



5.5~18.5kW(200V), 5.5~90kW(400V)

# AC Variable Speed Drive

## H100 Troubleshooting Manual



### Safety Instructions

Read this manual carefully before servicing or inspecting this equipment.

Keep this manual within easy reach for quick reference.

# Quick Reference Table

The following table listed situations frequently encountered while working with inverters. Refer to the typical situations to quickly and easily locate solutions to your questions.

Situation	Reference
The motor is too noisy.	P. 33
I want to review recent fault trip and warning histories.	P. 18
The motor is producing too much heat.	P. 31
The cooling fan is not working.	P. 34
I want to know how I can keep the inverter when I am not using it.	P. 44
I want to initialize all parameters.	P. 16
I want to terminate the inverter.	P. 44
I want to review the input/output module.	P. 38
I want to change the fan when it exceeded the replacement period.	P. 42
I want to change the carrier frequency.	P. 14
I cannot set the parameters.	P. 30
The motor is not working.	P. 30
The motor stops when it is connected to the load or accelerated.	P. 32

# Contents



■ INTRODUCTION	3
Manual Composition	3
■ PRODUCT IDENTIFICATION	4
■ ASSOCIATION MANUAL	4
■ SAFETY INFORMATION	5
■ REVISION RECORD	7

## 1 BASIC CHECKLIST 8

1.1 Before you think it failed	8
1.2 Basic Operations	10
1.3 Parameter Change	14
1.3.1 Carrier Frequency Change	14
1.3.2 Initializing All Parameters	16
1.3.3 Read and Write Parameters	17
1.4 Fault Trip Monitoring	18

## 2 TROUBLESHOOTING 21

2.1 Trips and Warning	21
2.1.1 Failure/Warning List	21
2.1.2 Troubleshooting Fault Trips	25
2.2 Troubleshooting Other Fault	30

## 3 MAINTENANCE 35

3.1 Regular Inspection List	35
3.1.1 Daily Inspections	35
3.1.2 Annual Inspections	36
3.1.3 Bi-Annual Inspections	37
3.1.4 Check Input/Output Module	38
3.1.5 Replace Cooling FAN	42
3.2 Storage and Disposal	44
3.2.1 Storage	44
3.2.2 Disposal	44

# Introduction

## Manual Composition

### 1 Basic Checklist

#### 1.1 Before you think it failed

#### 1.2 Basic Operations

#### 1.3 Parameter Change

##### 1.3.1 Carrier Frequency Change

##### 1.3.2 Initializing All Parameters

##### 1.3.3 Read and Write Parameters

#### 1.4 Fault Trip Monitoring



This section covers check points when there is a problem in the inverter.

Then check the parameter settings using basic operations and the trip records.

### 2 Troubleshooting



This section explains troubleshooting fault trips and other common faults.

If problems are not solved, please contact your vendor or LSIS.

#### 2.1 Trips and Warning

##### 2.1.1 Failure/Warning List

##### 2.1.2 Troubleshooting Fault Trips

#### 2.2 Troubleshooting Other Fault

#### 3.1 Regular Inspection List

##### 3.1.1 Daily Inspections

##### 3.1.2 Annual Inspections

##### 3.1.3 Bi-Annual Inspections

##### 3.1.4 Check Input/Output Module

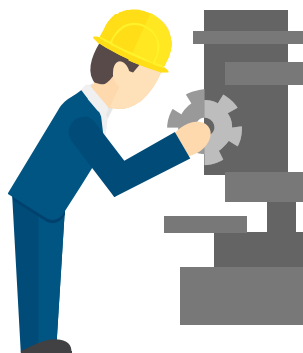
##### 3.1.5 Replace Cooling FAN

#### 3.2 Storage and Disposal

##### 3.2.1 Storage

##### 3.2.2 Disposal


### 3 Maintenance



This section provides information on how to maintain the inverters on a regular basis for different time periods.

When there is a problem in the inverter, please check the input/output module. This is the basic method to check the hardware.

# Product Identification



**Model name**  
**LSLV0055H100-4COFN**

**Power source specifications**  
**INPUT** 380-480V 3 Phase 50/60Hz  
 HD: 11.0A, ND: 14.7A

**Output specifications**  
**OUTPUT** 0-Input V 3 Phase 0.01-400Hz  
 HD: 12A, ND: 16A  
 9.1kVA  
 Ser. No 55025310146  
 Inspected by D. K. YU  
 MSIP-REM-LSR-XXXXXXX

**UL US**  
 LISTED  
 INS. CONT. EQ.  
 872A

**LSIS** **MADE IN KOREA**

**LSLV 0055 H100 - 4CEFN**

**Motor capacity**

0008-0.75kW	0022-2.2kW
0015-1.5kW	0037-3.7kW
0055-5.5kW	0300-30kW
0075-7.5kW	0370-37kW
0110-11kW	0450-45kW
0150-15kW	0550-55kW
0185-18.5kW	0750-75kW
0220-22kW	0900-90kW

**Series name**

**Input voltage**

2 - 3-phase 200V

4 - 3-phase 400V

**Keypad type**

C - LCD Keypad

**UL type**

O - UL Open

E - UL Type1

**EMC filter**

F : Built-in EMC

N : No Built-in EMC

**Reactor**

D - Built-in DCL

N - No Built-in Reactor

## Note

The H100 75/90 kW, 400 V inverters satisfy the EMC standard EN61800-3 without installation of optional EMC filters.

# Association Manual

H100 user manual can be downloaded through LSIS homepage.

Link : <http://www.lsis.com/support/download/>

# Safety Information

Read and follow all safety instructions in this manual precisely to avoid unsafe operating conditions, property damage, personal injury, or death.

## Safety symbols in this manual

### **Danger**

Indicates an imminently hazardous situation which, if not avoided, will result in severe injury or death.

### **Warning**

Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

### **Caution**

Indicates a potentially hazardous situation that, if not avoided, could result in minor injury or property damage.

## Safety information

### **Danger**

- Do not open the cover of the equipment while it is on or operating. Likewise, do not operate the inverter while the cover is open. Exposure of high voltage terminals or charging are to the external environment may cause an electric shock. Do not remove any covers or touch the internal circuit boards (PCBs) or electrical contacts on the product when the power is on or during operation. Doing so may cause serious injury, death or serious property damage.
- Do not open the cover of the equipment even when the power supply to the inverter has been turned off unless it is necessary for maintenance or regular inspection. Opening the cover may lead to an electric shock even when the power supply is off.
- The equipment may hold charge long after the power supply has been turned off. Use a multi-meter to make sure that there is no voltage before working on the inverter, motor, or motor cable.

### **Warning**

- This equipment must be grounded for safe and proper operation.
- Do not supply power to a faulty inverter. If you find that the inverter is faulty, disconnect the power supply and have the Inverter repaired.
- The Inverter becomes hot during operation. Avoid touching the Inverter until it has cooled down to avoid burns.
- Do not allow external objects, such as screws, metal chips, debris, water, or oil to get inside the Inverter. Allowing external substances inside the Inverter may cause the Inverter to malfunction or ignite fire.
- Do not operate the Inverter with wet hands. Doing so may cause electric shock.

### **Caution**

- Do not modify the interior structure/components of the Inverter. Doing so will void the warranty.
- The Inverter is designed for 3-phase motor operation. Do not use the Inverter to operate 3-phase motor.
- Do not place heavy objects on top of electric cables. Doing so may damage the cable and cause an electric shock.

# Revision Record

Version	Date	Changed main contents	Reference Page
V1.0	2016.10	1. First edition	-



# 1 Basic Checklist

## 1.1 Before you think it failed

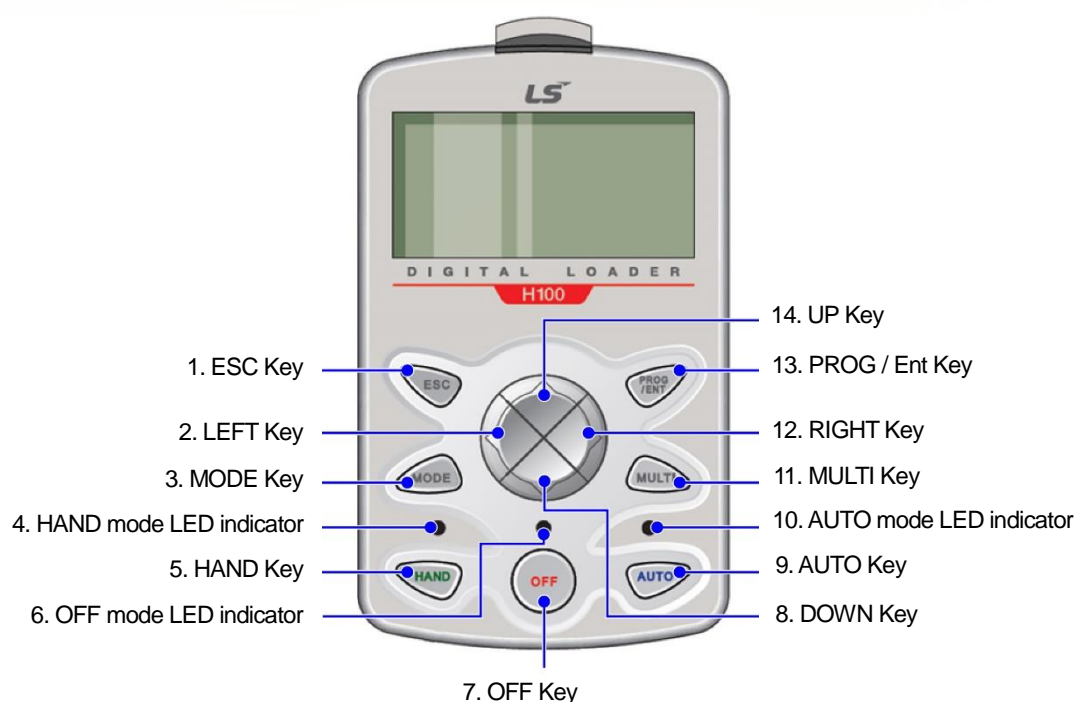
Items	Check Point	Result
Installed Environment / Input/Output voltage	Is the installed location appropriate?	
	Does the environment meet the inverters operating conditions?	
	Does the power source match the inverter's rated input?	
	Is the rated output of the inverter sufficient to supply the equipment?	
Power Terminal Wiring	Is the circuit breaker installed on the input side of the inverter?	
	Is the circuit breaker correctly rated?	
	Are the power source cables correctly connected to the R/S/T terminals of the inverter? (Caution: Connecting the power source to the U/V/W terminals may damage the inverter)	
	Are the motor output cables connected in the correct phase rotation (U/V/W)? (Caution: Motors will rotate in reverse direction if three phase cables are not wired in the correct rotation)	
	Are the cables used to connect power terminals correctly rated?	
	Is the inverter grounded properly?	
	Are the power terminal screws and the ground terminal screws tightened to their specific torques?	
	Are the overload protection circuits installed correctly on the motors (if multiple motors are running using one inverter)?	
	Is the inverter separated from the power source by a magnetic contactor (if a braking resistor is in use)?	
	Are advanced-phase capacitors, surge protection and electromagnetic interference filters installed correctly? (These devices MUST NOT be installed on the output side of the inverter)	

