Thank you for purchasing LS Variable Frequency Drives!

SAFETY INSTRUCTIONS

- Always follow safety instructions to prevent accidents and potential hazards from occurring.

- In this manual, safety messages are classified as follows:

  ⚠ Warning

  Improper operation may result in serious personal injury or death.

  ⊙ Caution

  Improper operation may result in slight to medium personal injury or property damage.

- Throughout this manual we use the following two illustrations to make you aware of safety considerations:

⚠	• Identifies potential hazards under certain conditions. • Read the message and follow the instructions carefully.
⚡	• Identifies shock hazards under certain conditions. • Particular attention should be directed because dangerous voltage may be present.

- Keep operating instructions handy for quick reference.

- Read this manual carefully to maximize the performance of SV-iG5H series inverter and ensure its safe use.

⚠ Warning

- Do not remove the cover while power is applied or the unit is in operation. Otherwise, electric shock could occur.
- Do not run the inverter with the front cover removed. Otherwise, you may get an electric shock due to high voltage terminals or charged capacitor exposure.
- Do not remove the cover except for periodic inspections or wiring, even if the input power is not applied. Otherwise, you may access the charged circuits and get an electric shock.
- 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 DC 30V). Otherwise, you may get an electric shock.
- Operate the switches with dry hands. Otherwise, you may get an electric shock.
- Do not use the cable when its insulating tube is damaged. Otherwise, you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise, you may get an electric shock.

⊙ Caution

- Install the inverter on a non-flammable surface. Do not place flammable material nearby. Otherwise, fire could occur.
- Disconnect the input power if the inverter gets damaged. Otherwise, it could result in a secondary accident and fire.
- After the input power is applied or removed, the inverter will remain hot for a couple of minutes. Otherwise, you may get bodily injuries such as skin-burn or damage.
- 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 matter into the drive. Otherwise, fire or accident could occur.

OPERATING PRECAUTIONS

(1) Handling and installation

- Handle according to the weight of the product.
- Do not stack the inverter boxes higher than the number recommended.
- Install according to instructions specified in this manual.
- Do not open the cover during delivery.
- Do not place heavy items on the inverter.
- Check the inverter mounting orientation is correct.
- Do not drop the inverter, or subject it to impact.
- Follow your national electrical code for grounding. Recommended Ground impedance for 200 V Class is below 100 ohm and for 400V class below 10 ohm.
- iG5H series contains ESD (Electrostatic Discharge) sensitive parts. Take protective measures against ESD before touching the pcb for inspection or installation.
- Use the inverter under the following environmental conditions:

Environment	Surrounding temperature	- 10 - 50 ℃ (non-freezing)
	Relative humidity	90% RH or less (non-condensing)
	Storage temperature	- 20 - 65 ℃
	Location	Protected from corrosive gas, combustible gas, oil mist or dust
	Altitude, Vibration	Max. 1,000m above sea level, Max. 5.9m/sec2 (0.6G) or less
	Atmospheric pressure	70 - 106 kPa

(2) Wiring

- Do not connect a power factor correction capacitor, surge suppressor, or RFI filter to the output of the inverter.
- The connection orientation of the output cables U, V, W to the motor will affect the direction of rotation of the motor.
- Incorrect terminal wiring could result in the 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, you may get an electric shock or have bodily injury.

(3) Trial run

- Check all parameters during operation. Changing parameter values might be required depending on the load.
- Always apply permissible range of voltage to the each terminal as indicated in this manual. Otherwise, it could lead to inverter damage.

(4) Operation precautions

- When the Auto restart function is selected, stay away from the equipment as a motor will restart suddenly after an alarm stop.
- The Stop key on the keypad is valid only when the appropriate function setting has been made. Prepare an emergency stop switch separately.
- If an alarm reset is made with the reference signal present, a sudden start will occur. Check that the reference signal is turned off in advance. Otherwise an accident could occur.
- Do not modify or alter anything inside the inverter.
- Motor might not be protected by electronic thermal function of inverter.
- Do not use a magnetic contactor on the inverter input for frequent starting/stopping of the inverter.
- Use a noise filter to reduce the effect of electromagnetic interference. Otherwise nearby electronic equipment may be affected.
- In case of input voltage unbalance, install AC reactor. Power Factor capacitors and generators may become overheated and damaged due to potential high frequency noise transmitted from inverter.
- Use an insulation-rectified motor or take measures to suppress the micro surge voltage when driving 400V 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.
- Inverter can easily be set to high-speed operations, Verify capability of motor or machinery prior to operating unit.
- Stopping torque is not produced when using the DC-Break function. Install separate equipment when stopping torque is needed.

(5) Fault prevention precautions

- Provide a safety backup such as an emergency brake which will prevent the machine and equipment from hazardous conditions if the inverter fails.

(6) Maintenance, inspection and parts replacement

- Do not conduct a megger (insulation resistance) test on the control circuit of the inverter.
- Refer to 12.4.2 Periodic inspection (parts replacement).

(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 circuit breaker, a cover or partially open. Never run the inverter like this. Always place the cover with circuit breakers and follow this instruction manual when operating the inverter.

Important User Information

- The purpose of this manual is to provide the user with the necessary information to install, program, start up and maintain the SV-iG5H series inverter.
- To assure successful installation and operation, the material presented must be thoroughly read and understood before proceeding.
- This manual contains.

Chapter	Title	Description
1	Basic information & precautions	Provides general information and precautions for safe use of the SV-iG5H series inverter.
2	Installation & Wiring	Provides instructions on how to install and wiring for power source & signal terminal of SV-iG5H inverter.
3	Basic configuration	Describes how to connect the optional peripheral devices to the inverter.
4	Programming keypad & Basic operation	Illustrates keypad features and display & Provides instructions for quick start of the inverter.
5	Function list	Parameter values are listed.
6	Control block diagram	Shows control flow to help users easily understand operation mode.
7	Basic functions	Provides information for basic functions in the SV-iG5H
8	Advanced functions	Indicates advanced functions used for system application.
9	Monitoring	Gives information on the operating status and fault information.
10	Protective functions	Outlines protective functions of the SV-iG5H.
11	RS 485	Provides specification of RS485 communication.
12	Troubleshooting & maintenance	Defines the various inverter faults and the appropriate action to take as well as general troubleshooting information.
13	Specifications & Option	Gives information on Input/Output rating, control type and more details of the SV-iG5H inverter. Explains options including Remote keypad, Conduit, EMC filter, DB resistor.

Table of Contents

1 Basic information & precautions

1.1 Important precautions

Unpacking and inspection	• Inspect the inverter for any damage that may have occurred during shipping. To verify the inverter unit is the correct one for the application you need, check the inverter type, output ratings on the nameplate and the inverter is intact.


```
SV008iG5H-2
INPUT    200-230V   3 Phase   50/60Hz
         6.6A
OUTPUT 0-Input V    3 Phase
         5.0A         0.1-400Hz
         1.9KVA   (D)
Ser. No 55083270004
Inspected by S . L. Kim
KCC-REM-LSR-SV008i5GH-2
LS'is                    Made in KOREA
```

Inverter Type
Input power rating
Output power rating
Rated output current frequency
Inverter capacity(kVA)
QR code and serial number

| | SV | 075 | | iG5H | - | 2 | |

LS Inverter	Motor rating		Series Name		Volt Range	
	004	0.4 [kW]				
	008	0.75 [kW]			2	Three Phase 200-230[V]
	015	1.5 [kW]				
	022	2.2 [kW]				
	037	3.7 [kW]	iG5H			
	040	4.0 [kW]			4	Three Phase 380-480[V]
	055	5.5 [kW]				
	075	7.5 [kW]				

• Accessories
If you have found any discrepancy, damage, etc., contact your sales representative.

Preparations of instruments and parts required for operation	Instruments and parts to be prepared depend on how the inverter is operated. Prepare equipment and parts as necessary.
Installation	To operate the inverter with high performance for a long time, install the inverter in a proper place in the correct direction and with proper clearances
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 Product Details

Appearance

Status LED Display

RUN button

Front cover:
Removed when
wiring

Bottom cover:
Removed when
wiring input
power and a
motor

STOP/RESET
button

[ENT] button

Inverter
nameplate
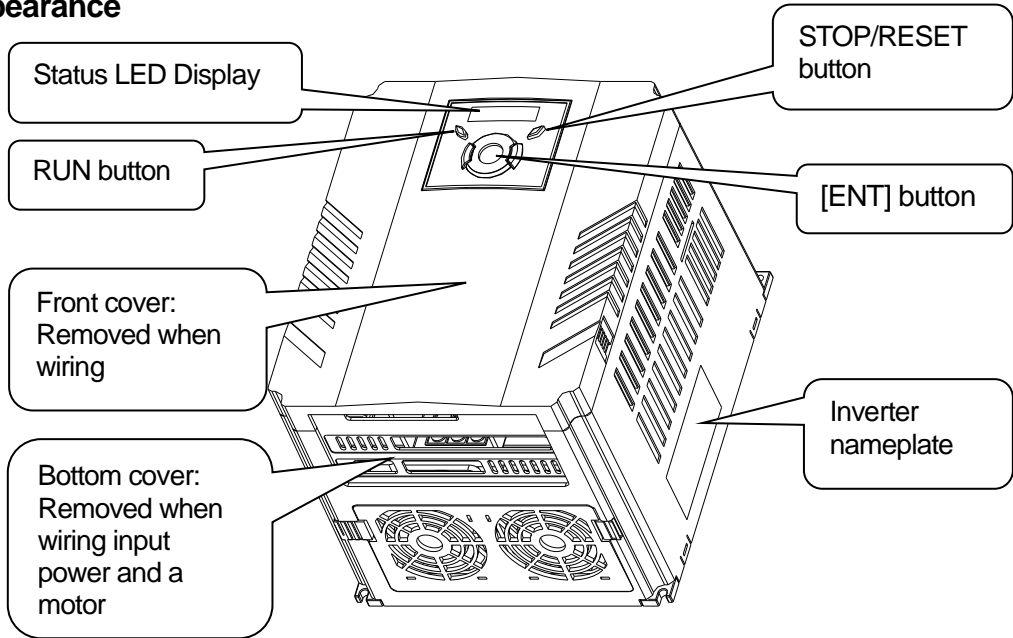
Inside view after front cover is removed

Refer to "1.3 Product assembling & disassembling" for details.

NPN, PNP
Select Switch

Inverter Ground
Terminal

Cooling fan

4-Way button for
parameter setting
(Up/Down/Left/Right)

Control signal
Terminal

Power terminal
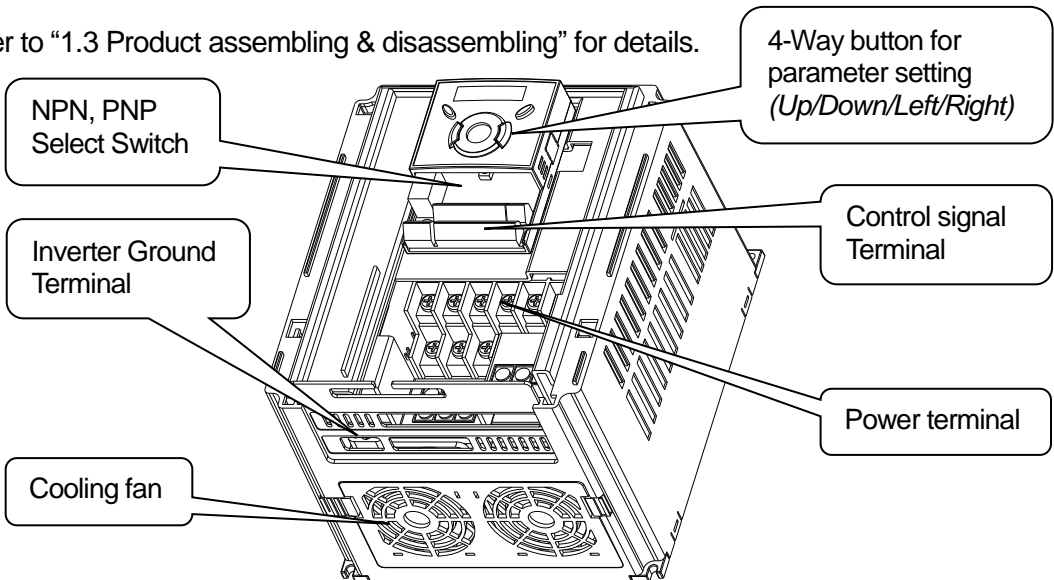
1.3 Product assembling & disassembling

To remove the front cover: Press the both indented sides of the cover lightly and pull up.
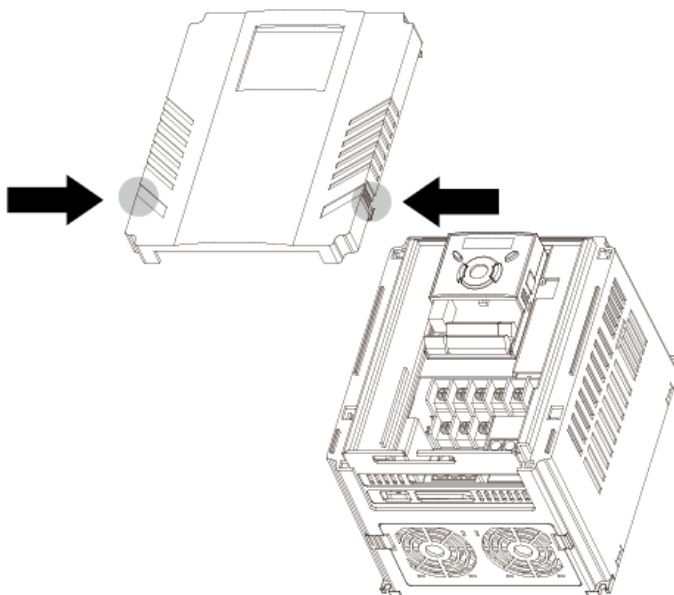
To change the inverter fan: Press the both sides of bottom cover lightly and pull out to your side

.
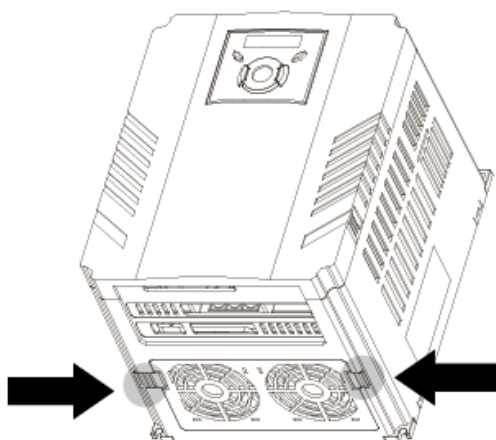
2 Installation & Wiring

2.1 Installation precautions

⊙ Caution

- Handle the inverter with care to prevent damage to the plastic components. Do not hold the inverter by the front cover. It may fall off.
- Install the inverter in a place where it is immune to vibration (5.9 m/s^2 or less).
- Install in a location where temperature is within the permissible range (-10-50 ^{o}C).

<Ambient Temp Checking Location>
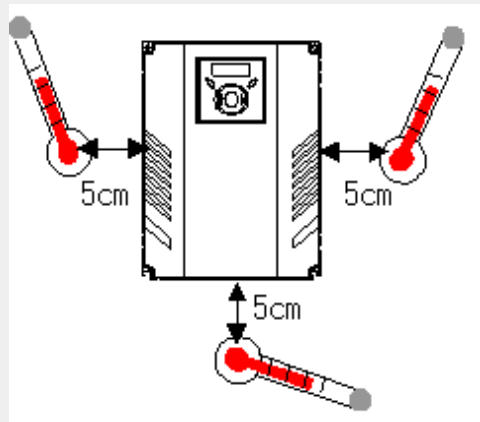
- The inverter will be very hot during operation. Install it on a non-combustible surface.
- Mount the inverter on a flat, vertical and level surface. Inverter orientation must be vertical (top up) for proper heat dissipation. Also leave sufficient clearances around the inverter.

10cm Min

5cm Min

5cm Min

10cm Min

Leave space enough to allow cooled air flowing easily between wiring duct and the unit

Cooling air

Ventilating fan
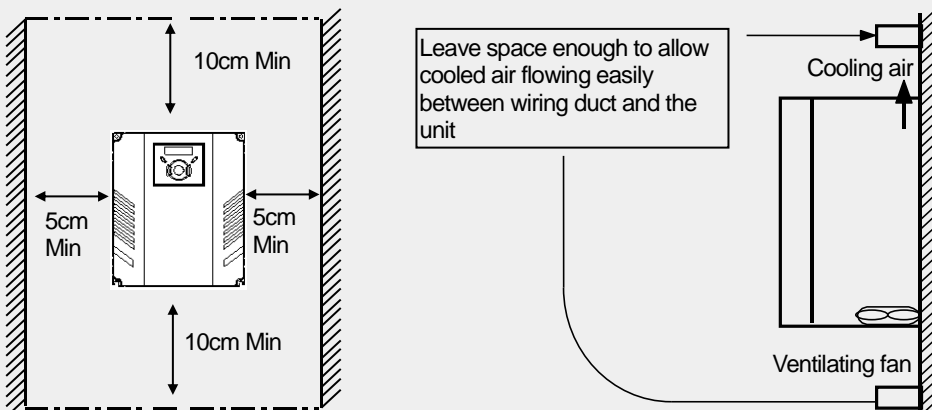
- Protect from moisture and direct sunlight.

- Do not install the inverter in any environment where it is exposed to waterdrops, oil mist, dust, etc. Install the inverter in a clean place or inside a "totally enclosed" panel any suspended matter is not entered.
- When two or more inverters are installed or a cooling fan is mounted in a panel, the inverters and fan must be installed in proper positions with extreme care to keep the ambient temperature below the permissible range.
- Installed the inverter using screws or bolts to insure the inverter is firmly fastened.

< For installing multiple inverters in a panel>
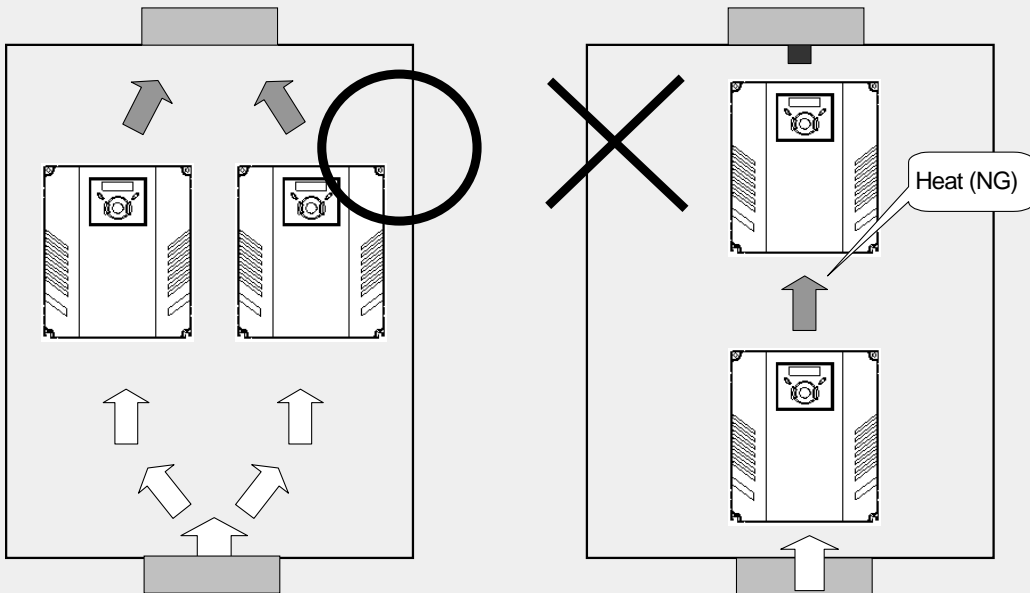
⊘ Caution

Take caution on proper heat ventilation when installing inverters and fans in a panel.
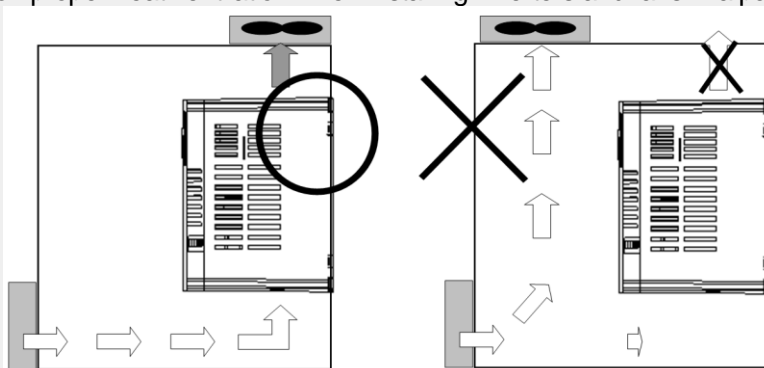
2.2 Dimensions

SV004iG5H-2 / SV008iG5H-2
SV004iG5H-4 / SV008iG5H-4
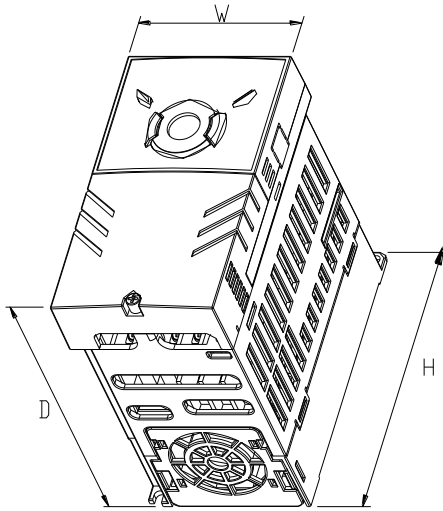
SV015iG5H-2 / SV015iG5H-4
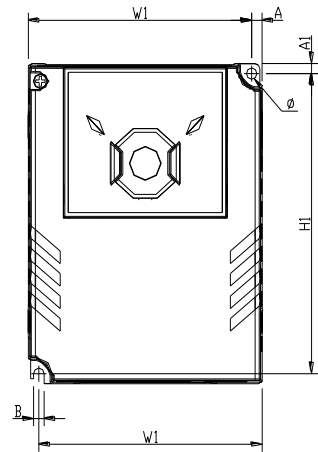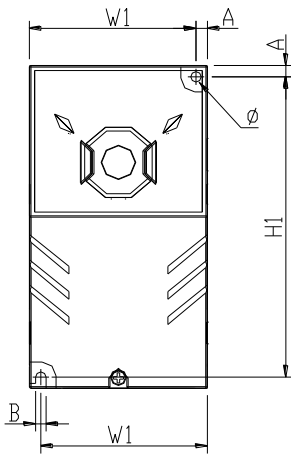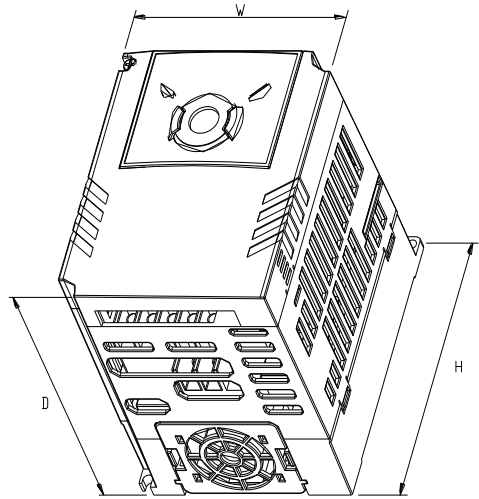
SV022iG5H-2 / SV037iG5H-2 / SV040iG5H-2
SV022iG5H-4 / SV037iG5H-4 / SV040iG5H-4

SV055iG5H-2 / SV075iG5H-2
SV055iG5H-4 / SV075iG5H-4
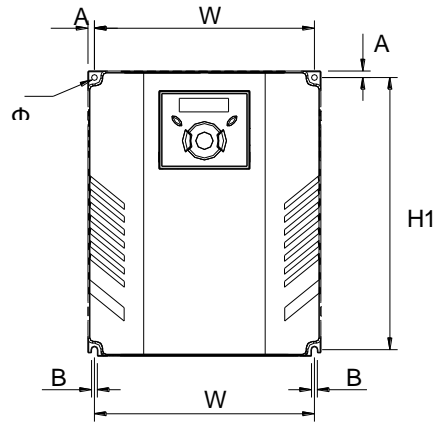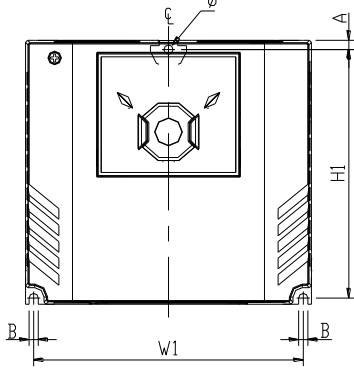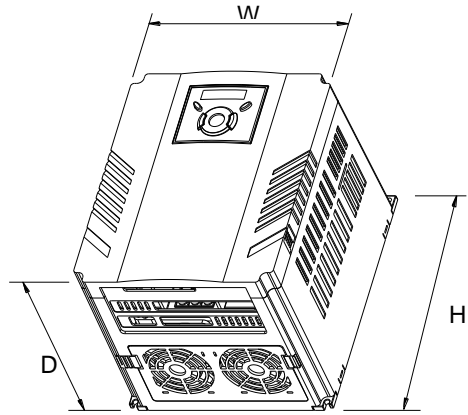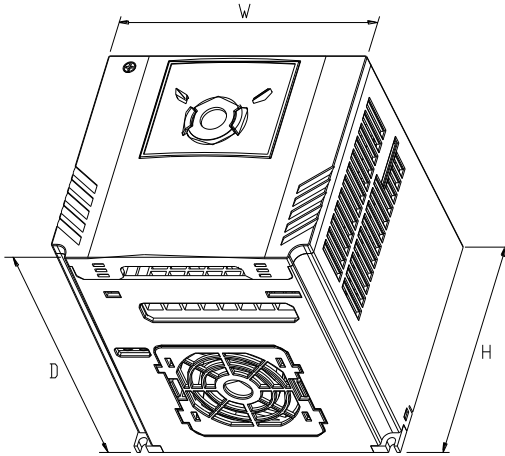
Inverter	[kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ	A [mm]	B [mm]	[Kg]
SV004iG5H-2	0.4	70	65.5	128	119	130	4.0	4.5	4.0	0.76
SV008iG5H-2	0.75	70	65.5	128	119	130	4.0	4.5	4.0	0.77
SV015iG5H-2	1.5	100	95.5	128	120	130	4.5	4.5	4.5	1.12
SV022iG5H-2	2.2	140	132	128	120.5	155	4.5	4.5	4.5	1.84
SV037iG5H-2	3.7	140	132	128	120.5	155	4.5	4.5	4.5	1.89
SV040iG5H-2	4.0	140	132	128	120.5	155	4.5	4.5	4.5	1.89
SV055iG5H-2	5.5	180	170	220	210	170	4.5	5.0	4.5	3.66
SV075iG5H-2	7.5	180	170	220	210	170	4.5	5.0	4.5	3.66
SV004iG5H-4	0.4	70	65.5	128	119	130	4.0	4.5	4.0	0.76
SV008iG5H-4	0.75	70	65.5	128	119	130	4.0	4.5	4.0	0.77
SV015iG5H-4	1.5	100	95.5	128	120	130	4.5	4.5	4.5	1.12
SV022iG5H-4	2.2	140	132	128	120.5	155	4.5	4.5	4.5	1.84
SV037iG5H-4	3.7	140	132	128	120.5	155	4.5	4.5	4.5	1.89
SV040iG5H-4	4.0	140	132	128	120.5	155	4.5	4.5	4.5	1.89
SV055iG5H-4	5.5	180	170	220	210	170	4.5	5.0	4.5	3.66
SV075iG5H-4	7.5	180	170	220	210	170	4.5	5.0	4.5	3.66

2.3 Terminal wiring (Control I/O)

T/M	Description	
24	24V output	
P1	MF input terminal (factory setting)	FX: Forward run
P2		RX: Reverse run
CM	Input signal common	
P3	MF input terminal (factory setting)	BX: Emergency stop
P4		RST: Trip Reset
CM	Input signal common	
VR	10V power supply for potentiometer	
V1	Freq. Setting Voltage signal input: -10~10V	
I	Freq. Setting Current signal input: 0~20mA	
AM	Multi-function analog output signal: 0~10V	
A1	Multi-function relay output terminal	A1 contact output
B1		B1 contact output
C1		A1/B1 contact common
A2	Multi-function relay output terminal	A2 contact output
C2		C2 contact common
S+	RS485 communication terminal	
S-		

For connection to Remote Option or parameter copying
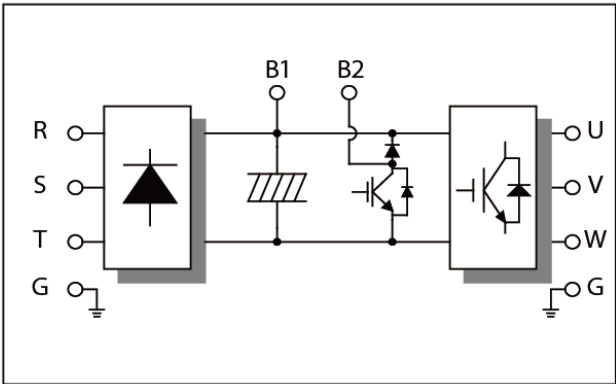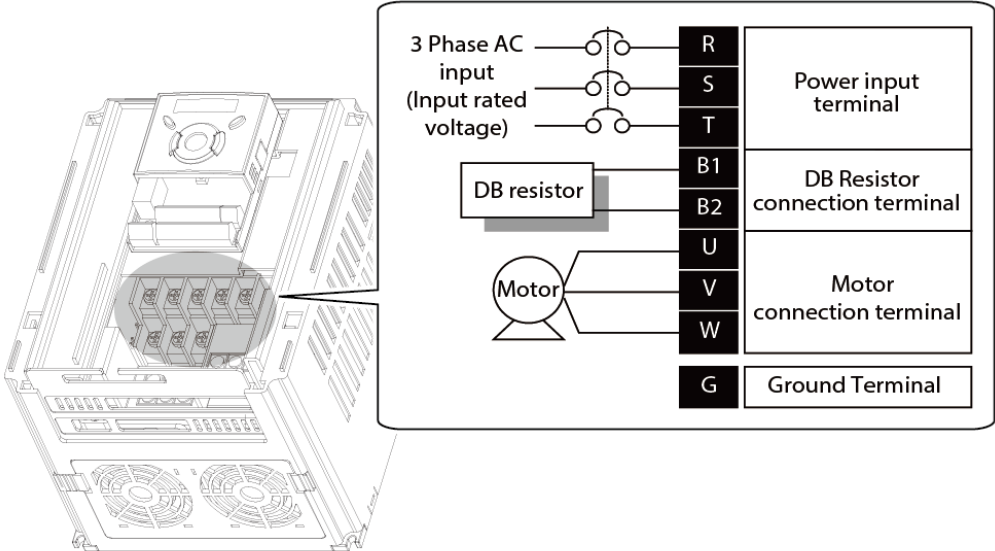
2.4 Specifications for power terminal block wiring

0.4 - 1.5kW(Three Phase)	2.2 - 4.0kW(Three Phase)

R	S	T	B1	B2	
			U	V	W

R	S	T	B1	B2	U	V	W

5.5 - 7.5kW(Three Phase)

B1		B2	U	V	W
R	S	T			

	R,S,T Size		U,V,W Size		Ground Size		Terminal Screw Size	Screw Torque (Kgf.cm)/lb-in
	mm^2	AWG	mm^2	AWG	mm^2	AWG		
SV004iG5H-2	2	14	2	14	3.5	12	M3.5	10/8.7
SV008iG5H-2	2	14	2	14	3.5	12	M3.5	10/8.7
SV015iG5H-2	2	14	2	14	3.5	12	M3.5	10/8.7
SV022iG5H-2	2	14	2	14	3.5	12	M4	15/13
SV037iG5H-2	3.5	12	3.5	12	3.5	12	M4	15/13
SV040iG5H-2	3.5	12	3.5	12	3.5	12	M4	15/13
SV055iG5H-2	5.5	10	5.5	10	5.5	10	M5	32/28
SV075iG5H-2	8	8	8	8	5.5	10	M5	32/28
SV004iG5H-4	2	14	2	14	2	14	M3.5	10/8.7
SV008iG5H-4	2	14	2	14	2	14	M3.5	10/8.7
SV015iG5H-4	2	14	2	14	2	14	M4	15/13
SV022iG5H-4	2	14	2	14	2	14	M4	15/13
SV037iG5H-4	2	14	2	14	2	14	M4	15/13
SV040iG5H-4	2	14	2	14	2	14	M4	15/13
SV055iG5H-4	3.5	12	2	14	3.5	12	M5	32/28
SV075iG5H-4	3.5	12	3.5	12	3.5	12	M5	32/28

* Strip the sheaths of the wire insulation 7mm when a ring terminal is not used for power connection.

← 7.0mm
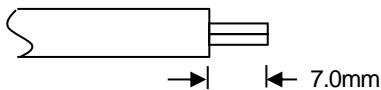
⚠ Caution

- Apply the rated torque to terminal screws. Loosen screws can cause of short circuit and malfunction. Tightening the screw too much can damage the terminals and cause short circuit and malfunction.
- Use copper wires only with 600V, 75℃ ratings for wiring.
- Make sure the input power is off before wiring.
- When power supply is switched off following operation, wait at least 10 minutes after LED keypad display is off before you start working on it.
- Applying input power supply to the output terminals U, V and W causes internal inverter damage.
- Use ring terminals with insulated caps when wiring the input power and motor wiring.
- Do not leave wire fragments inside the inverter. Wire fragments can cause faults, breakdowns and malfunctions.
- When more than one motor is connected to one inverter, total wire length should be less than 200m (656ft). Do not use a 3-wire cable for long distances. Due to increased leakage capacitance between wires, over-current protective feature may operate or equipment connected to the output side may malfunction. In case of long wire length, it should be required to lower carrier frequency or use Micro Surge Filter.

Length between Inverter and Motor	Up to 50m	Up to 100m	More than 100m
Allowable Carrier Frequency	Less than 15kHz	Less than 5kHz	Less than 2.5kHz

(For products of less than 3.7kW, the wire length should be less than 100m(328ft)).

- Never short B1 and B2 terminals. Shorting terminals may cause internal inverter damage.
- Do not install a power factor capacitor, surge suppressor or RFI filters in the output side of the inverter. Doing so may damage these components.
- To avoid circuit interruption or damaging connected equipment, do not install magnetic contactors on the output side of the inverter.

⚠ Warning

Power supply must be connected to the R, S, and T Terminals.
Connecting it to the U, V, W terminals causes internal damages to the inverter. Arranging the phase sequence is not necessary.

Motor should be connected to the U, V, and W Terminals.
If the forward command (FX) is on, the motor should rotate counter clockwise when viewed from the load side of the motor. If the motor rotates in the reverse, switch the U and V terminals.

⚠ Warning

- Use the Type 3 grounding method (Ground impedance: Below 100Ω) for 230V class inverters.
- Use the Special Type 3 grounding method (Ground impedance: Below 10Ω) for 460V class inverters.
- Use the dedicated ground terminal to ground the inverter. Do not use the screw in the case or chassis, etc for grounding.

Opening to access Groud terminal
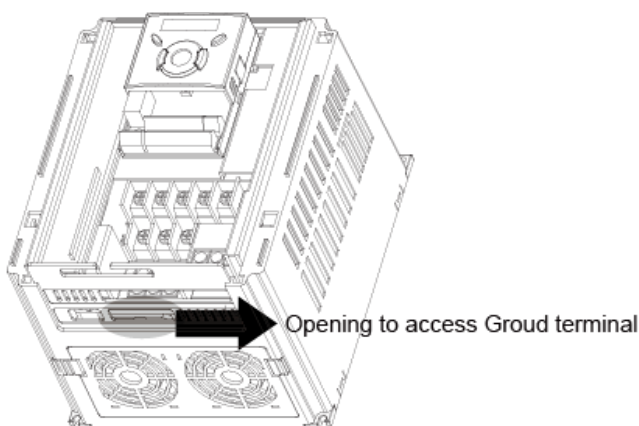
Note

Grounding procedure
   1) Remove the front cover.
   2) Connect the Grounding wire to the ground terminal through the opening for ground terminal as shown above. Enter the screw driver from vertical to the terminal and secure the screw tightly.

[Grounding work guidance]

Inverter capacity	200V Class			400V Class		
	Wire size	Terminal screw	Ground Specification	Wire size	Terminal screw	Ground Specification
0.4-4.0 kW	3.5 mm^2	M3	Type 3	2.0 mm^2	M3	Special Type 3
5.5-7.5 kW	5.5 mm^2	M4		3.5 mm^2	M4	

2.5 Control terminal specification

						24	CM	P1	P2	S-	S+
A1	B1	C1	A2	C2	CM	P3	P4	VR	V1	I	AM

T/M	Terminal Description	Wire size[mm^2]		Screw size	Torque [Nm]	Specification
		single wire	Stranded			
P1-P4	Multi-function input T/M 1-4	1.0	1.5	M2.6	0.4	
CM	Common Terminal	1.0	1.5	M2.6	0.4	
VR	power supply for external potentiometer	1.0	1.5	M2.6	0.4	Output voltage: 12V Max output current: 100mA Potentiometer:1 - 5kohm
V1	Input terminal for Voltage operation	1.0	1.5	M2.6	0.4	Max input voltage: -10V - +10V input
I	Input terminal for Current operation	1.0	1.5	M2.6	0.4	0 - 20mA input internal resistor: 250 ohm
AM	Multi-function analog output terminal	1.0	1.5	M2.6	0.4	Max output voltage: 11[V] Max output current: 10mA
A2	Multi-function relay output A2 contact	1.0	1.5	M2.6	0.4	Below AC 250V, 1A
C2	Common for Multi-function relay A2	1.0	1.5	M2.6	0.4	
24	24V External Power Supply	1.0	1.5	M2.6	0.4	Max output current: 100mA
A1	Multi-function relay output A1 contact	1.0	1.5	M2.6	0.4	Below AC 250V, 1A
B1	Multi-function relay output B1 contact	1.0	1.5	M2.6	0.4	Below DC 30V, 1A
C1	Common for Multi-function relays A1, B1	1.0	1.5	M2.6	0.4	

Note 1) Tie the control wires more than 15cm away from the control terminals. Otherwise, it interferes front cover reinstallation.

Note 2) Use Copper wires rated 600V, 75 ℃ and higher.

Note 3) Use the recommended tightening torque when securing terminal screws.

Installation

Note

When you use external power supply (24V) for multi-function input terminal (P1-P4), terminals will be active above 12V level. Take caution not to drop the voltage below 12V.

2.6 PNP/NPN selection and connector for communication option
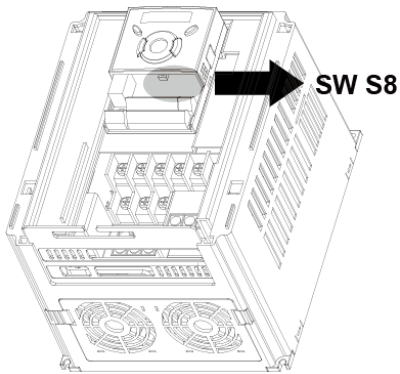
1. When using DC 24V inside inverter [NPN]
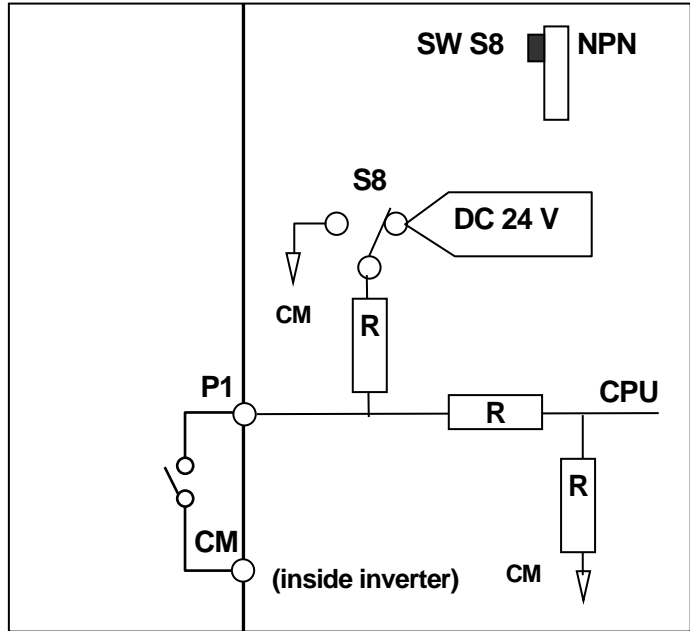
2. When using external DC 24V [PNP]
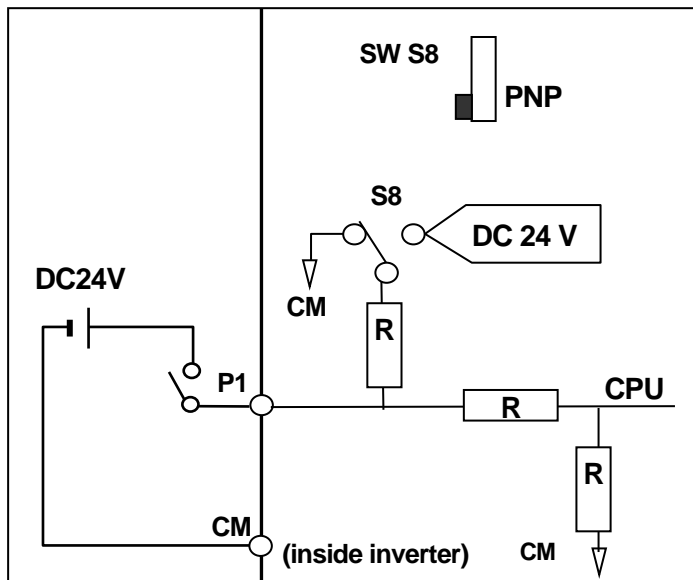
2.7 Terminating Resistor selection

1. When not using Terminating Resistor

SW S9

Communication IC

○ S+

○ S−

SW S9

2. When using Terminating Resistor

SW S9

○ 5V

R

Communication IC

○ S+

R

○ S−

R

CM
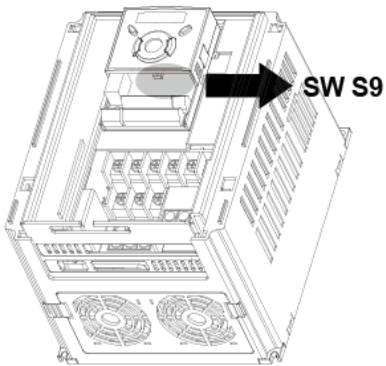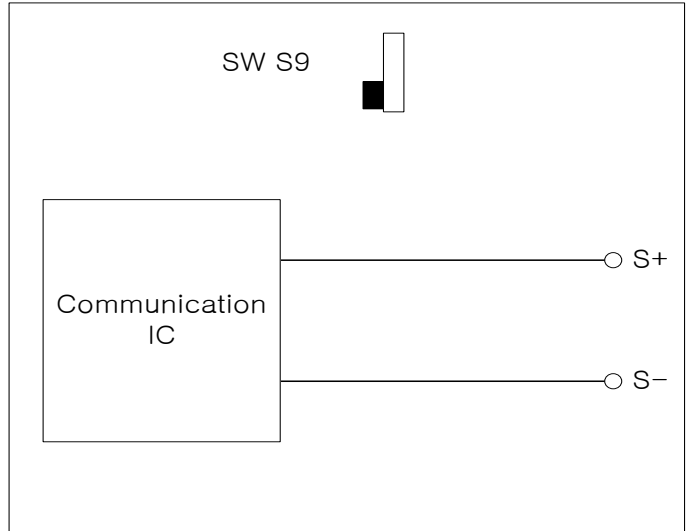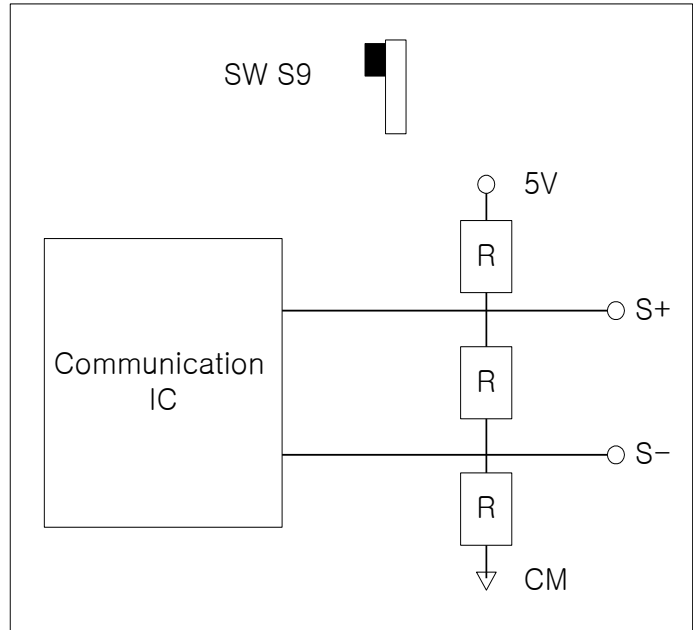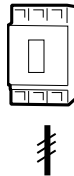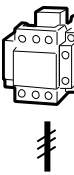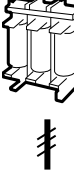
3 Basic configuration

3.1 Connection of peripheral devices to the inverter

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 the power supply within the permissible range of inverter input power rating (Refer to Page 197).
MCCB or Earth leakage circuit breaker (ELB)	Select circuit breakers with care. A large inrush current may flow in the inverter at power on.
Magnetic Contactor	Install it if necessary. When installed, do not use it for the purpose of starting or stopping. Otherwise, it could lead to reduction in product life.
AC and DC Reactors [notice1]	The AC reactors must be used when the power factor is to be improved or the inverter is installed near a large power supply system (more than 10 times of inverter capacity and wiring distance within 10m).
Installation and wiring	To operate the inverter with high performance for a long time, install the inverter in a proper place in the correct direction and with proper clearances. Incorrect terminal wiring could result in the equipment damage.
To motor	Do not connect a power factor capacitor, surge suppressor or radio noise filter to the output side of the inverter.

