HITACHI

Basic Manual of Hitachi NE-S1 series inverter

Thank you for purchasing the Hitachi NE-S1 series inverter.
Please read this document and QRG(Quick Reference Guide), and understand perfectly how to handle properly and the safety cautions of the product before operation, for safety and proper usage.
Note that this Manual is intended for each product and should be delivered to the end user of the inverter.
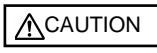
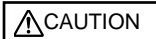NT341BX

Safety precautions

Be sure to read this Instruction Manual and appended documents thoroughly before installing, operating the inverter.

Maintenance and service items in this manual are only caution related items. Read QRG (Quick Reference Guide) carefully before starting the maintenance and service. (QRG can be downloaded from our website.)

In the Instruction Manual, safety instructions are classified into two levels, namely WARNING and CAUTION.

⚠WARNING : Indicates that incorrect handling may cause hazardous situations, which may result in serious personal injury or death.

⚠CAUTION : Indicates that incorrect handling may cause hazardous situations, which may result in moderate or slight personal injury or physical damage alone.

Note that even a ⚠CAUTION level situation may lead to a serious consequence according to circumstances. Be sure to follow every safety instruction, which contains important safety information. Also focus on and observe the items and instructions described under "Notes" in the text.

⚠ **CAUTION**

Many of the drawings in the Instruction Manual show the inverter with covers and/or parts blocking your view being removed.
Do not operate the inverter in the status shown in those drawings. If you have removed the covers and/or parts, be sure to reinstall them in their original positions before starting operation, and follow all instructions in the Instruction Manual when operating the inverter.

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1. Installation

⚠ **CAUTION**

- Install the inverter on a non-flammable surface, e.g., metal. Otherwise, you run the risk of fire.
- Do not place flammable materials near the installed inverter. Otherwise, you run the risk of fire.
- When carrying the inverter, do not hold its top cover. Otherwise, you run the risk of injury and damage by dropping the inverter.
- Prevent foreign matter (e.g., cut pieces of wire, sputtering welding materials, iron chips, wire, and dust) from entering the inverter. Otherwise, you run the risk of fire.
- Install the inverter on a structure able to bear the weight specified in the Instruction Manual. Otherwise, you run the risk of injury due to the inverter falling.
- Install the inverter on a vertical wall that is free of vibrations. Otherwise, you run the risk of injury due to the inverter falling.
- Do not install and operate the inverter if it is damaged or its parts are missing. Otherwise, you run the risk of injury.
- Install the inverter in a well-ventilated indoor site not exposed to direct sunlight. Avoid places where the inverter is exposed to high temperature, high humidity, condensation, dust, explosive gases, corrosive gases, flammable gases, grinding fluid mist, or salt water. Otherwise, you run the risk of fire.
- The inverter is precision equipment. Do not allow it to fall or be subject to high impacts, step on it, or place a heavy load on it. Doing so may cause the inverter to fail.

2. Wiring

⚠ **WARNING**

- Be sure to ground the inverter. Otherwise, you run the risk of electric shock or fire.
- Commit wiring work to a qualified electrician. Otherwise, you run the risk of electric shock or fire.
- Before wiring, make sure that the power supply is off. Otherwise, you run the risk of electric shock or fire.
- Perform wiring only after installing the inverter. Otherwise, you run the risk of electric shock or injury.
- The inverter must be powered OFF before you change any of the slide switch settings. Otherwise, you run the risk of electric shock or injury.

⚠ **CAUTION**

- Make sure that the voltage of AC power supply matches the rated voltage of your inverter. Otherwise, you run the risk of injury or fire.
- Do not input single-phase power into the 3-phase inverter. Otherwise, you run the risk of fire.
- Do not connect AC power supply to any of the output terminals (U, V, and W). Otherwise, you run the risk of injury or fire.
- NE-S1 series inverter do not have terminals for braking resistor. Do not connect the resistor. Otherwise there is a risk of fire.
- Connect an earth-leakage breaker to the power input circuit. Otherwise, you run the risk of fire.
- Use only the power cables, earth-leakage breaker, and magnetic contactors that have the specified capacity (ratings). Otherwise, you run the risk of fire.
- Do not use the magnetic contactor installed on the primary and secondary sides of the inverter to stop its operation.
- Tighten each screw to the specified torque. No screws must be left loose. Otherwise, you run the risk of fire.
- Before operating slide switch in the inverter, be sure to turn off the power supply. Otherwise, you run the risk of electric shock and injury.
- Please make sure that earth or ground screw is tightened properly and completely.
- First, check the screws of output terminal (U, V and W) are properly tighten, and then tighten the screws of input terminal (R, S and T)

3. Operation

⚠ **WARNING**

- While power is supplied to the inverter, do not touch any terminal or internal part of the inverter, check signals, or connect or disconnect any wire or connector. Otherwise, you run the risk of electric shock or fire.
- Be sure to close the top cover before turning on the inverter power. Do not open the top while power is being supplied to the inverter or voltage remains inside. Otherwise, you run the risk of electric shock.
- Do not operate switches with wet hands. Otherwise, you run the risk of electric shock.
- While power is supplied to the inverter, do not touch the terminal of the inverter, even if it has stopped. Otherwise, you run the risk of injury or fire.
- If the retry mode has been selected, the inverter will restart suddenly after a break in the tripping status. Stay away from the machine controlled by the inverter when the inverter is under such circumstances. (Design the machine so that human safety can be ensured, even when the inverter restarts suddenly.) Otherwise, you run the risk of injury.
- Do not select the retry mode for controlling an elevating or traveling device because output free-running status occurs in retry mode. Otherwise, you run the risk of injury or damage to the machine controlled by the inverter.
- If an operation command has been input to the inverter before a short-term power failure, the inverter may restart operation after the power recovery. If such a restart may put persons in danger, design a control circuit that disables the inverter from restarting after power recovery. Otherwise, you run the risk of injury.
- Prepare the additional emergency stop switch in addition to the stop key of the integrated operator and/or the optional operator. Otherwise, there is a danger of injury.
- If an operation command has been input to the inverter before the inverter enters alarm status, the inverter will restart suddenly when the alarm status is reset. Before resetting the alarm status, make sure that no operation command has been input.
- While power is supplied to the inverter, do not touch any internal part of the inverter or insert a bar in it. Otherwise, you run the risk of electric shock or fire.
- Run/Stop/Reset is integrated in one button, before you press the button. Please make sure that the machine (facility) can be operated. Otherwise, you run the risk of injury or damage to the machine controlled by the inverter.

⚠ **CAUTION**

- Do not touch the heat sink, which heats up during the inverter operation. Otherwise, you run the risk of burn injury.
- The inverter allows you to easily control the speed of motor or machine operations. Before operating the inverter, confirm the capacity and ratings of the motor or machine controlled by the inverter. Otherwise, you run the risk of injury.
- Install an external brake system if needed. Otherwise, you run the risk of injury.
- When using the inverter to operate a standard motor at a frequency of over 60 Hz, check the allowable motor speeds with the manufacturers of the motor and the machine to be driven and obtain their consent before starting inverter operation. Otherwise, you run the risk of damage to the motor and machine.
- During inverter operation, check the motor for the direction of rotation, abnormal sound, and vibrations. Otherwise, you run the risk of damage to the machine driven by the motor.
- Regardless Run command setting (A002/A202), if the key is pressed, the inverter starts running. Therefore, if you selected Run command such as operator or terminal, please handle the key after you made sure that the machine/facility can be operated safely.

4. Maintenance, inspection, and parts replacement

⚠ **WARNING**

- Before inspecting the inverter, be sure to turn off the power supply and wait for 10 minutes or more. Otherwise, you run the risk of electric shock. (Before inspection, confirm that the Charge lamp on the inverter is off.)
  In case the power indication of the operator does not turn ON after power-up, inverter may be damaged. In that case, the inspection must be done after waiting two hours or more of the power OFF. Otherwise there is a danger of electric shock and/or injury.
- Commit only a designated person to maintenance, inspection, and the replacement of parts.
  (Be sure to remove wristwatches and metal accessories, e.g., bracelets, before maintenance and inspection work and to use insulated tools for the work.) Otherwise, you run the risk of electric shock and injury.

5. Others

⚠ **CAUTION**

- Do not discard the inverter with household waste. Contact an industrial waste management company in your area who can treat industrial waste without polluting the environment.

⚠ **WARNING**

- Never modify the inverter. Otherwise, you run the risk of electric shock and injury.
  Do not discard the inverter with household waste. Contact an industrial waste management company in your area who can treat industrial waste without polluting the environment.
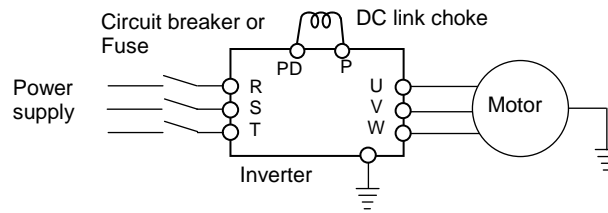
Cautions for UL and cUL

(Standard to comply with : UL508C,CSA C22.2 No.14-05)

<u>Wiring diagram of inverter</u>

a) Maximum surrounding air temperature rating of 50ºC.

b) Solid State motor overload protection reacts with max. 150 % of FLA.

c) Suitable for use on a circuit capable of delivering not more than 100,000 rms Symmetrical Amperes, 240 Volts Maximum.

d) Drive has no provision for motor over temperature protection.   Motor over temperature protection is required at end application.

e) Protected by J, CC, G or T Class Fuses. or when protected by a circuit breaker having an interrupting rating not less than 100,000 rms symmetrical amperes, 240 Volts maximum.

f) Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

g) Drive has no provision for motor over temperature protection. Motor over temperature protection required at end application.

h) Use 60/75ºC CU wire only.

i) Tightening torque and wire range as shown in the table below.

Model No.	Required Torque (N.m)	Wire Range (AWG)
NES1-002S	0.8~1.0	16~14
NES1-004S	0.8~1.0	16~14
NES1-007S	1.8	14~12
NES1-015S	1.8	12~10
NES1-022S	1.8	10
NES1-002L	0.8~1.0	16~14
NES1-004L	0.8~1.0	16~14
NES1-007L	0.8~1.0	16~14
NES1-015L	1.8	14
NES1-022L	1.8	12

j) Distribution fuse and circuit breaker size marking is included in the manual to indicate that the unit shall be connected with a Listed Cartridge Nonrenewable fuse or Inverse time circuit breaker, rated 600 VAC with the current ratings as shown in the table below:

Model No.	Fuse		Circuit Breaker	
	Type	Maximum Rating	Type	Maximum Rating
NES1-002S	Class J, CC, G or T	10 A	Inverse Time	15 A
NES1-004S				
NES1-007S		20 A		
NES1-015S		30 A		30 A
NES1-022S				
NES1-002L*	Class J, CC, G or T	10 A	Inverse Time	15 A
NES1-004L*				
NES1-007L*		15 A		
NES1-015L				
NES1-022L		20 A		20 A

* In case of using Circuit Breaker, an additional 5 A external protector is needed.