Items	Check Point	Result
Control Terminal Wiring	Are STP (shielded twisted pair) cables used for control terminal wiring?	
	Is the shielding of the STP wiring properly grounded?	
	If 3-wire operation is required, are the multi-function input terminals defined prior to the installation of the control wiring connections?	
	Are the control cables properly wired?	
	Are the control terminal screws tightened to their specified torques?	
	Is the total cable length of all control wiring less than 165ft (50m)?	
	Is the total length of safety wiring less than 100ft (30m)?	
Miscellaneous Items	Are optional cards connected correctly?	
	Is there any debris left inside the inverter?	
	Are there any cables (contacting adjacent terminals) creating a potential short circuit risk?	
	Are the control terminal connections separated from the power terminal connections?	
	Have the capacitors been replaced if they have been in use for more than 2 years?	
	Has a fuse been installed for the power source?	
	Are the connections to the motor separated from other connections?	

## 1.2 Basic Operations






### ■ Key Functions




Refer to the following illustration to identify part names and functions



### ■ Operation Keys

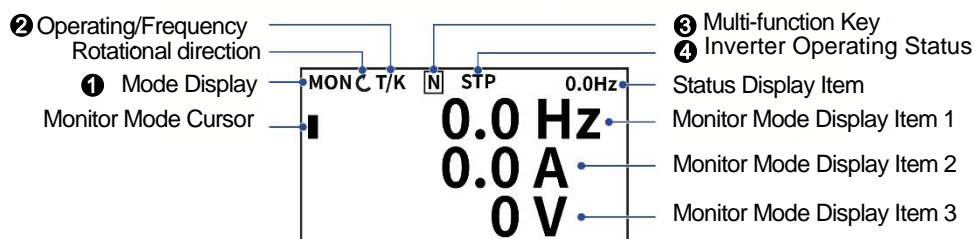
The following table lists the names and functions of the keypad's operation keys.

Key	Key Name	Function Description
	[MODE] Key	Used to switch between modes.
	[PROG / Ent] Key	Used to select, confirm, or save a parameter value.
	[Up] key	Switch between codes or increase or decrease parameter values.
	[Down] key	
	[Left] key	Switch between codes or increase or decrease parameter values.
	[Right] key	
	[MULTI] Key	Used to perform special functions, such as user code registration.
	[ESC] Key	Used to cancel an input during parameter setup. Pressing the [ESC] key before pressing the [PROG / ENT] key reverts the parameter value to the previously set value. Pressing the [ESC] key while editing the codes in any function group makes the keypad display the first code of the function group. Pressing the [ESC] key while moving through the modes makes the

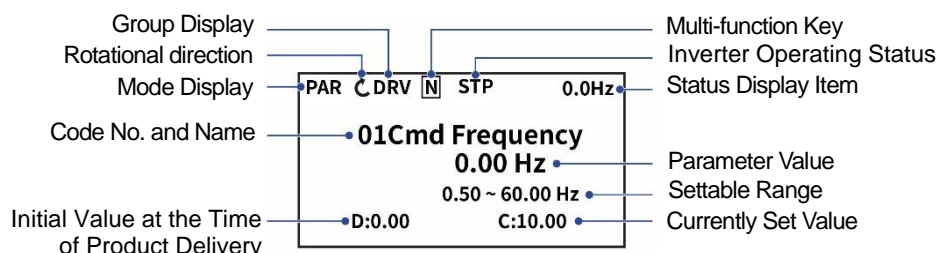
		keypad display Monitor mode.
	[HAND] Key	Used to switch to HAND (local/manual) operation mode.
	[OFF] Key	Used to switch to OFF (standby) mode or to reset the inverter faults.
	[AUTO] Key	Used to switch to AUTO (remote) operation mode.

## ■ Composition of Display

### (1) Monitor Mode



### (2) Parameter change display



## ■ Display Item List

The following table lists the functions and description of the keypad displays characters.

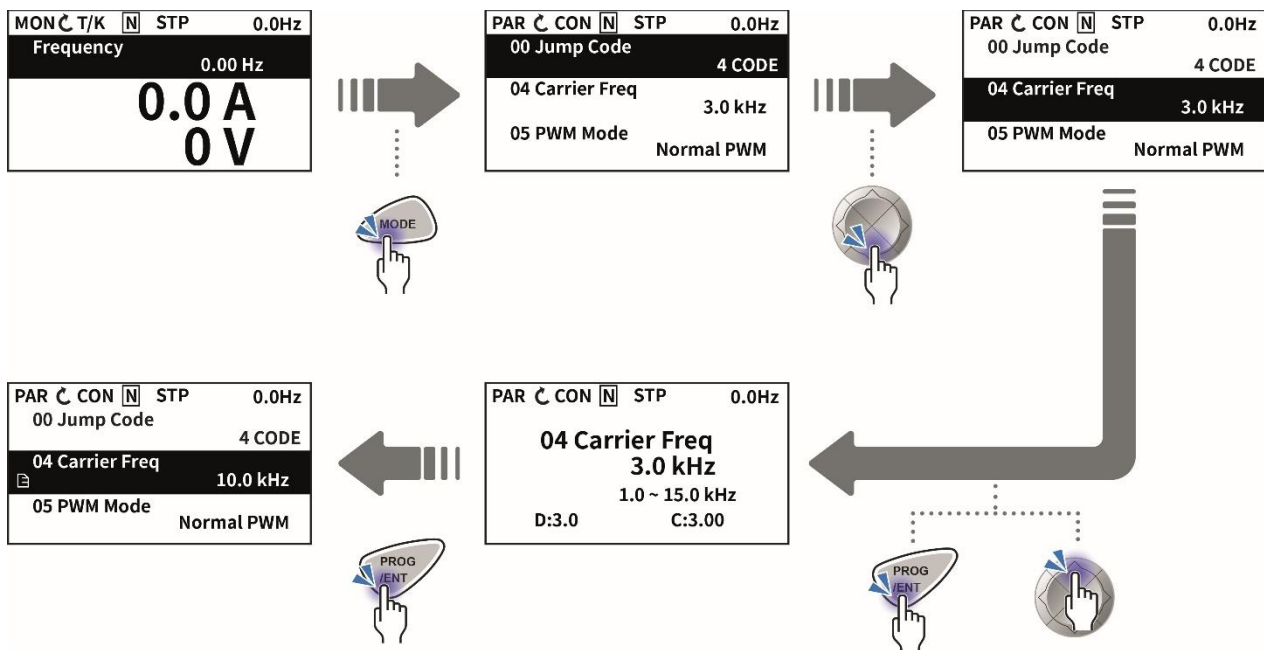
No.	Function	Display	Description
1	Mode Display	MON	Monitor Mode
		PAR	Parameter Mode
		U&M	USR & Macro Mode
		TRP	Trip Mode
		CNF	Config Mode
2	Operating Command	K	Keypad operation command
		O	FieldBus communication option operation command
		A	Application option operation command
		E	Time Event operation command
		R	Built-in 485 operation command
		T	Terminal block operation command
2	Frequency Command	K	Keypad frequency command
		V	V1 input frequency command
		I	I2 input frequency command
		P	Pulse input frequency command
		U	Frequency command during UP operation

			(Up-Down operation)
		D	Frequency command during DOWN operation (Up-Down operation)
		S	Frequency command during STOP operation (Up-Down operation)
		O	FBus Option frequency command
		J	Jog frequency command
		R	Internal 485 frequency command
		1 ~7	Multi-step frequency command
3	Multi Function Key Setting	UserGrp SelKey	Used to register parameters as a user group in the parameter mode or delete parameters in the user group.
4	Inverter Operating Status	STP	Motor stopped
		FWD	Operating forward
		REV	Operating reversely
		↻	Forward command given
		↺	Reverse command given
		DC	DC outputting
		WAN	Warning
		STL	Stalling
		SPS	Speed Searching
		OSS	Software Over Current controlled
		OSH	Hardware Over Current controlled
		TUN	Auto Tuning
		PHT	Pre-heat
		FIR	Fire mode operation
		SLP	Sleep mode operation
		LTS	Load tuning
		CAP	Capacity diagnostics
		PCL	Pump clean

## 1.3 Parameter Change

### 1.3.1 Carrier Frequency Change

The following example demonstrates how to configure Carrier Frequency by modifying CON group 04 code(Carrier Frequency) from 3.00(Hz) to 10.00(Hz). You can configure the parameters for different codes in any other group in exactly the same way.



