Thank you for purchasing LS Variable Frequency Drives!

SAFETY INSTRUCTIONS

To prevent injury and property damage, follow these instructions during the installation and operation of the inverter.

Incorrect operation due to ignoring these instructions may cause harm or damage. The following symbols are used throughout the manual to highlight important information.

⚠ **DANGER**	**This symbol indicates death or serious injury can occur if you do not follow instructions.**
⚠ **WARNING**	**This symbol indicates the possibility of death or serious injury.**
⚠ **CAUTION**	**This symbol indicates the possibility of damage to the inverter or other components.**

■ The meaning of each symbol in this manual and on your equipment is as follows.

This is the safety alert symbol.
Read and follow instructions carefully to avoid a dangerous situation.

This symbol alerts the user to the presence of "dangerous voltage" inside the product that might cause bodily harm or electric shock.

■ This manual should be placed in a location where it can be accessed by users.

■ This manual should be given to the person who actually uses the inverter and is responsible for its maintenance.

⚠ WARNING

- **Do not remove the cover while power is applied or the unit is in operation.**
  Otherwise, electric shock could occur.

- **Do not operate the inverter with the front cover removed.**
  Otherwise, electric shock can occur due to the exposed terminals and bus bars.

- **Do not remove the cover except for periodic inspections or wiring, even if the input power is not applied.**
  Otherwise, electric shock can occur due to accessing capacitor banks.

- **Wiring and periodic inspections should be performed at least 10 minutes after disconnecting the input power and after checking the DC link voltage is discharged with a meter (below 30VDC).**
  Otherwise, electric shock could occur.

- **Operate the switches with dry hands.**
  Otherwise, electric shock could occur.

- **Do not use the cable when its insulating tube is damaged.**
  Otherwise, electric shock could occur.

- **Do not subject the cables to scratches, excessive stress, heavy loads or pinching.**
  Otherwise, electric shock could occur.

⚠ CAUTION

- **Install the inverter on a non-flammable surface. Do not place flammable materials nearby.**
  Otherwise, fire could occur.
- **Disconnect the input power if the inverter has been damaged.**
  Otherwise, it could result in a secondary accident and fire.
- **Do not touch the inverter after shutting down or disconnecting it. It will remain hot for a couple of minutes.**
  Otherwise, bodily injuries such as skin-burn or damage could occur.
- **Do not apply power to a damaged inverter or to an inverter with parts missing even if the installation is complete.**
  Otherwise, electric shock could occur.
- **Do not allow lint, paper, wood chips, dust, metallic chips or other foreign material into the drive.**
  Otherwise, fire or accident could occur.

OPERATING PRECAUTIONS

(1) Handling and installation

- The LSMV series inverter can be heavy. Lift according to the weight of the product. Use a hoist or crane to move and install the LSMV series inverter if necessary. Failure to do so may result in personal injury or damage to the inverter.
- Do not stack the inverter boxes higher than the number recommended.
- Install the inverter according to instructions specified in this manual.
- Do not open the cover during delivery.
- Do not place heavy items on the inverter.
- Check that the inverter mounting orientation is correct.
- Do not drop the inverter, or subject it to hard impact.
- Verify the ground impedance 100ohm or less for 230 V Class inverters and 10ohm or less for 460V class inverters.
- Take protective measures against ESD (Electrostatic Discharge) before touching the pcb boards during inspection, installation or repair.
- The inverter is designed for use under the following environmental conditions:

Environment	Ambient temp.	0 ~ 40 ℃ (32°F ~ 104°F)
	Relative humidity	90% Relative Humidity or less (non-condensing)
	Storage temp.	0 ~ 65 ℃ ℃ (32°F ~ 149°F)
	Location	Protected from corrosive gas, combustible gas, oil mist or dust (Pollution Degree 2 Environment)
	Altitude, Vibration	Max. 1,000m (3,300ft) above sea level, Max. 5.9m/sec^2 (0.6G) or less
	Atmospheric pressure	70 ~ 106 kPa (20.67 in Hg ~ 31.3 in Hg)

(2) Wiring

- Do not connect power factor correction capacitors, surge suppressors, or RFI filter to the output of the inverter.
- The connection orientation of the motor output cables U, V, W will affect the direction of rotation of the motor. Verify correct wiring before starting inverter.
- Incorrect terminal wiring could result in inverter and/or equipment damage.
- Reversing the polarity (+/-) of the terminals could damage the inverter.
- Only authorized personnel familiar with LS inverter should perform wiring and inspections.
- Always install the inverter before wiring. Otherwise, electric shock or bodily injury can occur.

(3) Trial run

- Check all parameters during operation. Parameter values might require adjustment depending on the application.
- Always apply voltage within the permissible range of each terminal as indicated in this manual. Otherwise, inverter damage may result.

(4) Operation precautions

- When the Auto restart function is selected, the inverter will restart after a fault has occurred.
- The Stop key on the keypad can only be used to stop the inverter when keypad control is enabled. Install a separate emergency stop switch if necessary.

- If a fault reset is made with the run command and /or reference signal present, a sudden start will occur. Check that the run command and /or reference signal is turned off in advance of resetting any faults. Otherwise an accident could occur.
- Do not modify the inverter.
- Depending on the motor specifications and user ETH overload settings, the motor may not be protected by electronic thermal function of inverter.
- The operation of the inverter is intended to be controlled by either keypad command or control input signals. Do not use a magnetic contactor or any other device that routinely disconnects the inverter and reconnects the inverter to the input supply power for the purpose of starting and stopping the motor.
- A noise filter may be installed to reduce the effect of electromagnetic interference. Otherwise nearby electronic equipment may be affected.
- In cases with input voltage unbalances, install an AC input reactor.
- Power Factor capacitors and generators may become overheated and damaged due to harmonics created by the inverter.
- Use an insulation-rectified motor or take measures to suppress the micro surge voltage when driving 460V class motor with inverter. A micro surge voltage attributable to wiring constant is generated at motor terminals, and may deteriorate insulation and damage motor.
- Before operating unit and prior to user programming, reset user parameters to default settings.
- The Inverter can be set to operate a motor at high-speeds. Verify the speed capability of motor and machinery prior to operating inverter.
- Holding torque is not produced when using the DC-Brake function. Install separate equipment when holding torque is required.

(5) Fault prevention precautions
- If required, provide a safety backup such as an emergency mechanical brake to prevent any hazardous conditions if the inverter fails during operation.

(6) Maintenance, inspection and parts replacement
- Do not megger (hi-pot or insulation resistance) test the power or control circuit of the inverter.
- Refer to Chapter 8 for periodic inspection and parts replacement details.

(7) Disposal
- Handle the inverter as an industrial waste when disposing of it.

(8) General instructions
Many of the diagrams and drawings in this instruction manual show the inverter without a cover. Prior to operating the unit, be sure to restore covers and circuit protection according to specifications.

Table of Contents

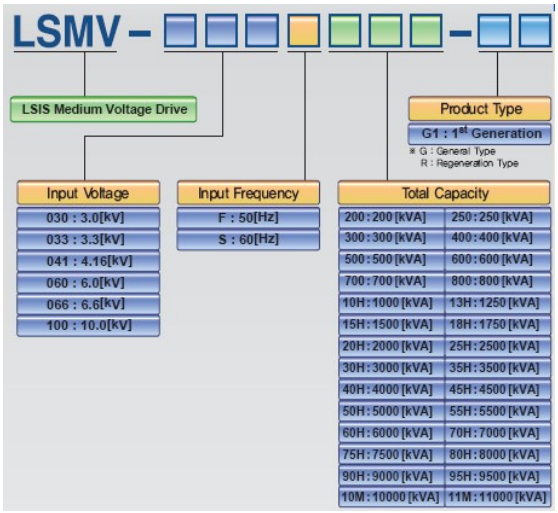
CHAPTER 1 - BASIC INFORMATION

1.1 Inspection

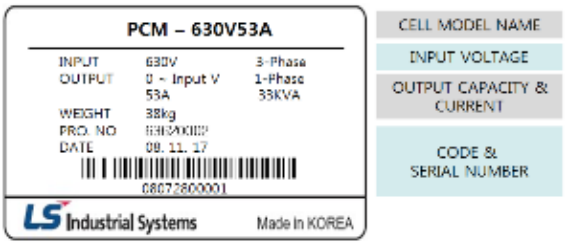
- Remove the inverter from its packing and inspect its exterior for shipping damage. If damage is apparent notify the shipping agent and your LSIS sales representative.
- Remove the cover and inspect the inverter for any apparent damage or foreign objects. Ensure that all mounting hardware and terminal connection hardware is properly seated, securely fastened, and undamaged.
- Check the nameplate on the LSMV inverter. Verify that the inverter unit is the correct horsepower and input voltage for the application.

1.1.1. Inverter model number

The numbering system of the inverter is as shown below.



The numbering inverter of cell unit is as shown below.



1.1.2. Installation

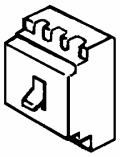
To operate the inverter reliably, install the inverter in a proper place with the correct direction and with the proper clearances.

1.1.3. Wiring

Connect the power supply, motor and operation signals (control signals) to the terminal block. Note that incorrect connection may damage the inverter and peripheral devices.

1.2 Basic configuration

The following devices are required to operate the inverter. Proper peripheral devices must be selected and correct connections made to ensure proper operation. An incorrectly applied or installed inverter can result in system malfunction or reduction in product life as well as component damage. You must read and understand this manual thoroughly before proceeding.

	AC Source Supply	Use a power source with a voltage within the permissible range of inverter input power rating.
	MCCB or Earth leakage circuit breaker (ELB)	Select circuit breakers or fuses in accordance with applicable national and local codes.
	Input VCB Panel	Check that the panel meets the specifications of the inverter.
	Installation and wiring	To reliably operate the drive, install the inverter in the proper orientation and with proper clearances. Incorrect terminal wiring could result in the equipment damage.
	To motor	Do not connect power factor capacitors, surge arrestors or radio noise filters to the output side of the inverter.

CHAPTER 2 - SPECIFICATION

2.1 Basic Specifications

Model Number (LSMV-066F10H-G1)		
Output ratings	Voltage	3Phaes 3kV/3.3kV/4.16kV/6kV/6.6kV/10kV
	Frequency	0 – 120[Hz]
	Voltage Level	MAX 25Level
Input ratings	Voltage	3Phaes 3kV/3.3kV/4.16kV/6kV/6.6kV/10kV ± 10%
	Frequency	50/60[Hz] ± 5% *Note1)
Basic structure	Cascade Stair	2 stair/3 stair/4 stair/5 stair/6 stair/9 stair Serial
	Cell input voltage	3Phase 630[V]
	Cell bypass	Basic internal

*Note1) Please contact us for any other voltage specification.

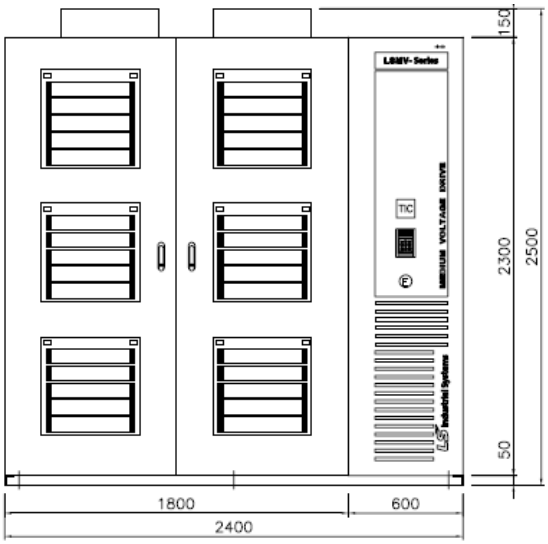
Cooling method		Forced air cooling	
CONTROL	Control Method	V/F, Sensorless Vector, Slip Compensation	
	Frequency Range	0 – 120[Hz]	
	Frequency Accuracy	± 0.1%	
	Frequency Setting Resolution	0.01[Hz]	
	Overload Capacity	120% 60Ssec	
	Accel/Decel Time	0.1s ~ 6000s	
Communication		RS485 built-in option : DeviceNet, Profibus, Modbus-RTU, Lonworks, Bac-Net	
Additional Function		Retry/Cell bypass	
Power factor		More than 95% (20% ~ 100% of Load), Satisfy IEEE 510-1002	
Efficiency		More than 97% (Rated Speed and Load)	
Input current THD		Less than 5%(30% ~ 100% of Load), Satisfy IEEE Std. 519-1992	
Modulation Method		PWM Modulation	
Signal input/output		Digital input/output	23[CH]
		Analog input/output	6[CH]
ENVIRONMENT	Ambient Temperature	0℃ ~ 40℃ (32°F ~ 104°F) (Use loads less than 80% at 50℃)	
	Storage Temperature	0℃ ~ 65℃ (32°F ~ 149°F)	
	Ambient Humidity	Less Than 90 % RH Max. (Non-Condensing)	
	Altitude – Vibration	Below 1,000m (3,300ft), Below 5.9m/sec^2 (0.6g)	
	Protection degree	IP30	
	Application Site	Pollution degree 2, No Corrosive Gas, Combustible Gas, Oil Mist, or Dust	

2.2 Dimensions

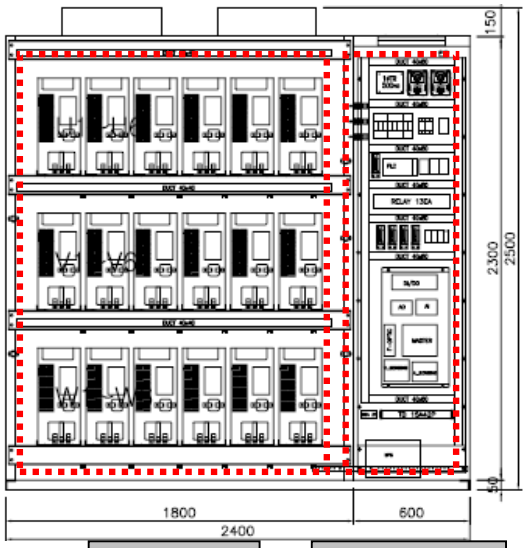
1) LSMV-066F10H-G1

MVDRIVE Structure Total 3Part (Input Transformer Part, Cell Part, Control Part)
(According to MVDRIVE Capability the MVDRIVE structure to being different)

Front View

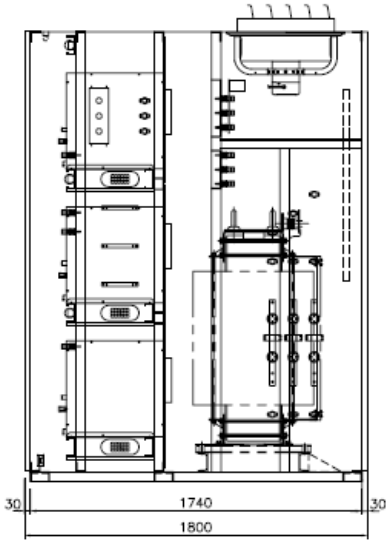


Front Inner View

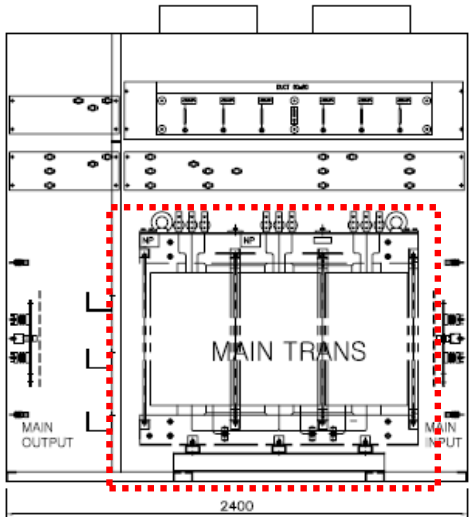


Cell Part **Control part**

Side Inner View

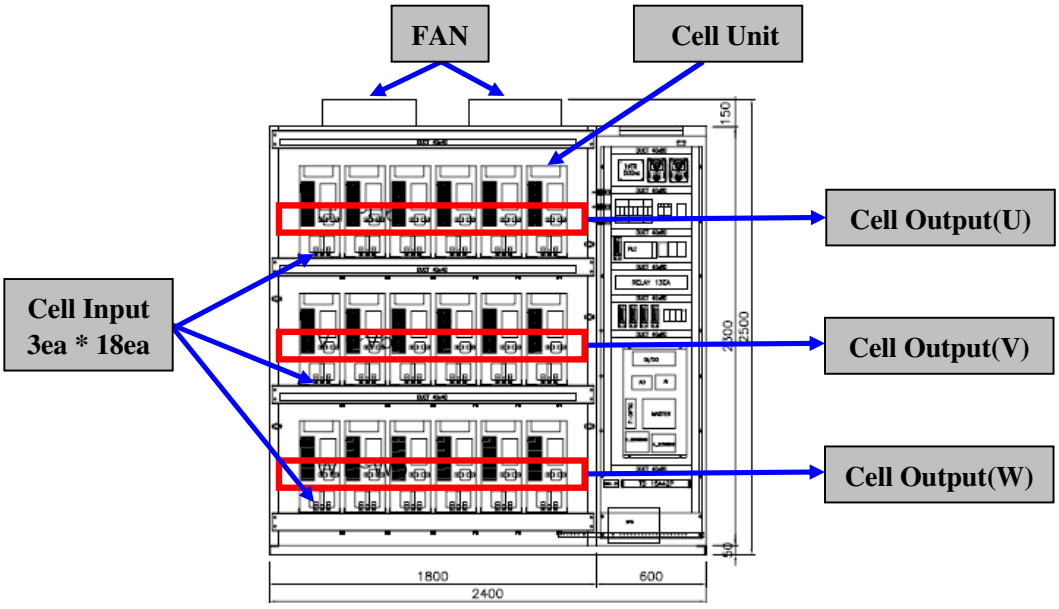


Rear Inner View



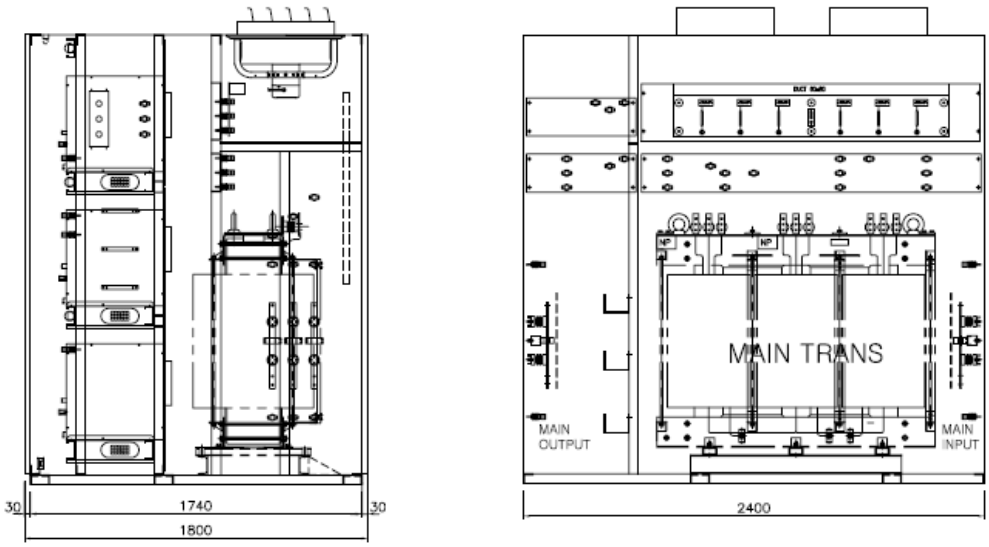
Input Transformer part

2) CELL PART



A cell panel has 6 cells per phase. The voltage of an output phase is the sum of the voltages of the cells in serial connection. Each cell receives 3-phase power and outputs single-phase power. All the cells are electrically and mechanically identical, therefore, they are interchangeable. Each cell has a control board and independent structure communicating with the master controller via optical cable. A fan is installed to cool down cells and transformer.

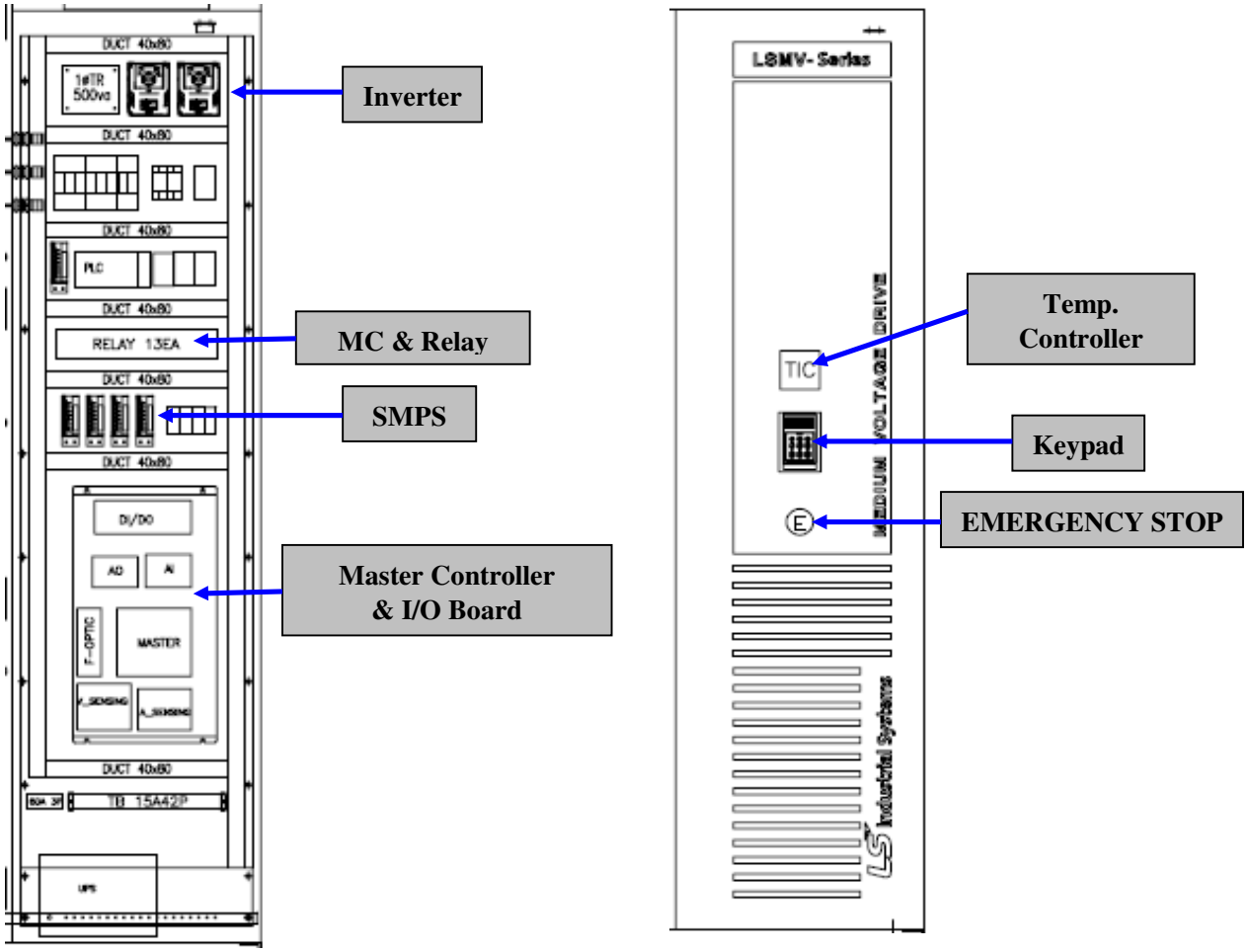
2) TRANS PART



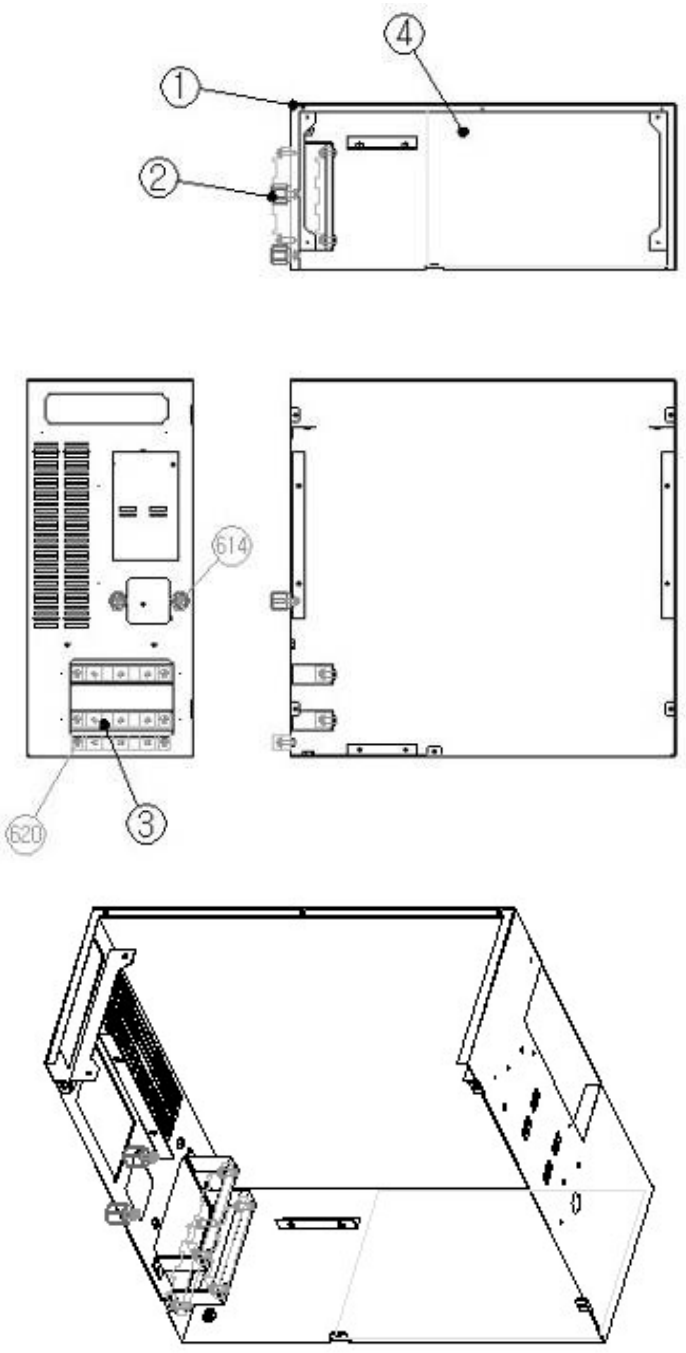
The transformer panel includes a phase shifting transformer and input/output detector. The phase shifting transformer supplies independent and phase shifted power to each cell.
The I/O detector senses the current and voltage input and output and sends the data to the master controller.

3) CONTROL PART

On the front of the control panel are the MV SystemView (option) which shows the system status and a keypad for entering commands and settings. Local/remote operation can be selected. An emergency stop button is provided to power-off the system immediately in abnormal condition.
The control panel comprises the master controller, digital I/O, analog command and output, controller hardware for CAN communication, a transformer, MCCB, MC, and relays. The master controller performs system control and protection, control of the cells in each phase, and operation command.

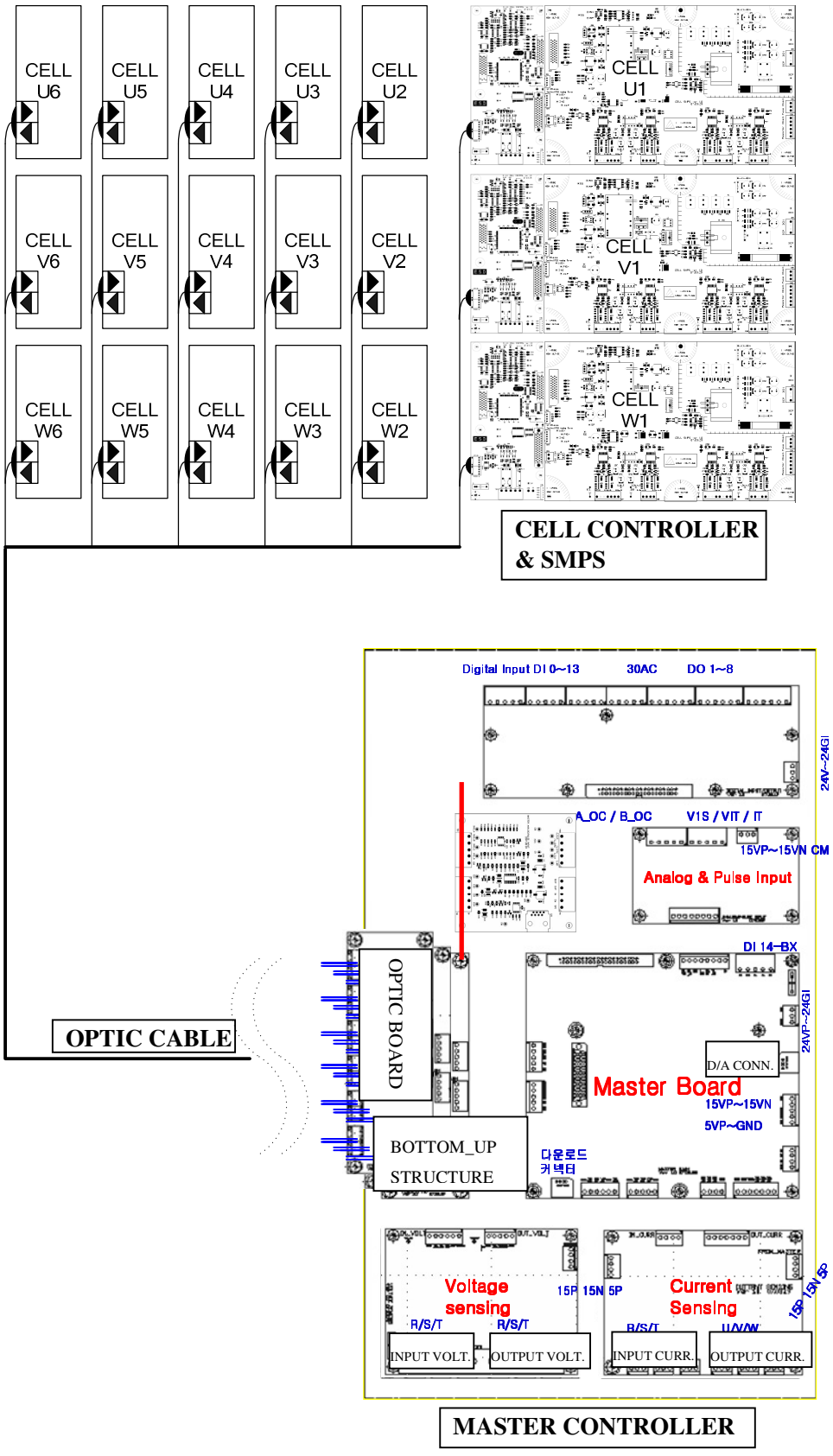


4) CELL STRUCTURE



The above figure shows the cell structure. On the front are I/O terminals and a keypad. On the rear is a DC-link capacitor potential divider resistor. Each cell is built-in with power circuit and an MC to enable bypass in case of the cell failure. An SMPS supplied power to the controller, and a controller for distributed control communicates with the master controller.

5) CONTROLLER STRUCTURE



MASTER CONTROLLER'S STRUCTURE

- MASTER BOARD
- VOLTAGE SENSING BOARD
- CURRENT SENSING BOARD
- ANALOG INPUT BOARD
- ANALOG INPUT BOARD
- DIGITAL I/O BOARD
- OPTIC COMMUNICATION BOARD

CELL CONTROLLER'S STRUCTURE

- CPU BOARD
- SMPS BOARD

2.2.1 MASTER CONTROLLER

A Part of MASTER CONTROLLER
: System Control, Protection, V/F,Sensorless Control, Cell'S Communication, Total System Communication

- MASTER BOARD
  The operation part that performs system control and protection, and processing of detected values to maintain system stability and control the motor according to the user command.