Supplement of Cautions for UL and cUL

Note (* mark) of item j): When a breaker is used in NES1-002L/004L/007L, a breaker of 15A and a protector (breaker) of 5A in series is additionally required by the NEC(National Electrical code) standard un US.

1.1 Inspection at unpacking

Please check the followings after unpacking.
Please contact Hitachi if there are any problems such as noted below on the product.

(1) Any damage during transportation?
(2) Basic manual (English and Japanese) are packed together with the product?
(3) The product is the one you ordered (check with the specification label)

Specification label
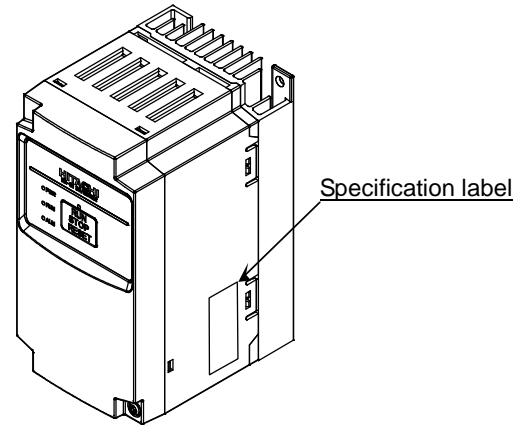
Model name	(NES1-002SB example)
Input	Freq. Voltage Phase Current
Output	Freq. Volt. & phase Current
Manufacturing number	

```
H I T A C H I        INVERTER
Model: NES1-002SB
Input  :50Hz, 60Hz    200-240 V 1Ph      3.1 A
         50Hz, 60Hz          V 3Ph          A
Output :0.5-400Hz     200-240 V 3Ph      1.4 A
MFG No. 2616200716000001        Date:1206
Hitachi Industrial Equipment
Systems Co.,Ltd.          W      NE18158-001
```

Example of the specification label

1.2 Basic Manual (This document)

This Basic manual is for NE-S1 series inverters.
Read this manual carefully for the proper operation of the product. Please keep this manual for future usage.
Please refer to QRG for the further detailed information. QRG can be downloaded from our website.
HP address: http://www.hitachi-ies.co.jp/english/products/inv/nes1/index.htm
When you use any options, please refer to the manual of each option.

1.3 In case of contact

When contacting the store or vendor where you bought the product or Hitachi directly, please provide the following information.
(1) Model name of the inverter
(2) Manufacturing number
(3) When you bought the product
(4) Contents of your inquiry
   - Damaged portion and condition, and else

1.4 Warranty Terms

   The warranty period under normal installation and handling conditions shall be two (2) years from the date of manufacture, or one (1) year from the date of installation, whichever occurs first. The warranty shall cover the repair or replacement, at Hitachi's sole discretion, of ONLY the inverter that was installed.
1. Service in the following cases, even within the warranty period, shall be charged to the purchaser:
 a. Malfunction or damage caused by mis-operation or modification or improper repair
 b. Malfunction or damage caused by a drop after purchase and transportation
 c. Malfunction or damage caused by fire, earthquake, flood, lightening, abnormal input voltage, contamination, or other natural disasters
2. When service is required for the product at your work site, all expenses associated with field repair shall be charged to the purchaser.
3. Always keep this manual handy; please do not lose it. Please contact your Hitachi distributor to purchase replacement or additional manuals.

2. Name of each portion (removed front cover)

□ Connector for dedicated operator for NES1-OP

□ RUN/STOP/RESET keys

□ Intelligent relay terminal
→ P8 to 9

□ Main terminal
→ P8 to 9

□ Switch for termination resistor SW4
OFF (Default) → P9 | ON

□ Switch for RS485/OPE SW5
RS485 | OPE (Default)
→ P9

□ RS422/RS485 port

□ Switch for O/OI (analog input) changeover SW6
Current OI | Voltage O (Default)
→ P9

□ Logic terminal A

□ Logic terminal B
→ P8 to 9

□ Charge indicator lamp

Name	Description
□ Connector for dedicated operator for NES1-OP	Dedicated operator for NE-S1 (NES1-OP) can be connected on this connector.
□ RUN/STOP/RESET key	Push key for run, stop and reset operation.
□ Intelligent relay terminal	Output terminal for intelligent relay (1 from c contact).
□ Main terminal	For connecting power supply, motor output and DC reactor.
□ Switch for termination resistor	Switch for integrated termination resistor (100Ω) for RS485.Integrated resistor of 100Ω is connected when switched ON.
□ Switch for RS485/OPE	Changeover switch for RS422/RS485 communication setting.
□ RS422/RS485 port	Connector for RS485 external operator or PC software (RJ45 jack)
□ Switch for O/OI (analog input) changeover	Voltage input (O) or current input (OI) can be selected using this switch.
□ Logic terminal A,B	Terminal for connecting input/output signals (digital/analog) for the inverter control.
□ Charge indicator lamp	Turns ON when the internal DC bus voltage is 45V or more. In case of wiring, maintenance or else, please be sure to check that this lamp is turned OFF after waiting 10 minutes of power OFF.

Note 1) Refer to page 13 for the description of the display and key operation.
Note 2) Position of □charge lamp depends on the model. Refer to page 11 for the details.
Note 3) Pay attention when operating by PC via □RS422/RS485 port, as the operation can also be done from the panel of the inverter.
Note 4) Be sure to turn power OFF when connecting or disconnecting the operator such as OPE-SRmini, OPE-S, WOP to the □RS422/RS485 port.

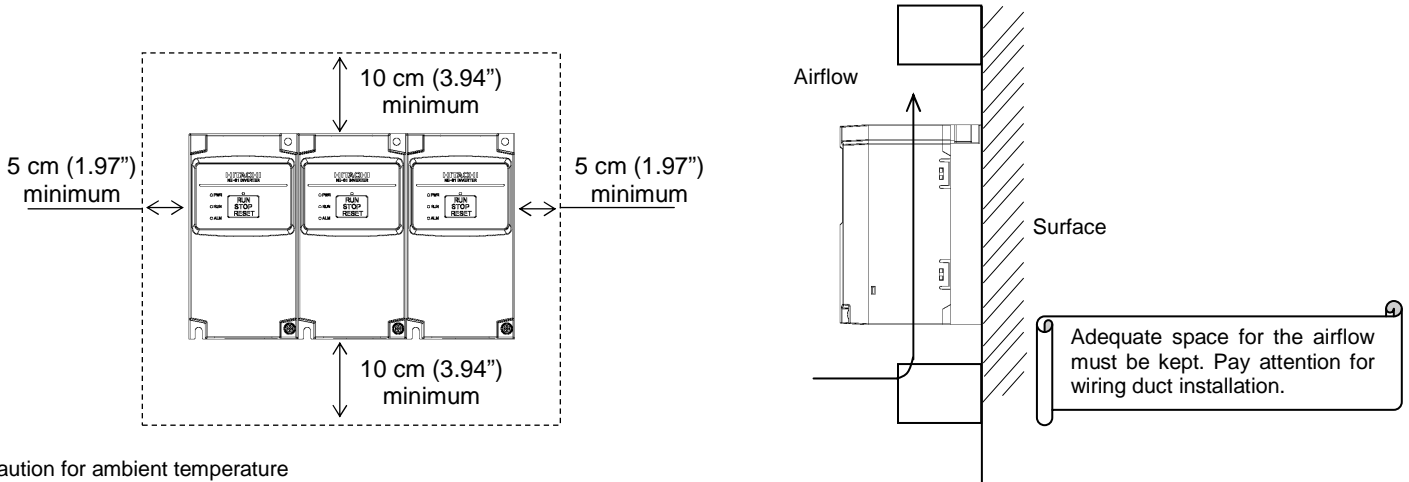## 3. Cautions for installation

□Caution during transportation
Please pay attention when carrying the product as it is covered by a plastic case.
Especially, do not put pressure onto the front cover and terminal cover. Otherwise there is a risk of damaging the product.
Please do not use products that are damaged, and/or lacking components.

☐Ensure Adequate Ventilation

To summarize the caution messages – you will need to find a solid, non-flammable, vertical surface that is in a relatively clean and dry environment. In order to ensure enough room for air circulation around the inverter to aid in cooling, it is recommended to maintain the specified clearance and the inverter specified in the below diagram.

10 cm (3.94")
minimum

5 cm (1.97")
minimum

5 cm (1.97")
minimum

10 cm (3.94")
minimum

Airflow

Surface

Adequate space for the airflow must be kept. Pay attention for wiring duct installation.

☐Caution for ambient temperature

Verify ambient temperature at installation site is within the standard specification range (-10~50°C). Measure ambient temperature 5cm from the bottom center of inverter main body and confirm that it is within the allowable temperature range.

Using the inverter at higher temperature than allowable temperature may result in shortening of lifetime of inverter (especially of electrolytic capacitors). A derating curve is shown on QRG (Please refer to the website.)

☐Do not install the inverter in such places as high temperature, high humidity, or prone to condensation.

Use the inverter within the allowable humidity range (20~90%RH) described in standard specifications.

Especially, please use it in place where no condensation occurs. If condensation occurs and beading is generated inside the inverter, electronic parts are short-circuited each other to cause a failure. Also, please avoid installing it in direct sunlight.

☐Caution for installation environment

Please avoid installing the inverter in such places where dust, corrosive gas, explosive gas, flammable gas, mist of grinding fluid, or salt pollution, etc. exists.

Invasion of dust, dirt etc. into the inverter may cause a failure. So, when you use it in dusty place by necessity, please devise a countermeasure such as putting it into a closed type chassis.

⚠ CAUTION
-Reduction of the carrier frequency or using bigger kW model is required if depends on the load or ambient.

⚠ WARNING
- Do not open the front cover during operation.