Step	Instruction	Keypad Display
1	Monitor Mode is displayed.	<div> MON C T/K [N] STP 0.0Hz  Frequency 0.00 Hz  0.0 A  0 V </div>
2	Shift to CON by using Mode key.	<div> PAR C CON [N] STP 0.0Hz  00 Jump Code 4 CODE  04 Carrier Freq 3.0 kHz  05 PWM Mode Normal PWM </div>
3	Shift to code 04 using Down key. Press PROG.	<div> PAR C CON [N] STP 0.0Hz  00 Jump Code 4 CODE  04 Carrier Freq 3.0 kHz  05 PWM Mode Normal PWM </div>

4	Change the Carrier Frequency to 10 using Up key. Press ENT.	<div> PAR  CON  STP 0.0Hz </div> <div> <b>04 Carrier Freq</b>  <b>3.0 kHz</b>  1.0 ~ 15.0 kHz  D:3.0 C:3.00 </div>
5	The display come back to the initialization selection after finishing Carrier Frequency Change	<div> PAR  CON  STP 0.0Hz  00 Jump Code 4 CODE </div> <div> <b>04 Carrier Freq</b> 10.0 kHz  <b>05 PWM Mode</b> Normal PWM </div>

Adjust motor operational noise by changing carrier frequency settings. Power transistors (IGBT) in the inverter generate and supply high frequency switching voltage to the motor. The switching speed in this process refers to the carrier frequency. If the carrier frequency is set high, it reduces operational noise from the motor, and if the carrier frequency is set low, it increases operational noise from the motor.

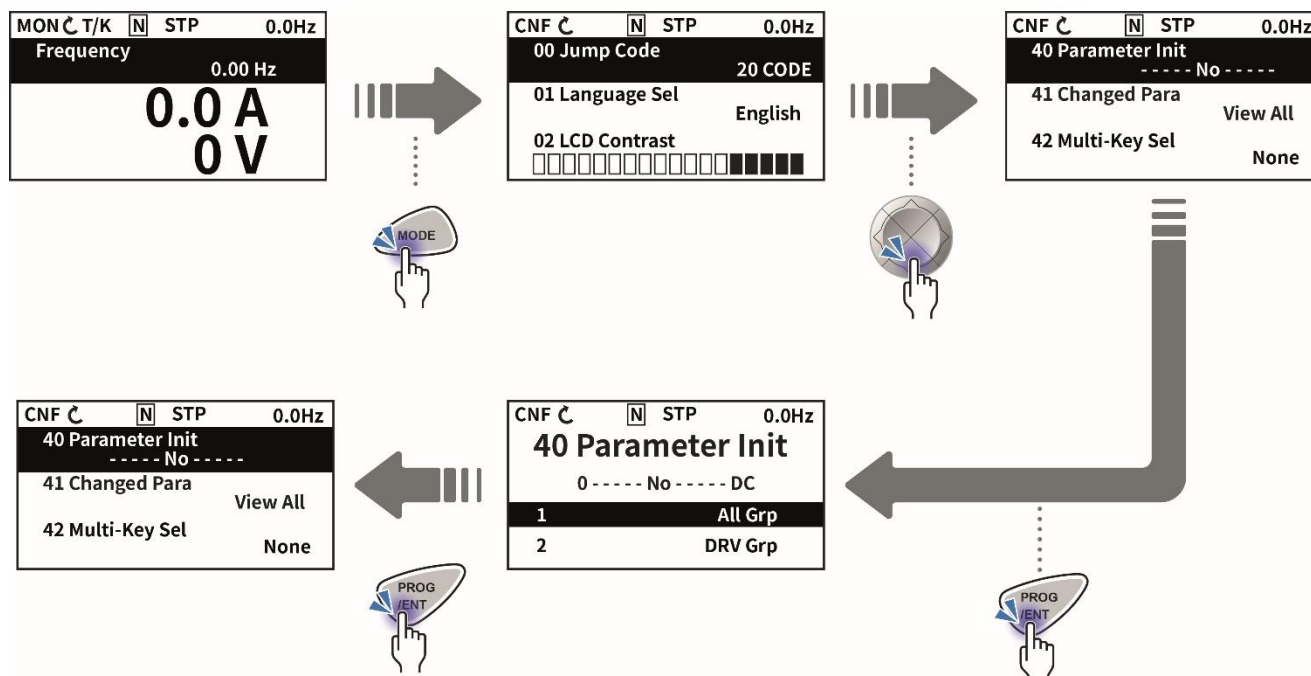
Below are advantages and disadvantages according to the sound of the inverter during operation.

Item	Carrier Frequency	
	LOW	HIGH
Motor noise	↑	↓
Heat generation	↓	↑
Noise generation	↓	↑
Leakage current	↓	↑



### 1.3.2 Initializing All Parameters

You can initialize the parameter that has been changed by the user to the initial state at the time of delivery. Not only the entire parameter but a group of the parameter mode can be selected and initialized.



Step	Instruction	Keypad Display
1	Monitor mode is displayed.	<div>MON <math>\bar{C}</math> T/K [N] STP 0.0Hz</div> <div>Frequency 0.00 Hz</div> <div>0.0 A</div> <div>0 V</div>
2	Press the [MODE] key to move to the Config (CNF) mode.	<div>CNF <math>\bar{C}</math> [N] STP 0.0Hz</div> <div>00 Jump Code 20 CODE</div> <div>01 Language Sel English</div> <div>02 LCD Contrast</div> <div>□□□□□□□□□□□□□□□□</div>
3	Press the [Down] key to go to CNF-40 (Parameter Init). Press the [PROG/ENT] key to configure the parameter initialization options.	<div>CNF <math>\bar{C}</math> [N] STP 0.0Hz</div> <div>40 Parameter Init ----- No -----</div> <div>41 Changed Para View All</div> <div>42 Multi-Key Sel None</div>

Step	Instruction	Keypad Display
4	In the list of options, select '1(All Grp),' and then press the [PROG/ENT] key to perform parameter initialization.	
5	The parameter initialization option is displayed again when the initialization is complete.	

### Note

Following parameter initialization, all parameters are reset to factory default values. Ensure that parameters are reconfigured before running the inverter again after an initialization.

### 1.3.3 Read and Write Parameters

This is the function of copying the parameter saved in the inverter to the keypad and copying the parameter saved in the keypad to the inverter.

Group	Code No.	Function Display		Setting Display	Unit
CNF	46	Parameter Read	1	YES	CNF
	47	Parameter Write	1	YES	
	48	Parameter Save	1	YES	

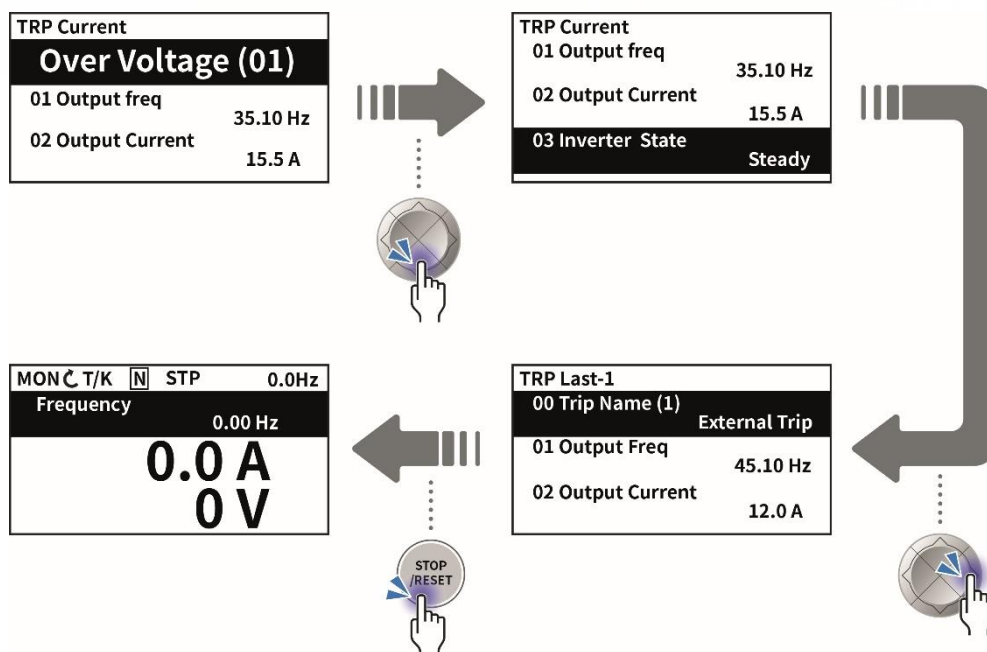
### Read and Write Setting Details

Code	Description
CNF-46 Parameter Read	Copies the parameter in the inverter to the keypad. The existing parameters saved in the keypad are all deleted.
CNF-47 Parameter Write	Copies the parameter saved in the keypad to the inverter. The existing parameters in the inverter are all deleted. In case of an error during parameter writing motion, the previously saved data can be directly used. If there is no data saved in the keypad, a message reading "EEP Rom Empty" is displayed.
CNF-48 Parameter Save	Because the parameters set in communication are saved in the RAM area, they are all gone if the inverter power is turned Off/On. If you set parameters in communication and select Yes in CNF-48 Parameter Save, the set parameters remain unchanged even if the inverter power is turned Off/On.

\* Available on LCD keypad only.