3.2 Recommended MCCB

Inverter Capacity	MCCB	MC	ELCB
004iG5H-2	ABS33c/5, UTE100/15	MC-6a	EBS33c/5
008iG5H-2	ABS33c/10, UTE100/15	MC-9a, MC-9b	EBS33c/10
015iG5H-2	ABS33c/15, UTE100/15	MC-18a, MC-18b	EBS33c/15
022iG5H-2	ABS33c/20, UTE100/20	MC-22b	EBS33c/20
037iG5H-2	ABS33c/30. UTE100/30	MC-32a	EBS33c/30
040iG5H-2		MC-32a	EBS33c/30
055iG5H-2	ABS53c/50, UTE100/50	MC-50a	EBS53c/50
075iG5H-2	ABS63c/60, UTE100/60	MC-65a	EBS63c/60
004iG5H-4	ABS33c/3, UTE100/15	MC-6a	EBS33c/5
008iG5H-4	ABS33c/5, UTE100/15	MC-6a	EBS33c/5
015iG5H-4	ABS33c/10, UTE100/15	MC-9a, MC-9b	EBS33c/10
022iG5H-4		MC-12a, MC-12b	EBS33c/10
037iG5H-4	ABS33c/15, UTE100/15	MC-18a, MC-18b	EBS33c/15
040iG5H-4	ABS33c/20, UTE100/20	MC-18a, MC-18b	EBS33c/20
055iG5H-4	ABS33c/30, UTE100/30	MC-22b	EBS33c/30
075iG5H-4		MC-32a	EBS33c/30

Note

- The capacity of the MCCB should be 1.5 to 2 times the rated output current of the drive.
- Use an MCCB keep the drive from faulting out instead of using overheat protection (120% for one minute at the rated output current.)

Configuration

3.3 Recommendable Fuse, Reactors

Inverter Capacity	AC Input fuse [External Fuse]		AC Reactor	DC Reactor
	Current	Voltage		
004iG5H-2	10 A	600 V	4.20 mH, 3.5A	
008iG5H-2	10 A	600 V	2.13 mH, 5.7A	
015iG5H-2	15 A	600 V	1.20 mH, 10A	-
022iG5H-2	25 A	600 V	0.88 mH, 14A	-
037iG5H-2	30 A	600 V	0.56 mH, 20A	-
040iG5H-2	30 A	600 V	0.56 mH, 20A	-
055iG5H-2	30 A	600 V	0.39 mH, 30A	-
075iG5H-2	50 A	600 V	0.28 mH, 40A	-
004iG5H-4	5 A	600 V	18.0 mH, 1.3A	-
008iG5H-4	10 A	600 V	8.63 mH, 2.8A	-
015iG5H-4	10 A	600 V	4.81 mH, 4.8A	-
022iG5H-4	10 A	600 V	3.23 mH, 7.5A	-
037iG5H-4	20 A	600 V	2.34 mH, 10A	-
040iG5H-4	20 A	600 V	2.34 mH, 10A	-
055iG5H-4	20 A	600 V	1.22 mH, 15A	-
075iG5H-4	30 A	600 V	1.14 mH, 20A	-

- **Short Circuit Rating**
  "Suitable For Use ON A Circuit Capable Of Delivering Not More Than 65KA
  Symmetrical Amperes. 240V drives or 480V drives Volts Maximum,"
- **Short Circuit Fuse/Breaker Marking**
  Use Class H or RK5 UL Listed Input Fuse and UL Listed Breaker Only. See the table above
  For the Voltage and Current rating of the fuse and the breaker

4 Programming Keypad & Basic operation

4.1 Keypad features

Display

- SET/RUN LED
- FWD/REV LED
- 7 Segment LED

Key

- RUN
- STOP/RESET
- Up/Down
- Left/Right
- Enter [ENT]
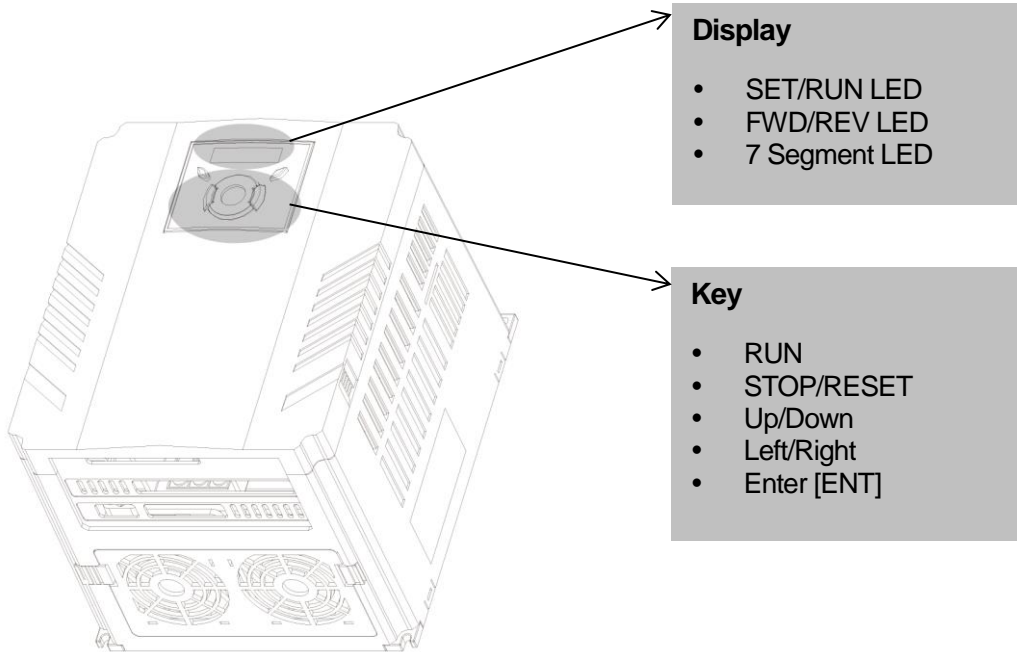
Display		
FWD	Lit during forward run	Blinks when a fault occurs
REV	Lit during reverse run	
RUN	Lit during Operation	
SET	Lit during parameter setting	
7 segment	Displays operation status and parameter information	

Keys		
RUN	Run command	
STOP/RESET	STOP: Stop command during operation, RESET: Reset command when fault occurs.	
▲	UP	Used to scroll through codes or increase parameter value

Keys		
▼	Down	Used to scroll through codes or decrease parameter value
◄	Left	Used to jump to other parameter groups or move a cursor to the left to change the parameter value
►	Right	Used to jump to other parameter groups or move cursor to the right to change the parameter value
●	ENT	Used to set the parameter value or save the changed parameter value

4.2 Alpha-numeric view on the LED keypad

0	0	*A*	A	*K*	K	*U*	U
1	1	*b*	B	*L*	L	*U*	V
2	2	*C*	C	*M*	M	*W*	W
3	3	*d*	D	*N*	N	*X*	X
4	4	*E*	E	*O*	O	*Y*	Y
5	5	*F*	F	*P*	P	*Z*	Z
6	6	*G*	G	*q*	Q		
7	7	*H*	H	*r*	R		
8	8	*I*	I	*S*	S		
9	9	*J*	J	*t*	T		

4.3 Moving to other groups

- There are 5 different parameter groups in SV- iG5H series as shown below.
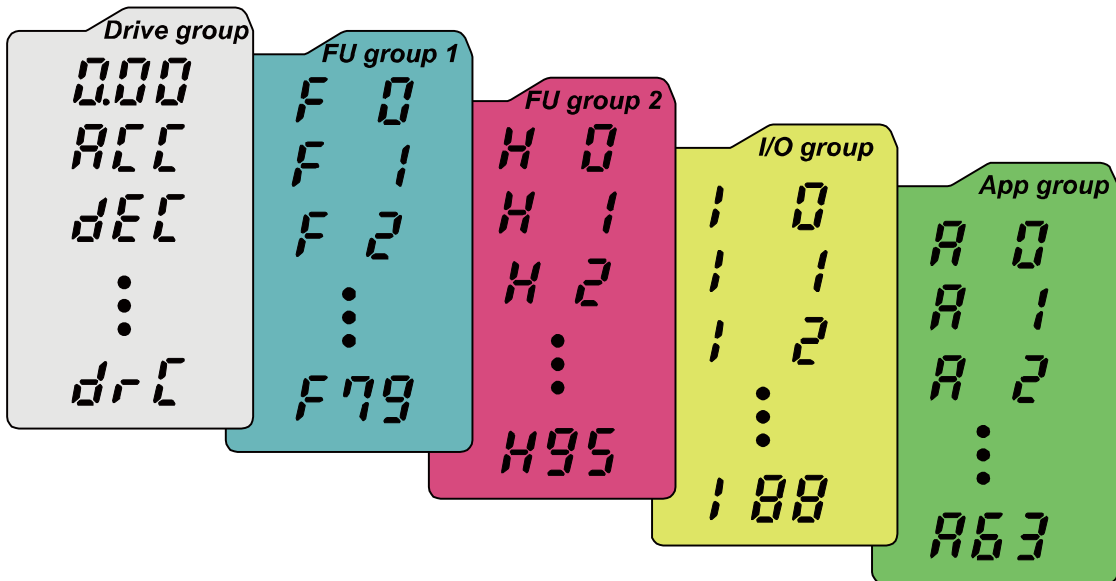
Drive group	Basic parameters necessary for the inverter to run. Parameters such as Target frequency, Accel/Decel time settable.
Function group 1	Basic function parameters to adjust output frequency and voltage.
Function group 2	Advanced function parameters to set parameters for such as PID Operation and second motor operation.
I/O (Input/Output) group	Parameters necessary to make up a sequence using Multi-function input/output terminal.
Application group	Parameters to set advanced function for fan and pump such as multi motor control and sleep boost, etc.

Basic Ops.

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- **Moving to other parameter groups** is only available in the first code of each group as the figure shown below.

Moving to other groups using the Right (▶) key	Moving to other groups using the Left (◀) key
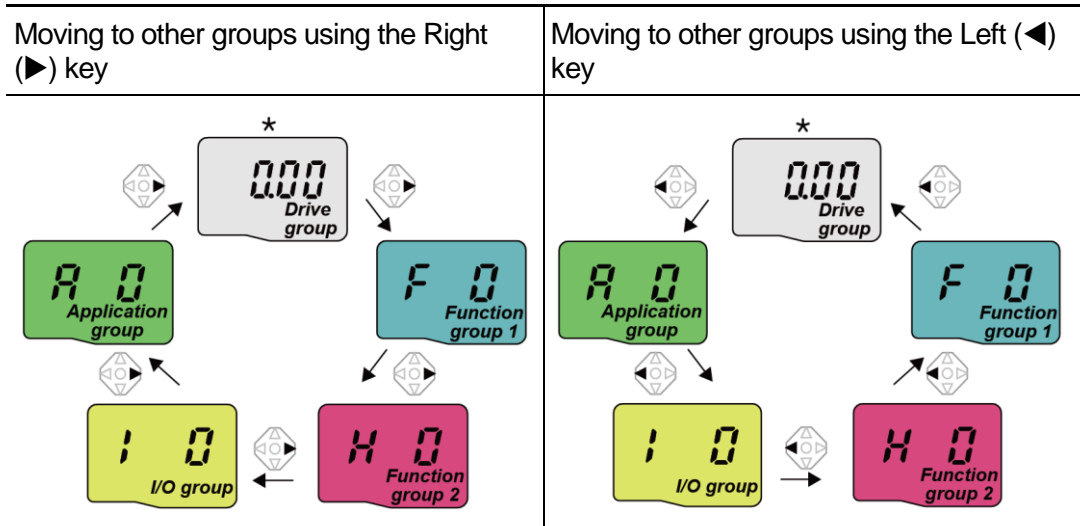
* Target frequency can be set at 0.0 (the 1st code of drive group). Even though the preset value is 0.0, it is user-settable. The changed frequency will be displayed after it is changed.

- How to move to other groups at the 1st code of each group

1		• **The 1st code in Drive group "0.00"** will be displayed when AC input power is applied. • Press the right arrow (▶) key once to go to Function group 1.
2		• **The 1st code in Function group 1 "F 0"** will be displayed. • Press the right arrow (▶) key once to go to Function group 2.
3		• **The 1st code in Function group 2 "H 0"** will be displayed. • Press the right arrow (▶) key once to go to I/O group.
4		• **The 1st code in I/O group "I 0"** will be displayed. • Press the right arrow (▶) key once again to go to Application group.
5		• **The 1st code in Application group "A 0"** will be displayed. • Press the right arrow (▶) key once again to return to Drive group.
6		• Return to the **1st code in Drive group "0.00"**.

♣ If the left arrow key (◀) is used, the above will be executed in the reverse order.

- How to move to other groups from any codes other than the 1st code

Pressing left or right arrow key in any code will return to first code of each group.
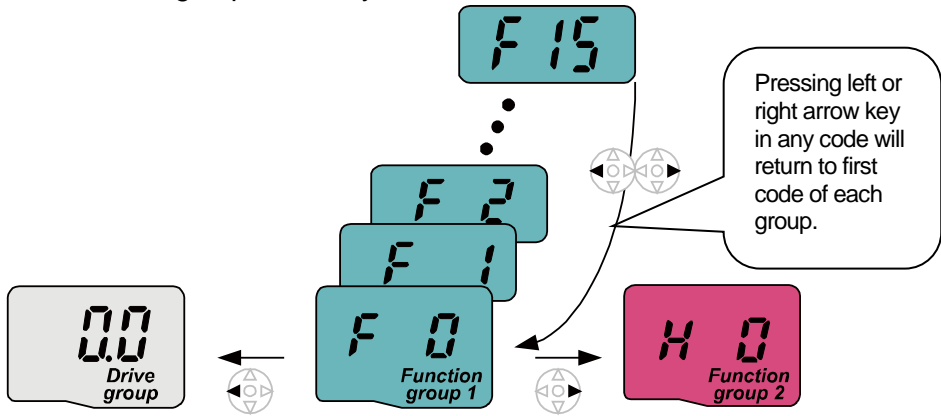
To move from the F 15 to function group 2

1	F 15	• In F 15, press the Left (◄) or Right arrow (►) key. Pressing the key goes to the first code of the group.
2	F 0	• The 1st code in function group 1 "F 0" is displayed. • Press the right arrow (►) key.
3	H 0	• The 1st code in function group 2 "H 0" will be displayed.

4.4 How to change the codes in a group

- Code change in Drive group

1	**0.00**	•	In the 1st code in Drive group "0.00", press the Up (▲) key once.
2	**ACC**	•	The 2nd code in Drive group "ACC" is displayed.
		•	Press the Up (▲) key once.
3	**dEC**	•	The 3rd code "dEC" in Drive group is displayed.
		•	Keep pressing the Up (▲) key until the last code appears.
4	**drC**	•	The last code in Drive group "drC" is displayed.
		•	Press the Up (▲) key again.
5	**0.00**	•	Return to the first code of Drive group.

♣ Use Down (▼) key for the opposite order.

- Code jump

When moving from the "F 0" to the "F 15" directly

1	**F 0**	•	Press the Ent (●) key in "F 0".
2	**1**	•	1 (the code number of F1) is displayed. Use the Up (▲) key to set to 5.
3	**05**	•	"**0**5" is displayed by pressing the Left (◄) key once to move the cursor to the left. The numeral having a cursor is displayed brighter. In this case, **0** is active.
		•	Use the Up (▲) key to set to 1.
4	**15**	•	**1**5 is set.
		•	Press the Ent (●) key once.
5	**F 15**	•	Moving to F 15 has been complete.

♣ Function group 2 and I/O group are settable with the same setting.

- Navigating codes in a group

When moving from F 1 to F 15 in Function group 1

	1	$\boxed{F \quad 1}$	• In F 1, continue pressing the Up (▲) key until F15 is displayed.
	2	$\boxed{F \quad 15}$	• Moving to F15 has been complete.
	♣ The same applies to Function group 2 and I/O group.		

Note

Some codes will be skipped in the middle of increment (▲)/decrement (▼) for code change. That is because it is programmed that some codes are intentionally left blank for future use or left invisible intentionally.
Refer to the Ch.5 for more specific contents

For example, when F24 [High/low frequency limit select] is set to "0 (No) ", F25 [High frequency limit] and F26 [Low frequency limit] are not displayed during code change. But When F24 is set to "1(Yes)", F25 and F26 will appear on the display.

4.5 Parameter setting

- Changing parameter values in Drive Group

When changing ACC time from 5.0 sec to 16.0 sec
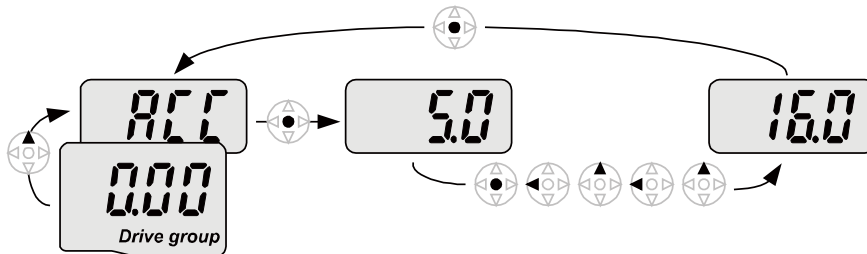
1	0.00	• In the first code "0.00", press the Up (▲) key once to go to the second code.
2	ACC	• ACC [Accel time] is displayed. • Press the Ent key (●) once.
3	5.0	• Preset value is 5.**0**, and the cursor is in the digit **0**. • Press the Left (◄) key once to move the cursor to the left.
4	5.0	• The digit **5** in **5**.0 is active. Then press the Up (▲) key once.
5	6.0	• The value is increased to **6**.0 • Press the Left (◄) key to move the cursor to the left.
6	06.0	• **0**.60 is displayed. The first **0** in **0**.60 is active. • Press the Up (▲) key once.
7	16.0	• **1**6.0 is set. • Press the Ent (●) key once. • **1**6.0 is blinking. • Press the Ent (●) key once again to return to the parameter name.
8	ACC	• **ACC** is displayed. **Accel time** is changed from 5.0 to 16.0 sec.

♣ In step 7, pressing the Left (◄) or Right (►) key while 16.0 is blinking will disable the setting.

Note

Pressing the Left (◄)/ Right (►) /Up (▲) /Down (▼) key while cursor is blinking will cancel the parameter value change. Pressing the Enter key (●) in this status will enter the value into memory.

- Frequency setting

When changing run frequency to 30.05 Hz in Drive group
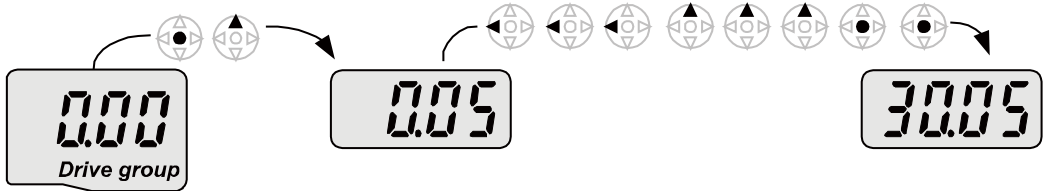
1	$\boxed{0.00}$	• In "0.00", press the Ent (●) key once.
2	$\boxed{0.00}$	• The second decimal **0** becomes active. • Press the UP (▲) key until 5 is displayed.
3	$\boxed{0.05}$	• Press the Left (◀) key once.
4	$\boxed{0.05}$	• The first decimal **0** becomes active. • Press the Left (◀) key once.
5	$\boxed{0.05}$	• Press the Left (◀) key once.
6	$\boxed{0.005}$	• Set 3 using UP (▲) key.
7	$\boxed{30.05}$	• Press the Ent (●) key. • 30.05 is blinking. • Press the Ent (●) key.
8	$\boxed{30.05}$	• 30.05 is entered into memory.

♣ SV-iG5H display can be extended to 5 digits using left (◀)/right (▶) keys.

♣ parameter setting is disabled when pressing other than Enter Key in step 7.

- Changing parameter value in Input/Output group

When changing the parameter value of F28 from 2 to 5
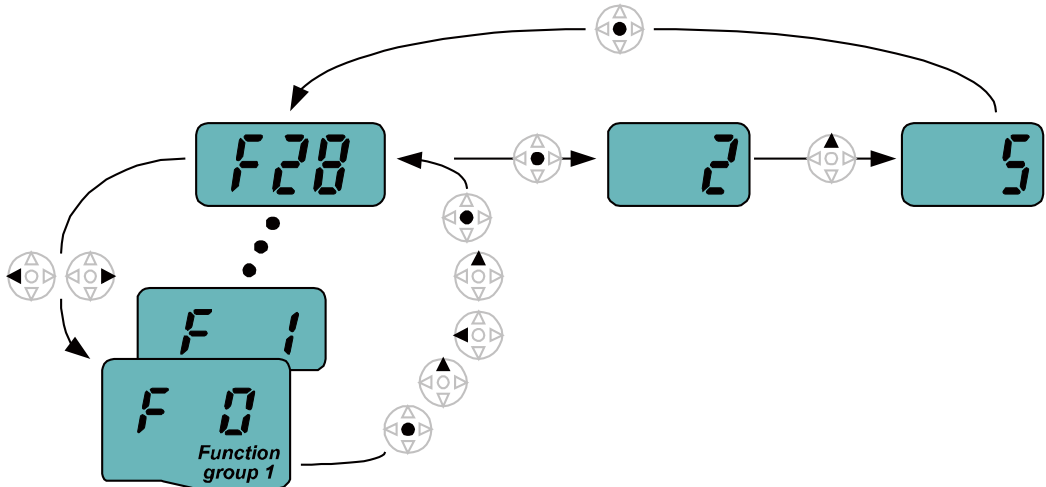
1	$\mathsf{F\ 0}$	• In F0, press the Ent (●) key once.
2	$\mathit{1}$	• Check the present code number. • Increase the value to 8 by pressing the Up (▲) key.
3	$\mathit{8}$	• When 8 is set, press the Left (◀) key once.
4	$\mathit{08}$	• **0** in **0**8 is active. • Increase the value to 2 by pressing the Up (▲) key.
5	$\mathit{28}$	• **2**8 is displayed • Press the Ent (●) key once.
6	$\mathsf{F\ 28}$	• The parameter number F28 is displayed. • Press the Ent (●) key once to check the set value.
7	$\mathit{2}$	• The preset value 2 is displayed. • Increase the value to 5 using UP key (▲).
8	$\mathit{5}$	• Press the Ent (●) key.
9	$\mathsf{F\ 28}$	• Code number will appear after 5 is blinking. Parameter change is complete. • Press either Left (◀) or Right (▶) keys.
10	$\mathsf{F\ 0}$	• Moving to first code of Function group 1 is complete.

♣ The above setting is also applied to change parameter values in function group 2 and I/O group.

4.6 Monitoring of operation status

4.6.1 Output current display

Monitoring output current in Drive group
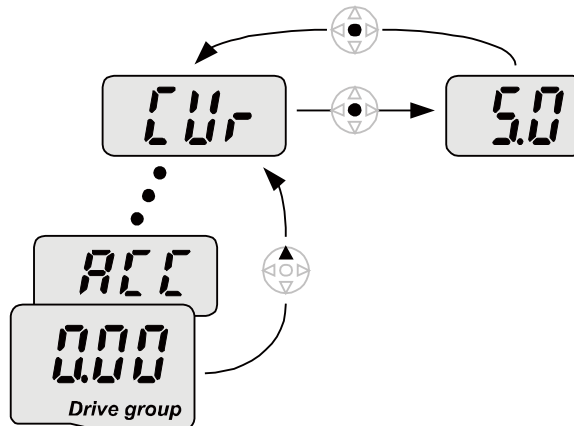
1	**0.00**	•	In [0.0], continue pressing the Up (▲) or Down (▼) key until [CUr] is displayed.
2	**CUr**	•	Monitoring output current is provided in this parameter.
		•	Press the Enter (●) key once to check the current.
3	**5.00**	•	Present output current is 5 A.
		•	Press the Enter (●) key once to return to the parameter name.
4	**CUr**	•	Return to the output current monitoring code.

♣ Other parameters in Drive group such as dCL (Inverter DC link voltage) or vOL (Inverter output voltage) can be monitored via the same method.

4.6.2   Fault display

How to monitor fault condition in Drive group
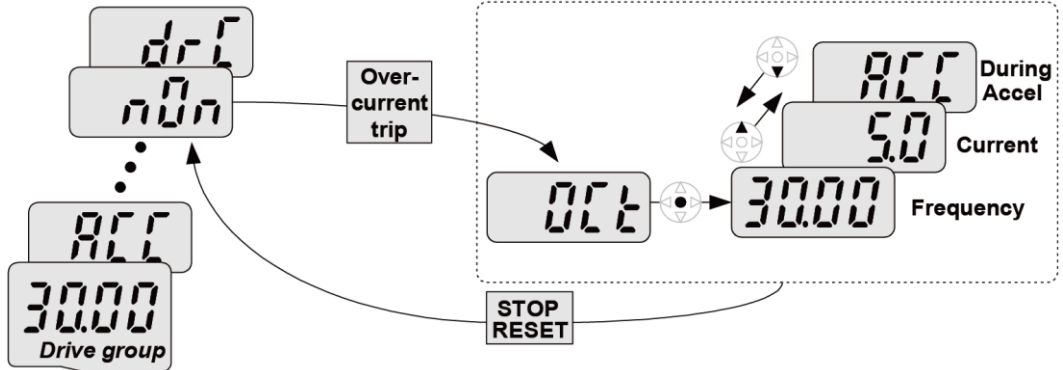
1		• This message appears when an Overcurrent fault occurs. • Press the Enter (●) key or UP/Down key once.
2		• The **run frequency** at the time of fault (30.0) is displayed. • Press the Up (▲) key once.
3		• The **output current** at the time of fault is displayed. • Press the Up (▲) key once.
4		• Operating status is displayed. A fault occurred during acceleration. • Press the STOP/RST key once.
5		• A fault condition is cleared and "nOn" is displayed.

When more than one fault occurs at the same time
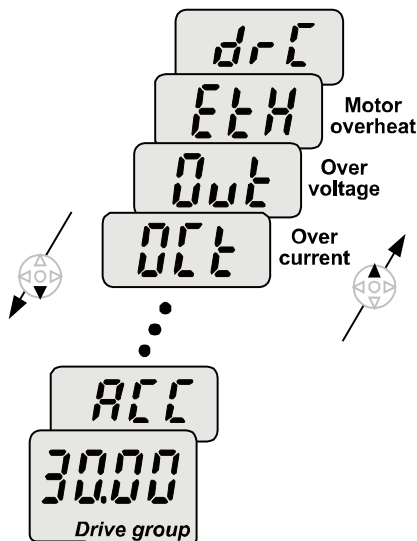
• Maximum three faults information is displayed as shown left.

4.6.3   Parameter initialize

How to initialize parameters of all four groups in H93
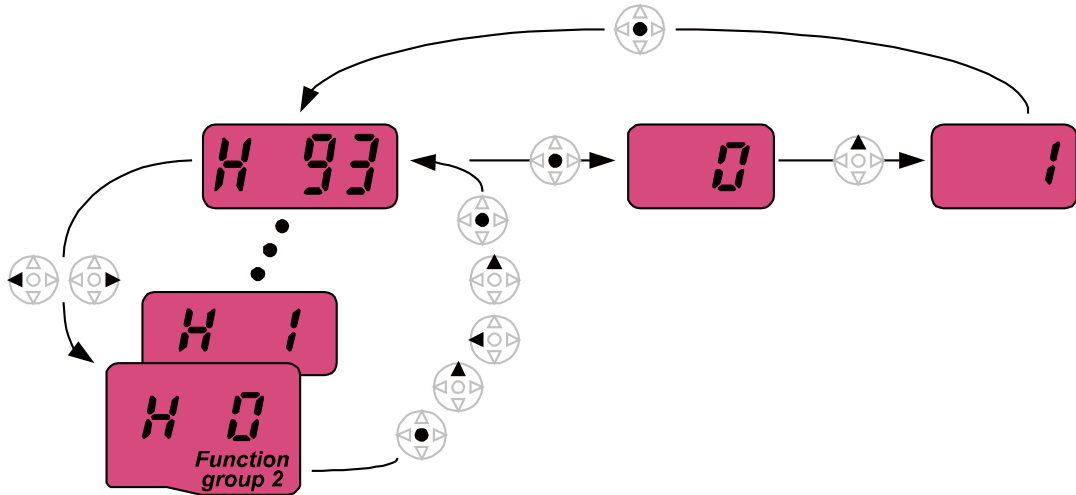
1		•	In H0, press the Enter (●) key once.
2		•	Code number of H0 is displayed.
		•	Increase the value to 3 by pressing the Up (▲) key.
3		•	In **3**, press the Left (◀) key once to move the cursor to the left.
4		•	**0**3 is displayed. **0** in **0**3 is active.
		•	Increase the value to 9 by pressing the Up (▲) key.
5		•	**9**3 is set.
		•	Press the Enter (●) key once.
6		•	The parameter number is displayed.
		•	Press the Enter (●) key once.
7		•	Present setting is 0.
		•	Press the Up (▲) key once to set to 1 to activate parameter initialize.
8		•	Press the Enter (●) key once.
9		•	Return to the parameter number after blinking. Parameter initialize has been complete.
		•	Press the either Left (◀) or Right (▶) key.
10		•	Return to H0.

4.7 Frequency Setting and Basic Operation

⊘ Caution

The following instructions are given based on the fact that all parameters are set to factory defaults. Results could be different if parameter values are changed. In this case, initialize parameter values (see page 139) back to factory defaults and follow the instructions below.

4.7.1 Frequency Setting via keypad & operating via terminals

1		• Apply AC input power to the inverter.
2	*0.00*	• When 0.00 appears, press the Ent (●) key once.
3	*0.00*	• The second digit in 0.0**0** is lit as shown right. • Press the Left (◄) key three times.
4	*00.00*	• **0**0.00 is displayed and the first **0** is lit. • Press the Up (▲) key.
5	*10.00*	• **1**0.00 is set. Press the Ent (●) key once. • 10.00 is blinking. Press the Ent (●) key once.
6	*10.00*	• Run frequency is set to **10.00** Hz when the blinking stops. • Turn on the switch between P1 (FX) and CM terminals.
7	*10.00*	• RUN lamp begins to blink with FWD (Forward Run) lit and accelerating frequency is displayed on the LED. • When target run frequency 10Hz is reached, **10.00** is displayed. • Turn off the switch between P1 (FX) and CM terminals.
8	*10.00*	• RUN lamp begins to blink and decelerating frequency is displayed on the LED. • When run frequency is reached to 0Hz, Run and FWD lamp turn off and **10.00** is displayed.
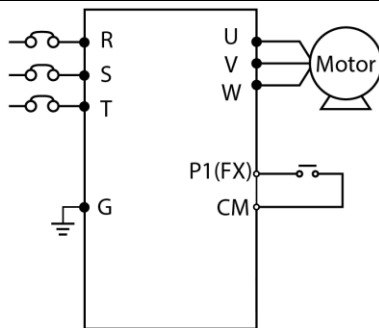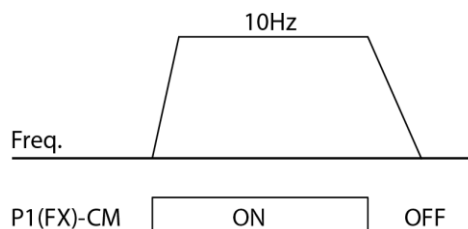
Wiring	Operating pattern

4.7.2   Frequency Setting via potentiometer & operating via terminals

1		•	Apply AC input power to the inverter.
2	$\boxed{0.00}$	•	When 0.00 appears Press the Up (▲) key four times.
3	$\boxed{Fr9}$	• •	Frq is displayed. Frequency setting mode is selectable. Press the Ent (●) key once.
4	$\boxed{0}$	• •	Present setting method is set to 0 (frequency setting via keypad). Press the Up (▲) key three times.
5	$\boxed{3}$	•	After 3 (Frequency setting via potentiometer) is set, press the Ent (●) key once.
6	$\boxed{Fr9}$	• • •	Frq is redisplayed after 3 stops blinking. Press the Down (▼) key four times. Turn the potentiometer to set to 10.00 Hz in either Max or Min direction.
7	$\boxed{10.00}$	• • • •	Turn on the switch between P1 (FX) and CM (See Wiring below). RUN lamp begins to blink with FWD lamp lit and the accelerating frequency is displayed on the LED. When run frequency 10Hz is reached, the value is displayed as shown left. Turn off the switch between P1 (FX) and CM terminals.
8	$\boxed{10.00}$	• •	RUN lamp begins to blink and decelerating frequency is displayed on the LED. When run frequency is reached to 0Hz, Run and FWD lamp turn off and **10.00** is displayed.
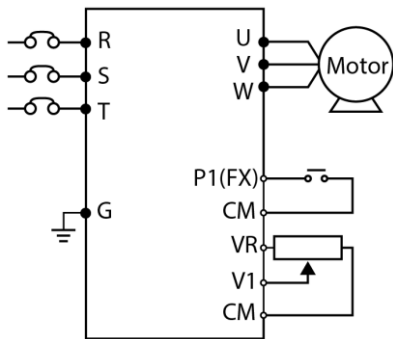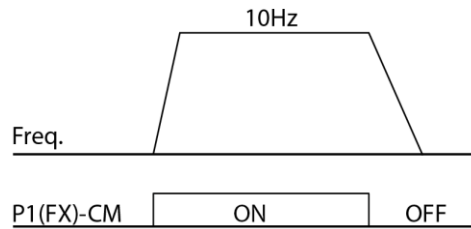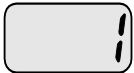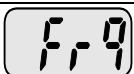
Wiring	Operating pattern

4.7.3 Frequency setting via potentiometer & operating via the Run key

1		•	Apply AC input power to the inverter.
2	**0.00**	•	When 0.00 is displayed, press the Up (▲) key three times.
3	**drv**	•	"drv" is displayed. Operating method is selectable.
		•	Press the Ent (●) key.
4	**1**	•	Check the present operating method ("1": Run via control terminal).
		•	Down (▼) key once.
5	**0**	•	After setting "0", press the Ent (●) key. When 0 is blinking, press the Ent again.
6	**drv**	•	"drv" is displayed after "0" is blinking. Operation method is set via the Run key on the keypad. -. Press the Up (▲) key once.
7	**Frq**	•	Different frequency setting method is selectable.
		•	Press the Ent (●) key.
8	**0**	•	Check the present frequency setting method ("0" is run via keypad).
		•	Press the Up (▲) key three times.
9	**3**	•	After checking "**3**" (frequency setting via potentiometer), press the Ent (●) key.
10	**Frq**	•	"**Frq**" is displayed after "3" is blinking. Frequency setting is set via the potentiometer on the keypad.
		•	Press the Down (▼) key four times.
		•	Turn the potentiometer to set to 10.0 Hz in either Max or Min direction.
11	○ **10.00** ● ● **10.00** ○	•	Press the Run key on the keypad.
		•	RUN lamp begins to blink with FWD lamp lit and accelerating frequency is displayed on the LED.
		•	When run frequency 10Hz is reached, **10.00** is displayed as shown left.
		•	Press the STOP/RST key.
12	○ **10.00** ○ ○ **10.00** ○	•	RUN lamp begins to blink and decelerating frequency is displayed on the LED.
		•	When run frequency is reached to 0Hz, Run and FWD lamp turn off and **10.00** is displayed.

Wiring	Operating pattern
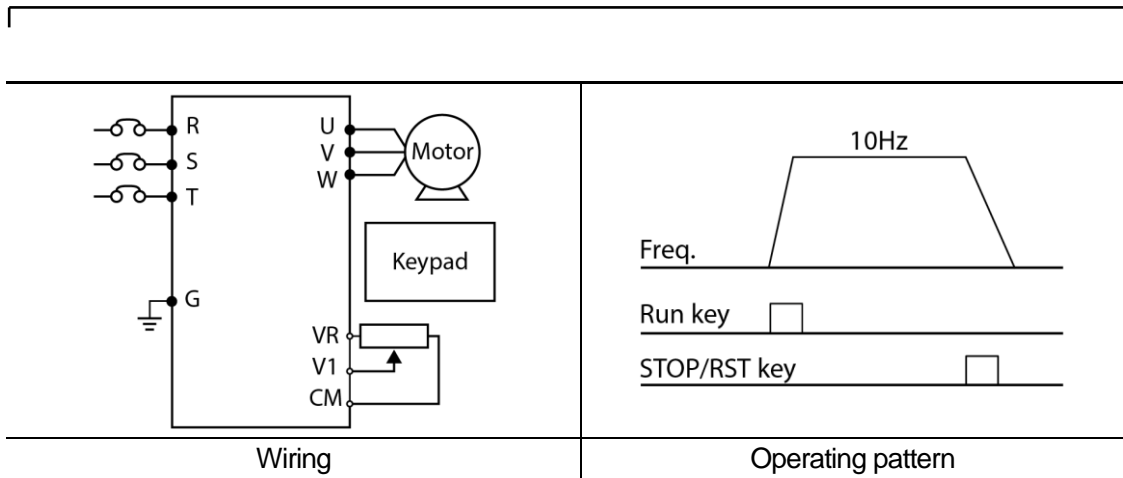
5 Function list

5.1 Drive Group

LED display	Address for communi-cation	Parameter name	Min/Max range	Description			Factory defaults	Adj. during run	Page
0.00	A100	[Frequency command]	0 - 400 [Hz]	This parameter sets the frequency that the inverter is commanded to output. During Stop: Frequency Command During Run: Output Frequency During Multi-step operation: Multi-step frequency 0. It cannot be set greater than F21-[Max frequency].			0.00	O	72
ACC	A101	[Accel time]	0 - 6000 [Sec]	During Multi-Accel/Decel operation, this parameter serves as Accel/Decel time 0.			10.0	O	83
dEC	A102	[Decel time]					10.0	O	83
drv	A103	[Drive mode]	0 - 3	0	Run/Stop via Run/Stop key on the keypad		1	X	79
				1	Terminal operation	FX: Motor forward run RX: Motor reverse run			79
				2		FX: Run/Stop enable RX: Reverse rotation select			
				3	RS485 communication				80
Frq	A104	[Frequency setting method]	0 - 8	0	Digital	Keypad setting 1	0	X	72
				1		Keypad setting 2			72
				2	Analog	V1 1: -10 - +10 [V]			73
				3		V1 2: 0 - +10 [V]			74
				4		Terminal I: 0 - 20 [mA]			75
				5		Terminal V1 setting 1 + Terminal I			75
				6		Terminal V1 setting 2+ Terminal I			76
				7	RS485 communication				76
				8	Digital Volume				77
St1	A105	[Multi-Step frequency 1]	0 - 400 [Hz]	Sets Multi-Step frequency 1 during Multi-step operation.			10.00	O	78
St2	A106	[Multi-Step frequency 2]		Sets Multi-Step frequency 2 during Multi-step operation.			20.00	O	78
St3	A107	[Multi-Step frequency 3]		Sets Multi-Step frequency 3 during Multi-step operation.			30.00	O	78
CUr	A108	[Output current]		Displays the output current to the motor.			-	-	141

LED display	Address for communi-cation	Parameter name	Min/Max range	Description			Factory defaults	Adj. during run	Page
rPM	A109	[Motor RPM]		Displays the number of Motor RPM.			-	-	141
dCL	A10A	[Inverter DC link voltage]		Displays DC link voltage inside the inverter.			-	-	142
vOL	A10B	[User display select]		This parameter displays the item selected at H73- [Monitoring item select].			vOL	-	142
				vOL	Output voltage				
				POr	Output power				
				tOr	Torque				
nOn	A10C	[Fault Display]		Displays the types of faults, frequency and operating status at the time of the fault			-	-	145
drC	A10D	[Direction of motor rotation select]	F, r	Sets the direction of motor rotation when drv - [Drive mode] is set to either 0 or 1.			F	O	79
				F	Forward				
				r	Reverse				
drv2	A10E	[Drive mode 2]	0 - 3	0	Run/Stop via Run/Stop key on the keypad		1	X	128
				1	Terminal operation	FX: Motor forward run RX: Motor reverse run			
				2		FX: Run/Stop enable RX: Reverse rotation select			
				3	RS-485 communication				
Frq2[1]	A10F	[Frequency setting method 2]	0 - 8	0	Digital	Keypad setting 1	0	X	128
				1		Keypad setting 2			
				2	Analog	V1 1: -10 - +10 [V]			
				3		V1 2: 0 - +10 [V]			
				4		Terminal I: 0 - 20 [mA]			
				5		Terminal V1 setting 1 + Terminal I			
				6		Terminal V1 setting 2+ Terminal I			
				7	RS485 communication				
				8	Digital Volume				
rEF[2]	A110	PID control standard value setting	0-400 [Hz] or 0-100 [%]	If H58 is 0, it is expressed as a [Hz] unit. If H58 is 1, it is expressed as a [%] unit. In [Hz] unit, you can't set Max. frequency more than (F21). In [%] unit, 100% means Max. frequency.			0.00	O	106
Fbk[2]	A111	PID control feedback amount		It indicates a feedback amount in PID control. If H58 is 0, it is expressed as a [Hz] unit. If H58 is 1, it is expressed as a [%] unit.			-	-	106

[1] Only displayed when one of the Multi-function input terminals 1-4 [I17-I20] is set to "22".

[2] It is indicated when H49(PID control selection) is 1.

Functions List

5.2 Function group 1

LED display	Address for communi-cation	Parameter name	Min/Max range	Description		Factory defaults	Adj. during run	Page
F 0	A200	[Jump code]	0 - 99	Sets the parameter code number to jump.		1	O	28
F 1	A201	[Forward/ Reverse run disable]	0 - 2	0	Fwd and rev run enable	0	X	81
				1	Forward run disable			
				2	Reverse run disable			
F 2	A202	[Accel pattern]	0 - 1	0	Linear	0	X	86
F 3	A203	[Decel pattern]		1	S-curve			
F 4	A204	[Stop mode select]	0 - 3	0	Decelerate to stop	0	X	92
				1	DC brake to stop			
				2	Free run to stop			
				3	Power Braking stop			131
F 5	A205	[Power On Start select]	0 - 1	This parameter is activated when drv is set to 1 or 2 (Run/Stop via Control terminal). Motor starts acceleration after AC power is applied while FX or RX terminal is ON.		0	O	82
F 6	A206	[Run Time Delay]	0-6000.0 [sec]	Run after the time set		0	X	118
F 8[1]	A208	[DC Brake start frequency]	0.1 - 60 [Hz]	This parameter sets DC brake start frequency. It cannot be set below F23 - [Start frequency].		5.00	X	95
F 9[1]	A209	[DC Brake wait time]	0 - 60 [sec]	When DC brake frequency is reached, the inverter holds the output for the setting time before starting DC brake.		0.1	X	
F10[1]	A20A	[DC Brake voltage]	0 - 200 [%]	This parameter sets the amount of DC voltage applied to a motor. It is set in percent of H33 – [Motor rated current].		50	X	
F11[1]	A20B	[DC Brake time]	0 - 60 [sec]	This parameter sets the time taken to apply DC current to a motor while motor is at a stop.		1.0	X	
F12	A20C	[DC Brake start voltage]	0 - 200 [%]	This parameter sets the amount of DC voltage before a motor starts to run. It is set in percent of H33 – [Motor rated current].		50	X	96
F13	A20D	[DC Brake start time]	0 - 60 [sec]	DC voltage is applied to the motor for DC Brake start time before motor accelerates.		0	X	
F14	A20E	[Time for magnetizing a motor]	0 - 60 [sec]	This parameter applies the current to a motor for the set time before motor accelerates during Sensorless vector control.		0.1	X	
F20	A214	[Jog frequency]	0 - 400 [Hz]	This parameter sets the frequency for Jog operation. It cannot be set above F21 – [Max frequency].		10.00	O	98

[1] Only displayed when F 4 is set to 1 (DC brake to stop).

Function group 1

LED display	Address for communication	Parameter name	Min/ Max range	Description	Factory defaults	Adj. during run	Page
F21	A215	[Max frequency]	40 - 400 [Hz]	This parameter sets the highest frequency the inverter can output. It is frequency reference for Accel/Decel (See H70) ⊙ Caution Any frequency cannot be set above Max frequency except Base frequency	50.00	X	93
F22	A216	[Base frequency]	30 - 400 [Hz]	The inverter outputs its rated voltage to the motor at this frequency (see motor nameplate).	50.00	X	88
F23	A217	[Start frequency]	0.1 - 10 [Hz]	The inverter starts to output its voltage at this frequency. It is the frequency low limit.	0.50	X	
F24	A218	[Frequency high/low limit select]	0 - 1	This parameter sets high and low limit of run frequency.	0	X	
F25[1]	A219	[Frequency high limit]	0 - 400 [Hz]	This parameter sets high limit of the run frequency. It cannot be set above F21 – [Max frequency].	50.00	X	93
F26[1]	A21A	[Frequency low limit]	0 - 400 [Hz]	This parameter sets low limit of the run frequency. It cannot be set above F25 - [Frequency high limit] and below F23 – [Start frequency].	0.50	X	
F27	A21B	[Torque Boost select]	0 - 1	0 Manual torque boost 1 Auto torque boost	0	X	90
F28	A21C	[Torque boost in forward direction]	0 - 15 [%]	This parameter sets the amount of torque boost applied to a motor during forward run. It is set in percent of Max output voltage.	4.0	X	90
F29	A21D	[Torque boost in reverse direction]	0 - 15 [%]	This parameter sets the amount of torque boost applied to a motor during reverse run. It is set as a percent of Max output voltage	4.0	X	90

[1] Only displayed when F24 (Frequency high/low limit select) is set to 1.

Functions List

Function group 1

LED display	Address for communi-cation	Parameter name	Min/Max range	Description		Factory defaults	Adj. during run	Page
F30	A21E	[V/F pattern]	0 - 4	0	Linear	0	X	88
				1	Square			88
				2	User V/F			
				3	High Torque 1			89
				4	High Torque 2			
F31[1]	A21F	[User V/F frequency 1]	0 - 400 [Hz]	It is used only when V/F pattern is set to 2(User V/F) It cannot be set above F21 – [Max frequency]. The value of voltage is set in percent of H70 – [Motor rated voltage]. The values of the lower-numbered parameters cannot be set above those of higher-numbered.		12.50	X	89
F32	A220	[User V/F voltage 1]	0 - 100 [%]			25	X	
F33	A221	[User V/F frequency 2]	0 - 400 [Hz]			25.00	X	
F34	A222	[User V/F voltage 2]	0 - 100 [%]			50	X	
F35	A223	[User V/F frequency 3]	0 - 400 [Hz]			37.50	X	
F36	A224	[User V/F voltage 3]	0 - 100 [%]			75	X	
F37	A225	[User V/F frequency 4]	0 - 400 [Hz]			50.00	X	
F38	A226	[User V/F voltage 4]	0 - 100 [%]			100	X	
F39	A227	[Output voltage adjustment]	40 - 110 [%]	This parameter adjusts the amount of output voltage. The set value is the percentage of input voltage.		100	X	90
F40	A228	[Energy-saving level]	0 - 30 [%]	This parameter decreases output voltage according to load status.		0	0	122
F50	A232	[Electronic thermal select]	0 - 1	This parameter is activated when the motor is overheated (time-inverse).		0	0	159

[1] Set F30 to 2(User V/F) to display this parameter.