- VOLTAGE SENSING BOARD
  This board senses the input and output voltages to enable the master controller for voltage operation. The I/O voltages are also used for system protection.

- CURRENT SENSING BOARD
  This board senses the input and output currents to enable the master controller for current operation. The I/O currents are also used for motor control operation and system protection.

- ANALOG INPUT BOARD
  This board provides the frequency commands in voltage or current signals.
  Frequency command by voltage: -12V ~ 0 ~ 12V
  Frequency command by current: 4mA~20mA

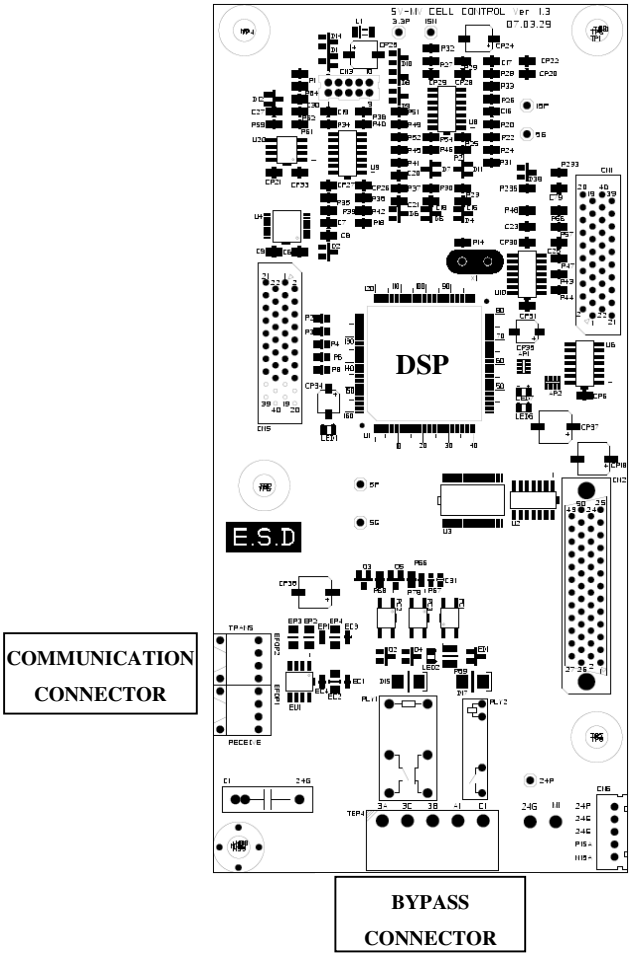
- ANALOG INPUT BOARD
  This board outputs the values of data memory in voltage or current signals.
  Voltage signals: 0~10V
  Current signals: 0mA~20mA

- DIGITAL I/O BOARD
  The multi-functional input of this board has 15 terminals, whose functions can be set up as desired. The 8 output terminals can be configured for specific functions, too.

- OPTIC COMMUNICATION BOARD
  This board communicates cell status information and commands between the cell and the master board, respectively.

2.2.2 CELL CONTROLLER

The cell controller receives power from the SMPS at 5V, +15V, -15V, and +24V. With the built-in DSP, the cell controller performs control and protective functions through self operation. It also performs PWM, cell protection and communication with the voltage signals from the master controller, in addition to the execution of output voltage control algorithm and cell power factor control to maintain the power factors of the cells at the same level. The cell bypass function supported with MC is provided to isolate a failed cell.

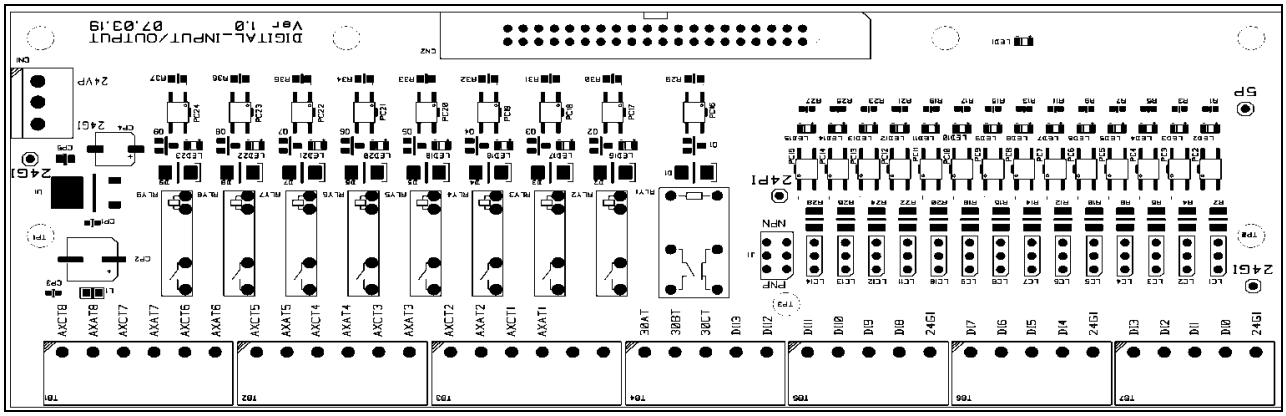


CHAPTER 3 - INSTALLATION

3.1 Installation

3.1.1 Control Circuit Terminal

Check to ensure that the control power supply and high voltage fan power supply (6600V) are correct. Check that the environment conditions meet the specifications.

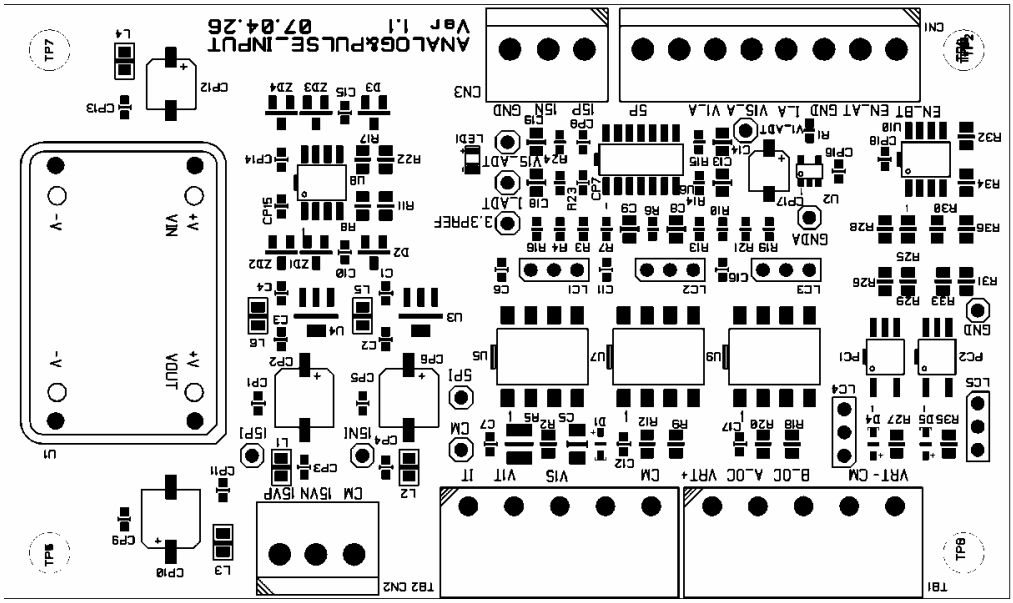


Symbol	Name	Description
M1,M2,M3	Programmable Digital Input 1,2,3	Defines Programmable Digital Input (Factory setting : Multi-Step Frequency 1, 2, 3)
FX [M7]	Forward Run Command	Forward Run When Closed and Stopped When Open.
RX [M8]	Reverse Run Command	Reverse Run When Closed and Stopped When Open.
JOG[M6]	Jog Frequency Reference	Runs at Jog Frequency when the Jog Signal is ON. The Direction is set by the FX (or RX) Signal.
Ext Trip1[M5]	External Trip	The failure outside of the system.
RST[M4]	Fault Reset	Used for Fault Reset.
Trans. OHT[M11]	Transformer Over Heat	Detects overheating of the phase shifting transformer. The signal is checked with contact point.
Fan Trip[M12]	Fan Trip	Detects the failure of the cooling fan on top of the panel.
High Voltage[M13]	High Voltage ON	Indicates that the system in applied with high voltage (6600V).
Run Enable[14]	Run Enable	Setting this terminal will enable RUN command only when this is ON state.
24GI	Sequence Common(NPN) 24V Common	Common terminal for NPN contact input and also common for the external 24V supply.
24	Sequence Common(PNP)/Ext. +24Vdc supply	Common 24V terminal for PNP contact input. Can also be used as a 24Vdc external power supply (maximum output : +24V, 50mA)
BX[M15]	Inverter Disable	When the BX Signal is ON the Output of the Inverter is Turned Off. When Motor uses an Electrical Brake to Stop, BX is used to Turn Off the Output Signal. Take caution when BX Signal is OFF (Not Turned Off by Latching) and FX Signal (or RX Signal) is ON. If so, motor continues to Run.

Symbol	Name	Description
3A,3C,3B	Fault Contact Output	Energizes when a fault is present. (AC250V, 1A; DC30V, 1A) Fault: 3A-3C Closed (3B-3C Open) Normal: 3B-3C Closed (3A-3C Open)
AXAT1 AXCT1	READY [Aux 1]	Run Enable Status
AXAT2 AXCT2	Fan Run [Aux 2]	Fan Run Staus
AXAT3 AXCT3	NORMAL [Aux 3]	Normal Communication Status.
AXAT4 AXCT4	RUN [Aux 4]	Run Status
AXAT5 AXCT5	Warning [Aux 5]	Protection Operating Warning Status

※ Unselected terminals can be selected when necessary.

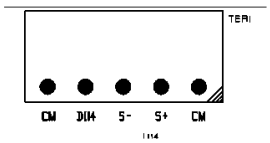
3.1.2 Analog Frequency Terminal



Symbol	Name	Description
V+, V-	Analog Power Source (+12V,-12V)	Power supply for Analog Frequency Setting. Maximum Output: +12V, 100mA, -12V, 100mA.
V1	Frequency Reference (Voltage)	Used by a DC 0-12V or –12~ 12 V input to set the frequency reference. (Input impedance is 20 kΩ)
I	Frequency Reference (Current)	Used by a 4-20mA input to set the frequency reference.
EN_AT, EN_BT	Frequency Reference (Pulse)	Used by a pulse input to set the frequency reference.
GNDA	Frequency Reference Common Terminal	Common Terminal for Analog Frequency Reference Signal.

3.1.3 RS485 Communication Terminal

RS485 Communication Connected MV SystemView

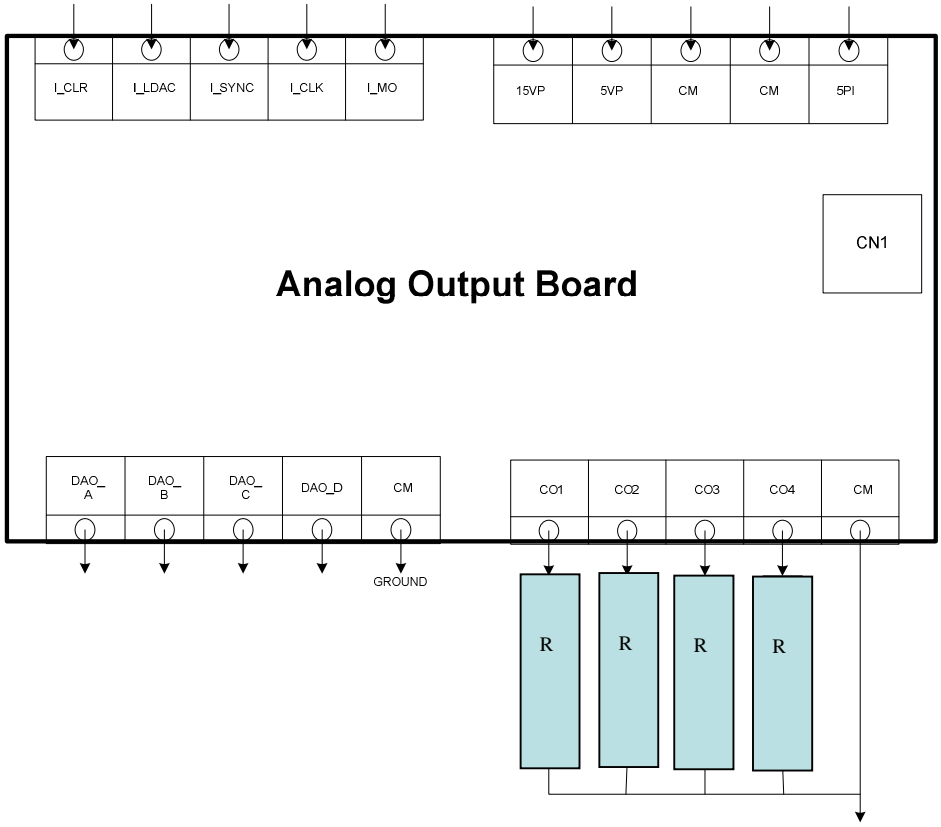


Symbol	Name	Description
S+, S-	RS485 signal High, Low	RS485 signal (See RS485 communication in the manual for more details.)
CM	RS485 common	Common Ground. Terminal for RS485 interface.

※ The BX[M15] terminal is on the master board.

OPTION RS485 is used from connection with other control devices such as a PC.

3.1.4 Analog Output Terminal



Symbol	Name	Description
CM	Analog output Common Terminal	A common terminal for the analog output for indicator.
DAO_A, DAO_B DAO_C, DAO_D	Analog Output Voltage	One of the output frequency, output voltage, or DC voltage is selected and outputted. The output frequency is the default factory setting. The output voltage range is 0~10V.
CO1, CO2 CO3, CO4	Analog Output Current	One of the output frequency, output current, output voltage, or DC current is selected and outputted. The output current range is 0~25mA.

3.1.5 Input/Output Current, Voltage Terminal

: Transformer input current and voltage, and inverter output current and voltage can be checked with this board. No user setting required.

3.2 WIRING

3.2.1 Wiring Precaution

1) The internal circuit of the inverter will be damaged if the incoming power is connected and applied to output terminal (U, V, W).
2) User ring terminals with insulated caps when wiring the input power and motor wiring.
3) Do not leave wire fragments inside of the inverter. Wire fragments can cause faults, breakdowns, and malfunctions.
4) For input and output wiring, user wires with sufficient size to rated voltage of High voltage inverter.
5) Do not use power factor capacitor, surge killers, or RFI filters on the output side of the inverter. Doing so may damage these components or occur inverter trip.
6) Always check whether the LCD and the carge lamp for the power terminal are OFF before wiring terminals. The charge capacitor may hold high-voltage even after the power is connected. User caution to prevent the possibility of personal injury.

3.2.2 Grounding

1) High voltage inverter is a high switching device, and leakage current may flow. Ground the inverter to avoid electrical shock. User caution to prevent the possibility of personal injury.
2) The ground impedance should be less than 10 ohm for high-voltage inverter and motor.
3) Connect only to the decicated ground terminal of the high-voltage inverter. Do not use the case or the cassis screw for grounding.
4) Grounding wire should be as thick as possible.

3.2.3 Control Wiring Caution

1) CM, 5G and 24GI terminals are insulated each other. Do not connect these terminals together or to the ground.
2) Use shielded wires or twisted wires for control circuit wiring, and separate these wires from the main power circuits and other high voltage circuit (200V relay sequence circuit).
3) It is recommended to use the cables of 0.0804mm^2 (28 AWG) ~ 1.25mm^2 (16 AWG) for analog command terminals of control circuit and 0.33mm^2 (22 AWG) ~ 2.0mm^2 (14 AWG) for terminal board (programmable digital input/output terminal and fault signal contact point).

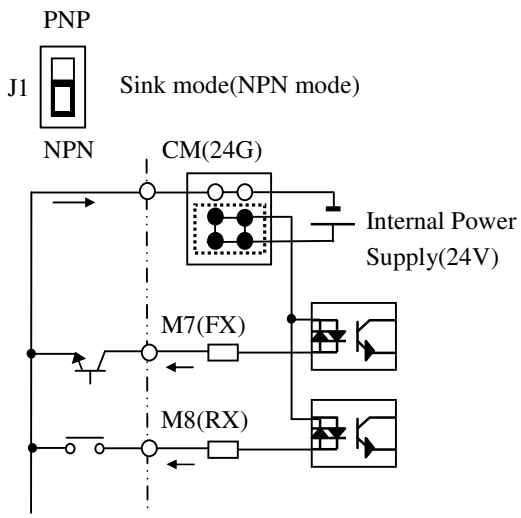
3.2.3 Sink mode(NPN mode) / Source mode(PNP mode)

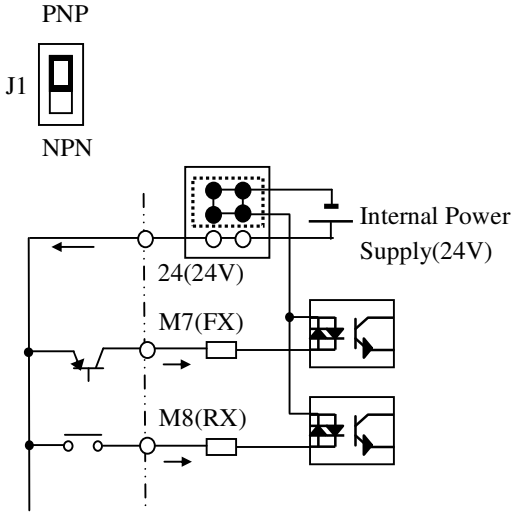
LSMV provides Sink/Source(NPN/PNP) modes for sequence input terminal on the control circuit.
The logic of the input terminal is setable to Sink mode(NPN mode) / Source mode(NPN mode) by using the J1 switch. Connection method is shown below.

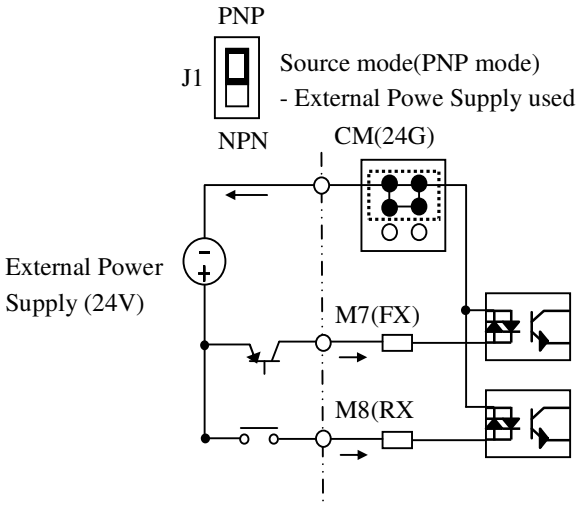
(1) Sink mode(NPN mode)
- Put J1 swich down to set to Sink mode(NPN mode). CM terminal (24V GND) is common terminal for contact signal input.
- The factory default is Sink mode(NPN mode).

(2) Source mode(PNP mode) - Internal Power Supply used
- Put J1 swich up to set to Source mode(PNP mode). Terminal 24 (24V Power Supply) is common terminal for contact input signal.

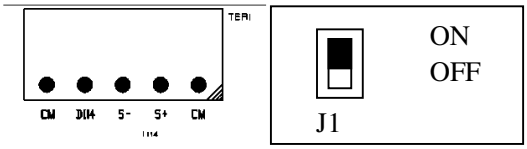
(3) Source mode(PNP mode) - External Power Supply used
- Put J1 swich up to set to Source mode(PNP mode).
- To use external 24V Power Supply, make a sequence between external Power Supply (-) terminal and CM(24V GND) terminal.







3.2.4 RS485 Wiring



Use the S+(RS485signal High) and S-(RS485 signal LOW) terminals in the TER1 terminal block of the master board. To use the termination resistor (120 ohm), set the switch J1 on top of the TER1 terminal block to ON(up).

Item	Specification
Transmission type	Bus method, Multi drop Link System
Applicable inverter	LSMV - series
Transmission distance	Within 1200m Max. (700m desired)
Recommendable cable	0.75mm^2(18AWG), Shield Type Twisted-pair Wire

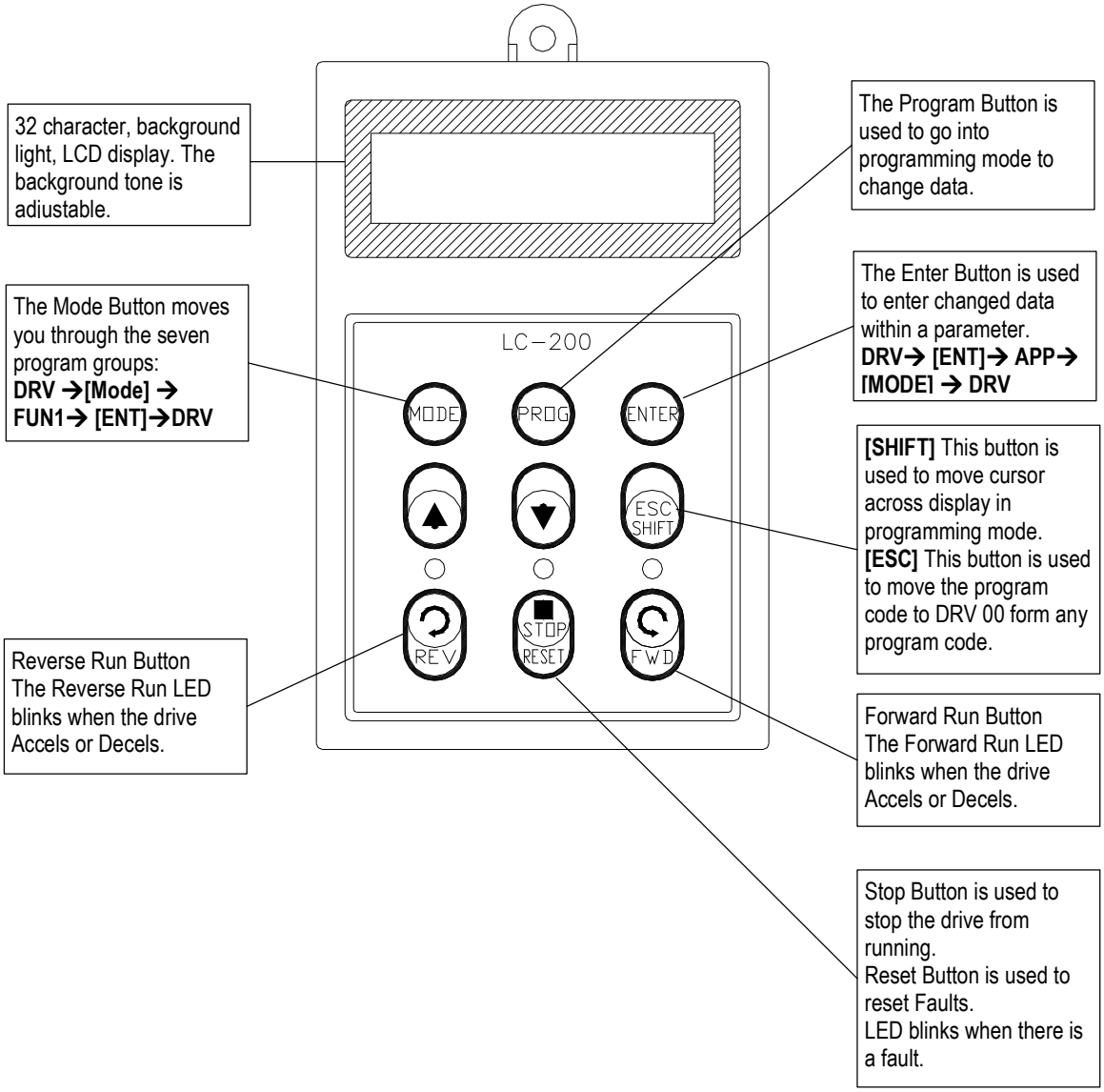
Item	Specification
Installation	S+, S-, CM terminals on the control terminal block
Power supply	Insulated from the inverter power supply

CHAPTER 4 - OPERATION

4.1 Programming Keypads

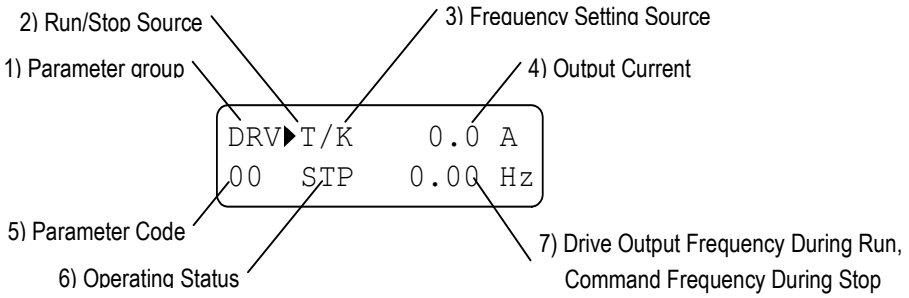
4.1.1 LCD Keypad

LCD keypad can display up to 32 alphanumeric characters, and various settings can be checked directly from the display. The following is an illustration of the keypad.



4.1.2 Detail description

1) LCD Keypad Display



Displays	Description
1) Parameter Group	Displays the parameter group. There are DRV, FU1, FU2, I/O, CEL groups.
2) Run/Stop Source	Displays the source of motor Run and Stop **K**: Run/Stop using FWD, REV buttons on keypad **T**: Run/Stop using control terminal input FX, RX **R**: Run/Stop using RS485 **O**: Run/Stop via option board
3) Frequency Setting Source	Displays the source of command frequency setting **K:** Frequency setting using keypad **V:** Frequency setting using V1 (0 ~12V or -12~ 12V) or V1 + I terminal **W:** Frequency setting using I (-12 ~ 12V) terminal **I:** Frequency setting using I (4 ~ 20mA) terminal **R:** Frequency setting using RS485 **U:** Up terminal input when Up/Down operation is selected **D:** Down terminal input when Up/Down operation is selected **S:** Stop status when Up/Down operation is selected **O**: Frequency setting via Option board **J**: Jog terminal input **1 ~ 15**: Step frequency operation (except Jog)
4) Output Current	Displays the Output Current during operation.
5) Parameter Code	Displays the code of a group. Use the ▲(Up), ▼(Down) key to move through 0~99 codes.
6) Operating Status	Displays the operation information. **STP**: Stop Status **FWD**: During Forward operation **REV**: During Reverse operation **DCB**: During DC Braking **LOP**: Loss of Reference from Option Board (DPRAM fault) **LOR**: Loss of Reference from Option Board (Communication network fault) **LOV**: Loss of Analog Frequency Reference (V1: 0~12V, -10~12V) **LOI:** Loss of Analog Frequency Reference (I: 4~20mA) **SEN :** Sensorless, Vector(Speed,Torque) Mode **CMP:** CAN mode(Compare mode) **NOR :** Normal Drive Status **FLT :** Normal operation of the inverter is impossible due to failure **TUN :** Auto tunning mode **FLY :** When the counter electromotive force is confirmed at the beginning of Flying Start **TST** : TEST Mode
7) Inverter Output Frequency/	Displays the Output Frequency during run. Displays the Command Frequency

Command Frequency	during stop.

4.1.3 Parameter setting and changing

1) Press **[MODE]** key until the desired parameter group is displayed.

2) Press **[▲]** or **[▼]** keys to move to the desired parameter code. If you know the desired parameter code, you can set the code number of each parameter group in "Jump code", except DRV group.

3) Press **[PROG]** key to go into the programming mode, the cursor starts blinking.

4) Press **[SHIFT/ESC]** key to move the cursor to the desired digit.

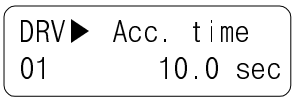
5) Press **[▲]** or **[▼]** keys to change the data.

6) Press **[ENT]** key to enter the data. The cursor stops blinking.

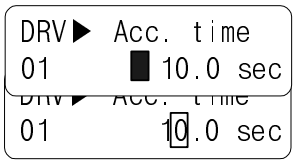
Note: Data cannot be changed when 1) the parameter is not adjustable during the inverter is running (see the function list), or 2) Parameter Lock function FU2-94 [Parameter Lock] is activated.

EX) Changing Accel time from 10 sec to 15 sec

1) LCD keypad

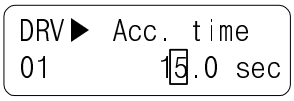


Move to the desired code to change.

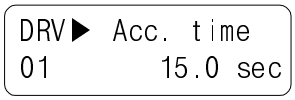


Press the **[PROG]** key.
A Cursor (■) will appear.

Use the **[SHIFT]** key to move the cursor.



Change the data using **[▲]**, **[▼]** keys.



Press the **[ENT]** key to save the value into memory.
The Cursor will disappear.

4.1.4 Parameter groups

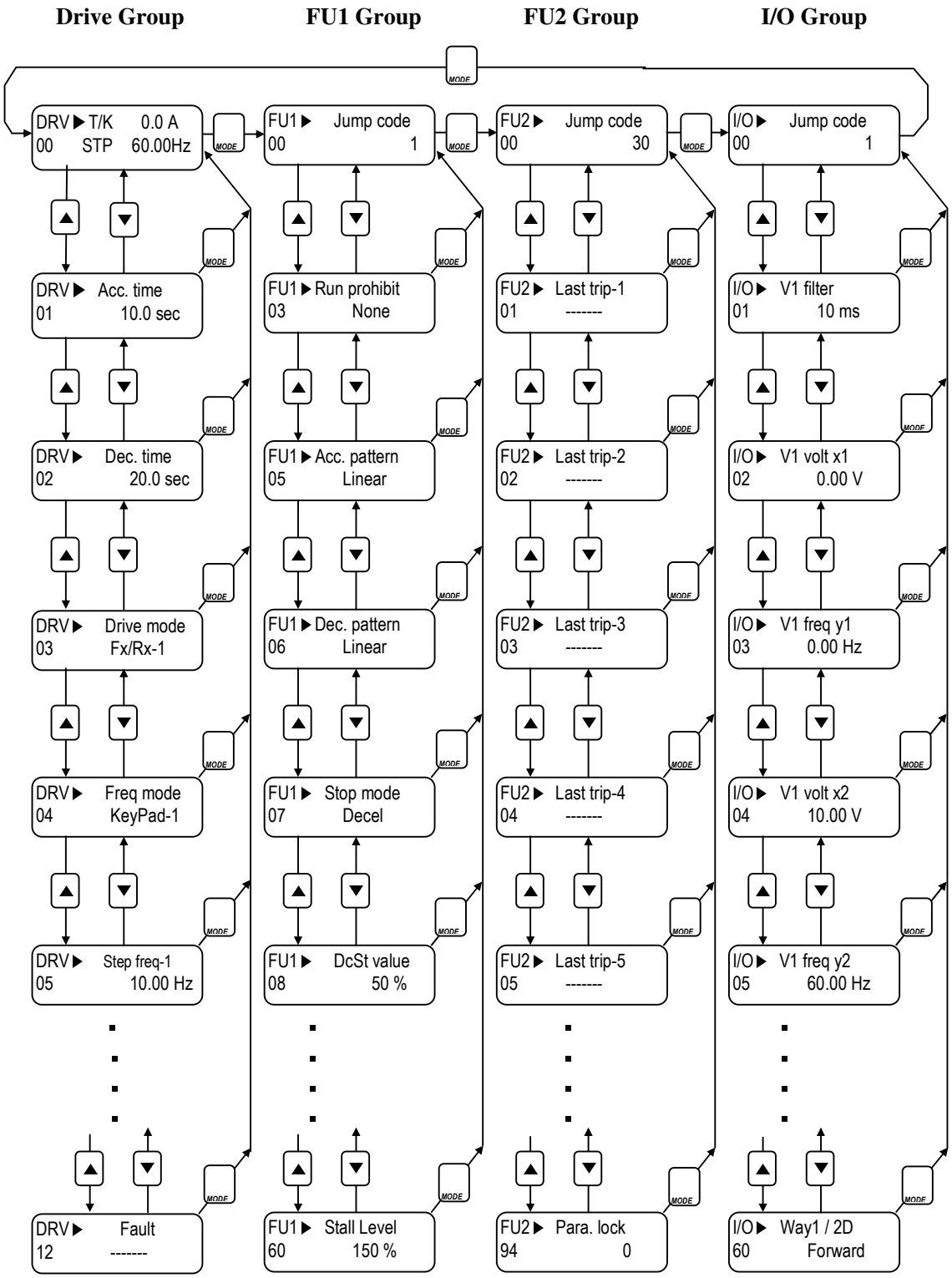
The LSMV series inverter has 5 parameter groups separated according to their applications as indicated in the following table.