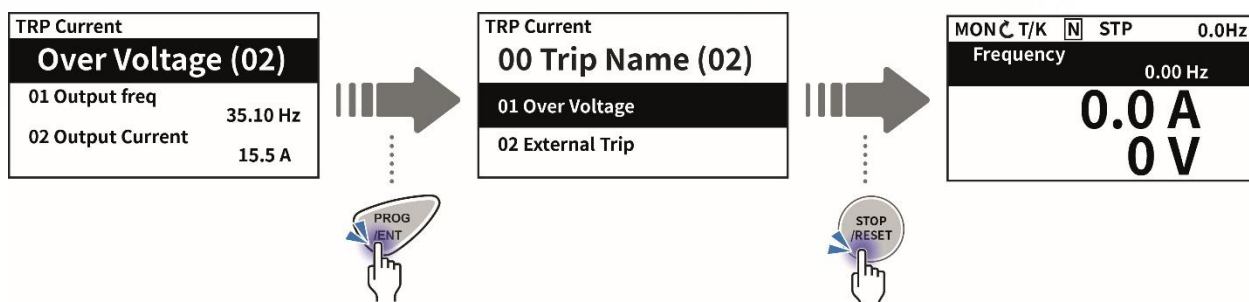
## 1.4 Fault Trip Monitoring

### ■ Failure during operation



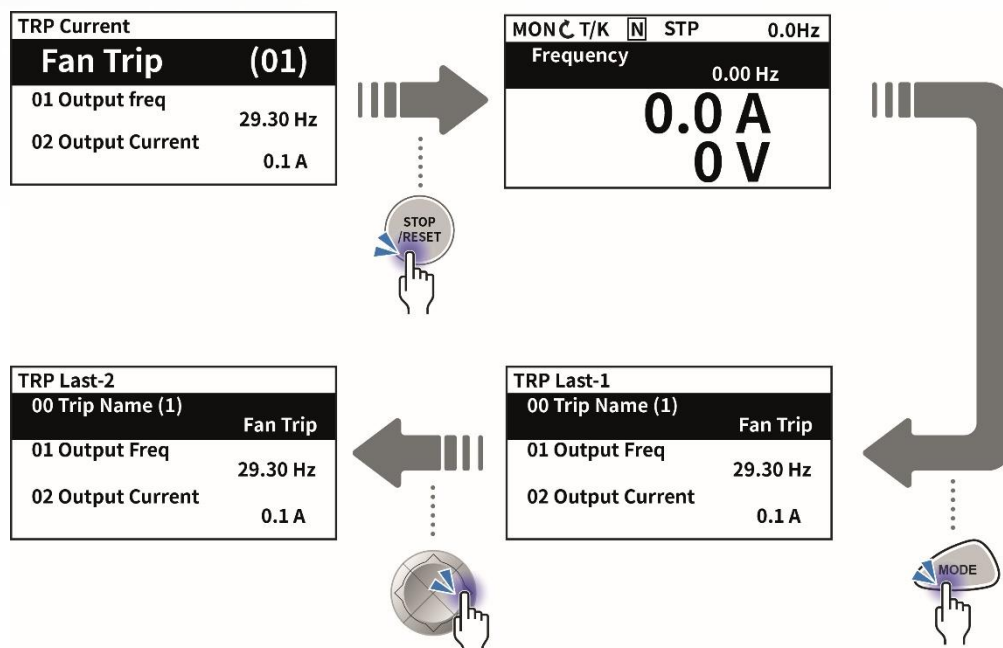
Step	Instruction	Keypad Display
1	If a fault trip occurs during inverter operation, the inverter enters Trip mode automatically and displays the type of fault trip that occurred.	<b>TRP Current</b> <b>Over Voltage (01)</b> 01 Output freq 35.10 Hz 02 Output Current 15.5 A
2	Press the [Down] key to view the information on the inverter at the time of fault, including the output frequency, output current, and operation type.	<b>TRP Current</b> 01 Output freq 35.10 Hz 02 Output Current 15.5 A <b>03 Inverter State Steady</b>
3	If there were any fault trips that occurred previously, press the [Right] key to display the fault trip information at the times of previous fault trips.	<b>TRP Last-1</b> <b>00 Trip Name (1) External Trip</b> 01 Output Freq 45.10 Hz 02 Output Current 12.0 A
4	When the inverter is reset and the fault trip is released, the keypad display returns to the screen it was at when the fault trip occurred.	<b>MON T/K</b> STP 0.0Hz Frequency 0.00 Hz <b>0.0 A</b> <b>0 V</b>

## ■ Multiple failures at a time



Step	Instruction	Keypad Display
1	If multiple fault trips occur at the same time, the number of fault trips occurred is displayed on the right side of the fault trip type. Press the [PROG/ENT] key to view the list of all the fault trips.	<div>TRP Current</div> <div><b>Over Voltage (02)</b></div> <div>01 Output freq 35.10 Hz</div> <div>02 Output Current 15.5 A</div>
2	The list of all the fault trips is displayed.	<div>TRP Current</div> <div><b>00 Trip Name (02)</b></div> <div>01 Over Voltage</div> <div>02 External Trip</div>
3	When the inverter is reset and the fault trip is released, the keypad display returns to the screen it was at when the fault trip occurred.	<div>MON C T/K N STP 0.0Hz</div> <div>Frequency 0.00 Hz</div> <div><b>0.0 A</b></div> <div><b>0 V</b></div>

## ■ Saving and monitoring of failure history



Step	Instruction	Keypad Display
1	In case of a failure during operation, the mode automatically shifts to Trip Mode with the trip displayed.	<b>TRP Current</b> <b>Fan Trip (01)</b> 01 Output freq 29.30 Hz 02 Output Current 0.1 A
2	If you press Reset or the terminal is entered, the failure above is Automatically saved and the display goes back to the place before the failure. Move to Trip Mode using Mode key.	<b>MON T/K</b> <b>N</b> <b>STP</b> 0.0Hz Frequency 0.00 Hz <b>0.0 A</b> <b>0 V</b>
3	The most recent failure is saved in Last-1 code. Press Right key.	<b>TRP Last-1</b> <b>00 Trip Name (1) Fan Trip</b> 01 Output Freq 29.30 Hz 02 Output Current 0.1 A
4	A previous failure is saved in Last-2 code. If another failure occurs, what was in Last-2 moves to Last-3.	<b>TRP Last-2</b> <b>00 Trip Name (1) Fan Trip</b> 01 Output Freq 29.30 Hz 02 Output Current 0.1 A

## 2 Troubleshooting

This chapter explains how to troubleshoot when the protective functions, fault trips, warning signals, or a fault occurs while operating the inverter. If the inverter does not work as expected after following the suggested troubleshooting steps, please contact the LSIS Customer Service Center.

### 2.1 Trips and Warning

The Inverter will stop operating or send out a warning signal when it detected a fault. The keypad will show brief information of the trip and warning signal. If the model is using the LCD keypad, the LCD will show detailed information.

The following is how the fault conditions are categorized.

- **Level:** After the fault is corrected, the trip or warning signal disappears. The fault is not saved in the fault history.
- **Latch:** After the fault is corrected, the trip or warning signal disappears once the Inverter is reset.
- **Fatal:** After the fault is corrected, the trip or warning signal disappears when conducted the following procedure. Turn off the Inverter and wait until the charge indicator light goes off. Then, turn on the Inverter. If the Inverter still failed, please contact the supplier or LSIS Customer Service Center.

#### 2.1.1 Failure/Warning List

The following table shows a list of faults and warning signals that can occur while operating H100.

Category		LCD Display	Details	Page
Critical	Latch	Over Current1	Over current trip	P. 25
		Over Voltage	Over voltage trip	P. 26
		External Trip	Trip due to an external signal	-
		NTC Open	Temperature sensor fault trip	P.29
		Over Current2	ARM short current fault trip	P.28
		Option Trip-x*	Option fault trip*	-
		Over Heat	Over heat fault trip	-
		Out Phase Open	Output open-phase fault trip	P.27

Category		LCD Display	Details	Page
		In Phase Open	Input open-phase fault trip	P.28
		Ground Trip	Ground fault trip	P.27
		FanTrip	Fan fault trip	P.29
		E-Thermal	Motor overheat fault trip	P.27
		IO Board Trip	IO Board connection fault trip	-
		No Motor Trip	No motor fault trip	-
		Low Voltage2	Low voltage fault trip during operation	P.27
		ParaWrite Trip	Write parameter fault trip	-
		Pipe Broken	Pipe Break fault trip	-
		Damper Err	Damper Err trip	-
		Over Load	Motor overload fault trip	P.25
		Under Load	Motor under load fault trip	P.25
		CleanRPTErr	Pump clean trip	-
		Level Detect	Level detect trip	-
		MMC Interlock	MMC Interlock trip	-
		Inverter OLT	Inverter overheating trip	P. 28
		Thermal Trip	Motor overheating trip	-
		Lost KeyPad	Lost keypad trip	-
		Broken Belt	Broken belt trip	
		Pipe Broken	Pipe Broken trip	



Category		LCD Display	Details	Page
	Level	Low Voltage	Low voltage fault trip	P.26
		BX	Emergency stop fault trip	-
		Lost Command	Command loss trip	-
		Lost Keypad	Lost keypad trip	-
	Fatal	EEP Err	External memory error	-
		ADC Off Set	Analog input error	-
		IO Board Trip	IO Board connection fault trip	-
		Watch Dog-1 Watch Dog-2	CPU Watch Dog fault trip	-
Warning		Lost Command	Command loss fault trip warning	-
		Over Load	Overload warning	-
		Under Load	Under load warning	-
		Inv Over Load	Inverter overload warning	-
		FanWarning	Fan operation warning	-
		DB Warn %ED	Braking resistor braking rate warning	-
		Low Battery	Low battery warning	-
		Fire Mode	Fire mode warning	-
		Pipe Broken	Pipe Break warning	-
		Level Detect	Level detect warning	-
		CAP. Warning	Capacitor lifetime warning	-
		Fan Exchange	Fan replacement warning	-



Category	LCD Display	Details	Page
	Lost Keypad	Lost keypad warning	-
	Load Tune	Load curve tuning warning	-
	Broken Belt	Broken belt warning	-
	ParaWrite Fail	Smart copier error warning	-
	Rs Tune Err	Auto tuning warning(Rs)	-
	Lsig Tune Err	Auto tuning warning(Lsigma)	-

### Note

- In a latch type trip, the inverter cannot unlock the fault if the user does not reset the inverter, even if the trip state is released after the trip occurs.
- In level type trip, the inverter can unlock the fault by itself if the trip state is unlocked after the trip occurs.
- In a fetal type trip, there is no way to unlock the fault other than turning the inverter off then back on after the trip occurs.

