 data is 1.)	Rated capacity of motor
P03	(Rated current)	0.00 to 100.0 A	Rated value of Fuji standard motor
P04	(Auto-tuning)	0: Disable 1: Enable (Tune %R1 and %X while the motor is stopped.) 2: Enable (Tune %R1, %X, rated slip and no-load current while the motor is stopped.)	0
P05	(Online tuning)	0: Disable 1: Enable	0
P06	(No-load current)	0.00 to 50.00 A	Rated value of Fuji standard motor
P07	(%R1)	0.00 to 50.00 %	Rated value of Fuji standard motor
P08	(%X)	0.00 to 50.00 %	Rated value of Fuji standard motor
P09	(Slip compensation gain for driving)	0.0 to 200.0 %	100.0 %
P10	(Slip compensation response time)	0.01 to 10.00 s	0.20 s
P11	(Slip compensation gain for braking)	0.0 to 200.0 %	100.0 %
P12	(Rated slip frequency)	0.00 to 15.00 Hz	Rated value of Fuji standard motor
P99	Motor 1 Selection	0: Motor characteristics 0 (Fuji standard motors, 8-series) 1: Motor characteristics 1 (HP rating motors) 3: Motor characteristics 3 (Fuji standard motors, 6-series) 4: Other motors	0

H codes: High performance functions

Code	Name	Data setting range	Default setting
H03	Data Initialization	0: Disable initialization 1: Initialize all function code data to the factory defaults 2: Initialize motor 1 parameters 3: Initialize motor 2 parameters	0
H04	Auto-reset (Times)	0: Disabled 1 to 10	0
H05	(Reset interval)	0.5 to 20.0	5.0 s
H06	Cooling Fan ON/OFF Control	0.0: Automatic ON/OFF depending upon temperature 0.5 to 10 min: OFF by timer 999: Disabled (Always ON)	999 min
H07	Acceleration/Deceleration Pattern	0: Linear 1: S-curve (Weak) 2: S-curve (Strong) 3: Curvilinear 4: Full S-curves control (The setting from o61 to o66 becomes effective.)	4
H12	Instantaneous Overcurrent Limiting (Mode selection)	0: Disabled 1: Enabled	0
H26	Thermistor (Mode selection)	0: Disabled 1: Enabled (With PTC, the inverter immediately trips with <i>TH</i> displayed.) 2: Enabled (Upon detection of (PTC), the inverter continues running while outputting alarm signal (THM).)	0
H27	(Level)	0.00 to 5.00 V	1.60 V
H65	Starting Speed (Soft start time)	0.00 to 60.00 s	0.25 s
H97	Clear Alarm Data	0: Does not clear alarm data 1: Clear alarm data and return to zero	0
H98	Protection/Maintenance Function (Mode selection)	0 to 31: Display data on the keypad's LED monitor in decimal format (In each bit, "0" for disabled, "1" for enabled.) Bit 0: Lower the carrier frequency automatically Bit 1: Detect input phase loss Bit 2: Detect output phase loss Bit 3: Select life judgment threshold of DC link bus capacitor Bit 4: Judge the life of DC link bus capacitor	23 (bit4, 2,1,0=1)

J codes: Application functions


Code	Name	Data setting range	Default setting
J63	Overload Stop of UPS Operation (Detection value)	0: Torque 1: Current 2: Input power	2
J64	(Detection level : UPS capacity)	20 to 200%	100 %
J65	(Mode selection)	0: Disable 1: Decelerate to stop 2: Coast to a stop	2
J66	(Operation condition)	0: Enable at constant speed and during deceleration 1: Enable at constant speed 2: Enable anytime	2
J67	(Timer)	0.00 to 600.00s	0.00 s
J68	Braking Signal (Brake release(OFF) current)	0 to 200%	10 %
J69	(Brake release(OFF) frequency)	0.0 to 25.0 Hz	0.3 Hz
J70	(Brake release(OFF) timer)	0.00 to 10.00s	0.20 s
J71	(Brake apply(ON) frequency)	0.0 to 25.0 Hz	0.5 Hz
J72	(Brake apply(ON) timer)	0.00 to 100.00s	0.50 s