☐Cautions for installation direction

Surface of the installation must be no vibration, and should be capable of holding the weight of the product. And the product must be fixed to the surface with proper screws in a vertical direction. Be sure to screw using all the screw holes for the installation.
(002L/SB, 004L/SB, 007LB : 2 positions, 007SB, 015L/SB, 022L/SB : 4 positions)
There is a risk of performance failure, and/or breakdown when the product is not installed vertical direction.
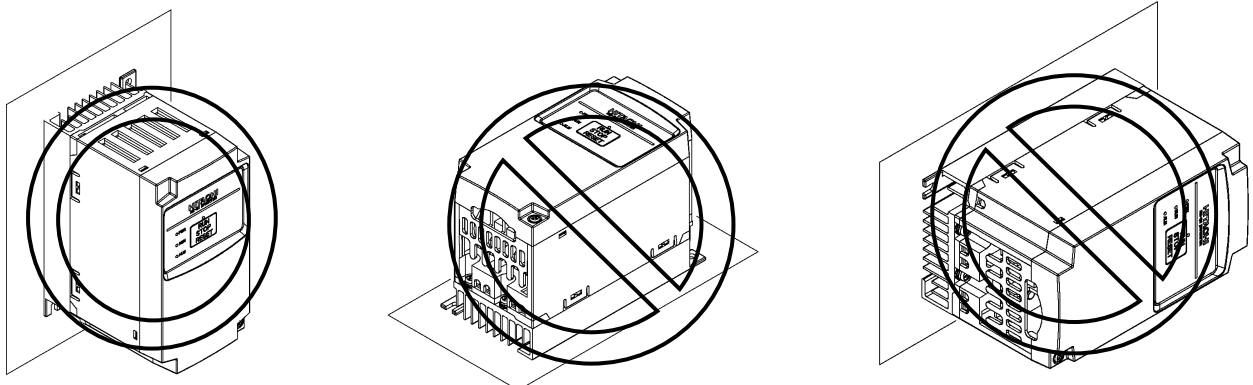
□Cautions for installation into the cabinet

Please pay attention to the location of the ventilation holes of the inverter and the cabinet, in case of side-by-side installation and using ventilation fan.

cooling performance of the inverter highly depends on the location of the holes. Please pay high attention to the ambient temperature of the inverter to be less than the specified value.

Position of the ventilation

□Watt Loss

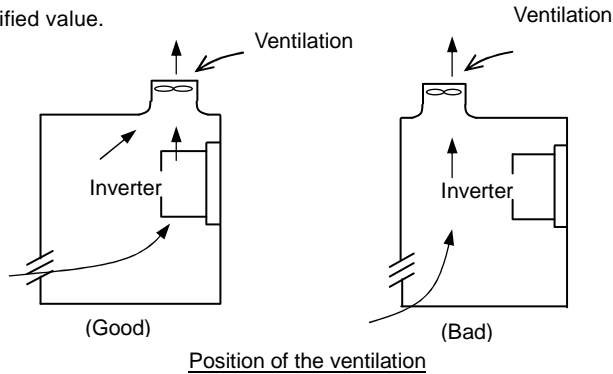1-ph./3-ph. 200V class

Model name	002S/L	004S/L	007S/L	015S/L	022S/L
Watt Loss (100% load)(W)	22	30	48	79	104
Efficiency at rated load(%)	90	93	94	95	95.5

4.1 How to attach and remove the front cover

(1) How to remove

□ Loosen up the screw

□ remove the cover by pressing the bottom side of the cover to the direction shown below.

□ Move the wiring plate like shown below in case of wiring.

Press in this direction
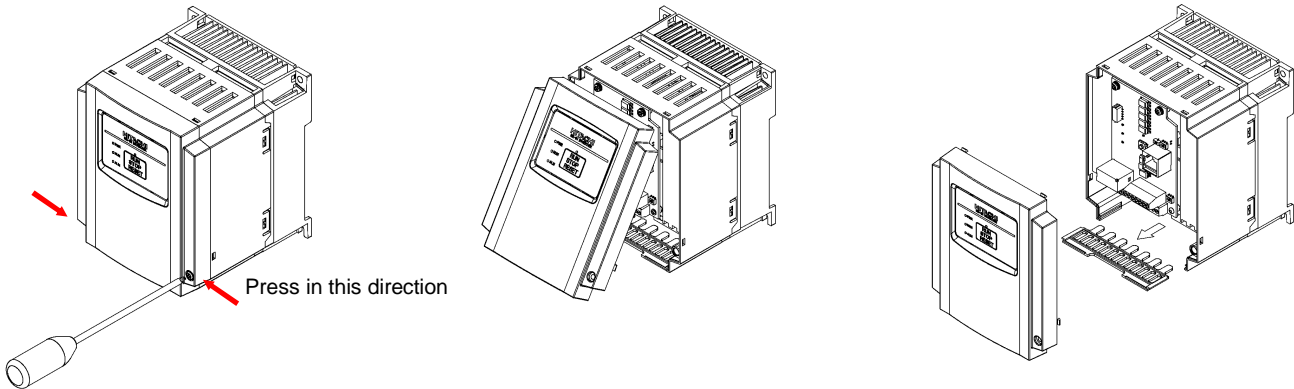
Screw for fixing the front cover is located at right-bottom side

Window for connecting

Front cover

Screw for fixing front cover

Screw for fixing front cover
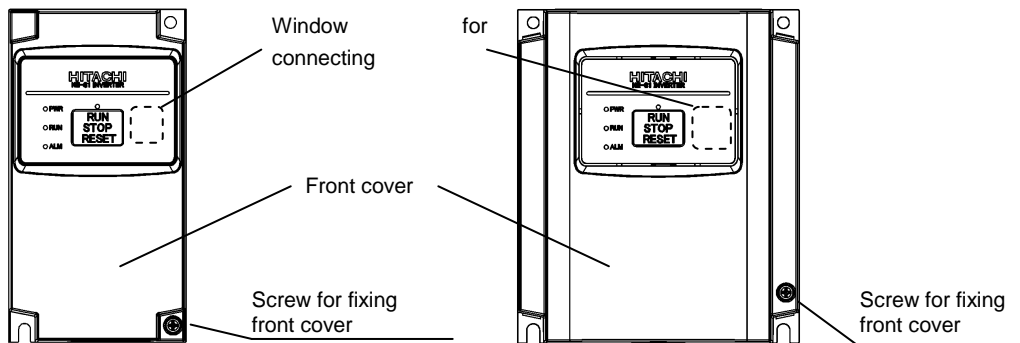
(2) It is necessary to make window on the front cover when using remote operator (OPE-S/SR/SBK/SRmini, WOP), Modbus-RTU, or PC software (ProDriveNext). See above for the position of the window.
  - Be sure to make window after removing the front cover.
  - There are cutouts at the window, so it can be removed easily by pressing up side and bottom side of the window alternatively.
  - The window cannot be restored if it is once opened. Please use commercially supplied RJ45 connector cap or the like if necessary.

(3) How to attach
  - Press the front cover to the main body until there is a click sound.
  - Do not tighten the screw too much.

4.2 Wiring and terminal description
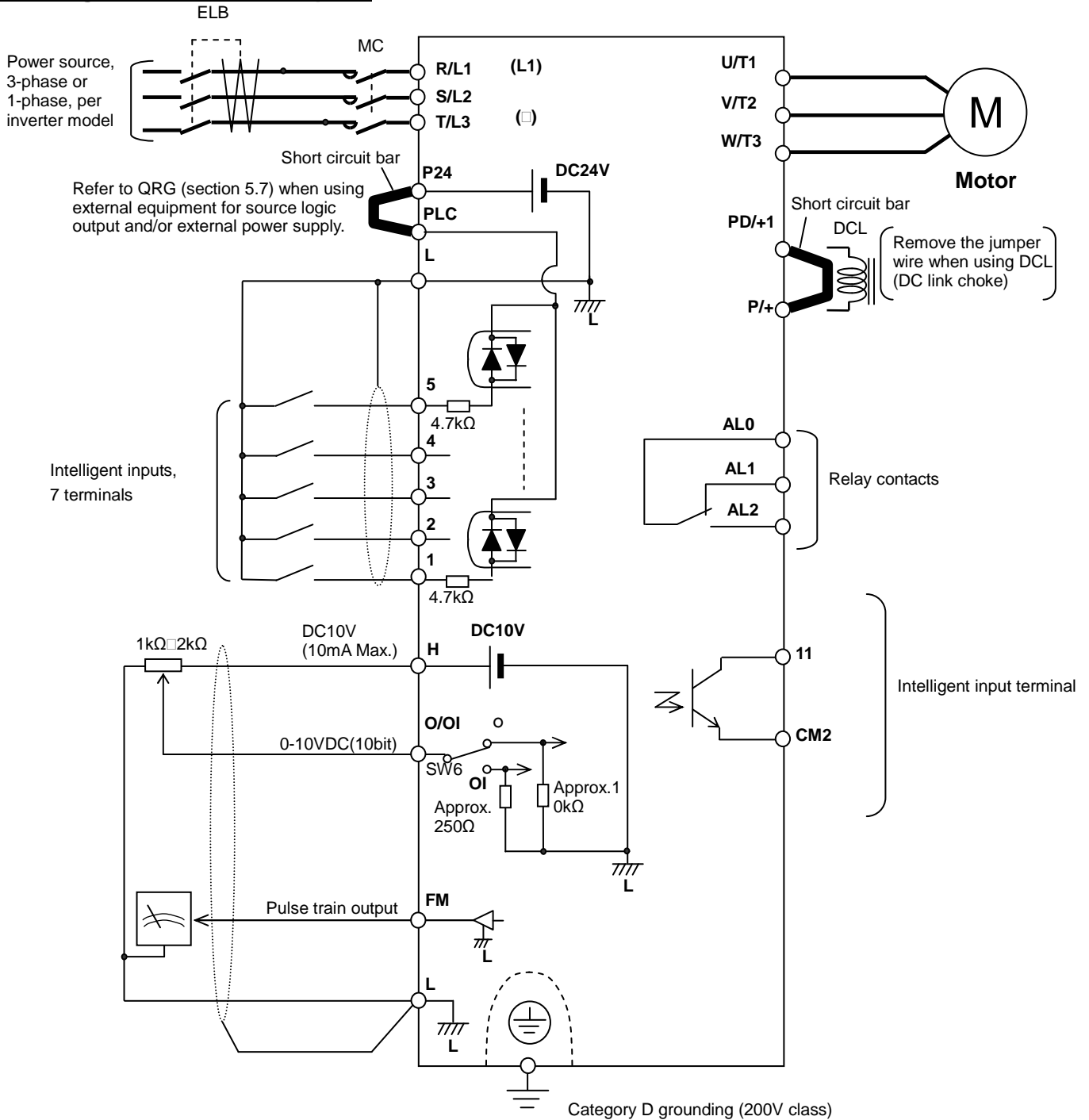
Note 1) Above shows an example of voltage (O) input. Changeover of SW6 must be done in case of current (OI) input. (Refer to page 9).