## 2.1.2 Troubleshooting Fault Trips

Refer to the following tables for solutions to fault trips or warnings.

Keypad Display		Type	Description
Over Load	Overload Trip	Latch	Occurs when the motor load exceeds the value that was set for the motor overload trip. Operation will resume after setting PRT-20 at a value other than 0
Problem		Solution	
The load is greater than the motor's rated capacity.		Make sure the motor and inverter has the appropriate capacity ratings. Replace the motor and inverter that has a bigger capacity.	
The value set for overload trip level (PRT-21) is too small.		Increase the setting value.	
There is a fault with the output module (IGBT).		Refer to 3.1.4 Check Input/Output Module to identify the fault cause of the output module (IGBT). DO NOT operate the inverter. Contact the retailer or the LSIS Customer Service Center.	
The mechanical brake of the motor is operating too fast.		Check the mechanical brake.	
The torque boost level is too high		Reduce the torque boost level.	
Acc/Dec time is too short compared to the load inertia (GD2).		Increase Acc/Dec time.	

Keypad Display		Type	Description
Under Load	Underload Trip	Latch	Occurs when the motor load is less than the value that was set for the motor underload level. Operation will resume after setting PRT-27 at a value other than 0
Problem		Solution	
There is a motor-load connection problem.		Replace the motor and inverter with models with lower capacity.	
The set value for underload level (PRT-24) is less than the system's minimum load.		Reduce the set value for the underload level.	

Keypad Display		Type	Description
Over Current1	Over Current Trip	Latch	Occurs when the Inverter output current exceeds 180% of the rated current.
Problem		Solution	
Acc/Dec time is too short compared to the load inertia (GD2).		Increase Acc/Dec time.	
Inverter load is greater than the rated capacity.		Replace the inverter that has a bigger capacity.	
The inverter produced an output while the motor was not operating.		Operate the inverter after the motor stopped or use the speed search function (CON-70).	
The mechanical brake of the		Check the mechanical brake.	

motor is operating too fast.	
Output wiring is short-circuited / Ground fault occurred.	Remove the short circuit. Check the motor for ground fault.
There is a problem in the wiring between the inverter and the motor.	Check the output wiring as well as the recommended specifications of the wiring length, thickness, etc..
There is a fault with the output module (IGBT).	Refer to 3.1.4 Check Input/Output Module to identify the fault cause of the output module (IGBT). DO NOT operate the inverter. Contact the retailer or the LSIS Customer Service Center.

Keypad Display		Type	Description
Over Voltage	Over Voltage Trip	Latch	Occurs when voltage rate of the DC circuit is higher than the specific value..
Problem		Solution	
The input voltage is too high.		Check whether the input voltage is higher than the specified value.	
The actual DC link voltage is different from the value on the display.		Need to inspect the Hardware. Contact the retailer or the LSIS Customer Service Center.	
Acc/Dec time is too short compared to the load inertia (GD2).		Increase Acc/Dec time.	
There is a generative load at the inverter output.		Use the braking unit.	

Keypad Display		Type	Description
Low Voltage	Low Voltage Trip	Level	Occurs when the DC circuit voltage is lower than the specified value.
Problem		Solution	
The input voltage is too low.		Check whether the input voltage is lower than the specified value.	
The actual DC link voltage is different from the value on the display.		Need to inspect the Hardware. Contact the retailer or the LSIS Customer Service Center.	
There is a problem with the input (R, S, T) wiring.		Rewire.	
The magnetic contactor connected the power source is faulty..		Replace the magnetic contactor.	
A load greater than the power capacity is connected to the power system. (welder, direct motor connection, etc.)		Increase power capacity.	

Keypad Display		Type	Description
Low Voltage2	Low Voltage Trip2	Latch	Occurs when the DC circuit voltage is lower than the specified value during inverter operation
Problem		Solution	
The input voltage has decreased during the operation.		Check whether the input voltage is lower than the specified value.	
An input phase-loss has occurred.		Check the input wiring.	
The magnetic contactor connected the power source is faulty..		Replace the magnetic contactor.	

Keypad Display		Type	Description
Ground Trip	Ground fault Trip	Latch	Occurs when there is excessive current than the specific value due to a ground fault in the output. The ground fault detection current is different per inverter capacity.
Problem		Solution	
Ground fault occurred in the output lead.		Separate the output wiring and check whether the ground fault is present. Remove the ground fault	
There is a problem in the wiring between the inverter and the motor.		Check the output wiring as well as the recommended specifications of the wiring length, thickness, etc. Replace it if necessary.	
The insulation of the motor is damaged.		Replace the motor.	
There is too much noise.		Decrease the carrier frequency value.	

Keypad Display		Type	Description
E-Thermal	Motor overheat fault trip	Latch	Occurs depending on the inverse time (delay) to prevent overheat of the motor due to overload. Operation will resume after setting PRT-40 at a value other than 0.
Problem		Solution	
The motor has overheated.		Reduce the load or operation frequency.	
The inverter load is greater than the rated capacity.		Replace the inverter that has a bigger capacity.	
The value for electronic thermal protection (ETH) is too low.		Set the ETH level appropriately.	
The inverter has been operating at low speed for a long time.		Replace the motor that supplies extra power to the cooling fan.	

Keypad Display		Type	Description
Out Phase Open	Output open-phase fault trip	Latch	Occurs when one of the three output phases is phase open. Operation will resume after setting PRT-05 bit 1 to 1.

Problem	Solution
There is a problem with the magnetic contactor in the output.	Check the magnetic contactor on the outside.
The output wiring is faulty.	Check the output wiring.

Keypad Display		Type	Description
In Phase Open	Input open-phase fault trip	Latch	Occurs when one of the three input phases is phase open. Operation will resume after setting PRT05 bit 2 to 1.
Problem		Solution	
There is a problem with the magnetic contactor in the input.		Check the magnetic contactor on the input side.	
The input wiring is faulty.		Check the input wiring.	
The DC condenser needs to be replaced.		Replace the DC condenser. Contact the retailer or the LSIS Customer Service Center.	

Keypad Display		Type	Description
Inverter OLT	Inverter Overload Trip	Latch	Occurs when the overload time equivalent to 60% of the inverter overheat protection (inverter IOLT) level, is accumulated. Set the digital output terminals or relay (OUT-31–35 or OUT-36) to '6 (IOL)' to receive the inverter overload warning output signals.
Problem		Solution	
The load is greater than the motor's rated capacity		Replace the motor and inverter that has a bigger capacity..	
The torque boost level is too high.		Reduce the torque boost level.	

Keypad Display		Type	Description
Over Heat	Over Heat Trip	Latch	Occurs when the temperature of the heat sink exceeds the specific value.
Problem		Solution	
There is a problem with the cooling system.		Check whether there are any external substances (dust, etc.) in the air inlet, outlet or vent.	
The cooling fan has been operating for a long time		Change the cooling fan. (Refer to 3.1.5 Replace cooling fan)	
The ambient temperature is too high.		Keep the ambient temperature below 50°C.	

Keypad Display		Type	Description
Over Current2	ARM short current fault trip	Latch	Occurs when the DC circuit in the inverter detects an excessive short circuit current.

Problem	Solution
Acc/Dec time is too short compared to the load inertia (GD2).	Increase Acc/Dec time.
Output lead is short circuit.	Check the output wiring.
There is a problem in the wiring between the inverter and the motor.	Check the output wiring as well as the recommended specifications of the wiring length, thickness, etc. Replace it if necessary.
There is a fault with the output module (IGBT).	Refer to 3.1.4 Check Input/Output Module to identify the fault cause of the output module (IGBT). DO NOT operate the inverter. Contact the retailer or the LSIS Customer Service Center.

Keypad Display		Type	Description
NTC Open	Temperature sensor fault trip	Latch	Occurs when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT).
Problem		Solution	
The ambient temperature is too low		Keep the ambient temperature above -10 °C	
There is a fault with the internal temperature sensor.		Contact the retailer or the LSIS customer service center.	

Keypad Display		Type	Description
FAN Trip	Fan fault trip	Latch	Occurs when there is a problem with the cooling fan. Operation will resume after setting PRT-79 to 0
Problem		Solution	
There are external substances blocking the air vent.		Remove the external substances.	
The cooling fan needs to be replaced.		Change the cooling fan. (Refer to 3.1.5 Replace cooling fan)	

## 2.2 Troubleshooting Other Fault

Refer to the following tables for solutions other than fault trips or warnings.