Function group 1

LED display	Address for communi-cation	Parameter name	Min/Max range	Description	Factory defaults	Adj. during run	Page
F51[1]	A233	[Electronic thermal level for 1 minute]	50 - 200 [%]	This parameter sets max current capable of flowing to the motor continuously for 1 minute. The set value is the percentage of H33 – [Motor rated current]. It cannot be set below F52 –[Electronic thermal level for continuous].	120	O	159
F52[1]	A234	[Electronic thermal level for continuous]	50 - 150 [%]	This parameter sets the amount of current to keep the motor running continuously. It cannot be set higher than F51 – [Electronic thermal level for 1 minute].	100	O	
F53[1]	A235	[Motor cooling method]	0 - 1	0 — Standard motor having cooling fan directly connected to the shaft 1 — A motor using a separate motor to power a cooling fan.	0	O	
F54	A236	[Overload warning level]	30 - 150 [%]	This parameter sets the amount of current to issue an alarm signal at a relay or multi-function output terminal (see I54, I55). The set value is the percentage of H33-[Motor rated current].	110	O	161
F55	A237	[Overload warning time]	0 - 30 [Sec]	This parameter issues an alarm signal when the current greater than F54-[Overload warning level] flows to the motor for F55- [Overload warning time].	10	O	
F56	A238	[Overload trip select]	0 - 1	This parameter turns off the inverter output when motor is overloaded.	1	O	161
F57	A239	[Overload trip level]	30 - 200 [%]	This parameter sets the amount of overload current. The value is the percentage of H33-[Motor rated current].	120	O	
F58	A23A	[Overload trip time]	0 - 60 [Sec]	This parameter turns off the inverter output when the F57- [Overload trip level] of current flows to the motor for F58-[Overload trip time].	60	O	

[1] Set F50 to 1 to display this parameter.

Functions List

Function group 1

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description				Factory defaults	Adj. during run	Page
F59	A23B	[Stall prevention select]	0 - 7	This parameter stops accelerating during acceleration, decelerating during constant speed run and stops decelerating during deceleration. During Decel (Bit 2) / During constant run (Bit 1) / During Accel (Bit 0): 0: - / - / - 1: - / - / ✓ 2: - / ✓ / - 3: - / ✓ / ✓ 4: ✓ / - / - 5: ✓ / - / ✓ 6: ✓ / ✓ / - 7: ✓ / ✓ / ✓				4	X	162
F60	A23C	[Stall prevention level]	30 - 200 [%]	This parameter sets the amount of current to activate stall prevention function during Accel, constant or Decel run. The set value is the percentage of the H33- [Motor rated current].				130	X	162
F63	A23F	[Save up/down frequency select]	0 - 1	This parameter decides whether to save the specified frequency during up/down operation. When 1 is selected, the up/down frequency is saved in F64.				0	X	100
F64 2)	A240	[Save up/down frequency]		If 'Save up/down frequency' is selected at F63, this parameter saves the frequency before the inverter stops or decelerated.				0.00	X	100
F65	A241	[Up-down mode select]	0-2	We can select up-down mode among three thing 0: Increases goal frequency as a standard of Max. frequency/Min. frequency 1: Increases as many as step frequency according to edge input 2: Available to combine 1 and 2				0	X	101

1) It is indicated when setting bit 2 of F59 as 1

2) Set F63 to 1 to display this parameter.

Function group 1

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description		Factory defaults	Adj. during run	Page
F66	A242	[Up-down step frequency]	0-400 [Hz]	In case of choosing F65 as a 1 or 2, it means increase or decrease of frequency according to up-down input		0.00	X	101
F70	A246	[Draw run mode select]	0-3	0	Inverter doesn't run as a draw mode	0	X	132
				1	V1(0-10V) input draw run			
				2	I(0-20mA) input draw run			
				3	V1(-10-10V) input draw run			
F71	A247	[Draw rate]	0-100 [%]	Sets rate of draw		0.00	0	132
F72	A248	On Off Control Source	0-1	0	None	0	O	118
				1	Voltage			
				2	Current			
F73	A249	On Control Level	F73-100 [%]	Set On/Off level at the output terminal.		90.0	O	
F74	A24A	Off Control Level	0-F74[%]			10.0	O	
F75	A24B	Regen Avoid Select	0-1	Select regeneration prevention		0	X	119
F76	A24C	Regen Avoid Level	75.0-100.0 [%]	Regeneration prevention operation voltage level		87.5	X	
F77	A24D	Regen Compensation Freq	0-10.00 [Hz]	Regeneration prevention compensation frequency limit		1.00	X	
F78	A24E	Regen Avoid P-Gain	0-1000	Regeneration prevention P gain		50.0	O	
F79	A24F	Regen Avoid I-Gain	10-3200	Regeneration prevention I gain		500	O	

5.3 Function group 2

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description	Factory defaults	Adj. during run	Page
H 0	A300	[Jump code]	0-95	Sets the code number to jump.	1	O	28
H 1	A301	[Fault history 1]	-	Stores information on the types of faults, the frequency, the current and the Accel/Decel condition at the time of fault. The latest fault is automatically stored in the H 1- [Fault history 1].	nOn	-	146
H 2	A302	[Fault history 2]	-		nOn	-	
H 3	A303	[Fault history 3]	-		nOn	-	
H 4	A304	[Fault history 4]	-		nOn	-	
H 5	A305	[Fault history 5]	-		nOn	-	
H 6	A306	[Reset fault history]	0-1	Clears the fault history saved in H 1-5.	0	O	
H 7	A307	[Dwell frequency]	0.1-400 [Hz]	When run frequency is issued, motor starts to accelerate after dwell frequency is applied to the motor during H8- [Dwell time]. [Dwell frequency] can be set within the range of F21- [Max frequency] and F23- [Start frequency].	5.00	X	104
H 8	A308	[Dwell time]	0-10 [sec]	Sets the time for dwell operation.	0.0	X	
H10	A30A	[Skip frequency select]	0 - 1	Sets the frequency range to skip to prevent undesirable resonance and vibration on the structure of the machine.	0	X	
H11[1]	A30B	[Skip frequency low limit 1]	0.1-400 [Hz]	Run frequency cannot be set within the range of H11 thru H16. The frequency values of the low numbered parameters cannot be set above those of the high numbered ones. Settable within the range of F21 and F23.	10.00	X	94
H12	A30C	[Skip frequency high limit 1]			15.00	X	
H13	A30D	[Skip frequency low limit 2]			20.00	X	
H14	A30E	[Skip frequency high limit 2]			25.00	X	
H15	A30F	[Skip frequency low limit 3]			30.00	X	
H16	A310	[Skip frequency high limit 3]			35.00	X	

[1] Only displayed when H10 is set to 1. # H17, H18 are used when F2, F3 are set to 1 (S-curve).

Function group 2

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description					Factory defaults	Adj. during run	Page
H17	A311	[S-Curve accel/decel start side]	1-100 [%]	Set the speed reference value to form a curve at the start during accel/decel. If it is set higher, linear zone gets smaller.					40	X	86
H18	A312	[S-Curve accel/decel end side]	1-100 [%]	Set the speed reference value to form a curve at the end during accel/decel. If it is set higher, linear zone gets smaller.					40	X	
H19	A313	[Input/output phase loss protection select]	0 - 3	0 Disabled / 1 Output phase protection / 2 Input phase protection / 3 Input/output phase protection					0	O	164
H21	A315	[Restart after fault reset selection]	0 -1	This parameter is activated when drv is set to 1 or 2 (Run/Stop via Control terminal). Motor accelerates after the fault condition is reset while the FX or RX terminal is ON.					0	O	82
H22 [1]	A316	[Speed Search Select]	0 - 15	This parameter is active to prevent any possible fault when the inverter outputs its voltage to the running motor.					0	X	122

Detail for H19 / A313:

0	Disabled	1	Output phase protection
2	Input phase protection	3	Input/output phase protection

Detail for H22 / A316:

	1. H20-[Power On start]	2. Restart after instant power failure	3. Operation after fault	4. Normal accel
	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-
1	-	-	-	✓
2	-	-	✓	-
3	-	-	✓	✓
4	-	✓	-	-

[1] Normal acceleration has first priority. Even though #4 is selected along with other bits, Inverter performs Speed search #4.

Function group 2

LED display	Address for communi-cation	Parameter name	Min/Max range	Description				Factory defaults	Adj. during run	Page
				1. H20-[Power On start]	2. Restart after instant power failure	3. Operation after fault	4. Normal accel			
				Bit 3	Bit 2	Bit 1	Bit 0			
H22 1)	A316	[Speed Search Select]	0 - 15	5 - ✓ - ✓ 6 - ✓ ✓ - 7 - ✓ ✓ ✓ 8 ✓ - - - 9 ✓ - - ✓ 10 ✓ - ✓ - 11 ✓ - ✓ ✓ 12 ✓ ✓ - - 13 ✓ ✓ - ✓ 14 ✓ ✓ ✓ - 15 ✓ ✓ ✓ ✓				O		122
H23	A317	[Current level during Speed search]	80-200 [%]	This parameter limits the amount of current during speed search. The set value is the percentage of the H33- [Motor rated current].				100	O	122
H24	A318	[P gain during Speed search]	0-9999	It is the Proportional gain used for Speed Search PI controller.				100	O	
H25	A319	[I gain during speed search]	0-9999	It is the Integral gain used for Speed search PI controller.				200	O	
H26	A31A	[Number of Auto Restart try]	0 -10	This parameter sets the number of restart tries after a fault occurs. Auto Restart is deactivated if the fault outnumbers the restart tries. This function is active when [drv] is set to 1 or 2 {Run/Stop via control terminal}. Deactivated during active protection function (OHT, LVT, EXT, HWT etc.).				0	O	125

1) Normal acceleration has first priority. Even though #4 is selected along with other bits, Inverter performs Speed search #4.

Function group 2

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description		Factory defaults	Adj. during run	Page
H27	A31B	[Auto Restart time]	0-60 [sec]	This parameter sets the time between restart tries.		1.0	O	125
H30	A31E	[Motor type select]	0.2-22.0	0.2	0.2kW	7.5[1]	X	
				-	-			
				22.0	22.0kW			
H31	A31F	[Number of motor poles]	2 - 12	This setting is displayed via rPM in drive group.		4	X	
H32	A320	[Rated slip frequency]	0 - 10 [Hz]	$$f_s = f_r - \left(\frac{rpm \times P}{120} \right)$$ Where, f_s = Rated slip frequency f_r = Rated frequency rpm = Motor nameplate RPM P = Number of Motor poles		2.33[2]	X	104
H33	A321	[Motor rated current]	0.5-150 [A]	Enter motor rated current on the nameplate.		26.3	X	
H34	A322	[No Load Motor Current]	0.1-100 [A]	Enter the current value detected when the motor is rotating in rated rpm after the load connected to the motor shaft is removed. Enter the 50% of the rated current value when it is difficult to measure H34 – [No Load Motor Current].		11	X	
H36	A324	[Motor efficiency]	50-100 [%]	Enter the motor efficiency (see motor nameplate).		87	X	
H37	A325	[Load inertia rate]	0 - 2	Select one of the following according to motor inertia. 0 | Less than 10 times 1 | About 10 times 2 | More than 10 times		0	X	104

[1] H30 is preset based on inverter rating.

[2] H32 - H36 factory default values are set based on OTIS-LG motor.

Functions List

Function group 2

LED display	Address for communi-cation	Parameter name	Min/Max range	Description	Factory defaults	Adj. during run	Page
H39	A327	[Carrier frequency select]	1 - 15 [kHz]	This parameter affects the audible sound of the motor, noise emission from the inverter, inverter temp, and leakage current. If the set value is higher, the inverter sound is quieter but the noise from the inverter and leakage current will become greater.	3	O	127
H40	A328	[Control mode select]	0 - 2	0 {Volts/frequency Control}	0	X	88
				1 {Slip compensation control}			104
H41	A329	[Auto tuning]	0 - 1	If this parameter is set to 1, it automatically measures parameters of the H42 and H44.	0	X	
H42	A32A	[Stator resistance (Rs)]	0 - 28 [Ω]	This is the value of the motor stator resistance.	-	X	120
H44	A32C	[Leakage inductance (Lσ)]	0-300.0 [mH]	This is leakage inductance of the stator and rotor of the motor.	-	X	
H48	A330	PWM mode select	0-1	If you want to limit a inverter leakage current, select 2 phase PWM mode. It has more noise in comparison to Normal PWM mode.	0	X	134
				0 Normal PWM mode			
				1 2 phase PWM mode			
H49	A331	PID select	0-1	Selects whether using PID control or not	0	X	106

Function group 2

LED display	Address for communi- cation	Parameter name	Min/ Max range	Description		Factory defaults	Adj. during run	Page
H50 1)	A332	[PID F/B select]	0 - 2	0	Terminal I input (0 - 20 mA)	0	X	
				1	Terminal V1 input (0 - 10 V)			
				2	RS-485 communication feedback			
H51	A333	[P gain for PID]	0- 999.9 [%]	This parameter sets the gains for the PID controller.		300.0	O	
H52	A334	[Integral time for PID	0.1- 32.0 [sec]			1.0	O	
H53	A335	[Differential time for PID (D gain)]	0 - 30.0 [sec]			0.0	O	
H54	A336	[PID control mode select]	0-1	Selects PID control mode		0	X	
				0	Normal PID control			
				1	Process PID control			
H55	A337	[PID output frequency high limit]	0.1 - 400 [Hz]	This parameter limits the amount of the output frequency through the PID control. The value is settable within the range of F21 – [Max frequency] and F23 – [Start frequency].		50.00	O	106
H56	A338	[PID output frequency low limit]	0.1 - 400 [Hz]			0.50	O	
H57	A339	[PID standard value select]	0-4	Selects PID standard value. Standard value is indicated in "rEF" of Drive group.		0	X	
				0	Loader digital setting 1			
				1	Loader digital setting 2			
				2	V1 terminal setting 2: 0-10V			
				3	I terminal setting: 0-20mA			
				4	Setting as a RS-485 communication			
H58	A33A	PID control unit select	0-1	Selects a unit of the standard value or feedback amount.		1	X	
				0	Frequency[Hz]			
				1	Percentage[%]			
H59	A33B	PID Output Inverse	0 - 1	Select the output direction of PID control.		0	X	
				0	No			
				1	Yes			
H60	A33C	PID Step Ref1	0-100 [%]	Sets the PID Step1 Reference Percent.		30.0	O	
H61	A33D	PID Step Ref2	0-100 [%]	Sets the PID Step2 Reference Percent.		25.0	O	111
H62	A33E	PID Step Ref3	0-100 [%]	Sets the PID Step3 Reference Percent.		20.0	O	

1) Set H49 to 1 (PID control) to display this parameter.

Functions List

Function group 2

LED display	Address for communi-cation	Parameter name	Min/Max range	Description		Factory defaults	Adj. during run	Page
H70	A346	[Frequency Reference for Accel/Decel]	0 - 1	0	Based on Max freq (F21)	0	X	83
				1	Based on Delta freq.			
H71	A347	[Accel/Decel time scale]	0 - 2	0	Settable unit: 0.01 second.	1	O	83
				1	Settable unit: 0.1 second.			
				2	Settable unit: 1 second.			
H72	A348	[Power on display]	0 - 17	This parameter selects the parameter to be displayed on the keypad when the input power is first applied.		0	O	142
				0	Frequency command			
				1	Accel time			
				2	Decel time			
				3	Drive mode			
				4	Frequency mode			
				5	Multi-Step frequency 1			
				6	Multi-Step frequency 2			
				7	Multi-Step frequency 3			
				8	Output current			
				9	Motor rpm			
				10	Inverter DC link voltage			
				11	User display select (H73)			
				12	Fault display			
				13	Direction of motor rotation select			
				14	Output current 2			
				15	Motor rpm 2			
				16	Inverter DC link voltage 2			
				17	User display select 2			
H73	A349	[Monitoring item select]	0 - 2	One of the following can be monitored via vOL - [User display select].		0	O	142
				0	Output voltage [V]			
				1	Output power [kW]			
				2	Torque [kgf · m]			
H74	A34A	[Gain for Motor rpm display]	1 - 1000 [%]	This parameter is used to change the motor rotating speed (r/min) to mechanical speed (m/mi) and display it.		100	O	141
H75	A34B	[DB resistor operating rate limit select]	0 - 1	0	Unlimited	1	O	168
				1	Use DB resistor for the H76 set time.			
H76	A34C	[DB resistor operating rate]	0 - 30[%]	Set the percent of DB resistor operating rate to be activated during one sequence of operation.		10	O	

Function group 2

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description		Factory defaults	Adj. during run	Page
H77[1]	A34D	[Cooling fan control]	0 - 2	0	Always ON	0	O	134
				1	Keeps ON when its temp is higher than inverter protection limit temp. Activated only during operation when its temp is below that of inverter protection limit.			
				2	Regardless of the operation fan is active when its temp is higher than inverter protection limit temp.			
H78	A34E	[Operating method select when cooling fan malfunctions]	0 - 1	0	Continuous operation when cooling fan malfunctions.	0	O	135
				1	Operation stopped when cooling fan malfunctions.			
H79	A34F	[S/W version]	x.xx	This parameter displays the inverter software version.		x.xx	X	-
H81[2]	A351	[2nd motor Accel time]	0 - 6000 [sec]	This parameter actives when the selected terminal is ON after I17-I20 is set to 12 {2nd motor select}.		5.0	O	127
H82	A352	[2nd motor Decel time]				10.0	O	
H83	A353	[2nd motor base frequency]	30 - 400 [Hz]			50.00	X	
H84	A354	[2nd motor V/F pattern]	0 - 2			0	X	
H85	A355	[2nd motor forward torque boost]	0 - 15 [%]			5	X	
H86	A356	[2nd motor reverse torque boost]				5	X	
H87	A357	[2nd motor stall prevention level]	30-150 [%]			130	X	
H88	A358	[2nd motor Electronic thermal level for 1 min]	50-200 [%]			120	O	
H89	A359	[2nd motor Electronic thermal level for continuous]	50-150 [%]			100	O	
H90	A35A	[2nd motor rated current]	0.1-100 [A]			26.3	X	

[1] Exception: Since SV004iG5H-2/SV004iG5H-4 is Natural convection type, this code is hidden.

[2] It is indicated when choosing I17-I20 as a 12 (2nd motor select).

Functions List

Function group 2

LED display	Address for communi- cation	Parameter name	Min/ Max range	Description		Factory defaults	Adj. during run	Page
H91[1]	A35B	[Parameter read]	0 - 1	Copy the parameters from inverter and save them into remote loader.		0	X	138
H92	A35C	[Parameter write]	0 - 1	Copy the parameters from remote loader and save them into inverter.		0	X	
H93	A35D	[Parameter initialize]	0 - 5	This parameter is used to initialize parameters back to the factory default value.		0	X	139
				0	-			
				1	All parameter groups are initialized to factory default value.			
				2	Only Drive group is initialized.			
				3	Only Function group 1 is initialized.			
				4	Only Function group 2 is initialized.			
				5	Only I/O group is initialized.			
H94	A35E	[Password register]	0 - FFFF	Password for H95-[Parameter lock]. Set as Hexa value.		0	O	
H95	A35F	[Parameter lock]	0 - FFFF	This parameter is able to lock or unlock parameters by typing password registered in H94.		0	O	139
				UL (Unlock)	Parameter change enable			
				L (Lock)	Parameter change disable			

[1] H91,H92 parameters are displayed when Remote option is installed.

5.4 Input/output group

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description	Factory defaults	Adj. during run	Page
I 0	A400	[Jump code]	0 - 87	Sets the code number to jump.	1	O	28
I 2	A402	[NV input Min voltage]	0 - -10 [V]	Sets the minimum voltage of the NV (-10V-0V) input.	0.00	O	73
I 3	A403	[Frequency corresponding to I 2]	0 - 400 [Hz]	Sets the inverter output minimum frequency at minimum voltage of the NV input.	0.00	O	73
I 4	A404	[NV input Max voltage]	0 - -10 [V]	Sets the maximum voltage of the NV input.	10.0	O	73
I 5	A405	[Frequency corresponding to I 4]	0 - 400 [Hz]	Sets the inverter output maximum frequency at maximum voltage of the NV input.	50.00	O	73
I 6	A406	[Filter time constant for V1 input]	0 - 9999	Adjusts the responsiveness of V1 input (0 - +10V).	10	O	74
I 7	A407	[V1 input Min voltage]	0 - 10 [V]	Sets the minimum voltage of the V1 input.	0	O	74
I 8	A408	[Frequency corresponding to I 7]	0 - 400 [Hz]	Sets the inverter output minimum frequency at minimum voltage of the V1 input.	0.00	O	74
I 9	A409	[V1 input Max voltage]	0 - 10 [V]	Sets the maximum voltage of the V1 input.	10	O	74
I10	A40A	[Frequency corresponding to I 9]	0 - 400 [Hz]	Sets the inverter output maximum frequency at maximum voltage of the V1 input.	50.00	O	74
I11	A40B	[Filter time constant for I input]	0 - 9999	Sets the input section's internal filter constant for I input.	10	O	75
I12	A40C	[I input Min current]	0 - 20 [mA]	Sets the minimum current of I input.	4.00	O	75
I13	A40D	[Frequency corresponding to I 12]	0 - 400 [Hz]	Sets the inverter output minimum frequency at minimum current of I input.	0.00	O	75
I14	A40E	[I input Max current]	0 - 20 [mA]	Sets the Maximum current of I input.	20.00	O	75
I15	A40F	[Frequency corresponding to I 14]	0 - 400 [Hz]	Sets the inverter output maximum frequency at maximum current of I input.	50.00	O	75
I16	A410	[Criteria for Analog Input Signal loss]	0 - 2	0: Disabled 1: activated below half of set value. 2: activated below set value.	0	O	165
I17	A411	[Multi-function input terminal P1 define]	0 - 30	0 Forward run command 1 Reverse run command	0	O	79

LED display	Address for communi- cation	Parameter name	Min/ Max range	Description			Factory defaults	Adj. during run	Page
I18	A412	[Multi-function input terminal P2 define]		2	Emergency Stop Trip		1	O	-
				3	Reset when a fault occurs {RST}				-
I19	A413	[Multi-function input terminal P3 define]		4	Jog operation command		2	O	99
				5	Multi-Step freq – Low				
I20	A414	[Multi-function input terminal P4 define]		6	Multi-Step freq – Mid		3	O	78
				7	Multi-Step freq – High				
				8	Multi Accel/Decel – Low				
				9	Multi Accel/Decel – Mid				85
				10	Multi Accel/Decel – High				
				11	DC brake during stop				95
				12	2nd motor select				127
				13	-Reserved-				-
				14	-Reserved-				-
				15	Up-down	Frequency increase (UP) command			100
				16		Frequency decrease command (DOWN)			
				17	3-wire operation				103
				18	External trip: A Contact (EtA)				164
				19	External trip: B Contact (EtB)				
				20	Self-diagnostic function				-
				21	Change from PID operation to V/F operation				106
				22	2nd Source				128
				23	Analog Hold				77
				24	Accel/Decel Disable				87
				25	Up/Down Save Freq. Initialization				100
				26	JOG-FX				99
				27	JOG-RX				
				28	Fire Mode				137
				29	PID_Step_Low				111
				30	PID_Step_Mid				

* See "Chapter 14 Troubleshooting and maintenance" for External trip A/B contact.

* Each multi-function input terminal must be set differently.

Input/output group

LED display	Address for communi-cation	Parameter name	Min/Max range	Description				Factory default	Adj. during run	Page
I25	A419	[Input terminal status display]		BIT3	BIT2	BIT1	BIT0	-	-	143
				P4	P3	P2	P1			
I26	A41A	[Output terminal status display]		BIT1		BIT0		-	-	144
				Relay2		Relay1				
I27	A41B	[Filtering time constant for Multi-function Input terminal]	1 - 15	If the value is set higher, the responsiveness of the Input terminal is getting slower.				4	O	-
I30	A41E	[Multi-Step frequency 4]	0 - 400 [Hz]	It cannot be set greater than F21 – [Max frequency].				30.00	O	78
I31	A41F	[Multi-Step frequency 5]						25.00	O	
I32	A420	[Multi-Step frequency 6]						20.00	O	
I33	A421	[Multi-Step frequency 7]						15.00	O	
I34	A422	[Multi-Accel time 1]	0-6000 [sec]					3.0	O	85
I35	A423	[Multi-Decel time 1]						3.0		
I36	A424	[Multi-Accel time 2]						4.0		
I37	A425	[Multi-Decel time 2]						4.0		
85	A426	[Multi-Accel time 3]						5.0		
I39	A427	[Multi-Decel time 3]						5.0		
I40	A428	[Relay1 On Delay]	0-1000 [sec]					0.0	-	117
I41	A429	[Relay1 Off Delay]						0.0		
I42	A42A	[Relay2 On Delay]						0.0		
I43	A42B	[[Relay2 Off Delay]						0.0		
I50	A432	[Analog output item select]	0 - 3	Output item	Output to 10[V]			0	O	147
					200V	400V				
				0	Output freq.	Max frequency				

Functions List

LED display	Address for communi- cation	Parameter name	Min/ Max range	Description				Factory default	Adj. during run	Page
				1	Output current	150 %				
				2	Output voltage	AC 282V	AC 564V			
				3	Inverter DC link voltage	DC 400V	DC 800V			
I51	A433	[Analog output level adjustment]	10- 200 [%]	Based on 10V.				100	O	147
I52	A434	[Frequency detection level]	0 - 400 [Hz]	Used when I54 or I55 is set to 0-4. Cannot be set higher than F21.				30.00	O	148
I53	A435	[Frequency detection bandwidth]						10.00	O	
I54	A436	[Multi-function realy1 select]		0	FDT-1			17	O	148
				1	FDT-2					
				2	FDT-3					148
				3	FDT-4					
I55	A437	[Multi-function relay 2select]	0 - 27	4	FDT-5			12	O	148
				5	Overload (OLt)					
				6	Inverter Overload (IOLt)					
				7	Motor stall (STALL)					
				8	Over voltage trip (Ovt)					148
				9	Low voltage trip (Lvt)					
				10	Inverter Overheat (OHt)					
				11	Command loss					
				12	During Run					
				13	During Stop					
				14	During constant run					
				15	During speed searching					148
				16	Wait time for run signal input					
				17	Fault Output					
				18	Warning for cooling fan trip					
				19	On Off Control					
				20	Pipe Broken					
				21	Over Pressure					
				22	Under Load Trip					
				23	Broken Belt Trip					148
				24	Motor Alternation					
				25	MMC1					
				26	MMC2					

LED display	Address for communi-cation	Parameter name	Min/Max range	Description				Factory default	Adj. during run	Page
				27	Fire Mode					
I56	A438	[Fault relay output]	0 - 7		When setting the H26– [Number of auto restart try]	When the trip other than low voltage trip occurs	When the low voltage trip occurs	2	O	148
					Bit 2	Bit 1	Bit 0			
				0	-	-	-			
				1	-	-	✓			
				2	-	✓	-			
				3	-	✓	✓			
				4	✓	-	-			
				5	✓	-	✓			
				6	✓	✓	-			
				7	✓	✓	✓			
I57	A439	[Output terminal select when communication error occurs]	0 - 3		Multi-function relay		Multi-function output terminal	0	O	158
					Bit 1		Bit 0			
				0	-		-			
				1	-		✓			
				2	✓		-			
				3	✓		✓			
I59	A43B	[Communication protocol select]	0 - 1	Set communication protocol.				0	X	80
				0	Modbus RTU					
				1	LS BUS					
I60	A43C	[Inverter number]	1 - 250	Set for RS485 communication				1	O	80

Functions List

Input/Output Group

LED display	Address for communi- cation	Parameter name	Min/ Max range	Description		Factory defaults	Adj. during run	Page
I61	A43D	[Baud rate]	0 - 4	Select the Baud rate of the RS485.		3	O	80
				0	1200 [bps]			
				1	2400 [bps]			
				2	4800 [bps]			
				3	9600 [bps]			
				4	19200 [bps]			
I62	A43E	[Drive mode select after loss of frequency command]	0 - 3	It is used when freq command is given via V1 /I terminal or RS485.		0	O	165
				0	Continuous operation at the frequency before its command is lost.			
				1	Free Run stop (Output cut-off)			
				2	Decel to stop			
				3	Lost Preset			
I63	A43F	[Wait time after loss of frequency command]	0.1 - 120 [sec]	This is the time inverter determines whether there is the input frequency command or not. If there is no frequency command input during this time, inverter starts operation via the mode selected at I62.		1.0	O	165
I64	A440	[Communi- cation time setting]	2 - 100 [ms]	Frame communication time		5	O	-
I65	A441	[Parity/stop bit setting]	0-3	When the protocol is set, the communication format can be set.		O	O	-
				0	Parity: None, Stop Bit: 1			
				1	Parity: None, Stop Bit: 2			
				2	Parity: Even, Stop Bit: 1			
				3	Parity: Odd, Stop Bit: 1			

Input/Output Group

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description	Factory defaults	Adj. during run	Page
I66	A442	[Read address register 1]			5		
I67	A443	[Read address register 2]			6		
I68	A444	[Read address register 3]			7		
I69	A445	[Read address register 4]	0-42239	The user can register up to 8 discontinuous addresses and read them all with one Read command.	8	O	181
I70	A446	[Read address register 5]			9		
I71	A447	[Read address register 6]			10		
I72	A448	[Read address register 7]			11		
I73	A449	[Read address register 8]			12		
I74	A44A	[Write address register 1]			5		
I75	A44B	[Write address register 2]	0-42239	The user can register up to 8 discontinuous addresses and write them all with one Write command	6	O	181
I76	A44C	[Write address register 3]			7		

Functions List

Input/Output Group

LED display	Address for communi-cation	Parameter name	Min/Max range	Description	Factory defaults	Adj. during run	Page
I77	A44D	[Write address register 4]			8		
I78	A44E	[Write address register 5]			5		
I79	A44F	[Write address register 6]			6		181
I80	A450	[Write address register 7]			7		
I81	A451	[Write address register 8]			8		
I88[1]	A458	[Lost Preset Freq]	0-400 [Hz]	If I62 is set "3", when the drive go into the lost command state, the drive will operate the motor at lost command frequency.	30.0	O	165

[1]: It is indicated when choosing I62 as a 3 (Lost Preset)

5.5 Application Group

LED display	Address for communication	Parameter name	Min/ Max range	Description	Factory defaults	Adj. during run	Page
A1[1]	A501	[Sleep delay time]	0-2000 [s]	Sets a sleep delay time in PID drive.	20.0	O	109
A2[1]	A502	[Sleep frequency]	0-400 [Hz]	Sets a sleep frequency when executing a sleep function in PID control drive. You can't set more than Max. frequency(F21)	0.00	O	109
A3[1]	A503	[Sleep Boost Set]	0-100 [%]	Set the percentage of the PID reference before entering sleep mode.	0.00	O	109
A4[1]	A504	[Sleep Boost Time]	0-1000.0 [s]	If the set time is exceeded, sleep mode is entered.	0.0	O	109
A5[1]	A505	[Wake up Delay Time]	0-6000.0 [s]	Sets a Wake Up delay time in PID drive.	20.0	O	109
A6[1]	A506	[Wake up level]	0-100.0 [%]	Sets a wake up level in PID control drive.	20.0	O	109
A7[1]	A507	[Pre-PID Mode Freq]	0-400 [Hz]	Sets the frequency range for a general acceleration without PID control.	0.00	O	110
A8[1]	A508	[Pre-PID Exit Level]	0-100.0 [%]	When the feedback exceeds the Pre-PID Exit Level, the Pre-PID operation ends and a normal process PID operation begins.	20.0	O	110
A9[1]	A509	[Pre-PID Timer]	0-100.0 [s]	When the time exceeds the Pre-PID Timer, the Pre-PID operation ends and a normal process PID operation begins.	60.0	O	110
A11[1]	A50B	[MMC Sel]	0-1	Selects the MMC operation settings. 0 No: Deactivates MMC function 1 Yes : Activates MMC function	0	X	112
A12[2]	A50C	[Num Of Aux]	1-2	Decides the number of auxiliary motors to use.	2	O	112
A13[2]	A50D	[Start Freq1]	A15-400 [Hz]	Sets the auxiliary motor start frequency.	40.0	O	112
A14[2]	A50E	[Start Freq2]	A16-400 [Hz]	Sets the auxiliary motor start frequency.	40.0	O	112
A15[2]	A50F	[Stop Freq1]	0-A13 [Hz]	Sets the auxiliary motor stop frequency.	20.0	O	112
A16[2]	A510	[Stop Freq2]	0-A14 [Hz]	Sets the auxiliary motor stop frequency.	20.0	O	112
A17[2]	A511	[Aux Start Delay Time]	0.1-600.0 [s]	The auxiliary motors turns on or off after the auxiliary motor stop delay time elapses.	5.0	O	112

[1]: Set H49 to 1 (PID control) to display this parameter.

[2]: Set A11 to 1 (MMC Select) to display this parameter.

Application Group

LED display	Address for communi-cation	Parameter name	Min/Max range	Description	Factory defaults	Adj. during run	Page
A18[2]	A512	[Aux Stop Delay Time]	0.1-600.0 [s]	The auxiliary motors turns on or off after the auxiliary motor stop delay time elapses.	5.0	O	112
A19[2]	A513	[PID Acc Time]	0-600.0 [s]	When the auxiliary motor stops, the main motor accelerates up to the auxiliary motor restart frequency set at A13, 14 (Start Freq 1, 2) based on the acceleration time set at A20 (PID Acc Time).	5.0	O	112
A20[2]	A514	[PID Dec Time]	0-600.0 [s]	When an auxiliary motor starts, the main motor decelerates to the auxiliary motor deceleration frequency set at A15, 16 (Stop Freq 1, 2) based on the deceleration time set at A19 (PID Dec Time).	5.0	O	112
A21[2]	A515	[Aux All Stop]	0-1	0 No / 1 Enable Aux All Stop	No	O	112
A22[2]	A516	[Aux On/Off Sequence]	0-1	Sets the operating priority of MMC. 0 First In First Out / 1 First In Last Out	0	O	112
A23[2]	A517	[Auto Change Select]	0-1	0 No / 1 Enable Aux Auto Change	No	O	114
A24[3]	A518	[Auto Change Time]	1-6000 [m]	Sets the auto change intervals.	6	X	114
A25[3]	A519	[Auto Change Level]	startFreq-400 [Hz]	All the conditions for Auto Change are met under the frequency in which output frequency of Main motors are set in A25. A25 is the frequency to activate Auto Change.	20.00	O	114
A26[3]	A51A	[Start Motor]	1-2	Sets the start auxiliary motor.	1	X	114
A27[3]	A51B	[Auto Change Operation Time]	0-6000 [m]	Indicates time to activate Auto Change.	-	X	114
A29	A51D	[Alternation Select]	0-1	0 NO / 1 Enable Motor Alternation	No	X	116
A30	A51E	[Alt. Set Time]	0-6000 [m]	Sets the Motor Alternation time..	1	X	116
A31	A51F	[Alt. Delay Time]	600.0 [sec]	Sets the Alternation Delay Time.	10	X	116
A32	A520	[Lead Pump Select]	1-2	Select Lead Pump.	1	X	116
A33	A521	[Lead Pump Display]	1-2	Pump Operation Time.	-	O	116

[2]: Set A11 to 1 (MMC Select) to display this parameter.
[3]: Set A23 to 1 (Auto Change Select) to display this parameter.

Application Group

LED display	Address for communi-cation	Parameter name	Min/ Max range	Description	Factory defaults	Adj. during run	Page
A35	A523	[Start Ramp Acc]	0-6000.0 [s]	Multi-step acceleration time	10.0	O	136
A36	A524	[End Ramp Dec]	0-6000.0 [s]	Multi-step deceleration time	10.0	O	136
A37	A525	[Start & End Ramp Freq]	0-400 [Hz]	Acc/Dec time switch frequency	0.00	O	136
A38[1]	A526	[Pipe Broken Select]	0-1	Sets the Pipe Broken function.	No	O	172
A39[4]	A527	[Pipe Broken Level]	0-100.0 [%]	Sets the Pipe Break Detection level.	0.0	O	172
A40[4]	A528	[Pipe Broken Delay]	0-600.0 [s]	Sets the detection delay time.	10.0	O	172
A41[4]	A529	[Pipe Broken Freq]	0-H55 [Hz]	Sets the Pipe Broken frequency.	49.00	O	172
A42	A52A	[Fire Mode Freq]	0-400 [Hz]	Set the Fire Mode Freq	50.00	O	137
A43	A52B	[Fire Mode Count]	0-10000	Fire Mode Count	0	O	137
A44	A52C	[ULT Select]	0-1	0　NO 1　YES	No	O	
A45[5]	A52D	[ULT Level Freq]	0-400 [Hz]	Defines the ULT Level Freq.	49.00	O	
A46[5]	A52E	[ULT Level]	0-100.0 [%]	Defines the ULT Current Level.	70.0	O	
A47[5]	A52F	[ULT Delay Time]	0-600.0 [s]	A protect function operates when under load level conditions explained above maintain for the trip time set.	5.0	X	169
A48[5]	A530	[ULT Retry Number]	0-10	The number of available auto restarts can be set at A48. If a ULT trip occurs during an operation, the inverter restarts after the time set at A49 (Retry DT).	0	O	
A49[5]	A531	[ULT Auto Retry Delay Time]	0-600.0 [s]		1.0	X	

[1]: Set H49 to 1 (PID control) to display this parameter.
[4]: Set A38 to 1 (Pipe Broken Select) to display this parameter.
[5]: Set A44 to 1 (ULT Select) to display this parameter

Functions List

Application Group

LED display	Address for communi-cation	Parameter name	Min/Max range	Description		Factory defaults	Adj. during run	Page
A54	A536	[Broken Belt Select]	0-2	0	NONE	0	X	171
				1	Warning			
				2	Free-Run			
A55	A537	[Broken Belt Freq]	15.0-400 [Hz]	Broken Belt Freq		15.0	X	
A56	A538	[Current Torque]	-	Current Torque display.		-	X	
A57	A539	[Broken Belt Torque]	0-100.0 [%]	Sets the Broken Belt Torque		10.0	X	
A58	A53A	[Broken Belt Delay]	0-600.0 [s]	Broken Belt Delay time		10.0	X	171
A62[1]	A53E	[Over Pressure Trip]	0-2	0	NONE	0	X	172
				1	Auto Reset			
				2	Manual Reset			
A63[1]	A53F	[Over Pressure Level]	0-100.0 [%]	Defines the Over Pressure level.		80.0	X	

[1]: Set H49 to 1 (PID control) to display this parameter.
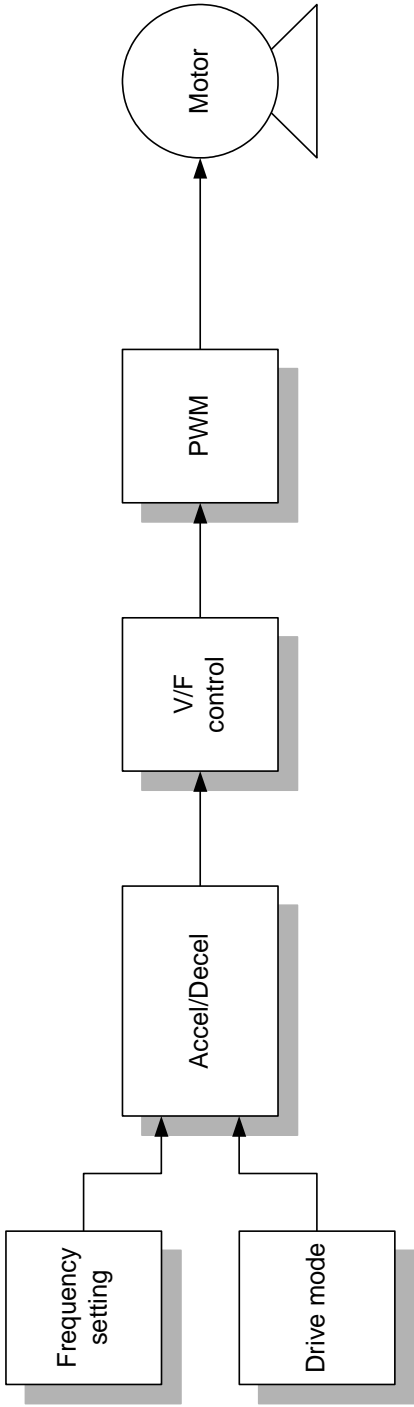
6 Control Block Diagram

6.1 Frequency setting
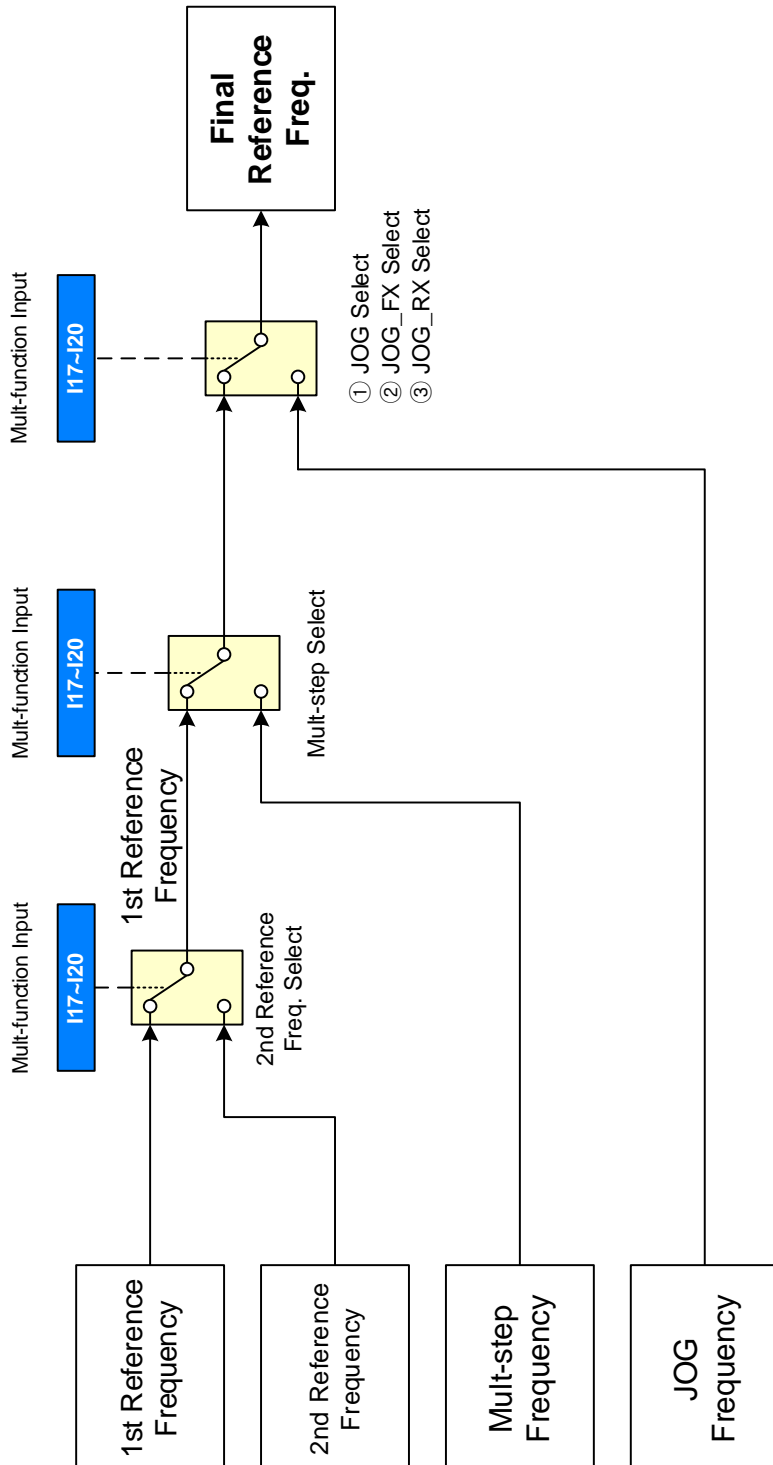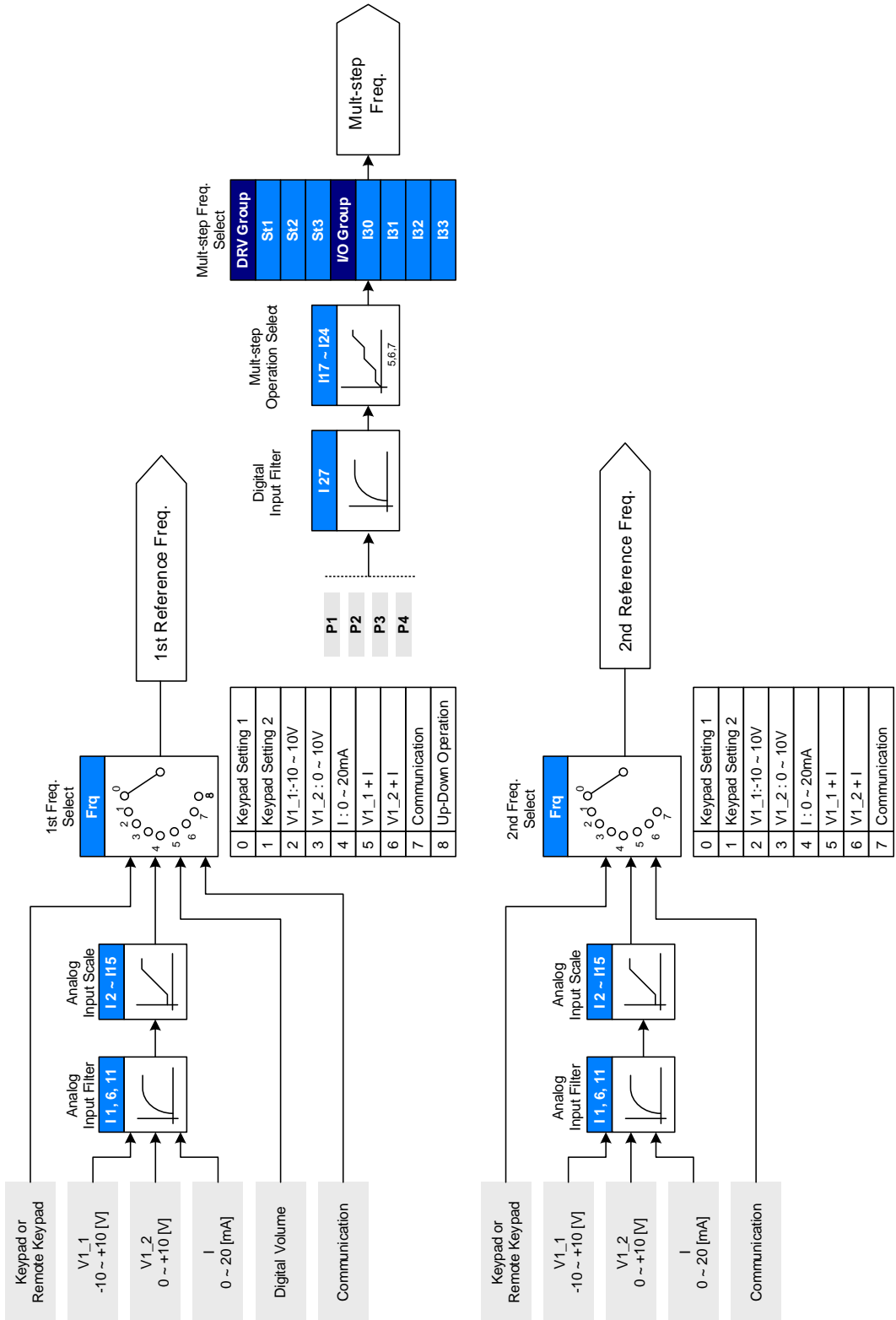
6.2 Drive command setting
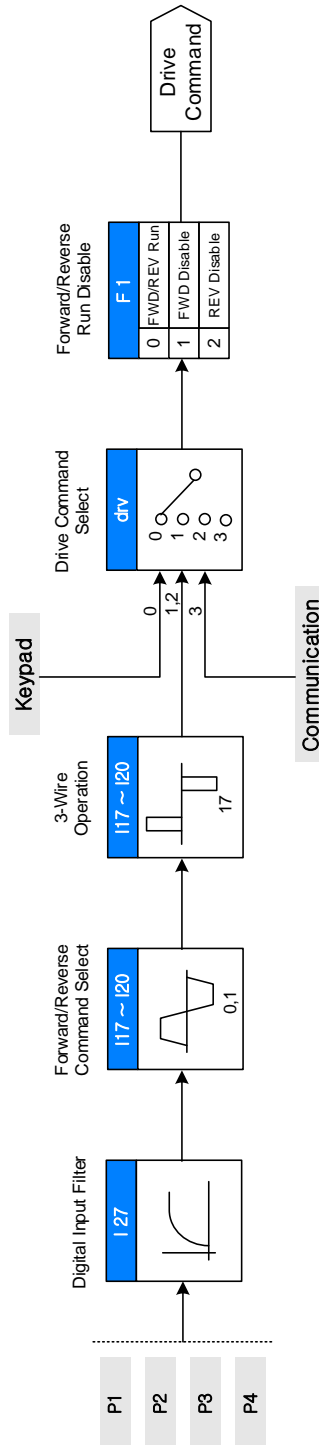
6.3 Accel/Decel setting and V/F control
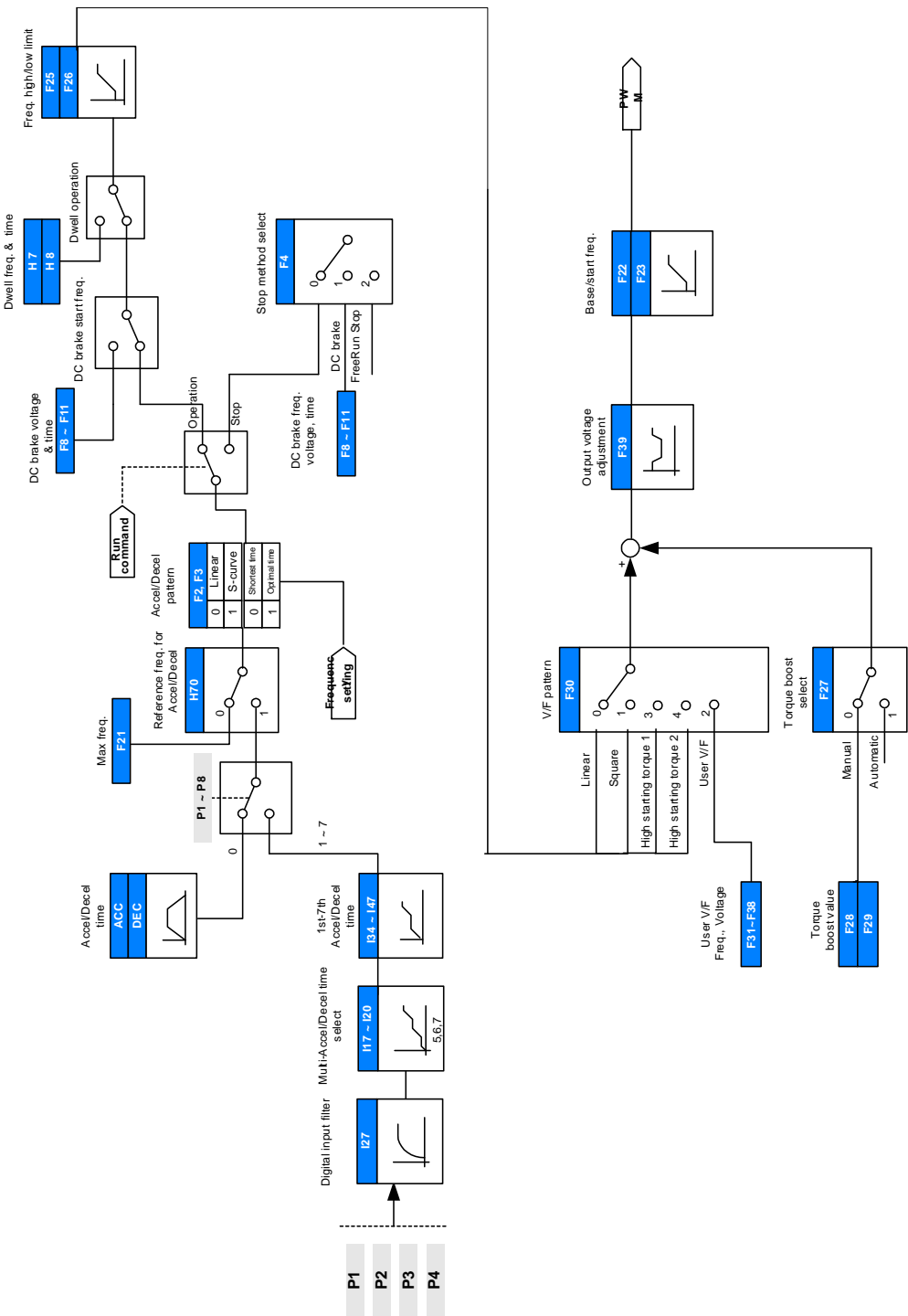
7 Basic Functions

7.1 Frequency mode

7.1.1   Keypad Frequency setting 1

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.00	[Frequency Command]	-	0 - 400	0.00	Hz
	Frq	**[Frequency mode]**	**0**	0 - 8	0	

- Set **Frq** – [Frequency mode] to 0 {Frequency setting via Keypad 1}.
- Set the desired frequency in **0.00** and press the Prog/Ent (●) key to enter the value into memory.
- The value is settable less than **F21** – [Max frequency].