(1) Mains terminal description

Symbol	Name	Description
R/L1(L1)		Connect power supply
S/L2	Power input terminals	- Use [L1] and [N] terminal in case of 1-ph. 200V power supply
T/L3(N)		
U/T1		
V/T2	Power output terminals	Connect 3-ph. motor
W/T3		
PD/+1	DC link choke connection terminal	First, remove the short circuit bar between PD/+1 and P/+ terminal. Then connect optional DC link choke for improving the input harmonics.
P/+		
G(⏚)	Earth terminal	To make grounding. Be sure to make this grounding to avoid electric shock, and for improving the EMC performance. The terminal is located on the heatsink.

(2) Control terminal description

Category		Symbol	Name	Description	Electrical characteristics
Analog	Power supply	L	Common for input signals	Common for internal control power supply, digital inputs/outputs, analog inputs/outputs	
		H	Power supply for external potentiometer	DC10V power supply. Used with variable resistor for O input.	Max.10mA withdraw
	Freq. set	O/OI	Analog voltage (Use SW6 for selection)	Frequency set via DC0~10V input	Input impedance=apprx.10kΩ Allowable range; -0.3~+12VDC
			Analog current (Use SW6 for selection)	Frequency set via 0~20mA Parameter adjustment should be done in case of 4~20mA	Input impedance=apprx.250Ω Allowable range; 0~24mA
Digital	Power supply	L	Common of digital and analog Inputs	Common for internal control power supply, digital inputs, analog inputs/outputs	
		P24	Power supply for digital inputs	DC24V power supply for dry contact input. (Common terminal in case of source logic)	Max.100mA output
		PLC	Power supply terminal for input terminals	Sink logic : connected to P24 Source logic : connected to L Remove the jumper wire when using external power supply for controlling the dry contact inputs (Refer to "QRG"5.7)	

Category			Symbol	Name	Description	Electrical characteristics
Digital	Input	Contact	5 4 3 2 1	Intelligent input terminals	Select 5 functions from 35 available functions which can be assigned to any terminal 1 to 5. Sink or source logic can be selected. Refer to section 7.3 of "QRG" for the details	Voltage between each input and PLC - V(ON) = min.18V - V(OFF) = MAX.3V - Max. allowable voltage = 27VDC - Load current 5mA (24V)
	Output	Open-collector	11	Intelligent output terminals	One function from 28 available functions can be assigned. Refer to section 7.3 of "QRG" for the details	Open collector output Between 11 and CM2 - Voltage drop during ON=4V or less - Max. allowable voltage = 27V - Max allowable current = 50mA
			CM2	Common for intelligent output terminals	Common for the terminal 11.	Max. allowable current = 100mA
		Relay	AL0 AL1 AL2	Intelligent relay outputs	One function from 28 available functions can be assigned. (1-c contact) Refer to section 7.3 of "QRG" for the details.	Max. contact capacity AL1-AL0 : AC250V, 2A(resistive),0.2A(inductive) AL2-AL0 : AC250V, 1A(resistive),0.2A(inductive) Min. contact capacity AC100V, 10mA DC5V, 100mA
		Pulse train	FM	Digital pulse train output	(PTO) Pulse frequency maximum is 3.6kHz	Pulse voltage : DC0/10V output Max. allowable current : 2mA

(3) Changeover switch description

Refer to page 5 for the location of the switches.

⚠ **CAUTION**

- Adjustment of the switch must be done during power off. Otherwise there is a risk of electric shock.
- Power ON must be done after closing the front cover. Do not open the front cover during power up, or when there is a remaining voltage.
  There is a risk of electric shock.

Symbol	Name	Description	
SW4	Termination resistor selection switch	Select able/disable of the termination resistor of RS485 port (RJ45)	
		OFF (left side)	Termination resistor (100Ω) Disable (Default)
		ON (right side)	Termination resistor (100Ω) Able
SW5	RS485/OPE(RS422) selection switch	Select depending on the options and communication method, connected to RS422/RS485 port.	
		OFF(right side)	For operator (OPE-S/SR/SBK/SRmini),ProDriveNext (Default)
		ON(left side)	For RS485 communication (Modbus-RTU)
SW6	Analog input (O/OI) selection switch	OFF (left side)	Current input (0~20mA) OI
		ON (right side)	Voltage input (0~10Vdc) O (Default)

• • •

4.3 Mains wiring

(1) Cautions on wiring

Be sure to confirm that the charge lamp is turned OFF before the wiring work.

Once it is powered up, there will be a remaining voltage at the DC bus capacitor for a certain period regardless the motor operation.

Wiring work must be done 10 minutes after the power off, and after confirming the safety of personnel.

In case the power indication of the operator does not turn ON after power-up, inverter may be damaged. In that case, the inspection must be done after waiting two hours or more of the power OFF. Otherwise there is a danger of electric shock and/or injury.

◻Mains input terminals (R/L1,S,T/N)

◻ Use earth leakage breaker (ELB) for protection between power supply and input terminals (R/L1,S,T/N).

◻ The ELB is recommended to have bigger capability for the high frequency sensitivity, so to avoid malfunction.

Distance between inverter and motor	Cutoff current of ELB
100m or less	30mA
300m or less	100mA
800m or less	200mA

[Rough indication of earth leakage current] 30mA/km : use CV cable with metallic tube. Leakage current will be approximately 8 times more when using H-IV cable.

Therefore, it is recommended to use one class bigger capability of the ELB. Previously mentioned "leakage current" is based on the RMS value of fundamental wave, excluding harmonic current.

◻ There is a possibility that the malfunction or failure of the customer's system when the protection circuit of the inverter is activated. Please use magnetic contactor to shutoff the inverter power supply.

◻ Do not turn power ON and OFF by the magnet contactor at the primary side or secondary side of the inverter to start and stop the motor. Use operation command (FW, RV) from the control input terminal in case of using external signal.

◻ Do not use the 3-ph input type with single phase input (phase loss). Otherwise there is a risk of inverter failure. Single phase input to the 3 phase type inverter will result in an undervoltage, overcurrent, or will result in a damage of the inverter. [DC bus capacitor will be charged even under phase loss and it is dangerous. Refer to "(1) Cautions for wiring" for the wiring.]

◻ There is a risk of breakdown of the internal converter module, and/or shortening drastically the lifetime of DC bus capacitors due to an increase of the ripple current. Especially, if high reliability is required on the system, use AC reactor between power supply and inverter. And if severe weather,such as thunderstorms is expected, use appropriate lightning protection equipment.
- Unbalance at the input voltage (3% or more)
- Impedance of the power supply is 10 times or more, and 500kVA or more
- Rapid change is voltage is expected
(Example)   - 2 or more inverters are connected at the same net with short cable.
- Inverter is connected in parallel with the thyristor equipment with short cable.
- Phase advancing capacitor is switching on a same net

◻ Frequency of the power ON/OFF must be once/3 minutes or longer interval. There is a danger of inverter failure.

◻ An inverter run by a private power generator may overheat the generator or suffer from a deformed output voltage waveform of the generator. Generally, the generator capacity should be five times that of the inverter (kVA) in a PWM control system or six times greater in a PAM control system.

◻ In the case of important equipment, to shorten the non-operational time of inverter failure, please provide a backup circuit by commercial power supply or spare inverter.

◻ In case of commercial power source switching functionality, mechanically interlock the MC1 & MC2 contacts with each others. Otherwise you may damage the inverter and the danger of injury and/or fire.Please refer to following diagram.
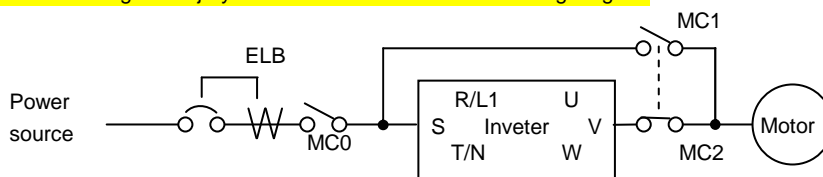
◻Inverter output terminals (U, V, and W)

◻ Use larger gauge cable leads than the specified applicable cable for the wiring of output terminals to prevent the output voltage drop between the inverter and motor. Especially at low frequency output, a voltage drop due to cable resistance will cause the motor torque to decrease.

◻ Do not connect a phase-advanced capacitor or surge absorber on the output side of the inverter. If connected, the inverter may trip or the phase-advanced capacitor or surge absorber may be damaged.

◻ If the cable length between the inverter and motor exceeds 20 m (especially in the case of 400 V class models), the stray capacitance and inductance of the cable may cause a surge voltage at motor terminals, resulting in a motor burnout. A special filter to suppress the surge voltage is available. If you need this filter, contact your supplier or local Hitachi Distributor.

◻ When connecting multiple motors to the inverter, connect a thermal relay to the inverter output circuit for each motor.

◻ The RC rating of the thermal relay must be 1.1 times as high as the rated current of the motor. The thermal relay may go off too early, depending on the cable length. If this occurs, connect an AC reactor to the output of the inverter.

◻DC reactor connection terminals (PD and P)

◻ Use these terminals to connect the optional DC power factor reactor (DCL).

As the factory setting, terminals P and PD are connected by a jumper. Remove this to connect the DCL.

◻ The cable length between the inverter and DCL must be 5 m or less.

Remove the jumper only when connecting the DCL. If the jumper is removed and the DCL is not connected, power is not supplied to the main circuit of the inverter, and the inverter will not operate.

☐Inverter ground terminal (G ⏚)

☐ Be sure to ground the inverter and motor to prevent electric shock.

☐ According to the Electric Apparatus Engineering Regulations, connect 200 V class models to grounding electrodes constructed in compliance with type-D grounding (conventional type-III grounding with ground resistance of 100Ω or less) or the 400 V class models to grounding electrodes constructed in compliance with type-C grounding (conventional special type-III grounding with ground resistance of 10Ω or less).

☐ Use a grounding cable thicker than the specified applicable cable, and make the ground wiring as short as possible.

☐ When grounding multiple inverters, avoid a multi-drop connection of the grounding route and formation of a ground loop, otherwise the inverter may malfunction.
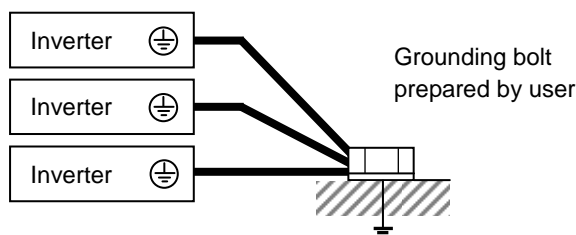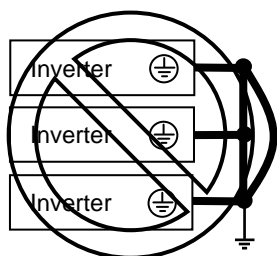
(2) Layout of main circuit terminals

The figures below show the terminal layout on the main circuit terminal block of the inverter.