Parameter Group	LCD Keypad	Description
Drive Group	DRV	Command Frequency, Accel/Decel Time etc. Basic function Parameters
Function 1 Group	FU1	Max. Frequency, Amount of Torque Boost etc. Parameters related to basic functions
Function 2 Group	FU2	Frequency Jumps, Max/Min Frequency Limit etc. Basic Application Parameters
Input / Output Group	I/O	Programmable Digital Input/Output Terminal Setting, Auto Operation etc. Parameters needed for Sequence Operation
Cell Group	CEL	Cell status, Communication status Check

Refer to the function descriptions for detailed description of each group.

1) Parameter Navigation (LCD Keypad)

The parameter group moves directly to DRV group by pressing [**SHIFT**] key in any parameter code.



☞ **Note:** This figure shows the group and code navigation through LCD display keypad. It can be different from the actual display due to the group addition or code change.

4.2 Operating Example

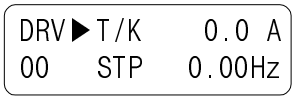
4.2.1 Easy Start Operation

Easy Start Operation is activated by pressing STOP key on the Keypad for 2~3 seconds and inverter begins operation via Keypad (FWD/REV RUN/STOP). **Drive mode is preset to V/F and reference frequency to JOG.**

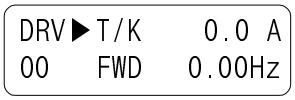
4.2.2 Operation via Control terminal + Keypad

Setting: DRV-03 [Drive Mode (Run/Stop method)] = **Fx/Rx-1**
DRV-04 [Frequency Mode (Freq. setting method)] = **Keypad**
With above setting, Freq setting via terminal & Run/Stop via Keypad disabled

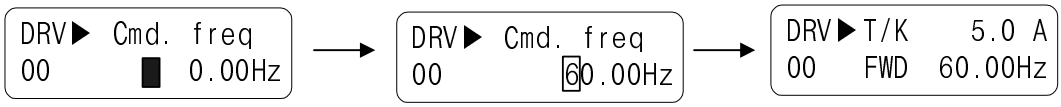
1) Check the LCD display when Power ON. Otherwise, change the setting correctly as shown above.



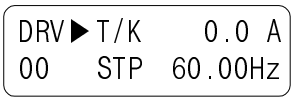
2) Turn the FX (or RX) terminal ON. Then FWD (or REV) LED will be lit.



3) When setting the Ref. Freq to 60 Hz using **PROG/ENT/SHIFT**, ▲ keys, the motor will rotate at 60Hz. FWD (or REV) LED will be flickering during Acceleration/ Deceleration.



4) Turn the FX (or RX) terminal Off. Then Stop LED will be lit.



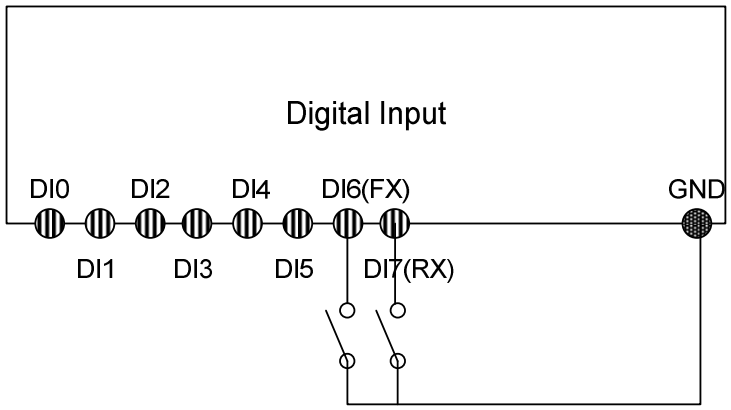
Note) To enable Run/Stop via keypad & Freq setting via control terminal…
Setting: DRV-03 [Drive Mode (Run/Stop method)] = Keypad
DRV-04 [Frequency Mode (Freq. setting method)] = V1 or I

Operation Example (1)	Freq Setting via Keypad + Run/Stop via Terminal (FX/RX)

[Operation condition]

-. Control mode: V/F control
-. Ref. Frequency: 50[Hz] setting via keypad
-. Accel/Decel time: Accel – 60 [sec], Decel – 180 [sec]
-. Drive mode: Run/Stop via FX/RX terminal, Control terminal: NPN mode

[Wiring]

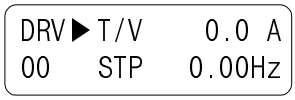


Step	Parameter setting	Code	Description
1	Drive Mode	DRV-03	Set it to 1 FX/RX-1.
2	Frequency Mode	DRV-04	Set it to 0 Keypad-1.
3	50[Hz] freq command setting	DRV-00	Set freq command 50[Hz] via Keypad.
4	Accel/Decel time	DRV-01 DRV-02	Set Accel time to 10 [sec] in DRV-1. Set Decel time to 20 [sec] in DRV-2.
5	Terminal FX (M7)	I/O-20	Motor starts to rotate in Forward direction at 50Hz with Accel time 60 [sec] when FX terminal is turned ON. Motor decelerates to stop with Decel time 180[sec] when FX terminal is turned OFF.
6	Terminal RX (M8)	I/O-21	When RX terminal is turned ON motor starts to rotate in Reverse direction at 50[Hz] with Accel time 60 [sec]. When it is OFF, motor decelerates to stop with Decel time 180 [sec].

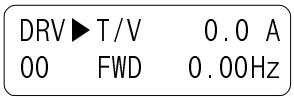
4.2.3 Operation via Control Terminal

Setting: **DRV-03** [Drive Mode (Run/Stop method)] = **1 (Fx/Rx-1)**
DRV-04 [Frequency Mode (Freq. setting method)] = **2 (V1)**

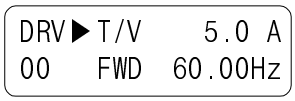
1) Check the LCD display when Power ON. Otherwise, change the setting correctly as shown above.



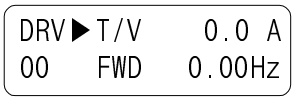
2) Turn the FX (or RX) terminal ON. Then FWD (or REV) LED will be lit.



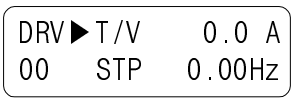
3) Set the frequency using V1 (Potentiometer), Output freq (60Hz). Rotating direction (FWD or REV) and output current (5A) will be displayed on the LCD.



4) Output freq value is decreasing when turning the potentiometer counterclockwise. Inverter output stops at 0.00Hz and motor is stopped.



5) Turn FX (or RX) terminal OFF.

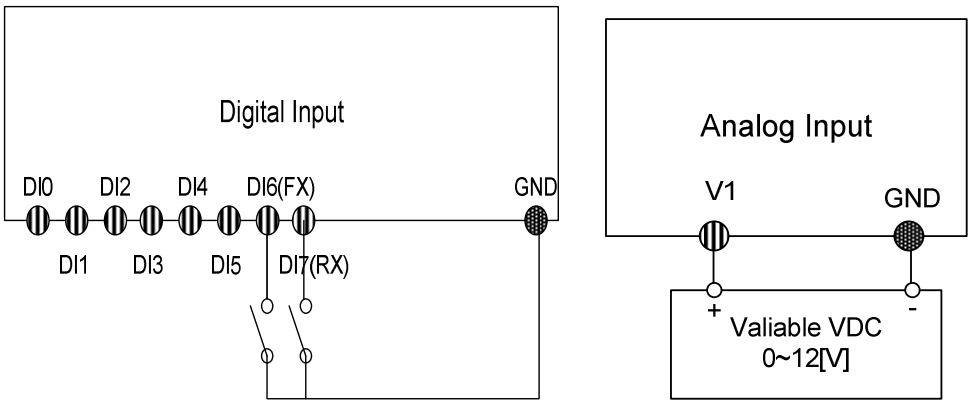


Operation Example (2)	Analog Voltage Input (V1) + Operation via Terminal (FX/RX)

[Operation condition]

-. Control mode: V/F control
-. Reference Frequency: 50[Hz] analog input via V1 (Potentiometer)
-. Accel/Decel time: Accel – 60 [sec], Decel – 180 [sec]
-. Drive mode: Run/Stop via FX/RX terminal, Control terminal: NPN mode

[Wiring]

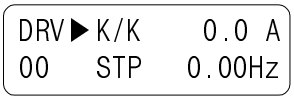


Step	Parameter setting	Code	Description
1	Drive Mode	DRV-3	Set it to 1 Fx/Rx-1.
2	Frequency Mode	DRV-4	Set it to 2 V1 Analog input.
3	50[Hz] freq command setting	DRV-0	Set freq command 50[Hz] via V1 (potentiometer).
4	Accel/Decel time	DRV-1 DRV-2	Set Accel time to 60 [sec] in DRV-1. Set Decel time to 180 [sec] in DRV-2.
5	Terminal FX (M7)	I/O-20	Motor starts to rotate in Forward direction at 50Hz with Accel time 60 [sec] when FX terminal is turned ON. Motor decelerates to stop with Decel time 180[sec] when FX terminal is turned OFF.
6	Terminal RX (M8)	I/O-21	When RX terminal is turned ON motor starts to rotate in Reverse direction at 50[Hz] with Accel time 60 [sec]. When it is OFF, motor decelerates to stop with Decel time 180 [sec].

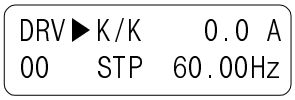
4.2.4 Operation via Keypad

Setting: **DRV-03** [Drive Mode (Run/Stop method)] = **0 (Keypad)**
DRV-04 [Frequency Mode (Freq. setting method)] = **0 (Keypad-1)**

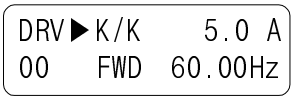
1) Check the LCD display when Power ON. Otherwise, change the setting as shown above.



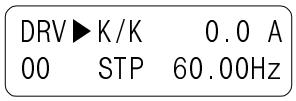
2) Set the Ref. Freq to 60 Hz using **PROG/ENT/SHIFT**, ▲ keys. Set freq is displayed during stop.



3) When pressing **FWD/REV** key, motor starts running and output freq and output current are displayed.



4) Press **STOP/RESET** key. Then motor decelerates to stop. Set freq 60Hz is displayed.



4.3 Various function setting & Description

4.3.1 Basic function parameter setting

It is the basic function setting. All settings are factory defaults unless users make change. It is recommended to use factory setting value unless the parameter change is necessary.

1) Common parameter setting

The following table shows common parameter setting that should be checked before use regardless of control mode.

Parameter Name	Code	Description
Line Frequency.	FU1-20	Sets a freq of the inverter input power source.
Max Frequency	FU1-21	Sets the Inverter max Frequency.
Base Frequency	FU1-22	Sets the Motor Base Frequency.
Starting Frequency	FU1-23	Sets the Inverter Start Frequency.
Motor Rated Voltage	FU1-31	Sets the Motor Rated Voltage.
Motor Rated Current	FU2-34	Sets the Motor Rated Current.
Motor No Load Current	FU2-35	Sets the Motor No Load Current.
Drive Mode	DRV-03	Operation via Keypad, Fx/Rx-1, Fx/Rx-2 and Int 485 setting.
Frequency Mode	DRV-04	Frequency reference source setting parameter
Accel/Decel time setting	DRV-01, DRV-02	Accel/Decel time setting

2) V/F control

FU2-60 [Control mode] is set to 0 “V/F” as factory setting. Operation via V/F control is activated after the above common parameter setting is done and the followings are set.

Parameter Name	Code	Description
Starting freq.	FU1-23	Set frequency to start the motor.
Torque boost value	FU2-47 FU2-48	Set Torque boost value

3) Slip compensation

Operation is done via Slip compensation if FU2-40 is set to ‘Slip compen’. This control keeps motor speed constant regardless of load change.

4) Sensorless vector control

Set FU2-40 to "Sensorless" to enable Sensorless vector control. It is strongly recommended to perform **Auto-tuning** before starting Sensorless control in order to maximize performance.

Parameter Name	Code	Description
Control method selection	FU2-40	Select Sensorless.
Starting freq	FU1-23	Starting freq of the motor.
Auto tuning	FU1-42	Set motor value.

5) Auto-tuning of motor constant

This parameter enables auto-tuning of the motor constants. If FU2-61 is set to Yes and press the enter key, **Rs, Lsigma** values begin tuning with the motor stopped. Refer to motor nameplate for the rest of other parameters.

Parameter Name	Code	Description
Auto-tuning	FU2-42	No, Yes

Note) Motor no-load current and slip freq should be set correctly for safe and better performance. Be sure to check these values and set them properly. Refer to Chapter 5, FU2-40~66 for more.

4.3.2 Advanced function setting

LSMV inverter features advanced function parameters to maximize efficiency and performance of the motor. It is recommended to use the factory setting unless parameter value change is inevitable.

1) V/F control

Parameter Name	Code	Description
V/F Pattern	FU1-40	Use it according to load characteristics. If User V/F is selected, user can select the optimum output V/F characteristic for the application and load characteristics in [FU1-41]~[FU1-48].
Dwell operation	FU2-10 FU2-11	Used to output torque in an intended direction. Inverter stops acceleration for the preset [FU2-10] Dwell time while running at Dwell frequency [FU2-11] and starts acceleration at commanded frequency. Setting [FU2-08] Dwell time to 0 disable the Dwell operation.
Jump Frequency	FU2-12 FU2-13~18	When it is desired to avoid resonance attributable to the natural frequency of a mechanical system, these parameters allow resonant frequencies to be jumped. Up to three areas can be set, with the jump frequencies set to either the top or bottom point of each area. To enable the function, set [FU2-10] to 'Yes' and set the value in [FU2-11]~[FU2-16].
Accel/Decel pattern S-curve	FU1-02, 03 FU1-04, 05	This pattern has an effect on the prevention of cargo collapse on conveyor etc and reduction in an acceleration/ deceleration shock.

2) Sensorless vector control

Related parameters for starting in **Sensorless vector control** when FU2-40 [Control Mode Selection] is set to Sensorless.

Parameter Name	Code	Description
When starting	FU1-08	Pre-excitation time setting

3) Parameters to monitor motor and inverter status

Parameter Name	Code	Description
Output current/ motor speed	DRV-08~09	Displays output current and motor rpm.
DC link voltage	DRV-10	Displays DC link voltage.
User display selection (watt)	FU2-81	Either output voltage or power selected in FU2-81 is displayed in DRV-11.
Fault display	DRV-12	Displays the current inverter fault.

4) Parameter initialize

Parameter Name	Code	Description
Software version	FU2-82	Displays the inverter software version.
Parameter Read/Write/Initialize/ Lock	FU2-91 FU2-92 FU2-93 FU2-94 FU2-95	[FU2-91], [FU2-92]: Copying parameters from other inverter [FU2-93]: Initializing parameters to factory setting values [FU2-94]: Parameter write disabled [FU2-95]: Parameter save

5) Protection & Trip level setting

Parameter Name	Code	Description
Electronic thermal	FU1-53 FU1-54 FU1-55	Protection of the motor from overheating without the use of external thermal relay. Refer to parameter descriptions for more detail.
Overload alarm & trip	FU1-57 FU1-58 FU1-59 FU1-60 FU1-61	Warning alarm outputs and displays the trip message when overcurrent above the threshold value keeps on.
Stall prevention	FU1-64	Set the output current level at which the output freq will be adjusted to prevent the motor from stopping due to over-current etc. It activates during accel/ constant speed/decel to prevent the motor stall.

6) Starting / Accel/ Decel / Stopping pattern setting

Parameter Name	Code	Description
Accel/Decel pattern	FU1-02 FU1-03	2 types of Accel/Decel pattern: 'S-curve', 'U-curve' settable according to application and load characteristic. If 'S-curve' is selected, the desired value of [FU1-4], [FU1-5] is settable.
Starting/Stopping method	FU1-06 FU1-09	4 types of stopping method 'Decel', 'DC-brake', 'Free-run', 'Flux Brake' selectable. If 'DC-brake' is selected, the desired value of [FU1-21, 22], [FU1-24]~ [FU1-27] is settable. See function description of chapter 5 for more details.
Frequency Limit selection	FU1-24 FU1-25 FU1-26	Limits the active frequency. Inverter operates at the freq range between upper freq limit [FU1-35] and bottom freq limit [FU1-34] and higher/ lower freq value is entered, it is automatically replaced by limit value. Setting range: [FU1-30] Maximum freq to [FU1-32] starting freq.

7) Operation-starting method

Parameter Name	Code	Description
Speed Search Selection	FU2-06 FU2-21	Speed search function is available during Accel, trip, instant power failure, restart after fault reset and Speed search at auto restart. See parameter description for more details.
DC excitation	FU2-06 FU2-07 FU2-08	DC motor starting method After DC excitation This function is available big starting torque load

4.3.3 Application function setting

1) Jog and Multi-speed operation

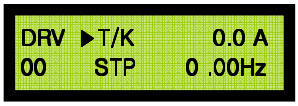
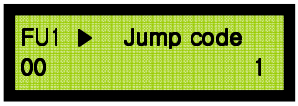
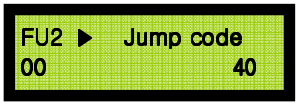
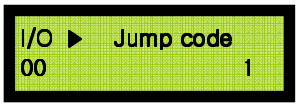
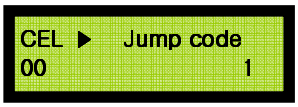
Parameter Name	Code	Description
Multi function input terminal setting	I/O-14 ~28	If I/O-14 ~28 are set to Speed-H, Speed-M, Speed-L, multi- speed operation up to speed 17 is available.
Filter time constant for input terminal	I/O-31	Effective for eliminating noise in the freq. Setting circuit
Speed reference value	DRV-05 ~07 I/O-58 ~ I/O-69	Speed reference value for each step setting
Accel/Decel time setting for each step	I/O-70 ~ 83	Accel/Decel time for each step setting
Jog freq.	I/O-57	Jog freq for jog operation setting

Speed-X	Speed-H	Speed-M	Speed-L	JOG	Speed Command	Parameter value
0	**0**	**0**	**0**	**0**	**Speed 0**	**DRV-00**
0	**X**	**X**	**X**	**1**	**Jog freq.**	**I/O-57**
0	**0**	**0**	**1**	**0**	**Speed –1**	**DRV-05**
0	**0**	**1**	**0**	**0**	**Speed –2**	**DRV-06**
..	**..**	**..**	**..**	**..**	**..**	**..**
..	**..**	**..**	**..**	**..**	**..**	**..**
1	**1**	**0**	**1**	**0**	**Speed –13**	**I/O-67**
1	**1**	**1**	**0**	**0**	**Speed –14**	**I/O-68**
1	**1**	**1**	**1**	**0**	**Speed –15**	**I/O-69**

CHAPTER 5 - PARAMETER LIST

5.1 Parameter groups

The parameters of LSMV Series are divided into 5 function groups in accordance with the application. Their names, principal contents and LCD keypad displays are shown below.

Name of Group	LCD Keypad Display	Description
Drive Group [DRV]		Target Frequency and Accel/ Decel Time, etc. Basic parameters
Function1 Group [FU1]		Maximum Frequency and Protection, etc Parameters regarding basic functions
Function2 Group [FU2]		Frequency Jump and Frequency Limit, etc Parameters regarding application functions
Input/Output Group [I/O]		Programmable Digital terminal Define and Analog Command, etc Parameters necessary for sequence configuration
Cell Group [CEL]		Cell status and communication check functions

5.2 Parameter list

[DRV Group]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
DRV-00 (1)	9100	**Motor run :** Output Frequency during **Motor stop :** Reference Frequency	Cmd. freq	0 to Maximum Freq. [Hz]	0 [Hz]	O	6-12
DRV-01	9101	Acceleration Time	Acc. time	0 to 6000 [sec]	60 [sec]	O	6-1
DRV-02	9102	Deceleration Time	Dec. time	0 to 6000 [sec]	180 [sec]	O	6-1
DRV-03	9103	Drive Mode (Run/Stop Method)	Drive mode	Keypad Fx/Rx-1 Fx/Rx-2 Int. 485	Keypad	X	6-2
DRV-04	9104	Frequency Mode (Frequency setting method)	Freq mode	Keypad-1 Keypad-2 V1 I V1+I Pulse Int. 485	Keypad-1	X	6-3
DRV-05	9105	Step Frequency 1	Step freq-1	0 to Maximum Freq [Hz]	10 [Hz]	O	6-3
DRV-06	9106	Step Frequency 2	Step freq-2		20 [Hz]	O	
DRV-07	9107	Step Frequency 3	Step freq-3		30 [Hz]	O	
DRV-08	9108	Output Current	Current	* [A]	* [A]	*	6-4
DRV-09	9109	Motor Speed	Speed	* [rpm]	* [rpm]	*	6-4
DRV-10	910A	DC link Voltage	DC link Vtg	* [V]	* [V]	*	6-4
DRV-11	910B	User Display Selection	User disp		Output voltage [V]	*	6-4
DRV-12	910C	Current Trip Display	Fault	*	*	*	6-4
DRV-16	910D	High voltage selection	High Vol Sel	Hard Wear Soft Wear	Hard Wear	X	
DRV-17	910E	High Voltage Input selection (1)	High Vol ON	No Yes	No	X	
DRV-70	910F	R_Phase Voltage	Rph_InputVtg				
DRV-71	9110	S_Phase Voltage	Sph_InputVtg				
DRV-72	9112	T_Phase Voltage	Tph_InputVtg				
DRV-80	9113	Input_Phase Voltage	InputVoltage				
DRV-81	9114	Input Current	InputCurrent				
DRV-91 (2)	915B	Drive mode 2	Drive mode2	Keypad Fx/Rx-1 Fx//Rx-2	Fx/Rx-1	X	6-35
DRV-92	915C	Frequency mode 2	Freq mode2	Keypad-1 Keypad-2 V1 I V1+I Pulse	Keypad-1	X	6-35

* The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.

(1) Only displayed when DRV-16 is set to [Soft Wear].

(2) IO-13 via terminal used when Loc/Rem is set.

[FU1 GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU1-00	9200	Jump to Desired Code #	Jump code	1 to 99	1	O	6-6
FU1-01	9201	Run Prevention	Run prev	None Forwd prev Reverse prev	None	X	6-6
FU1-02	9202	Acceleration Pattern	Acc. Pattern	Linear S-curve U-curve	Linear	X	6-6
FU1-03	9203	Deceleration Pattern	Dec. Pattern	Linear S-curve U-curve	Linear	X	6-6
FU1-04	9204	Start Curve for S-Curve Accel/Decel Pattern	Start Curve	0 to 100 [%]	50 [%]	X	6-6
FU1-05	9205	End Curve for S-Curve Accel/Decel Pattern	End Curve	0 to 100 [%]	50 [%]	X	
FU1-06 (1)	9214	Start Mode	Start mode	Accel Dc-start Flying-start	Accel	X	6-7
FU1-07	9115	Starting DC Injection Braking Time	DcSt time	0.1 to 60 [sec]	1.0 [sec]	X	6-7
FU1-08	9116	Starting DC Injection Braking Value	DcSt value	0 to 150 [%]	33 [%]	X	
FU1-09 (2)	9217	Stop Mode	Stop mode	Decel Dc-brake Free-run	Free-run	X	6-8
FU1-10	9218	DC Injection Braking On-delay Time	DcBlk time	0 to 60 [sec]	0.1 [sec]	X	6-9
FU1-11	9219	DC Injection Braking Frequency	DcBr freq	0.1 to 60 [Hz]	5 [Hz]	X	
FU1-12	921A	DC Injection Braking Time	DcBr time	0 to 60 [sec]	1.0 [sec]	X	
FU1-13	921B	DC Injection Braking Value	DcBr value	0 to 200 [%]	50 [%]	X	
FU1-20	921D	Power Source Freq	Line Freq	40 to 120 [Hz]	60 [Hz]	X	6-10
FU1-21	921E	Maximum Frequency	Max freq	40 to 120 [Hz]	60 [Hz]	X	6-10
FU1-22	921F	Base Frequency	Base freq	30 to 120 [Hz]	60 [Hz]	X	6-10
FU1-23	9220	Starting Frequency	Start freq	0.1 to 10 [Hz]	0.5 [Hz]	X	6-10
FU1-24 (3)	9221	Frequency Limit selection	Freq limit	No Yes	No	X	6-11
FU1-25	9222	Low Limit Frequency	F-limit Lo	0 to FU1-26	0.5 [Hz]	O	6-11
FU1-26	9223	High Limit Frequency	F-limit Hi	FU1-21 to FU1-25	60 [Hz]	X	
FU1-40 (4)	9228	Volts/Hz Pattern	V/F pattern	Linear Square User V/F	Linear	X	6-11
FU1-41	9229	User V/F – Frequency 1	User freq 1	0 to FU1-30	15 [Hz]	X	6-12
FU1-42	922A	User V/F – Voltage 1	User volt 1	0 to 100 [%]	25 [%]	X	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU1-43	922B	User V/F – Frequency 2	User freq 2	0 to FU1-30	30 [Hz]	X	
FU1-44	922C	User V/F – Voltage 2	User volt 2	0 to 100 [%]	50 [%]	X	
FU1-45	922D	User V/F – Frequency 3	User freq 3	0 to FU1-30	45 [Hz]	X	
FU1-46	922E	User V/F – Voltage 3	User volt 3	0 to 100 [%]	75 [%]	X	
FU1-47	922F	User V/F – Frequency 4	User freq 4	0 to FU1-30	60 [Hz]	X	
FU1-48	9230	User V/F – Voltage 4	User volt 4	0 to 100 [%]	100[%]	X	
FU1-50	9231	Input voltage adjustment	VACt	73 to 115.0 [%]	100.0 [%]	X	
FU1-53	923C	Electronic Thermal Selection	ETH select	No Yes	Yes	O	6-12
FU1-54	923D	Electronic Thermal Level for 1 Minute	ETH 1min	FU1-55 to 200 [%]	150 [%]	O	6-12
FU1-55	923E	Electronic Thermal Level for Continuous	ETH cont	50 to FU1-54 (Maximum 200%))	120 [%]	O	6-12
FU1-56	923F	Characteristic Selection (Motor Type)	Motor type	Self-cool Forced-cool	Self-cool	O	6-12
FU1-57	9240	Overload Warning Level	OL level	30 to 110 [%]	110 [%]	O	6-13
FU1-58	9241	Overload Warning Time	OL time	0 to 30 [sec]	10 [sec]	O	6-13
FU1-59	9242	Overload Trip Selection	OLT select	No Yes	No	O	6-14
FU1-60	9243	Overload Trip Level	OLT level	30 to 150 [%]	120[%]	O	6-14
FU1-61	9244	Overload Trip Delay Time	OLT time	0 to 60 [sec]	60 [sec]	O	6-14
FU1-62	9245	Input/Output Phase Loss Protection	Trip select	00 to 11 (Bit Set)	00	O	6-14
FU1-64	9247	Stall Prevention Level	Stall level	30 to 150 [%]	100[%]	X	6-14
FU1-70	9248	Accel/Decel Change Frequency	Acc/Dec ch F	0 to FU1-30	0 [Hz]	X	6-15
FU1-71	9249	Reference Frequency for Accel and Decel	Acc/Dec freq	Max freq Delta freq	Max freq	X	6-16
FU1-72	924A	Accel/Decel Time Scale	Time scale	0.01 sec 0.1 sec 1 sec	1 sec	O	6-16
FU1-81		Integrated Power Value	KilloWattHour	0~9999kWh	*	X	
FU1-82		Power Value adjustment	Power Set	0.1 ~ 400 %	100.0%		
FU1-83		Inverter Temp	Cell Temp.	0 – 1	0	X	

* ▭ The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.

(1) Only displayed when FU1-06 is set to [DC-start].
(2) Only displayed when FU1-09 is set to [DC-break].
(3) FU1-41~48 Only displayed when FU1-40 is set to [User V/F].
(4) Only displayed when FU1-51 is set to [Manual].

[FU2 GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU2-00	9300	Jump to desired code #	Jump code	1 to 99	40	O	6-17
FU2-01	9301	Last trip 1	Last trip-1	By pressing [PROG] and [▲] key, the frequency, current, and operational status at the time of fault can be seen.	None	*	6-17
FU2-02	9302	Last trip 2	Last trip-2		None	*	6-17
FU2-03	9303	Last trip 3	Last trip-3		None	*	6-17
FU2-04	9304	Last trip 4	Last trip-4		None	*	6-17
FU2-05	9305	Last trip 5	Last trip-5		None	*	6-17
FU2-06	9306	Erase trips	Erase trips	No Yes	No	O	6-17
FU2-10	9307	Dwell Frequency	Dwell time	0 to 10 [sec]	0 [sec]	X	6-17
FU2-11	9308	Dwell Frequency	Dwell freq	FU1-21 to FU1-23	5 [Hz]	X	6-17
FU2-12	930A	Frequency Jump Selection	Jump freq	No Yes	No	X	6-17
FU2-13	930B	Jump Frequency 1 Low	jump lo 1	0 to FU2-12	10 [Hz]	O	6-17
FU2-14	930C	Jump Frequency 1 High	jump Hi 1	FU2-11 to FU1-30	15 [Hz]	O	
FU2-15	930D	Jump Frequency 2 Low	jump lo 2	0 to FU2-14	20 [Hz]	O	
FU2-16	930E	Jump Frequency 2 High	jump Hi 2	FU2-13 to FU1-30	25 [Hz]	O	
FU2-17	930F	Jump Frequency 3 Low	jump lo 3	0 to FU2-16	30 [Hz]	O	
FU2-18	9310	Jump Frequency 3 High	jump Hi 3	FU2-15 to FU1-30	35 [Hz]	O	
FU2-21	9314	Flying start percent	Flying Perc	30 ~ 160	50%	X	
FU2-25	9319	Restart after Fault Reset	Reset start	No Yes	NO	X	6-19
FU2-26 (1)	9319	Number of Auto Retry	Retry number	0 to 10	1	O	6-19
FU2-27	931A	Delay Time Before Auto Retry	Retry delay	0 to 60 [sec]	1 [sec]	O	6-19
FU2-31	9328	Rated Motor Voltage	Motor Volt	0 to 6600	6600	X	6-19
		* A motor rating same as inverter capacity is automatically set. If different, set the correct value.					
FU2-32	9329	Number of Motor Poles	Pole number	2 to 12	4	X	6-19
FU2-33	932A	Rated Motor Slip	Rated-Slip	0 to 10 [Hz]	2 [Hz]	X	6-19
FU2-34	932B	Rated Motor Current (RMS)	Rated-Curr	1 to 300 [A]	100 [A]	X	
FU2-35	932C	No Load Motor Current (RMS)	Noload-Curr	1 to 300 [A]	30 [A]	X	
FU2-38	932F	Gain for Motor Speed Display	RPM factor	1 to 1000 [%]	100 [%]	O	
FU2-40	933C	Control Mode Selection	Control mode	V/F Slip compen Sensorless	V/F	X	6-20
FU2-41 (2)	933C	Sensorless Mode	Sensor mode	Sensorless	Sensorless	X	6-20
FU2-42	933D	Auto Tuning Selection	Auto tuning	(No) (Yes)	No	X	6-22

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU2-43	933E	Stator Resistance of Motor	%Rs	-	1.90%	X	
FU2-44	933F	Leakage Inductance of Motor	%Lsigma	-	12.00%	X	6-22
	* Automatically set corresponding to motor rating. If different, check the motor rating setting.						
FU2-45	9341	P Gain for Sensorless Control	SL P-gain	0 to 32767	600	X	6-22
FU2-46	9342	I Gain for Sensorless Control	SL I-gain	0 to 32767	4	X	6-22
FU2-47	9344	Torque Boost in Forward Direction	Fwd boost	0 to 5 [%]	1.0 [%]	X	
FU2-48	9345	Torque Boost in Reverse Direction	Rev boost	0 to 5 [%]	1.0 [%]	X	
FU2-80	9350	Power On display	PowerOn disp	0 to 12	0	O	6-23
FU2-81	9351	User Display Selection	User disp	Voltage Watt	Voltage	O	6-23
FU2-82	9352	Software Version	LS-MV S/W Version	Ver X.XX	Ver 1.0	*	6-23
FU2-83	9353	Last Trip Time	LastTripTime	X:XX:XX:XX:XX:X		X	6-23
FU2-84	9354	Power On Time	On-time	X:XX:XX:XX:XX:X		X	
FU2-85	9355	Run-time	Run-time	X:XX:XX:XX:XX:X		X	
FU2-91	935B	Read Parameter	Para. Read	No Yes	No	X	6-24
FU2-92	935C	Write Parameter	Para. Write	No Yes	No	X	6-24
FU2-93	935D	Initialize Parameters	Para. init	No All Groups DRV FU1 FU2 I/O CEL	No	X	6-25
FU2-94	935E	Parameter Write Protection	Para. Lock	0 to 9999	0	O	6-25
FU2-95	935F	Parameter Save	Para. save	No Yes	No	X	6-25

* The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.
(1) Only FU2-26~27 displayed when FU2-25 is set to [YES].
(2) Only FU2-41 displayed when FU2-40 is set to [Sensorless].