► When remote keypad is connected, keypad keys on the body are deactivated.

7.1.2   Keypad Frequency setting 2

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.00	[Frequency Command]	-	0 - 400	0.00	Hz
	Frq	**[Frequency mode]**	**1**	0 - 8	0	

- Set **Frq** – [Frequency mode] to 1{Frequency setting via Keypad 2}.
- In **0.00**, frequency is changed upon pressing the Up (▲)/Down (▼) key. In this case, UP/Down keys serve as a potentiometer.
- The value is settable less than **F21** – [Max frequency].

► When remote keypad is connected, keypad keys on the body are deactivated.

7.1.3   Frequency setting via –10 - +10[V] input

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.00	[Frequency Command]	-	0 -400	0.00	Hz
	Frq	**[Frequency Mode]**	**2**	0 - 8	0	
I/O group	I 2	[NV input minimum voltage]	-	0 - -10	0.0	V
	I 3	[Frequency corresponding to I2]	-	0 - 400	0.00	Hz
	I 4	[NV input max voltage]	-	0 - 10	10.00	V
	I 5	[Frequency corresponding to I4]	-	0 - 400	60.00	Hz
	I6 - I10	[V1 input]				

•   Set **Frq** – [Frequency Mode] to 2.
•   The set frequency can be monitored in **0.00** - [Frequency Command].

►   Apply –10V - +10V signal between V1 and CM terminal.
►   Output frequency corresponding to –10V - +10V input voltage to V1 terminal
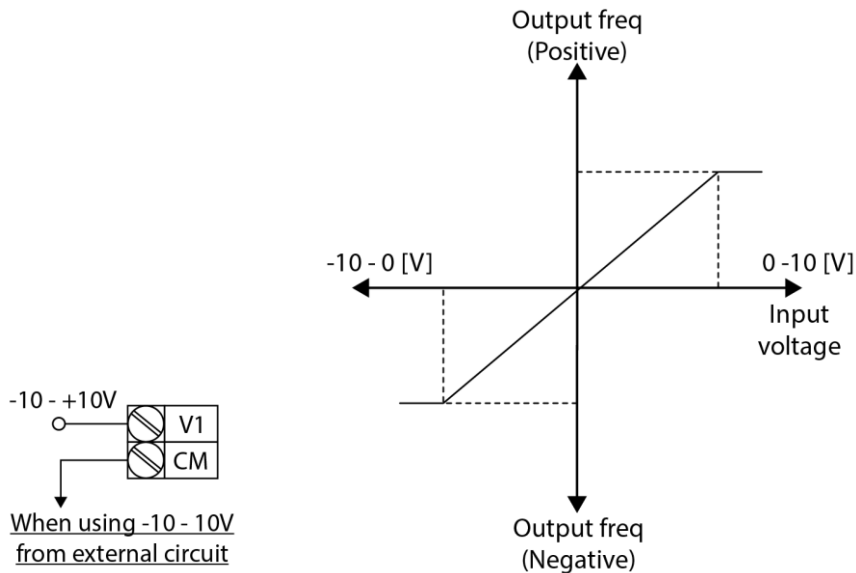
►   I 2 - I 5: Setting input range and corresponding frequency to -10V - 0V V1 input voltage
     Ex) when minimum (-) input voltage is -2V with corresponding frequency 10Hz and Max
     voltage is –8V with run freq. 50Hz.
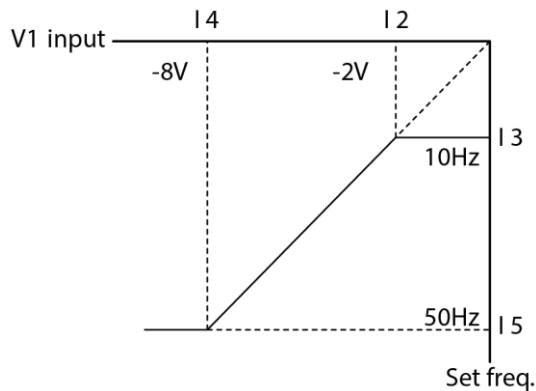
► I6 - I10: Setting input range and corresponding frequency to 0 - +10V V1 input voltage
Ex) when minimum (+) input voltage is 2V with corresponding frequency 10Hz and Max
voltage is 8V with run freq.
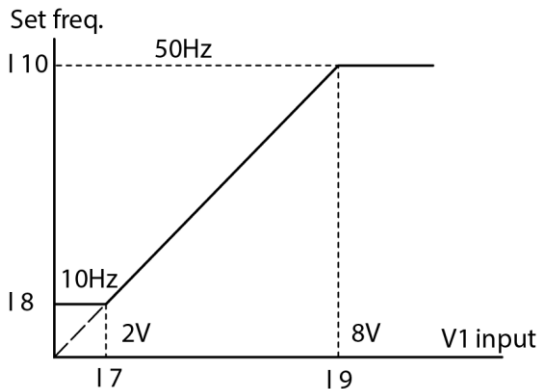
7.1.4 Frequency setting via 0 - 10 [V] input or Terminal Potentiometer

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.00	[Frequency Command]	-	0 -400	0.00	Hz
	Frq	**[Frequency Mode]**	**3**	0 - 8	0	
I/O group	I 6	[Filter time constant for V1 input]	10	0 - 9999	10	
	I 7	[V1 input Min voltage]	-	0 - 10	0	V
	I 8	[Frequency corresponding to I 7]	-	0 - 400	0.00	Hz
	I 9	[V1 input max voltage]	-	0 - 10	10	V
	I10	[Frequency corresponding to I 9]	-	0 - 400	60.00	Hz

• Select 3 in Frq code of Drive group.
• 0-10V can be directly applied from an external controller or a potentiometer connected on terminals VR, V1 and CM.

► Wire the terminals as shown below and refer to I 6 - I 10.
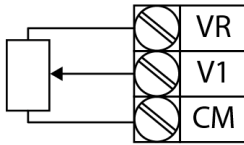
Wiring of potentiometer
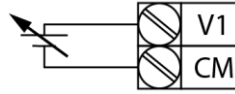
0 - 10V input via external controller

7.1.5 Frequency setting via 0 - 20 [mA] input

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.00	[Frequency Command]	-	0 -400	0.00	Hz
	Frq	**[Frequency Mode]**	**4**	0 - 8	0	
I/O group	I11	[Filter time constant for I input]	10	0 - 9999	10	
	I12	[I input minimum current]	-	0 - 20	4	mA
	I13	[Frequency corresponding to I12]	-	0 - 400	0.00	Hz
	I14	[I input max current]	-	0 - 20	20	mA
	I15	[Frequency corresponding to I14]	-	0 - 400	60.00	Hz

• Select 4 in Frq code of Drive group.
• Frequency is set via 0-20mA input between I and CM terminal.

7.1.6 Frequency setting via -10 - +10[V] voltage input + 0 - 20[mA] input

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.00	[Frequency Command]	-	0 -400	0.00	Hz
	Frq	**[Frequency Mode]**	**5**	0 - 8	0	

• Select 5 in Frq code of Drive group.
• Override function available using Main/Auxiliary speed adjustment
• Related code: I 2 - I 5, I 6 - I10, I11 - I15

► Override function is to gain precise control and fast response by combining Main and Auxiliary speed input. Fast response can be achieved by Main speed and precise control can be accomplished by Aux. speed if the accuracy of Main/Aux speed is set differently.
► Follow the setting below when Main speed is given via 0 - 20mA with Aux. speed via V1 terminal (–10 - 10V).
► When override function is used, select the Main/Aux. speed according to loads used.

Group	Code	Parameter Name	Setting	Unit
I/O group	I 2	[NV input Min voltage]	0	V
	I 3	[Frequency corresponding to I 2]	0.00	Hz
	I 4	[NV input Max voltage]	10.00	V
	I 5	[Frequency corresponding to I 4]	5.00	Hz
	I7	[V1 input Min voltage]	0.00	V
	I 8	[Frequency corresponding to I 7]	0.00	Hz
	I 9	[V1 input max voltage]	10.00	V
	I10	[Frequency corresponding to I 9]	5.00	Hz
	I12	[I input minimum current]	4.00	mA
	I13	[Frequency corresponding to I 12]	0.00	Hz
	I14	[I input max current]	20.00	mA
	I15	[Frequency corresponding to I 14]	60.00	Hz

• After the above setting is made, if 5V is applied to V1 with 12mA given to terminal I, output frequency would be 32.5Hz. If –5V is applied to V1 terminal with 12mA given to terminal I, output frequency would be 27.5Hz.

7.1.7   Frequency setting via 0 - 10[V] + 0 - 20[mA] input

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.00	[Frequency Command]	-	0 -400	0.00	Hz
	Frq	**[Frequency Mode]**	**6**	0 - 8	0	

• Select 6 in Frq code of Drive group.
• Related code: I 6 - I 10, I 11 - I 15
• Refer to Frequency setting via -10 - +10V voltage input + 0 - 20mA input.

7.1.8   Frequency setting via RS 485 communication

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.0	[Frequency Command]	-	0 -400	0.00	Hz
	Frq	**[Frequency Mode]**	**7**	0 - 8	0	

• Select 7 in Frq code of Drive group.
• Related code: I 59, I 60, I 61
• Refer to Chapter 11. RS485 communication.

7.1.9   Frequency setting via Digital Volume (up-down)

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	0.0	[Frequency Command]	-	0 -400	0.00	Hz
	Frq	**[Frequency Mode]**	**8**	0 - 8	0	

• Select 7 in Frq code of Drive group.
• Related code: I 59, I 60, I 61
• Refer to Chapter 11. RS485 communication.

7.1.10   Analog Hold

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**Frq**	**[Frequency Mode]**	**2 - 7**	0 - 8	0	
I/O group	I17	[Multi-function input terminal P1 define]	-		0	
	-	-		0 -25		
	I20	**[Multi-function input terminal P4 define]**	**30**		3	

• It is available when Frq code setting is 2 - 7.
• Select one terminal to use for Analog Hold command among Multi-function input terminal (P1 - P4).

► When P4 terminal is selected,
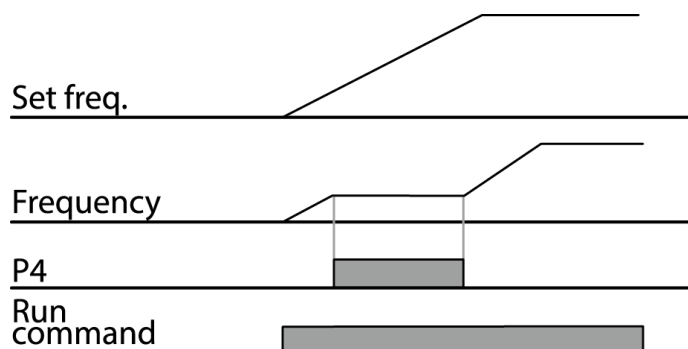
7.2 Multi-Step Frequency setting

Group	Code	Parameter Name	Setting	Range	Default	Unit
	0.0	[Frequency Command]	5.0	0 - 400	0.00	Hz
	Frq	[Frequency Mode]	0	0 - 8	0	-
Drive group	St1	[Multi-Step frequency 1]	-		10.00	
	St2	[Multi-Step frequency 2]	-	0 - 400	20.00	Hz
	St3	[Multi-Step frequency 3]	-		30.00	
	I18	**[Multi-function input terminal P2 define]**	**5**		1	-
	I19	**[Multi-function input terminal P3 define]**	**6**	0 - 30	2	-
I/O group	**I20**	**[Multi-function input terminal P4 define]**	**7**		3	-
	I30	[Multi-Step frequency 4]	-		30.00	
	I31	[Multi-Step frequency 5]	-	0 - 400	25.00	Hz
	I32	[Multi-Step frequency 6]	-		20.00	
	I33	[Multi-Step frequency 7]	-		15.00	

- Select a terminal to give Multi-step frequency command among P1-P4 terminals.
- If terminals P2-P4 are selected, set I18-I20 to 5-7 to give Multi-step frequency command.
- Multi-step frequency 0 is settable in Frq – [Frequency mode] and 0.00 – [Frequency command].
- Multi-step frequency 1-3 are set at St1-St3 in Drive group, while Step frequency 4-7 are set at I30-I33 in I/O group.
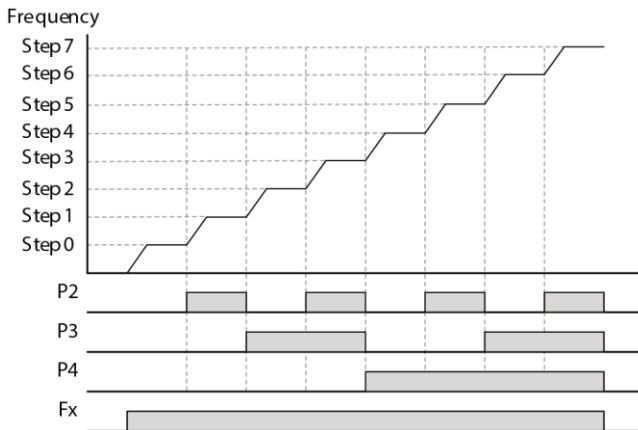
Step freq.	FX or RX	P4	P3	P2
0	✓	-	-	-
1	✓	-	-	✓
2	✓	-	✓	-
3	✓	-	✓	✓
4	✓	✓	-	-
5	✓	✓	-	✓
6	✓	✓	✓	-
7	✓	✓	✓	✓

7.3 Operating command setting method

7.3.1 Operation via keypad RUN key and STOP/RST key

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**drv**	**[Drive mode]**	**0**	0 - 4	1	
	drC	[Direction of motor rotation select]	-	F, r	F	

- Set drv – [Drive mode] to 0.
- Acceleration is started upon pressing the Run key while operating frequency is set. Motor decelerates to stop by pressing the STOP/RST key.
- Selecting rotation direction is available at drC - [Direction of motor rotation select] when operating command is issued via keypad.

drC	[Direction of motor rotation select]	F	Forward
		r	Reverse

Forward: Counter-clockwise
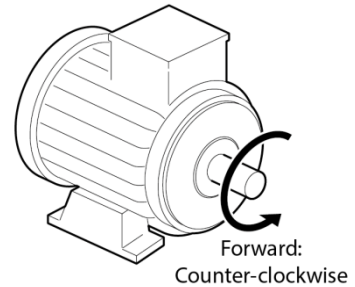
► When remote keypad is connected, body-embedded keypad is deactivated.

7.3.2 Operating command via FX, RX terminal 1

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	drv	**[Drive mode]**	**1**	0 - 4	1	
I/O group	I17	[Multi-function input terminal P1 define]	0	0 - 30	0	
	I18	[Multi-function input terminal P2 define]	1	0 - 30	1	

- Set **drv** – [Drive mode] to 1.
- Set I17 and I18 to 0 and 1 to use P1 and P2 as FX and RX terminals.
- "FX" is Forward run command and "RX" Reverse run.
- ► Motor is stopped when FX/RX terminal is ON/OFF at the same time.

Freq.

FX

RX
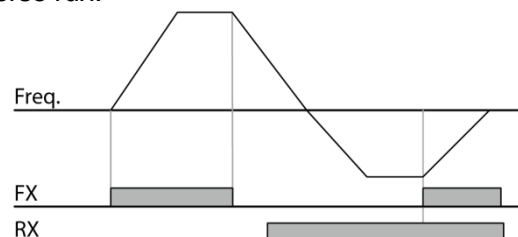
7.3.3   Operating command via FX, RX terminal 2

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**drv**	**[Drive mode]**	**2**	0 - 4	1	
I/O group	I17	[Multi-function input terminal P1 define]	0	0 - 30	0	
	I18	[Multi-function input terminal P2 define]	1	0 - 30	1	

- Set the **drv** to 2.
- Set I17 and I18 to 0 and 1 to use P1 and P2 as FX and RX terminals.
- FX: Operating command setting. Motor runs in forward direction when RX terminal (P2) is OFF.
- RX: Direction of motor rotation select. Motor runs in reverse direction when RX terminal (P2) is ON.
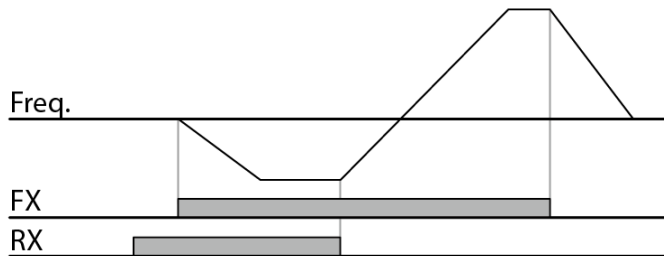
7.3.4   Operating command via RS485 communication

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**drv**	**[Drive mode]**	**3**	0 - 4	1	
I/O group	I59	[Communication protocol select]	-	0 - 1	0	
	I60	[Inverter number]	-	1 - 250	1	
	I61	[Baud rate]	-	0 - 4	3	

- Set the **drv** to 3.
- Set I59, I60 and I61 correctly.
- Inverter operation is performed via RS485 communication.
- Refer to Chapter. 11. RS485 communication.

7.3.5 Rotating direction select via –10 - +10[V] input of V1 terminal

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**frq**	**[Frequency setting]**	**2**	0 - 8	0	
	drv	[Drive mode]	-	0 - 4	1	

• Set **frq** to 2.
• Inverter is operating as the table below regardless of Drive mode setting.

	FWD RUN Command	REV RUN Command
0 - +10 [V]	FWD RUN	REV RUN
-10 - 0 [V]	REV RUN	FWD RUN

► Motor runs in Forward direction when input voltage to V1-CM is 0-10[V] and FWD RUN command is active. When input voltage polarity is reversed to –10-0[V] during FWD RUN, motor decelerates to stop and runs in reverse direction.

► When input voltage to V1-CM is 0-10[V] and REV RUN command is active, motor runs in Reverse direction and if -10-0[V] is input, motor rotating direction is reverse.

7.3.6 FX/RX Run Disable

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	drC	[Direction of motor rotation select]	-	F, r	F	
Function group 1	**F 1**	**[Forward/Reverse run disable]**	-	0 - 2	0	

• Select the direction of motor rotation.
• 0: Forward and Reverse run enable
• 1: Forward run disable
• 2: Reverse run disable

7.3.7 Power On Start select

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**drv**	**[Drive mode]**	**1, 2**	0 - 3	1	
Function group 2	**H20**	**[Power On Start select]**	**1**	0 - 1	0	

- Set H20 to 1.
- When AC input power is applied to the inverter with drv set to 1 or 2 {Run via control terminal} ON, motor starts acceleration.
- This parameter is inactive when drv is set to 0 {Run via keypad} or 3 {RS485 communication}.

ⓘ Caution

Particular attention must be directed to this function due to potential hazard as motor starts to run suddenly upon applying AC input power.

When H20 is 0   When H20 is 1
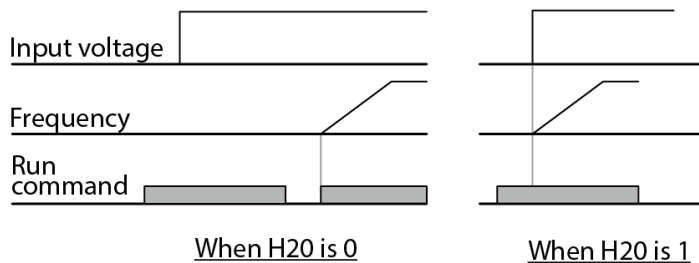
7.3.8 Restart after fault reset

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**drv**	**[Drive mode]**	**1, 2**	0 - 3	1	
Function group 2	**H21**	**[Restart after fault reset selection]**	**1**	0 - 1	0	

- Set H21 to 1.
- Motor starts acceleration if **drv** is set to 1 or 2 and the selected terminal is ON when a fault is cleared.
- This parameter is inactive when **drv** is set to 0 {Run via keypad} or 3 {RS485 communication}.

ⓘ Caution

Particular attention must be directed to this function due to potential hazard as motor starts to run suddenly after the fault is cleared.

| When H21 is 0 | When H21 is 1 |
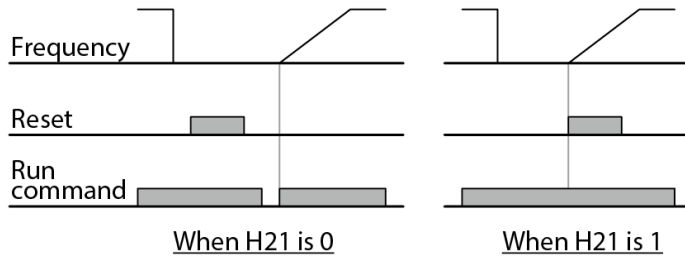
7.4 Accel/Decel time and pattern setting

7.4.1 Accel/Decel time setting based on Max frequency

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**ACC**	**[Accel time]**	-	0 - 6000	5.0	Sec
	dEC	**[Decel time]**	-	0 - 6000	10.0	Sec
Function group 1	F21	[Max Frequency]	-	40 - 400	60.00	Hz
Function group 2	**H70**	**[Frequency Reference for Accel/Decel]**	**0**	0 - 1	0	
	H71	[Accel/Decel time scale]	-	0 - 2	1	

- Set the desired Accel/Decel time at ACC/dEC in Drive group.
- If H70 is set to 0 {Max frequency}, Accel/Decel time is the time that takes to reach the max freq from 0 Hz.
- Desired Accel/Decel time unit is settable at the H71.

► Accel/Decel time is set based on **F21** – [Max frequency]. For instance, if **F21** is set to 60Hz, Accel/Decel time 5 sec, and run frequency 30Hz, time to reach 30Hz would be 2.5 sec.
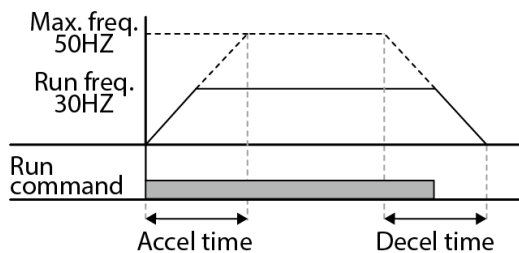
► More precise time unit can be set corresponding to load characteristics as shown below.
► In SV-iG5H, number display is available up to 5. Therefore, if time unit is set to 0.01 sec, Max Accel/Decel time would be 600.00 sec.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	H71	[Accel/Decel time scale]	0	0.01-600.00	0.01	sec
			1	0.1-6000.0	0.1	sec
			2	1-60000	1	sec

7.4.2   Accel/Decel time setting based on Operating Frequency

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	ACC	[Accel time]	-	0 - 6000	5.0	Sec
	dEC	[Decel time]	-	0 - 6000	10.0	Sec
Function group 2	**H70**	**[Frequency Reference for Accel/Decel]**	**1**	0 - 1	0	

• Accel/Decel time is set at the ACC/dEC.
• If you set H70 to 1 {Delta frequency}, Accel/Decel time is the time that takes to reach a target freq from constant run freq (Current operating freq.).

► When H70 and Accel time are set to 1 {Delta frequency} and 5 sec, respectively,
► The below graph in Section A shows the change in operating frequency when target frequency is set to 10Hz at first and then changed to 30Hz.
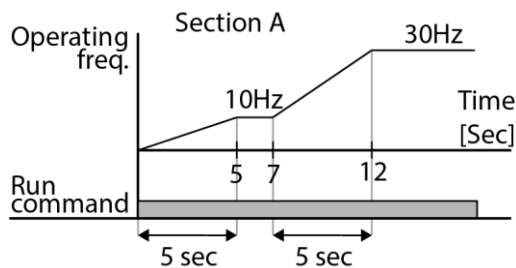
7.4.3   Multi-Accel/Decel time setting via Multi-function terminals

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	ACC	[Accel time]	-	0 - 6000	5.0	Sec
	dEC	[Decel time]	-	0 - 6000	10.0	Sec
I/O group	I17	[Multi-function input terminal P1 define]	0	0 - 30	0	
	I18	**[Multi-function input terminal P2 define]**	**8**		1	
	I19	**[Multi-function input terminal P3 define]**	**9**		2	
	I34	[Multi-Accel time 1]	-	0 - 6000	3.0	Sec
	-	-				
	I39	[Multi-Decel time 3]	-		5.0	

- Set I18, I19 to 8, 9 if you want to set Multi - Accel/Decel time via P2-P3 terminals.
- Multi-Accel/Decel time 0 is settable at ACC and dEC.
- Multi-Accel/Decel time 1-3 is settable at I34-I39.
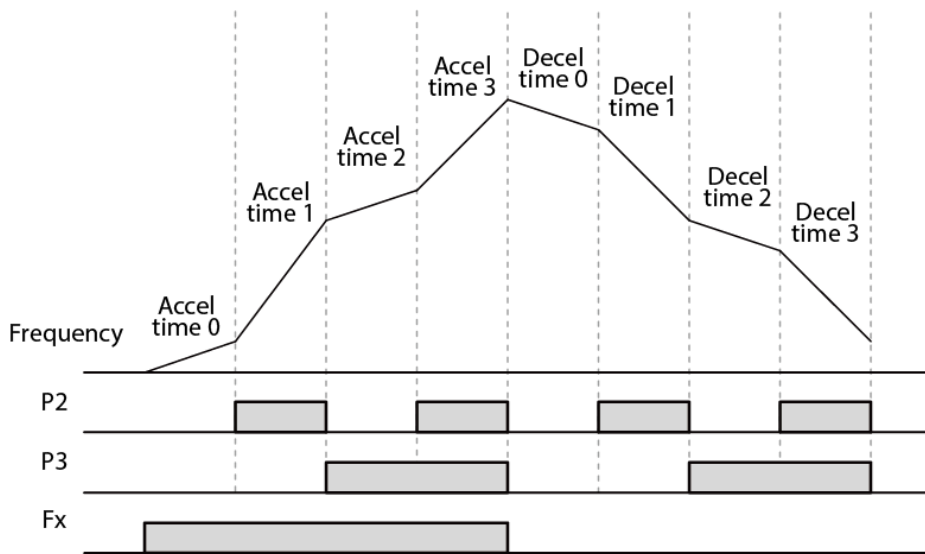
Accel/Decel time	P2	P3
0	-	-
1	-	✓
2	✓	-
3	✓	✓

7.4.4 Accel/Decel pattern setting

Group	Code	Parameter Name	Setting		Range	Default	Unit
Function group 1	F 2	[Accel pattern]	0	Linear	0		
	F 3	[Decel pattern]	1	S-curve			
Function group 2	H17	[S-Curve Accel/Decel start side]	0- 100		40		%
	H18	[S-Curve Accel/Decel end side]			40		%

- Accel/Decel pattern is settable at F2 and F3.
- Linear: This is a general pattern for constant torque applications.
- S-curve: This curve allows the motor to accelerate and decelerate smoothly.

⊘ Caution

For S-curve, the actual Accel/Decel time takes longer than the time set by user.
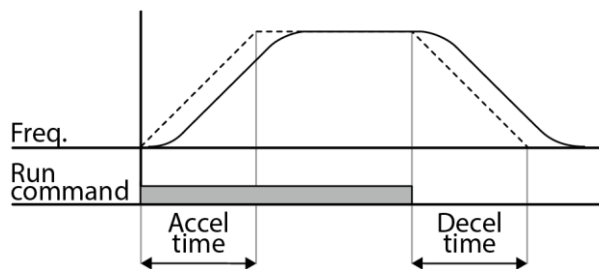
► H17 sets the starting ratio between S-curve and Linear in 1/2 of Accel/Decel Ref. Frequency. For smooth Accel/Decel starting, increase H17 to extend S-curve ratio.

► H18 sets the ending ratio between S-curve and Linear in 1/2 of Accel/Decel Ref. Frequency. For smooth and accurate speed arrival and stopping, increase H18 to extend S-curve ratio.
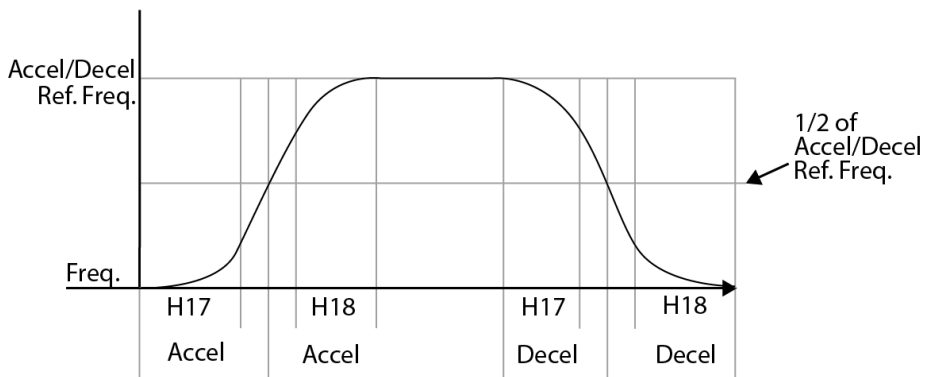
► Note that setting Frequency Ref. for Accel/decel (H70) is set to Max Freq and target freq is set below Max freq. the shape of S-curve may be distorted.
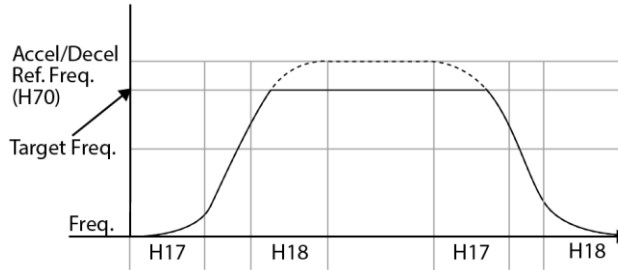
⊘ Caution

If Target Frequency is below Max Frequency, the waveform will be shown with the top portion cut out.

- Accel time for S-curve setting
$$= ACC + ACC \times \frac{H17}{2} + ACC \times \frac{H18}{2}$$

- Decel time for S-curve setting
$$= dEC + dEC \times \frac{H17}{2} + dEC \times \frac{H18}{2}$$

- ACC, dEC indicate the set time in Drive group.

7.4.5   Accel/Decel Disable

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I17	[Multi-function input terminal P1 define]	-	0 -30	0	
	-	-				
	I20	**[Multi-function input terminal P4 define]**	**24**		3	

- Select one terminal among Multi-function input terminals 1-4 to define Accel/Decel disable.
- If P4 is selected, set I20 to 24 to activate this function.
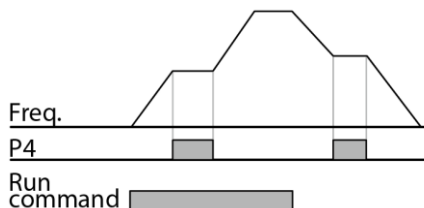
7.5 V/F control

7.5.1 Linear V/F pattern operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F22	[Base frequency]	-	30 - 400	60.00	Hz
	F23	[Start frequency]	-	0.1 - 10.0	0.50	Hz
	F30	**[V/F pattern]**	**0**	0 - 4	0	
Function group 2	H40	[Control mode select]	-	0 - 2	0	

• Set F30 to 0 {Linear}.
• This pattern maintains a linear Volts/frequency ratio from F23 - [Start frequency] to F22- [Base frequency]. This is appropriate for constant torque applications.
► Base Frequency: Inverter outputs its rated voltage at this level. Enter the motor nameplate frequency.
► Start Frequency: Inverter starts to output its voltage at this level.
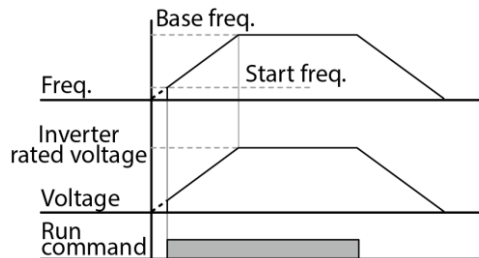
7.5.2 Square V/F pattern

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F30**	**[V/F pattern]**	**1**	0 - 4	0	

• Set F30 to 1{Square}.
• This pattern maintains squared volts/hertz ratio. Appropriate applications are fans, pumps, etc.
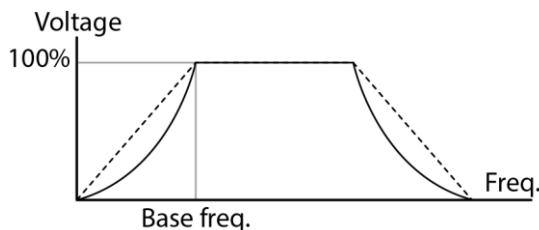
7.5.3   High starting torque pattern

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F30	[V/F pattern]	3, 4	0 - 4	0	

- Set F30 to {3 High starting torque 1} or {4 High starting torque 2}.
- iG5H offers a Two types of high starting torque pattern suitable for special pump load requiring high starting torque.
- Otherwise Select high starting torque when: Wiring between the drive and motor exceeds 150 m, An   AC reactor is installed.

High starting torque 1   High starting torque 2
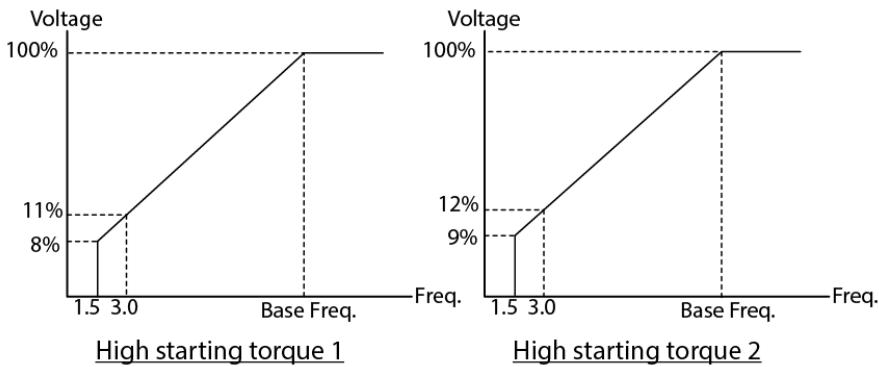
7.5.4   User V/F pattern operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F30**	**[V/F pattern]**	**2**	0 - 4	0	
	F31	[User V/F frequency 1]	-	0 - 400	15.00	Hz
	-	-				
	F38	[User V/F voltage 4]	-	0 - 100	100	%

- Select F30 to 2 {User V/F}.
- User can adjust the Volt/Frequency ratio according to V/F pattern of specialized motors and load characteristics.

⚠ Caution

In case of using a standard induction motor, if this value is set much higher than linear V/F pattern, it could result in torque shortage or motor overheating due to over-energizing.
When User V/F pattern is active, F28 - [Torque Boost in forward direction] and F29 - [Torque Boost in reverse direction] are deactivated.
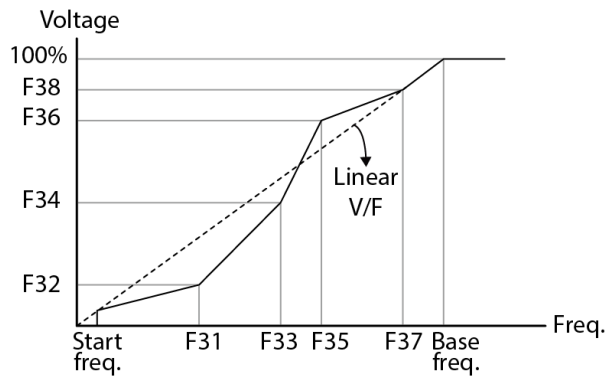
7.5.5   Output voltage adjustment

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F39**	**[Output voltage adjustment]**	-	40 - 110	100	%

- This function is used to adjust the output voltage of the inverter. This is useful when you use a motor that has a rated voltage lower than the input voltage.
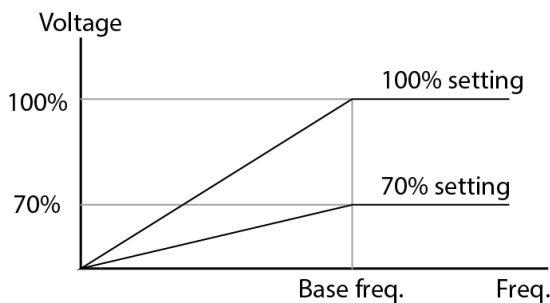
7.5.6   Manual torque boost

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F27**	**[Torque Boost select]**	**0**	0 - 1	0	
	F28	[Torque boost in forward direction]	-	0 - 15	4	%
	F29	[Torque boost in reverse direction]				

- Set F27 to 0 {Manual torque boost}.
- The values of [Torque boost in forward/reverse direction] are set separately in F28 and F29.

⊙ Caution

If the boost value is set much higher than required, it may cause motor overheating due to over-energizing.
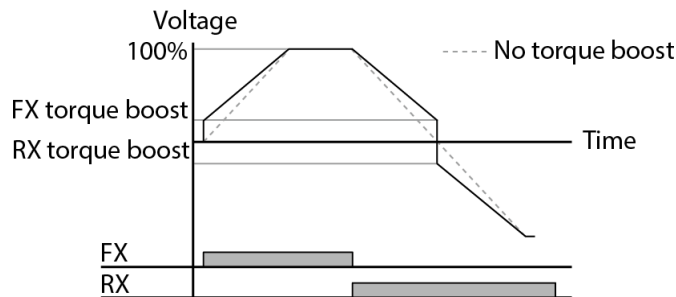
7.5.7   Auto torque boost

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F27**	**[Torque Boost select]**	**1**	0 - 1	0	
Function group 2	H34	[No load motor Current]	-	0.1 - 100	-	A
	H41	[Auto tuning]	0	0 - 1	0	
	H42	[Stator resistance (Rs)]	-	0 - 28	-	Ω

- Before Auto Torque Boost setting, H34 and H42 should be set correctly (See page 165, 171).
- Select 1{Auto torque boost} in F27.
- Inverter automatically calculates torque boost value using motor parameters and outputs the corresponding voltage.

7.6 Stop method select

7.6.1   Decel to stop

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F4**	**[Stop mode select]**	**0**	0 - 3	0	

• Select 0 {decel to stop} in F4 code.
• Motor decelerates to 0 Hz and stops during the setting time.
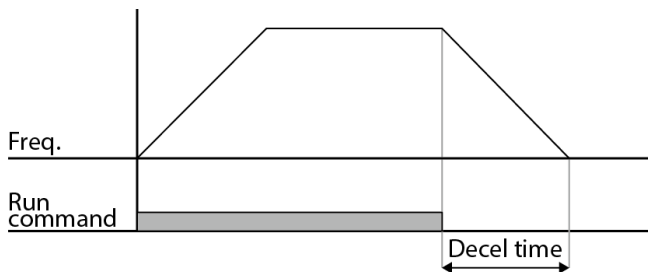
7.6.2   DC braking to stop

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F4**	**[Stop mode select]**	**1**	0 - 3	0	

• Select 1 {DC brake to stop} in F4 code.
• Refer to page 95.

7.6.3   Free run stop

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F4**	**[Stop mode select]**	**2**	0 - 3	0	

• Select 2 {Free run stop} in F4 code.
• When operating command is turned OFF, Output Frequency and voltage are shut down.
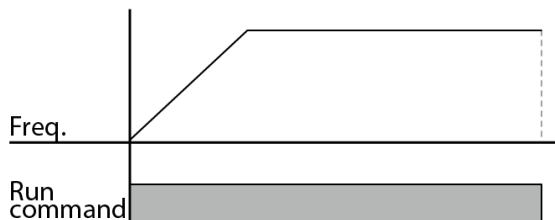
7.7 Frequency limit

7.7.1 Frequency limit using Max Frequency and Start Frequency

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F21	[Max frequency]	-	40 - 400	50.00	Hz
	F23	[Start frequency]	-	0.1 - 10	0.50	Hz

- Max Frequency: Frequency highest limit. Any frequency cannot be set above [Max frequency] except for F22 [Base frequency].
- Start Frequency: Frequency lowest limit. If a frequency is set lower than this, 0.00 is automatically set.

7.7.2 Frequency command limit using High/Low limit

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F24	[Frequency high/low limit select]	1	0 - 1	0	
	F25	[Frequency high limit]	-	0 - 400	50.00	Hz
	F26	[Frequency low limit]	-	0 - 400	0.50	Hz

- Set F24 to 1.
- Active run frequency can be set within the range of F25 and F26.