The main circuit terminal block opens a faceplate and wires it.

Single-phase 200V   0.2 to 0.4kW
Three-phase 200V   0.2 to 0.75kW

Single-phase 200V   0.75 to 2.2kW
Three-phase 200V   1.5, 2.2kW

(4)Wiring and Accesories

The table below lists the specifications of cables, crimp terminals, and terminal screw tightening torques for reference.
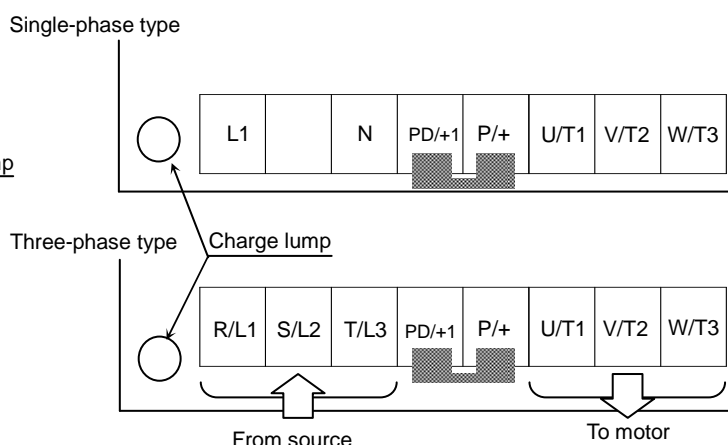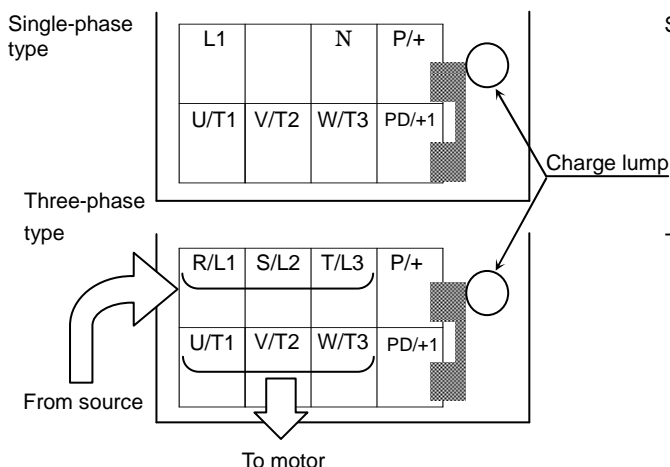
Input Voltage	Motor output (kW)	Applicable inverter model NES1-	Wiring			Accessories Note1)		
			Gauge of power line cable (mm²) Note3) Note4)	Size of terminal screw ⎡Terminal width⎤ (mm)	Tightening torque (N-m)	Earth-leakage breaker (ELB) Note2)Note5)	Magnetic contactor (MC) Note2)	Fuse (UL-rated, class J,600V) Note6)
1-phase 200V	0.2	002SB	AWG14 (2.0)	M3.5 (7.6)	1.0	EX30 (5A)	H10C	10A
	0.4	004SB	AWG14 (2.0)	M3.5 (7.6)	1.0	EX30 (10A)	H10C	10A
	0.75	007SB	AWG14 (2.0)	M4 (10)	1.4	EX30 (15A)	H10C	15A
	1.5	015SB	AWG10 (5.5)	M4 (10)	1.4	EX30 (20A)	H20	20A
	2.2	022SB	AWG10 (5.5)	M4 (10)	1.4	EX30 (20A)	H20	30A
3-phase 200V	0.2	002LB	AWG16 (1.25)	M3.5 (7.6)	1.0	EX30 (5A)	H10C	10A
	0.4	004LB	AWG16 (1.25)	M3.5 (7.6)	1.0	EX30 (10A)	H10C	10A
	0.75	007LB	AWG16 (1.25)	M3.5 (7.6)	1.0	EX30 (10A)	H10C	15A
	1.5	015LB	AWG14 (2.0)	M4 (10)	1.4	EX30 (15A)	H10C	15A
	2.2	022LB	AWG14 (2.0)	M4 (10)	1.4	EX30 (20A)	H20	20A

Note 1)The peripheral equipment described here is applicable when the inverter connects a standard Hitachi 3-phase, 4-pole squirrel-cage motor.
Note 2)Select breakers that have proper capacity. (Use breakers that comply with inverters.) Select above proper ELB capacity following above table for the inverter. Only one inverter must be supplied by the above proper ELB.
Note 3)If the power line exceeds 20m, cable that is thicker than the specified applicable cable must be used for the power line.
Note 4)Use copper electric wire (HIV cable) of which the maximum allowable temperature of the insulation is 75℃.
Note 5)Use earth-leakage breakers (ELB) to ensure safety.
Note 6)To comply UL, use either ELB/or FUSE which is specified by UL for the Power supply for the inverter.
Note 7)The ground or earthed line should be a larger gauge than electric supply wire diameter used in the power line.

5.1 Confirmation before power up the inverter

Please confirm the followings before operation.

(1) Connection of the power input (R,S,T, L1,N) and motor (U/T1, V/T2, W/T3) is correctly connected. Otherwise there is a risk of inverter failure.

(2) There must be no incorrect-connection of the control wiring. Otherwise there is a risk of inverter failure.

(3) Earth grounding is properly connected. Otherwise there is a risk of electric shock.

(4) There is no ground fault other than earth grounding terminal. Otherwise there is a risk of inverter failure.

(5) There must be no short circuit such as wire strands or chips etc., there must be no tools left inside the inverter. Otherwise there is a risk of inverter failure.

(6) There must be no short circuit or ground fault at the output side. Otherwise there is a risk of inverter failure.

(7) Front cover must be closed. Otherwise there is a risk of inverter failure.

5.2 Changing parameters

One of the following is required when changing parameters on NE-S1 series inverters.

(1) Dedicated operator (NES1-OP)
    The operator (NES1-OP) is used with integration onto the inverter. It is not possible to use the operator external with cable.

(2) Digital operator (OPE-SRmini,OPE-S/SR/SBK)
    Digital operator can be used with connector cable (ICS-1,3) and connected to the RS422/RS485 port (RJ45) in the inverter. Turn the changeover switch to the operator side (OFF side) in that case (See page 9). Refer to the manual for each operator for the detailed information.

(3) 5-line LCD operator (WOP)
    WOP having serial number of "16918938000081" or later (2011/07 production) is applied to NE-S1 series inverter. (English only)
    WOP can be used with connector cable (ICS-1,3) and connected to the RS422/RS485 port (RJ45) in the inverter. Turn the changeover switch to the operator side (OFF side) in that case (See page 9). Refer to the manual for WOP for the detailed information.

(4) PC programming tool (ProDriveNext)
    ProDriveNext Version "1.2.33.000" and later is applied to the NE-S1 series inverter.
    PC can be used with connector cable (ICS-1,3) and connected to the RS422/RS485 port (RJ45) in the inverter. Turn the selection switch to the operator side (OFF side) in that case (See page 9). Refer to the manual for ProDriveNext for the detailed information.

NOTE: It is necessary to turn power off to store the changed data.

5.3 Power up the inverter

(1) Power up the inverter after confirming the items shown in above section 5.1.

(2) Confirm the LED is emitting like shown below.
  - Standard panel : Confirm that both PWR lamp and Key valid lamp are emitting
  - Dedicated operator (NES1-OP) : Confirm that the PWR lamp is emitting. Display will be the one set by b038 (Initial display selection).
   "0.00(output frequency monitor)" will be displayed under default condition.

(3) Refer to section "5.4 Operating the inverter" and set required parameters. And then refer to section "5.5 Motor operation".
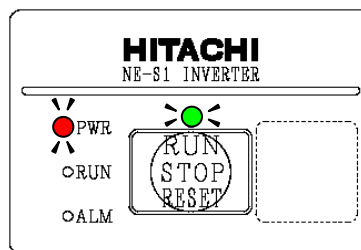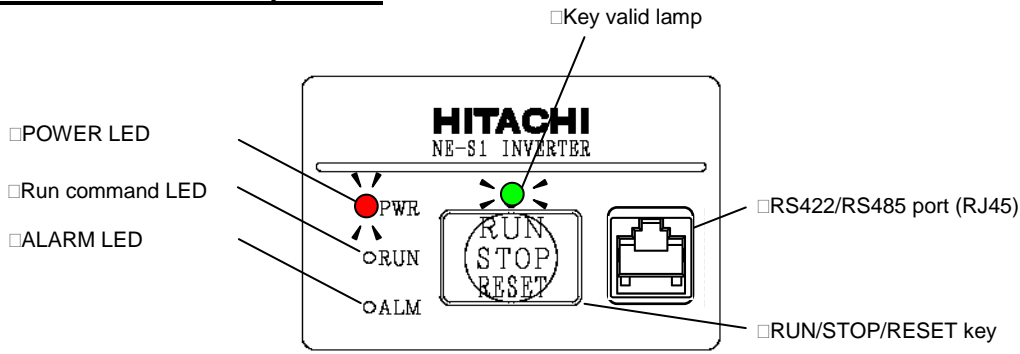

Standard panel

Note 1) It will take around 1.5 seconds for the inverter to be ready(each LED emits). Please take in account this delay in case of an application , for which this delay will be important.

5.4 Names and functions of components

<u>Standard panel</u>

- □Key valid lamp
- □POWER LED
- □Run command LED
- □ALARM LED
- □RS422/RS485 port (RJ45)
- □RUN/STOP/RESET key

Name	Description
□POWER LED	- Turns on (red) during inverter is powered up
□Run command LED	- Turns on (green) during inverter operation. (This turns ON either Run command is given, or the inverter is giving out power. Therefore it keeps turning on during 0 Hz driving, or keeps turning on during deceleration period even after the run command is OFF.
□ALARM LED	- Turns on (red) when the inverter is in trip status. - Refer to section 6.8 of QRG how to reset the trip status.
□Key valid lamp	- Turns on (green) when the RUN/STOP/RESET is ready. It turns off when there is a RUN command. If the run command is being given from the RUN/STOP/RESET key, the lamp is being on during deceleration period even after the run command is OFF. While Run command is given such as FW(RV) terminal,if "RUN/STOP/RESET key" was pressed, even Run command is OFF, the "Key valid lamp" is OFF until inverter is Stopped.
□RUN/STOP/RESET key	- Makes inverter run, stop and reset. RUN/STOP/RESET key is set default and it can be made invalid by the key sensitivity selection (C151) to "no". - It restores from the trip state if the inverter is in trip state. - If the ModBus communication is selected, it can be temporary changed to an external operator mode if the inverter is powered up with pressing the RUN/STOP/RESET key and keep it pressing 5seconds,and take off from the key.. Changeover switch must be changed later on. Note 1)
□RS422/RS485 port (RJ45)	- This is a port for external operator, Modbus connection, or ProDriveNext (RS485/operator changeover switch must be operated) before Power ON. In case of Modbus communication, it is necessary to set the changeover switch and parameter (C070). Display of NES1-OP will be according to the parameter set of b150 continuously, if the external operator is connected while the dedicated operator (NES1-OP) is integrated. Note2)

Note 1) It is necessary to set changeover switch and the parameter C070 for releasing the Modbus communication. If the parameter C070 is set to Modbus, external operator via the RS45 jack cannot be used.
Note 2) Connecting to the RJ45 jack must be done during the inverter power off.