o codes: Option functions

Code	Name	Data setting range	Default setting
o40	Torque Boost Gain for normal operation	0.00 to 3.00	1.06
o41	Voltage compensation response time	(Run speed operation)	0.00 to 10.00 s
o42		(UPS operation)	1.00 s
o43		(Less than start f. when starting)	0.20 s
o44		(Creep speed operation)	1.00 s
o45	Slip compensation response time	(UPS operation)	1.00 s
o46		(Creep speed operation)	1.00 s
o47	Threshold of Creep Speed	0.00 to 60.00 Hz	10.00 Hz
o58	Start method selection	0: Start frequency holding method 1: DC Braking method	0
o61	S-curve Setting 1	0 to 50 % of max. frequency	20 %
o62	S-curve Setting 2		20 %
o63	S-curve Setting 3		20 %
o64	S-curve Setting 4		20 %
o65	S-curve Setting 5		20 %
o66	S-curve Setting 6		20 %
o75	MC Control		(Startup delay time)
o76		(MC OFF delay time)	0.00 to 10.00 s
o80	UPS Operation level	Edc 120 to 220: (for 200 V class series) Edc 240 to 440: (for 400 V class series)	120 V 240 V
o81	Torque Boost Gain for UPS Operation	0.00 to 3.00	1.50

9. TROUBLESHOOTING

Alarm code	Alarm name	Alarm description
OC1	Overcurrent protection during acceleration	Excessive output current due to: - Excessive motor load. - Acceleration (deceleration) too fast. - Short circuit in the output circuit. - Ground fault (this protection is effective only during start up).
OC2	Overcurrent protection during deceleration	
OC3	Overcurrent protection at constant speed	
OU1	Overvoltage protection during acceleration	Voltage in the DC link too high (400 V for 200 V class inverters; 800 V for 400 V class inverters) due to: - Deceleration too fast. - The motor is regenerating energy and there is no braking resistor connected to the inverter.
OU2	Overvoltage protection during deceleration	
OU3	Overvoltage protection at constant speed	
LU	Undervoltage protection	Voltage in the DC link too low (200 V for 200 V class inverters; 400 V for 400 V class inverters).
L in	Input phase loss protection	Input phase loss. If the inverter load is low or a DC reactor is installed the event of an input phase loss may be not detected.
OPL	Output phase lost protection	An output phase of the inverter is in open circuit.
OH1	Overheat protection	Excessive heat sink temperature due to: - Inverter fan is not working. - The inverter is overloaded.