► When frequency setting is done via Analog input (voltage or current input), the inverter operates within the range of high and low limit frequency as shown below.
► This setting is also valid when frequency setting is done via keypad.
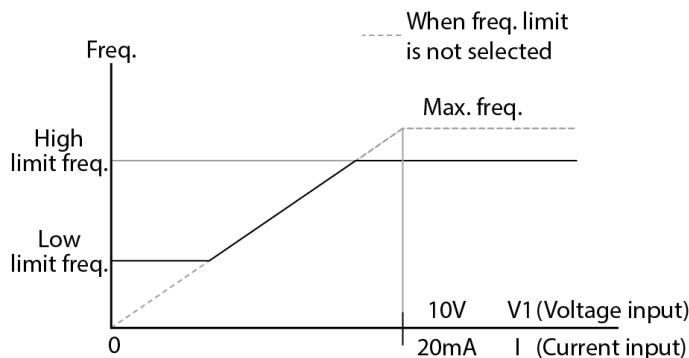
7.7.3   Skip frequency

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	H10	[Skip frequency select]	1	0 - 1	0	
	H11	[Skip frequency low limit 1]	-	0.1 - 400	10.00	Hz
	-	-				
	H16	[Skip frequency low limit 3]	-	0.1 - 400	35.00	Hz

- Set H10 to 1.
- Run frequency setting is not available within the skip frequency range of H11-H16.
- Skip frequency is settable within the range of F21 – [Max frequency] and F23 – [Start frequency].
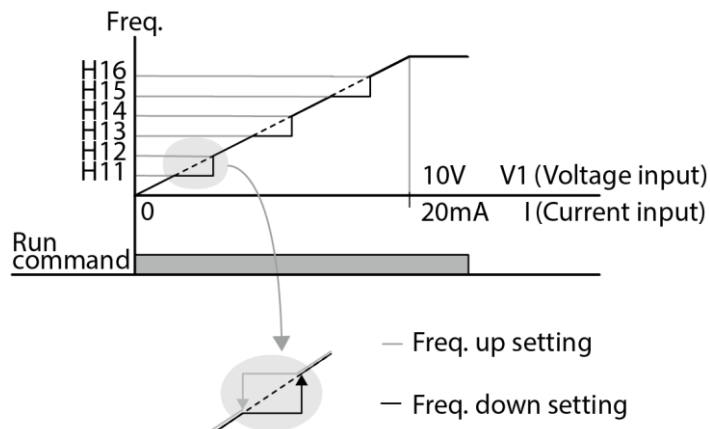
► When it is desired to avoid resonance attributable to the natural frequency of a mechanical system, these parameters allow resonant frequencies to be skipped. Three different areas of [Skip frequency High/Low limit] can be set with the skip frequencies set to either the top or bottom point of each area. However, during acceleration or deceleration, the run frequency within the set area is valid.

► In the case of increasing frequency setting as shown above, if frequency set value (Analog setting via voltage, current, or digital setting via keypad) is within the range of Skip frequency, it maintains Skip freq RS485 communication, frequency low limit value. If the set value is outside the range, it increases the frequency.

► In the case of decreasing frequency setting, if frequency set value (Analog setting via voltage, current, RS485 communication, or Digital setting via keypad) is within the range of Skip frequency, it maintains Skip frequency high limit value. If the set value is outside the range, it decreases the frequency.

8 Advanced functions

8.1 DC brake

8.1.1 Stopping motor by DC brake

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F 4**	**[Stop mode select]**	**1**	0 - 3	0	
	F 8	[DC Brake start frequency]	-	0.1 - 60	5.00	Hz
	F 9	[DC Brake wait time]	-	0 - 60	0.1	sec
	F10	[DC Brake voltage]	-	0 - 200	50	%
	F11	[DC Brake time]	-	0 - 60	1.0	sec

- Set F4 - [Stop mode select] to 1.
- F 8: The frequency at which the DC brake will become active.
- F 9: Inverter output will hold for this time after F8 - [DC Brake start frequency] before applying F10 - [DC Brake voltage].
- F10: Set this value as a percent of H33 – [Motor rated current].
- F11: It sets the time for F10 - [DC Brake voltage] to be applied to the motor after F 9 - [DC Brake wait time].

⚠ Caution

If excessive DC Brake voltage is set or DC Brake time is set too long, it may cause motor overheating and damage to the motor.

► Setting F10 or F11 to 0 will disable DC brake.
► F 9 – [DC Brake Wait time]: When load inertia is large or F 8 – [DC Brake Start Frequency] is high, over current trip may occur. It can be prevented using F9.

Advanced Functions
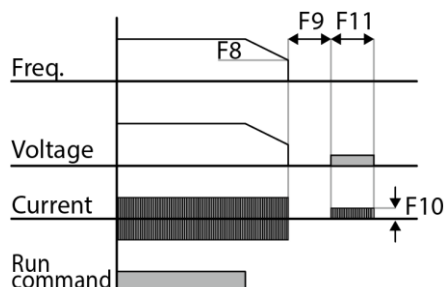
► In case of DC brake at high load inertia and frequency, change the DC brake controller gain according to H37 set value.

H37	Load inertia ratio	0	Less than 10 times motor inertia
		1	10 times motor inertia
		2	Greater than 10 times motor inertia

8.1.2 Starting DC brake

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F12**	**[DC Brake start voltage]**	-	0 - 200	50	%
	F13	**[DC Brake start time]**	-	0 - 60	0	sec

- F12: It sets the level as a percent of H33 – [Motor rated current].
- F13: Motor accelerates after DC voltage is applied for the set time.

⊘ Caution

If excessive DC Brake voltage is set or DC Brake time is set too long, it may cause motor overheating and damage to the motor.
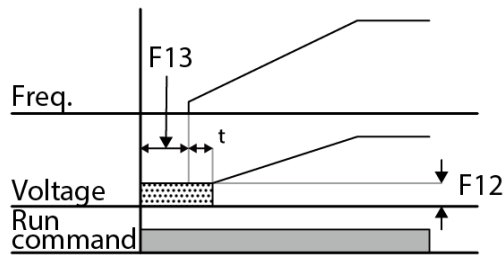
► Setting F12 or F13 to 0 will disable Starting DC brake.
► t: After F13 - [DC Brake start time], the frequency is increasing after DC voltage is applied until the time t.

8.1.3　DC brake at a stop

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F12**	**[DC Brake start voltage]**	-	0 - 200	50	%
I/O group	**I19**	**[Multi-function Input terminal P3 Function select]**	**11**	0 - 25	2	

- F12: It sets the level as a percent of H33 – [Motor rated current].
- Select a terminal to issue a command of DC brake at a stop among P1 to P4.
- If P3 terminal is set for this function, set I19 to 11 {DC brake during stop}.

ⓘ Caution

If excessive DC Brake voltage is set or DC Brake time is set too long, it may cause motor overheating and damage to the motor.
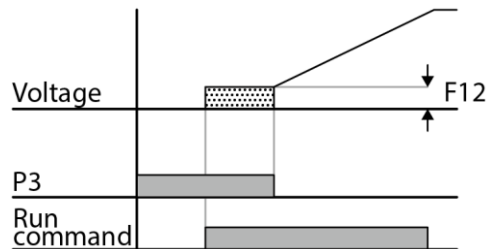
8.2 Jog operation

8.2.1　Terminal jog operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F20**	**[Jog frequency]**	**-**	0 - 400	10.00	Hz
I/O group	**I21**	**[Multi-function input terminal P4 define]**	**4**	0 - 30	3	

• Set the desired jog frequency in F20.
• Select a terminal from P1 – P4 to use for this setting.
• If P4 is set for Jog operation, set I20 to 4 {Jog}.
• Jog frequency can be set within the range of F21 - [Max frequency] and F23 – [Start frequency].
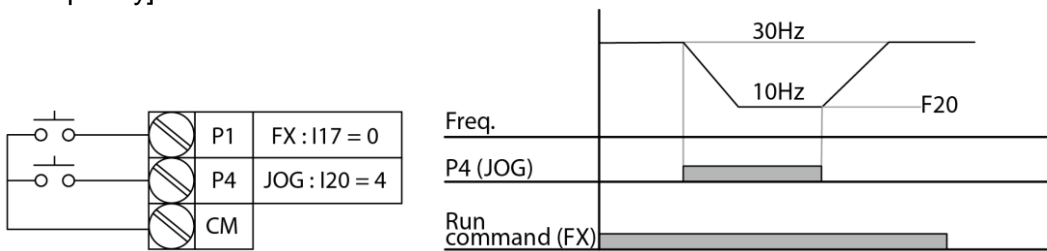
► Jog operation overrides all other operations except Dwell operation. Therefore, if Jog frequency command is entered in the middle of Multi-Step, Up-Down or 3-wire operation, operation is executed at Jog frequency.
► The above diagram is an example when Multi-function input is set to NPN mode.
► Terminal jog operation

8.2.2　Terminal JOG FX/RX operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F20	**[Jog frequency]**	-	0 - 400	10.00	Hz
I/O group	I19	**[Multi-function input terminal P3 define]**	26	0 - 30	2	
	I20	**[Multi-function input terminal P4 define]**	27	0 - 30	3	

- Set the desired jog frequency in F20.
- Select a terminal from P1 – P4 to use for this setting.
- If P3 is set for Jog operation, set I19 to 26 {Jog}.

► Jog frequency's setting range can be set between Max. frequency (F21) and start frequency (F23).
► The following diagram is an example when reference frequency is 30Hz and Jog frequency is 10 Hz.

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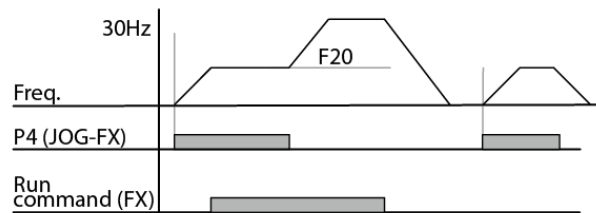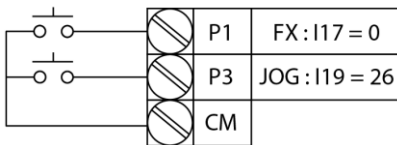
8.3 UP-DOWN Operation

8.3.1 Up-down storage function

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**Frq**	**[Frequency setting method]**	**8**	0-8	0	
I/O group	**I17**	**[Multi-function input terminal P1 define]**	**0**	0 - 30	0	
	I18	**[Multi-function input terminal P2 define]**	**25**		1	
	I19	**[Multi-function input terminal P3define]**	**15**		2	
	I20	**[Multi-function input terminal P4define]**	**16**		3	
Function group 1	**F63**	**[Up-down frequency Save select]**	**-**	0-1	0	
	F64	**[Up-down frequency storage]**	**-**		0.00	

- Select 8 in Frq code of drive group
- Select the terminal which uses as a up-down drive among multi-function input (P1-P4)
- If you select P3 and P4 as an up-down drive terminal, select each 15 (frequency increase command) and 16 (frequency decrease command) in the I19 and I20 of I/O group.
- If you select P2 terminal as an up-own save initial terminal, select 25 (up-down save initialization) as above.
- Up/down Save function: If F63, 'Save up/down frequency', is set to 1, the frequency before the inverter was stopped or decelerated is saved in F64.

► While up-down save operates, the user can initialize the saved up-down frequency by setting multi-function input terminal as a up-down frequency save initialization.

F63	Save up/down frequency select	0	Remove 'save up/down frequency'
		1	Set 'save up/down frequency'
F64	Save up/down frequency	Up/down frequency saved	

► If 'Up/Down Save Frequency Initialization' signal is input while the multi-function input 'Up' or 'Down' function is applied, this signal is ignored.

8.3.2   Up-down mode select

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**Frq**	**[Frequency setting method]**	**8**	0-8	0	
I/O group	**I17**	**[Multi-function input terminal P1 define]**	**0**	0 - 30	0	
	I19	**[Multi-function input terminal P3define]**	**15**		2	
	I20	**[Multi-function input terminal P4define]**	**16**		3	
Function group 1	**F65**	**[Up-down mode select]**	**-**	0-2	0	
	F66	**[Up-down step frequency]**	**-**	0-400	0.00	Hz

- Select 8 in Frq code of drive group
- Select the terminal which uses as a up-down drive among multi-function input (P1-P4)
- Operates in selected mode as a step frequency set in F66.

► The up-down mode is Select as follows

F65	Up/down select	0	The reference frequency is increased according to base of Max./Min. frequency. (Initial value)
		1	Increased as many as step frequency (F66) according to edge input
		2	Combination of 0 and 1
F66	Step frequency		Frequency increased according to edge input

► When F65 is 0: If you press UP, it is increased up to Max. frequency as a speed set in the above. (If frequency limit exist, speed is increased up to upper limit.) If press DOWN, It is decreased as a speed set in the above regardless of stop method. (If frequency limit exist, speed is decreased up to lower limit.)
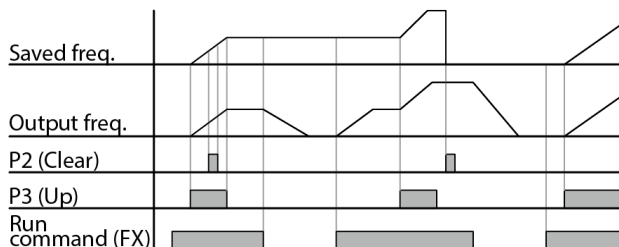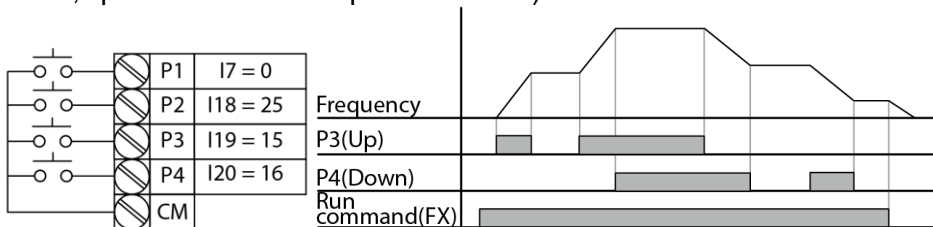
► When F65 is 1: It is increased as many as step frequency set as F66 at the rising edge of multi-function input set as UP and when up-down is defined, it saves frequency at the falling edge. It is decreased as many as step frequency set as F66 at the falling edge of rising edge of multi-function input set as DOWN and when up-down is defined, it saves frequency as the falling edge. In this case, while multi-function input set as UP or DOWN is defined, if stop command is inputted, previous falling edge value is saved and if multi-function input is not defined, present frequency is not saved. The accel/decel time is same with when stetted as "0".
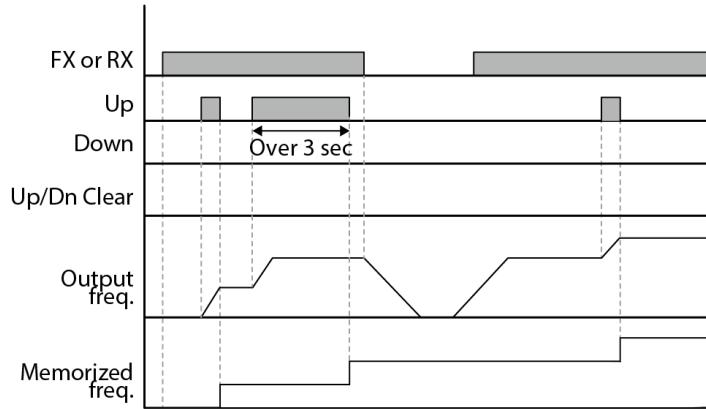
► When F65 is 2: It is increased as many as step frequency set as F66 at the rising edge of multi-function input set as UP and if it is activated for 3 second, it operates like something set as "0". It is decreased as many as step frequency set as F66 at the rising edge of multi-function input set as DOWN and if it is activated for 3 second, it operates like something set as "0" and the accel/decel time is same with when stetted as "0".
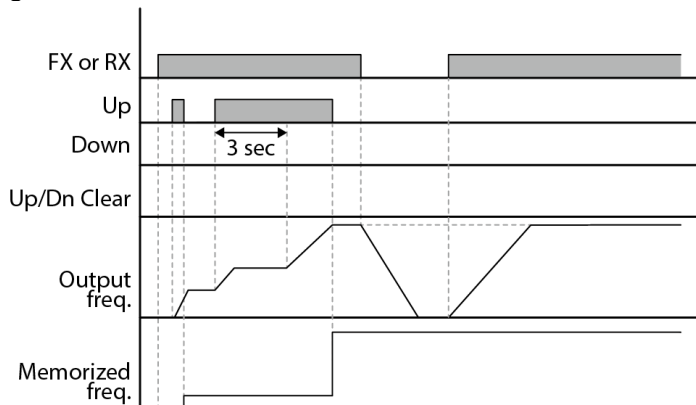
⊙ Caution

Because of UP or DOWN, when the input is entered again before it is increased as many as 1 step frequency, the input is ignored and the saved frequency is also frequency of the inactivated moment

8.4 3-Wire

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I17	[Multi-function Input terminal P1 select]	0		0	
	-	-		0 - 30		
	I20	**[Multi-function Input terminal P4 select]**	**17**		3	

- Select the terminal from P1-P4 for use as 3-Wire operation.
- If P4 is selected, set I20 to 17 {3-Wire operation}.
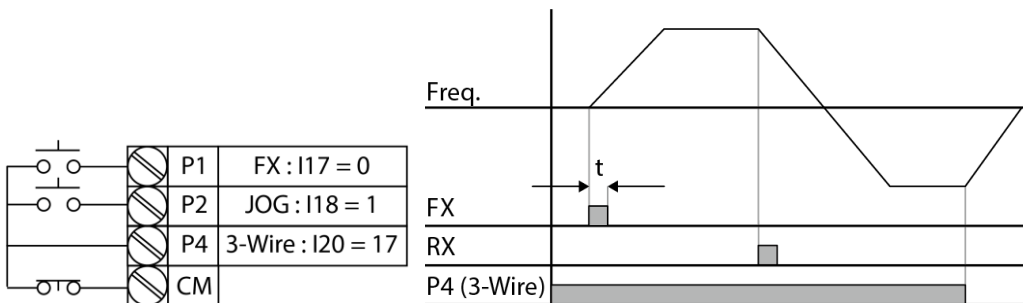
- Input signal is latched (saved) in 3-Wire operation. Therefore, inverter can be operated by Push-button switch.
- The bandwidth of pulse (t) should not be less than 50msec.

8.5 Dwell operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H 7**	**[Dwell frequency]**	-	0.1 - 400	5.00	Hz
	H 8	**[Dwell time]**	-	0 - 10	0.0	sec

• In this setting, motor begins to accelerate after dwell operation is executed for dwell time at the dwell frequency.
• It is mainly used to release mechanical brake in elevators after operating at dwell frequency.

► Dwell frequency: This function is used to output torque in an intended direction. It is useful in hoisting applications to get enough torque before releasing a mechanical brake. Rated Slip frequency is calculated by the formula shown below.
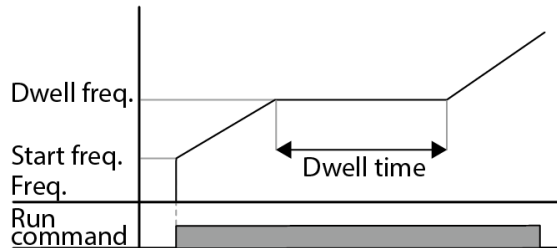
8.6 Slip compensation

Group	Code	Parameter Name	Setting	Range	Default	Unit
	H30	[Motor type select]	-	0.2 - 22	7.5	
	H31	[Number of motor poles]	-	2 - 12	4	
	H32	[Rated slip frequency]	-	0 - 10	2.33	Hz
Function group 2	H33	[Motor rated current]	-	0.5 - 150	26.3	A
	H34	[Motor No Load Current]	-	0.1 - 50	11.0	A
	H36	[Motor efficiency]	-	50 - 100	87	%
	H37	[Load inertia rate]	-	0 - 2	0	
	H40	**[Control mode select]**	**1**	0 - 2	0	

• Set H40 – [Control mode select] to 1 {Slip compensation}.
• This function enables the motor to run in constant speed by compensating inherent slip in an induction motor.

► H30: Set the motor type connected to the inverter output side.

H30	[Motor type select]	0.2	0.2kW
		-	
		22.0	22.0kW

► H31: Enter the pole number on the Motor nameplate.
► H32: Enter the slip frequency in accordance with the following formula and motor nameplate.

$$f_s = f_r - \left(\frac{rpm \times P}{120} \right)$$

Where, f_s = Rated slip frequency

f_r = Rated frequency

rpm = Motor rated RPM

P = Motor pole number

Ex) Rated freq.: 60Hz, Rated RPM: 1740rpm, Poles: 4,

$$f_s = 60 - \left(\frac{1740 \times 4}{120} \right) = 2Hz$$

► H33: Enter the motor nameplate rated current.
► H34: Enter the measured current when the motor is running at rated frequency after the load is removed. Enter 50% of the rated motor current when it is difficult to measure the motor no load current.
► H36: Enter motor efficiency on the nameplate.
► H37: Select load inertia based on motor inertia as shown below.

H37	[Load inertia rate]	0	Less than 10 times motor inertia
		1	About 10 times motor inertia
		2	Greater than 10 times motor inertia

► As the loads are heavier, the speed gap between rated RPM and synchronous speed is widening (see the figure below). This function compensates for this inherent slip.

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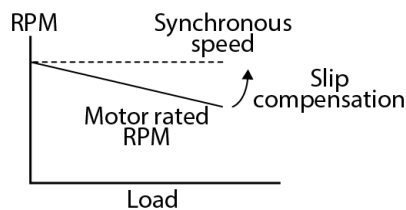
8.7 PID control

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H49**	**[PID Operation select]**	**1**	0 - 1	0	-
	H50	[PID Feedback select]	-	0 - 1	0	-
	H51	[P gain for PID controller]	-	0 - 999.9	300.0	%
	H52	[Integral time for PID controller (I gain)]	-	0.1- 32.0	1.0	sec
	H53	[Differential time for PID controller (D gain)]	-	0.0-30.0	0	sec
	H54	[PID mode select]	-	0 - 1	0	-
	H55	[PID output frequency high limit]	-	0.1 - 400	50.0	Hz
	H56	[PID output frequency low limit]	-	0.1 - 400	0.50	Hz
	H57	[PID reference select]	-	0-4	0	Hz
	H58	[PID unit select]	-	0-1	1	-
	H59	[PID Out Inverse]	-	0-1	0	-
Application Group	A1	[Sleep delay time]	-	0.0-2000.0	20.0	-
	A2	[Sleep frequency]	-	0.00-400	0.00	Hz
	A6	[Wake-up level]	-	0.0-100.0	35.0	%
I/O group	I17-I20	[Multi-function input terminal P1-P4 define]	21	0 - 30	-	-
Drive group	rEF	[PID reference]	-	0-400 /0-100	0.00 /0.0	Hz /%
	Fbk	[PID feedback]	-	0-400 /0-100	0.00 /0.0	Hz /%

- In order to control the amount of following water, pressure and temperature, do PID control to inverter output frequency.
- Select H49 of function group 2 as a 1 (PID drive select). Then REF and FBK category show. Set PID reference value in REF and real PID feedback amount is monitored at the FBK
- PID drive is classified as two which are Normal PID mode and Process PID mode. It can be set in the H54 (PID mode select)

► H50: Select the feedback type of PID controller.

H50	[PID Feedback select]	0	Terminal I input (0 - 20[mA])
		1	Terminal V1 input (0 - 10[V])

► H51: Set the percentage of output to error. If P Gain is set to 50%, 50% of the error value will be output. Higher value can reach the target control value faster but it may cause oscillation.
► H52: Set the time to output the accumulated error value. Set the time required to output 100% when the error value is 100%. If H52 - [Integral time for PID controller (I gain)] is set to 1 sec and the error becomes 100%, 100% will be output in 1 sec. Adjusting the

value may reduce the nominal error. If the value is reduced, response will be faster but setting too low may lead to controller oscillation.

► H53: Set the output value to the variation of the error. The error is detected by 0.01 sec in SV-iG5H. If differential time is set to 0.01 sec and the percentage variation of error per 1 sec is 100%, 1% per 10msec is output.

► H54: PID Feed Forward Gain. Set the gain to add the target value to the PID controller output.

► H55, H56: It limits the output of the PID controller.

► H57: selects PID Reference

► H58: PID Reference and PID feedback's units are classified as two which is [Hz] and [%]. H58=0: [Hz], H58=1: [%]

► H59 : [PID Out Inverse] sets PID controller's output Invert.

► I17 - I20: To exchange PID to normal operation, set one of P1-P4 terminal to 21 and turn ON.

► rPM: Calculates the feedback from H50 into Motor frequency and displays it.

► rEF: indicates PID controller's command value.

► Fbk: converts feedback amount set in H50 to motor frequency.

8.7.1   PID control diagram

Normal PID drive (H54=0)
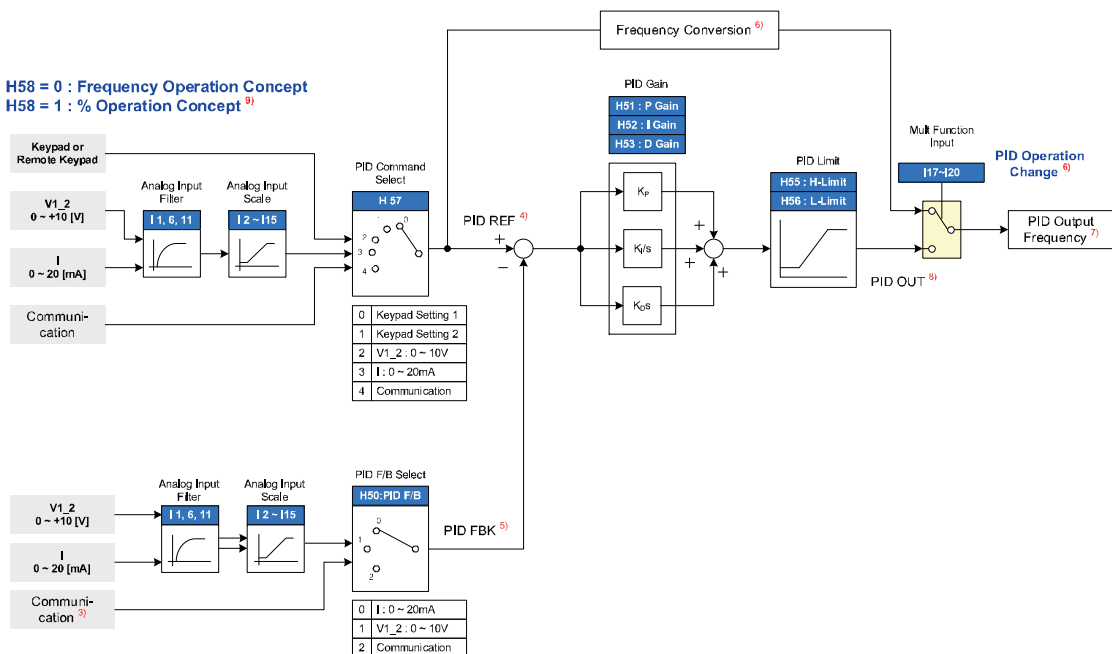
1) Adds RS-485 communications to PID Feedback category.
2) PID REF value can be changed and checked in the "rEF" of the DRV group.
    Unit is [Hz] when H58=0 and [%] when H58=1
3) PID FBK value cab be checked in the "Fbk" of the DRV group
    Unit is sane with the "rEF"
4) If PID switching is inputted to the multi-input (P1-P4), though H58 is 1, [%] is converted into [Hz].
5) Output frequency is displayed in the "SPD" of DRV group.
6) PID OUT of Normal PID is single polarity and it is limited by H55 (H-Limit) and H56 (L-Limit).
7) 100% is F21 (Max. frequency)

Process PID drive (H54=1)
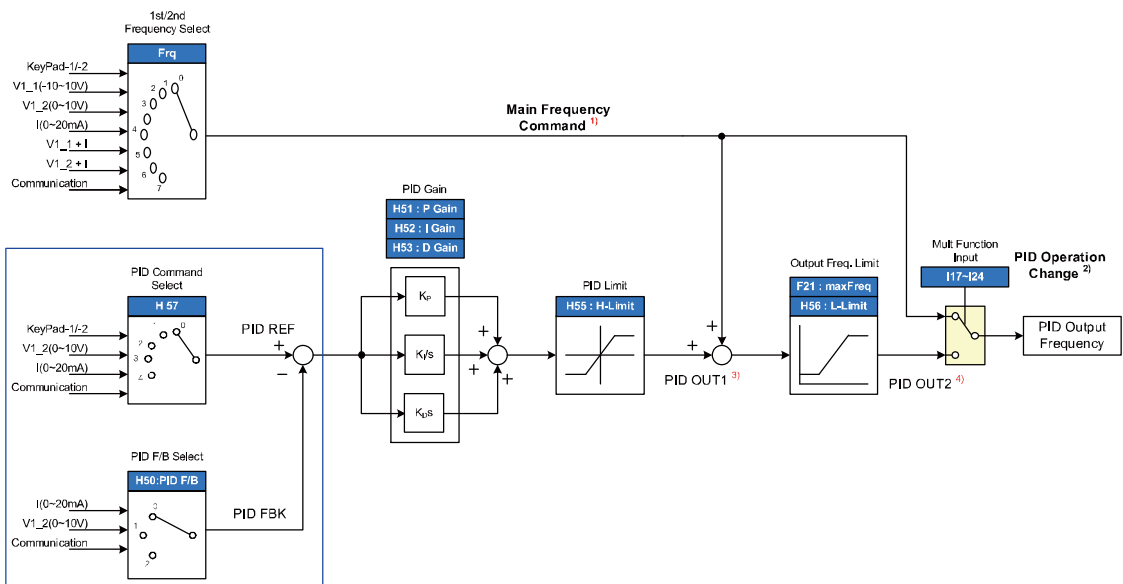
H58 = 0 : Frequency Operation Concept
H58 = 1 : % Operation Concept [9]

1) Speed command is the frequency (FRQ=8, except Up/Down) set by FRQ/FRQ2 and real output frequency is sum of speed command, PID OUT1 and PID OUT2.
2) If PID switching drive is selected,
3) PID OUT1's polarity is double. It is limited H55 (PID upper Limit).
4) Real output frequency PID OUT2 is limited by F21 (MaxFreq) and H56 (PID lower Limit)
   Other operation is same with the Normal PID.

8.7.2   Sleep & Wake-up

• In the night for example, if output frequency of PID control is maintained over sleep delay time(A1) due to not enough flux, Sleep function becomes sleep mode automatically and inverter is stop. Under sleep mode, if error of PID Reference and Feedback is over A6(Wake-up Level), Sleep mode is released and the inverter restarts.
• If stop command is input, Sleep mode is released
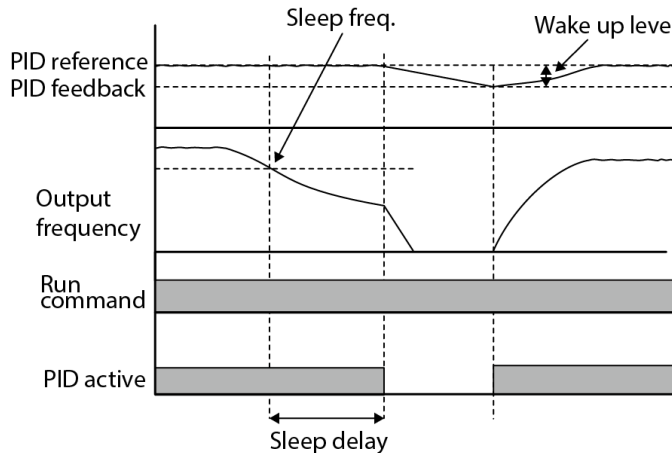
8.7.3   Sleep Boost

• Before going into sleep mode, the inverter additionally operates to increases feedback pressure.
• This extends the time in which the motor is stopped that can avoid frequent start/stop.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A 1	Sleep Delay	-	0-6000.0	20.0	sec
	A 2	Sleep Freq.	-	0-Max Freq.	0.00	Hz
	A 3	Sleep Boost Set	-	0.0-100.0	0.00	%
	A 4	Sleep Boost Time	-	0-6000.0	0.0	sec
	A 5	Wake-up Delay Time	-	0-6000.0	20.0	sec
	A 6	Wake-up Level	-	0.0-100.0	20.0	%

When the inverter is entering sleep mode, the PID reference is increased by A03_Sleep Boost Set value for the time defined by parameter A04_Sleep Boost time.
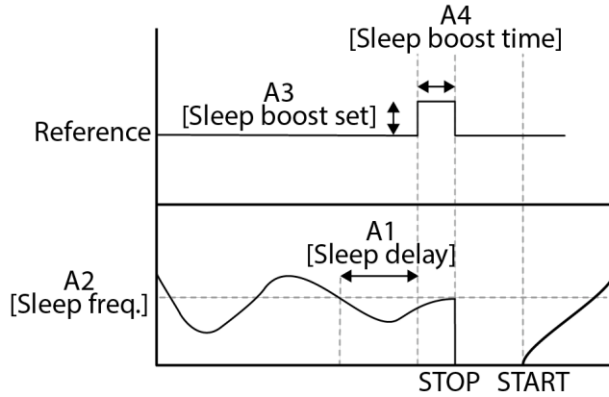
8.7.4   Pre-PID

- Using Pre-PID, the inverter ramps up to A7_Pre-PID Mode Freq. without PID control via ACC time. When the output frequency idles for the time set at A9_Pre-PID timer, the inverter automatically switches to closed-loop mode and the PID controller becomes activated. This is useful in applications that require quick acceleration to a minimum speed at startup.
- Also, if the feedback is reached to A8_Pre-PID Exit Level the PID controller also activates.

[Pre-PID Timer Condition]   **[Pre-PID Exit Level Condition]**
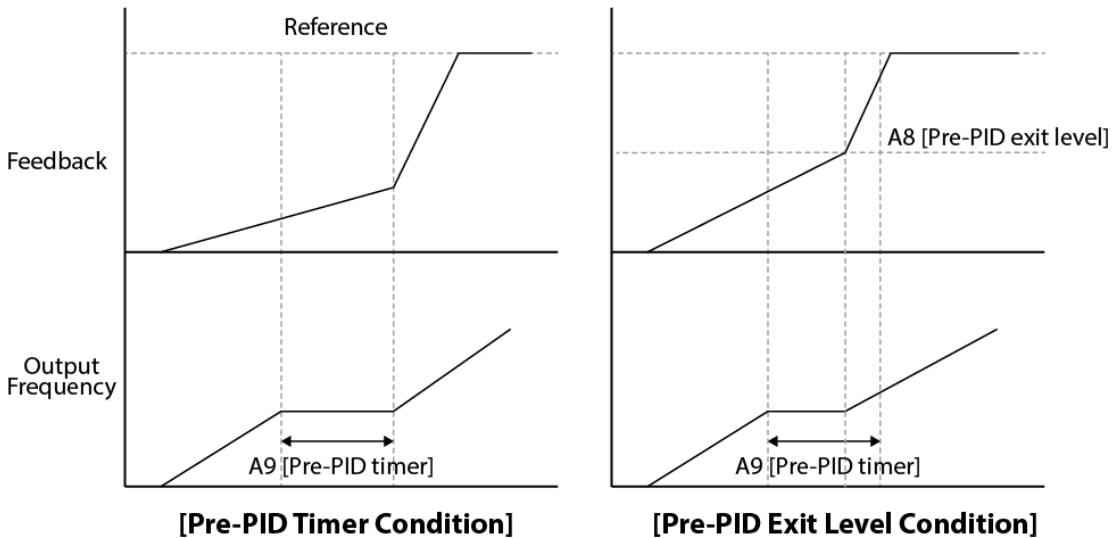
- Pre-PID Timer and Exit Level operates as a OR condition (where if either condition is met, the PID controller is turned on)

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A 7	Pre-PID Mode Freq	-	0-Max Freq	0.00	Hz
	A 8	Pre-PID Exit Level	-	0.0-100.0	20.0	%
	A 9	Pre-PID Timer	-	0-6000	60	sec

► A7: Sets the frequency range for a general acceleration without PID control.
► A8: When the feedback exceeds the Pre-PID Exit Level, the Pre-PID operation ends and a normal process PID operation begins.
► A9: When the time exceeds the Pre-PID Timer, the Pre-PID operation ends and a normal process PID operation begins.

8.8 Multi Step PID

Four different set points(reference values) can be set programed according to the combination of the PID_Step_L, PID_Step_M signals in binary code

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	Ref	PID control standard value setting	-	0-400.00 0-100	-	Hz %
Function group 2	H58	PID control unit select	1	0: Frequency 1: Percentage	1	Hz %
I/O group	I17-20	Multi-function digital input 1-4	-	29: PID_Step_Low 30: PID_Step_Mid	-	-
Function group 2	H60-62	PID Step Reference 1-3	-	0-400.00 0-100	-	Hz %

Step Freq.	PID_Step_L (2^0=1)	PID_Step_M (2^1=2)
PID Reference	-	-
PID_Step_REF1	✓	-
PID_Step_REF2	-	✓
PID_Step_REF3	✓	✓

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8.9 MMC

- The MMC (Multiple Motor Control) function is used to control multiple motors for in a pump system. The main motor connected with the inverter output, operated by the PID controller. The auxiliary motors are connected with the supply power and turned on and off by the relay within the inverter.
- Max. of two auxiliary motors can be connected with one operable in PID. Auto change function(Aux Exchange) is available to balance the run time of each auxiliary motors.

3-phase input
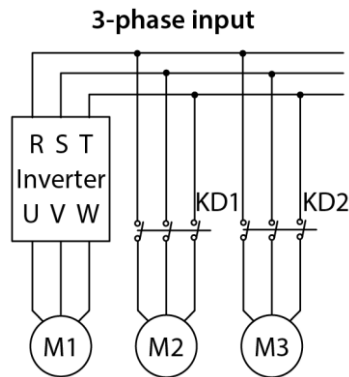
Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A11	MMC Sel	**1**	0-1	0	
	A12	Num of Aux	-	0-2	0	
	A13	Start Freq1	-	AP15-MaxFreq	40.0	Hz
	A14	Start Freq2	-	AP16-MaxFreq	40.0	Hz
	A15	Stop Freq1	-	0-AP13	20.0	Hz
	A16	Stop Freq2	-	0-Ap14	20.0	Hz
	A17	Aux Start DT	-	0.1-600.0	5.0	sec
	A18	Aux Stop DT		0.1-600.0	5.0	sec
	A19	PID Acc Time		0-600.0	5.0	sec
	A20	PID Dec Time		0-600.0	5.0	sec
	A21	Aux All Stop		0-1	No	
	A22	Aux On/Off Seq		0-1	0	
	A26	Start Motor	**1**	1-2	1	
I/O group	I54	Multi-function relay1 select	**25**	0-30	17	
	I55	Multi-function relay2 select	**26**	0-30	12	

► A11: Selects the MMC operation settings.
► A12: Decides the number of auxiliary motors to use.
► A13, A14: Sets the auxiliary motor start frequency.
► A15, A16: Sets the auxiliary motor stop frequency.
► A17, A18: The auxiliary motors turns on or off after the auxiliary motor stop delay time elapses.
► A19: When the auxiliary motor stops, the main motor accelerates up to the auxiliary motor restart frequency set at A13, 14 (Start Freq 1, 2) based on the acceleration time set at A20 (PID Acc Time).
► A20: When an auxiliary motor starts, the main motor decelerates to the auxiliary motor deceleration frequency set at A15, 16 (Stop Freq 1, 2) based on the deceleration time set at A19 (PID Dec Time).
► A21: When [A21 Aux All Stop] is set to :No" during input to stopoperating, auxiliary motors are turned off at the same time. When [A21 Aux All Stop] is set to "YES", auxiliary motors are turned off gradually based on time of [A18 Aux Stop DT].
► A22: Sets the operating priority of MMC. 0(FIFO) : Same as On/Off order of auxiliary motors. 1(FILO): Opposite to On/Off order auxiliary motors.
► A26: Sets the start auxiliary motor
► I54, I55: Configure the output terminals to 25(MMC1), 26(MMC2) to use the terminals to control the auxiliary motors.
► During PID operation, the auxiliary motors are turned on when the inverter frequency reaches the start frequencies set at A13, 14 (Start freq 1, 2). The auxiliary motors stop operating when the operation frequency decreases to the stop frequency set at A15, 16 (Stop Freq 1, 2).
► The following diagram describes the MMC basic sequence based on FILO and FIFO settings and Aux All stop mode.
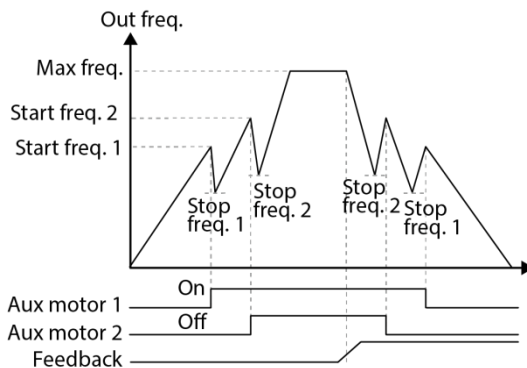
[MMC Basic operation(FILO)]   [MMC Basic operation(FIFO)]

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[Aux All Stop]
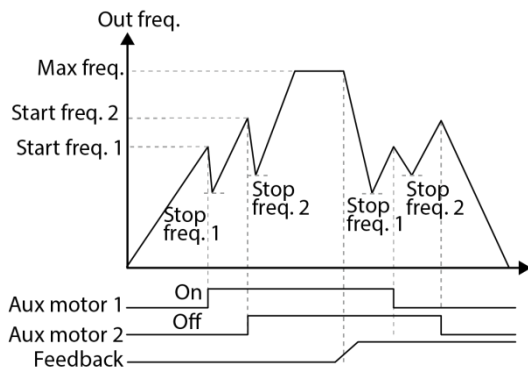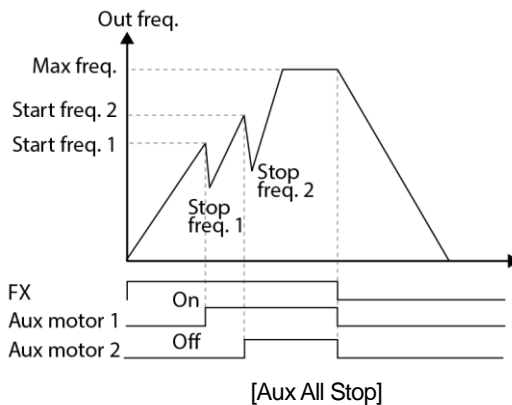
Note

When run signal is off or the inverter has gone into sleep mode on either FIFO/FILO, the motor set at A26 [start motor] always starts.

8.10 MMC(Auto Change)

Auto Change function is automatic rotation of the start order between auxiliary motors. Prolonged continuous operation of a motor deteriorates motor capabilities. The auto change function switches the motors automatically when certain conditions are met to avoid biased use of certain motors and protect them from deterioration.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A23	AutoCh Sel	-	0-1	0	
	A24	AutoChTime	-	1-6000	0	min
	A25	AutoChLevel	-	startFreq - MaxFreq[Hz]	20	Hz
	A26	Start Motor	-	1-2	1	
	A27	Auto Change Operation Time	-	-	-	

► A24: Sets the auto change intervals.
► A25: All the conditions for Auto Change are met under the frequency in which output frequency of Main motors are set in A25. A25 is the frequency to activate Auto Change.
► A26: Sets the start auxiliary motor.
► A27: Indicates time to activate Auto Change.

Auto Change is activated when auxiliary motors are in the operating state over time of A24 and then every auxiliary motor is stopped and the inverter operation frequency is below the frequency set at A25.

Note

Start order and stop order of the auxiliary motors are based on the order set at A22(FIFO/FILO).
The following diagrams depict the auxiliary motor start and stop sequence, based on a FILO configuration, when the inverter operation time exceeds the auto change interval set at A24. If all the auxiliary motors are turned off and the inverter operation frequency is below the frequency set at A25 (Auto Ch Level), auto change is operated. Then, when the inverter frequency increases due to decrease in the feedback, auxiliary motor #2 starts instead of auxiliary motor #1 due to this auto change (auxiliary motor #1 starts last, for it has the lowest priority).
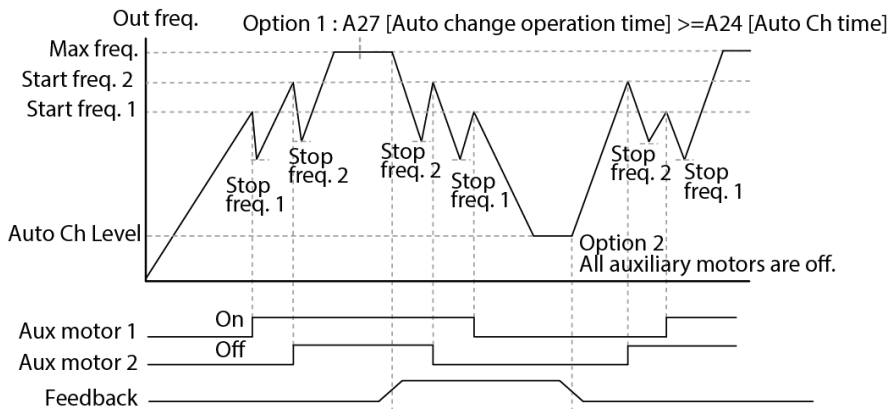
8.11 Motor Alternation

- It is a function that can extend the life of the motor through M/C alternation sequence.
- In many industrial pumping applications, two identical pumps are used for the same job. A standby unit is available in case the first pump fails. However, the main motor pump might deteriorate and provide no safety margin. Motor alternation function prevents this by assuring both pumps to operate with equal run time.
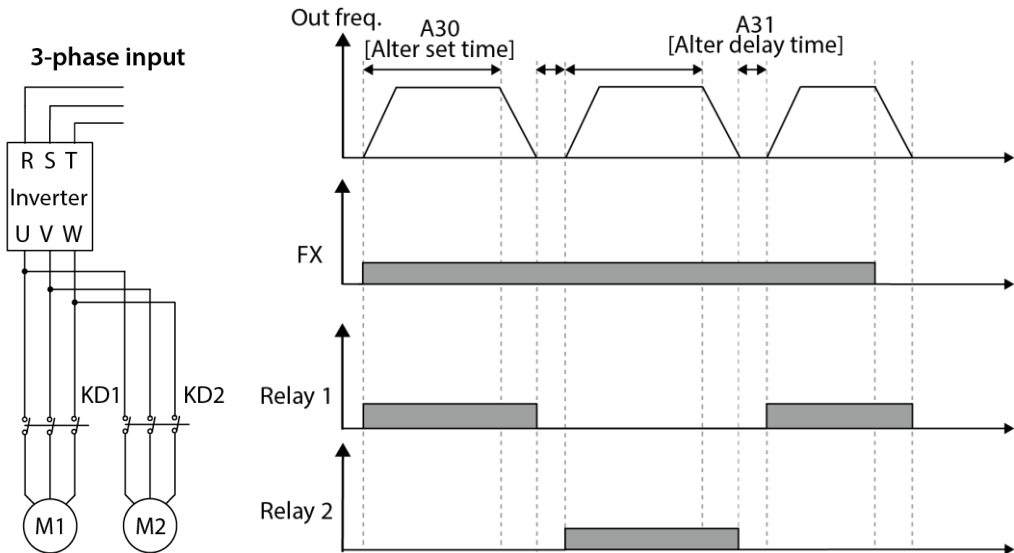
- This function can be used in normal operation as well as PID.
- In PID mode, the timer counts-up even in sleep, LVT, BX state.
- When 1 motor is damaged and the setting at 30_Alternation Sel. is set to 'No', the lead pump will operate according to the setting in 32_Lead Pump Sel.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A29	Alternation Sel	-	0-1	0	
	A30	Alt. Set Time	-	0-6000	1	min
	A31	Alt. Delay Time	-	0-600.0	10	sec
	A32	Lead Pump Sel	-	0-2	1	
	A33	Lead Pump Display	-	-	-	
I/O group	I54	Multi-function relay1 select	-	24:Motor Alternation	17	
	I55	Multi-function relay2 select	-	24:Motor Alternation	12	

8.12 Relay On/Off Delay

• Delay time setting to activate or deactivate relay-1(A1, B1, C1), relay-2(A2, C2) outputs.
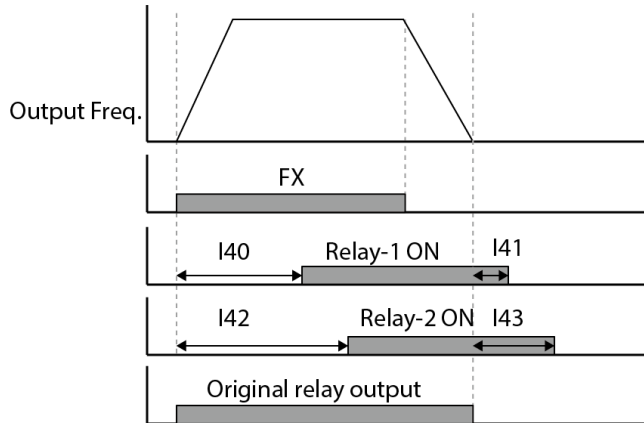
• If the input terminal's state is not changed during the set time, when the terminal receives an input, it is recognized as On or Off.