5.5 Motor operation

   Both "Run command" and "frequency command" is necessary to run the motor. Motor does not run if one of each is missing. For example, motor will not run when a run command is given, but a frequency command is 0Hz. Additionally, the motor will not run if a FRS (free run stop) signal (and the like) is being given.

   NE-S1 series inverter has following way to set the run command and frequency command. (This is an example of sink logic and uses internal control power supply.)

Driving method in the default 5.5.1→

5.5.1 Driving with the standard panel

RUN/STOP/RESET key on the standard operation panel is effective regardless of the setting of the driving order method(A002). Thus, the following operation method (1) to (3) is possible without an option if it is an initial value.

(1)Method to perform driving in RUN/STOP/RESET key and perform frequency setting in Multispeed select

This is the operation method using Run command is given by "RUN/STOP/RESET key" & Frequency setting is given by Fixed value such as 20/40/60Hz, Accel&Decel time is 10 seconds. If you don't need to change parameters such as Accel&Decel time, the optional Operator is not required.) To use the set Freq. setting, use the Multi-speed default frequency setting (1=60Hz),(2=40Hz),(3=20Hz).

■Control circuit terminals wiring

| 4 | 3 | ... | L | PLC | P24 |

CF2   CF1

■Setup

Function Name	Code	Data	Note
Input [3] function	C003	02(CF1)	Default
Input [4] function	C004	03(CF2)	

The initial value of Acceleration/ Deceleration time is 10sec.

Please change the following parameters as needed.

Function Name	Code	Setting Range	Note
Acceleration time	F002	0.00 to 3600sec.	Default□10 sec.
Deceleration time	F003	0.00 to 3600sec.	Default□10 sec.

□ One of the following is required when changing parameters on NE-S1 series inverters.
　　□ Dedicated operator (NES1-OP) □ Digital operator 　□ 5-line LCD operator
　□ Modbus 　□ PC programming tool (ProDriveNext)
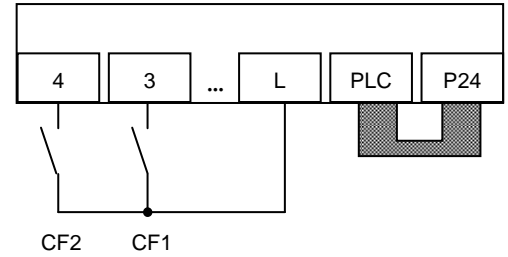
■Example of use(default)

	Intelligent input terminal [3]	Intelligent input terminal [4]
60Hz order	OFF	ON
40Hz order	ON	OFF
20Hz order	ON	ON

(2) Method to perform driving in RUN/STOP/RESET key and perform frequency setting in speed potentiometer

This is the operation method using Run command is given by "RUN/STOP/RESET key" & Frequency setting is given by analog input such as O-L voltage, Accel&Decel time is 10 seconds. If you don't need to change parameter such as Accel&Decel time, the optional Operator is not required.) Below diagram is to set the external Freq. setting connecting H-O-L volume to supply O-L voltage.

■Control circuit terminals wiring

| H | O/OI | L | PLC | P24 |

Frequency setting resistor

■Setup

Function Name	Code	Data	Note
Frequency source	A001	01(Control circuit terminals)	Default

The initial value of Acceleration/ Deceleration time is 10sec.

Please change the following parameters as needed.

Function Name	Code	Setting Range	Note
Acceleration time	F002	0.00 to 3600 sec.	default□10 sec.
Deceleration time	F003	0.00 to 3600 sec.	default□10 sec.

□ One of the following is required when changing default parameters on NE-S1 series inverters.
　　□ Dedicated operator (NES1-OP) □ Digital operator 　□ 5-line LCD operator
　□ Modbus 　□ PC programming tool (ProDriveNext)

Note)
The above is a method to perform analog input(O/OI) by voltage input. It is necessary for SW6 on the board to be set for voltage input(default). →P9

(3) Method to perform driving in FW/RV teraminal and perform frequency setting in volume resistor

This is the operation method using Run command is given by intelligent input terminal such as FW(RV) function & Frequency setting is given by analog input such as O-L voltage. If you don't need to change such as Accel&Decel time, optional Operator is not required.) Below diagram is to set the external Freq. setting connecting H-O-L volume to supply O-L voltage.

■Control circuit terminals wiring

| H | O/OI | L | 2 | 1 | L | PLC | P24 |

Frequency setting resistor　　RV　FW

■Setup

| Function Name	Code	Data	Note
Frequency source	A001	01(Control circuit terminals)	Default
Run command source	A002	01(Control circuit terminals)	Default
Input [1] function	C001	00(FW)	Default
Input [2] function	C002	01(RV)	

The initial value of Acceleration/ Deceleration time　is 10sec.

Please change the following parameters as needed.

Function Name	Code	Setting Range	Note
Acceleration time	F002	0.00 to 3600 sec.	Default□10 sec.
Deceleration time	F003	0.00 to 3600 sec.	Default□10 sec.

□ One of the following is required when changing default parameters on NE-S1 series inverters
　　□ Dedicated operator (NES1-OP) □ Digital operator 　□ 5-line LCD operator
　□ Modbus 　□ PC programming tool (ProDriveNext)

Note)
The above is a method to perform analog input(O/OI) by voltage input. It is necessary for SW6 on the board to be set for voltage input(default). →P9

6.1 Specifications

Item		Three-phase 200V class Specifications					Single-phase 200V class Specifications				
WJ200 inverters, 200V models		002L	004L	007L	015L	022L	002S	004S	007S	015S	022S
Applicable motor size Note1)	kW	0.2	0.4	0.75	1.5	2.2	0.2	0.4	0.75	1.5	2.2
	HP	1/4	1/2	1	2	3	1/4	1/2	1	2	3
Rated capacity(kVA)	200V	0.4	0.9	1.3	2.4	3.4	0.4	0.9	1.3	2.4	3.4
	240V	0.5	1.0	1.6	2.9	4.1	0.5	1.0	1.6	2.9	4.1
Rated input voltage		Three-phase: 200V-15% to 240V +10%, 50/60Hz ±5%					Single-phase: 200V-15% to 240V +10%, 50/60Hz ±5%				
Rated output voltage Note2)		3-phase: 200 to 240V (proportional to input voltage)									
Rated output current (A)		1.4	2.6	4.0	7.1	10.0	1.4	2.6	4.0	7.1	10.0
Cooling method		Self-cooling			Force ventilation		Self-cooling			Force ventilation	
Braking (capacitive feedback) Note3)		Approx.50%			Approx.20 to 40%		Approx.50%			Approx.20 to 40%	
Weight	(kg)	0.7	0.8	0.9	1.2	1.3	0.7	0.8	0.9	1.2	1.3
	(lb)	1.6	1.8	2.0	2.7	2.9	1.6	1.8	2.0	2.7	2.9

Common specification

	Item	Specification
Protective housing (JIS C 0920,IEC60529)		IP20
Control	Control method	Sinusoidal Pulse Width Modulation (PWM) control
	Output frequency range Note4)	0.1 to 400 Hz
	Frequency accuracy Note5)	Digital command: ±0.01% of the maximum frequency Analog command: ±0.2% of the maximum frequency (25°C ± 10°C)
	Frequency setting resolution	Digital input: 0.01 Hz Analog input: Maximum output frequency/1000
	Volt./Freq. characteristic	V/f control (constant torque, variable torque)
	Overload capacity	150%/60 seconds
	Acceleration/deceleration time	0.01 to 3,600.0 seconds (in linear or curved pattern)2nd motors setting is possible
Input signal	Freq. setting	External signaladjustable resistor / 0 to +10 VDC /0 to 20 mA, ModbusOption operatorDedicated operator
	RUN/STOP Order	External digital input signal(3-wire input possible), Modbus Option OperatorDedicated Operator
	Intelligent input terminal	5terminals
	Analog input	1terminal(O/OI terminalVoltage input10bit/0 to 10V, Current input10bit/0 to 20mA selected with a selection switch)
Output signal	Intelligent output terminal	5 open-collector output terminals, 1 relay (1 from c-contact) output terminal
	Pulse Output	1terminal
connection	RS-422	RJ45 Connector ,(Common with RS485selecting it with a selection switch)Option Operator,ProDriveNext
	RS-485	RJ45 Connector ,(Common with RS422selecting it with a changeover switch)Modbus-RTU
General specification	Temperature Note6)	Operating (ambient): -10 to 50°C, / Storage: -20 to 65°C
	Humidity	20 to 90% humidity (non-condensing)
	Vibration	5.9m/s^2 (0.6G), 10 to 55 Hz
	Location	Altitude 1,000m or less, indoors (no corrosive gasses or dust)
	Standards Compliance	ULCEc-ULc-tick

Note1 The applicable motor refers to Hitachi standard 3-phase motor (4p). When using other motors, care must be taken to prevent the rated motor current (50/60Hz) from exceeding the rated output current of the inverter.

Note2 The output voltage decreases as the main supply voltage decreases (except when using the AVR function). In any case, the output voltage cannot exceed the input power supply voltage.

Note3 The braking torque via capacitive feedback is the average deceleration torque at the shortest deceleration (stopping from 50/60Hz as indicated). It is not continuous regenerative braking torque. The average deceleration torque varies with motor loss. This value decreases when operating beyond 50Hz.

Note4 To operate the motor beyond 50/60Hz, consult the motor manufacturer for the maximum allowable rotation speed.

Note5 To get motor stabilized operation, inverter output Frequency might exceeds preset maximum Freq.(A004/A204) by 2Hz in maximum.

Note6 Derating curve is shown on QRG (Refer to section 12.3 of QRG).