[I/O GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-00	9400	Jump to desired code #	Jump code	1 to 99 (LCD Keypad Only)	1	O	6-25
I/O-01 (1)	9401	Filtering Time Constant for V1 Signal Input	V1 filter	0 to 9999 [msec]	10 [msec]	O	6-25
I/O-02	9402	V1 Input Minimum Voltage	V1 volt x1	0 to 12[V]	0 [V]	O	
I/O-03	9403	Frequency Corresponding to V1 Input Minimum Voltage	V1 freq y1	0 to FU1-21 [Hz] 0 to 100.00 [**]	0 [Hz]	O	
I/O-04	9404	V1 Input Minimum Voltage	V1 volt x2	0 to 12[V]	10 [V]	O	
I/O-05	9405	V1 Input Maximum Voltage	V1 freq y2	0 to FU1-21 [Hz] 0 to 100.00 [**]	60 [Hz]	O	
I/O-06	9406	Filtering Time Constant for I Signal Input	I filter	0 to 9999 [msec]	10 [msec]	O	6-26
I/O-07	9407	I Input Minimum Current	I curr x1	0 to 20 [mA]	4 [mA]	O	
I/O-08	9408	Frequency Corresponding to I Input Minimum Current	I freq y1	0 to FU1-21 [Hz] 0 to 100.00 [**]	0 [Hz]	O	
I/O-09	9409	Filtering Time Constant for I Signal Input	I curr x2	0 to 20 [mA]	20 [mA]	O	
I/O-10	940A	Frequency Corresponding to I Input Maximum Current	I freq y2	0 to FU1-21 [Hz] 0 to 100.00 [**]	60 [Hz]	O	
I/O-11	9411	Criteria for Analog Input Signal Loss	Wire broken	None half of x1 below x1	None	O	6-27
I/O-12	9412	Operating selection at Loss of Freq. Reference	Lost command	None FreeRun Stop	None	O	
I/O-13	9413	Waiting Time after Loss of Freq. Reference	Time out	0.1 to 120 [sec]	1.0 [sec]	O	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-14	9414	Programmable Digital Input Terminal ‘M1’ Define	M0 define	FX RX RST JOG BX Speed-L Speed-M Speed-H Speed-X XCEL-L XCEL-M XCEL-H Up Down 3-Wire Analog hold Ana.Change XCEL stop LOC/REM Door-Open Trans.OHW Trans.OHT Motor OHT Fan Trip Ext Trip1 Ext Trip2 High Voltage Run Enable Control LV None	RST	O	6-28
I/O-15	9415	Programmable Digital Input Terminal ‘M2’ Define	M1 define	Same as I/O-14	Ext Trip1	O	
I/O-16	9416	Programmable Digital Input Terminal ‘M3’ Define	M2 define	Same as I/O-14	FX	O	
I/O-17	9417	Programmable Digital Input Terminal ‘M4’ Define	M3 define	Same as I/O-14	RX	O	
I/O-18	9418	Programmable Digital Input Terminal ‘M5’ Define	M4 define	Same as I/O-14	Trans.OHT	O	
I/O-19	9419	Programmable Digital Input Terminal ‘M6’ Define	M5 define	Same as I/O-14	Fan Trip	O	
I/O-20	941A	Programmable Digital Input Terminal ‘M7’ Define	M6 define	Same as I/O-14	High Voltage	O	6-28
I/O-21	941B	Programmable Digital Input Terminal ‘M8’ Define	M7 define	Same as I/O-14	Run Enable	O	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-22		Programmable Digital Input Terminal 'M9' Define	M8 define	Same as I/O-14	Control LV	O	
I/O-23		Programmable Digital Input Terminal 'M10' Define	M9 define	Same as I/O-14	None	O	
I/O-24		Programmable Digital Input Terminal 'M11' Define	M10 define	Same as I/O-14	None	O	
I/O-25		Programmable Digital Input Terminal 'M12' Define	M11 define	Same as I/O-14	None	O	
I/O-26		Programmable Digital Input Terminal 'M13' Define	M12 define	Same as I/O-14	None	O	
I/O-27		Programmable Digital Input Terminal 'M14' Define	M13 define	Same as I/O-14	None	O	
I/O-28		Programmable Digital Input Terminal 'M15' Define	M14 define	Same as I/O-14	BX	O	
I/O-29	941C	Terminal Input Status	In status	00000000000 /11111111111	00000000000	*	
I/O-30		Terminal Input Status	In status_H	0000/ 1111	0000	*	
I/O-31	941D	Filtering Time Constant for Programmable Digital Input Terminals	Ti Filt Num	2 to 1000 [msec]	15	O	
I/O-32		Terminal Input Hardwear selection	In No/Nc Set	00000000000/ 11111111111	0000000000		
I/O-33		Terminal Input Hardwear selection	H No/Nc Set	0000/ 1111	0000		
I/O-34		Input CheckTime	In CheckTime	1 – 1000 [ms]	1ms		
I/O-35	944A	Frequency Detection Level	FDT freq	0 to FU1-30 [Hz]	30 [Hz]	O	
I/O-36	944B	Frequency Detection Bandwidth	FDT band	0 to FU1-30 [Hz]	10 [Hz]	O	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-37	944C	Programmable Digital Output Terminal Define (Aux terminal)	Aux mode1	None FDT-1 FDT-2 FDT-3 FDT-4 FDT-5 OL IOL Stall OV LV OH Lost Command Run Stop Steady Speed Search Ready Warning FAN RUN NORMAL OCT Cell ByPass RUN_MV	Ready	O	6-30
I/O-38	944D	Programmable Digital Output Terminal Define	Aux mode2	Same as I/O-37	FAN RUN	O	
I/O-39	944E	Programmable Digital Output Terminal Define	Aux mode3	Same as I/O-37	RUN	O	
I/O-40	944F	Programmable Digital Output Terminal Define	Aux mode4	Same as I/O-37	Warning	O	
I/O-41		Programmable Digital Output Terminal Define	Aux mode5	Same as I/O-37	None	O	
I/O-42		Programmable Digital Output Terminal Define	Aux mode6	Same as I/O-37	None	O	
I/O-43		Programmable Digital Output Terminal Define	Aux mode7	Same as I/O-37	None	O	
I/O-44		Programmable Digital Output Terminal Define	Aux mode8	Same as I/O-37	None	O	
I/O-45	9451	Terminal Output Status	Out status	00000000/11111111	00000000	*	
I/O-46	9450	Fault Output Relay Setting (3A, 3B, 3C)	Relay mode	00 to 11 [bit]	10 [bit]	O	6-34

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-47	9452	Waiting time after Fault Output Relay On	Relay On	0 to 9999[sec]	0.0[sec]	X	6-34
I/O-48	9453	Waiting time after Fault Output Relay Off	Relay Off	0 to 9999[sec]	0.0[sec]	X	
I/O-49		Analog output A	SDA A read	NONE FREQUENCY CURRENTR VOLTAGE DC_LINK_VTAGE	NONE	O	
I/O-50		Analog output A shift Perc.	SDA A shift	50% ~ 150%	100%	O	
I/O-51		Analog output B	SDA B read	NONE FREQUENCY CURRENTR VOLTAGE DC_LINK_VTAGE	NONE	O	
I/O-52		Analog output B shift Perc.	SDA B shift	50% ~ 150%	100%	O	
I/O-53		Analog output C	SDA 1 read	None InputCurr R InputCurr S InputCurr T InputVolt R InputVolt S InputVolt T OutputCurr U OutputCurr V OutputCurr W OutputVolt U OutputVolt V OutputVolt W	None	O	
I/O-54		Analog output C shift	SDA 1 shift	0~19	10		
I/O-55		Analog output D	SDA 2 read	Same as IO-53	None		
I/O-56		Analog output D shift	SDA 2 shift	0~19	10		
I/O-57	941E	Jog Frequency Setting	Jog freq	0 to FU1-21	10 [Hz]	O	6-35
I/O-58	941F	Step Frequency 4	Step freq-4	0 to FU1-21	40 [Hz]	O	
I/O-59	9420	Step Frequency 5	Step freq-5	0 to FU1-21	50 [Hz]	O	
I/O-60	9421	Step Frequency 6	Step freq-6	0 to FU1-21	40 [Hz]	O	
I/O-61	9422	Step Frequency 7	Step freq-7	0 to FU1-21	30 [Hz]	O	
I/O-62	9423	Step Frequency 8	Step freq-8	0 to FU1-21	20 [Hz]	O	
I/O-63	9424	Step Frequency 9	Step freq-9	0 to FU1-21	10 [Hz]	O	
I/O-64	9425	Step Frequency 10	Step freq-10	0 to FU1-21	20 [Hz]	O	
I/O-65	9426	Step Frequency 11	Step freq-11	0 to FU1-21	30 [Hz]	O	
I/O-66	9427	Step Frequency 12	Step freq-12	0 to FU1-21	40 [Hz]	O	
I/O-67	9428	Step Frequency 13	Step freq-13	0 to FU1-21	50 [Hz]	O	
I/O-68	9429	Step Frequency 14	Step freq-14	0 to FU1-21	40 [Hz]	O	
I/O-69	942A	Step Frequency 15	Step freq-15	0 to FU1-21	30 [Hz]	O	
I/O-70	9432	Acceleration Time 1 (for Step speed)	Acc time-1	0 to 6000 [sec]	60 [sec]	O	6-36

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-71	9433	Deceleration Time 1 (for Step speed)	Dec time-1	0 to 6000 [sec]	180 [sec]	O	
I/O-72	9434	Acceleration Time 1 (for Step speed)	Acc time-2	0 to 6000 [sec]	90 [sec]	O	
I/O-73	9435	Deceleration Time 2	Dec time-2	0 to 6000 [sec]	270 [sec]	O	
I/O-74	9436	Acceleration Time 3	Acc time-3	0 to 6000 [sec]	120 [sec]	O	
I/O-75	9437	Deceleration Time 3	Dec time-3	0 to 6000 [sec]	360 [sec]	O	
I/O-76	9438	Acceleration Time 4	Acc time-4	0 to 6000 [sec]	150 [sec]	O	
I/O-77	9439	Deceleration Time 4	Dec time-4	0 to 6000 [sec]	450 [sec]	O	
I/O-78	943A	Acceleration Time 5	Acc time-5	0 to 6000 [sec]	120 [sec]	O	
I/O-79	943B	Deceleration Time 5	Dec time-5	0 to 6000 [sec]	360 [sec]	O	
I/O-80	943C	Acceleration Time 6	Acc time-6	0 to 6000 [sec]	90 [sec]	O	
I/O-81	943D	Deceleration Time 6	Dec time-6	0 to 6000 [sec]	270 [sec]	O	
I/O-82	943E	Acceleration Time 7	Acc time-7	0 to 6000 [sec]	60 [sec]	O	
I/O-83	943F	Deceleration Time 7	Dec time-7	0 to 6000 [sec]	180 [sec]	O	
I/O-84	940B	Pulse input method	P pulse set	(A+B) (A)	(A)	X	
I/O-85	940C	Pulse input filter	P filter	0 to 9999 [msec]	10 [msec]	O	
I/O-86	940D	Pulse input Minimum frequency	P pulse x1	0 to I/O-88[Hz]	0 [kHz]	O	
I/O-87	940E	Frequency corresponding to I/O-13 Pulse input Maximum frequency	P freq y1	0 to FU1-21 [Hz]	0 [Hz]	O	
I/O-88	940F	Frequency corresponding to I/O-15	P pulse x2	I/O-86 to 100 [kHz]	10 [kHz]	O	
I/O-89	9410	Pulse input Minimum frequency	P freq y2	0 to FU1-21 [Hz]	60 [Hz]	O	
I/O-90	945A	Inverter Number	Inv No.	1 to 250	1	O	
I/O-91	945B	Baud Rate Selection	Baud rate	1200 bps 2400 bps 4800 bps 9600 bps 19200 bps 38400 bps	38400 bps	O	6-38
I/O-92	945C	Operating method at loss of freq. reference	COM Lost Cmd	None FreeRun Stop	None	O	6-38
I/O-93	945D	Waiting time after loss of freq. reference	COM Time Out	0.1 to 120 [sec]	1.0 [sec]	O	
I/O-94	945E	Communication Response Delay time	Delay Time	2 to 1000 [msec]	5 [msec]	O	6-38
I/O-98		UPS off delay time set	UPS_OFF_Dly	0-9000[sec]	60sec	O	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
* The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set. (1) When DRV-04 is set to either V1, I or V1+I or Pulse, only selected item codes are displayed in I/O-1~I/O-10.							

[CEL GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
CEL-00	9700	Jump Code	Jump code	1 – 99	1	○	
CEL-01	9701	CAN Mode Selection	Can mode	Display Only	Compare mode	X	
CEL-02	9702	Total Stair	Total Stair	Display Only	6	X	
CEL-03	9703	Max Stair	Max Stair	Display Only	6	X	
CEL-04	9704	U Phase Status	U CAN Status	Display Only	00111111	X	
CEL-05	9705	V Phase Status	V CAN Status	Display Only	00111111	X	
CEL-06	9706	W Phase Status	W CAN Status	Display Only	00111111	X	
CEL-07	9707	U Phase Protection Status	U ProtStatus	Display Only	00000000	X	
CEL-08	9708	V Phase Protection Status	V ProtStatus	Display Only	00000000	X	
CEL-09	9709	W Phase Protection Status	W ProtStatus	Display Only	00000000	X	
CEL-10	970A	CELL Setting	Go Setting	No Yes	No	X	
CEL-11	970B	U Phase Bypass	BPU 87654321	00000000/11111111	00000000	X	
CEL-12	970C	V Phase Bypass	BPV 87654321	00000000/11111111	00000000	X	
CEL-13	970D	W Phase Bypass	BPW 87654321	00000000/11111111	00000000	X	
CEL-16	970E	U Phase Bypass Status	U Bypass St	00000000/11111111	Display Only	X	
CEL-17	960F	V Phase Bypass Status	V Bypass St	00000000/11111111	Display Only	X	
CEL-18	9711	W Phase Bypass Status	W Bypass St	00000000/11111111	Display Only	X	
CEL-21	9716	U Phase upstair Status	U_Uper_Stair	- Display Only	0000	X	
CEL-22	9717	U Phase downstair Status	U_Lowe_Stair	- Display Only	0000	X	
CEL-23	9718	V Phase upstair Status	V_Uper_Stair	- Display Only	0000	X	
CEL-24	9719	V Phase downstair Status	V_Lowe_Stair	- Display Only	0000	X	
CEL-25	971A	W Phase upstair Status	W_Uper_Stair	- Display Only	0000	X	
CEL-26	971B	W Phase downstair Status	W_Lowe_Stair	- Display Only	0000	X	
CEL-30	971C	Bypass mode selection	BypassMode	No ManualBypass Auto-Bypass	No	X	
CEL-35		Bypass Restoration	All Back	No Yes	No	X	

* The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.

CHAPTER 6 - PARAMETER DESCRIPTION

6.1 Drive group [DRV]

DRV-00: Command Frequency/ Output Current (LCD)

DRV▶ Cmd. Freq 00 0.00 Hz	00	0.00

Factory Default: 0.00 Hz **0.00**

1) **Digital frequency setting**
- When DRV-04 [Frequency Mode] is set to 0 (Keypad-1) or 1 (Keypad-2), command freq is settable less than FU1-21 [Maximum Frequency].

2) **Monitoring function setting**
- Command frequency displayed during stop.
- Output current/frequency displayed during run.

Analog/digital frequency command source setting: DRV-04 [Frequency Mode]

When DRV-04 [Frequency Mode] is set to V1, V1S, I, V1+I or Pulse, frequency command is set via I/O-01~13, I/O-84~89 [Analog Frequency command]. Refer to I/O-01~13, I/O-84~89 for detail description.

When DRV-09 [Speed Unit Selection] is set to Rpm, Hz display is changed to Rpm.

DRV-04 [Frequency Mode] setting guide

DRV -04	Name	Programming Description
Key Pad-1	Digital freq. command	1. In DRV-00, press the [PROG] key. 2. Set the desired freq. 3. Press the [ENT] key to write the new value into memory.
Key Pad-2		1. In DRV-00, press the [PROG] key. 2. Press the [⇧(Up)] or [⇩(Down)] key to set the desired freq. Speed is reflected to the inverter real time upon pressing the UP/DOWN keys. 3. Press the [ENT] key to write the new value into memory.
V1	Analog freq. command	Voltage analog input (0 to 12V) to Control terminal "V1". See the description of I/O-01~05.
I		Current analog input (4 to 20mA) to Control terminal "I". See the description of I/O-06~10.
V1+I		0-10V/4-20mA Analog input Control terminal "V1","I". See the description of I/O-01~10.
Pulse	Pulse command	(0~5V) Pulse signal is applied to the Pulse terminal of the analog input board. See the I/O-84~89.

DRV -00	Digital command Frequency / Output current	
Related Function	DRV-04	Frequency mode
	DRV-09	Rpm mode
	FU1-21	Max frequency
	FU2-40	Control mode
	I/O-1~13	Analog command Frequency

DRV-01, 02: Accel/Decel Time 0

DRV▶ Acc. time 01 20.0 sec	01	20.0

Factory Default: 20.0 sec **20.0**

DRV▶ Dec. time 02 30.0 sec	02	30.0

Factory Default: 30.0 sec **30.0**

The inverter targets FU2-73 when accelerating or decelerating. When FU2-73 is set to "Maximum Frequency", the acceleration time is the time taken by the motor to reach FU1-30 from 0 Hz. The deceleration time is the time taken by the motor to reach 0 Hz from FU1-30 [Maximum Frequency]. When FU2-73 is set to "Delta Frequency", the acceleration and deceleration time is the time taken to

reach a target frequency (instead the maximum frequency) from a specific frequency.
The acceleration and deceleration time can be changed to a preset time via Programmable digital inputs. By setting M1~M8 to 'XCEL-L', 'XCEL-M', 'XCEL-H' respectively, the 1~7 Accel and Decel time set in I/O-50 to I/O-63 are applied by the binary inputs of the M1~M8.

Note: Set the Accel time more than 0.5 sec for smooth acceleration. Setting it too short may deteriorate the starting performance.

Code	LCD display	Name	XCEL -H	XCEL -M	XCEL -L	Default
DRV-01	Acc time	Acc time 0	0	0	0	20 sec
DRV-02	Dec time	Dec time 0	0	0	0	30 sec
I/O-50	ACC-1	Acc time 1	0	0	1	20 sec
I/O-51	DEC-1	Dec time 1	0	0	1	20 sec
I/O-52	ACC-2	Acc time 2	0	1	0	30 sec
I/O-53	DEC-2	Dec time 2	0	1	0	30 sec
I/O-54	ACC-3	Acc time 3	0	1	1	40 sec
I/O-55	DEC-3	Dec time 3	0	1	1	40 sec
I/O-56	ACC-4	Acc time 4	1	0	0	50 sec
I/O-57	DEC-4	Dec time 4	1	0	0	50 sec
I/O-58	ACC-5	Acc time 5	1	0	1	40 sec
I/O-59	DEC-5	Dec time 5	1	0	1	40 sec
I/O-60	ACC-6	Acc time 6	1	1	0	30 sec
I/O-61	DEC-6	Dec time 6	1	1	0	30 sec
I/O-62	ACC-7	Acc time 7	1	1	1	20 sec
I/O-63	DEC-7	Dec time 7	1	1	1	20 sec

FU2-71 [Accel/Decel Reference frequency]
Reference Frequency for Accel and Decel

FU1 -71	Description
Max freq.	The Accel/Decel time is the time that takes to reach the maximum frequency from 0 Hz. (Factory setting)
Delta Freq.	The Accel/Decel time is the time that takes to reach a target frequency from any frequency.

FU2-72 [Accel/Decel time scale]
Set the Accel/Decel time unit.

FU1 -72	Description
0.01 sec	Minimum 0 sec settable Maximum 60 sec settable
0.1 sec	Minimum 0 sec settable Maximum 600 sec settable
1 sec	Minimum 0 sec settable Maximum 6000 sec settable (Factory setting)

DRV-03: Drive Mode (Run/Stop Method)

DRV▶ Drive mode 03 Fx/Rx-1	03	1

Factory Default: Fx/Rx-1 **1**

Select the source of run/stop command.

Setting Range	Description
Keypad	Run/Stop control by Keypad.
Fx/Rx-1	Run/Stop control by Control Terminals FX, RX. (Method 1) FX: Forward Run/Stop RX: Reverse Run/Stop
Fx/Rx-2	Run/Stop control by Control Terminals FX, RX. (Method 2) FX: Run/Stop command RX: Forward/Reverse selection
Int. 485	Run/Stop control by RS485. (MV SystemView)

Note : Refer to option board user manual for Run/Stop command by option board.

DRV-04: Frequency Mode

DRV► Freq mode 04 Keypad-1	04	0

Factory Default: Keypad-1 **0**

If the DRV-04 [Frequency Mode] is set to V1, I, V1+I, see the description of I/O-01~13, I/O-84~89 [Analog Voltage/Current input signal adjustment].

Setting Range	Description
Keypad-1	Frequency is set at DRV-00. The frequency is changed by pressing **PROG** key and entered by pressing **ENT** key. The inverter does not output the changed frequency until the **ENT** key is pressed.
Keypad-2	Frequency is set at DRV-00. Press **PROG** key and then by pressing the ▲, ▼ key, the inverter immediately outputs the changed frequency. Pressing the **ENT** key saves the changed frequency.
V1	Apply the frequency reference (0-12V) to the "V1" control terminal. Refer to the I/O-01 to I/O-05 for scaling the signal.
I	Apply the frequency reference (4~20mA) to the "I" control terminal. Refer to the I/O-06 to I/O-10 for scaling the signal.
V1+I	Apply the frequency reference (0~12V, 4~20mA) to the "V1","I" control terminals. The 'V1' signal overrides the 'I' signal. See I/O-01~10.
PULSE	Set the freq command using "A_0C, B_0C" terminals. Range: 0V~5V Pulse. See I/O-84~89.
Int. 485	Set the freq command using RS485 communication. See I/O-90~93.

DRV -04	Description	
Related Function	DRV-00	Digital Command frequency.
	FU2-40	Control Mode
	I/O-01~13 I/O-84~89	Analog Command frequency.

DRV-05 ~ DRV-07: Step Frequency 1 ~ 3

DRV► Step freq-1 05 10.00 Hz	05	10.00

Factory Default: 10.00 Hz **10.00**

DRV► Step freq-2 06 20.00 Hz	06	20.00

Factory Default: 20.00 Hz **20.00**

DRV► Step freq-3 07 30.00 Hz	07	30.00

Factory Default: 30.00 Hz **30.00**

The inverter outputs preset frequencies set in these codes according to the Programmable Digital Input terminals configured as 'Speed-L', 'Speed-M', 'Speed-H' and 'Speed-X'. The output frequencies are decided by the binary combination of M0~M14.
See I/O-14~28 description for Step Freq 4~7.

Binary Input Combination			Output Frequency	Step Speed
Speed-L	Speed-M	Speed-H		
0	0	0	DRV-00	Speed 0
0	0	1	DRV-05	Speed 1
0	1	0	DRV-06	Speed 2
0	1	1	DRV-07	Speed 3

Note: Speed 0 is the set value in DRV-04.

DRV-04 data	DRV-00, 0 speed	Freq command source
KeyPad-1	Digital command freq	Keypad
KeyPad-2	Digital command freq	Keypad
V1	Analog command freq	Terminal
I	Analog command freq	Terminal
V1+I	Analog command freq	Terminal
Pulse	Pulse command freq	Terminal
Int. 485	Comm. command freq	Terminal

DRV -04	Description	
Related Function	I/O-14~28	Input Terminal Selection.
	I/O-31	Input Terminal Filter Value

DRV-08: Output Current

DRV▶ Current 08 0.0 A	08	0.0

Factory Default: 0.0 A **0.0**

This code displays the output current of the inverter in RMS.

DRV-09: Motor RPM

DRV▶ Speed 09 0rpm	09	0

Factory Default: 0rpm **0**

This code displays the motor speed in RPM while the motor is running.
Use the following equation to scale the mechanical speed using FU2-38 [Gain for Motor Speed display] if you want to change the motor speed display to rotation speed (r/min) or mechanical speed (m/min).
Motor speed = 120 * (F/P) * FU2-47
Where, F= Output Frequency and P= the Number of Motor Poles

DRV-10: DC Link Voltage

DRV▶ DC link vtg 10 ----- V	10	----

Factory Default: ---- V **----**

This code displays the DC link voltage inside the Cell.

DRV-11: User Display Selection

DRV▶ User disp 11 0.0 V	11	0.0

Factory Default: 0.0 V **0.0**

This code displays the parameter selected in FU2-81 [User Display].

FU2 -81	Function Name	Description
Voltage	Output Voltage	Displayed output voltage
Watt	Output Power	Displayed output Power

DRV-12: Current Trip Display

DRV▶ Fault 12 None	12	nOn

Factory Default: None **nOn**

This code displays the current fault (trip) status of the inverter. Use the **PROG**, ▲ and ▼ key before pressing the **RESET** key to check the fault content(s), output frequency, output current, and whether the inverter was accelerating, decelerating, or in constant speed at the time of the fault occurred. Press the **ENT** key to exit. The fault content will be stored in FU2-01 to FU2-05 when the **RESET** key is pressed.

[Fault Contents]

Fault (Trip)	LCD Keypad display
Over-Current 1	Over Current1
Cell Over-Voltage	DC_Link OVT
External Trip Input	Ext. Trip1(2)
Emergency Stop	BX
Input Low-Voltage	Input. LVT
Input Over-Voltage	Input. OVT
Ground Fault	Ground Fault
Over-Heat Cell	Over Heat
Electronic Thermal Trip	E-Thermal
Over-Load Trip	Over Load
CAN communication Error	CAN Error
FAN Error	FAN Error
Output Over Current	Output OCT
Output Phase Open	OutPhase Open
Input Phase Open	InPhase Open
Inverter Over Load	Inv. OLT
Motor OverHeat	Motor OverHeat
Trans OverHeat	Trans OverHeat
Cell Fault	Cell Fault
Panel Open	Door Open

DRV -12	Description	
Related Function	FU2-1~5	Trips History
	FU2-06	Erase Trips History
	FU2-83	Last Trip Time

Note: Only the highest-level fault will be displayed when multiple faults occur. The rest of faults can be monitored in FU2-01~05 [Fault history]. Cycle the power when the fault is cleared.

Up to 5 faults can be saved in FU2-01~05 [Fault history]. The lowest hierarchy fault such as "Last trip 5" is the latest. After pressing [PROG] key, press [⇧(Up)], [⇩(Down)] key to check the operation information at the time of the fault (Output freq.,

current, Accel/Decel/Constant Run) and fault type. Press the [ENT] key to escape.
FU2-06 [Erase fault history] clears the faults information. However, FU2-83 [Last Trip Time] is automatically reset when a trip occurs.

Code	Display	Description
FU2-01	Last trip-1	Fault history 1
FU2-02	Last trip-2	Fault history 2
FU2-03	Last trip-3	Fault history 3
FU2-04	Last trip-4	Fault history 4
FU2-05	Last trip-5	Fault history 5

FU2-83 [Last Trip Time] shows the total time elapsed after the last trip occurs so it is possible to know the actual trip time by recounting.

DRV-16: High Voltage on Display

DRV▶High Vol Sel 16 Hard Wear	16	Hard Wear

Factory Default : Hard Wear

DRV -16	Description	
Related Function	DRV-17	High voltage on selection

- Selection between whether the high voltage power supply (or no-supply) signal shall be received with hardware or software.

- When there is no signal for whether high voltage power is to be supplied or not, the inverter cannot be operated,

DRV-17: High Voltage on Display

DRV▶ High Vol ON 17 NO	17	NO

Factory Default : NO

DRV-17	Description
YES	Set up by user when high voltage power supply is applied
NO	When high voltage power supply is not applied (default)

- DRV-16 High Vol Sel has to be set to Software to display DRV-17.
- The user has to make this setting manually, not altered by automatically. Select 'Yes' when power is applied.
- It 'Yes' is selected when power is not applied, errors such as Input LVT, Can Error, etc., will occur.

DRV-70: R-Phase Voltage

DRV▶Rph_InputVtg 70 ----- V	70	----

Factory Default : ---- V ----

DRV-71: S-Phase Voltage

DRV▶Sph_InputVtg 71 ----- V	71	----

Factory Default : ---- V ----

DRV-72: T-Phase Voltage

DRV▶Tph_InputVtg 72 ----- V	72	----

Factory Default : ---- V ----

DRV-80: Input Voltage RMS Value

DRV▶ InputVoltage 80 ----- V	80	----

Factory Default : ---- V ----

DRV-82: Out Voltage

DRV▶ Out Voltage 82 ----- V	82	----

Factory Default : ---- V ----

DRV-83: Inverter Output Current RMS Value

DRV▶ Out Current 83 ----- A	83	----

Factory Default : ---- A ----

DRV-91: Drive Mode 2

DRV▶ Drive mode2 91 Fx/Rx-1	91	Fx/Rx-1

Factory Default : Fx/Rx-1

DRV -91	Description	
Related Function	I/O-14 ~ 28	LOC/REM

DRV -91	Description
Fx/Rx-1	Terminal
Fx/Rx-2	Terminal

- This function relates to LOC/REM setting in the function definition of the IO-14 ~ 28 terminal block. Refer to the IO-14 ~ 28 terminal block functions for further details.

DRV-92: Frequency Mode 2

DRV▶ Freq mode2 92 KeyPad-1	92	KeyPad-1

Factory Default : KeyPad-1

DRV -16	Description	
Related Function	I/O-14 ~ 28	LOC/REM

DRV -91	Description
KeyPad-1	KeyPad Command
KeyPad-2	KeyPad Command
V1	Analog Command
PULSE	Analog Command
I	Analog Command
V1+I	Analog Command

- This function relates to LOC/REM setting in the function definition of the IO-14 ~ 28 terminal block. Refer to the IO-14 ~ 28 terminal block functions for further details.

6.2 Function 1 Group [FU1]

FU1-00: Jump to Desired Code

FU1▶ Jump code 00 1

Factory Default: 1 **1**

Jumping directly to any parameter code can be accomplished by entering the desired code number. This code is available only with LCD keypad.

FU1-01: Run Prevention

FU1▶ Run prev. 01 None	01	0

Factory Default: None **0**

This function prevents reverse operation of the motor. This function may be used for loads that rotate only in one direction such as fans and pumps.

Setting	Description
None	Forward &Reverse run available. (Factory default)
Fwd Prev	Forward run prohibited.
Rev Prev	Reverse run prohibited.