### Setting parameters is not working.

Problem	Solution
The inverter is operating (inverter mode).	Stop the inverter and change to program mode and set the parameters.
The parameter access level is incorrect.	Check the correct parameter access level and set the parameter.
The password is incorrect.	Check the password and disable the parameter lock by setting CNF-52 to Unlock. Then set the parameter.
Low voltage is detected.	Check the power input to resolve the low voltage problem. Then set the parameter

### The motor does not rotate.

Problem	Solution
The setting of the operation command source is incorrect.	Check the setting of the operation command source.
There is no power supplied to the R/S/T terminals.	Check the connections of R/S/T and U/V/W terminals.
The charge lamp is turned off.	Turn on the inverter.
The operation command (RUN) is off.	Turn on the operation command (RUN).
The motor is locked.	Unlock the motor or lower the load level.
The load is too high.	Operate the motor independently.
There is an input on the emergency stop signal.	Reset the emergency stop signal.
The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
The input option for the frequency command is incorrect.	Check the input option for the frequency command.
The input voltage or current for the frequency command is incorrect.	Check the input voltage and current for the frequency command.
The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode.
The frequency command value is too low.	Check the frequency command value and set the command that is above minimum frequency.
The [STOP/RESET] was pressed.	The motor was stopped normally so run the inverter.
The motor torque is too low.	Change the operation modes (V/F, IM Sensorless). If the fault remains, replace the inverter that has bigger capacity.



**The motor rotates in the opposite direction to the command.**

Problem	Solution
The wiring of the motor output cable is incorrect.	Check whether the output side is wired correctly to the phase (U/V/W) of the motor.
The rotation signal connection between the control circuit terminal (forward/reverse rotation) and the forward/reverse rotation control panel is incorrect.	Check the forward/reverse rotation wiring.

**The motor only rotates in one direction.**

Problem	Solution
Reverse rotation prevention is selected.	Release/Remove the reverse rotation prevention setting and resume operation.
The reverse rotation signal is not input even though the 3-wire sequence was selected.	Check the input signal associated with the 3-wire operation.

**The motor is overheating.**

Problem	Solution
The load is too high.	Reduce the load. Increase the Acc/Dec time.
	Check the motor specifics and set to the correct values.
	Replace the motor and inverter appropriate to load capacity.
The ambient temperature of the motor is too high.	Lower the ambient temperature.
The phase-to-phase voltage of the motor is insufficient.	Use the motor that can withstand phase-to-phase voltage surges, greater than the maximum surge voltage.
	Only use motors suitable for inverter applications.
	Connect the AC reactor to the inverter output (Set the carrier frequency to 2kHz in code H39).
The motor fan stopped. / The external substances are inside/blocking the fan.	Check the motor fan and remove any external substances (dust, debris, etc.)



**The motor stopped when accelerated or connected to load.**

Problem	Solution
The load is too high.	Reduce the load.
	Replace the motor and inverter appropriate to inverter capacity.

**The motor does not accelerate. / The acceleration time is too long.**

Problem	Solution
The frequency command is too low.	Change the setting accordingly.
The load is too high.	Reduce the load. Increase the acceleration time. Check the status of the mechanical brake.
The acceleration time is too long.	Change the setting accordingly.
The properties of the motor and inverter parameters are incorrect.	Change the parameters of the motor.
The stall prevention level during acceleration is low.	Change the stall prevention level.
The stall prevention level during operation is low.	Change the stall prevention level.
Starting torque is insufficient.	Change to vector control operation mode. If the fault still exists, replace the inverter that has a bigger capacity.

**Motor speed changes during operation.**

Problem	Solution
There is high variance in the load.	Replace the motor and inverter that has a bigger capacity.
The input voltage changes.	Reduce the input voltage variance (standard deviation).
The motor speed changes at a specific frequency.	Adjust the output frequency to avoid resonance.

**The motor rotation is different from the setting.**

Problem	Solution
The V/F pattern is set incorrectly.	Set a V/F pattern suitable for motor specification.

**The deceleration time is too long even with the Dynamic Breaking resistor connected to the motor.**

Problem	Solution
The deceleration time is set too long.	Change the setting accordingly.
The motor torque is insufficient.	If there is no problem with motor parameters, this is due to motor capacity. Replace the motor with a bigger capacity.
The load is higher than the internal torque limit (based on the rated current) of the inverter..	Replace the inverter with a bigger capacity.

**The control unit is not working or noise is generated when the inverter is in operation.**

Problem	Solution
The switching inside the inverter caused noise.	Reduce the carrier frequency in CON-04.
	Install a micro surge filter in the inverter output.

**The earth leakage breaker is activated when the inverter is in operation.**

Problem	Solution
The earth leakage breaker is activated due to leaking current from the inverter.	Connect the inverter to the ground terminal.
	Check the ground resistance is less than 100 $\Omega$ for 200V and less than 10 $\Omega$ for 400V inverters.
	Check the capacity of the leakage breaker and connect properly based on the rated current of the inverter.
	Reduce the carrier frequency in CON-04.
	Make the cable length between the inverter and the motor as short as possible.

**The motor vibrates intensely and does not rotate normally.**

Problem	Solution
The phase-to-phase voltage of 3-phase power source is not balance.	Check the input voltage and stabilize the voltage.
	Check and test the insulation of the motor.

**The motor makes humming or loud noises.**

Problem	Solution
There is resonance between the motor's natural frequency and the carrier frequency.	Reduce the carrier frequency in CON-04.

There is resonance between the motor's natural frequency and the inverter's output frequency.	Slightly change the command frequency
	Use the frequency jump function to avoid resonance.

### The motor vibrates / hunts.

Problem	Solution
The frequency input demand was externally set to analog command.	Change the input filter time constant if there are interferences in the frequency command due to noise from the analog input side.
The wiring between the motor and inverter is too long.	Make sure that the total cable length between the inverter and the motor is less than 150m (50m for motors rated 3.7kW and lower).

### The motor does not stop completely when the inverter output stopped.

Problem	Solution
The motor cannot decelerate sufficiently due to malfunction of the DC braking.	Adjust the DC braking parameter.
	Increase the set value for DC braking current.
	Increase the set value for the DC braking stopping time.
Free run stop was selected.	Change the stopping method to decelerating.

### The output frequency does not reach the target frequency.

Problem	Solution
The target frequency is within the jump frequency range.	Set the target frequency higher than the jump frequency range.
The target frequency is higher than the upper limit of the frequency command.	Set the upper limit of the frequency command higher than the target frequency.
The stall prevention function is not working due to high load.	Replace the inverter with a bigger capacity.

### The cooling fan does not rotate.

Problem	Solution
The control parameter for the cooling fan is set incorrectly.	Check the control parameter settings for the cooling fan in ADV-64

## 3 Maintenance

This chapter covers regular inspections for different time periods, how to replace the cooling fan, and how to properly store and dispose Inverters. The surrounding environment highly affects the conditions of the inverters. Meaning, improper management will wear down the components and lead to malfunction. In order to prevent this from happening, please follow the recommended maintenance guidelines in this section.

### ⚠ Caution

- Read all safety instructions in this manual before inspecting the product.
- Make sure the power is off before cleaning the product.
- Clean the inverters with dry cloths. Using wet cloths, water, solvents, or detergents may lead to electric shock or damage to the product.

### 3.1 Regular Inspection List

#### 3.1.1 Daily Inspections

Part	Category	Check points	Method	Standard	Equipment
All	Ambient environment	Is the ambient temperature and humidity appropriate within the range? Is there any dust or substances nearby?	Refer to Installation & Wiring in the User Manual	Temperature: 10~40°C.  Humidity: Below 50%	Thermometer, hygrometer, recorder
	Complete Inverter	Is there any unusual vibration or noise?	Visual inspection	All clear	
	Power voltage	Are the input/output voltages in the normal range?	Voltage ratings between R/S/T phases in the inverter's terminal block	Refer to Input and Output standards in the User Manual	Digital multimeter / Analog tester
Input/Output circuit	Smoothing capacitor	Is there any internal leakage?	Visual inspection	All clear	
		Is the condenser swollen (change in shape)?			
Cooling system	Cooling fan	Is there any unusual vibration or noise?	Check by rotating the fan manually when the system is turned off	Rotate smoothly	-

Display	Measuring device	Is the display value normal?	Check the display value on the panel	Check the rated, managerial value	Voltmeter, ammeter, etc.
Motor	All	Is there any unusual vibration or noise?	Visual inspection	All clear	-
		Is there any unusual smell (odor)?	Check for overheat or damage		

### 3.1.2 Annual Inspections

Part	Category	Check points	Method	Standard	Equipment
Input/Output circuit	All	Megger test (between input/output terminals and earth terminal)	Disconnect the inverter wirings and short R/S/T/U/V/W terminals. Measure each terminal to the ground terminal using a Megger. (Refer to 3.1.4 Check Input/Output Module)	Above 5MΩ	DC 500V Megger
		Are there any loose parts in the device?	Tighten all screws	All clear	
		Are there any evidence of overheat?	Visual inspection		
	Conductor Connections /Cables	Are there any corroded cables?	Visual inspection	All clear	-
		Is there any damage on the wire clothing?			
	Terminal block	Is there any damage?	Visual inspection	All clear	-
	Smoothing condenser	Measure electrostatic capacity	Measure with capacity meter	Above 85% of the rated capacity	Capacity meter
	Relay	Is there any chattering noise during operation?	Visual inspection	All clear	-
		Is there any damage on the contacts?	Visual inspection		
	Resistors	Is there any damage on the resistors?	Visual inspection	All clear	Digital multimeter / Analog tester

Part	Category	Check points	Method	Standard	Equipment
		Check disconnection	Remove one side and measure	Must be within $\pm 10\%$ of the rated resistance	
Control / Protection circuit	Check operation	Check imbalance of output voltage during operation	Measure voltage between output terminal U/V/W	Phase-to-phase voltage balance: Within 4V for 200V Within 8V for 400V	Digital multimeter / DC Voltmeter
		Is there any error in the display circuit after the sequence protection test?	Test inverter output protection at both short and open circuit conditions	Circuit must work according to the sequence	
Cooling system	Cooling fan	Are there any loose parts around the fan?	Tighten all screws	All clear	-
Display	Display device	Is the display value normal?	Check the command values on the display device	Specified values and manageable values must match	Voltmeter Ammeter