6.2 Dimensions
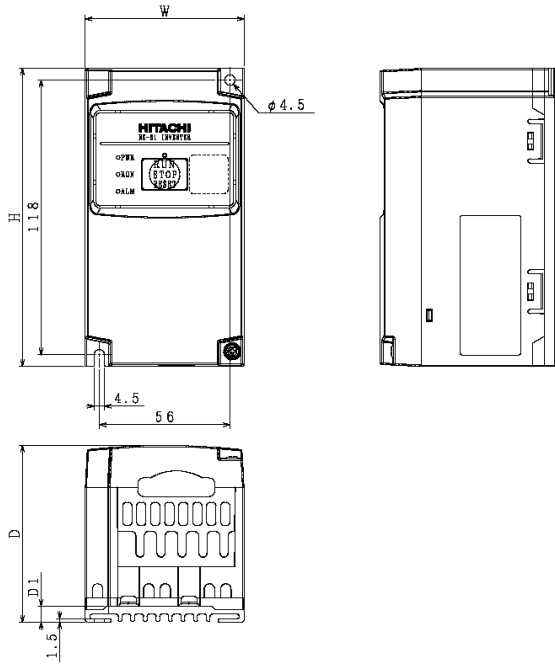
Model	W (mm)	H (mm)	D (mm)	D1 (mm)
NES1-002SB			76	7
NES1-004SB			91	21.5
NES1-002LB	68	128	76	7
NES1-004LB			91	21.5
NES1-007LB			115	46
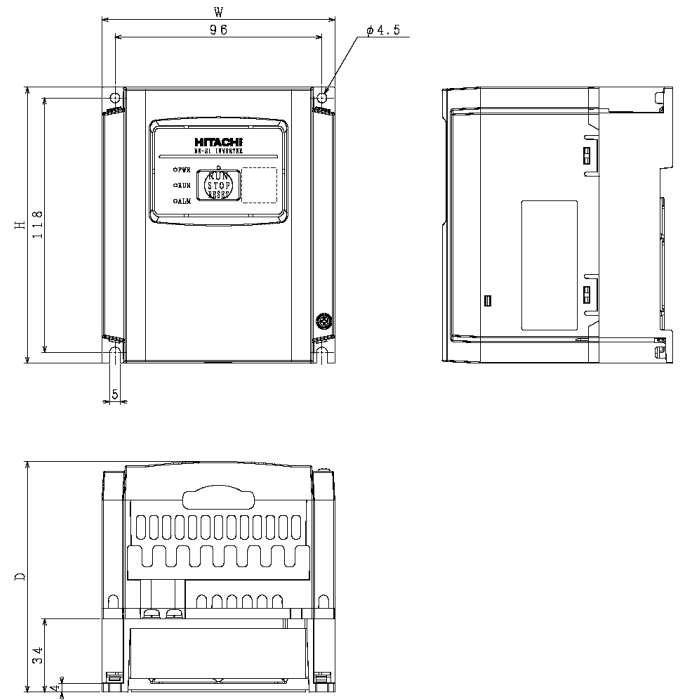
Model	W (mm)	H (mm)	D (mm)
NES1-015SB			107
NES1-022SB	108	128	125
NES1-015LB			107
NES1-022LB			125
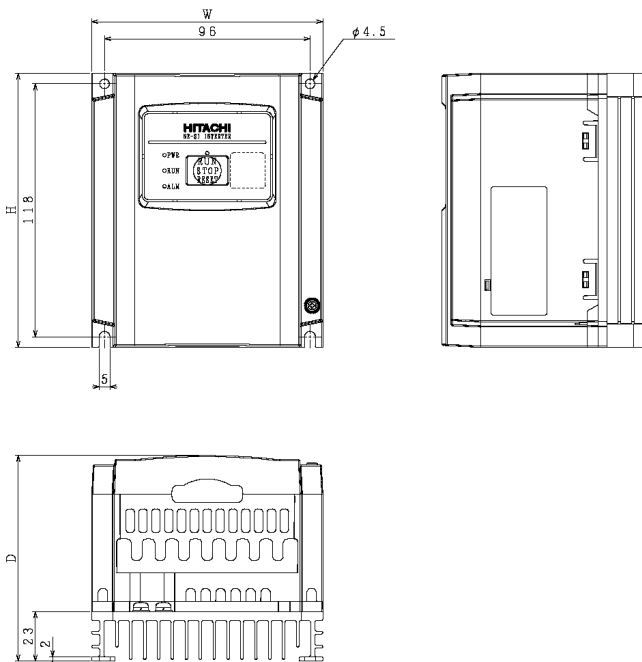
Model	W (mm)	H (mm)	D (mm)
NES1-007SB	108	128	96

SUITABILITY FOR USE

Hitachi Industrial Equipment Systems shall not be responsible for conformity with any standard, codes, or regulations that apply to the combination of products in the customer's application or use of the products.
Take all necessary steps to determine the suitability of the product for the Systems, machines, and equipment with which it will be used.
Please know and observe all prohibitions of use applicable to the products.
NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS
RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM
AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT
THE HITACHI INDUSTRIAL EQUIPMENT SYSTEMS PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

See also product catalogs

◎ **Hitachi Industrial Equipment Systems Co., Ltd.**

Appendix A: List of data setting

[Parameter Settings for Keypad Entry]

NE-S1 series inverters provide many functions and parameters that can be configured by the user. We recommend that you record all parameters that have been edited, in order to help in troubleshooting or recovery from a loss of parameter data.

Inverter model   NES1 [   ] } This information is printed on the specification label located on the right

MFG. No. [   ]

[Monitoring mode]

"d" Monitor Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
d001	Output frequency monitoring	0.00 to 99.99/100.0 to 400.0 (Hz)	✓	–	–
d002	Output current monitoring	0.0 to 655.3 (A)	✗	–	–
d003	Rotation direction monitoring	F(forward rotation) / o(stopped) / r(reverse rotation)	✗	–	–
d004	PID feedback monitoring	0.00 to 99.99/100.0 to 999.9/1000. to 9999./1000 to 9999(10000 to 99990)/□100 to □999(100000 to 999000)	✗	–	–
d005	Intelligent input terminal status	ON 「Example」 terminal 1,2 : ON terminal 3 to 5 : OFF 5 4 3 2 1 OFF	✗	–	–
d006	Intelligent input terminal status	ON 「Example」 terminal 11 : ON terminal relay : OFF rela 11 OFF	✗	–	–
d007	Scaled output frequency monitoring	0.00 to 99.99/100.0 to 999.9/1000. to 9999./1000 to 3999	✓	–	–
d013	Output voltage monitoring	0.0 to 600.0(V)	✗	–	–
d014	Input power monitoring	0.0 to 999.9(kW)	✗	–	–
d015	Cumulative power monitoring	0.0 to 999.9/1000. to 9999./1000 to 9999(10000 to 99990)/□100 to □999(100000 to 999000)	✗	–	–
d016	Cumulative operation RUN time monitoring	0. to 9999./1000 to 9999(10000 to 99990)/□100 to □999(100000 to 999000)(hr)	✗	–	–
d017	Cumulative power-on time monitoring	0. to 9999./1000 to 9999(10000 to 99990)/□100 to □999(100000 to 999000)(hr)	✗	–	–
d018	Heat sink temperature monitoring	-020. to 120.0(□)	✗	–	–
d050	Dual Monitoring	display the monitoring data selected by b160, b161	✗	–	–
d080	Trip counter	0. to 9999./1000 to 6553(10000 to 65530)(time)	✗	–	–
d081	Trip monitoring 1	Factor, frequency(Hz),current(A), voltage across P-N(V), running time(hours), power-on time(hours)	✗	–	–
d082	Trip monitoring 2		✗	–	–
d083	Trip monitoring 3		✗	–	–
d084	Trip monitoring 4		✗	–	–
d085	Trip monitoring 5		✗	–	–
d086	Trip monitoring 6		✗	–	–
d090	Warning monitoring	Warning code	✗	–	–
d102	DC voltage monitoring	0.0 to 999.9/1000.(V)	✗	–	–
d104	Electronic thermal overload monitoring	0.0 to 100.0(%)	✗	–	–

[Function mode (F Group)]

Note) Mark "✓" in [Run Mode Edit] shows the accessible parameters when b031 is set "10", high level access.

Func. Code	"F" Function		Run Mode Edit	Defaults	
	Name	Description		Initial data	Units
F001	Output frequency setting	Standard default target frequency that determines constant motor speed, range is 0.00 / start frequency to maximum frequency (A004)	✔	0.00	Hz
F002	Acceleration time (1)	Standard default acceleration, range is 0.00 to 3600 seconds.	✔	10.00	s
F202	Acceleration time (1), 2nd motor		✔	10.00	s
F003	Deceleration time (1)	Standard default deceleration, range is 0.00 to 3600 seconds.	✔	10.00	s
F203	Deceleration time (1), 2nd motor		✔	10.00	s
F004	Keypad RUN key routing	Two options; select codes: **00** …Forward **01** …Reverse	✖	00	–

[Function mode (A Group)]

"A" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
A001	Frequency source	Five options; select codes: 00 …POT on ext. operator 01 …Control terminal 02 …Function F001 setting 03 …Modbus network input 10 …Calculate function output	✘	01	–
A201	Frequency source, 2nd motor		✘	01	–
A002	Run command source	Three options; select codes: 01 …Control terminal 02…Run key on keypad, or digital operator 03 …Modbus network input	✘	01	–
A202	Run command source, 2nd motor		✘	01	–
A003	Base frequency	Settable from 30.0 Hz to the maximum frequency(A004)	✘	60.0	Hz
A203	Base frequency, 2nd motor	Settable from 30.0 Hz to the 2nd maximum frequency(A204)	✘	60.0	Hz
A004	Maximum frequency	Settable from the base frequency to 400.0	✘	60.0	Hz
A204	Maximum frequency, 2nd motor	Settable from the 2nd base frequency to 400.0	✘	60.0	Hz
A011	[O/OI] input active range start frequency	The output frequency corresponding to the analog input range starting point, range is 0.00 to 400.00	✔	0.00	Hz
A012	[O/OI] input active range end frequency	The output frequency corresponding to the analog input range ending point, range is 0.0 to 400.00	✔	0.00	Hz
A013	[O/OI] input active range start voltage	The starting point (offset) for the active analog input range, range is 0. to 100.	✔	0.	%
A014	[O/OI] input active range end voltage	The ending point (offset) for the active analog input range, range is 0. to 100.	✔	100.	%
A015	[O/OI] input start frequency enable	Two options; select codes: 00…Use offset (A011 value) 01…Use 0Hz	✔	01	–
A016	Analog input filter	Range n = 1 to 31, 1 to 31 :•2ms filter	✔	31.	Spl.
A019	Multi-speed operation selection	Select codes: 00...Binary operation (8 speeds selectable with 3 terminals) 01...Bit operation (4 speeds selectable with 3 terminals)	✘	00	–
A020	Multi-speed freq. 0	Defines the first speed of a multi-speed profile, range is 0.00 / start frequency to 400.0 A020 = Speed 0 (1st motor)	✔	0.00	Hz
A220	Multi-speed freq. 0, 2nd motor	Defines the first speed of a multi-speed profile or a 2nd motor, range is 0.00 / start frequency to 400.0 A220 = Speed 0 (2nd motor)	✔	0.00	Hz
A021 to A027	Multi-speed freq. 1 to 7 (for both motors)	Defines 7 more speeds, range is 0.00 / start frequency to 400.0. A021=Speed 1 ~ A027=Speed7	✔	See next row	Hz
		A021	✔	60.00	Hz
		A022	✔	40.00	Hz
		A023	✔	20.00	Hz
		A024 ~ A027	✔	0.00	Hz
A038	Jog frequency	Defines limited speed for jog, range is from start frequency to 9.99 Hz	✔	6.00	Hz