FU1-02: Acceleration Pattern
FU1-03: Deceleration Pattern

FU1▶Acc. pattern 02 Linear	02	0

Factory Default: Linear **0**

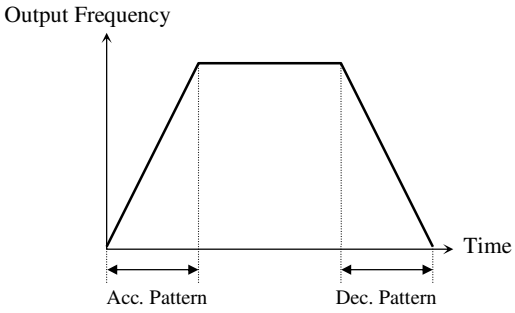
FU1▶Dec. pattern 03 Linear	03	0

Factory Default: Linear **0**

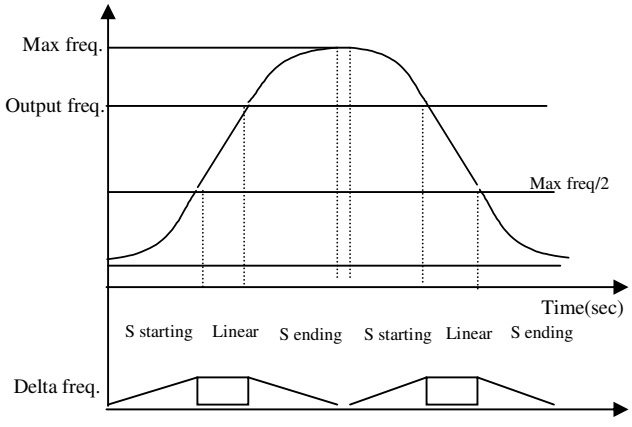
Different combinations of acceleration and deceleration patterns can be selected according to the application.

Setting Range	Description
Linear	A general pattern for constant torque applications. (Factory default)
S-curve	This pattern allows the motor to accelerate and decelerate smoothly. The actual acceleration and deceleration time takes longer- about 40% than the time set in DRV-01 and DRV-02. This setting prevents shock during acceleration and deceleration, and prevents objects from swinging on conveyors or other moving equipment.
U-curve	This pattern provides more efficient control of acceleration and deceleration in typical winding machine applications.

Note: Setting value in DRV-01 and DRV-02 is ignored.

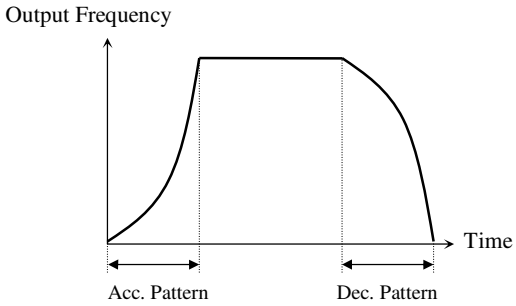


[Accel/Decel Pattern: 'Linear']



[Accel/Decel Pattern: 'S-curve']

Actual accel time = Preset accel time+ Preset accel time *Starting curve ratio/2 + Preset accel time * Ending curve ratio /2
Actual decel time = Preset decel time + Preset decel time * Starting Curve ratio/2 + Preset decel time * Ending curve ratio/2



[Accel/Decel Pattern: 'U-curve']

FU1-06: Start Mode
FU1-07: Starting DC Magnetizing Time
FU1-08: Starting DC Magnetizing Value

FU1▶ DcSt time 07 0.0 sec	07	0.0
Factory Default: 0.0 sec		0.0

FU1▶ DcSt value 08 33 %	08	33
Factory Default: 50 %		33

Inverter holds the starting frequency for Starting DC Magnetizing Time. It outputs DC voltage to the motor for FU1-07 [Starting DC Magnetizing Time] with the FU1-08 [Starting DC Magnetizing Value] before accelerating.
Select the starting method of the inverter.

FU1-06 set data	Function description
Accel	Acceleration to start (Factory default)
Dc-start	Inverter starts acceleration after magnetizing DC current.
Flying-start	Inverter starts RUN while a motor is rotating.

1) The direction of Motor rotation and the command should be set equal to optimum use of Flying-start function. **However, this function is effective with less than 50% to rated rpm when direction of motor rotation and**

reference command is opposite.

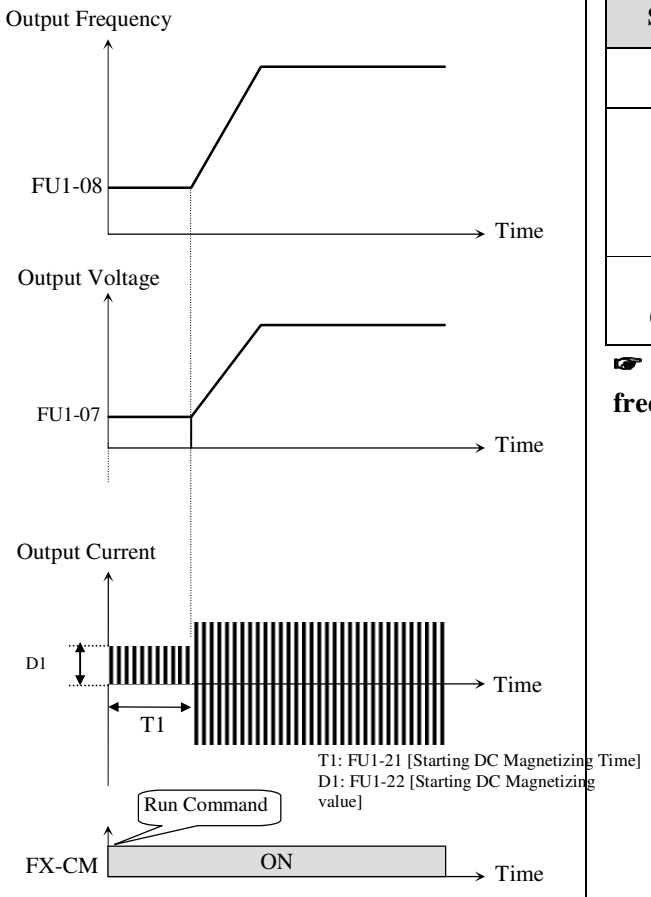
2) DC-start is disabled when FU1-07 or 08 is set to "0".

3) DC-start is deactivated in Sensorless mode.

4) It is possible to occur No Motor Trip in case that there is output phase loss when DC-start is operated

Inverter starts acceleration after FU1-07 [Starting DC Magnetizing Time] while FU1-08 [Starting DC Magnetizing Voltage] is operated.

Code	LCD Display	Default	Setting
FU1-07	DcSt time	1 [sec]	0.1 ~ 60 [sec]
FU1-08	DcSt value	33 [%]	0 ~ 150 [%]



[DC-start Operation]

FU1-08 [Starting DC Magnetizing Value] is the DC Current amount applied to the motor and is set as percent of FU2-34[Motor Rated Current].

Note: Do not set FU1-08 [Starting DC Magnetizing Value] higher than Inverter Rated Current. Otherwise, Motor Overheating or Overload Trip may occur.

FU1-09: Stop Mode

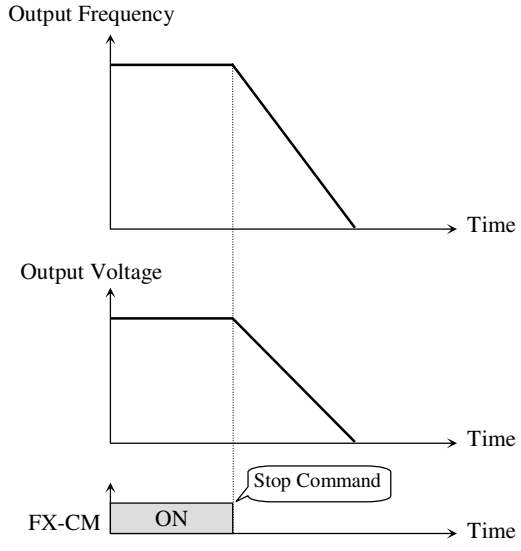
FU1► Stop mode 09 Decel	09	Decel

Factory Default: Decel Decel

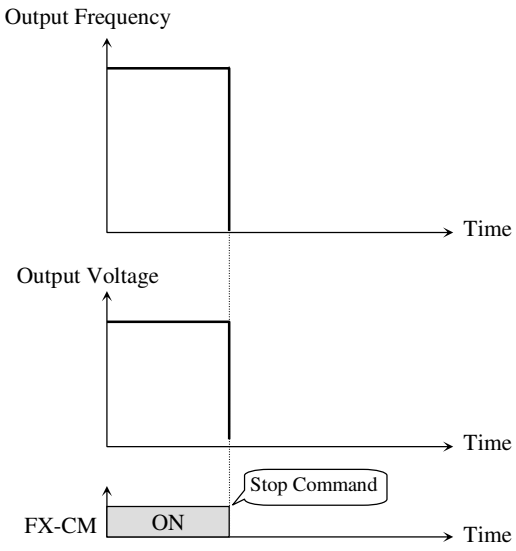
Sets the stopping method for the inverter.

Setting Range	Description
Decel	Inverter stops by the deceleration pattern.
Dc-brake	Inverter stops with DC injection braking. Inverter outputs DC voltage when the frequency reached the DC injection braking frequency during decelerating.
Free-run (Coast to stop)	Inverter cuts off its output immediately when the stop signal is commanded.

☞ **Caution: Motor may be overheated due to frequent use of Flux Brake function.**



[Stop Mode: 'Decel']



[Stop mode: Free-run]

FU1-10: DC Injection Braking Hold Time
FU1-11: DC Injection Braking Frequency
FU1-12: DC Injection Braking Time
FU1-13: DC Injection Braking Value

FU1▶ DcBlk time 10 0.10 sec	10	0.10
Factory Default: 0.10 sec		0.10
FU1▶ DcBr freq 11 0.50 Hz	11	0.5
Factory Default: 0.50 Hz		0.5
FU1▶ DcBr time 12 1.0 sec	12	1.0
Factory Default: 1.0 sec		1.0
FU1▶ DcBr value 13 50 %	13	50
Factory Default: 50 %		50

By introducing a DC voltage to the motor windings this function stops the motor immediately. Selecting 'DC-Brake' in FU1-23 activates FU1-10 through FU1-13.

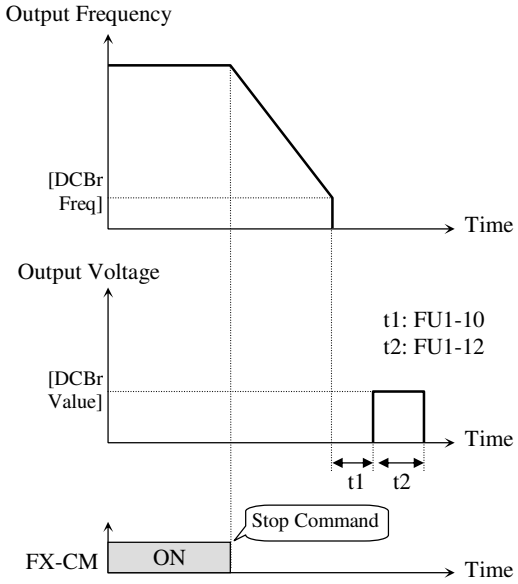
When FU1-23 [Stop mode] is set to "DC Brake", inverter decelerates until FU1-11 [DC Injection Braking Frequency] and begins DC Braking at this frequency.

FU1-10 [DC Injection Braking Hold Time] is the inverter output blocking time before DC injection braking.

FU1-11 [DC Injection Braking Frequency] is the frequency at which the inverter starts to output DC voltage during deceleration.

FU1-12 [DC Injection Braking Time] is the time the DC current is applied to the motor.

FU1-13 [DC Injection Braking Value] is the DC voltage applied to the motor and is based on FU2-34 [Rated Current of Motor].



[DC Injection Braking Operation]

Note: Do not set the FU1-13 higher than Inverter rated current. Otherwise, it may lead to motor overheat or overload trip.
Note: Do not set FU1-11 [DC Braking Frequency] too high than its range (between 0~5Hz). Otherwise, it may deteriorate its performance.

FU1-20: Line Frequency

FU1► Line Freq 20 60.00 Hz	20	60.00

Factory Default: 60.00 Hz	60.00

It sets input power frequency. Set 50 or 60Hz in FU1-20 [Line Frequency].

☞ **Caution: If line frequency is changed, related frequencies such as Max frequency, Base frequency are automatically changed. To set the related frequencies different to line, user should set the codes manually.**

FU1-21: Maximum Frequency
FU1-22: Base Frequency
FU1-23: Starting Frequency

FU1► Max freq 21 60.00 Hz	20	60.00

Factory Default: 60.00 Hz	60.00

FU1► Base freq 22 60.00 Hz	22	60.00

Factory Default: 60.00 Hz	60.00

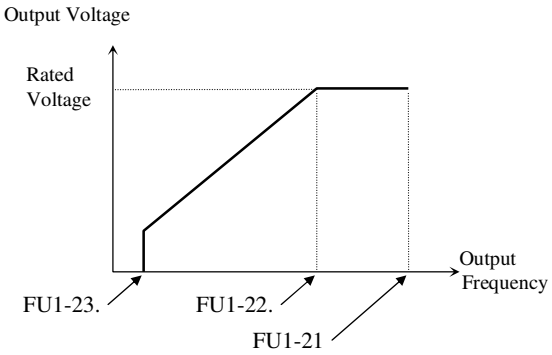
FU1► Start freq 23 0.50 Hz	23	0.50

Factory Default: 0.50 Hz	0.50

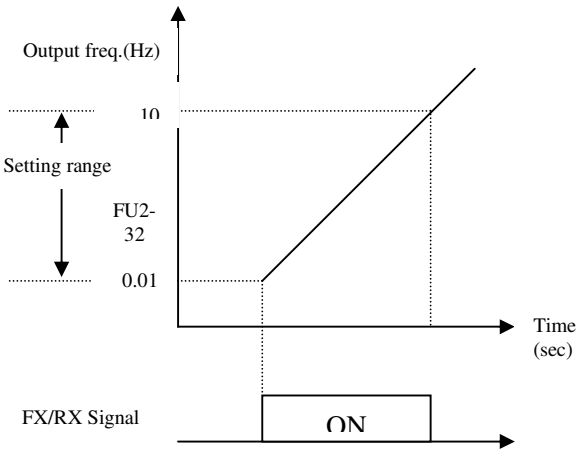
FU1-21 [Maximum Frequency] is the maximum output frequency of the inverter. Make sure this maximum frequency does not exceed the rated speed of the motor.

FU1-22 [Base Frequency] is the frequency where the inverter outputs its rated voltage. In case of using a 50Hz motor, set this to 50Hz.

FU1-23 [Starting Frequency] is the frequency where the inverter starts to output its voltage. **If it is set to 5Hz, motor starts running from 5 Hz.**



☞ **Caution: Note that Overheat trip or torque shortage may occur if FU1-22 is set different to motor rated frequency.**

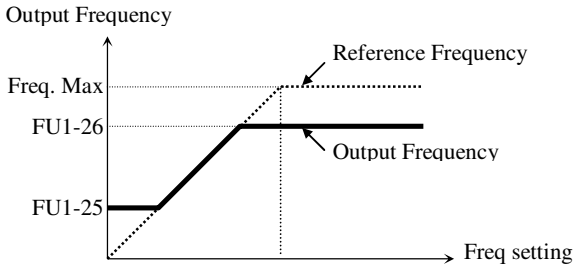


Note: Motor starts running at 5Hz when FU2-23 is set to 5Hz.

FU1-24: Frequency Limit Selection
FU1-25: Low Limit Frequency
FU1-26: High Limit Frequency

FU1▶ Freq limit 24 No	24	0
Factory Default: No		0
FU1▶ F-limit Lo 25 0.50 Hz	25	0.50
Factory Default: 0.50 Hz		0.50
FU1▶ F-limit Hi 26 60.00 Hz	26	60.00
Factory Default: 60.00 Hz		60.00

FU1-24 selects the limits the inverter operating frequency. If FU1-24 is set to 'Yes', inverter operates within the upper and lower limit setting. The inverter operates at the upper or the lower limit when the frequency reference is outside the frequency limit range.



[Freq. limit: 'Yes']

Note: if freq set value is below freq low limit, inverter operates at the low limit.

Note: Normal Accel/Decel is performed for the range below low limit during Accel/Decel.

FU1-40: Volts/Hz Pattern

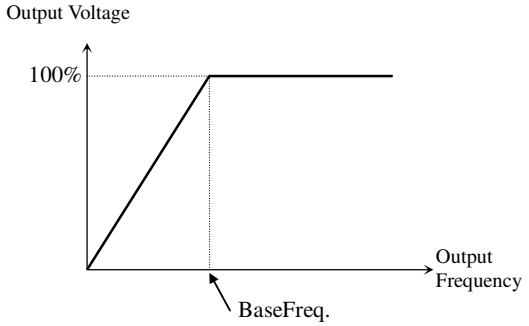
FU1▶ V/F pattern 40 Linear	40	0
Factory Default: Linear		0

This is the pattern of voltage/frequency ratio. Select the proper V/F pattern according to the load. The motor torque is dependent on this V/F pattern.

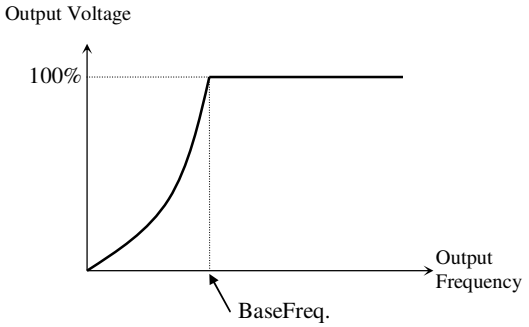
[Linear] pattern is used where constant torque is required. This pattern maintains a linear volts/frequency ratio from zero to base frequency. This pattern is appropriate for constant torque applications. The performance will be improved with the help of FU2-47~48 [Torque boost].

[Square] pattern is used where variable torque is required. This pattern maintains squared volts/hertz ratio. This pattern is appropriate for fans, pumps, etc.

[User V/F] pattern is used for special applications. Users can adjust the volts/frequency ratio according to the application. This is accomplished by setting the voltage and frequency, respectively, at four points between starting frequency and base frequency. The four points of voltage and frequency are set in FU1-41 through FU1-48.



[V/F Pattern: 'Linear']

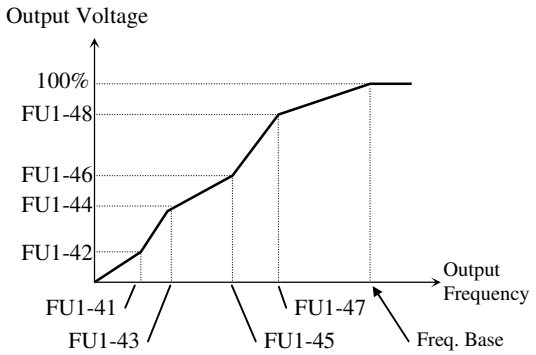


[V/F Pattern: 'Square']

FU1-41 ~ FU1-48: User V/F Frequency and Voltage

FU1▶ User freq 1 41 15.00 Hz	41	15.00
Factory Default: 15.00 Hz		15.00
FU1▶ User volt 1 42 25 %	42	25
Factory Default: 25 %		25
FU1▶ User freq 4 47 60.00 Hz	47	60.00
Factory Default: 60.00 Hz		60.00
FU1▶ User volt 4 48 100 %	48	100
Factory Default: 100 %		100

These functions are available only when 'User V/F' is selected in FU1-40 [V/F pattern]. Users can make the custom V/F pattern by setting four points between FU1-23 [Starting Frequency] and FU1-22 [Base Frequency].



[User V/F]

Note: When the 'User V/F' is selected, the torque boost of FU2-47 through FU2-48 is ignored.

FU1-50: AC Input Voltage

FU1▶AC InputVolt 50 100.0 %	50	73.0~1150
Factory Default: 100.0 V		100.0

FU1-50 [input voltage setting] is required because inverter input voltage much different from the standard input, e.g., 6600[V], 3300[V] can influence inverter performance significantly.

The setting value will be the criteria of the low voltage failure decision of the inverter. Therefore, use this setting only when the voltage fluctuation exceeds the tolerance or differs from the standard input.

Note: when changing the FU1-50 setting value, the changed value will be applied as soon as entered using the button on the loader.

FU1-53: Electronic Thermal (Motor i²t) Selection
FU1-54: Electronic Thermal Level for 1 Minute
FU1-55: Electronic Thermal Level for Continuous
FU1-56: Electronic Thermal Characteristic (Motor type) selection

These functions protect the motor from overheating without using external thermal relay. Inverter calculates the temperature rise in a motor based on several parameters and determines whether or not the motor is overheated from load current. Inverter will turn off its output and display a trip message when the electronic thermal feature is activated.

FU1▶ ETH select 53 --- Yes ---	53	1
Factory Default: Yes		1

This function activates the ETH parameters by setting 'Yes'. ETH level is set as the percentage of FU2-34 [Motor rated current].

FU1▶ ETH 1min 54 150 %	54	150
Factory Default: 150 %		150

This is the reference current when the inverter determines the motor has overheated. For example, it trips in one minute when 150% of rated motor current in FU2-34 flows for one minute.
Note: The set value is the percentage of FU2-34 [Rated Motor Current].

FU1▶ ETH cont 55 120 %	55	120

Factory Default: 120 %	120

This is the current at which the motor can run continuously. Generally, this value is set to '100%', which means the motor rated current set in FU2-34. This value must be set less than FU1-54 [ETH 1min].
Note: The set value is the percentage of FU2-34 [Rated Motor Current].

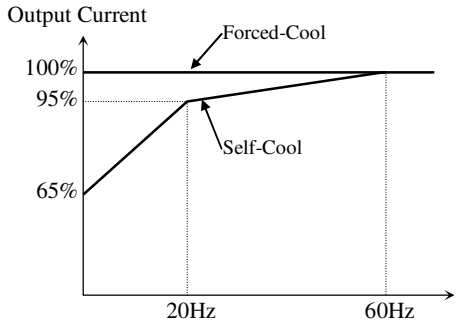
FU1▶ Motor type 56 Self-cool	56	Self-cool

Factory Default: Self-cool	Self-cool

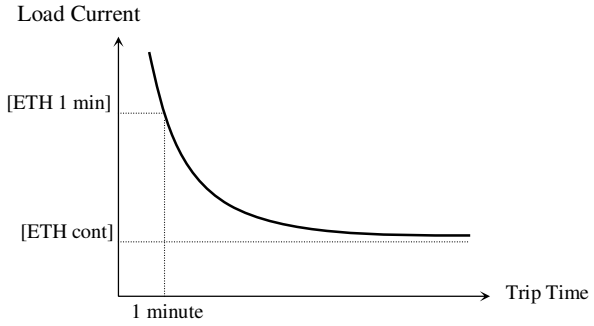
To make the ETH function (Motor i^2t) work correctly, the motor cooling method must be selected correctly according to the motor.

[Self-cool] is a motor that has a cooling fan connected directly to the shaft of the motor. Cooling effects of a self-cooled motor decrease when a motor is running at low speeds. The Motor is easily heated at low speed, compared to the motor at high speed with the same current. The motor current is derated as the motor speed decreases as shown below.

[Forced-cool] is a motor that uses a separate motor to power a cooling fan. As the motor speed changes, the cooling effect does not change. FU1-55 [Electronic thermal level for continuous] set value is applied regardless of operating frequency.



[Load Current Derating Curve]



[Motor i^2t Characteristic Curve]

Note: Despite the motor current changing frequently due to load fluctuation or acceleration and deceleration, the inverter calculates the i^2t and accumulates the value to protect the motor.

FU1-57: Overload Warning Level
FU1-58: Overload Warning Time

FU1▶ OL level 57 110 %	57	110

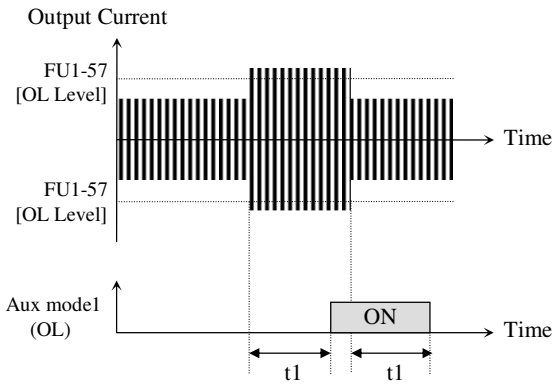
Factory Default: 110 %	110

FU1▶ OL time 58 10.0 sec	58	10.0

Factory Default: 10.0 sec	10.0

The inverter generates an alarm signal when the output current has reached the FU1-57 [Overload Warning Level] for the FU1-58 [Overload Warning Time]. The alarm signal persists for the FU1-58 even if the current has become the level below the FU1-57. Programmable Digital Output Terminal is used as the alarm signal output. To output the alarm signal, set I/O-37 [Aux mode1] to 'OL'.

Note: FU1-64 is set as the percentage of FU2-34 [Rated Motor Current].



t1: FU1-58 [Overload Warning Time]

[Overload Warning]

FU1-59: Overload Trip Selection
FU1-60: Overload Trip Level
FU1-61: Overload Trip Delay Time

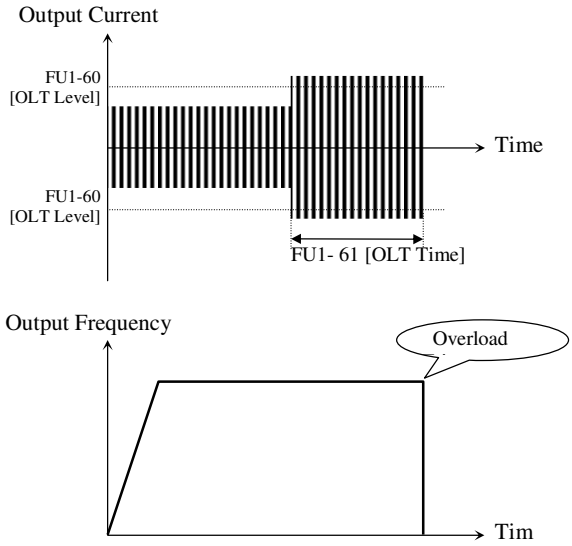
FU1▶ OLT select 59 --- No ---	59	0
Factory Default: No		0

FU1▶ OLT level 60 120 %	60	120
Factory Default: 120 %		120

FU1▶ OLT time 61 60.0 sec	61	60.0
Factory Default: 60.0 sec		60.0

Inverter cuts off its output and displays fault message when the output current persists over the FU1-60 [Overload Trip Level] for the time of FU1-61 [Overload Trip Delay Time]. This function protects the inverter and motor from abnormal load conditions.

Note: The set value is the percentage of FU2-23 [Rated Motor Current].
Note: Activated only when Heatsink temperature exceeds its preset level.



[Overload Trip Operation]

FU1-62: Input/Output Phase Loss Protection (Bit Set)

FU1▶ Trip select 62 00	62	00
Factory Default: 00		00

This function is used to cut the inverter output off in case of phase loss in either input power or inverter output.

1st bit: Output phase loss protection Enable/Disable

0: Disabled at Output phase loss protection.
1: Enabled at Output phase loss protection. Inverter output is shut down and stopped.

2nd bit: Input phase loss protection Enable/Disable

0: Input phase loss protection disabled.
1: Input phase loss protection enabled. Inverter output is shut down and stopped.

FU1-64: Stall Prevention Level

FU1▶ Stall level 64 100 %	64	100
Factory Default: 100 %		100

This function is used to prevent the motor from stalling by reducing the inverter output frequency until the motor current decreases below the stall prevention level. This function can be selected for each mode of acceleration, steady speed, and

deceleration via bit combination.

Note: FU1-64 is set as the percentage of FU2-34 [Rated Motor Current].

Note: Do not set the FU1-64 higher than inverter rated current.

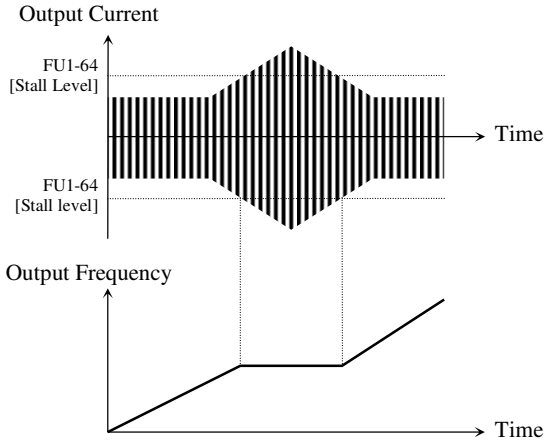
Note : Stall level will be automatically reduced if inverter is operated at the frequency higher than base frequency.

Note: Accel time may get longer due to stall prevention during Accel.

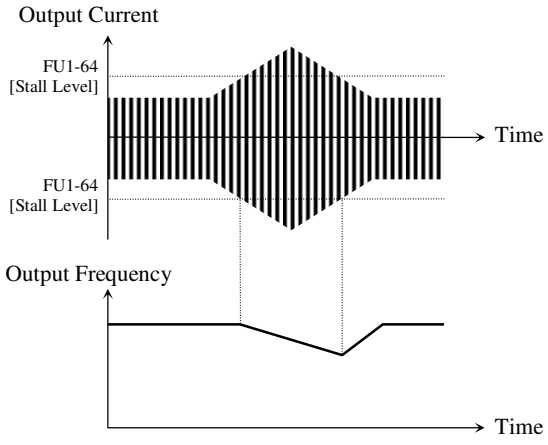
Note: Inverter starts deceleration when Stop command is applied while motor stall state persists.

Note: Output frequency may oscillates due to stall prevention during constant run.

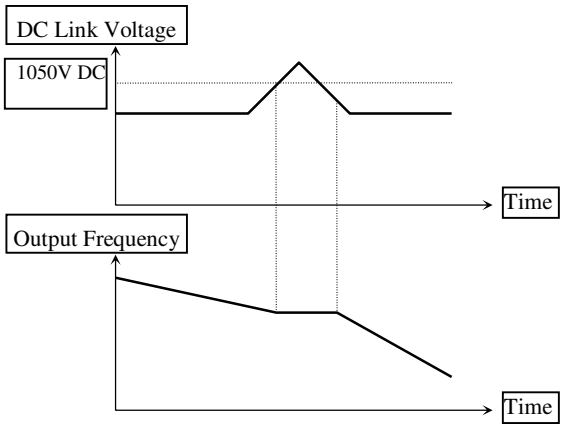
Note: Decel time may get longer due to stall prevention during Decel.



[Stall Prevention during Acceleration]



[Stall Prevention during Constant Run]



[Stall Prevention during Deceleration]

FU1-70: Accel/Decel Change Frequency

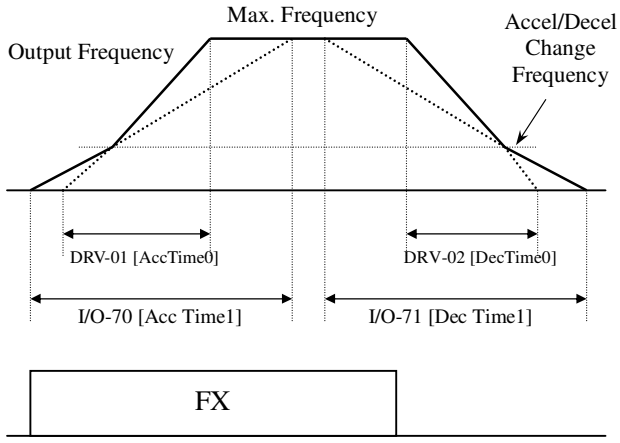
FU1▶Acc/Dec ch F 70 0.00 Hz	70	0.00

Factory Default: 0.00 Hz	0.00

This function is used to change Accel/Decel ramp at a certain frequency.

Note: If Accel/Decel change frequency is set and 'XCEL-L', XCEL-M', and XCEL-H' defined in Programmable digital terminals are ON, Multi Accel/Decel operation has the priority.

Note: normal Accel/Decel will be performed when the Accel/Decel switching frequency is zero, i.e, zero Accel/Decel time is applied.