### 3.1.3 Bi-Annual Inspections

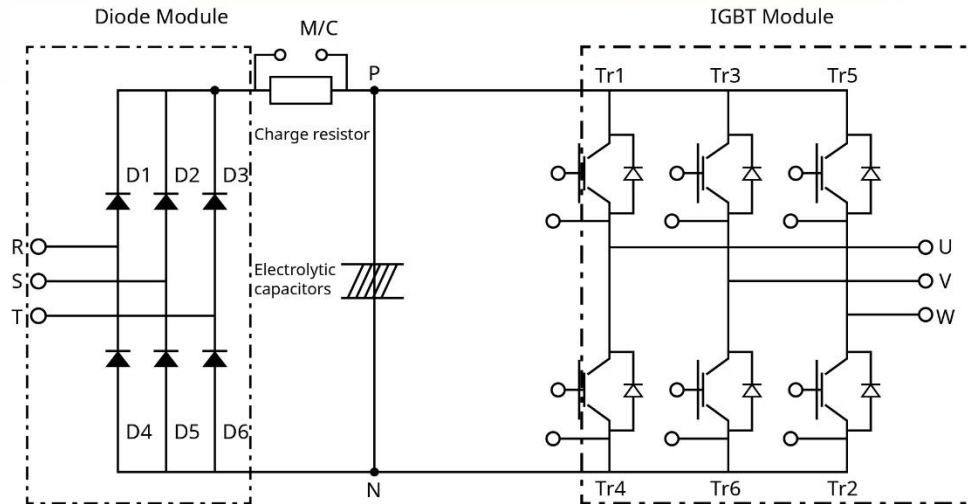
Part	Category	Check points	Method	Standard	Equipment
Motor	Insulation resistors	Megger test (between input/output terminals and earth terminal)	Disconnect the cables for terminals U/V/ W and test the wiring	Above 5M $\Omega$	DC 500V Megger

#### Caution

Do not run the Megger (Insulation Resistance Test) on the control circuit as it may lead to damage to the product.

### 3.1.4 Check Input/Output Module

#### How to check the diode module and IGBT module (5.5~30kW)



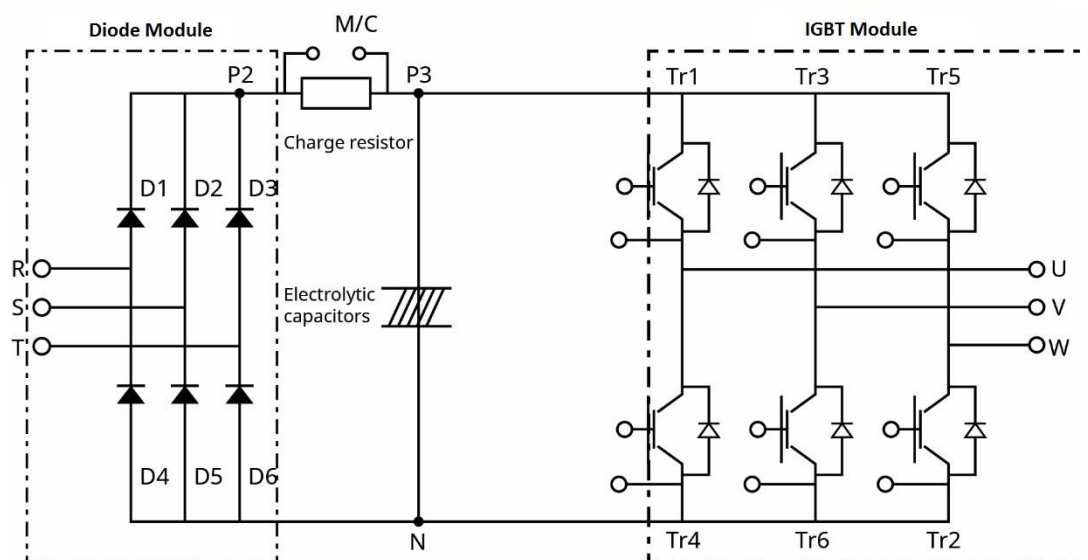
#### Testing method

- 1) Disconnect all power cables (R,S,T) and motor output cables (U,V,W).
- 2) Before testing, check the discharge of electrolytic capacitor (DCP-DCN).
- 3) When the circuit is open, DMM will indicate high resistance (several MΩ). In some situations, the DMM may display a closed circuit (low resistance) and then show high resistance due to the capacitors. When the circuit is closed, the DMM shows resistance of several hundred kΩ or less.
- 4) Displayed values may not be constant as it depends on the module and tester type. The value measured between the phases is acceptable if the standard deviation is approximately  $\pm 10\%$ .

Module		Test Polarity		Check Value	Module		Test Polarity		Check Value
		+	-				+	-	
Diode	D1	R	P	Closed	D4	R	N	Open	Open
		P	R	Open		N	R	Closed	
	D2	S	P	Closed	D5	S	N	Open	Open
		P	S	Open		N	S	Closed	
	D3	T	P	Closed	D6	T	N	Open	Open
		P	T	Open		N	T	Closed	
IGBT	Tr1	U	P	Closed	Tr4	U	N	Open	Open
		P	U	Open		N	U	Closed	
	Tr3	V	P	Closed	Tr6	V	N	Open	Open
		P	V	Open		N	V	Closed	
	Tr5	W	P	Closed	Tr2	W	N	Open	Open
		P	W	Open		N	W	Closed	



## How to check the diode module and IGBT module (37~90kW)



### Testing Method

- 1) Disconnect all power cables (R,S,T) and motor output cables (U,V,W).
- 2) Before testing, check the discharge of electrolytic capacitor (DCP-DCN).
- 3) When the circuit is open, DMM will indicate high resistance (several MΩ). In some situations, the DMM may display a closed circuit (low resistance) and then show high resistance due to the capacitors. When the circuit is closed, the DMM shows resistance of several hundred kΩ or less.
- 4) Displayed values may not be constant as it depends on the module and tester type. The value measured between the phases is acceptable if the standard deviation is approximately  $\pm 10\%$ .

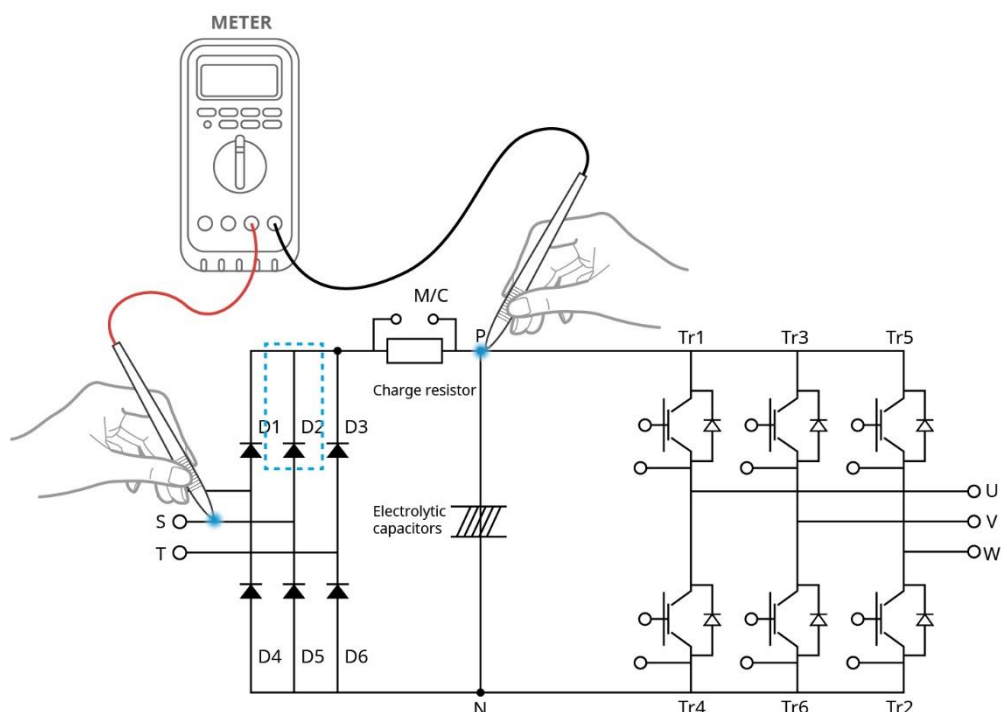
Module		Test Polarity		Check Value	Module		Test Polarity		Check Value
		+	-				+	-	
Diode	D1	R	P2	Closed	D4	R	N	Open	
		P2	R	Open		N	R	Closed	
	D2	S	P2	Closed	D5	S	N	Open	
		P2	S	Open		N	S	Closed	
	D3	T	P2	Closed	D6	T	N	Open	
		P2	T	Open		N	T	Closed	
IGBT	Tr1	U	P3	Closed	Tr4	U	N	Open	
		P3	U	Open		N	U	Closed	
	Tr3	V	P3	Closed	Tr6	V	N	Open	
		P3	V	Open		N	V	Closed	
	Tr5	W	P3	Closed	Tr2	W	N	Open	
		P3	W	Open		N	W	Closed	



### ■ Example) Checking diode module and IGBT module

#### Checking Diode D2

- 1) Measure the resistance of D2 by placing the red lead (positive terminal of DMM) on S phase and the black lead (negative terminal of DMM) on P.
  - If the resistance indicated on DMM is several hundred k $\Omega$  or less, it is acceptable.
- 2) Measure the resistance of D2 by placing the red lead from the positive terminal of DMM on P and the black lead from negative terminal of DMM on S phase.
  - If the resistance indicated on DMM is M $\Omega$ , it is acceptable.
- 3) Measure the resistance of other diodes in the same way.