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I40	Relay-1 On Delay	-	0.0-1000.0	0.00	sec
	I41	Relay-1 Off Delay	-	0.0-1000.0	0.00	sec
	I42	Relay-2 On Delay	-	0.0-1000.0	0.00	sec
	I43	Relay-2 Off Delay	-	0.0-1000.0	0.00	sec

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8.13 Relay On/Off Control

If the analog input value is over the set value, the output relay or multi-function output terminal can be turned ON or OFF. Select the analog input to use for ON/OFF control at F72 and set the levels at which the output terminal is ON and OFF at F73, 74 respectively. If the analog input value is over the value set at F73, the output terminal is ON and if below F74, it is OFF.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F72	OnOff Ctrl Src	-	0: None 1: V 2: I	0	
	F73	On-Ctrl Level	-	0.00-100.00[sec]	90.00	sec
	F74	Off-Ctrl Level	-	0.00-100.00[sec]	10.00	sec
I/O group	I54-55	Relay Define x	-	19. OnOffControl	0.00	

8.14 Power On Run Delay

- After Run command is applied by the terminals, the inverter will operate after the time set in F06_Power-on run has exceeded.
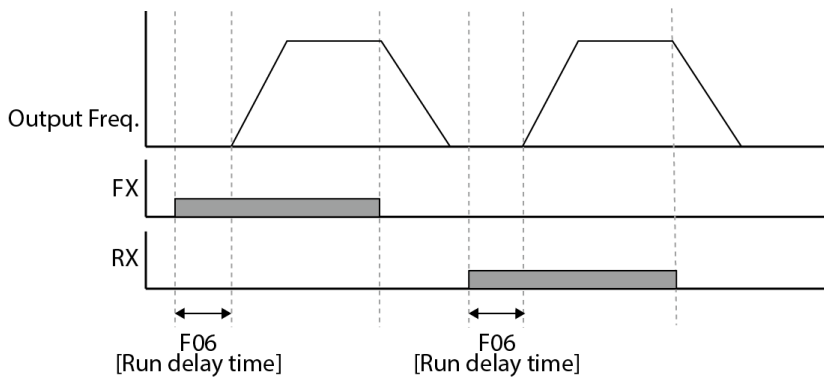
- This function can be applied for lubrication purpose in applications such as mining or oil systems.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F5	Power On Run	-	0 : NO 1 : YES	0 : NO	
	F6	Run Delay Time	-	0-6000[sec]	0	sec

8.15 Regeneration Avoidance Function

•   The regenerative status can be avoided by detecting the DC Link Voltage level and raising the frequency to burn out the excessive regenerative energy.
•   Regenerative energy is occasionally generated due to other fan devices connected in the same duct.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	F75	RegenAvd Sel	-	0: NO 1: YES	0: NO	
	F76	RegenAvd Level	-	75.0-100.0	87.5	%
	F77	ComFreq Limit	-	0-10.00	1.00	Hz
	F78	RegenAvd Pgain	-	0-100.0	50.0	
	F79	RegenAvd Igain	-	1.0-320.0	50.0	

•   When RegenAvd Level is 100%, DC link voltages are 400V/800V. so when the value is 87.5% by default, the dc voltage to start regen-avoidance function are 350V/700V.

In a regenerative status, DC link voltage will rise, which may is the main cause of overvoltage alarm. Regenerative status can be avoided by increasing the speed of the motor when rising of DC link voltage is detected. Overspeed operation is start when the DC link voltage level exceeds F76_RegenAvd Level.
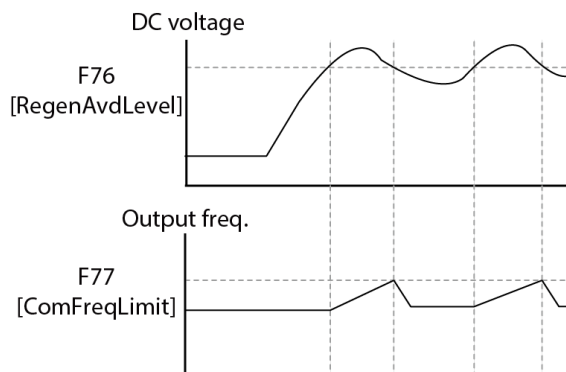
8.16 Auto-tuning

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H41**	**[Auto tuning]**	**1**	0 - 1	0	-
	H42	[Stator resistance (Rs)]	-	0 - 28	-	Ω
	H44	[Leakage inductance (Lσ)]	-	0 - 300.00	-	mH

- Automatic measuring of the motor parameters is provided.
- The measured motor parameters in H41 can be used in Auto Torque Boost.

⊘ Caution

Auto tuning should be executed after stopping the motor. Motor shaft must not run by the load during H41 – [Auto tuning].

► H41: When H41 is set to 1 and press the Enter (●) key, Auto tuning is activated and "TUn" will appear on the LED keypad. When finished, "H41" will be displayed.

► H42, H44: The values of motor stator resistance and leakage inductance detected in H41 are displayed, respectively. When Auto tuning is skipped or H93 – [Parameter initialize] is done, the default value corresponding to motor type (H30) will be displayed.

► Press the STOP/RST key on the keypad or turn on the EST terminal to stop the Auto Tuning.

► If Auto tuning of H42 and H44 is interrupted, the default value will be set. If H42 and H44 are finished and auto-tuning of leakage inductance is interrupted, the measured value of H42 and H44 are used and the default of leakage inductance is set.

► See page 112 for motor parameter default values.

⊘ Caution

Do not enter any incorrect value as stator resistance and leakage inductance. Otherwise, the function of Auto torque boost could be deteriorated.

8.17 Factory default by motor ratings

Input voltage	Motor rating [kW]	Current rating [A]	No-load current [A]	Rated slip freq [Hz]	Stator resistance [Ω]	Leakage inductance [mH]
200	0.2	1.1	0.6	2.33	14.0	122.00
	0.4	1.8	1.2	3.00	6.70	61.00
	0.75	3.5	2.1	2.33	2.46	28.14
	1.5	6.5	3.0	2.33	1.13	14.75
	2.2	8.8	4.4	2.00	0.869	11.31
	3.7	12.9	4.9	2.33	0.500	5.41
	5.5	19.7	6.6	2.33	0.314	3.60
	7.5	26.3	11.0	2.33	0.196	2.89
	11.0	37.0	12.5	1.33	0.120	2.47
	15.0	50.0	17.5	1.67	0.084	1.12
	18.5	62.0	19.4	1.33	0.068	0.82
	22.0	76.0	25.3	1.33	0.056	0.95
400	0.2	0.7	0.4	2.33	28.00	300.00
	0.4	1.1	0.7	3.0	14.0	177.86
	0.75	2.0	1.3	2.33	7.38	88.44
	1.5	3.7	2.1	2.33	3.39	44.31
	2.2	5.1	2.6	2.00	2.607	34.21
	3.7	6.5	3.3	2.33	1.500	16.23
	5.5	11.3	3.9	2.33	0.940	10.74
	7.5	15.2	5.7	2.33	0.520	8.80
	11.0	22.6	7.5	1.33	0.360	7.67
	15.0	25.2	10.1	1.67	0.250	3.38
	18.5	33.0	11.6	1.33	0.168	2.46
	22.0	41.0	13.6	1.33	0.168	2.84

Advanced Functions

8.18 Energy-saving operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F40**	**[Energy-saving operation]**	-	0 - 30	0	%

- Set the amount of output voltage to be reduced in F40.
- Set as the percent of Max output voltage.
- For fan or pump applications, energy consumption can be dramatically reduced by decreasing the output voltage when light or no load is connected.
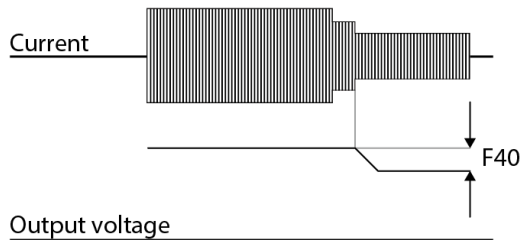
8.19 Speed search

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H22**	**[Speed search select]**	**-**	0 - 15	0	
	H23	[Current level]	-	80 - 200	100	%
	H24	[Speed search P gain]	-	0 - 9999	100	
	H25	[Speed search I gain]	-		200	
I/O group	I54	[Multi-function relay1 select]	15	0 - 27	12	
	I55	[Multi-function relay2 select]	15		17	

- This is used to prevent possible fault from occurring if the inverter outputs the voltage during operation after the load is removed.
- The inverter estimates the motor rpm based on output current. Therefore, detecting exact speed is difficult.

The following table shows 4 types of Speed search selection.

		Speed search during H20 – [Power ON start]	Speed search during Instant Power Failure restart	Speed search during H21- [Restart after fault reset]	Speed search during Acceleration
		Bit 3	Bit 2	Bit 1	Bit 0
H22	0	-	-	-	-
	1	-	-	-	✓
	2	-	-	✓	-
	3	-	-	✓	✓
	4	-	✓	-	-
	5	-	✓	-	✓
	6	-	✓	✓	-
	7	-	✓	✓	✓
	8	✓	-	-	-
	9	✓	-	-	✓
	10	✓	-	✓	-
	11	✓	-	✓	✓
	12	✓	✓	-	-
	13	✓	✓	-	✓
	14	✓	✓	✓	-
	15	✓	✓	✓	✓

► H23: Limits current during Speed search. Set as the percent of H33.
► H24, H25: Speed search is activated via PI control. Adjust P gain and I gain corresponding to the load characteristics.
► I54, I55: Signal of active Speed search is given to external sequence via Multi-function output terminal Relay1 and Multi-function relay output Relay2.

► EX) Speed search during Instant Power Failure restart
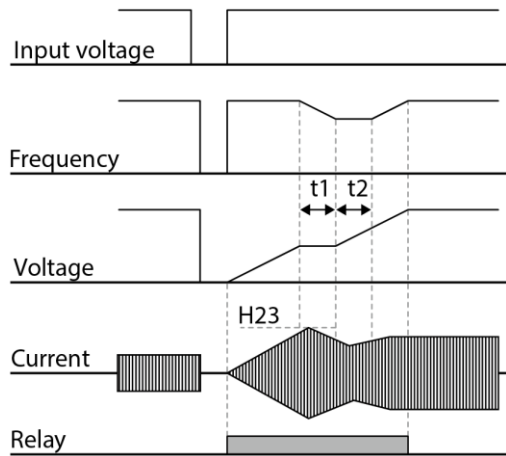
- When the input power is cut off due to instant power failure, the inverter outputs Low voltage trip (LV) to hold the output.
- When the power is restored, the inverter outputs the frequency before the low voltage trip and the voltage is increased due to PI control.
- t1: If current is increasing over the preset level in H23, the rise in voltage will stop and the frequency is decreased.
- t2: If the opposite of t1 occurs, the increase in voltage starts again and the decrease in frequency stops.
- When the frequency and voltage are restored back to the nominal level, acceleration will continue at the frequency before trip.

► Speed search operation is suitable for loads with high inertia. Stop the motor and restart when friction in load is high.
► SV-iG5H keeps normal operation when instant power failure occurs and power is restored in 15msec for the use of its inverter rating.
► Inverter DC link voltage can vary depending on output load quantity. Therefore, Low Voltage trip may occur when instant power failure is maintained over 15msec or output is higher than its rating.
► Instant power failure specification is applied when input voltage to Inverter is 200-230V AC for 200V class, or 380-480V AC for 400V class.

8.20 Auto restart try

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H26**	**[Number of Auto Restart try]**	**-**	0 - 10	0	
	H27	[Auto Restart time]	-	0 - 60	1.0	sec

- This parameter sets the number of times auto restart is activated in H26.
- It is used to prevent the system down caused by internal protection function activated by the causes such as noise.

- ► H26: Auto restart will become active after the H27. H26 – [Number of Auto restart try] is reduced by 1 when it is active. If the trip outnumbers the preset restart try, auto restart function is deactivated. If the setting is reset via the control terminal or the STOP/RST key on the keypad, the number of auto restart try set by user is automatically entered.
- ► If there is no more trip occurring for 30 sec after Auto restart operation, the H26 is restored to the preset value.
- ► When operation is stopped due to Low voltage {Lvt} or Emergency stop {EST}, Inverter Overheat {Oht}, and Hardware Trip {HWt}, Auto restart will be deactivated.
- ► After the H27- [Auto Restart time], the motor starts acceleration automatically via speed search (H22-25).

► The following pattern is shown when the H26 – [Number of auto restart try] is set to 2.
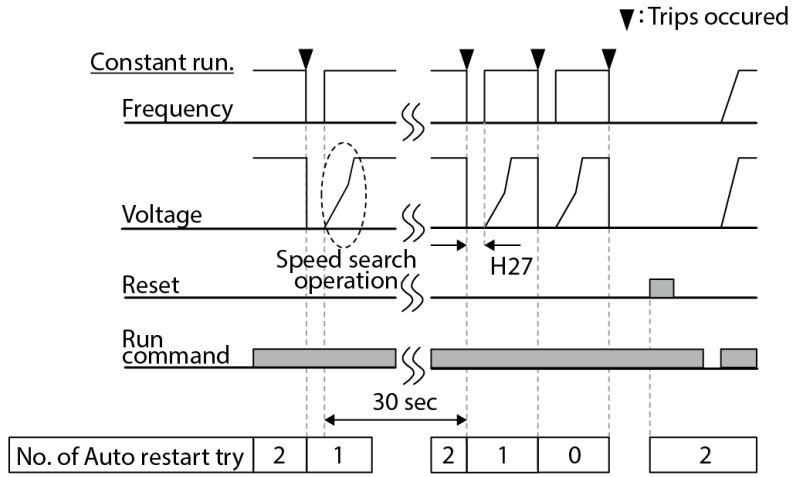
8.21 Operating sound select (Carrier frequency change)

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H39**	**[Carrier frequency]**	**-**	1 - 15	3	kHz

• This parameter affects the sound of the inverter during operation.

H39	When setting carrier frequency high,	Motor sound reduced	
		Inverter heat loss increased	
		Inverter noise increased	
		Inverter leakage current increased	

8.22 2nd motor operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	H81	[2nd motor accel time]	-	0 - 6000	5.0	sec
	H82	[2nd motor decel time]	-	0 - 6000	10.0	sec
	H83	[2nd motor base freq.]	-	30 - 400	50.00	Hz
	H84	[2nd motor V/F pattern]	-	0 - 2	0	
	H85	[2nd motor Positive torque boost]	-	0 - 15	5	%
	H86	[2nd motor Negative torque boost]	-	0 - 15	5	%
	H87	[2nd motor stall prevention level]	-	30 - 150	130	%
	H88	[2nd motor electronic thermal level for 1 min]	-	50 - 200	120	%
	H89	[2nd motor electronic thermal level for continuous operation]	-	50 - 150	100	%
	H90	[2nd motor rated current]	-	0.1-100	26.3	A
I/O group	I17	[Multi-function Input terminal P1Function select]	-	0 - 30	0	
	-	-				
	I20	**[Multi-function Input terminal P4Function select]**	**12**		3	

• Set the terminal among Multi-function input P1 thru P4for second motor operation.
• To define the terminal P4 as second motor operation, set I20 to 12.

Advanced Functions

► Used when an inverter operates 2 motors connected to two different types of the loads.
► 2nd motor operation does not drive 2 motors at the same time.
► As the figure below, when using two motors with an inverter by exchanging them, select one motor from 2 motors connected. When 1st selected motor operation is stopped, select a terminal for 2nd motor and define H81-H90 parameters to drive the 2nd motor.
► Define the 2nd motor select when a motor is stopped.
► H81 - H90 parameters function the same as 1st motor.
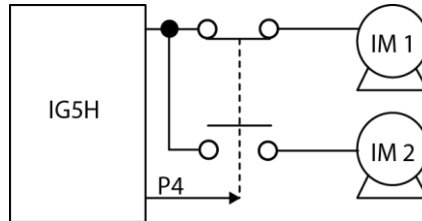
8.23 Frequency setting and 2nd drive method select

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	drv	Drive mode 1	-	0 - 3	1	-
	Frq	Frequency mode 1	-	0 - 8	0	-
	drv2	Drive mode 2	-	0 - 3	1	
	Frq2	Frequency mode 2	-	0 - 8	0	
I/O group	I17-I20	Multi-function input terminal P1 select	22	0 - 30		

- Drive mode 1 is used when the input set as 2nd source is not entered into multi-input (I17-I20)
- Drive mode 2 can input frequency setting and drive command as a 2nd setting value by using multi-input terminal. In case of driving away from inverter by communication, it is used when quit the communication and operate by inverter.
- The switching method for Drive mode 1 and Drive mode 2 is as follows
- If multi-input terminal set as Drive mode 2 is off, it used as Drive mode 1. If multi-input terminal set as Drive mode 2 is on, it used as Drive mode2.

► Selects the self drive in the 2nd switching of drv2 among the followings

		0	Operation via Run/Stop key on the Keypad	
drv2	Drive mode 2	1	Terminal operation	FX: Forward Run command
				RX: Reverse Run command
		2		FX: Run/Stop command
				RX: Forward/Reverse command
		3	Operation via communication	

► Selects the self drive in the 2nd switching of Frq2 among the followings

		0	Digital	Keypad digital frequency mode1
Frq2	Frequency mode 2	1		Keypad digital frequency mode2
		2	Analog	V1 terminal setting1: -10 - +10V
		3		V1 terminal setting2: 0 - +10V
		4		I terminal: 0 - 20mA
		5		V1 terminal setting1 + I terminal
		6		V1 terminal setting2 + I terminal
		7	Setting via RS-485 communication	
		8	Up-Down (Digital Volume) run	

► The following is example for switching of drv1 and drv2.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**drv**	**Drive mode 1**	**3**	**0 - 3**	**1**	**-**
	Frq	**Frequency mode 1**	**0**	**0 - 8**	**0**	**-**
	drv2	**Drive mode 2**	**1**	**0 - 3**	**1**	
	Frq2	**Frequency mode 2**	**0**	**0 - 8**	**0**	
I/O group	**I20**	**Multi-function input terminal P4 input terminal**	**22**	**0 - 30**	**3**	
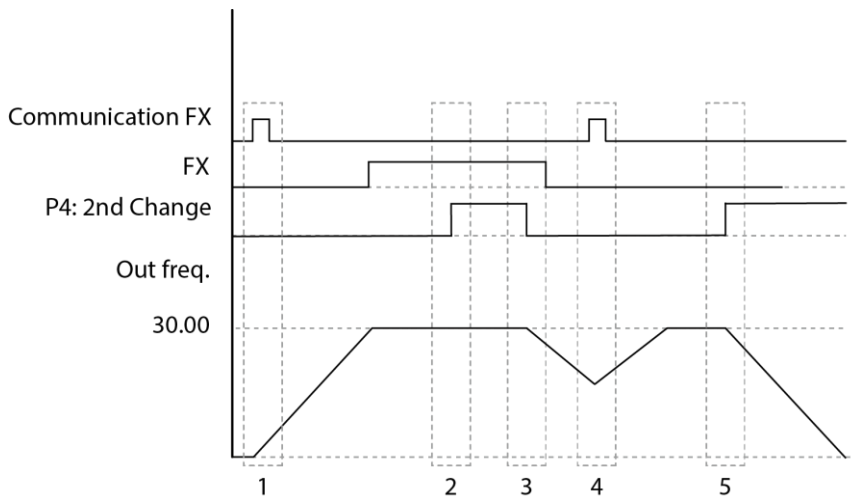
► The following figure is drawn when setting is like the above and command frequency is 30 [Hz], F4 [stop method]=0

①　Accelerate for accel time up to setting frequency by Drive 1 mode, FX signal.

②　Drive continuously under FX is ON because DRV2 is 1 when P4 terminal input is ON and change into 2nd.

③　Stop gradually as stop command because DRV is communication drive when P4 terminal input is OFF and change into 1st.

④　Accelerate up to setting frequency for Drive 1 mode, FX signal is ON.

⑤　Stop gradually under FX is OFF because DRV2 is 1 when P4 terminal input is ON and change into 2nd.

⊘ Caution

If you press ON while multi-function input terminal (P1 - P4) is set to 2nd Source, frequency command and drive command is changed to Drive mode 2. So you should check Drive mode 2 before input multi-function terminal.

8.24 Stall Prevention and Power Braking

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F 4**	**Select stop method**	**3**	0 - 3	0	
	F 59	BIT 0: stall prevention under Accel BIT 1: stall prevention under constant speed BIT 2: stall prevention under Decel	-	0 - 7	0	
	F 61	Select voltage limit under Decel	-	0 - 1	0	

► Stall prevention (decel) is set as default. And power braking function can help to avoid Over voltage trip.

► Overvoltage trip prevention when reducing speed: a function preventing overvoltage trip when reducing speed or at stop by using the regeneration braking power.

► Power Braking : Adjusting the deceleration slope or accelerate again, when inverter's DC voltage rises above a certain level by the electric motor's regeneration energy. It can be used when short deceleration time without braking resistance is needed. However, be aware that the deceleration time can get longer than the set one and when it's used at a load that frequently decelerates, be cautious of damage caused by the motor's over heating.

⊘ Caution

Stall prevention and Power Braking only operate when decelerating, and Power Braking has the precedence. That is, when BIT2 of F59 and Power Braking of F4 are both set, Power Braking operates.
F61(selecting voltage restriction when decelerating) is visible when BIT2 of F59 is set.
Overvoltage trip may occur, if the deceleration time is too short or the inertia too big.

8.25 DRAW Operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function Group 1	**F70**	**DRAW mode select**	-	0 - 3	0	-
	F71	DRAW ratio	-	0.0 - 100.0	0.0	%

► It's a kind of open loop tension control that uses the speed difference of motor running under main frequency command to keep material's tension in between steady.

► The ratio reflected in the output frequency differs according to the selection of F70(DRAW mode select)

F70	Draw Operation	0	Draw not operated
		1	V1(0-10V) input draw operation
		2	I(0-20mA) input draw operation
		3	V1(-10-10V) input draw operation

► Select 1 and 2 for F70
The center value of analogue input (selected by the set value of I6-I15) as standard, if the input is big it gets (+), if small (-) and gets reflected in the output frequency as the ratio set in F71.

► Select 3 for F70
OV as standard, if analog input voltage is big, it gets (+), if small (-) and gets reflected in the output frequency as the ratio set in F71.
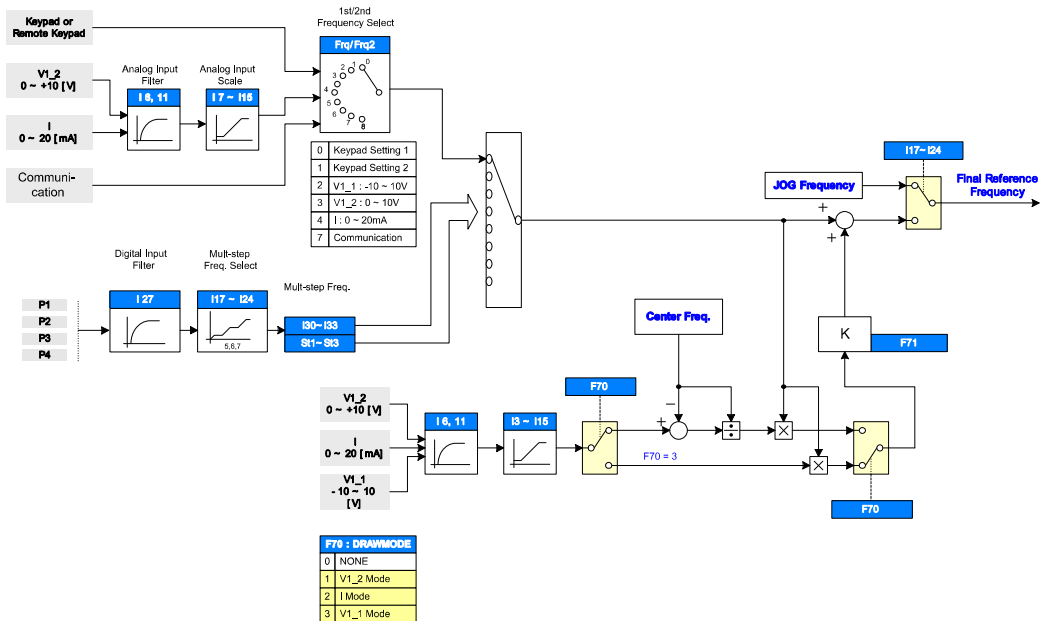
► DRAW operation example
  If draw operation is set to 30Hz, F70=3(V1: -10V -10V), F71=10.0% selected, (I3-I15 = plant shipment) Frequency that gets changed by DRAW operation is 27Hz(V1=-10V) - 33Hz(V1=10V)

ⓘ Caution

When operating DRAW, set command frequency to FRQ/FRQ2 and set the rest of it from F70(DRAW mode select). For example, if FRQ=2(V1) and F70=1(V1), it does not operate.

8.26 2 Phase PWM Operation

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function Group 2	**H48**	**PWM controlling mode** **0: NORMAL PWM** **1: 2 phase PWM**	**1**	0 - 2	0	

► Heat loss and leakage current from inverter can be reduced when H48 is set to 1(2 phase PWM) according to the ratio of load.

8.27 Cooling fan control

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H77**	**[Cooling Fan Control]**	-	0 - 2	0	

► Control the On/ Off of the cooling fan to cool the Inverter heatsink.

► When it is set to 0:
   - Cooling fan begins to operate when power ON.
   - Cooling fan is stopped when inverter main circuit voltage becomes low voltage due to power off.

► When it is set to 1:
   - Cooling fan begins to operate when power is turned ON with operating command ON.
   - Cooling fan is stopped when operating command is turned Off with inverter output shut off.
   - Cooling fan keeps operating when heat sink temperature exceeds a certain limit regardless of operating command.
   - Used when frequent Run/Stop or quite stop is required. This may make the cooling fan life longer.

► When it is set to 2:
   - The cooling fan is not active even when power is supplied to the inverter and an operating command is input. However, if the temperature of the inverter heat sink is higher than a certain degree, cooling fan is active.

8.28 Operating mode select when cooling fan trip occurs

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H78**	**[Operating mode when cooling fan trip occurs]**	**-**	0 - 1	0	-
I/O group	I54	[Multi-function relay1 select]	18	0 - 27	12	-
	I55	[Multi-function relay2 select]	18	0 - 27	17	-

• Select 0 or 1 in H78 code.
• If H78 code is set to 0 (continuous operation), alarm can be output in I54 or I55.

► 0: continuous operation when cooling fan trip occurs.
   - Operation is not stopped regardless of cooling fan trip.
   - When I54 or I55 is set to 18 (cooling fan fault alarm), fault alarm signal can be output using Multi-function output terminal or Multi-function relay.

⊙ Caution

If operation is continued after cooling fan trip occurs, Overheat trip may happen and protective function be activated. It also reduces the life of main components due to rise in inverter inner temperature.

► 1: operation stopped at cooling fan fault

   - When cooling fan fault occurs, $\boxed{F\,\mathcal{R}\,n}$ message is displayed on the LED and operation is stopped.
   - If I54 or I55 is set to 17(Fault output), fault message is displayed.

8.29 Accel/Decel Change Frequency

- This function is to use a different ACC/DEC time starting from a set frequency.
- At start, up to A37_Start&End Ramp frequency, the motor accelerates a normal time and from A37 frequency, ACC time references A35_StartRampAcc.
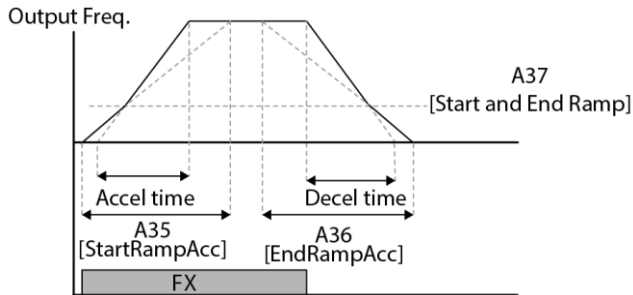
- During decel stop, A36_EndRampAcc is referenced until A37 frequency and normal deceleration time is applied.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application Group	A35	StartRampAcc	-	-0-6000	10.0	sec
	A36	EndRampDec	-	-0-6000	10.0	sec
	A37	Start&End Ramp	-	-0-Max Freq.	0.00	sec

- The inverter operates at the slope set at A35, A36 below the Start&End Ramp frequency set at A37 of the operating frequency. However, if the operating frequency rises over the Start&End Ramp, the inverter runs at the Acc/Dec slope set at ACC, DEC in the drive group.

8.30 Fire Mode

- Fire mode is used in case of an emergency to operate the inverter to extract smoke outdoors in traffic tunnels, subway stations, stairwells, etc
- When Fire mode is activated the inverter ignores all internal faults and motor protecting features to keep the motor running.
- Few fatal faults is not ignored as it can cause secondary explosion in a critical situation.

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I17-20	Multi-function digital input 1-4	-	28. Fire Mode		
	I54-55	Relay Define x	-	27. Fire Mode		
Application Group	A42	Fire Mode Freq	-	0-Max Freq.[Hz]	50.00	Hz

- On receipt of a digital fire input, the drive will run with following conditions.

a) Regardless of preset control method such as PID mode, the inverter switches to V/f control automatically.

b) The preset command frequency will be ignored and the inverter will run at A42_Fire Mode Freq. The fire mode frequency has the highest priority even over Jog operation.

c) The acceleration and deceleration time is fixed as 10 seconds and it is not changeable

d) the following faults or trips will be ignored and not displayed.
- Inverter overload, Overload trip, Cooling fan fault, Electronic thermal, External fault A/B contact input,
- Frequency command loss, Input/Output phase loss, Instantaneous output cut-off, Parameter save error, BX trip.

e) There is no limitation of on the number of attempts the inverter restarts. 'Auto restart after fault' function is activated automatically and delay time will be applied as preset.
- Overcurrent trip, Overvoltage trip, Low voltage trip, Ground fault current

f) The inverter will not restart in case of the following faults:
- Hardware fault, Keypad communication error

Advanced
Functions

8.31 Parameter read/write

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H91**	**[Parameter read]**	**1**	0 - 1	0	
	H92	**[Parameter write]**	**1**	0 - 1	0	

- Used to read/write Inverter Parameters using remote keypad.

⚠ Caution

Take caution when Parameter write (H92) is executed. By doing this, parameters in inverter are cleared and parameters in remote keypad are copied to inverter.

8.31.1 Parameter read

Step	Note	Keypad display
1	Move to H91 code.	H91
2	Press Enter (●) key once.	0
3	Press Up (▲) key once.	Rd
4	Press Enter (●) key twice.	rd
5	H91 is displayed when Parameter read is finished.	H91

8.31.2 Parameter write

Step	Note	Keypad display
1	Move to H92 code.	H92
2	Press Enter (●) key once.	0
3	Press Up (▲) key once.	Wr
4	Press Enter (●) key twice.	Wr
5	H91 is displayed when Parameter read is finished.	H92

H91[Parameter Read]

Inverter

Remote keypad

H92[Parameter Write]
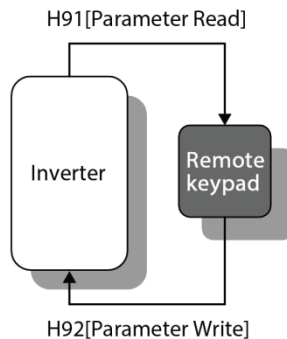
8.32 Parameter Initialize / Lock

8.32.1 Parameter initialize

Group	Code	Parameter Name	Setting	Range		Default	Unit
	H93	**[Parameter initialize]**	**-**	**0**	-	0	
Function group 2			-	1	5 groups initialize		
			-	2	Drive group initialize		
			-	3	F 1 group initialize		
			-	4	F 2 group initialize		
			-	5	I/O group initialize		
			-	6	Application group initialize		

• Select the group to be initialized and perform it in H93 code.

► Press Enter (●) key after setting in H93. H93 will be displayed again after initialization is complete.

8.32.2 Password register

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H94**	**[Password register]**	-	0 - FFFF	0	
	H95	[Parameter lock]	-	0 - FFFF	0	

• Register password for Parameter lock (H95).
• Password should be Hexadecimal. (0 - 9, A, B, C, D, E, F)

⊘ Caution

After setting modification lock function of H95, **Do not forget the registered password.** if you try to release lock, you need the registered password.

► Factory default password is 0. Enter the new password except 0.

► Follow the steps below when you register the password for the first time.

Step	Note	Keypad display
1	Move to H94 code.	H94
2	Press Enter (●) key twice.	0
3	Register password. (Ex: 123)	123
4	123 will blink when Enter (●) key is pressed.	123
5	Press Enter (●) key.	H94

► Follow the table below to change the password. (Current PW: 123 -> New PW: 456)

Step	Note	Keypad display
1	Move to H94 code.	H94
2	Press Enter (●) key.	0
3	Enter any number (e.g.: 122).	122
4	Press the Enter (●) key. 0 is displayed because wrong value was entered. Password cannot be changed in this status.	0
5	Enter the right password.	123
6	Press Enter (●) key.	123
7	Enter the new password.	456
8	Press the Enter (●) key. Then "456" will blink.	456
9	Press Enter (●) key.	H94

9 Monitoring

9.1 Operating status monitoring

9.1.1 Output current

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**CUr**	**[Output current]**	**-**			

• Inverter output current can be monitored in Cur.

9.1.2 Motor RPM

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**rPM**	**[Motor RPM]**	**-**			
Function group 2	H31	[Number of motor poles]	-	2 - 12	4	
	H49	[PID control select]	-	0 - 1	0	
	H74	[Gain for Motor rpm display]	-	1 - 1000	100	%

• Motor rpm can be monitored in rPM.

► When H40 is set to 0 {V/F control} or 1 {PID control}, the Inverter output frequency (f) is displayed in RPM using the formula below. Motor slip is not considered.

$$RPM = \left(\frac{120 \times f}{H31} \right) \times \frac{H74}{100}$$

► In case that H49 code is 1, Feed back amount is converted into frequency.
► H31: Enter the number of rated motor poles on the nameplate.
► H74: This parameter is used to change the motor speed display to rotating speed (r/min) or mechanical speed (m/min).

9.1.3　Inverter DC Link Voltage

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**dCL**	**[Inverter DC Link Voltage]**	**-**			

• Inverter DC link voltage can be monitored in dCL.

► $\sqrt{2}$ times the value of input voltage is displayed while motor is at a stop.

9.1.4　User display select

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**vOL**	**[User display select]**	**-**			
Function group 2	H73	[Monitoring item select]	-	0 - 2	0	

• The selected item in H73- [Monitoring item select] can be monitored in vOL- [User display select.
• If output power or torque is selected, Por or tOr will be displayed.

► H73: Select one of the desired item numbers.

		0	Output voltage [V]	$u\overline{0}L$
H73	[Monitoring item select]	1	Output power [kW]	$P\overline{0}r$
		2	Torque [kgf · m]	$t\overline{0}r$

► Enter motor efficiency indicated on motor nameplate to H36 to display correct torque.

9.1.5　Power on display

Group	Code	Parameter Name	Setting		Range	Default	Unit
Function group 2	**H72**	**[Power on display]**	**-**	**0**	Frequency command (0.00)	0	
		`	**-**	**1**	Accel time (ACC)		
			-	**2**	Decel time (DEC)		

Group	Code	Parameter Name	Setting	Range		Default	Unit
			-	**3**	Drive mode (drv)		
			-	**4**	Frequency mode (Frq)		
			-	**5**	Multi-step frequency 1(St1)		
			-	**6**	Multi-step frequency 2(St2)		
			-	**7**	Multi-step frequency 3(St3)		
			-	**8**	Output current (CUr)		
			-	**9**	Motor rpm (rPM)		
			-	**10**	Inverter DC link voltage (dCL)		
			-	**11**	User display select (vOL)		
			-	**12**	Fault display 1(nOn)		
			-	**13**	Operating direction select (drC)		
			-	**14**	Output current 2		
			-	**15**	Motor rpm 2		
			-	**16**	Inverter DC link voltage 2		
			-	**17**	User display select 2		

- Select the parameter to be displayed on the keypad when Power ON.
- The output current, motor rpm, DC link voltage and User display select are displayed directly when 14-17 are set.

9.2 Monitoring the I/O terminal

9.2.1   Input terminal status monitoring

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	**I25**	**[Input terminals status display]**	**-**			

- Current input terminal status (ON/Off) can be monitored in I25.

► The following is displayed when P1, P3, P4 are ON and P2 are OFF.

(ON)

(OFF)

P4　　P3　　P2　　P1
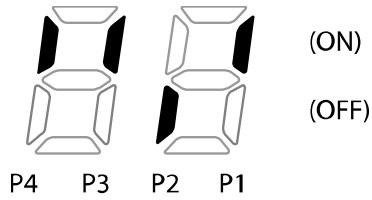
9.2.2　Output terminal status monitoring

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I26	[Output terminals status display]	-			

• Current output terminals (relays) status (ON/Off) can be monitored in I26.

► The followings are displayed when Multi-function output terminal is ON with Multi-function relay OFF.

(ON)

(OFF)

Relay2　　Relay1
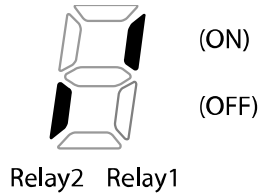
9.3 Monitoring fault condition

9.3.1   Monitoring current fault status

Group	Code	Parameter Name	Setting	Range	Default	Unit
Drive group	**nOn**	**[Current Fault Display]**	-			

- Fault occurred during operation is displayed in nOn.
- Up to 3 kinds of faults can be monitored.

► This parameter gives information on fault types and the operating status at the time of the fault. Refer to Page 32 or 145 for keypad setting.

	Frequency	30.00		
	Current	5.0		
Fault types	Accel/Decel Information	ACC	Fault during Accel	
		dEC	Fault during Decel	
		Std	Fault during constant run	

► Refer to Page 189 on fault types.

9.3.2   Fault History Monitoring

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	H 1	[Fault history 1]	-			
	-	-				
	H 5	[Fault history 5]				
	H 6	[Reset fault history]	-	0 - 1	0	

- H 1 - H 5: Up to 5 faults information is stored.
- H 6: Previous fault information stored in the code H1 thru H5 is all cleared.

► When a fault occurs during operation, it can be monitored in the **nOn**.
► When the fault condition is reset via the STOP/RST key or multi-function terminal, information displayed in the **nOn** will be moved to H1. In addition, the previous fault info stored in H1 will be automatically moved to H2. Therefore, the updated fault info will be stored in the H1.
► When more than 1 fault occurred at the same time, up to 3 types of faults will be stored in one code.
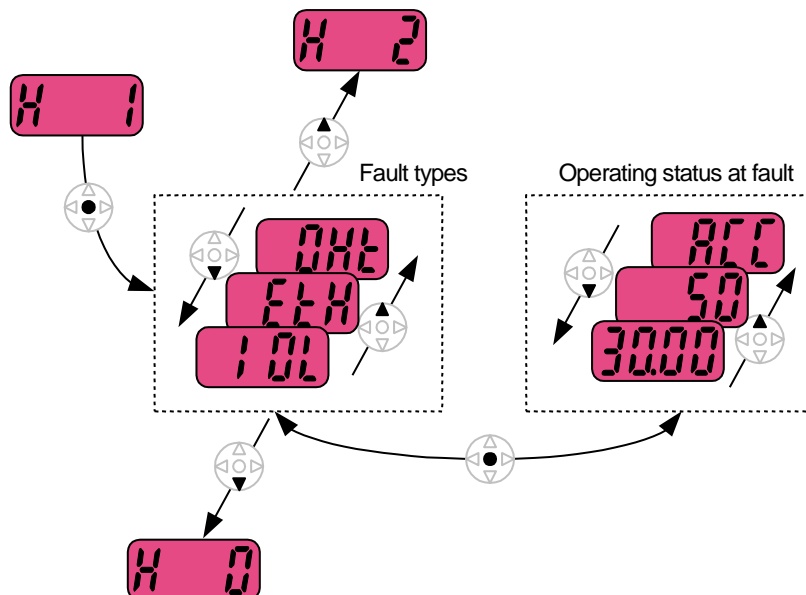
9.4 Analog Output

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	**I50**	**[Analog output item select]**	**-**	0 - 3	0	
	I51	[Analog output level adjustment]	-	10 - 200	100	%

• Output item and the level from the AM terminal are selectable and adjustable

► I50: The selected item will be output to Analog output terminal (AM).

					Item corresponding to 10V	
					200V	400V
I50	Analog output item select	0	Output frequency.		Max Frequency (F21)	
		1	Output current		150% of Inverter rated current	
		2	Output voltage		282Vac	564Vac
		3	Inverter DC link voltage		400Vdc	800Vdc

► I51: If you want to use Analog output value as a gauge input, the value can be adjustable according to various gauge specifications.
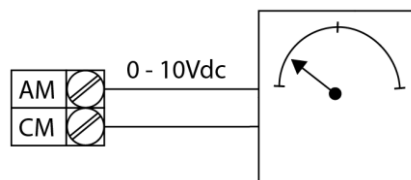
9.5 Multi-function output terminal Relay 1 and Relay 2

Group	Code	Parameter Name	Setting		Range			Default	Unit
I/O group	I54	**[Multi-function relay1 select]**	-	**0**	FDT-1			17	
			-	**1**	FDT-2				
	I55	**[Multi-function relay2 select]**	-	**2**	FDT-3			12	
			-	**3**	FDT-4				
			-	**4**	FDT-5				
			-	**5**	Overload {OLt}				
			-	**6**	Inverter Overload {IOLt}				
			-	**7**	Motor stall {STALL}				
			-	**8**	Over voltage trip {OV}				
			-	**9**	Low voltage trip {LV}				
			-	**10**	Inverter overheat {OH}				
			-	**11**	Command loss				
			-	**12**	During run				
			-	**13**	During stop				
			-	**14**	During constant run				
			-	**15**	During speed searching				
			-	**16**	Wait time for run signal input				
			-	**17**	Fault output				
			-	**18**	Cooling fan trip alarm				
			-	**19**	Brake control signal				
	I56	**[Fault relay output]**	-		When setting the H26–[Number of auto restart tries]	When the trip other than low voltage trip occurs	When the low voltage trip occurs		
			-		Bit 2	Bit 1	Bit 0		

Group	Code	Parameter Name	Setting	Range				Default	Unit
			-	**0**	-	-	-		
			-	**1**	-	-	✓		
			-	**2**	-	✓	-		
			-	**3**	-	✓	✓	2	
			-	**4**	✓	-	-		
			-	**5**	✓	-	✓		
			-	**6**	✓	✓	-		
			-	**7**	✓	✓	✓		

- Select the desired item to be output via relays.

► I56: When 17 {Fault display} is selected in I54 and I55, Multi-function output relays will be activated with the value in I56.

0: FDT-1

► Check whether the output frequency matches the user-setting frequency.
► Active condition: Absolute value (preset frequency - output frequency) <= Frequency Detection Bandwidth/2

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	**I53**	**[Detected Frequency Bandwidth]**	-	0 - 400	10.00	Hz

- Cannot be set above Max frequency (F21).

► When setting I53 to 10.0

Monitoring
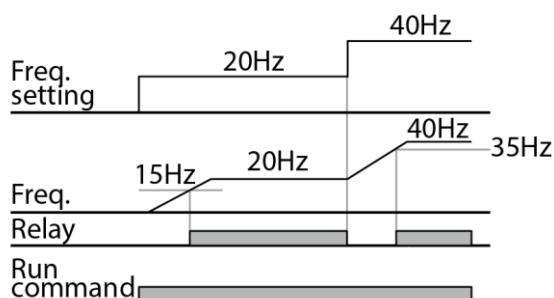
1: FDT-2

► Activated when the preset frequency matches frequency detection level (I52) and FDT-1 condition is met.

► Active condition: (Preset frequency = FDT level) & FDT-1

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I52	**[Detected Frequency level]**	**-**	0 - 400	30.00	Hz
	I53	**[Detected Frequency Bandwidth]**	**-**		10.00	

• Cannot be set above Max frequency (F21).

► When setting I52 and I53 to 30.0 Hz and 10.0 Hz, respectively
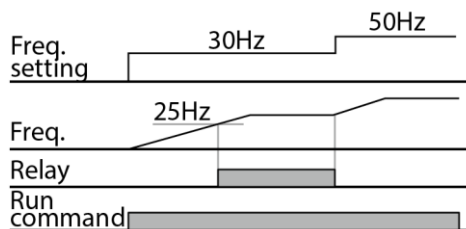
2: FDT-3

► Activated when run frequency meets the following condition.
► Active condition: Absolute value (FDT level - run frequency) <= FDT Bandwidth/2

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	**I52**	**[Detected Frequency level]**	-	0 - 400	30.00	Hz
	I53	**[Detected Frequency Bandwidth]**	-		10.00	

• Cannot be set above Max frequency (F21).

► When setting I52 and I53 to 30.0Hz and 10.0 Hz, respectively
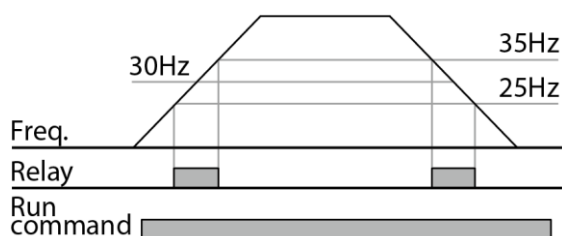
3: FDT-4

► Activated when run frequency meets the following condition.

Active condition:

Accel time: Run Frequency >= FDT Level

Decel time: Run Frequency > (FDT Level – FDT Bandwidth/2)

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	**I52**	**[Detected Frequency level]**	**-**	0 - 400	30.00	Hz
	I53	**[Detected Frequency Bandwidth]**	**-**		10.00	

- Cannot be set above Max frequency (F21).