[Accel/Decel Change Operation]

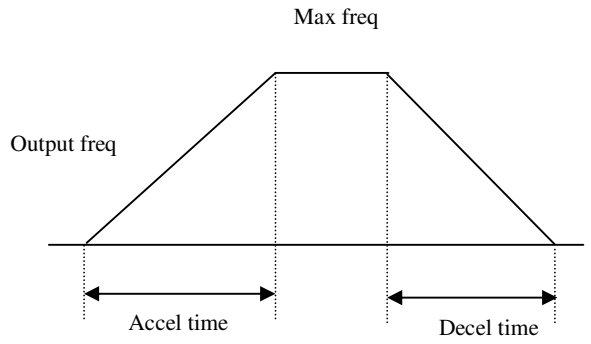
FU1-71: Reference Frequency for Accel/Decel

FU1►Acc/Dec freq 71 Max	71	Max

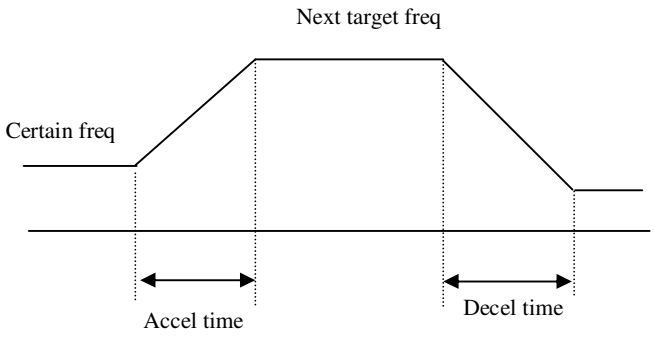
Factory Default: Max **Max**

This is the reference frequency for acceleration and deceleration. If a decided Accel/Decel time from a frequency to a target frequency is required, set this value to 'Delta freq'.

Setting Range	Description
Max freq	The Accel/Decel time is the time that takes to reach the maximum frequency from 0 Hz.
Delta freq	The Accel/Decel time is the time that takes to reach a target frequency from any frequency.



[FU1-71: Max. Freq]



[FU1-71: Delta Freq]

FU1-74: Accel/Decel Time Scale

FU1► Time scale 71 1 sec	71	1

Factory Default: 1 sec **1**

This is used to change the time scale.

Setting Range	Description
0.01 sec	The Accel/Decel time is changed by 10 msec. The maximum setting range is 60 seconds.
0.1 sec	The Accel/Decel time is changed by 100 msec. The maximum setting range is 600 seconds.
1 sec	The Accel/Decel time is changed by 1 sec. The maximum setting range is 6000 seconds.

FU1-81: KiloWattHour

FU1► KiloWattHour 81 kWh	81	kWh

Factory Default: kWh

Note: The displayed value of "Watt" is approximate value.

FU1-82: Power Set

FU1► Power Set 82 100%	82	100

Factory Default: 100 **100**

Note: since the integrated energy is expressed by the integral of instantaneous electric energy, it is recommended to correct the electric energy.

FU1-83: Cell Temp

FU1►Cell Temp 83 0	83	0

Factory Default: 0 **0**

Note: of the 3-phase cells of each layer, the highest cell temperature is displayed.

6.3 Function 2 Group [FU2]

FU2-00: Jump to desired code

FU2▶ Jump code 00 1		
Factory Default: 1		1

Jumping directly to any parameter code can be accomplished by entering the desired code number. This code is available only with LCD keypad.

FU2-01: Last trip 1
FU2-02: Last trip 2
FU2-03: Last trip 3
FU2-04: Last trip 4
FU2-05: Last trip 5
FU2-06: Erase Trips

FU2▶ Last trip-1 01 None	01	None
Factory Default: None		None

□
□
□

FU2▶ Last trip-5 05 None	05	None
Factory Default: None		None

This code displays up to five previous fault (trip) status of the inverter. Use the **PROG**, ▲ and ▼ key before pressing the **RESET** key to check the fault content(s) such as output frequency, output current, and whether the inverter was accelerating, decelerating, or in constant speed at the time of the fault occurred. Press the **ENT** key to exit.
FU2-83 [Last Trip Time] is the time elapsed after last trip occurs. User can count the last trip time from this value.

FU2▶ Erase trips 06 --- No ---	06	NO
Factory Default: No		NO

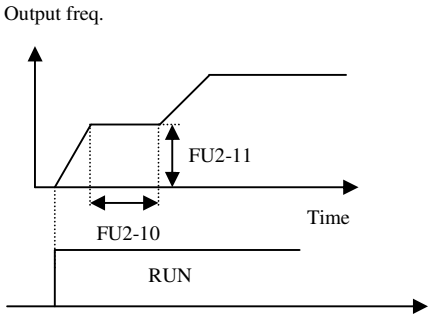
This function erases all fault histories of FU2-01 to FU-05 from the memory.
However, FU2-83 [Last Trip Time] cannot be reset.

FU2-10: Dwell Time
FU2-11: Dwell Frequency

FU2▶ Dwell time 10 0.0 sec	10	0.0
Factory Default: 0.0 sec		0.0

FU2▶ Dwell freq 11 5.00 Hz	11	5.00
Factory Default: 5.00 Hz		5.00

Note: If the dwell time is set at '0', this function is not available.
Note: Do not set the Dwell frequency above frequency command. Otherwise, it may lead to operation fault.
Note: this function is disabled in Sensorless control.



FU2-12 ~ FU2-18: Frequency Jump

FU2▶ Jump freq 12 --- No ---	12	0
Factory Default: No		0

FU2▶ jump lo 1 13 10.00 Hz	13	10.00
Factory Default: 10.00 Hz		10.00

FU2► jump Hi 1 14 15.00 Hz	14	15.00

Factory Default: 15.00 Hz	15.00

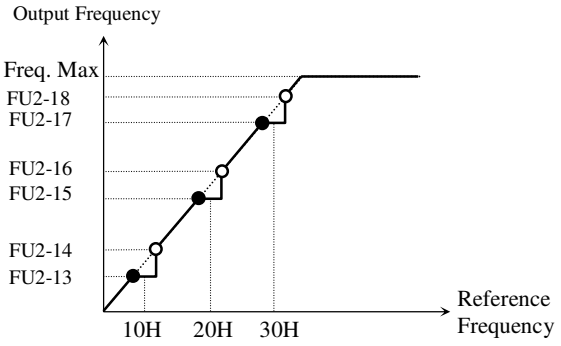
FU2► jump lo 3 17 30.00 Hz	17	30.00

Factory Default: 30.00 Hz	30.00

FU2► jump Hi 3 18 35.00 Hz	18	35.00

Factory Default: 35.00 Hz	35.00

To prevent undesirable resonance and vibration on the structure of the machine, this function locks out the potential resonance frequency from occurring. Three different jump frequency ranges may be set. This avoidance of frequencies does not occur during accelerating or decelerating. It only occurs during continuous operation.



[Frequency Jump]

Note: When the reference frequency is set between the jump frequency low/high limit, it follows the low limit frequency, marked by "•".
Note: If jump range 1 and range 2 are overlapped, lower freq. will become a low limit.
Note: Jump freq. is ignored during Accel/Decel.

FU2-21: Flying Percent

FU2►Flying Perc 21 50%	21	50

Factory Default: 50%	50

To use the motor during free-run before it stops, use the speed search function. The flying start percentage is the % value of the current during the speed search to the rated current [FU2-34] of the motor.

Note: if the % value is set up too small while under a large load, the speed search function may not be successful.

Note: no operation is carried out while in a failure condition.

FU2-25: Restart After Fault Reset

FU2►Reset start 25 No	25	No

Factory Default: No	No

When this is set to No, if the inverter is tripped and released, turn the terminal block OFF and then ON to start operation, even the terminal block is in operable state.

▶ When set to Yes, if a trip occurs to the inverter which has been operated with the terminal block, the trip will be reset after 3 seconds from the trip, automatically. When the problem is corrected and the terminal block is in operable condition, the inverter operation commands will be created according to the number of the FU2-26 retry with the retry delay time of the FU2-27.

▶ If the inverter fails, it isolates the output power resulting in the motor free-run. Restarting in this condition may cause trip. In the LS-MV, the Flying Start is applied automatically as the restart method (not user settable)

▶ When the BypassMode of the CEL-30 is set to ManualBypass or Auto-Bypass, the restart is performed bypassing the cell in failure which

requires bypass. If the ByPassMode is set to No, the trip caused byCell Fault or Can Error cannot be restarted.

▶ Operation status diagram

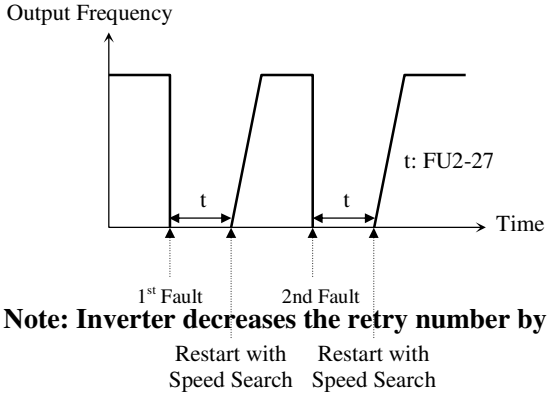
If the Reset Start of the FU2-25 is set to Yes, restart will be decided by the operation command status after solving the problem, regardless of operation by keypad or terminal block.

FU2-26: Number of Auto Retry
FU2-27: Delay Time Before Auto Retry

FU2▶Retry number 26 1	26	1
Factory Default: 0		0
FU2▶Retry delay 27 1.0 sec	27	1.0
Factory Default: 1.0 sec		1.0

This function is used to allow the inverter to reset itself for a selected number of times after FU2-27 elapses when inverter is tripped. If trip more than FU2-26 occur, inverter shuts down the output and displays a trip message. If the trip persists after FU2-27, number of trip is increased and Auto restart function is disabled. For example, FU2-26 [Retry number] is 1 with FU2-27 [Retry delay] set to 10 sec, if trip persists over 10 seconds and then is reset (cleared), Auto restart is not performed. Inverter may be tripped out in Motor Free-run status when this function is issued. To avoid it, use the speed search function.

Disabled when a low voltage (LV) trip, inverter disable (BX) or Arm short occurs.



Note: Inverter decreases the retry number by one as a fault occurs. If trip does not occur after restarting for 30 seconds, the inverter increases the retry number by one and maximum number is limited by the value set in FU2-26.

Op. Com.	Past Status	Time of failure	Failure Reset	Current op. com. status	Restart status
Key pad	In op.	Fault Mode		FWD	RUN
				STOP	STOP
	In stop			FWD	RUN
				STOP	STOP
TB	In op.			On	RUN
				Off	STOP
	In stop			On	RUN
				Off	STOP

FU2-31: Motor Volt

CAUTION

Particular attention must be directed to this function as motor restarts automatically after the fault is reset. Otherwise, it may result in personal damage.

FU2-32: Number of Motor Pole
FU2-33: Rated Motor Slip
FU2-34: Rated Motor Current
FU2-35: No Load Motor Current

If users do not set these values, inverter will use factory default values.

FU2▶Motor Volt 31 6600[V]	31	6600
Factory Default: 6600[V]		4
FU2▶ Pole number 32 4	32	4
Factory Default: 4		4

This is used to display the motor speed. If you set this value to 2, inverter will display 3600 rpm instead of 1800rpm at 60Hz output frequency. (See motor nameplate) When motor pole number is more than 4, select an inverter one rating higher than that of the motor because motor rated current is large.

FU2▶ Rated-Slip 33 2 Hz	33	2

Factory Default: 2 Hz **2**

This is used in 'Slip Compensation' control. If you set this value incorrectly, motor may stall during slip compensation control. (See motor nameplate)

FU2▶ Rated-Curr 34 100 A	34	100

Factory Default: 100 A **100**

This is very importance parameter that must be set correctly. This value is referenced in many of other inverter parameters. (See motor nameplate)

FU2▶ Noload-Curr 35 30A	35	30

Factory Default: 30 A **30**

If this value is not right, check the current after operating in V/F mode without load connected and enter that current value.

Note: make sure to use correct value for FU2-35 [Motor No-load Current]. Otherwise, Sensorless performance may be degraded.

Note: Preset motor parameters may differ with user motors. In this case, enter the nameplate value of your motor to the corresponding parameters. If motor rating exceeds inverter capacity, unsatisfactory control performance may result because all other control parameters follow inverter capacity.

Motor rated slip freq [Hz]=(Rated input freq. [Hz] – (Motor rpm * P/120)
P: Number of motor poles

(Ex) In the case of 60Hz, 4 pole, 1730 rpm motor
Motor rated slip freq [Hz]= (60[Hz]-(1750[rpm] * 4/120))
=60[Hz]-58.67[Hz]=1.33[Hz]

FU2-38: Gain for Motor Speed Display

FU2▶ RPM factor 38 100 %	38	100

Factory Default: 100 % **100**

This code is used to change the motor speed display to rotating speed (r/min) or mechanical speed (m/min). The display is calculated by following equation.

Rotating speed (r/min) = 120 * F / P,
Where, F=Output frequency, P= motor pole number

Mechanical speed (m/min) = Rotating speed * Motor RPM Display Gain [FU2-38]

FU2-60: Control mode selection

FU2▶Control mode 60 V/F	60	0

Factory Default: V/F **0**

Selects the control mode of the inverter

FU2-40 setting	LCD Display	Description
	V/F	V/F Control
	Slip compensation	Slip compensation
	Sensorless	Sensorless vector control speed operation

◆ V/F control:
This parameter controls the voltage/frequency ratio constant. It is recommended to use the torque boost function when a greater starting torque is required.
Related function: FU1-47~48 [Torque boost]

◆ Slip compensation:
This function is used to maintain constant motor speed. To keep the motor speed constant, the output frequency varies within the limit of slip frequency set in FU2-33 according to the load current. For example, when the motor speed decreases below the reference speed (frequency) due to a heavy load, the inverter increases the output frequency higher than the reference frequency to increase the motor speed. The inverter increases or decreases the output by delta frequency shown below.

Delta freq (Slip Comp. Freq.) = Motor Rated slip * (Output current - Motor No load current) / (Motor rated current - Motor No load current)
Output freq = Reference freq + Delta freq

Most suitable motor capacity corresponding inverter capacity is set as factory setting, but the following parameters can be adjusted if necessary.

FU2-31~35 [Motor related parameters for Slip Compensation]

Code	LCD Display	Description
FU2-31	Motor select	Select motor capacity
FU2-32	Pole number	Number of Motor Pole
FU2-33	Rated-Slip	Motor rated slip (Hz)
FU2-34	Rated-Curr	Motor rated current (rms)
FU2-35	Noload-Curr	Motor no load current (rms)

Note: Incorrectly set FU2-35 [Motor No-load Current] value may weaken the Sensorless control.

◈ Sensorless (Sensorless vector speed control) operation:

Use it when high starting torque is needed at low speed load fluctuation is high rapid response is needed. To use this function, set FU2-31~35 [Motor parameters] and FU2-40 [Control mode select] properly.
Set "Yes" in FU2-61 [Auto tuning] first before using this control.

Related parameters: FU2-42~43, FU2-45~46

Code	LCD display	Parameter
FU2-42	RS	Stator resistance
FU2-43	Lsigma	Leakage inductance
FU2-45	SL P-gain	Sensorless P gain
FU2-46	SL I-gain	Sensorless I gain

[Guide for Optimal Use of Sensorless Vector Control]

For optimal use of the sensorless control, the following conditions should be met. If one of the following conditions is not satisfied, the inverter may malfunction due to insufficient torque, irregular rotation, or excessive motor noise. In this case, it is recommended to use V/F control.

- Use a motor capacity that is equal to or one horsepower level lower than the inverter capacity.
- Set appropriate values for the electronic thermal function, the overload limit function and the stall prevention. The set values should exceed 100% of the rated motor current.
- When DRV–04 [Frequency Mode] is set to "V1", "I", or "V1+I", wiring should be conducted to eliminate potential noise influence with the frequency reference.
- Pole number of the motor should be 2 pole, 4 pole, or 6 pole.
- The distance between the inverter and the motor should not exceed regulation distance

[Cautions on Sensorless Vector Control]

- Forced-cooling should be used for the motor when the average operating speed is under 20Hz and more than 100% load is used constantly.
- Motor may rotate 0.5% faster than the maximum speed if the motor temperature does not reach normal operating temperature.
- Utilize the auto-tuning feature when the motor reaches normal temperature (average temperature where the motor normally operates).
- Overcurrent trip may occur if FU2-43 [Stator resistance] is set twice more than auto-tuned value.

[Detail Tuning Method for Sensorless Vector Control]

- Adjust the FU2–35 [No Load Motor Current (RMS)] value larger or smaller by 5% units if the current is larger or smaller than that of V/F control under small load.
- Adjust the FU2–33 [Rated Motor Slip] value larger or smaller by 5% units if the speed is faster or slower than that of V/F control with rated load.

FU2-42~44: Auto tuning

FU2► Auto tuning 42 NO	42	NO

Factory Default: NO	NO

All of the motor parameters can be tuned by setting "YES (1)". Auto tuning is deactivated when "No (0)" is selected.

The Auto Tuning function automatically measures the motor parameters, e.g., stator resistance, %Rs, leakage inductance, %Lsigma, required for the control so that the control method selected in the FU2-40 [Select Control Mode] can perform properly.

Since the %impedance concept is applied instead of the [Ohm, mH] expression of conventional inverters, the tabulation according to the motor capacity setting is not required. Though a little error is included, the average motor constant is applied as the default value. It is recommended to perform Auto Tuning to improve the performance of the Sensorless mode.

[Parameter display based on Inverter capacities]

Motor parameters	
Rs	**Lsigma**
X.XX% 초기 값(1.90%)	X.X% 초기 값(12.0%)

FU2-45: P Gain for Sensorless Control
FU2-46: I Gain for Sensorless Control

FU2► SL P-gain 45 600	45	600

Factory Default: 600	600

SL P-gain is the proportional gain of speed controller. If this value is set high, you can get fast speed response characteristic. However, if this value is set too high, the steady state characteristics may become unstable. Set the proper value for your application.

FU2► SL I-gain 46 4	46	4

Factory Default: 4	4

SL I-gain is the integral gain of speed controller. If this value is set low, you can get better transient response characteristic and steady state characteristic. However, if this value is set too low, there may be an overshoot in speed control.

Note: The response time of a system is affected by the load inertia.

The initial value is set up. Unless specially required, the set up value supports proper performance of the Sensorless mode.

FU2-47: Torque Boost in Forward Direction
FU2-48: Torque Boost in Reverse Direction

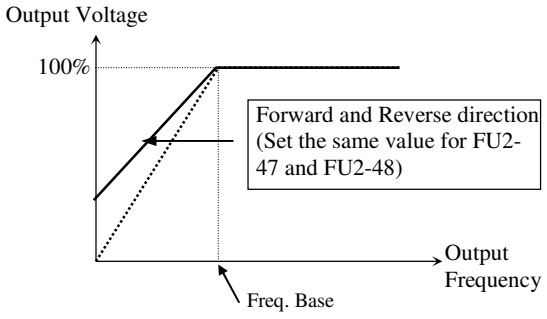
FU2► Fwd boost 47 1.0 %	47	1.0

Factory Default: 1.0 %	1.0

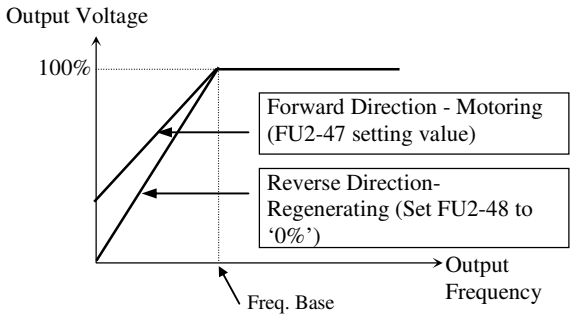
FU2► Rev boost 48 1.0 %	48	1.0

Factory Default: 1.0 %	1.0

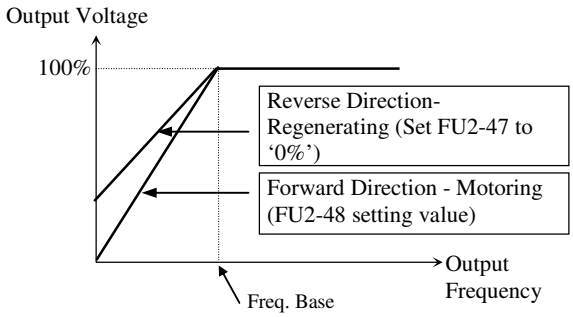
This function is used to increase the starting torque at low speed by increasing the output voltage of the inverter. If the boost value is set too high than required, it may cause the motor flux to saturate, causing over-current trip. Increase the boost value when there is excessive distance between inverter and motor.



[Constant Torque Loads: Conveyor, Moving Equip. etc.]



[Ascending and Descending Loads: Parking, Hoist etc.]



[Ascending and Descending Loads: Parking, Hoist etc.]

Related Functions: FU1-40 [Volts/Hz Pattern]
FU2-40 [Control Mode selection]

FU2-80: Power On Display

FU2▶PowerOn disp 80 0	80	0

Factory Default: 0 **0**

This code selects the parameter to be displayed first on keypad (DRV-00) when the power is turned on.

Setting Range	Description
0	DRV-00 [Command Frequency]
1	DRV-01 [Acceleration Time]
2	DRV-02 [Deceleration Time]
3	DRV-03 [Drive Mode]
4	DRV-04 [Frequency Mode]
5	DRV-05 [Step Frequency 1]
6	DRV-06 [Step Frequency 2]
7	DRV-07 [Step Frequency 3]
8	DRV-08 [Output Current]
9	DRV-09 [Motor Speed]
10	DRV-10 [DC link Voltage]
11	DRV-11 [User Display selected in FU2-81]
12	DRV-12 [Fault Display]

FU2-81: User display selection

FU2▶ User Disp 81 Voltage	81	0

Factory Default: 0 **0**

Related Function: DRV-11 [User display selection]
Select the display as shown below.

FU2-81	Name	Description
Voltage	Output voltage	Display output voltage of the inverter (Factory setting)
Watt	Output power	Display output power of the inverter

Note: The displayed value of "Watt" is approximate value.

FU2-82: Software Version

FU2▶ S/W Version 82 Ver X.X	82	X.X

Factory Default: Ver. X.X **X.X**

Displays the software version. This will vary depending on software version integrated.

FU2-83, 84, 85: Last Trip Time, On-time, Run-time

FU2▶LastTripTime 83 0:00:00:00:00	83	00.00

Factory Default: 0:00:00:00:00 **00.00**

Displays time elapsed after last trip occurs.
Note: it is reset automatically upon trip occurs.

FU2▶ On-time 84 0:00:00:00:00	84	00.00

Factory Default: 0:00:00:00:00 **00.00**

Displays time after Power is turned ON.
Note: it is not reset automatically.

FU2▶ Run-time 85 0:00:00:00:00	85	00.00

Factory Default: 0:00:00:00:00	00.00

Displays time for inverter to be run.

Note: it is not reset automatically.

FU1-83~85 display→ X : XX : XX : XX : XX

(Year:Month:Day:Hour:Minute)

FU2-91: Parameter Read
FU2-92: Parameter Write

FU2▶ Para. read 91 --- No ---	91	NO

Factory Default: No	NO

FU2▶ Para. write 92 --- No ---	92	NO

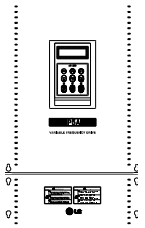
Factory Default: No	NO

This is useful for programming multiple inverters to have same parameter settings. The LCD keypad can read (upload) the parameter settings from the inverter memory and can write (download) them to other inverters. This function is only available with LCD keypad.

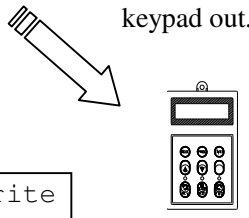
Note: Perform FU2-95 [Parameter save] first before FU2-91 [Parameter Read].

1) Set FU2-91 to "Yes" and press Enter key to read the parameters.

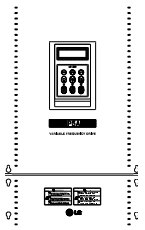
```
FU2▶ Para. read
91  ---  Yes ---
```



2) Take the LCD keypad out.



```
FU2▶ Para. write
92  ---  Yes ---
```



3) Install it to the subject inverter and set FU2-92 to "Yes" and press Enter to download the parameters.

FU2-93: Parameter Initialize

FU2► Para. init 93 No	93	0

Factory Default: No 0

This is used to initialize parameters back to the factory default values. Each parameter group can be initialized separately.

Note: Set FU2-40~46 [Motor parameters] again after this function.

Note: Parameter initialize cannot clear trip information. Instead, use FU2-06 [Erase trips].

Setting Range	Description
No	Displayed after initializing is finished.
All Groups	All parameter groups initialized to factory default value.
DRV	Only Drive group initialized.
FU1	Only Function 1 group initialized.
FU2	Only Function 2 group initialized.
I/O	Only Input/Output group initialized.
CEL	Only External group initialized.

FU2-94: Parameter Lock

FU2► Para. lock 94 0	94	0

Factory Default: 0 0

This function is used to lock the parameters from being changed. When the parameters are locked, the display arrow changes from solid to dashed line. The lock and unlock code is '12'.

FU2-95: Parameter Save (Manual Save)

FU2► Para. save 95 No	95	0

Factory Default: 0 0

When FU2-95 is set to "Yes", the changed parameter value is saved into memory.

6.4 Input/Output Group [I/O]

I/O-00: Jump to Desired Code

I/O► Jump code 00 1

Factory Default: 1

Jumping directly to any parameter code can be accomplished by entering the desired code number. This code is available only with LCD keypad.

I/O-01 ~ I/O-05: Analog Voltage Input (V1) Signal Adjustment

This is used to adjust the analog voltage input signal when the frequency is referenced by the control terminal 'V1'. This function is applied when DRV-04 is set to 'V1' or 'V1+I'. Reference frequency versus Analog voltage input curve can be made by four parameters of I/O-02 ~ I/O-04.

Code	Factory Default	Setting Range
I/O-01	10 [msec]	0~9999 [msec]
I/O-02	0 [V]	0 ~ 12 [V]
I/O-03	0 [Hz]	0 ~ Max Freq
	0 [**]	0 ~ 100.00 [**]
I/O-04	10 [V]	0 ~ 12 [V]
I/O-05	60 [Hz]	0 ~ Max Freq
	0 [**]	0 ~ 100.00 [**]

I/O► V1 filter 01 10 ms	01	10

Factory Default: 10 ms 10

This is the filtering time constant for V1 signal input. Increase this value if the V1 signal is affected by noise causing unstable operation of the inverter. Increasing this value makes response time slower.

I/O► V1 volt x1 02 0.00 V	02	0.00

Factory Default: 0.00 V 0.00

This is the minimum voltage of the V1 input at which inverter outputs minimum frequency.

I/O▶ V1 freq y1 03 0.00 Hz	03	0.00

Factory Default: 0.00 Hz	0.00

This is the inverter output minimum frequency (or target value) when there is the minimum voltage (I/O-02) on the V1 terminal.

I/O▶ V1 volt x2 04 0.00 V	04	10.00

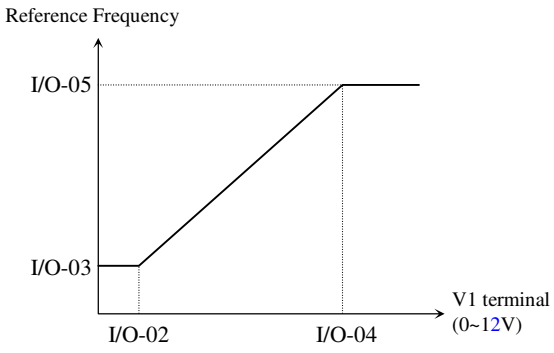
Factory Default: 10.00 V	10.00

This is the maximum voltage of the V1 input at which inverter outputs maximum frequency.

I/O▶ V1 freq y2 05 60.00 Hz	05	60.00

Factory Default: 60.00 Hz	60.00

This is the inverter output maximum frequency (or target value) when there is the maximum voltage (I/O-03) on the V1 terminal.



[Reference Frequency vs Analog Voltage Input (0 to 12V)]

I/O-06 ~ I/O-10: Analog Current Input (I) Signal Adjustment

This is used to adjust the analog current input signal when the terminal 'I' references the frequency. This function is applied when DRV-04 is set to 'I', or V1+I'. Reference frequency versus Analog current input curve can be made by four parameters of I/O-07 ~ I/O-10. User-selected Unit appears in [**]. To change the unit, more than one in APP-02 [PID operation selection] and APP-80 [Ext. PID operation selection] is set to "Yes" and then select the desired unit Percent, Bar, mBar, kPa, and Pa among in I/O-87 [I user unit selection].

Code	Default	Setting
I/O-06	10 [msec]	0~9999 [msec]
I/O-07	4 [mA]	0 ~ 20 [mA]
I/O-08	0 [Hz]	0 ~ Max freq
		0~100.00[**]
I/O-09	20[mA]	0 ~ 20 [mA]
I/O-10	60[Hz]	0 ~ Max freq
		0~100.00[**]

I/O▶ I filter 06 10 ms	06	10

Factory Default: 10 ms	10

This is the filtering time constant for 'I' signal input. If the 'I' signal is affected by noise causing unstable operation of the inverter, increase this value. Increasing this value makes response time slower.

I/O▶ I curr x1 07 4.00 mA	07	4.00

Factory Default: 4.00 mA	4.00

This is the minimum current of the 'I' input at which inverter outputs minimum frequency.

I/O▶ I freq y1 08 0.00 Hz	08	0.00

Factory Default: 0.00 Hz	0.00

This is the inverter output minimum frequency (or target value) when there is minimum current (I/O-07) input on the 'I' terminal.

I/O▶ I curr x2 09 20.00 mA	09	20.00

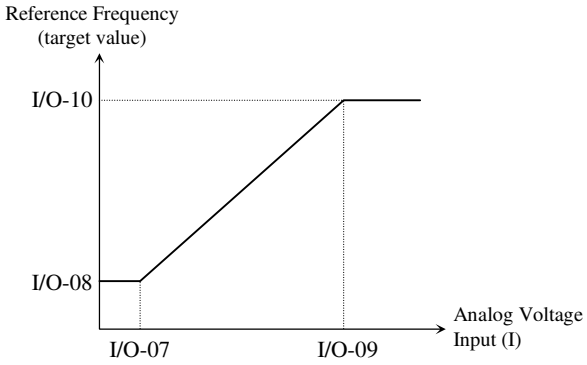
Factory Default: 20.00 mA	20.00

This is the maximum current of the 'I' input at which inverter outputs maximum frequency.

I/O▶ I freq y2 10 60.00 Hz	10	60.00

Factory Default: 60.00 Hz	60.00

This is the inverter output maximum frequency (or target value) when there is the maximum current input (I/O-09) on the 'I' terminal.



[Reference Frequency vs Analog Current Input (4 to 20mA)]

I/O-11, 12, 13: Criteria for Analog Input Signal Loss

I/O▶ Wire broken 11 None	11	0

Factory Default: None	0

I/O▶Lost command 12 None	12	0

Factory Default: None	0

I/O▶ Time out 13 1.0 sec	13	1.0

Factory Default: 1.0 sec	1.0

This is to set the criteria for analog input signal loss when DRV-04 [Frequency Mode] is set to 'V1', 'V1S' 'I', 'V1+I' or 'Pulse'. However, for "V1+I", main speed is V1 so inverter does not respond when I signal is missing. Following table shows the setting value.

Setting Range	Description
None	Disabled.
half of x1	The inverter determines that the frequency reference is lost when the analog input signal is less than half of the minimum set value (I/O-02, I/O-07).
below x1	The inverter determines that the frequency reference is lost when the analog input signal is less than the minimum set value (I/O-02 or I/O-07).

I/O-12 [Operating method after loss of analog freq. command] selects the operation after determining the loss of frequency reference.
The following table shows the selection in I/O-12.