Alarm code	Alarm name	Alarm description
<i>dbH</i>	External braking resistor overheat	Overheating of the external braking resistor
<i>OLU</i>	Overload protection	IGBT internal temperature calculated from the output current and from the temperature inside the inverter is over the preset value.
<i>OH2</i>	External alarm input	A digital input is programmed with the function THR (9) and has been deactivated.
<i>OL 1</i>	Electronic thermal overload motor 1	The inverter is protecting the motor in accordance with the electronic thermal overload protection setting: <ul style="list-style-type: none"> - F10=1 is for general purpose motors. - F10=2 is for inverter motors. - F11 defines the operation level (current level). - F12 defines the thermal time constant.
<i>OH4</i>	PTC thermistor	The thermistor input has stopped the inverter to protect the motor. The thermistor has to be connected between terminals [C1] and [11]. Also the slide switch has to be set to the correct position and functions H26 (enable) and H27 (level) have to be set.
<i>Er 1</i>	Memory error detection	Memory error has been detected during power up.
<i>Er 2</i>	Keypad communications error detection	The inverter has detected a communications error with the keypad (standard keypad or multifunction keypad).
<i>Er 3</i>	CPU error detection	Inverter has detected a CPU error or LSI error caused by noise or some other factors.
<i>Er 4</i>	Option communications error detection	Inverter has detected a communications error with the option card.
<i>Er 5</i>	Option error detection	The option card has detected an error.
<i>Er 6</i>	Start check function	The inverter prohibits any run operations and displays <i>Er6</i> on the 7-segment LED monitor if any run command is present when: <ul style="list-style-type: none"> - Powering up - An alarm is released (the  key is turned ON or an alarm reset RST is input.) - "Enable communications link LE" has been activated and the run command is active in the linked source.
<i>Er 7</i>	Tuning error detection	During tuning of motor parameters (auto tuning), one of the following errors happened: <ul style="list-style-type: none"> - Tuning has failed. - Tuning has been aborted (for example, by removing run command) - An abnormal condition has been detected.
<i>Er B</i>	RS485 communications error detection	The inverter is connected to a communications network via the RS485 port of the keypad and a communications error has been detected.
<i>Er F</i>	Data save error during undervoltage	The data could not be saved during activation of the undervoltage protection function.
<i>Er P</i>	RS485 communications error detection (Optional)	The inverter is connected to a communications network via the optional RS485 communications card (OPC-E1-RS) and a communications error has been detected.
<i>Er H</i>	Hardware error	Hardware error due to: <ul style="list-style-type: none"> - Poor connection between the control printed circuit board (control PCB) and the power printed circuit board (power PCB), interface printed circuit board (interface PCB) or option card. - Short circuit between terminals 11 and 13.
<i>Er r</i>	Mock Alarm	Simulated alarm that can be generated by setting H45=1. This allows checking the fault sequence in an electrical system.

For further information about alarm codes please refer to the FRENIC-Multi user's manual.

CONTACT INFORMATION

Headquarters Europe

Fuji Electric Europe GmbH

Goethering 58
63067 Offenbach/Main
Germany
Tel.: +49 (0)69 669029 0
Fax: +49 (0)69 669029 58
info_inverter@fujielectric.de
www.fujielectric.de

Germany

Fuji Electric Europe GmbH
Sales Area South
Drosselweg 3
72666 Neckartailfingen
Tel.: +49 (0)7127 9228 00
Fax: +49 (0)7127 9228 01
hgneiting@fujielectric.de

Switzerland

Fuji Electric Europe GmbH
ParkAltenrhein
9423 Altenrhein
Tel.: +41 71 85829 49
Fax.: +41 71 85829 40
info@fujielectric.ch
www.fujielectric.ch

United Kingdom

Fuji Electric Europe GmbH
Tel.: +44 (0)7 989 090 783
info_inverter@fujielectric.de

France

Fuji Electric Europe GmbH
265 Rue Denis Papin
F - 38090 Villefontaine
Tel.: +33 (0)4 74 90 91 24
Fax: +33 (0)4 74 90 91 75
info_inverter@fujielectric.de

Headquarters Japan

Fuji Electric Systems Co., Ltd

Gate City Ohsaki East Tower,
11-2 Osaki 1-chome, Shinagawa-ku,
Chuo-ku
Tokyo 141-0032
Japan
Tel: +81 3 5435 7280
Fax: +81 3 5435 7425
www.fesys.co.jp

Fuji Electric Europe GmbH
Sales Area North
Friedrich-Ebert-Str. 19
35325 Mücke
Tel.: +49 (0)6400 9518 14
Fax: +49 (0)6400 9518 22
mrost@fujielectric.de

Spain

Fuji Electric Europe GmbH, Sucursal en España
Ronda Can Fatjó 5, Edifici D, Local B
Parc Tecnològic del Vallès
08290 Cerdanyola (Barcelona)
Tel.: +34 93 582 43 33
Fax: +34 93 582 43 44
infospain@fujielectric.de

Italy

Fuji Electric Europe GmbH
Via Rizzotto 46
41126 Modena (MO)
Tel. +390594734266
Fax +390594734294
info_inverter@fujielectric.de