► When setting I52 and I53 to 30.0Hz and 10.0 Hz, respectively.
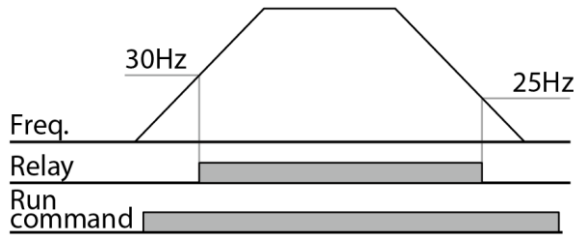
4: FDT-5

► Activated as B contact contrast to FDT-4.

Active condition:

Accel time: Run Frequency >= FDT Level

Decel time: Run Frequency > (FDT Level – FDT Bandwidth/2)

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I52	**[Detected Frequency level]**	-	0 - 400	30.00	Hz
	I53	**[Detected Frequency Bandwidth]**	-		10.00	

• Cannot be set above Max frequency (F21).
► When setting I52 and I53 to 30.0Hz and 10.0 Hz, respectively
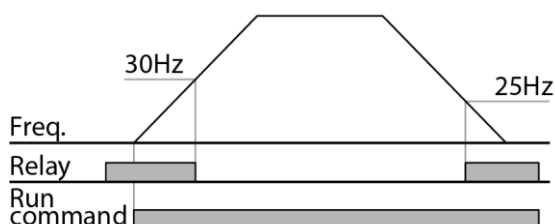
5: Overload (OLt)

► Refer to page 161.

6: Inverter Overload (IOLt)

► Refer to page 165.

7: Motor stall (STALL)

► Refer to page 162.

8: Over voltage trip (Ovt)

► Activated when over voltage trip occurs due to DC link voltage exceeded 400Vdc for 200V class and 820Vdc for 400V class.

9: Low voltage trip (Lvt)

► Activated when low voltage trip occurs due to DC link voltage under 180Vdc for 200V class and 360Vdc for 400V class.

10: Inverter heatsink overheat (OHt)

► Activated when the heatsink is overheated.

11: Command loss

► Activated when Analog (V1,I) and RS485 communication commands are lost.

12: During operation

► Activated when run command is input and inverter outputs its voltage.
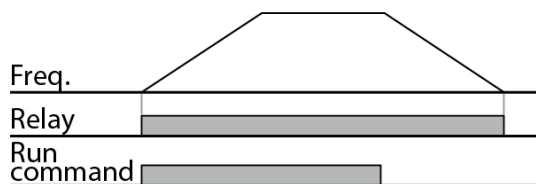
13: During stop

► Activated during stop without active command.
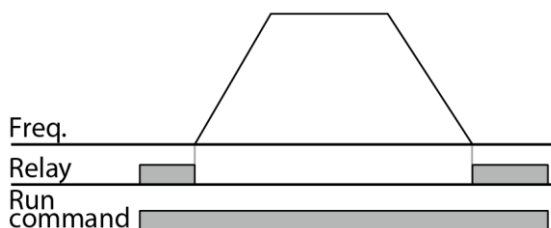
14: during constant run

► Activated during constant speed operation.
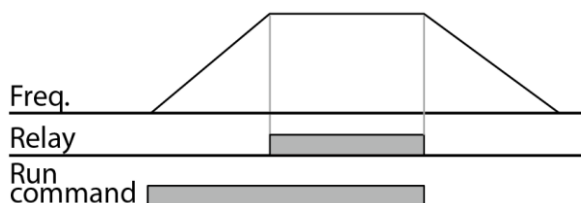
15: During speed searching

► Refer to page 122.

16: Wait time for run signal input

► This function becomes active during normal operation and that the inverter waits for active run command from external sequence.

17: Fault output

► The parameter set in I56 is activated.
► For example, if setting I55, I56 to 17 and 2, respectively, Multi-function output relay will become active when trip other than "Low voltage trip" occurred.

18: Cooling fan trip alarm

► Used to output alarm signal when H78 is set to 0(constant operation at cooling fan trip). Refer to page 135.

19: On/Off Control

► Outputs a signal using an analog input value as a standard. Refer to page 118.

20: Pipe Broken

► Pipe Broken is a safety function to stop when it has detected a broken pipe during operation. Refer to page 172.

21: Over Pressure

► Trip occurs if the feedback of the PID is higher than the A63_Over Pressure level. Refer to page 173.

22: Under Load Trip

► An under load trip can be detected using output current and output frequency. The under-load protection is activated when the condition is maintained for the set time. Refer to page 169.

23: Broken Belt

► Broken Belt is used to trip the fan or pump shows a defective coupling or belt of the motor. Refer to page 171.

24: Motor Alternation

► It is a function that can extend the life of the motor through M/C alternation sequence. Refer to page 116.

25: MMC1

26: MMC2

► Select Aux Relay. Refer to page 112.

27: Fire Mode

► When Fire mode is activated the inverter ignores all internal faults and motor protecting features to keep the motor running. Refer to page 137.

9.6 Output terminal select at loder communication error

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	**I57**	**[Output terminal select when communication error with keypad]**	-	0 - 3	0	

• Select relay output or open collector output when keypad-inverter communication fails.

► Keypad and inverter CPU communication is made by serial communication, delivering information. When communication error occurs for a certain time, $\boxed{Err}$ will be displayed and error signal can be output to Relay1 or Relay2.

	MFI output relay	MFI output terminal
	Bit 1	Bit 0
0	-	-
1	-	✓
2	✓	-
3	✓	✓

► 0: Not used
► 1: Signal output to Relay1
► 2: Signal output to Relay2
► 3: Signal output to Relay1, Relay2

10 Protective functions

10.1 Electronic Thermal

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F50**	**[ETH (Electronic thermal) select]**	**1**	0 - 1	0	
	F51	[Electronic thermal level for 1 minute]	-	50 - 200	120	%
	F52	[Electronic thermal level for continuous]	-	50 - 150	100	%
	F53	[Motor type]	-	0 - 1	0	

- Select F50 – [Electronic thermal select] to 1.
- It activates when the motor is overheated (time-inverse). If current greater than set in F51 flows, inverter output is turned off for the preset time in F51- [Electronic thermal level for 1 minute].

► F51: Enter the value of max current that is capable of flowing to the motor continuously for one minute. It is set in percent of motor rated current. The value cannot be set lower than F52.

► F52: Enter the amount of current for continuous operation. Normally motor rated current is used. It cannot be set greater than F51.

► F53: For an inductance motor, cooling effects decrease when a motor is running at low speed. A special motor is a motor that uses a separately powered cooling fan maximize cooling effect even in low speed.

F53	[Motor type]	0	Standard motors having a cooling fan directly connected to the shaft
		1	Special motor that uses a separately powered cooling fan.

Protective Functions
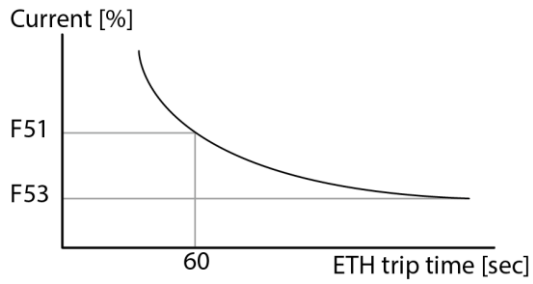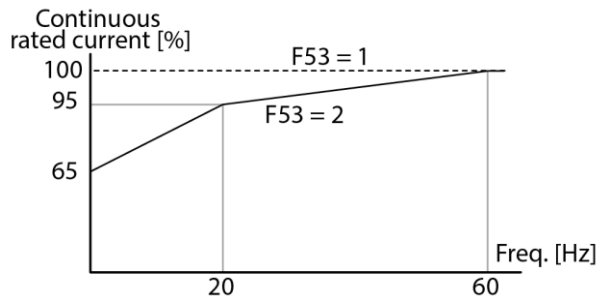
10.2 Overload Warning and trip

10.2.1 Overload warning

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	F54	**[Overload warning level]**	-	30 - 150	110	%
	F55	**[Overload warning time]**	-	0 - 30	10	Sec
I/O group	I54	**[Multi-function relay1 select]**	5	0 - 27	12	
	I55	[Multi-function relay2 select]	5		17	

• Select one output terminal for this function between Relay1 and Relay2.
• If selecting Relay1 as output terminal, set I54 to 5 {Overload: OL}

► F54: Set the value as a percent of motor rated current.
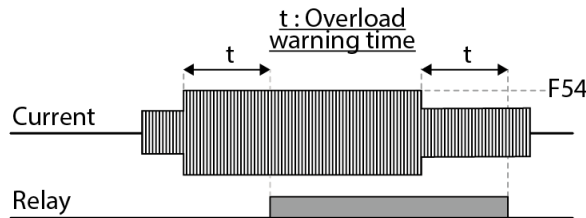
10.2.2 Overload trip

Group	Code	Parameter	Set	Range	Default	Unit
Function group 1	F56	**[Overload trip select]**	1	0 - 1	1	
	F57	[Overload trip level]	-	30 - 200	120	%
	F58	[Overload trip time]	-	0 - 60	60	sec

• Set F56 to 1.
• Inverter output is turned off when motor is overloaded.
• Inverter output is turned off when excessive current flows to the motor for F58 – [Overload trip time].

10.3 Stall prevention

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 1	**F59**	**[Stall prevention select]**	**-**	0 - 7	4	
	F60	**[Stall prevention level]**	**-**	30 - 200	130	%
I/O group	I54	[Multi-function relay1 select]	7	0 -30	12	
	I55	[Multi-function relay2 select]	7		17	

• During acceleration: Motor starts deceleration when current exceeding the value set in F60 flows.
• During constant run: Motor decelerates when current exceeding the value set in F60 flows.
• During deceleration: Motor deceleration is stopped when inverter DC link voltage rises above a certain voltage level.
• F60: The value is set as the percent of motor rated current (H33).
• I54, I55: Inverter outputs signals through multi-function output terminal Relay1 or relay output Relay2 or external sequence when stall prevention function is activated. Motor stall status still can be monitored in these codes though F59 is not selected (000).

► F59: Stall prevention can be set as the table below.

		Setting	During Deceleration	During constant speed	During Acceleration
			Bit 2	Bit 1	Bit 0
F59	Stall prevention	0	-	-	-
		1	-	-	✓
		2	-	✓	-
		3	-	✓	✓
		4	✓	-	-
		5	✓	-	✓
		6	✓	✓	-
		7	✓	✓	✓

► For example, set F59 to 3 to make stall prevention active during Acceleration and constant run.

► When stall prevention is executed during acceleration or deceleration, Accel/Decel time may take longer than the user-setting time.

► When stall prevention is activated during constant run, t1, t2 executed in accordance with the value set in ACC - [Accel time] and dEC - [Decel time].
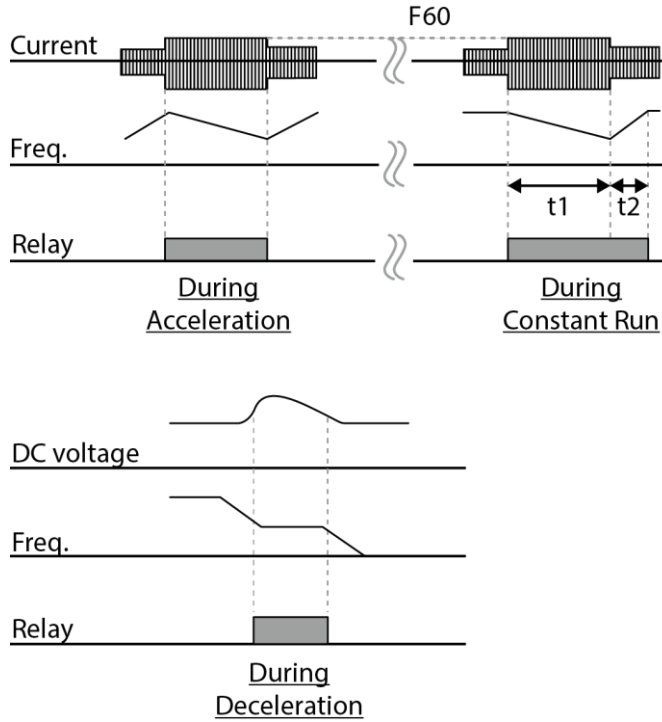
10.4 Output phase loss protection

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H19**	**[Input/Output phase loss protection select]**	**1**	0 - 3	0	

- Set H19 value to 1.
- Output phase loss: Inverter output is shut off at the event of more than one phase loss among U, V and W.
- Input phase loss: Inverter output is blocked at the event of more than one phase loss among R, S and T. If there is no input phase loss, output is shut off when it is time to replace DC link capacitor.

⚠ Caution

Set H33 [Motor rated current] correctly. If the actual motor rated current and the value of H33 are different, output phase loss protection function could not be activated.

		0	Not used
H19	[Input/Output phase loss protection select]	1	Output phase loss protection
		2	Input phase loss protection
		3	Input/output phase loss protection

10.5 External trip signal

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I17	[Multi-function input terminal P1 define]		0 - 30	0	
	-	-				
	I19	**[Multi-function input terminal P3 define]**	**18**		2	
	I20	**[Multi-function input terminal P4 define]**	**19**		3	

- Select a terminal among P1 thru P4 to output external trip signal.
- Set I19 and I20 to 18 and 19 to define P3 and P4 as External A contact and B contact

► External trip signal input A contact (N.O.): Normal open contact input. When a P3 terminal set to "Ext trip-A" is ON (Closed), inverter displays the fault and turns off its output.

► External trip signal input B contact (N.C.): Normal close contact input. When a P4 terminal set to "Ext trip-B" is OFF (Open), inverter displays the fault and turns off its output.
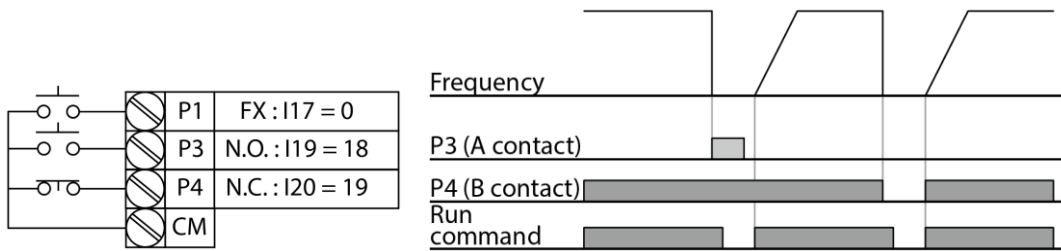
10.6 Inverter Overload

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I54	[Multi-function relay1 select]	6	0 - 27	12	
	I55	[Multi-function relay2 select]	6		17	

► Inverter overload prevention function is activated when the current above inverter rated current flows.

► Multi-function output terminal Relay1 or Multi-function relay2 is used as the alarm signal output during inverter overload trip.

10.7 Speed command loss

Group	Code	Parameter Name	Setting	Range	Default	Unit
I/O group	I16	[Select criteria for analog speed command loss]	0	0 - 2	0	
	I62	[Drive mode select at loss of speed command]	-	0 - 3	0	
	I63	[Wait time after loss of speed command]	-	0.1 - 120	1.0	sec
	I54	[Multi-function relay1 select]	11	0 - 27	12	
	I55	[Multi-function relay2 select]	11		17	

• Select the Drive mode when frequency reference set via Analog (V1, I) input terminal or communication option is lost.

► I16: This is to set the criteria for analog input signal loss.

I16	[Criteria for analog input signal loss]	0	Disabled (Does not check the analog input signal loss)
		1	When half the value set in I2, I7, I12 is entered
		2	When less than the value set in I 2, I 7, I 12 is entered

Ex 1) The inverter determines the freq reference is lost when DRV-Frq is set to 3 (Analog V1 input), I 16 to 1 and analog input signalis less than half the value set in I 7.
Ex 2) The inverter determines the freq reference is lost when DRV-Frq is set to 6 (V1+I), I 16 to 2 and V1 input signal is either below the value set in I 7 or I input value is less than the I 12 value.

► I62: When no frequency command is given for the time set in I63, set the drive mode as the table below.

I62	[Drive mode select after loss of frequency command]	0	Continuous operation with the frequency before command loss occurs
		1	Free run stop (output cut off)
		2	Decel to stop
		3	Lost Preset

► I54, I55: Multi-function output terminal Relay1 or Multi-function relay output Relay2 is used to output information on loss of frequency command to external sequence
Ex) when I16 is set to 2, I62 to 2, I63 to 5.0 sec and I54 to 11, respectively,
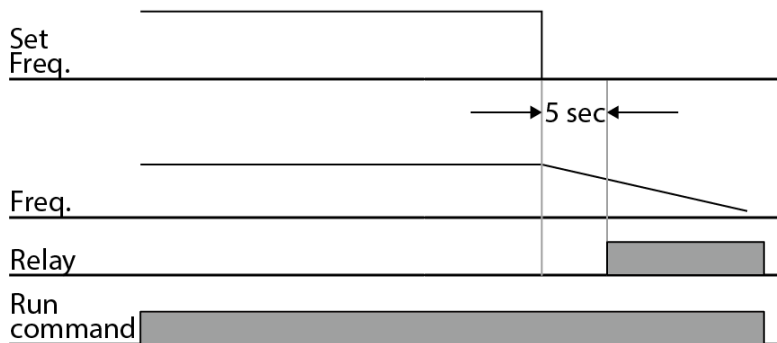
► **Lost Preset F(I62=3)** : If the operating method(I62) is set as No. 3 Lost Preset in case of loss of the speed command, the protective action starts setting the frequency for continuance of operation.
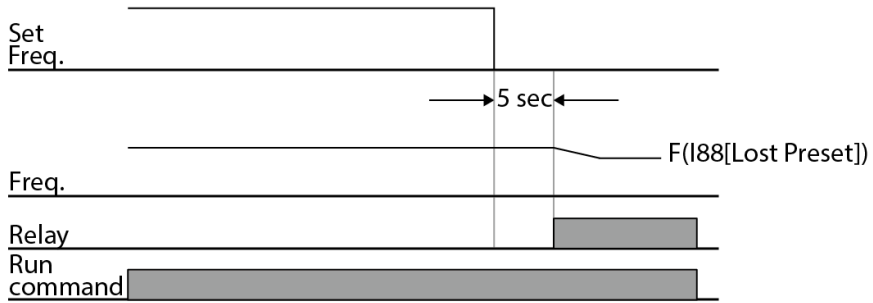
10.8 DB Resistor Enable Duty setting

Group	Code	Parameter Name	Setting	Range	Default	Unit
Function group 2	**H75**	**[Enable duty limit]**	**1**	0 - 1	1	
	H76	[Enable duty]	-	0 - 30	10	%

- Set H75 to 1.
- Set %ED (Enable Duty) in H76.

► 75: DB resistor ED limit setting

	No limit
0	⊙ Caution Take caution when DB resistor is used over its Watt rating. Fire may result from resistor overheat. When resistor having heat detection sensor is used, sensor output can be used as external trip signal in multi-function input.
1	ED is limited as the setting in H 76.

► H76: set the resistor operating rate(%ED) in one sequence of operation. Continuous usage reate is Max 15 sec and usage signal is not issued over 15 sec.

Ex 1)
$$H76 = \frac{T\_dec}{T\_acc + T\_steady + T\_dec + T\_stop} \times 100[\%]$$

Where,

T_acc: Acceleration time to reach a setting freq.

T_steady: Time for constant speed operation at setting freq.

T_dec: Time to decelerate to lower freq. than that in constant speed or time to stop from freq. in constant speed.

T_stop: waiting time at a stop before operation is resumed.

Freq.

T_acc   T_steady   T_dec   T_stop
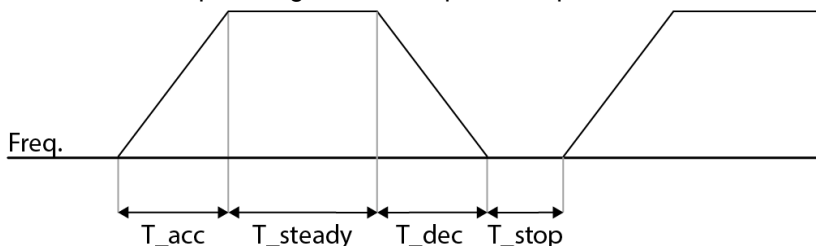
Ex 2)
$$H76 = \frac{T\_dec}{T\_dec + T\_steady1 + T\_acc + T\_steady2} \times 100[\%]$$
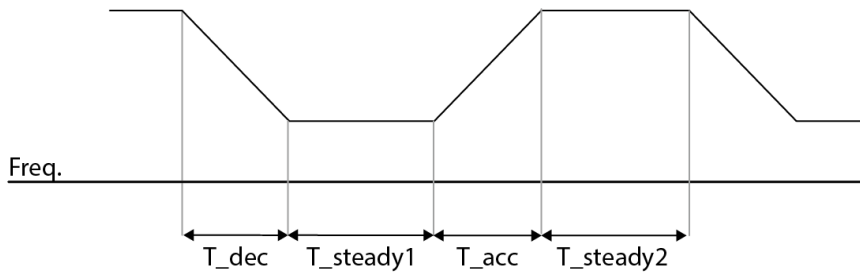
10.9 Under Load Protection

Generally this function helps protect the pump from cavitation. The inverter constantly evaluates the load condition based on the output current. When water circulation stop, the pump runs dry or when pipes leak, the drive cuts off its output and the relay that be set as ULT is turned on.
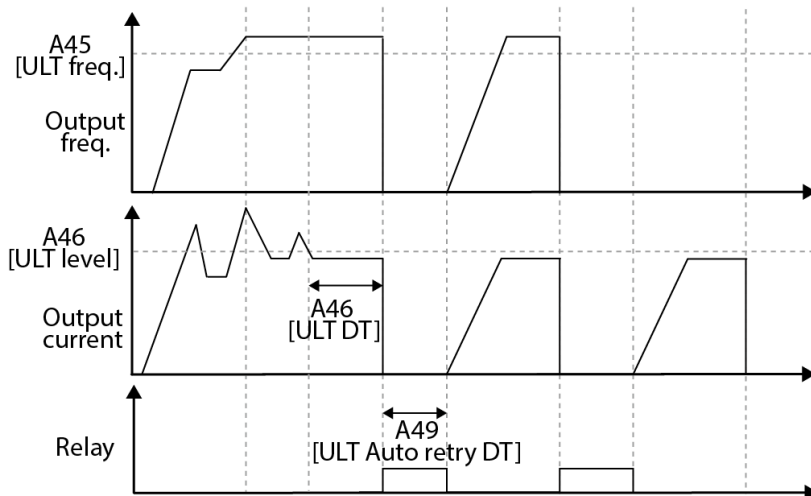
- An under load trip can be detected using output current and output frequency. The under-load protection is activated when the condition is maintained for the set time.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A44	ULT Level Sel	-	0 : No 1 : Yes	NO	
	A45	ULT LevelFreq	-	0-Max Freq.	49.00	Hz
	A46	ULT Level	-	0-100.	70.0	%
	A47	ULT Delay Time	-	0-60.0	5.0	sec
	A48	ULT Retry Num	-	0-10	0	sec
	A49	ULT Auto Retry Delay Time	-	0-60.0	1.0	
I/O group	I54-55	Relay Define x	-	22. ULT	-	

- A44 defines the Under-Load protection function.
- A45 defines the ULT Level Freq.
- A46 defines the ULT Current Level.
- A protect function operates for A47 when under load level conditions explained above maintain for the trip time set.
- The number of available auto restarts can be set at A48. If a ULT trip occurs during an operation, the inverter restarts after the time set at A49 (Retry DT).
- If ULT is set, when a ULT occurs, the inverter sends out output with Relay.

10.10 Broken Belt Protection

Broken Belt is used to trip the fan or pump shows a defective coupling or belt of the motor.
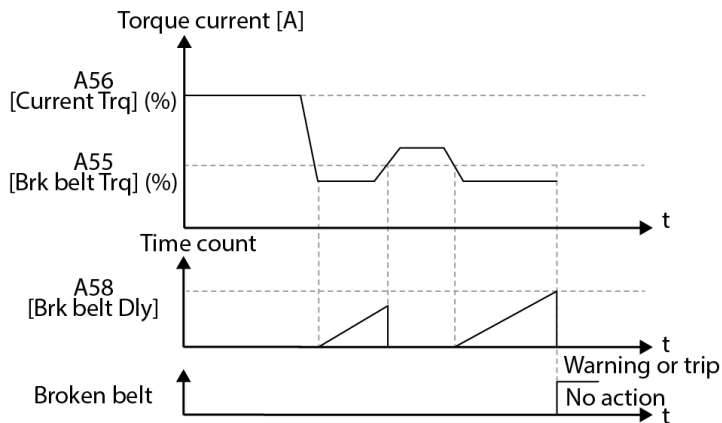
- When the inverter is operating in the frequency over A55_Broken Belt Freq. and current torque reaches the limit set at A57_Broken Belt Trq., trip occurs after the delay time set on A58_Broken Belt Delay.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A54	Broken Belt Sel	-	0: None 1: Warning 2: Free-Run	2: Free-Run	
	A55	Broken Belt Freq	-	0-Max Freq.[Hz]	15.00	Hz
	A56	Current Trq	-			
	A57	Broken Belt Trq	-	0-100.0[%]	10.0	%
	A58	Broken Belt Delay	-	0-100.0[%]	10.0	%
I/O group	I54-55	Relay Define x	-	23. BrokenBelt		

10.11   Pipe Broken

•   Pipe Broken is a safety function to stop when it has detected a broken pipe during operation. Broken pipe can be detected by an abnormal drop of feedback which will cause max. speed operation to compensate the feedback drop.
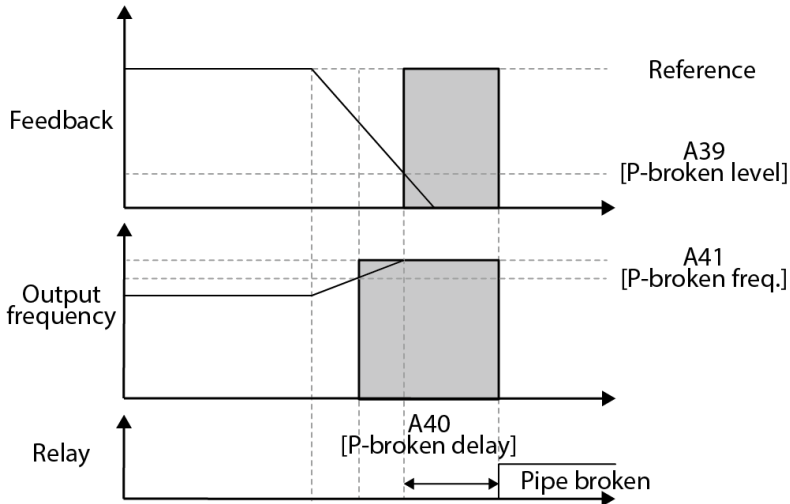
•   The drive provides broken-pipe protection that will trip (shut off) the drive in this incident.
•   The setting can be done when the Feedback maintains below A39_Pipe Broken Level and Output frequency maintains over A41_Pipe Broken Freq. for the time set at A40_Pipe Broken Delay.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A38	Pipe Broken Sel	-	Yes/No	No	
	A39	Pipe Broken Level	-	0-100.0	0.0	%
	A40	Pipe Broken Delay	-	0-60.0	10.0	sec
	A41	Pipe Broken Freq	-	0-Max Freq.	49.00	Hz
I/O group	I54-55	Relay Define x	-	20. Pipe Broken	0	

►   A38: Sets the Pipe Broken function.
►   A39: Sets the Pipe Break Detection level.

► A40: Sets the detection delay time.
► A41: Sets the Pipe Broken frequency.
► I54-55: Relay output in case of Pipe Broken

10.12   Over Pressure

• Over Pressures used to prevent accidents that may arise through high feedback.
• Trip occurs if the feedback of the PID is higher than the A63_Over Pressure level.
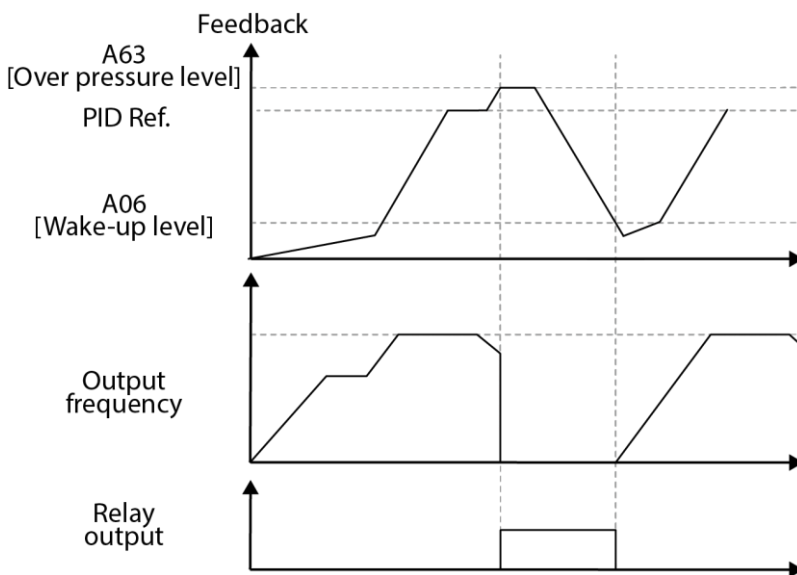
• In Auto configuration in A62_Over Pressure Trip, automatic reset and restart will be performed after feedback decline to Wake-up Level.

Group	Code	Parameter Name	Setting	Range	Default	Unit
Application group	A62	Over Pressure Trip	-	0: None 1: Auto 2: Manual	0	
	A63	Over Pressure Lvl	-	0-100.0	80.0	%
I/O group	I54-55	Relay Define x	-	21. Over Pressure		
Application group	A6	Wake-up Level	-	0-100.0	20.0	%

► A62: If set to 1 (Auto), auto-Reset / Restart will be performed automatically after reaching the Wake-up Level. If set to 2 (Manual), it have to be reset manually.
► A63: Defines the Over Pressure level.

11   RS485 communication

11.1 Introduction

Inverter can be controlled and monitored by the sequence program of the PLC or other master module.

Drives or other slave devices may be connected in a multi-drop fashion on the RS-485 network and may be monitored or controlled by a single PLC or PC. Parameter setting and change are available through PC.

Features

Inverter can be easily applied for factory automation because operation and monitoring is available by User-program.

* Parameter change and monitoring is available via computer.

(Ex: Accel/Decel time, Freq. Command etc.)

* Interface type of RS485 reference:

   1) Allows the drive to communicate with any other computers.

   2) Allows connection of up to 31 drives with multi-drop link system.

   3) Noise-resistant interface.

Users can use any kind of RS232-485 converters. The specifications of converters depend on the manufacturers. Refer to the converter manual for detailed specifications.

Before installation

Before installation and operation, this should be read thoroughly. If not, it can cause personal injury or damage to other equipment.

11.2 Specification

Item	Specification
Communication method	RS485
Transmission form	Bus method, Multi drop Link System
Applicable inverter	SV-iG5H series
Converter	RS232 converter
Connectable drives	Max 16
Transmission distance	Max. 1,200m (Within 700m Recommend)
Communication speed	19,200/9,600/4,800/2,400/1,200 bps selectable
Control procedure	Asynchronous communication system
Communication system	Half duplex system
Character system	ASCII (8 bit)
Stop bit length	Modbus-RTU: 2 bit LS Bus: 1 bit
Sum check	2 byte
Parity check	None
Installation	Use S+, S- terminals on control terminal block
Power supply	Use Insulated power from the inverter power supply

11.3 Installation

Connecting the communication line

Connect the RS-485 communication line to the inverter's (S+), (S-) terminals of the control terminals.

Check the connection and turn ON the inverter.

If the communication line is connected correctly set the communication-related parameters as the following:

- DRV-03 [Drive mode]: 3(RS485)
- DRV-04 [Freq. mode]: 7(RS485)
- I/O-60 [Inv. Number]: 1-250 (If more than 1 inverters are connected, be sure to use different numbers for each inverter)
- I/O-61 [Baud-rate]: 3 (9,600 bps as Factory default)
- I/O-62 [Lost Mode]:   0   - No action (Factory default)
- I/O-63 [Time-Out]: 1.0 sec (Factory default)
- I/O-59 [Comm. Prot]:   0   - Modbus-RTU, 1 – LS BUS

Communication

Computer and inverter connection

System configuration
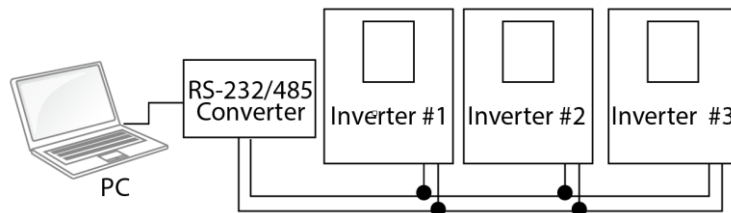
- The number of drives to be connected is up to 16 drives.
- The specification of length of communication line is max. 1200m. To ensure stable communication, limit the length below 700m.

11.4 Operation

Operating steps

Check whether the computer and the inverter are connected correctly.

Turn ON the inverter. But do not connect the load until stable communication between the computer and the inverter is verified.

Start the operating program for the inverter from the computer.

Operate the inverter using the operating program for the inverter.

Refer to "Troubleshooting & Maintenance" if the communication is not operating normally.

*User program or the "DriveView" program supplied from LS Industrial Systems can be used as the operating program for the inverter.

11.5 Communication protocol (MODBUS-RTU)

Use Modbus-RTU protocol (Open protocol).

Computer or other hosts can be Master and inverters Slave. Inverter responds to Read/Write command from Master.

Code		Description
Function Code	0x03	Read Hold Register
	0x04	Read Input Register
	0x06	Preset Single Register
	0x10	Preset Multiple Register
Exception Code	0x01	ILLEGAL FUNCTION
	0x02	ILLEGAL DATA ADDRESS
	0x03	ILLEGAL DATA VALUE
	0x06	SLAVE DEVICE BUSY
	User define	0x14	1.Write Disable (Address 0x0004 value is 0). 2.Read Only or Not Program during Running.

11.6 Communication protocol (LS BUS)

Basic format

Command message (Request):

Command message (Request):	ENQ	Drive No.	CMD	Data	SUM	EOT
	1 byte	2 bytes	1 byte	n bytes	2 bytes	1 byte
Normal response (Acknowledge Response)	ACK	Drive No.	CMD	Data	SUM	EOT
	1 byte	2 bytes	1 byte	n * 4 bytes	2 bytes	1 byte
Negative response (Negative Acknowledge Response)	NAK	Drive No.	CMD	Error code	SUM	EOT
	1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Communication

Description:

Request starts with "ENQ" and ends with "EOT".
Acknowledge Response starts with "ACK" and ends with "EOT".
Negative Acknowledge Response starts with "NAK" and ends with "EOT".
"Drive Number" is the number of drives and indicated in 2 bite ASCII-HEX.
(ASCII-HEX: Hexadecimal consists of '0' - '9', 'A' - 'F')
CMD: Capital letter

Character	ASCII-HEX	Command
'R'	52h	Read
'W'	57h	Write
'X'	58h	Request for monitoring
'Y'	59h	Action for monitoring

Data: ASCII-HEX

Ex) when data value is 3000: 3000 (dec) → '0' 'B' 'B' '8'h → 30h 42h 42h 38h

Error code: ASCII (20h - 7Fh)

Receive/Send buffer size: Receive= 39 bite, Send=44 bite
Monitor register buffer: 8 Word
SUM: to check the communication error
SUM= ASCII-HEX format of lower 8 bit of (Drive No. + CMD + DATA)
Ex) Command Message (Request) for reading one address from address "3000"

ENQ	Drive No	CMD	Address	Number of address to read	SUM	EOT
05h	"01"	"R"	"3000"	"1"	"A7"	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

SUM = '0' + '1' + 'R' + '3' + '0' + '0' + '0' + '1'
= 30h + 31h + 52h + 33h + 30h + 30h + 30h + 31h
= 1A7h (Control values such as ENQ/ACK/NAK are excluded.)

Detail communication protocol

1)   Request for Read: Request for read successive 'N' numbers of WORD from address "XXXX"

ENQ	Drive No	CMD	Address	Number of address to read	SUM	EOT
05h	"01" - "1F"	"R"	"XXXX"	"1" - "8" = n	"XX"	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

Total bite = 12

The quotation marks (" ") means character.

1.1)   Acknowledge Response:

ACK	Drive No	CMD	Data	SUM	EOT
06h	"01" - "1F"	"R"	"XXXX"	"XX"	04h
1 byte	2 bytes	1 byte	N * 4 bytes	2 byte	1 byte

Total bite = 7 + n * 4 = Max 39

1.2)   Negative Acknowledge Response:

NAK	Drive No	CMD	Error code	SUM	EOT
15h	"01" - "1F"	"R"	"**"	"XX"	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bite = 9

2)   Request for Write:

ENQ	Drive No	CMD	Address	Number of address to read	Data	SUM	EOT
05h	"01"- "1F"	"W"	"XXXX"	"1" - "8" = n	"XXXX…"	"XX"	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	n * 4 bytes	2 byte	1 byte

Total bite = 12 + n * 4 = Max 44

2.1)   Acknowledge response:

ACK	Drive No	CMD	Data	SUM	EOT
06h	"01" - "1F"	"W"	"XXXX…"	"XX"	04h
1:byte	2:bytes	1:byte	n * 4 bytes	2 bytes	1 byte

Total bite = 7 + n * 4 = Max 39

Note

When Request for Write and Acknowledge Response is exchanged between PC and Inverter for the first time, previous data is returned. From the second time of transmission, the current data will be returned.

2.2)   Negative response:

NAK	Drive No	CMD	Error code	SUM	EOT
15h	"01" - "1F"	"W"	"**"	"XX"	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bite = 9

3)   Request for Monitor Register

This is useful when constant parameter monitoring and data updates are required.

Request for Register of 'n' numbers of Address (not consecutive)

ENQ	Drive No	CMD	Number of address to read	Address	SUM	EOT
05h	"01" - "1F"	"X"	"1" - "8"=n	"XXXX…"	"XX"	04h
1 byte	2 bytes	1 byte	1 byte	n * 4 byte	2 byte	1 byte

Total bite = 8 + n * 4 = Max 40

3.1)   Acknowledge Response:

ACK	Drive No	CMD	SUM	EOT
06h	"01" - "1F"	"X"	"XX"	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bite = 7

3.2)   Negative Acknowledge Response:

NAK	Drive No	CMD	Error code	SUM	EOT
15h	"01" - "1F"	"X"	"**"	"XX"	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bite = 9

4)   Action Request for monitor register: Request for read of address registered by monitor register.

ENQ	Drive No	CMD	SUM	EOT
05h	"01" - "1F"	"Y"	"XX"	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bite = 7

4.1) Acknowledge response:

ACK	Drive No	CMD	Data	SUM	EOT
06h	"01" - "1F"	"Y"	"XXXX…"	"XX"	04h
1 byte	2 bytes	1 byte	n * 4 bytes	2 bytes	1 byte

Total bite= 7 + n * 4 = Max 39

4.2) Negative response:

NAK	Drive No	CMD	Error code	SUM	EOT
15h	"01" - "1F"	"Y"	"**"	"XX"	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bite = 9

5) Error code

Error code	Description
"IF"	When master is sending codes other than Function code (R, W, X, Y).
"IA"	When parameter address does not exist
"ID"	When Data value exceeds its permissible range during 'W' (Write).
"WM"	When the specific parameters cannot be written during 'W' (Write). (For example, in the case of Read Only, Write disabled during Run)
"FE"	When frame size of specific function is not correct and Checksum field is wrong.

11.7 Parameter code list <Common area>

1) <Common area>: Area accessible regardless of inverter models (Note 1, 2)

Address	Parameter	Scale	Unit	R/W	Allotment for Bits		
0x0000	Inverter model	-	-	R	A : iG5H		
0x0001	Inverter capacity	-	-	R	FFFF : 0.4kW	0000 : 0.75kW	0002 : 1.5kW
					0003 : 2.2kW	0004 : 3.7kW	0005 : 4.0kW
					0006 : 5.5kW	0007 : 7.5kW	Reserved
					Reserved	Reserved	Reserved
0x0002	Inverter Input Voltage	-	-	R	0 : 220V, 1 : 440V		
0x0003	S/W version	-	-	R	(Ex) 0x0022 : Version 2.2		
0x0004	Parameter Lock	-	-	R/W	0 : Lock(default), 1: Unlock		

Address	Parameter	Scale	Unit	R/W	Allotment for Bits
0x0005	Freq. Reference	0.01	Hz	R/W	Starting freq. - Max. freq.
0x0006	Run Command	-	-	R	B15, B14, B13 : Reserved
					B12, B11, B10, B9, B8 : Freq. command
					0 : DRV-00, 1 : Not Used,
					2-8 : Multi-Step frequency 1-7
					9 : Up, 10 : Down, 11 : Up-Down Zero
					12 : V0, 13 : V1, 14 : I,
					15 : V0+I, 16 : V1+I, 17 : JOG,
					18 : PID, 19 : Communication,
					20-31 : Reserved
					B7, B6 : Run Command
					0 : Terminal, 1 : Keypad, 3 : Communication
				R/W	B5 Reserved
					B4 Emergency stop (0->1)
					B3 Fault reset (0->1)
					B2 Reverse run (0->1)
					B1 Forward run (0->1)
					B0 Stop (0->1)
0x0007	Acceleration Time	0.1	sec	R/W	See Function List
0x0008	Deceleration Time	0.1	sec	R/W	See Function List
0x0009	Output Current	0.1	A	R	See Function List
0x000A	Output Frequency	0.01	Hz	R	See Function List
0x000B	Output Voltage	0.1	V	R	See Function List
0x000C	DC Link Voltage	0.1	V	R	See Function List
0x000D	Output Power	0.1	kW	R	See Function List
0x000E	Inverter Status	-	-	-	B0 Stop
					B1 Forward running
					B2 Reverse running
					B3 Fault (Trip)
					B4 Acceleration
					B5 Deceleration
					B6 Speed arrived
					B7 DC Braking
					B8 Stopping
					B9 Not Used
					B10 Brake open
					B11 Forward run command
					B12 Reverse run command
					B13 REM. R/S
					B14 REM. Freq.
					B15 Reserved

Address	Parameter	Scale	Unit	R/W	Allotment for Bits					
0x000F	Trip information-A	-	-	R	B15	LVT	B14	IOLT	B13	POT
					B12	FAN	B11	EEP	B10	EXT-B
					B9	HW-Diag	B8	OLT	B7	ETH
					B6	OHT	B5	GFT	B4	COL
					B3	EST (BX)	B2	EXT-A	B1	OVT
					B0	OCT				
0x0010	Input terminal status	-	-	R	B15- B4 : Reserved					
					B3		P4		B2	P3
					B1		P2		B0	P1
0x0011	Output terminal status	-	-	R	B7	Relay2	B4	Rely1		
					Others : Reserved					
0x0012	V1	-	-	R	Value corresponding to 0 - + 10V input					
0x0013	V2	-	-	R	Value corresponding to 0 - - 10V input when setting Freq Mode to 2					
0x0014	I1	-	-	R	Value corresponding to 0 - 20mA input					
0x0015	RPM	-	-	R	See Function List					
0x001A	Unit display	-	-	R	Not Used					
0x001B	Pole number	-	-	R	Not Used					
0x001C	Custom Version	-	-	R	Not Used					
0x001D	Trip information-B	-	-	R	B5	NBR	B4	OC2	B3	REEP
					B2	NTC	B1	FLTL	B0	COM
					Others : Reserved					
0x001E	PID Feedback	0.1	%	R/W	Writes feedback amount when feedback is set by communication in PID drive.					
0x001F	Output torque	0.1	kgfm	R	Motor output torque display					
0x0100 - 0x0107	Read address register (Note3)	-	-	R	0x0100 : I66 0x0101 : I67 0x0102 : I68 0x0103 : I69 0x0104 : I70 0x0105 : I71 0x0106 : I72 0x0107 : I73					
0x0108 - 0x010F	Write address register (Note3)	-	-	W	0x0108 : I74 0x0109 : I75 0x010A : I76 0x010B : I77 0x010C : I78 0x010D : I79 0x010E : I80 0x010F : I81					

Note

- Note 1) The changed value in Common area affects the current setting but returns to the previous setting when power is cycled or Inverter is reset. However, changing value is immediately reflected in other parameter groups even in the case of Reset or Power On/Off.
- Note 2) S/W version of Common area is displayed in Hexadecimal, while that of parameter area is displayed in decimal.
- Note 3) User can register up to Read address 8 ea/Write address 8 ea of discontinuous addresses and read/write them n data(s) with one Read/Write command. Input/Output group I66 through I73 are registered in the common read addresses 0x0100 through 0x0107 and it can be read the discontinuous n data(s) (less than 8 ea) with a read command. Input/Output group I74 through I81 are registered in the common write addresses 0x0108 through 0x010F and it can be written discontinuous n data(s) (less than 8 ea) with a write command.