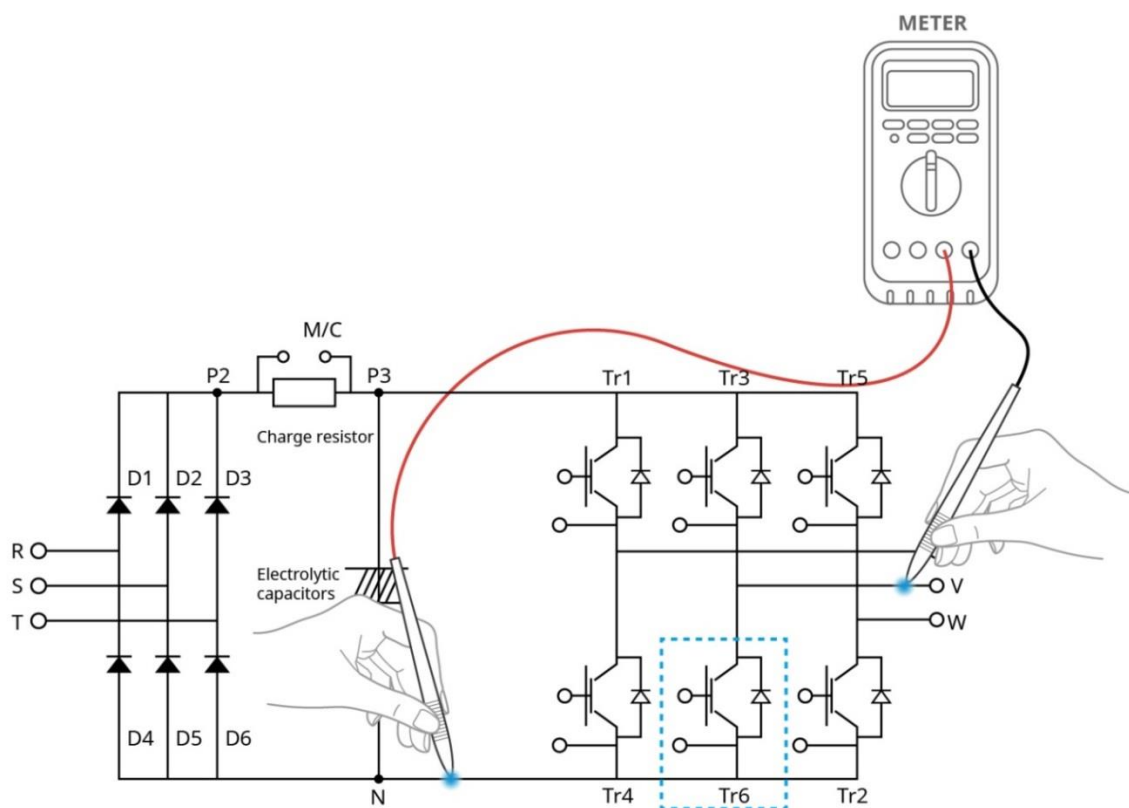


#### ⚠ Caution

Before testing, check the discharge of electrolytic capacitor (DCP-DCN).

### Checking IGBT Tr6

- 1) Measure the resistance of Tr6 by placing the red lead (positive terminal of DMM) on N and the black lead (negative terminal of DMM) on V phase.
  - If the resistance indicated on DMM is several hundred k $\Omega$  or less, it is acceptable.
- 2) Measure the resistance of Tr6 by placing the read lead (positive terminal of DMM) on V phase and the black lead (negative terminal of DMM) on N.
  - If the DMM indicates several M $\Omega$ , it is acceptable.
- 3) Measure the resistance of other Tr in the same way.



#### ⚠ Caution

Before testing, check the discharge of electrolytic capacitor (DCP-DCN).

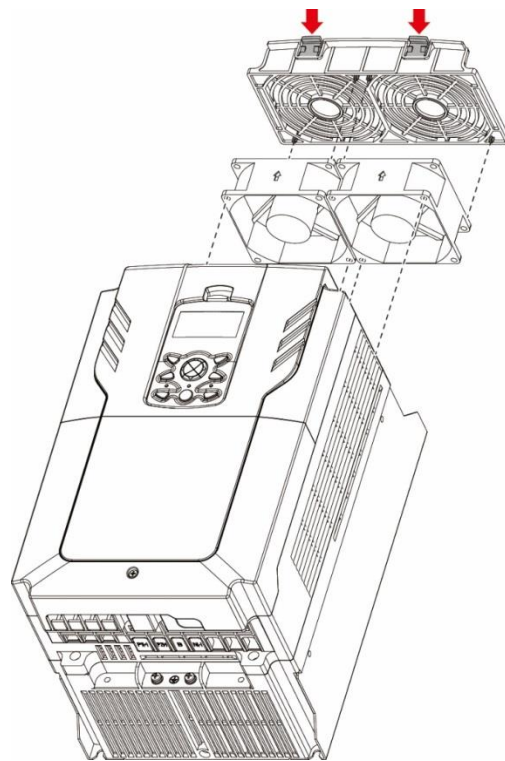
### 3.1.5 Replace Cooling FAN

If the inverter continued to operate after the cooling fan trip took place, a protective function will be activated due to overheat in the cooling fan. Increase in temperature may reduce the lifespan of major components. Make sure to solve the problem in the cooling fan before operating the inverter.

If the cooling fan has been operating longer than its (optimal) replacement period, this may lead to low performance of the inverter or the cause of inverter failure. The replacement period of the cooling fans is 3 years. Replace the old cooling fans with the new one

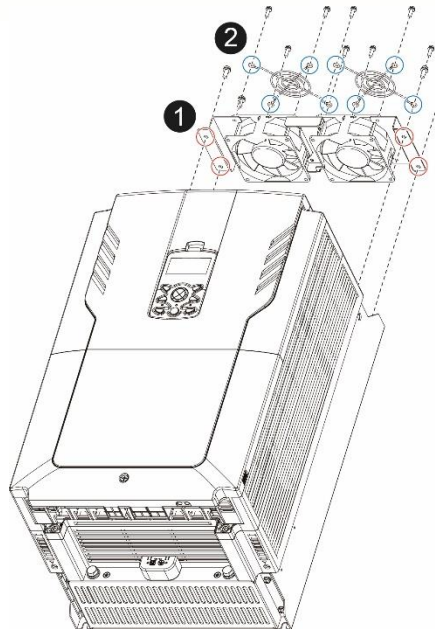
#### Replacement of 5.5~30kW FAN

- 1) Remove the fan cover by pressing the hook located by the arrow
- 2) Disconnect the fan wire and remove the fan from the inverter.

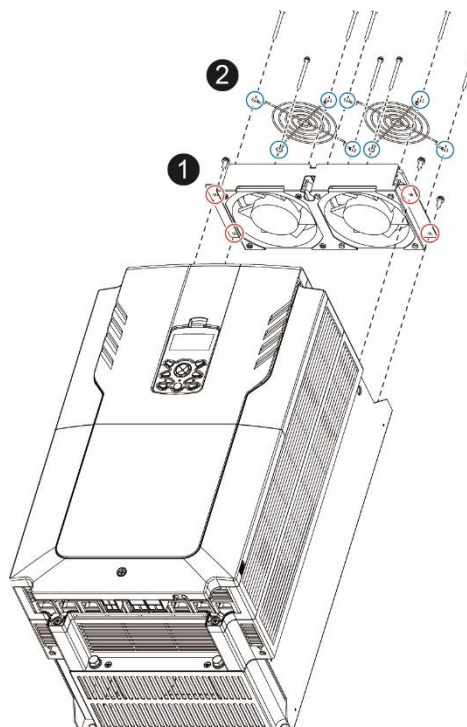


**Replacement of 37~55kW FAN**

- 1) Remove ① screws to separate the fan bracket from the inverter.
- 2) Disconnect the fan wire and remove ② screws.

**Replacement of 75~90kW FAN**

- 1) Remove ① screws to separate the fan bracket from the inverter.
- 2) Disconnect the fan wire and remove ② screws.



### **Caution**

- Turn off the inverter before replacing the fan. There is a possibility of an electric shock due to the charge voltage. Wait until the inverter is fully discharged to replace the fan. (The time to discharge varies per capacity, in average 1~3 minutes after turning off the inverter).
- Make sure the fan wire and connect is not touching the blades. If touched it leads to malfunction of the inverter. Make sure the inverter is completely turned off before cleaning.
- After replacing the fan, assemble the fan. Before using the inverter, turn on the inverter and check the condition of the fan by its motion.
- Be careful of the direction of the fan.

## 3.2 Storage and Disposal

### 3.2.1 Storage

Store the products in the following conditions listed below (if not used for a long period of time).

- Store the product in the same appropriate environmental conditions as in operation.
- If the product will be stored more than 3 months, keep the ambient temperature between -10°C~30°C to prevent degradation of the electrolytic capacitor.
- The products should not be exposed to snow, rain, fog and dust.
- When packing the inverter, include a dehumidifier (e.g. silica gel) to keep the ambient temperature inside the package below 70% and prevent in contact with moisture.
- If the products will be left in a humid or dusty environment (construction sites or control panel) separate the products in a location that has the same appropriate environmental conditions as in operation.

### 3.2.2 Disposal

Categorize the inverters as general industrial waste when disposing the product. Note that there are recyclable raw materials in the product, such as packing materials and metalwork. For the sake of conservation of energy and resources, recycle whenever possible. Depending on the country, plastic may be recyclable. Please check the local environmental regulations for more details.

### **Caution**

Capacitors lose their charging characteristics if not operated for a long time. In order to prevent this from happening, turn on the product and allow the device to operate for 30~60 minutes once a year. Note that operation should be conducted under no-load conditions.