Setting Range	Description
None	Continuous operating after loss of frequency reference.
FreeRun	Inverter cuts off its output after determining loss of frequency reference.
Stop	Inverter stops by its Decel pattern and Decel time after determining loss of frequency reference.

When the analog input signal is lost, inverter displays the following table.

Setting Range	Description
LOV	Loss of analog input signal, V1
LOI	Loss of analog input signal, I
LOA	Loss of pulse reference frequency

I/O-13 [Time out] sets the waiting time before determining the loss of reference signal. Inverter waits to determine the loss of a reference signal until time-out.

Reference frequency can be viewed as Rpm when DRV-16 [Hz/Rpm Display] is set to “rpm”.

I/O-14~28: Programmable Digital Input Terminal ‘M1, M2, M3’, ‘M4’, ‘M5’, ‘M6’, ‘M7’, ‘M8’ Define

I/O▶ M0 define 14 Speed-L	14	0
Factory Default: RST		0
I/O▶ M1 define 15 Ext.Trip1	15	9
Factory Default: Speed-M		1
I/O▶ M2 define 16 FX	16	18
Factory Default: Speed-H		2

□
□
□

Programmable Digital input terminals can be defined for many different applications. The following table shows the various definitions for them.

Code	LCD display	Default	Setting
I/O-14	M0 define	RST	See the table below
I/O-15	M1 define	Ext Trip1	
I/O-16	M2 define	FX	
I/O-17	M3 define	RX	
I/O-18	M4 define	Trans. OHT	
I/O-19	M5 define	Fan Trip	
I/O-20	M6 define	High Voltage	
I/O-21	M7 define	Run_Enable	
I/O-22	M8 define	Control LV	
I/O-23	M9 define	None	
I/O-24	M10 define	None	
I/O-25	M11 define	None	
I/O-26	M12 define	None	
I/O-27	M13 define	None	
I/O-28	M14 define	BX	

Note: BX is Emergency Stop key. Parameter setting is disabled when BX is ON.

Selection of M0, M1, M2 M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13, M14 in I/O-14~28

Setting Range	Description
Speed-L	Multi-step speed - Low
Speed-M	Multi-step speed - Mid
Speed-H	Multi-step speed - High
XCEL-L	Multi-accel/decel - Low
XCEL-M	Multi-accel/decel - Mid
XCEL-H	Multi-accel/decel - High
Up	Up drive
Down	Down drive
3-Wire	3 wire operation
Ext Trip1	External trip1
Ext Trip2	External trip2
LOC/REM	Exchange between Drv-03, 04 and Drv-91, 92
Analog hold	Hold the analog input signal
XCEL stop	Disable Accel and Decel
Speed-X	Additional Step frequency selection
Reset	Reset
BX	BX (Emergency stop)
JOG	Jog
FX	Forward Run/Stop
RX	Reverse Run/Stop
Ana Change	Analog input Switch-over
Door Open	Panel Door Open Trip
Trans.OHW	Transformer OverHeat Warning
Trans.OHT	Transformer OverHeat Trip
Motor OHT	Motor OverHeat Trip
Fan Trip	Fan Trip
High Voltage	High Voltage Input
Run Enable	Run Enable Selection
None	Disabled

I/O-29~30: Terminal Input Status

I/O► In status 29 00000000000	29	0000..

Factory Default: 00000000000 **0000..**

I/O► In status 30 0000	30	0000

Factory Default: 00000000000 **0000**

I/O-29 provides the information on the 11 less significant bits and I/O-30 provides information on the more significant bits.

[LCD Keypad Display]

Input T/M	M10	M9	M8	M7	M6	M5	M4	M3	M2	M1	M0
	10 bit	9 bit	8 bit	7 bit	6 bit	5 bit	4 bit	3 bit	2 bit	1 bit	0 bit
OFF status	0	0	0	0	0	0	0	0	0	0	0
ON status	1	1	1	1	1	1	1	1	1	1	1

Input T/M	M14	M13	M12	M11
	14 bit	13 bit	12 bit	11 bit
OFF status	0	0	0	0
ON status	1	1	1	1

I/O-31: Programmable Digital Input Terminal filter time constant

I/O► Ti Filt Num 31 15 ms	31	15

Factory Default: 15 ms **15**

Set the responsiveness of input terminals M1-M14. It is effective when noise level is high. Increasing this will make response time slower and decreasing faster.

Note: Set it higher than 100msec at Inverter-commercial line exchange operation. This will be useful to prevent chattering and momentary malfunction.

I/O-32~33: Normal Open/Close Selection

I/O► Jog freq 30 10.00 Hz	30	10.00

Factory Default: 10.00 Hz **10.00**

This code sets the jog frequency. See I/O-31~42, DRV-05~ 07 for details.

Input T/M	M10	M9	M8	M7	M6	M5	M4	M3	M2	M1	M0
	10 bit	9 bit	8 bit	7 bit	6 bit	5 bit	4 bit	3 bit	2 bit	1 bit	0 bit
NO status	0	0	0	0	0	0	0	0	0	0	0
NC status	1	1	1	1	1	1	1	1	1	1	1

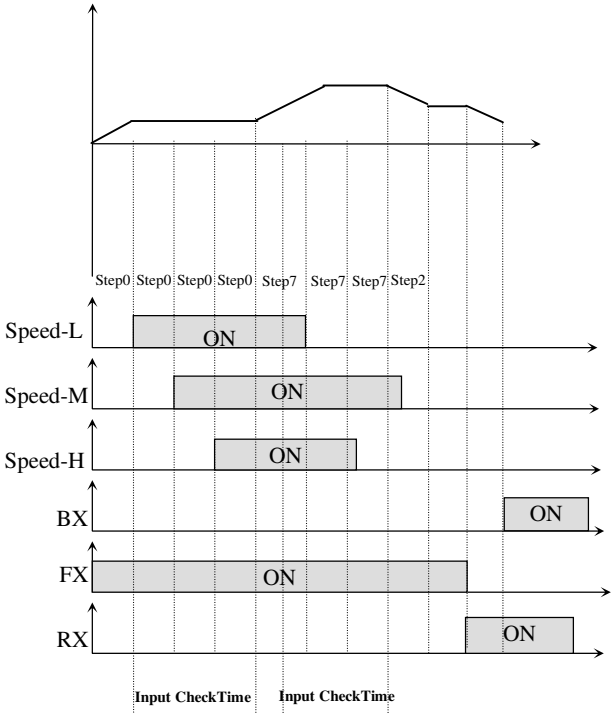
Input T/M	M14	M13	M12	M11
	14 bit	13 bit	12 bit	11 bit
NO status	0	0	0	0
NC status	1	1	1	1

I/O 32 selects the input contact type of the 11 less significant bits between Normal Open(A contact) or Normal Close(B contact). The 4 more significant bits select the input contact type at I/O 33 between Normal Open(A contact) or Normal Close(B contact).

I/O-34: Input Check Time

I/O▶ In CheckTime 34 1ms	34	1

Factory Default: 1ms **1**



I/O-35: FDT (Frequency Detection) Level
I/O-36: FDT Bandwidth

I/O▶ FDT freq 35 30.00 Hz	35	30.00

Factory Default: 30.00 Hz **30.00**

I/O▶ FDT band 36 10.00 Hz	36	10.00

Factory Default: 10.00 Hz **10.00**

These functions are used in I/O-37-44 [Programmable Digital Auxiliary Output Terminal]. See [FDT-#] in I/O-37~44.

I/O-37~44: Programmable Digital Auxiliary Contact Output mode 1, 2, 3, 4, 5, 6, 7, 8 define (AXAT-AXCT)

I/O▶ Aux mode1 37 Ready	37	Ready

Factory Default: None **Ready**

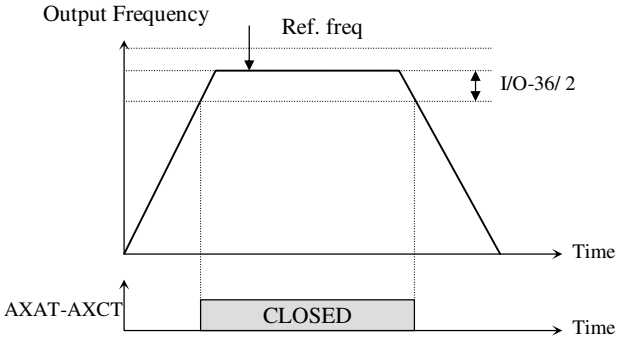
The auxiliary contact works (Close) when the defined condition has occurred.

Setting Range	Description
None	None
FDT-1	Output frequency arrival detection
FDT-2	Specific frequency level detection
FDT-3	Frequency detection with pulse
FDT-4	Frequency detection 1 with contact closure
FDT-5	Frequency detection 2 with contact closure
OL	Overload detection
IOL	Inverter overload detection
Stall	Stalling
OV	Over voltage detection
LV	Low voltage detection
OH	Inverter overheat detection
Lost Command	Lost command detection
Run	Inverter running detection
Stop	Inverter stop detection
Steady	Steady speed detection
Ssearch	Speed search mode detection
Ready	Inverter ready detection
Warning	Warning
FAN RUN	FAN RUN
NORMAL	Drive enable(CAN Mode)
OCT	Over Current Trip
Cell ByPass	Bypass state
Run_MV	Run signal during Bypass state

[FDT-1]

When the output frequency reaches the reference frequency (target frequency), AXAT-AXCT terminal is CLOSED.

Detecting Condition: Value (Ref. Freq-Output Freq)<= Freq Detection Bandwidth (I/O-36)/2



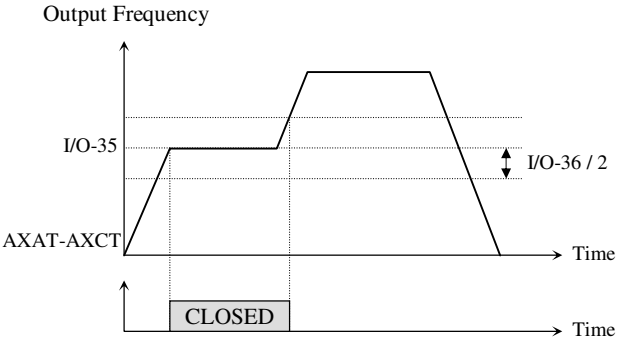
[AXAT-AXCT configured as 'FDT-1']

***AXAT: A1~A8, AXCT: C1~C8**

[FDT-2]

AXAT-AXCT is CLOSED when the reference frequency is in I/O-36 [FDT Bandwidth] centered on I/O-35 [FDT Frequency], and the output frequency reaches I/O-36 centered on I/O-35.

Detecting Condition: FDT-1 condition & (Value (Output Freq- Freq Detection)<= Freq Detection Bandwidth (I/O-36)/2)

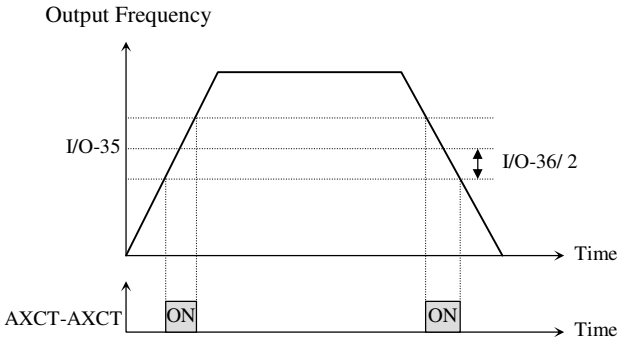


[AXAT-AXCT configured as 'FDT-2']

[FDT-3]

AXAT-AXCT is CLOSED when the output frequency reaches the band centered on the FDT frequency. The output is OPENED when the output frequency goes outside the FDT bandwidth centered on the FDT frequency.

Detecting Condition: Value (Freq Detection (I/O-35)- Output Freq)<= Freq Detection Bandwidth (I/O-36)/2



[AXAT-AXCT configured as 'FDT-3']

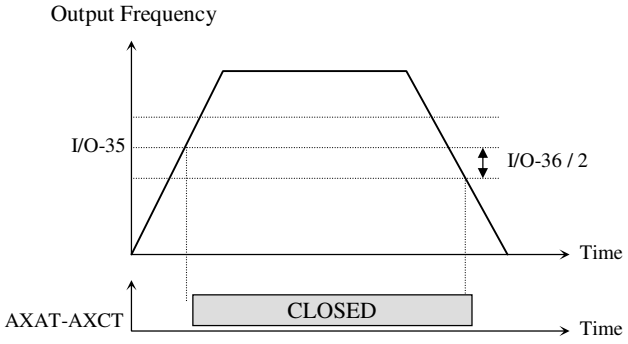
[FDT-4]

AXAT-AXCT is CLOSED when the output frequency reaches the FDT frequency. The output is OPENED when the output frequency goes below the FDT bandwidth centered on the FDT frequency.

Detecting Condition:

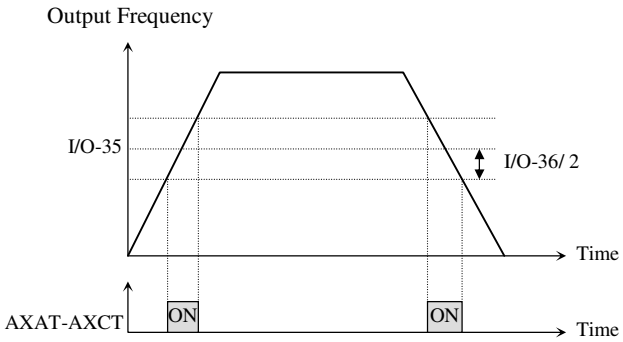
During Accel: Output freq >= Freq Detection

During Decel: Output freq > (Freq Detection (I/O-35) - Freq Detection Bandwidth (I/O-36)/2)



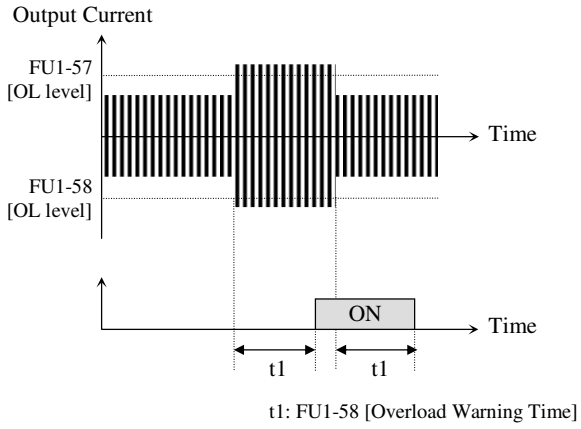
[AXAT-AXCT configured as 'FDT-4']

[FDT-5]
This is the inverted output of [FDT-4].
Detecting Condition:
During Accel: Output freq >= Freq Detection
During Decel: Output freq > (Freq Detection (I/O-35) - Freq Detection Bandwidth (I/O-36)/2)



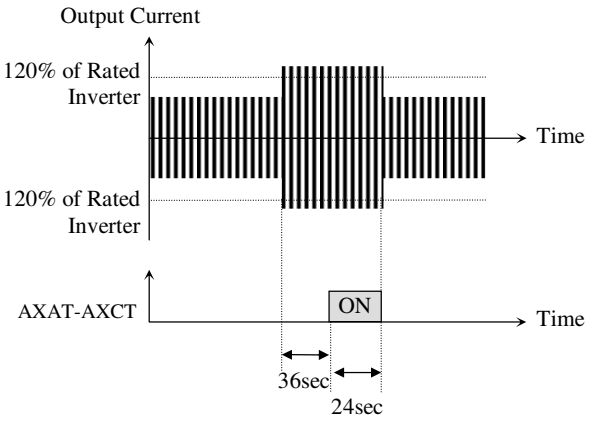
[AXAT-AXCT configured as 'FDT-5']

[OL]
AXAT-AXCT is CLOSED when the output current has reached the FU1-57 [Overload Warning Level] for the FU1-58 [Overload Warning Time].



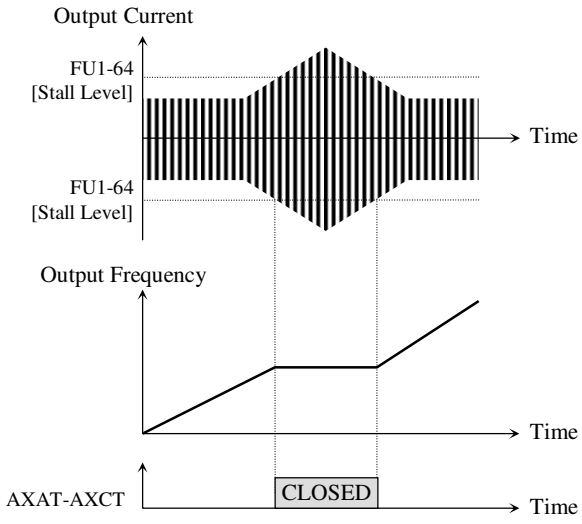
[AXAT-AXCT configured as 'OL']

[IOL]
AX-CX is CLOSED when the output current is above the 120% of rated inverter current for 60 seconds. If this situation is continued for one minute, the inverter will cut off its output and displays 'IOL' (Inverter overload) Trip. See the nameplate for the rated inverter current.



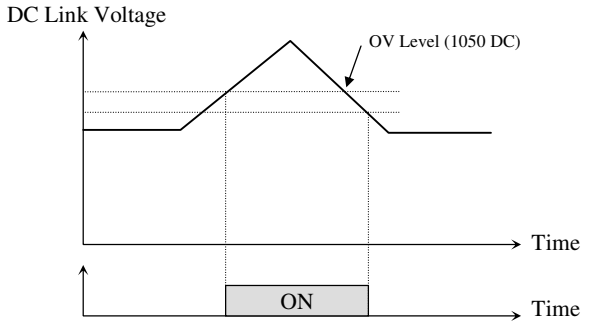
[AXAT-AXCT configured as 'IOL']

[Stall]
AXAT-AXCT is CLOSED when the inverter is on the stall prevention mode.



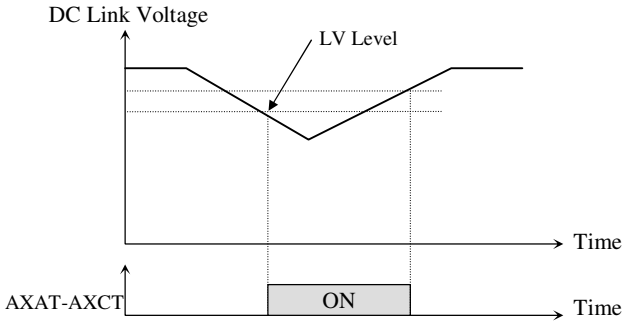
[AXAT-AXCT configured as 'Stall']

[OV]
AXAT-AXCT is CLOSED when the DC link voltage is above the Over-voltage level.



[AXAT-AXCT configured as 'OV']

[LV]
AXAT-AXCT is CLOSED when the DC link voltage is below the Low-voltage level.



[AXAT-AXCT configured as 'LV']

[OH]
AXAT-AXCT is CLOSED when the heat sink of the inverter is above the reference level.

[Lost Command]
AXAT-AXCT is CLOSED when frequency reference is lost.

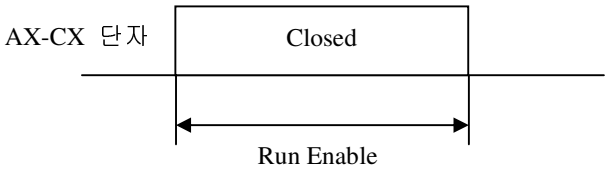
[Run]
AXAT-AXCT is CLOSED when the inverter is running.

[Stop]
AXAT-AXCT is CLOSED when the inverter is stopped.

[Steady]
AXAT-AXCT is CLOSED when the inverter is running at constant speed.

[Speedsearch]
AXAT-AXCT is CLOSED during the inverter is speed searching.

[Ready]
AXAT-AXCT is CLOSED when the inverter is ready to run.



[Warning]
AXAT-AXCT is CLOSED when the inverter is Transformer Overheat Warning.

[FAN RUN]
AXAT-AXCT is CLOSED during the inverter is High Voltage(I/O 15 ~ 28) ON and Ready status.

[Normal]
AXAT-AXCT is CLOSED during the inverter is Run enable status.

[OCT]
AXAT-AXCT is CLOSED during the inverter is Over Current Trip status.

I/O-45: Terminal Output Status

I/O► Out status	45	0000..
45 00000000000		

Factory Default: 00000000000 **0000..**

Input T/M	30AT ~30CT	AUX 4	AUX 4	AUX 4	AUX 4	AUX 4	AUX 3	AUX 2	AUX 1
	8 Bit	7 Bit	6 Bit	5 Bit	4 Bit	3 Bit	2 Bit	1 Bit	0 Bit
OFF status	0	0	0	0	0	0	0	0	0
ON status	1	1	1	1	1	1	1	1	1

I/O-46: Fault Output Relay (30AT,30BT,30CT)

I/O▶ Relay mode	46	10
46 10		

Factory Default: 10 **10**

This function is used to allow the fault output relay to operate when a fault occurs. The output relay terminal is 30AT, 30BT, 30CT where 30AT-30CT is a normally open contact and 30BT-30CT is a normally closed contact.

Bit	Setting	Description
Bit 0 (LV)	0	Fault output relay does not operate at 'Low voltage' trip.
	1	Fault output relay operates at 'Low voltage' trip.
Bit 1 (Trip)	0	Fault output relay does not operate at any fault.
	1	Fault output relay operates at any fault except 'Low voltage' and 'BX' (inverter disable) fault.

When several faults occurred at the same time, Bit 1 has the first priority. (Active order: Bit 0->Bit 1)

I/O-47~48: Fault Relay On/Off Delay Time

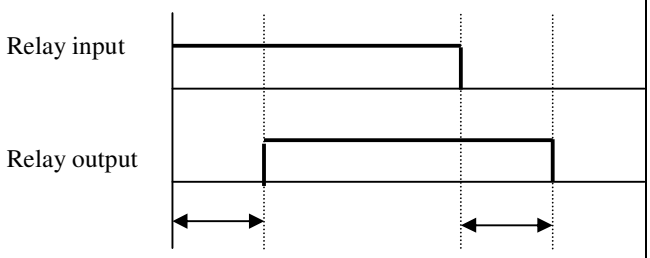
I/O▶ Relay On	47	0.0
47 0.0 sec		

Factory Default: 0.0 sec **0.0**

I/O▶ Relay Off	48	0.0
48 0.0 sec		

Factory Default: 0.0 sec **0.0**

Fault relay output is delayed for the set time and it is turned ON/OFF after the set time.



I/O-49~56: DAO_A, DAO_B, DAO_C, DAO_D Terminal

I/O▶ SDA A read	49	NONE
49 NONE		

Factory Default: 0000 **0000**

I/O▶ SDA A Shift	50	100
50 100%		

Factory Default: 10 **10**

I/O▶ SDA B read	51	NONE
51 NONE		

Factory Default: 0000 **0**

I/O▶ SDA B Shift	52	100
52 100%		

Factory Default: 10 **10**

I/O▶ SDA 1 read	53	0
53 None		

Factory Default: None **0**

I/O▶ SDA 1 Shift	54	10
54 10		

Factory Default: 10 **10**

I/O▶ SDA 2 read	55	0
55 None		

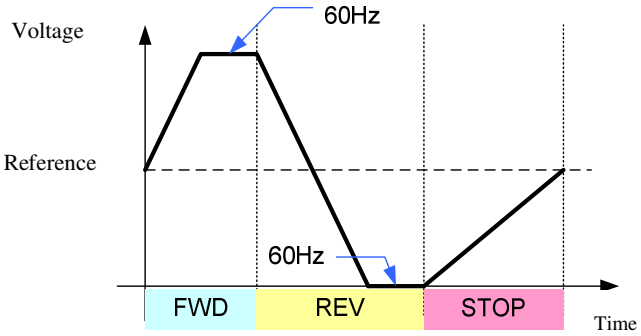
Factory Default: None **0**

I/O▶ SDA 2 Shift	56	10
56 10		

Factory Default: 10 **10**

The 4 kinds of the inverter information can be monitored via the SDA A, SDA B, SDA1, and SDA2 terminals. Selecting desired item in this code will output analog voltage through the SDA A, SDA B, SDA 1, and SDA 2 terminals. The output voltage of the SDA A, SDA B, SDA 1, and SDA 2 terminals is 0~10V. In case of graduation error when connecting with a meter, the error can be corrected using the SDA A, SDA B, SDA 1, SDA 2 terminal shift.

The output voltage of the SDA A and SDA B terminals is analog 0~10V. Since the reference voltage is 0V, (–) value cannot be expressed.
The output voltage of the SDA1 and SDA 2 terminals is analog 0~10V. Since the reference voltage is 5V, (–) values can be expressed.
If the factory setting of the SDA A and SDA B is 0000, the output of the SDA A is at the inverter output frequency by Output voltage = (inverter output frequency/MaxFreq) * 10[V]. SDA B outputs current during operation and its output voltage is [inverter output current/(rated inverter current*1.2)]*10[V].



I/O-57~69: JOG and Step Frequency4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

I/O▶ Jog Freq 57 10.00 Hz	57	10.00
Factory Default: 40.00 Hz		10.00
I/O▶ Step freq-4 58 40.00 Hz	58	40.00
Factory Default: 40.00 Hz		40.00
☐ ☐ ☐		
I/O▶ Step freq-15 69 30.00 Hz	69	30.00
Factory Default: 30.00 Hz		30.00

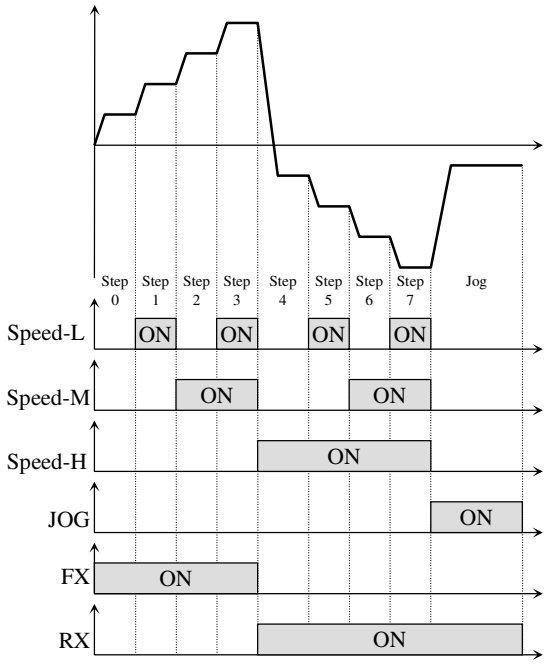
The step frequencies are determined by the combination of M1, M2 and M3 terminals as shown in the following table.

Code	Step speed Frequency	Spd-X	Spd-H	Spd-M	Spd-L	JOG
DRV-00	S. Freq-0 (Zero Spd)	0	0	0	0	0
I/O-57	Jog Freq	X	X	X	X	1
DRV-05	S. Freq-1 (Spd 1)	0	0	0	1	0
DRV-06	S. Freq-2 (Spd 2)	0	0	1	0	0
DRV-07	S. Freq-3 (Spd-3)	0	0	1	1	0
I/O-58	S. Freq-4 (Spd-4)	0	1	0	0	0
I/O-59	S. Freq-5 (Spd-5)	0	1	0	1	0
I/O-60	S. Freq-6 (Spd-6)	0	1	1	0	0
I/O-61	S. Freq-7 (Spd-7)	0	1	1	1	0
I/O-62	S. Freq-8 (Spd-8)	1	0	0	0	0
I/O-63	S. Freq-9 (Spd-9)	1	0	0	1	0
I/O-64	S. Freq-10 (Spd-10)	1	0	1	0	0
I/O-65	S. Freq-11 (Spd-11)	1	0	1	1	0
I/O-66	S. Freq-12 (Spd-12)	1	1	0	0	0
I/O-67	S. Freq-13 (Spd-13)	1	1	0	1	0
I/O-68	S. Freq-14 (Spd-14)	1	1	1	0	0
I/O-69	S. Freq-15 (Spd-15)	1	1	1	1	0

0: OFF, 1: ON, X: Ignored (Jog first)
Speed-L: Lowest bit in Multi-Step speed input
Speed-M: Middle bit in Multi-Step speed input
Speed-H: High bit in Multi-Step speed input
Speed-X: Highest bit in Multi-Step speed input
Note 1: 'Speed 0' is set in DRV-04.

DRV-04 Data	DRV-00 Speed 0	Freq source
Keypad-1	Digital Freq Ref	Keypad
Keypad-2	Digital Freq Ref	Keypad
V1	Analog Freq Ref.	Terminal
I	Analog Freq Ref.	Terminal
V1+I	Analog Freq Ref.	Terminal
Pulse	Pulse Freq Ref.	Terminal
Int. 485	Communication	Terminal

♣ Setting example
M1=Speed-L, M2=Speed-M, M3=Speed-H, M4=Jog
M5=BX, M7=FX, M8=RX
Step speed is to be set in DRV-05~06, I/O-37~69



[Multi-Step Frequency Operation]

I/O-70~83: 1st~7th Accel/Decel Time

I/O▶ Acc time-1 70 60.0 sec	70	60.0
Factory Default: 60.0 sec		60.0

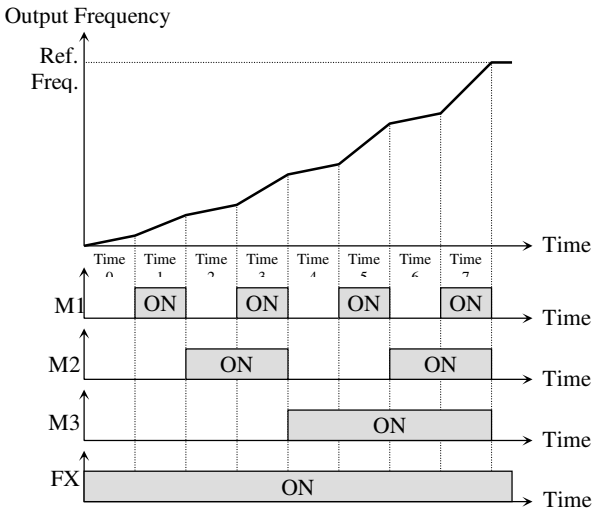
I/O▶ Dec time-1 71 180.0 sec	71	180.0
Factory Default: 180.0 sec		180.0

□
□
□

[XCEL-L, XCEL-M, XCEL-H]
By setting M1, M2 and M3 terminals to 'XCEL-L', 'XCEL-M' and 'XCEL-H' respectively, up to 8 different Accel and Decel times can be used. The Accel/Decel time is set in DRV-01 ~ DRV-02 and I/O-70 ~ I/O-83.
The Accel/Decel time is determined by the combination of M1, M2 and M3 terminals as shown in the following table.

Parameter Code	Accel/Decel Time	XCEL-H (M3)	XCEL-M (M2)	XCEL-L (M1)
DRV-01	Accel Time-0	0	0	0
DRV-02	Decel Time-0			
I/O-70	Accel Time-1	0	0	1
I/O-71	Decel Time-1			
I/O-72	Accel Time-2	0	1	0
I/O-73	Decel Time-2			
I/O-74	Accel Time-3	0	1	1
I/O-75	Decel Time-3			
I/O-76	Accel Time-4	1	0	0
I/O-77	Decel Time-4			
I/O-78	Accel Time-5	1	0	1
I/O-79	Decel Time-5			
I/O-80	Accel Time-6	1	1	0
I/O-81	Decel Time-6			
I/O-82	Accel Time-7	1	1	1
I/O-83	Decel Time-7			

0: OFF, 1: ON



[Multi-Accel/Decel Time Operation]

I/O-84~89: Frequency command setting via pulse

I/O▶ P pulse set 84 (A)	84	1
Factory Default: (A)		1
I/O▶ P filter 85 10 msec	85	10
Factory Default: 10 msec		10
I/O▶ P pulse x2 88 10.00 KHz	88	10
Factory Default: 10.0 KHz		10.0
I/O▶ P pulse y2 89 60.00 Hz	89	60.00
Factory Default: 60.00 Hz		60.00

Set the frequency command from control terminal EN_AT, EN_BT. It is settable when DRV-04 [Frequency mode] is set to "Pulse".