2) Extended Common Area :

2.1) Inverter Monitoring Area Parameters (Reading Only)

Address	Parameter	Scale	Unit	Allotment for Bits		
0x0300	Inverter Model	-	-	iG5H : 0x000A		
0x0301	Inverter capacity	-	-	0.4kW : 0x0019	0.75kW : 0x3200	1.5kW : 0x4015
				2.2kW : 0x4022	3.7kW : 0x4037	4.0kW : 0x4040
				5.5kW : 0x4055	7.5kW : 0x4075	Reserved
				Reserved	Reserved	Reserved
0x0302	Inverter input voltage /power supply type (1-phase, 3-phase) / cooling method	-	-	200V single phase open air cooling : 0x0220 200V 3 phase open air cooling : 0x0230 200V single phase forced cooling : 0x0221 200V 3 phase forced cooling : 0x0231 400V single phase open air cooling : 0x0420 400V 3 phase open air cooling : 0x0430 400V single phase forced cooling : 0x0421 400V 3 phase forced cooling : 0x0431		
0x0303	S/W version	-	-	(Ex) 0x0023 : Version 2.3		
0x0305	Inverter operating status	-	-	B15, B14, B13, B12 : 0 : Normal status, 8 : Fault status		
				B11, B10, B9, B8 : Reserved		
				B7, B6, B5, B4 : 1 : Speed search, 2 : Accelerating 3 : Steady speed, 4 : Decelerating 5 : Decelerating stop 6 : H/W OCS 7 : S/W OCS 8 : Dwell operating		
				B3, B2, B1, B0 :		

Address	Parameter	Scale	Unit	Allotment for Bits
0x0306	Inverter operating, frequency command source	-	-	0 : Stop 1 : Forward operating 2 : Reverse operating 3 : DC operating B15 - B8 : Operating command source 0 : Keypad 1 : Reserved 2 : Reserved 3 : Built-in 485 4 : Terminal B7 - B0 : Frequency command source 0 : Keypad 1 : Reserved 2-4 : Up/Down operating speed 5 : V1 6 : I 7 : Built-in 485 26-32 : Multi-step frequency 1-7
0x0310	Output current	0.1	A	-
0x0311	Output frequency	0.01	Hz	-
0x0312	Output RPM	1	RPM	-
0x0314	Output voltage	1	V	-
0x0315	DC Link voltage	1	V	-
0x0316	Output power	0.1	kW	-
0x0318	PID reference	0.1	%	-
0x0319	PID feedback	0.1	%	-
0x031A	Poles of motor	-	-	-
0x320	Digital input Information	-	-	B15 - B4 : Reserved B3 : P4 B2 : P3 B1 : P2 B0 : P1
0x321	Digital output information	-	-	B15 - B2 : Reserved B1 : Relay2 B0 : Relay1
0x0323	Select motor	-	-	0 : First motor, 1 : Second motor
0x0324	V1	0.01	%	Analog voltage input
0x0325	I	0.01	%	Analog current input
0x0328	AO	0.01	%	Analog output
0x0330	Latch type trip information-1	-	-	B15 : Reserved B14 : OHT B13 : OC2 B12 : EXT B11 : OVT B10 : OCT B9 : NTC B8 : Reserved B7 : Reserved B6 : COL B5 : POT B4 : GFT B3 : ETH B2 : IOLT B1 : Reserved B0 : OLT
0x0331	Latch type trip information-2	-	-	Others : Reserved B3 : FAN
0x0332	Latch type trip information-3	-	-	Others : Reserved B2 : Lost command B1 : LVT B0 : BX

Communication

Address	Parameter	Scale	Unit	Allotment for Bits
0x0333	H/W diagnosis trip information	-	-	Others : Reserved B0 : HW-diag
0x0334	Warning		-	Others : Reserved B4 : FAN working B2 : Inverter overload B0 : Overload

2.2)   Inverter Control Area Parameters (Reading and Writing Available)

Address	Parameter	Scale	Unit	Allotment for Bits
0x0380	Frequency command(Note1)	0.01	Hz	Command frequency setting
0x0381	RPM command(Note1)	1	rpm	Command RPM setting
0x0382	Operating command(Note2)	-	-	Others : Reserved B3 : Free run stop (0->1) B2 : Trip reset (0->1) B1 : Reverse command (0), Forward command (1) B0 : Stop command (0), Run command (1)
0x0383	Acceleration time	0.1	sec	Acceleration time setting
0x0384	Deceleration time	0.1	sec	Deceleration time setting
0x0388	PID reference(Note3)	0.1	%	PID reference command released
0x0389	PID feedback value(Note4)	0.1	%	PID feedback value

Note

1) Writing available, when frequency command is communication.
2) Writing available, when run command is communication mode.
3) Writing available, when PID Reference (H57 = 4) is communication mode.
4) Writing available, PID Feedback(H50 = 2) is communication mode.

2.3)   Inverter Memory Control Area (Reading and Writing Available)

Address	Parameter	Scale	Unit	Allotment for Bits
0x03E2	Parameter initialization	-	-	0 : No 1 : All group 2 : Drv group 3 : Function group 1 4 : Function group 2 5 : Input/Output group * no setting during trip
0x03E5	All history of failure deleted	-	-	0 : NO, 1 : YES

11.8 Troubleshooting

Refer to Troubleshooting when RS-485 communication error occurs.

Check points	Corrective measures
Is the power provided to the converter?	Provide electric power to the converter.
Are the connections between converter and computer correct?	Refer to converter manual.
Is Master not polling?	Verify the master is polling the inverter.
Is baud rate of computer and inverter correctly set?	Set the correct value in accordance with"11.3 Installation".
Is the data format of user program* right?	Revise User Program (Note1).
Is the connection between converter and communication card right?	Check for GF the correct wiring in accordance with"11.3 Installation".

Note

User program is User-made S/W for PC.

11.9 Miscellaneous

ASCII Code List

Character	Hex	Character	Hex	Character	Hex	Character	Hex	Character	Hex
A	41	a	61	0	30	:	3A		
B	42	b	62	1	31	;	3B	DLE	10
C	43	c	63	2	32	<	3C	EM	19
D	44	d	64	3	33	=	3D	ACK	06
E	45	e	65	4	34	>	3E	ENQ	05
F	46	f	66	5	35	?	3F	EOT	04
G	47	g	67	6	36	@	40	ESC	1B
H	48	h	68	7	37	[	5B	ETB	17
I	49	i	69	8	38	\	5C	ETX	03
J	4A	J	6A	9	39	]	5D	FF	0C
K	4B	k	6B	space	20		5E	FS	1C
L	4C	l	6C	!	21		5F	GS	1D
M	4D	m	6D	"	22		60	HT	09
N	4E	n	6E	#	23	{	7B	LF	0A
O	4F	o	6F	$	24			7C	NAK	15
P	50	p	70	%	25	}	7D	NUL	00
Q	51	q	71	&	26	-	7E	RS	1E
R	52	r	72	'	27	BEL	07	S1	0F
S	53	s	73	(	28	BS	08	SO	0E
T	54	t	74	)	29	CAN	18	SOH	01
U	55	u	75	*	2A	CR	0D	STX	02
V	56	v	76	+	2B	DC1	11	SUB	1A
W	57	w	77	,	2C	DC2	12	SYN	16
X	58	x	78	-	2D	DC3	13	US	1F
Y	59	y	79	.	2E	DC4	14	VT	0B
Z	5A	z	7A	/	2F	DEL	7F		

12 Troubleshooting & Maintenance
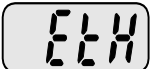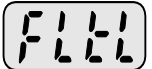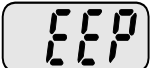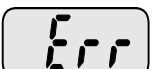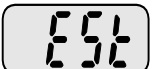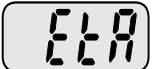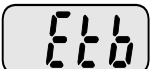
12.1 Protective functions

⚠ Warning

When a fault occurs, the cause must be corrected before the fault can be cleared. If protective function keeps active, it could lead to reduction in product life and damage to the equipment.

Fault Display and information

Keypad display	Protective functions	Descriptions
OCt	Overcurrent	The inverter turns off its output when the output current of the inverter flows more than the inverter rated current.
OC2	Overcurrent2	When IGBT's Arm is short and output short occurs, the inverter turns off its output
GFt	Ground fault current	The inverter turns off its output when a ground fault occurs and the ground fault current is more than the internal setting value of the inverter.
IOL	Inverter Overload	The inverter turns off its output when the output current of the inverter flows more than the rated level (120% for 1 minute).
OLt	Overload trip	The inverter turns off its output if the output current of the inverter flows at 150% of the inverter rated current for more than the current limit time (1 min).
OHt	Inverter overheat	The inverter turns off its output if the heat sink overheats due to a damaged cooling fan or an alien substance in the cooling fan by detecting the temperature of the heat sink.
POt	Output Phase loss	The inverter turns off its output when the one or more of the output (U, V, W) phase is open. The inverter detects the output current to check the phase loss of the output.
Out	Over voltage	The inverter turns off its output if the DC voltage of the main circuit increases higher than 400 V when the motor decelerates. This fault can also occur due to a surge voltage generated at the power supply system.
Lut	Low voltage	The inverter turns off its output if the DC voltage is below 180V because insufficient torque or overheating of the motor can occur when the input voltage of the inverter drops.

Keypad display	Protective functions	Descriptions
ELH	Electronic Thermal	The internal electronic thermal of the inverter determines the overheating of the motor. If the motor is overloaded the inverter turns off the output. The inverter cannot protect the motor when driving a motor having more than 4 poles or multi motors.
LUL	Input phase loss	Inverter output is blocked when one of R, S, T is open or the electrolytic capacitor needs to be replaced.
FLEL	Self-diagnostic malfunction	Displayed when IGBT damage, output phase short, output phase ground fault or output phase open occurs.
EEP	Parameter save error	Displayed when user-setting parameters fails to be entered into memory.
H.C	Inverter hardware fault	Displayed when an error occurs in the control circuitry of the inverter.
Err	Communication Error	Displayed when the inverter cannot communicate with the keypad.
rErr	Remote keypad communication error	Displayed when inverter and remote keypad does not communicate each other. It does not stop Inverter operation.
LOM	Keypad error	Displayed after Inverter resets keypad when keypad error occurs and this status is maintained for a certain time.
FAn	Cooling fan fault	Displayed when a fault condition occurs in the inverter cooling fan.
ESt	Instant cut off	Used for the emergency stop of the inverter. The inverter instantly turns off the output when the EST terminal is turned on. ⊙ Caution The inverter starts to regular operation when turning off the EST terminal while FX or RX terminal is ON.
EtA	External fault A contact input	When multi-function input terminal (I17-I20) is set to 18 {External fault signal input: A (Normal Open Contact)}, the inverter turns off the output.
Etb	External fault B contact input	When multi-function input terminal (I17-I20) is set to 19 {External fault signal input: B (Normal Close Contact)}, the inverter turns off the output.

Keypad display	Protective functions	Descriptions
$..\Gamma$	Operating method when the frequency command is lost	When inverter operation is set via Analog input (0-10V or 0-20mA input) or option (RS485) and no signal is applied, operation is done according to the method set in I62 (Operating method when the frequency reference is lost).
$n\Gamma\Gamma$	NTC open	When NTC is not connected, outputs are cut off.
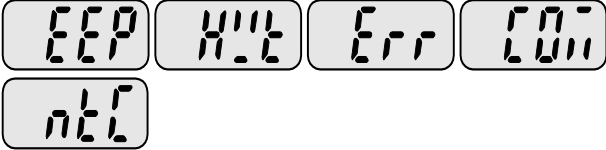
12.2 Fault remedy

Keypad display	Cause	Remedy
	⊙ Caution When an overcurrent fault occurs, operation must be started after the cause is removed to avoid damage to IGBT inside the inverter.	
$\Gamma F\Gamma$ Overcurrent	Accel/Decel time is too short compared to the GD^2 of the load. Load is greater than the inverter rating. Inverter output is issued when the motor is free running. Output short circuit or ground fault has occurred. Mechanical brake of the motor is operating too fast.	• Increase the Accel/Decel time. • Replace the inverter with appropriate capacity. • Resume operation after stopping the motor or use H22 (Speed search). • Check output wiring. • Check the mechanical brake.
$\Gamma F\Gamma$ Ground fault current	Ground fault has occurred at the output wiring of the inverter The insulation of the motor is damaged due to heat	• Check the wiring of the output terminal. • Replace the motor.
$1\ \overline{U}L$ Inverter overload	Load is greater than the inverter rating.	• Upgrade the capacity of motor and inverter or reduce the load weight.
$\overline{U}L\Gamma$ Overload trip	Torque boost scale is set too large.	• Reduce torque boost scale.

Keypad display	Cause	Remedy
OHt Inverter overheat	Cooling system has faults. An old cooling fan is not replaced with a new one. Ambient temperature is too high.	• Check for alien substances clogged in the heat sink. • Replace the old cooling fan with a new one. • Keep ambient temperature under 50°C.
POt Output Phase loss	Faulty contact of magnetic switch at output Faulty output wiring	• Make connection of magnetic switch at output of the inverter securely. • Check output wiring.
FAn Cooling fan fault	An alien substance is clogged in a ventilating slot. Inverter has been in use without changing a cooling fan.	• Check the ventilating slot and remove the clogged substances. • Replace the cooling fan.
OuP Over Pressure	When the PID feedback exceeds the over pressure level trip occurs.	• Reduce PID Feedback value.
PbV Pipe Broken	This function detects the water pipe breaks during the PID loop operation. when the PID feedback doesn't reach the set value within the setting time during the maximum output operations, trip occurs.	• Check the pipe for leaks.
bbt Broken Belt	This built-in feature in the inverter detects the breakage of the belt or coupling in the fan or pump system.	• Check your belt for breaks.
ULP Under Load Protection	As some process malfunctions may cause the motor load to drop below the normal operating range, the underload trip is generated.	• Adjust the Under Level.
Out Over voltage	Decel time is too short compared to the GD² of the load. Regenerative load is at the inverter output. Line voltage is too high.	• Increase the Decel time. • Use Dynamic Brake Unit. • Check whether line voltage exceeds its rating.

Keypad display	Cause	Remedy
$L\ ut$ Low voltage	Line voltage is low. Load larger than line capacity is connected to line (ex: welding machine, motor with high starting current connected to the commercial line). Faulty magnetic switch at the input side of the inverter.	• Check whether line voltage is below its rating. • Check the incoming AC line. Adjust the line capacity corresponding to the load. • Change a magnetic switch.
EtH Electronic thermal	Motor has overheated. Load is greater than inverter rating. ETH level is set too low. Inverter capacity is incorrectly selected. Inverter has been operated at low speed for too long.	• Reduce load weight and operating duty. • Change inverter with higher capacity. • Adjust ETH level to an appropriate level. • Select correct inverter capacity. • Install a cooling fan with a separate power supply.
EtA External fault A contact input Etb External fault B contact input	The terminal set to "18 (External fault-A)" or "19 (External fault-B)" in I17-I20 in I/O group is ON.	• Eliminate the cause of fault at circuit connected to external fault terminal or cause of external fault input.
$..L$ Operating method when the frequency command is lost	No frequency command is applied to V1 and I.	• Check the wiring of V1 and I and frequency reference level.
$rErr$ Remote keypad communication error	Communication error between inverter keypad and remote keypad	• Check for connection of communication line and connector.
nbr Brake control error	Break open current is not flow any more.	• Check the Motor Capacity & Wiring

Fault remedy

Protective functions & cause	Descriptions
$\boxed{EEP}$ $\boxed{HWt}$ $\boxed{Err}$ $\boxed{COM}$ $\boxed{ntC}$ EEP : Parameter save error HWT : Hardware fault Err : Communication error COM : Keypad error NTC : NTC error	• Contact your local LSIS sales representative.

12.2.1 Overload Protection

• IOLT : IOLT(inverter Overload Trip) protection is activated at 120% of the inverter rated current for 1 minute and greater.
• OLT : OLT is selected when F56 is set to 1 and activated at 200% of F57[Motor rated current] for 60 sec in F58. This can be programmable.
• iG5H is not provided with "Overspeed Protection."

12.3 Precautions for maintenance and inspection

⚠ Warning

Make sure to remove the input power while performing maintenance.
Make sure to perform maintenance after checking the DC link capacitor has discharged. The
bus capacitors in the inverter main circuit can still be charged even after the power is turned off.
Check the voltage between terminal P or P1 and N using a tester before proceeding.
SV-iG5H series inverter has ESD (Electrostatic Discharge) sensitive components. Take
protective measures against ESD before touching them for inspection or installation.
Do not change any inner parts and connectors. Never modify the inverter.

12.4 Check points

12.4.1 Daily inspections

- Proper installation environment
- Cooling system fault
- Unusual vibration and noise
- Unusual overheating and discoloration

12.4.2 Periodic inspection

- Screws and bolts may become loose due to vibration, temperature changes, etc.
- Check that they are tightened securely and retighten as necessary.
- Alien substances are clogged in the cooling system.
- Clean it using the air.
- Check the rotating condition of the cooling fan, the condition of capacitors and the
  connections with the magnetic contactor.
- Replace them if there are any abnormalities.

12.5 Part replacements

The inverter consists of many electronic parts such as semiconductor devices. The following parts may deteriorate with age because of their structures or physical characteristics, leading to reduced performance or failure of the inverter. For preventive maintenance, the parts must be changed periodically. The parts replacement guidelines are indicated in the following table. Lamps and other short-life parts must also be changed during periodic inspection.

Part name	Change period (unit: Year)	Description
Cooling fan	3	Exchange (as required)
DC link capacitor in main circuit	4	Exchange (as required)
Electrolytic capacitor on control board	4	Exchange (as required)
Relays	-	Exchange (as required)

13 Specifications

13.1 Technical data

13.1.1 Input & output ratings: Three Phase 200V Class

SV ■■■iG5H –2 ■■		004	008	015	022	037	040	055	075
Max capacity1	[HP]	0.5	1	2	3	5	5.4	7.5	10
	[kW]	0.4	0.75	1.5	2.2	3.7	4.0	5.5	7.5
Output ratings	Capacity [kVA] [2]	0.95	1.9	3.0	4.5	6.1	6.5	9.1	12.2
	FLA [A] [3]	2.5	5	8	12	16	17	24	32
	Max Frequency	400 [Hz] [4]							
	Max Voltage	3Φ 200 - 230V [5]							
Input ratings	Rated Voltage	3Φ 200 - 230 VAC (+10%, -15%)							
	Rated Frequency	50 - 60 [Hz] (±5%)							
Cooling method		N/C[6]	Forced cooling						
Weight [kg]		0.76	0.77	1.12	1.84	1.89	1.89	3.66	3.66

1) Indicates the maximum applicable motor capacity when using a 4-pole standard motor.

2) Rated capacity is based on 220V for 200V class and 440V for 400V class.

3) Refer to 200 when Carrier frequency setting (H39) is above 3kHz.

4) Maximum output voltage cannot be higher than the input voltage. It can be programmable below input voltage.

5) N/C: Natural Convention

13.1.2 Input & output ratings: Three Phase 400V Class

SV ■■■ iG5H – 4 ■■		004	008	015	022	037	040	055	075
Max capacity	[HP]	0.5	1	2	3	5	5.4	7.5	10
	[kW]	0.4	0.75	1.5	2.2	3.7	4.0	5.5	7.5
Output ratings	Capacity [kVA] [2]	0.95	1.9	3.0	4.5	6.1	6.9	9.1	12.2
	FLA [A] [3]	1.25	2.5	4	6	8	9	12	16
	Max Frequency	400 [Hz] [4]							
	Max Voltage	3Φ 380 - 480V [5]							
Input ratings	Rated Voltage	3Φ 380 - 480 VAC (+10%, -15%)							
	Rated Frequency	50 - 60 [Hz] (±5%)							
Cooling method		N/C	Forced cooling						
Weight [kg]		0.76	0.77	1.12	1.84	1.89	1.89	3.66	3.66

1) Indicates the maximum applicable motor capacity when using a 4-pole standard motor.

2) Rated capacity is based on 220V for 200V class and 440V for 400V class.

3) Refer to 200 when Carrier frequency setting (H39) is above 3kHz.

4) Maximum output voltage cannot be higher than the input voltage. It can be programmable below input voltage.

5) N/C: Natural Convention

13.1.3 Control

Control method	V/F
Frequency setting resolution	Digital command: 0.01Hz Analog command: 0.06Hz (Max freq.: 60Hz)
Frequency accuracy	Digital command: 0.01% of Max output frequency Analog command: 0.1% of Max output frequency
V/F pattern	Linear, Squared, User V/F
Overload capacity	120% per 1 min.
Torque boost	Manual/Auto torque boost
Dynamic Braking	Max braking torque	20% [1]
	Time/%ED	150% [2] when using optional DB resistor

1) Means average braking torque during Decel to stop of a motor.

2) Refer to page 205 for DB resistor specification.

13.1.4 Operation

Operation mode		Keypad/ Terminal/ Communication option/ Remote keypad selectable		
Frequency setting		Analog: 0 - 10[V], -10 - 10[V], 0 - 20[mA] Digital: Keypad		
Operation features		PID, Up-down, 3-wire		
Input	Multi-function terminal P1 - P4	NPN / PNP selectable		
		FWD/REV RUN, Emergency stop, Fault reset, Jog operation, Multi-step Frequency-High, Mid, Low, Multi-step Accel/Decel-High, Mid, Low, DC braking at stop, 2nd motor select, Frequency UP/Down, 3-wire operation, External trip A, B, PID-Inverter (v/f) operation bypass, Option-inverter (v/f) operation bypass, 2nd Source, Analog Hold, Accel/Decel stop, Up/Down Save Freq, Jog FX/RX, Fire mode, motor alternation		
Output	Multi-function relay1	Fault output and inverter status output	Less than AC 250V 1A Less than DC 30V 1A	
	Multi-function relay2		Less than AC250V 1A, Less than DC 30V 1A	
	Analog output	0 - 10 Vdc (less than10mA): Output Freq, Output Current, Output Voltage, DC link selectable		

13.1.5 Protective function

Trip	Over Voltage, Under Voltage, Over Current, Over Current 2, Ground Fault current detection, Inverter Overheat, Motor Overheat, Output Phase Open, Overload Protection, Communication Error, Loss of Speed Command, Hardware Fault, Fan trip, Brake error, Overpressure, Broken Belt, Underload Trip, Pipe broken.
Alarm	Stall prevention, overload
Momentary Power Loss[1]	Below 15 msec: Continuous operation (should be within rated input voltage, rated output power.) Above 15 msec: Auto restart enable

1) Single Phase products: Continuous operation (should be within rated input voltage, rated output power)

13.1.6 Environment

Protection degree	IP 20, UL TYPE1 (Ambient Temperature 40 °C) 2)
Ambient temp	-10°C - 50°C
Storage temp	-20°C - 65°C
Humidity	Below 90% RH (no condensation)
Altitude/Vibration	Below 1,000m, 5.9m/sec2 (0.6G)
Atmospheric pressure	70-106 kPa
Location	Protected from corrosive gas, combustible gas, oil mist or dust

2)   UL TYPE1 with top cover and conduit box installed.

13.2 Temperature Derating Information

Load and ambient temperature classified by the Carrier Frequency
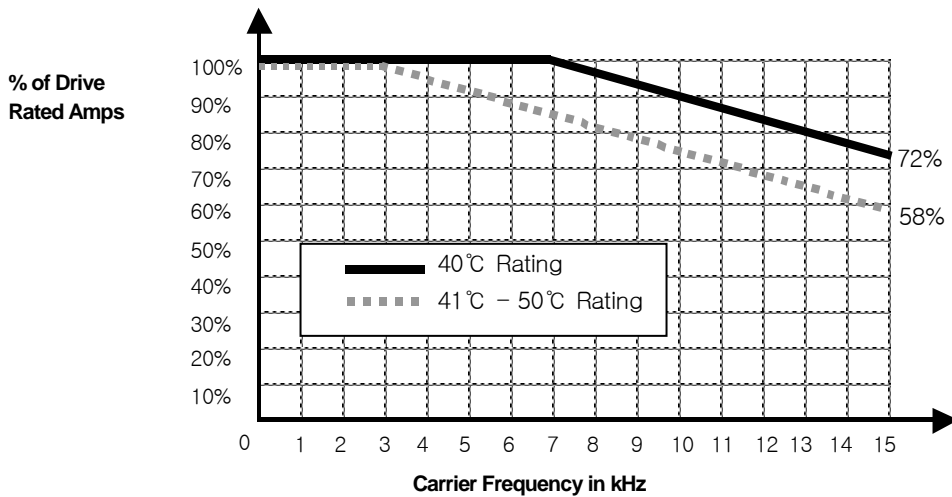
⊙ Caution

1) The above graph is only applied when the inverter is operated in the allowable temperature.
Pay attention to the air cooling when the inverter is installed in a panel box, and the inside
temperature should be within an allowable temperature range.
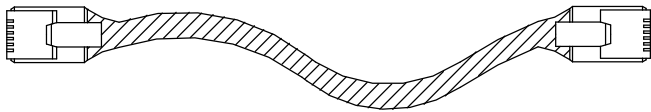2) This derating curve is based on inverter current rating when rated motor is connected

13.3 Remote Option

13.3.1 Parts

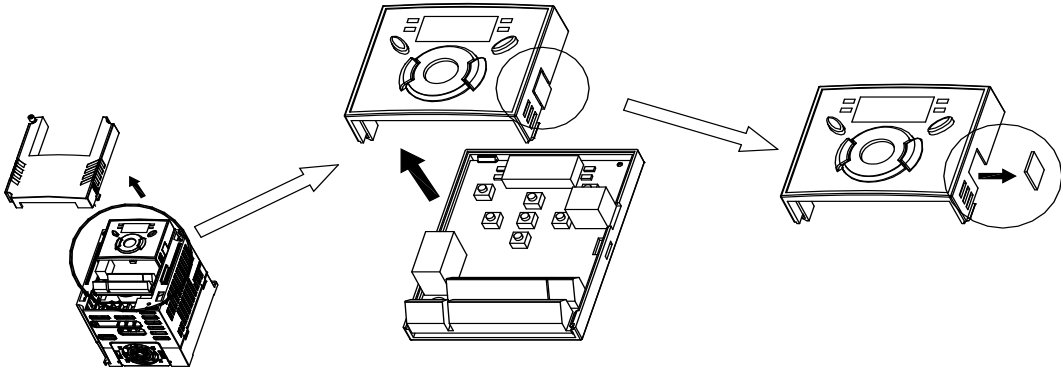**1**   Remote Keypad
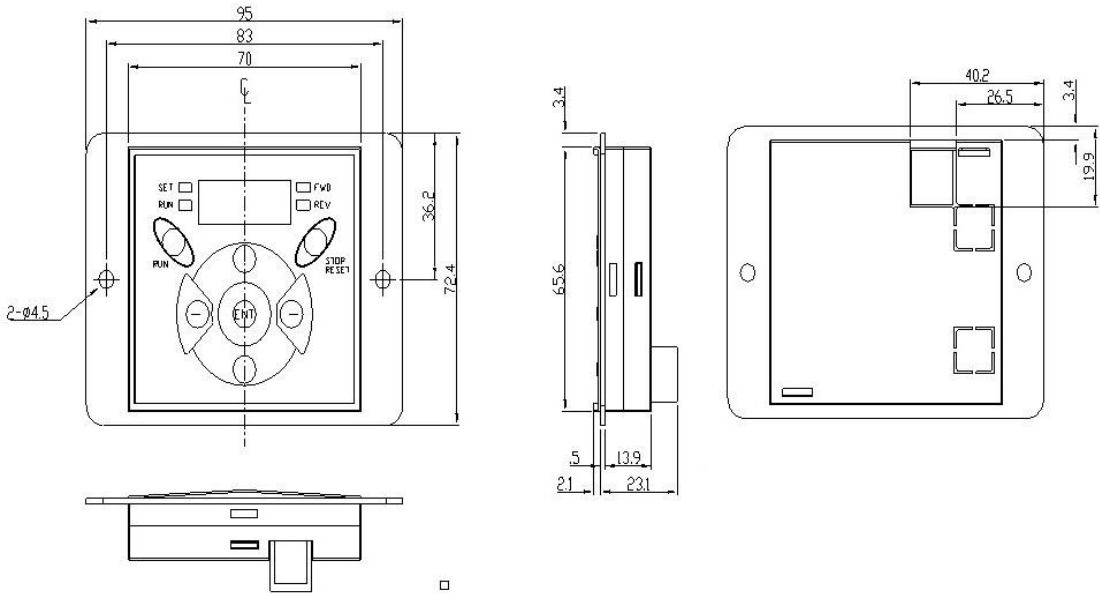
**2**   Remote Cable (1M,2M,3M,5M)

Remote Cable Model Number

| Model number	Specification
64100022	INV, REMOTE 1M (SV-iG5H)
64100001	INV, REMOTE 2M (SV-iG5H)
64100002	INV, REMOTE 3M (SV-iG5H)
64100003	INV, REMOTE 5M (SV-iG5H)

13.3.2 Installation

1 Take off the top cover of the I/O board kit and remove the hole cover to connect remote cable on the side.

2 Attach the top cover of the I/O board kit and connect the remote cable as shown below.
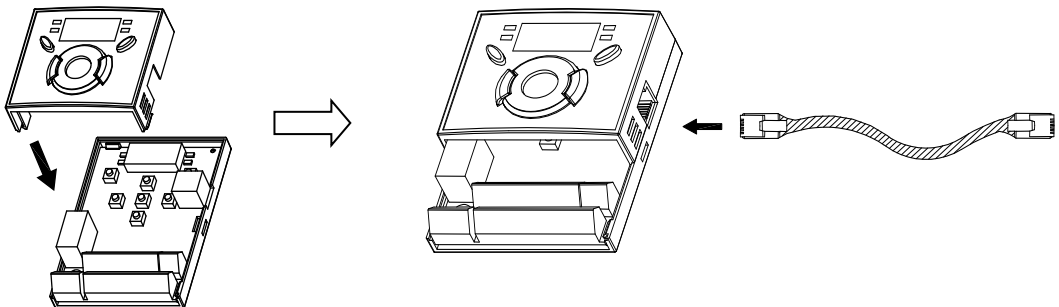
**3** Connect the other side of the remote cable to the remote keypad as shown below.
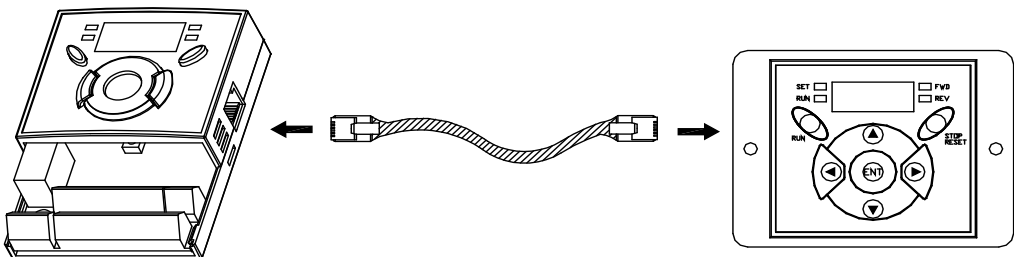
⊙ Caution

- Without Parameter Read(H91), Parameter Write(H92) is not available since the Remote memory is empty when the Remote keypad is first used.
- Do not use the remote cable other than standard LS'. Otherwise, malfunction may occur due to noise input or voltage drop in the keypad.
- Check for disconnection of the communication cable and/or poor cable connection if "---- " is displayed on the 7-segment display of the Remote keypad.
- When Parameter Read(H91) is executed, "rd"(Read) and "wr"(Verifiy) is displayed successively on the 7-segment display of the Remote keypad. On the other hand, when Parameter Write(H92) is executed, "wr"(Write) is displayed only.
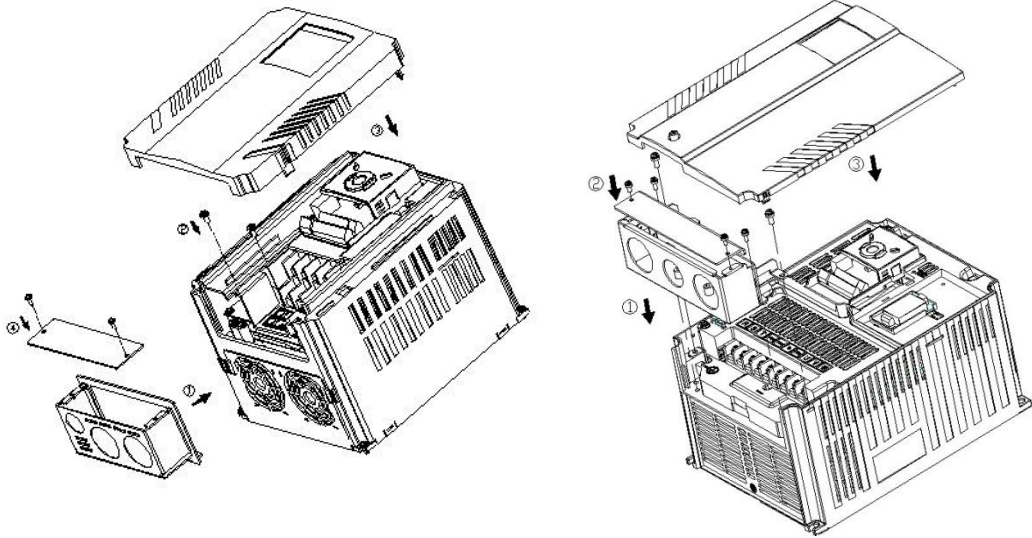
13.4 Conduit Kit

13.4.1 Installation

1   SV004iG5H-2, SV008iG5H-2, SV015iG5H-2, SV022iG5H-2, SV037iG5H-2, SV040iG5H-2, SV004iG5H-4, SV008iG5H-4, SV015iG5H-4, SV022iG5H-4, SV037iG5H-4, SV040iG5H-4
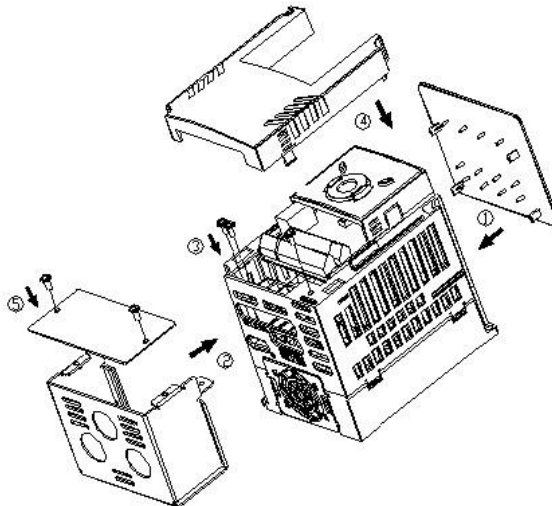
2   SV055iG5H-2, SV055iG5H-4, SV075iG5H-2, SV075iG5H-4,

13.4.2 Conduit Kit

Conduit Kit	Model
Inverter Conduit Kit 1	SV004iG5H-2/4, SV008iG5H-2/4
Inverter Conduit Kit 2	SV015iG5H-2/4
Inverter Conduit Kit 3	SV022iG5H-2/4, SV037iG5H-2/4, SV040iG5H-2/4
Inverter Conduit Kit 4	SV055iG5H-2/4, SV075iG5H-2/4

13.5 Braking resistor

Input Voltage	Inverter capacity [kW]	100 % braking		150% braking	
		[Ω]	[W]*	[Ω]	[W]*
200V	0.4	400	50	300	100
	0.75	200	100	150	150
	1.5	100	200	60	300
	2.2	60	300	50	400
	3.7/4.0	40	500	33	600
	5.5	30	700	20	800
	7.5	20	1000	15	1200
400V	0.4	1800	50	1200	100
	0.75	900	100	600	150
	1.5	450	200	300	300
	2.2	300	300	200	400
	3.7/4.0	200	500	130	600
	5.5	120	700	85	1000
	7.5	90	1000	60	1200

 * The wattage is based on Enable duty (%ED) 5% with continuous braking time 15 sec.

DECLARATION OF CONFIRMITY

LSIS
EC DECLARATION OF CONFORMITY

We, the undersigned,

Representative:	LSIS Co., Ltd.
Address:	LS Tower, 127, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
Manufacturer:	LSIS Co., Ltd.
Address:	56, Samseong 4-gil, Mokcheon-eup, Dongnam-gu, Cheonan-si, Chungcheongnam-do, Korea

Certify and declare under our sole responsibility that the following apparatus:

Type of Equipment:	**Inverter (Power Conversion Equipment)**
Model Name:	**STARVERT-iG5A series**
Trade Mark:	**LSIS Co., Ltd.**

Conforms with the essential requirements of the directives:

2014/35/EU Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

2014/30/EU Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

Based on the following specifications applied:

EN 61800-3:2004/A1:2012
EN 61800-5-1:2007

and therefore complies with the essential requirements and provisions of the 2014/35/CE and 2014/30/CE Directives.

Place: Cheonan, Chungnam, <u>Korea</u>

2016. 1. 13

(Signature / Date)

Mr. Sang Chun Moon / General Manager
(Full name / Position)

EMI / RFI POWER LINE FILTERS

LS inverters, iG5H series

RFI FILTERS

THE LS RANGE OF POWER LINE FILTERS   FF (Footprint) - FE (Standard) SERIES, HAVE BEEN SPECIFICALLY DESIGNED WITH HIGH FREQUENCY LS INVERTERS. THE USE OF LS FILTERS, WITH THE INSTALLATION ADVICE OVERLEAF HELP TO ENSURE TROUBLE FREE USE ALONG SIDE SENSITIVE DEVICES AND COMPLIANCE TO CONDUCTED EMISSION AND IMMUNITY STANDARS TO EN 50081 -> EN61000-6-3:02 and EN61000-6-1:02

CAUTION

IN CASE OF A LEAKAGE CURRENT PROTECTIVE DEVICES IS USED ON POWER SUPPLY, IT MAY BE FAULT AT POWER-ON OR OFF. IN AVOID THIS CASE, THE SENSE CURRENT OF PROTECTIVE DEVICE SHOULD BE LARGER THAN VALUE OF LEAKAGE CURRENT AT WORST CASE IN THE BELOW TABLE.

RECOMMENDED INSTALLATION INSTRUCTIONS

To conform to the EMC directive, it is necessary that these instructions be followed as closely as possible. Follow the usual safety procedures when working with electrical equipment. All electrical connections to the filter, inverter and motor must be made by a qualified electrical technician.

1-) Check the filter rating label to ensure that the current, voltage rating and part number are correct.

2-) For best results the filter should be fitted as closely as possible to the incoming mains supply of the wiring enclosure, usually directly after the enclousures circuit breaker or supply switch.

3-) The back panel of the wiring cabinet of board should be prepared for the mounting dimensions of the filter. Care should be taken to remove any paint etc... from the mounting holes and face area of the panel to ensure the best possible earthing of the filter.

4-) Mount the filter securely.

5-) Connect the mains supply to the filter terminals marked LINE, connect any earth cables to the earth stud provided. Connect the filter terminals marked LOAD to the mains input of the inverter using short lengths of appropriate gauge cable.

6-) Connect the motor and fit the ferrite core (output chokes) as close to the inverter as possible. Armoured or screened cable should be used with the 3 phase conductors only threaded twice through the center of the ferrite core. The earth conductor should be securely earthed at both inverter and motor ends. The screen should be connected to the enclosure body via and earthed cable gland.
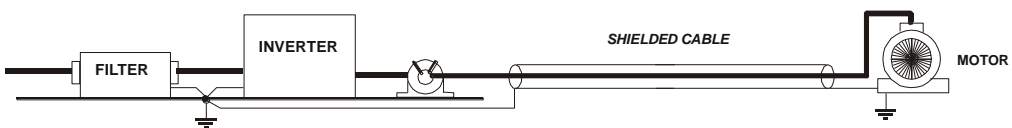
7-) Connect any control cables as instructed in the inverter instructions manual.

IT IS IMPORTANT THAT ALL LEAD LENGHTS ARE KEPT AS SHORT AS POSSIBLE AND THAT INCOMING MAINS AND OUTGOING MOTOR CABLES ARE KEPT WELL SEPARATED.

FF SERIES (Footprint)
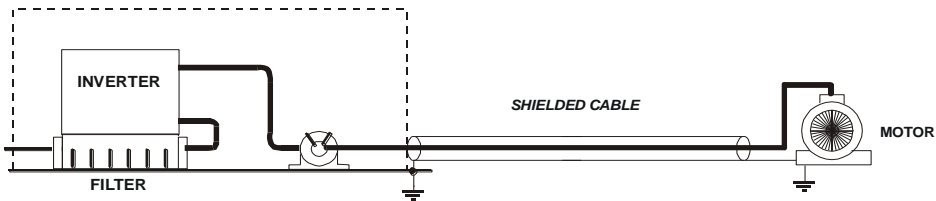
FE SERIES (Standard)

# EMI / RFI POWER LINE FILTERS

LS inverters, iG5H series

iG5H series / Footprint Filters

INVERTER	POWER	CODE	CURRENT	VOLTAGE	LEAKAGE CURRENT		DIMENSIONS L W H	MOUNTING Y X	WEIGHT	MOUNT	FIG.	OUTPUT CHOKES
					NOM.	MAX.						
THREE PHASE												
SV004iG5H-2	0.4kW	FFG5A-T005-3	5A	480VAC	0.5mA	27mA	175x76.5x40	161x53	1.2Kg.	M4	A	**FS – 1**
SV008iG5H-2	0.75kW											
SV015iG5H-2	1.5kW	FFG5A-T012-3	12A	480VAC	0.5mA	27mA	176.5x107.5x40	162.5x84	1.3Kg.	M4	A	**FS – 2**
SV022iG5H-2	2.2kW	FFG5A-T020-3	20A	480VAC	0.5mA	27mA	176.5x147.5x45	162.5x124	1.8Kg.	M4	A	**FS – 2**
SV037iG5H-2	3.7kW											
SV040iG5H-2	4.0kW											
SV055iG5H-2	5.5kW	FFG5A-T050-3	50A	480VAC	0.5mA	27mA	266x185.5x55	254x140	2.5Kg.	M4	B	**FS – 2**
SV075iG5H-2	7.5kW											
SV004iG5H-4	0.4kW	FFG5A-T005-3	5A	480VAC	0.5mA	27mA	175x76.5x40	161x53	1.2Kg.	M4	A	**FS – 1**
SV008iG5H-4	0.75kW											
SV015iG5H-4	1.5kW	FFG5A-T012-3	6A	480VAC	0.5mA	27mA	176.5x107.5x40	162.5x84	1.2Kg.	M4	A	**FS – 1**
SV022iG5H-4	2.2kW	FFG5A-T020-3	20A	480VAC	0.5mA	27mA	176.5x147.5x45	162.5x124	1.8Kg.	M4	A	**FS – 2**
SV037iG5H-4	3.7kW											
SV040iG5H-4	4.0kW											
SV055iG5H-4	5.5kW	FFG5A-T030-3	30A	480VAC	0.5mA	27mA	266x185.5x60	252x162	2Kg.	M4	B	**FS – 2**
SV075iG5H-4	7.5kW											

iG5H series / Standard Filters

INVERTER	POWER	CODE	CURRENT	VOLTAGE	LEAKAGE CURRENT		DIMENSIONS L W H	MOUNTING Y X	WEIGHT	MOUNT	FIG.	OUTPUT CHOKES
					NOM.	MAX.						
THREE PHASE												
SV004iG5H-2	0.4kW	FE-T006-3	6A	480VAC	0.5mA	27mA	250x110x60	238x76	1.6Kg.	---	C	FS – 2
SV008iG5H-2	0.75kW											
SV015iG5H-2	1.5kW	FE-T012-3	12A	480VAC	0.5mA	27mA	250x110x60	238x76	1.6Kg.	---	C	FS – 2
SV022iG5H-2	2.2kW	FE-T020-3	20A	480VAC	0.5mA	27mA	270x140x60	258x106	2.2Kg.	---	C	FS – 2
SV037iG5H-2	3.7kW											
SV040iG5H-2	4.0kW											
SV055iG5H-2	5.5kW	FE-T050-3	50A	480VAC	0.5mA	27mA	270x140x90	258x106	3.2Kg.	---	C	FS – 2
SV075iG5H-2	7.5kW											
SV004iG5H-4	0.4kW	FE-T006-3	6A	480VAC	0.5mA	27mA	250x110x60	238x76	1.6Kg.	---	C	FS – 2
SV008iG5H-4	0.75kW											
SV015iG5H-4	1.5kW											
SV022iG5H-4	2.2kW	FE-T012-3	12A	480VAC	0.5mA	27mA	250x110x60	238x76	1.6Kg.	---	C	FS – 2
SV037iG5H-4	3.7kW											
SV040iG5H-4	4.0kW											
SV055iG5H-4	5.5kW	FE-T030-3	30A	480VAC	0.5mA	27mA	270x140x60	258x106	2.4 Kg.	---	C	FS – 2
SV075iG5H-4	7.5kW											

SV004-075 iG5H-2/4 EN 55011 CLASS A/B GROUP 1 IEC/EN 61800-3 C1/C2
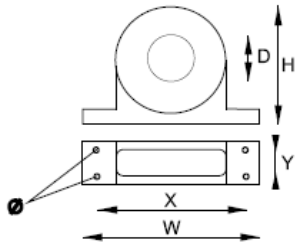
FS SERIES (output chokes)

CODE	D	W	H	X	Ø
FS – 1	21	85	46	70	5
FS – 2	28.5	105	62	90	5
FS – 3	48	150	110	125 x 30	5

DIMENSIONS

FF SERIES (Footprint)

FIG. A

FIG. B

Output cables

LINE

LOAD
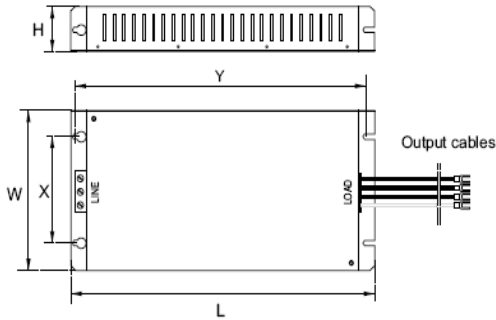
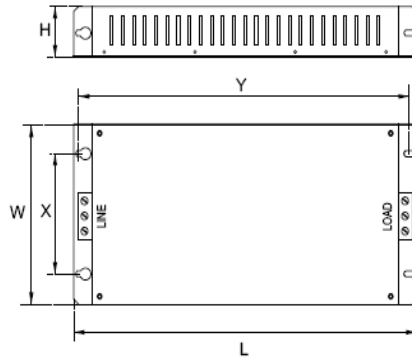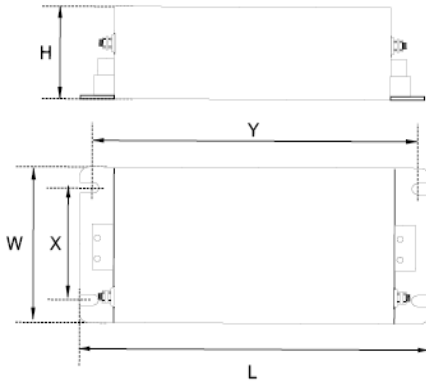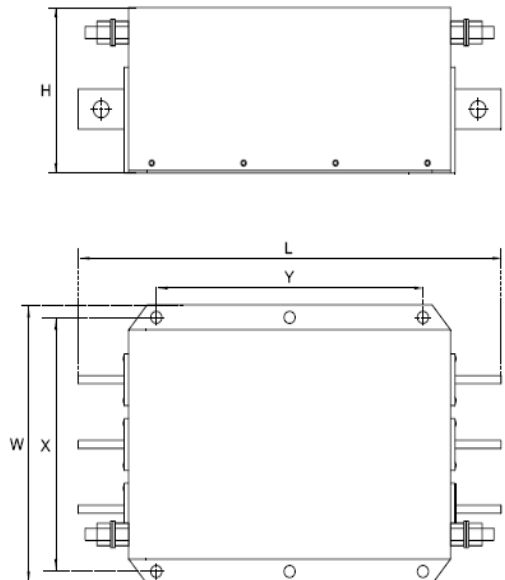**FE SERIES (Standard)**

FIG. C

FEP SERIES (Standard)

FIG. D

Vector Motor Control Ibérica S.L.
C/ Mar del Carib, 10
Pol. Ind. La Torre del Rector
08130 Santa Perpètua de Mogoda
(BARCELONA) ESPAÑA
Tel. (+34) 935 748 206
Fax (+34) 935 748 248
info@vmc.es
www.vmc.es

Warranty

Maker	LSIS Co., Ltd.	Installation (Start-up) Date	
Model No.	SV-iG5H	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 an earthquake, fire, flooding, lightning, or other natural calamities.
- When LS nameplate is not attached.

- Revision History

No	Date	Edition	Changes
1	2018.05.08	First Release	First Release
2			
3			
4			
5			
6			
7			
8			
9			