Code	Factory setting	Setting range
I/O-84	(A)	(A), (A)+(B)
I/O-85	10 [msec]	0 ~ 9999 [msec]
I/O-86	0 [KHz]	0 ~ 10 [KHz]
I/O-87	0 [Hz]	0 ~ Max frequency
	0 [**]	0 ~ 100.00[**]
I/O-88	10 [KHz]	10 ~ 100 [KHz]
I/O-89	60 [Hz]	0 ~ Max frequency
	0 [**]	0 ~ 100.00[**]

Note: Do not apply pulse to both EN_AT, EN_BT terminals when I/O-84 set value is A.

Pulse information

T/N	Default	Setting range
EN_AT	A Pulse Input	High: +3~+12V Max Low: +2.5V Max Max Input Freq.: 100KHz
EN_BT	B Pulse Input	High: +3~+12V Max Low: +2.5V Max Max Input Freq.: 100KHz

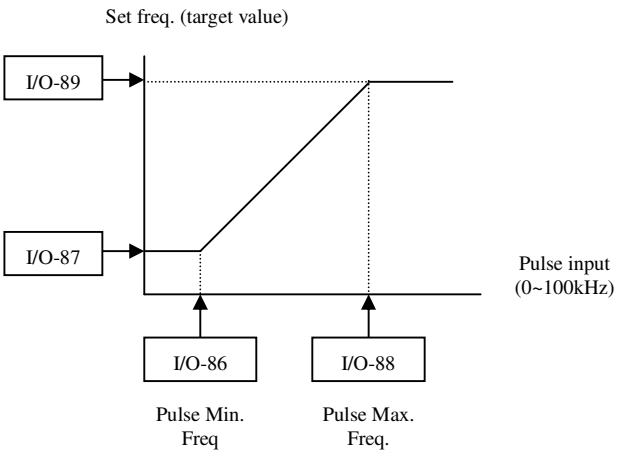
Note: Use Open Collector type encoder for Pulse input with Max. 12 V Power supply.

Code	LCD Display	Description
I/O-84	P Pulse Set	Set one of the frequency setting input method either A or A+B.
I/O-85	P filter	Set the embedded filter constant for P Pulse input.
I/O-86	P Pulse x1	Set the Minimum frequency for P Pulse input.
I/O-87	P freq y1	Set the output frequency corresponding to P Pulse input minimum frequency (I/O-86).
	P [**] y1	Set the target value corresponding to P Pulse input minimum frequency (I/O-86)
I/O-88	P Pulse x2	Set the Maximum frequency for P Pulse input.
I/O-89	P freq y2	Set the output frequency corresponding to P Pulse input Maximum frequency (I/O-15).
	P [**] y2	Set the target value corresponding to P Pulse input maximum frequency (I/O-15)

Note: Increase filter time constant when the noise interference deteriorates stable operation. Increasing that makes response time slower.
Note: When setting P Pulse Input Min/Max Freq. via motor encoder, set the value for encoder pulse as the following;

EX) To give 60Hz (1800 rpm) command from 1000 Pulse encoder

I/O-88 [Max Freq of P Pulse Input]=Rated rpm/60 sec * Number of Encoder Pulse
= 1800 [rpm]/60[sec]*1000=3000Hz,
Therefore, set I/O-88 to 3.0KHz



I/O-90, 91: Inverter Number, Baud Rate
I/O-92, 93: Operation method when communication signal is lost, Communication Time Out
I/O-94: Communication Delay Time
I/O-99: FAN off Delay Time

I/O▶ Inv No. 90 1	90	1
Factory Default: 1		1
I/O▶ Baud rate 91 38400 bps	91	38400
Factory Default: 9600 bps		3
I/O▶ COM Lost Cmd 92 None	92	0
Factory Default: None		0
I/O▶ COM Time Out 93 1.0 sec	93	1.0
Factory Default: 1.0 sec		1.0
I/O▶ Delay Time 94 5	94	5
Factory Default: 5 ms		5
I/O▶ UPS OFF Dly 98 600[sec]	98	600
Factory Default: 600		600
I/O▶ FAN offDly 99 600.0[sec]	99	600.0
Factory Default: 600.0[sec]		600.0

I/O-90 [Inverter Number] sets the inverter ID to perform RS485 communication with PC. I/O-91 [Baud rate] sets the communication speed. To make the multi-drop system, connect the terminal S+ and S- to CM.
I/O-92, 93 are only displayed when DRV-03 [Drive mode] or DRV-04 [Frequency mode] is set to "Int. 485".
In this case, the LCD display shows "LOR".
I/O-93 [Communication time out] determines whether the signal is lost.

Three types of operating method described on the table below are settable after loss of communication signal.

Setting Range	Description
None	Continuous operation after loss of communication signal.
FreeRun	Inverter cuts off its output after determining loss of communication signal.
Stop	Inverter stops by its Decel pattern and Decel time after determining communication signal.

I/O-94 setting is for communication using 232-485 converter. It should be set properly according to 232-485 converter specification.

I/O-95 setting is for FAN off time after inverter shut down.

6.5 CELL Group [CEL]

CEL-00: Jump to Desired Code

CEL▶ Jump code	
00 1	

Factory Default: 1	1

Jumping directly to any parameter code can be accomplished by entering the desired code number. This code is available only with LCD keypad.

CEL-01: CAN Mode Status

I/O▶ Can mode	01	0
01 Compare mode		

Factory Default: Compare mode	0

LCD Display	Description
Setting mode	CAN Communication Setting Mode Status.
Compare mode	CAN Communication Compare Mode.
Normal mode	Mode CAN Communication Normal Mode
Fault mode	Mode CAN Communication Fault Mode
Lsigma mode	Lsigma Mode (Auto tunning)
Senless mode	Sensorless Mode (Sensorless)

Note : CAN mode is not user settable. It appears automatically according to the communication mode.

CEL-02: Number of Cell Stair

CEL▶ Total Stair	02	6
02 6		

Factory Default: 6	6

Each cell of high voltage inverter has default number of layers.

CEL-03: Number of Cell Max Stair

CEL▶ Max Stair	03	6
03 6		

Factory Default: 6	6

CEL-04~06: U, V, W Phase CAN Communication Status

CEL▶ U CAN Status	04	00000000
04 00000000		

Factory Default: 00000000	00000000

□
□
□

CEL▶ W CAN Status	06	00000000
06 00000000		

Factory Default: 00000000	00000000

EX) In case of U-phase cell fails to communicate with the master, as the maximum number of layers is 6, the LCD will show followings.

CEL▶ W CAN Status	06	000111111
06 00111111		

CEL-07~09: U, V, W Phase Protection Status

CEL▶ W ProtStatus	07	00000000
07 00000000		

Factory Default: 00000000	00000000

□
□
□

CEL▶ W ProtStatus	09	00000000
09 00000000		

Factory Default: 00000000	00000000

EX)) In case of the 5th layer of the W-phase cell failure, the LCD will show followings.

CEL▶ W ProtStatus	09	00010000
09 00010000		

CEL-10: CELL Setting

CEL▶ Go Setting 10 No	10	No

Factory Default:	No	No

If the bypass setting is Yes, the maximum No. of cell [CEL-03] is reduced by the maximum value bypassed in U, V, W phases, and the cells in the U, V, W phases are arranged by the number of the largest layer.

EX) If the #1 and #3 cells in the U-phase are bypassed, CEL – 11 [U-phase bypass] status is indicated and the maximum No. of layer is changed from [CEL-03] to 4. Then, the 2 cells of V and W phases are bypassed leaving 4 layers.

Code	Function	Display
CEL-03	Max Stair	6
CEL-11	U_phase bypass	00000101
CEL-12	V_phase bypass	00000000
CEL-13	W_phase bypass	00000000

Bypass status of U,V,W phase before setting Go to yes

Code	Function	Display
CEL-03	Max Stair	4
CEL-11	U_phase bypass	00000101
CEL-12	V_phase bypass	00000101
CEL-13	W_phase bypass	00000101

Bypass status of U,V,W phase before setting Go to yes

CEL-11~13: U, V, W Bypass Setting

CEL▶ BPU 87654321 11 00000000	11	00000000

Factory Default:	00000000	00000000

CEL▶ BPV 87654321 12 00000000	12	00000000

Factory Default:	00000000	00000000

CEL▶ BPW 87654321 13 00000000	13	00000000

Factory Default:	00000000	00000000

Shows the bypass status of U, V, W phase.
If bypassed, '1' is indicated.

CEL-16~18: U, V, W Bypass Status

CEL▶ U Bypass St 16 00000000	16	00000000

Factory Default:	00000000	00000000

CEL▶ V Bypass St 17 00000000	17	00000000

Factory Default:	00000000	00000000

CEL▶ W Bypass St 18 00000000	18	00000000

Factory Default:	00000000	00000000

Shows the bypass status of U, V, W phase. If bypassed, '1' is indicated.

CEL-21, 23, 25 : U,V,W Uper_Stair Status
CEL-22, 24, 26 : U,V,W Lower_Stair Status

CEL▶ U_Uper_Stair 21 0000	21	0000

Factory Default:	0000	0000

This code displays each layer of the hardware cell of the upper cell in U-phase after bypass. Here, the criteria between upper and lower is 4 of each cell.

CEL▶ U_Lowe_Stair 22 0000	22	0000

Factory Default:	0000	0000

This code displays each layer of the hardware cell of the upper cell in U-phase after bypass. Here, the

criteria between upper and lower is 4 of each cell.

- □
- □
- □

CEL▶ W_Lowe_Stair 26 0000	26	0000

Factory Default: 0000	0000

CEL-30: Bypass Mode Selection

CEL▶ BypassMode 30 NO	30	NO

Factory Default: NO	NO

LCD Display	Description
NO	User Selection
ManualBypass	In case of certain failure cases [(NTC Open or Fuse Open of cell fault), Can Error], pressing Reset Key in the Master will cause automatic bypass..
Auto-Bypass	In case of certain failure cases [(NTC Open or Fuse Open of cell fault), Can Error], bypass will occur after 2 seconds automatically without user intervention to maintain

If used with FU2-25 RESET START function, restarting after automatic trip of after failure is possible.

CEL-35: Bypass Restoration

CEL▶ All Back 35 NO	35	NO

Factory Default: NO	NO

CHAPTER 7 - TROUBLESHOOTING & MAINTENANCE

7.1 Fault Display

After the faults are occurred, the alarm is activated by protective function and the LCD loader provides visual notification of a fault condition by displaying the following fault codes.

7.1.1 Fault codes displayed on master controller

- Fault codes displayed on master controller are as shown below.
- Master controller indicates [Cell Fault] which all of the faults are occurred on Cell as following fault codes at 1.1.2.

Protective Function	LCD Loader Text	Description
Overcurrent	Output OCT	The inverter disables its output when the current exceeds 140% of the rated current.
Cell Overvoltage Protection	DC-Link OVT	The inverter disables its output if the one of DC_Link voltage of Cells exceeds the rated value.
AC Input Overvoltage Protection	Input OVT	The inverter disables its output when the AC input of transformer exceeds 120% of the rated voltage.
AC Input Lowvoltage Protection	Input LVT	The inverter disables its output when the AC input of transformer is less than 70%.
Current Limit Protection (Overload Protection)	Over Load	The Inverter disables its output if the output current exceeds the continuous current rating (OLT level) for a prolonged period of time (OLT time).
Transformer Overheat	Trans Over Heat	The inverter disables its output if the transformer reaches its overtemperature threshold because of cooling fan failure or air flow obstructed by debris.
Cell Overheat	CELL OverHeat	The inverter disables its output if heatsink temperature of each cell is more than 75 ℃ by receiving the temperature through communication.
Cell Fault	Cell Fault	The master disables its output if the one of cell has a fault. (Overvoltage, Lowvoltage, NTC Open, FuseOpen, Overcurrent, ArmShort, Overheat)
Electronic Thermal	E-Thermal	The drive internal Motor Electronic Thermal Overload operates similar to a motor thermal switch to protect the motor from overheating damage.
External Fault 1	Ext.Trip 1	When External Trip is enabled, the drive will disable its output if an External Trip Signal is detected.
External Fault 2	Ext.Trip 2	
Input Phase Open	InPhase Open	The transformer disables its output when one or more input phase (R, S, and T), is open. The transformer monitors input current to detect an input phase loss.
Output Phase Open	OutPhase Open	The transformer disables its output when one or more output phase (U, V, W), is open. The transformer monitors output current to detect an output phase loss.
BX Protection (Instant Cut Off)	BX	Used for to immediately disable the inverter output and thus cause a coast-to-stop. The inverter instantly disables its output when the BX terminal is turned ON. Inverter returns to normal operation when the BX terminal is turned OFF. ☞ CAUTION: Unexpected motor start will occur when the BX terminal is turned OFF. The user must ensure that automatic start up of the driven equipment will not cause injury to operating personnel or damage to the

Protective Function	LCD Loader Text	Description
		driven equipment. In addition, the user is responsible for providing suitable audible or visual alarms or other devices to indicate that this function is enabled and the drive may start at any moment. Failure to observe this precaution could result in severe bodily injury or loss of life.
Communication Error 1	COM Error CPU Error	Fault trips when communication loss occurs between the LCD loader and the main inverter.
Communication Error 2	CAN Error	The inverter disables its output when communication loss occurs between the master and each cell.
Operating method on loss of speed reference	LOP/ LOV/ LOI/ LOX	When there is a loss of the reference command, one of three methods of operation may be selected in parameter I/O-12: (1) Continue running, (2) Coast stop, (3) Decelerate to a stop.
Inverter Overload	Inv. OLT	The inverter disables its output when the output current exceeds the rated level, (120% for 1 minute).
Ground Fault Protection	Ground Fault	The inverter disables its output when a ground fault is detected. The ground fault trip will occur when the ground current exceeds the ground fault rating for a prolonged period of time.
Fan Failure	FAN Error	The inverter disables its output when the fan has a fault since fan failure can make overheating of transformer and cell.
UPS Control Power Shortage	Control LVT	The inverter disables its output when the UPS capacity is not sufficient to provide the power.

7.1.2 Fault codes displayed on cell

- Fault codes displayed on cell controller are as shown below.

Protective Function	LCD Loader Text	Description
Overcurrent	Over Current 1	The inverter disables its output by sending the fault signal to master when the output current exceeds the rated value.
Cell Overvoltage Protection	Over Voltage	The inverter disables its output by sending the fault signal to master if the DC_Link voltage of cell exceeds the rated value.
Arm Short	Over Current 2	The inverter disables its output by sending the fault signal to master if iGBT of cell has a fault of Arm Short.
Communication Error	Can Rx Error	The inverter disables its output by sending the fault signal to master if cell did not receive the communication signal 3 times continuously. the communication between master and cell is not established
Fuse Open	Fuse Open	The inverter disables its output by sending the fault signal to master if the internal fuse of cell is damaged by Overcurrent.
Transformer Overheat	Trans Over Heat	The inverter disables its output if the transformer reaches its over temperature threshold because of cooling fan failure or air flow obstructed by debris.
NTC Open	NTC open	The inverter disables its output by sending the fault signal to master when the NTC for detecting the temperature of heatsink has a fault.
Lowvoltage Protection	Low Voltage	The inverter disables its output by sending the fault signal to master when the temperature of cell power is lower than rated value. Low voltage can make a torque shortage and overheat motor.

If a problem persists, please contact the factory or your local distributor.

7.2 Fault Remedy

Protective Functions	Possible Cause	Corrective Actions
Over Current	1) Acceleration/Deceleration time is too short for inertia of the load. 2) Inverter rating too low for load requirement. 3) Starting into a rotating load. 4) Output short circuit or ground fault detected. 5) Cooling failure resulting in component overtemperature.	1) Increase Acceleration and/or Deceleration time. 2) Increase inverter capacity. 3) Restart only after motor has come to rest. 4) Check output wiring. 5) Check cooling fan and heatsink. Clean as necessary. (Caution) Operating inverter prior to correcting fault may damage the IGBT.
Ground Fault Current Protection	1) Ground condition occurred at the drive output. 2) Output wiring connection not insulated properly.	1) Check output power wiring for proper connection. 2) Replace the motor.
Over Voltage Protection	1) The deceleration time is too short for inertia of the load. 2) High AC input voltage.	1) Increase deceleration time. 2) Check input line voltage.
Current Limit Protection (Overload Protection)	1) Load is larger than drive rating. 2) Incorrect inverter capacity setting. 3) Incorrect V/F curve setting.	1) Verify load requirements match drive and motor rating. If necessary, increase motor and/or inverter capacity. 2) Select correct inverter capacity. 3) Select correct V/F curve setting.
Overheat	1) Cooling fan failure. 2) Air flow obstructed by debris. 3) Ambient temperature exceeds 40 ℃, (104 °F)	1) Replace cooling fan. 2) Clean heatsink and remove obstructions from air flow channel. 3) Maintain ambient temperature below 40 ℃, (104 °F).
E-Thermal	1) Motor overloaded. 2) Drive and motor not sized correctly for the load. 3) ETH level set too low. 4) Incorrect V/F curve setting. 5) Low motor speed for long time.	1) Reduce driven load. 2) Install correctly rated inverter. 3) Set correct ETH parameter value. 4) Select correct V/F curve. 5) Install externally powered motor cooling fan.
External Trip	1) Open circuit at the External Trip terminal.	1) Determine open circuit condition and correct problem, or disable External Trip function.
Low Voltage Protection	1) Low input line voltage. 2) Electrical loading on the AC supply excessive. (welding machine, motor with high starting current connected to the commercial line) 3) Faulty magnetic switch at the input side of the inverter	1) Check input line voltage, add transformer if necessary. 2) Increase AC input line capacity, or reconnect to alternate branch circuit. 3) Replace magnetic switch.
Output Phase Open	1) Faulty output contactor (if used). 2) Faulty output wiring.	1) Check output contactor operation. 2) Check output wiring
Comm. Error	1) Faulty connection between main inverter and LCD loader. 2) Inverter CPU failure	1) Turn power off, then remove and replace Loader to assure proper connection. 2) Replace drive.
Operating method on loss of speed reference	1) LOP (Loss of reference from option), LOR (loss of reference from remote), LOV (loss of reference from V1), LOI (Loss of reference from I), LOW(Loss of reference from Pulse)	1) Analyze the reference path and resolve reason for signal loss (e.g. broken wire, PLC programming error)
Inverter Overload	1) Load exceeds inverter rating. 2) Incorrect inverter capacity selected.	1) Increase motor and/or inverter capacity. 2) Select correct inverter capacity.

Protective Functions	Possible Cause	Corrective Actions
Control Power Shortage	1) Commercial power source OFF 2) UPS capacity shortage	1) Check the capacity of commercial power source.

☞ Caution: If fault is not cleared after corrective action has been taken, Please contact your sales representative.

7.3 Trouble Shooting

Condition	Checking Point
The Motor Does Not Rotate.	1) Main circuit inspection: Is the input (line) voltage normal? (Is the LED in the inverter is lit?) Is the motor connected correctly? 2) Input signal inspection: Check the operating signal input to the inverter. Check the forward and the reverse signal input simultaneously to the inverter? Check the command frequency signal input to the inverter. 3) Parameter setting inspection: Is the reverse prevention (FU1-01) function set? Is the Drive mode (DRV-03) set correctly? Is the command frequency set to 0? 4) Load inspection: Is the load too large or is the motor jammed? (Mechanical brake) 5) Other: Is the alarm displayed on the keypad or is the alarm LED lit? (STOP LED blinks)
The Motor Rotates in Opposite Directions.	Is the phase sequence of the output terminal U, V, W correct? Is the starting signal (forward/reverse) connected correctly?
The Difference Between the Rotating Speed and the Reference is Too Large.	Is the frequency reference signal correct? (Check the level of the input signal) Is the following parameter setting is correct? Lower Limit Frequency (FU1-34), Upper Limit Frequency (FU1-35), Analog Frequency Gain (I/O-1~10) Is the input signal line influenced by external noise? (Use a shielded wire)
The Inverter Does Not Accelerate or Decelerate Smoothly.	Is the acceleration/deceleration time is set too short a period of time? Is the load too large? Is the Torque Boost (FU2-68, 69) value is too high that the current limit function and the stall prevention function do not operate?
The Motor Current is Too High.	Is the load too large? Is the Torque Boost Value (manual) too high?
The Rotating Speed Does Not Increase.	Is the Upper Limit Frequency (FU1-35) value correct? Is the load too large? Is the Torque Boost (FU1-68, 69) value too high that the stall prevention function (FU1-70, 71) does not operate?
The Rotating Speed Oscillates When the Inverter is Operating.	1) Load inspection: Is the load oscillating? 2) Input signal inspection: Is the frequency reference signal oscillating? 3) Other: Is the wiring too long when the inverter is using V/F control? (over 500m)

7.4 Maintenance

7.4.1 Regular Check List (once/year)

Check Point	Check items	Description
Main Circuit	Entire circuit	Megger Check（between main circuit terminals and ground terminals）
		Loose screw, bolt, or connect
		Thermal trace of parts
		Clean up the panel
	Wiring	Damage or deteriorated cable cover
	Transformer	Normal primary/secondary voltage
	Power Cell	Leakage at smoothing condenser
		Protrusion of the safety valve of the smoothing condenser
		Swelling of smoothing condenser
		Measure static capacity of smoothing condenser
		Loose screw or bolts
		Check main circuit control fuse
		Dust/dirt on heat radiating plate
Control Circuit	Operation	Check protection/indicator circuits
	Relay	Beep sound in operation
		Check timer action time
		Check contact points
	Board	Check abnormal odor or discoloration
		Check power supply
Cooling System	Cooling Fan	Check abnormal vibration or noise
		Check the bearing

7.4.2 MEGGER CHECK (insulation resistance measurement)

1) Measuring the insulation resistance of the inverter primary side

- Use 1000V MEGGER tester.
  Acceptance criteria is 2 MΩ min.
- Since this line is grounded with high resistance for input voltage detection, isolate the ground cable of voltage detection and the detection signal cable to the controller board before measuring the insulation resistance.

2) Measuring the insulation resistance of the inverter secondary side (motor)

- Use 1000V MEGGER tester. Acceptance criteria is 2 MΩ min.
- Since this line is grounded with high resistance for output voltage detection and ground fault detection, isolate the high resistor for voltage detection connected to the output terminal and the power cell output cable before measurement.
  (If the inverter has a secondary panel, open the connector and measure at the secondary panel output)

- Control power input terminal
- I/O terminals of control transformer
- I/O terminal of cooling fan connector
- Screws, bolts, and connectors of control boards
- External I/O terminals

7.4.3 Checking Screws, Bolts, and Connectors

Loose bolts of I/O terminals or loose connectors on boards may cause system malfunction or failure.
At every periodic inspection, check and tighten all the screws, bolts and connectors.
Major check points are as follows;

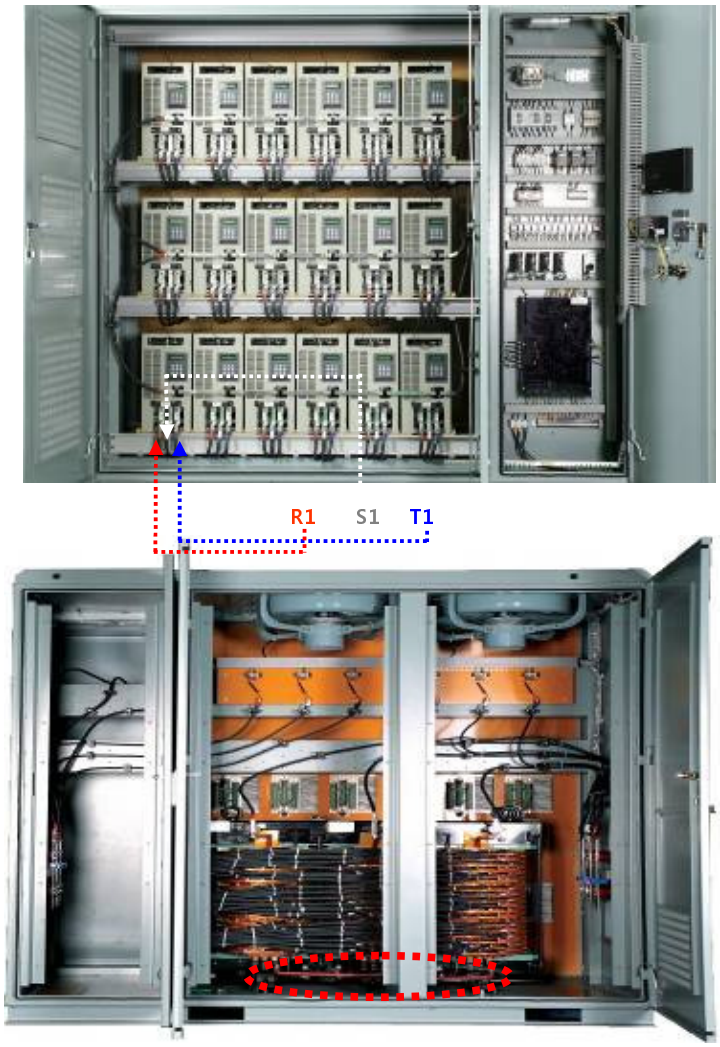
- High voltage I/O terminals
- I/O voltage detector circuit (high resistance part)
- TRANS I/O terminals, primary voltage tap terminals
- TRANS output terminal block
- Power cell I/O terminals, optical fiber cable connectors
- Screws, bolts and connectors of power cell

7.4.4 Transformer Inspection

Inspect the transformer in following method.

- Visual inspection
- Tightness of bolts of the transformer I/O terminals and primary voltage tap
- Measure secondary voltage of transformer

Apply control power and high voltage power and measure the input voltage of the power cell.
With the digital multimeter in AC range, measure input voltage of the power cell between R1, S1, and T1. The acceptance criteria is within ±10% of the rated voltage (AC 630V). If the criteria is exceeded in the whole, adjust the primary voltage tap (changeable by + 10, + 5, or 0%)



TAP Adjustment

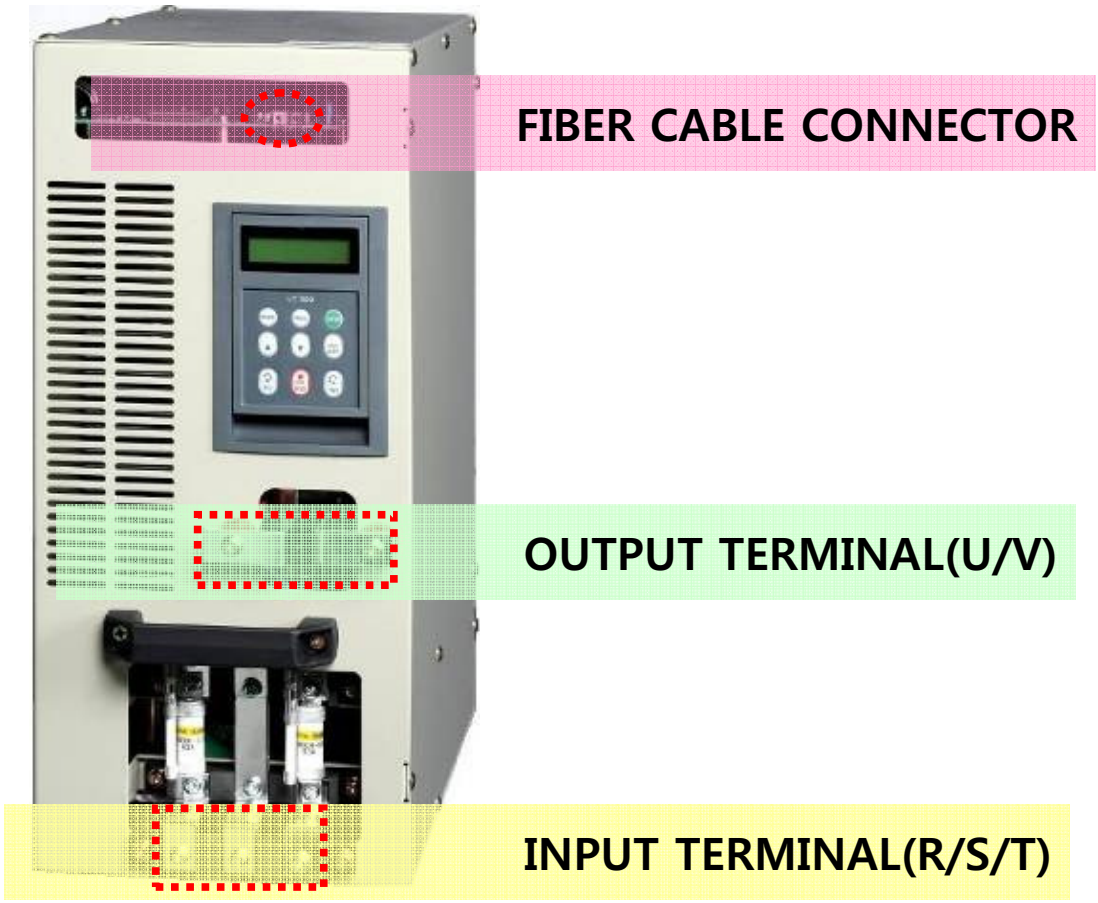
7.4.5 POWER CELL Inspection

Check the power cell in following method.

Visual inspection of power cell.

1) Trace of overheat, such as discoloration
2) Leak, protrusion pr swell of safety valve of smoothing condenser.
3) Loose bolt at input terminals (R/S/T)
4) Loose bolt at output terminals (U/V)
5) Reconnect optical fiber connectors
6) Tighten the screws and bolts of the power cell
7) Check the main circuit fuse and control fuse

8) Check if any discoloration or loose part
9) Clean up heat radiating plate
10) Remove dirt or dust with dry air whose pressure is 39.2 x10^4 ~ 58.8x10^4Pa(4 ~ 6kg.cm^2)



7.4.6 Air Filter Inspection

If the air filter is dirty or clogged, the cooling performance of the **LSMV-6V600** is degraded leading to temperature problem. Check the filter in daily inspection and clean it with neutral detergent if dirty.

7.4.7 Circuit Board Inspection

Perform visual inspection with the controller board for following defects;
1) Discoloration or odor of circuit board
2) Loose screw or connector

7.4.8 Cooling Fan inspection

Check the cooling fan for following defects;
1) Abnormal noise or vibration
2) Loose bolts
3) Motor insulation resistance
   - acceptance criteria is １０ＭΩ or above.
4) Motor bearing
   - Bearing service life is about 10,000 hours.

7.4.9 Parts Replacement

Replace worn parts to maintain proper performance and service life of the LSMV-6V600.

Parts	Standard Life	Action
Cooling Fan	1~2 years （10,000 service hours）	Replace bearing (motor and fan body)
Cell soothing CONDENSOR	5 years	Replace with a new condenser. (determine by inspection）
Fuses	10 years	Replace with a new fuse
Al condenser on the print circuit board	5 years	Replace with a new board (determine by inspection）
Breaker, power fuse	—	Determine by inspection

Warranty

Maker	LS Industrial Systems Co., Ltd.		**Installation (Start-up) Date**	
Model No.	**LSMV -** □□□V□□□-G1		**Warranty Period**	
Customer Information	Name			
	Address			
	Tel.			
Sales Office (Distributor)	Name			
	Address			
	Tel.			

Warranty period is 12 months after installation or 18 months after manufactured when the installation date is unidentified. However, the guarantee term may vary on the sales term.

■ **IN-WARRANTY service information**

If the defective part has been identified under normal and proper use within the guarantee term, contact your local authorized LS distributor or LS Service center.

■ **OUT-OF WARRANTY service information**

The guarantee will not apply in the following cases, even if the guarantee term has not expired.

- Damage was caused by misuse, negligence or accident.
- Damage was caused by abnormal voltage and peripheral devices' malfunction (failure).
- Damage was caused by improper repair or altering by other than LS authorized distributor or service center.
- Damage was caused by an earthquake, fire, flooding, lightning, or other natural calamities.
- When LS nameplate is not attached.
- When the warranty period has expired.

Revision History

No.	Date	Edition	Changes
1	Feburary, 2009	First Release	