"A" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
A039	Jog stop mode	Define how end of jog stops the motor; six options: 00…Free-run stop (invalid during run) 01…Controlled deceleration (invalid during run) 02…DC braking to stop(invalid during run) 03…Free-run stop (valid during run) 04…Controlled deceleration (valid during run) 05…DC braking to stop(valid during run)	✔	04	–
A041	Torque boost select	Two options: 00…Manual torque boost 01…Automatic torque boost	✘	00	–
A241	Torque boost select, 2nd motor		✘	00	–
A042	Manual torque boost value	Can boost starting torque between 0 and 20% above normal V/f curve, range is 0.0 to 20.0%	✔	1.0	%
A242	Manual torque boost value, 2nd motor		✔	1.0	%
A043	Manual torque boost frequency	Sets the frequency of the V/f breakpoint A in graph (top of previous page) for torque boost, range is 0.0 to 50.0%	✔	5.0	%
A243	Manual torque boost frequency, 2nd motor		✔	5.0	%
A044	V/f characteristic curve	Three available V/f curves; 00…Constant torque 01…Reduced torque (1.7) 02…Free V/F	✘	00	–
A244	V/f characteristic curve, 2nd motor		✘	00	–
A045	V/f gain	Sets voltage gain of the inverter, range is 20. to 100.%	✔	100.	%
A245	V/f gain, 2nd motor		✔	100.	%
A046	Voltage compensation gain for automatic torque boost	Sets voltage compensation gain under automatic torque boost, range is 0. to 255.	✔	100.	–
A246	Voltage compensation gain for automatic torque boost, 2nd motor		✔	100.	–
A047	Slip compensation gain for automatic torque boost	Sets slip compensation gain under automatic torque boost, range is 0. to 255.	✔	100.	–
A247	Slip compensation gain for automatic torque boost, 2nd motor		✔	100.	–
A051	DC braking enable	Three options; select codes: 00…Disable 01…Enable during stop 02…Frequency detection	✔	00	–
A052	DC braking frequency	The frequency at which DC braking begins, range is from the start frequency (**B082**) to 60.00Hz	✔	0.50	Hz
A053	DC braking wait time	The delay from the end of controlled deceleration to start of DC braking (motor free runs until DC braking begins), range is 0.0 to 5.0 seconds.	✔	0.0	s
A054	DC braking force for deceleration	Level of DC braking force, settable from 0 to 100%	✔	50.	%
A055	DC braking time for deceleration	Sets the duration for DC braking, range is from 0.0 to 10.0 seconds.	✔	0.5	s
A056	DC braking / edge or level detection for [DB] input	Two options; select codes: 00…Edge detection 01…Level detection	✔	01	–
A057	DC braking force at start	Level of DC braking force at start, settable from 0 to 100%	✔	0.	%
A058	DC braking time at start	Sets the duration for DC braking, range is from 0.0 to 10.0 seconds.	✔	0.0	s
A059	Carrier frequency during DC braking	Carrier frequency of DC braking performance, range is from 2.0 to 15.0kHz	✔	2.0	kHz

"A" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
A061	Frequency upper limit	Sets a limit on output frequency less than the maximum frequency (**A004**). Range is from frequency lower limit (**A062**) to maximum frequency (**A004**). 0.00 setting is disabled >0.00 setting is enabled	✔	0.00	Hz
A261	Frequency upper limit, 2nd motor	Sets a limit on output frequency less than the maximum frequency (**A204**). Range is from frequency lower limit (**A262**) to maximum frequency (**A204**). 0.00 setting is disabled >0.00 setting is enabled	✔	0.00	Hz
A062	Frequency lower limit	Sets a limit on output frequency greater than zero. Range is start frequency (**B082**) to frequency upper limit (**A061**) 0.00 setting is disabled >0.00 setting is enabled	✔	0.00	Hz
A262	Frequency lower limit, 2nd motor	Sets a limit on output frequency greater than zero. Range is start frequency (**B082**) to frequency upper limit (**A261**) 0.00 setting is disabled >0.00 setting is enabled	✔	0.00	Hz
A063 A065 A067	Jump freq. (center) 1 to 3	Up to 3 output frequencies can be defined for the output to jump past to avoid motor resonances (center frequency) Range is 0.00 to 400.0 Hz	✔	0.00 0.00 0.00	Hz
A064 A066 A068	Jump freq. width (hysteresis) 1 to 3	Defines the distance from the center frequency at which the jump around occurs Range is 0.00 to 10.00 Hz	✔	0.50 0.50 0.50	Hz
A069	Acceleration hold frequency	Sets the frequency to hold acceleration, range is 0.00 to 400.00Hz	✔	0.00	Hz
A070	Acceleration hold time	Sets the duration of acceleration hold, range is 0.0 to 60.0 seconds.	✔	0.0	s
A071	PID enable	Enables PID function, three option codes: **00**…PID Disable **01**…PID Enable **02**…PID Enable with reverse output	✔	00	–
A072	PID proportional gain	Proportional gain has a range of 0.00 to 25.00	✔	1.00	–
A073	PID integral time constant	Integral time constant has a range of 0.0 to 3600.0 seconds.	✔	1.0	s
A074	PID derivative time constant	Derivative time constant has a range of 0.00 to 100.00 seconds.	✔	0.00	s
A075	PV scale conversion	Process Variable (PV), scale factor (multiplier), range of 0.01 to 99.99	✔	1.00	–
A076	PV source	Selects source of Process Variable (PV), option codes: **01**…[O/OI] terminal **02**…Modbus network **10**…Calculate function output	✔	01	–
A077	Reverse PID action	Two option codes: **00**…PID input = SP-PV **01**…PID input = -(SP-PV)	✔	00	–
A078	PID variation range	Sets the limit of PID output as percent of full scale, range is 0.0 to 100.0%	✔	0.0	%
A081	AVR function select	Automatic (output) voltage regulation, selects from three type of AVR functions, three option codes:	✘	02	–

"A" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
A281	AVR function select, 2nd motor	00…AVR enabled 01…AVR disabled 02…AVR enabled except during deceleration	✘	02	–
A082	AVR voltage select	200V class inverter settings: ……200/215/220/230/240	✘	200	V
A282	AVR voltage select, 2nd motor		✘	200	V
A083	AVR filter time constant	Define the time constant of the AVR filter, range is 0.000 to 1.000 seconds.	✔	0.030	s
A084	AVR deceleration gain	Gain adjustment of the braking performance, range is 50 to 200%	✔	100.	%
A085	Energy-saving operation mode	Two option codes: 00…Normal operation 01…Energy-saving operation	✘	00	–
A086	Energy-saving mode tuning	Range is 0.0 to 100.0 %.	✔	50.0	%
A092	Acceleration time (2)	Duration of 2nd segment of acceleration, range is: 0.00 to 3600.00 seconds.	✔	10.00	s
A292	Acceleration time (2), 2nd motor		✔	10.00	s
A093	Deceleration time (2)	Duration of 2nd segment of deceleration, range is: 0.00 to 3600.00 seconds.	✔	10.00	s
A293	Deceleration time (2), 2nd motor		✔	10.00	s
A094	Select method to switch to Acc2/Dec2 profile	Three options for switching from 1st to 2nd accel/decel: 00…2CH input from terminal	✘	00	–
A294	Select method to switch to Acc2/Dec2 profile, 2nd motor	01…Transition frequency 02…Forward and reverse	✘	00	–
A095	Acc1 to Acc2 frequency transition point	Output frequency at which Accel1 switches to Accel2, range is 0.00 to	✘	0.00	Hz
A295	Acc1 to Acc2 frequency transition point, 2nd motor	400.00 Hz	✘	0.00	Hz
A096	Dec1 to Dec2 frequency transition point	Output frequency at which Decel1 switches to Decel2, range is 0.0 to	✘	0.00	Hz
A296	Dec1 to Dec2 frequency transition point, 2nd motor	400.0 Hz	✘	0.00	Hz
A097	Acceleration curve selection	Set the characteristic curve of Acc1 and Acc2, five options: 00…linear 01…S-curve 02…U-curve 03…Inverse U-curve	✘	00	–
A098	Deceleration curve selection	Set the characteristic curve of Dec1 and Dec2, options are same as above (α097)	✘	00	–
A131	Acceleration curve constant	Range is 1 to 10.	✔	2	–
A132	Deceleration curve constant	Range is 1 to 10.	✔	2	–
A141	A input select for calculate function	Seven options: 00…Operator 01…VR 02…Terminal [O/OI] input 04…RS485	✔	00	–
A142	B input select for calculate function	Seven options: 00…Operator 01…VR 02…Terminal [O/OI] input 04…RS485	✔	02	–
A143	Calculation symbol	Calculates a value based on the A input source (A141 selects) and B input source (A142 selects). Three options: 00…ADD (A input + B input) 01…SUB (A input - B input) 02…MUL (A input * B input)	✔	00	–

"A" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
A145	ADD frequency	An offset value that is applied to the output frequency when the [ADD] terminal is ON. Range is 0.00 to 400.00 Hz	✔	0.00	Hz
A146	ADD direction select	Two options: 00…Plus (adds A145 value to the output frequency setting) 01…Minus (subtracts A145 value from the output frequency setting)	✔	00	–
A154	Deceleration hold frequency	Sets the frequency to hold deceleration, range is 0.00 to 400.00Hz	✔	0.00	Hz
A155	Deceleration hold time	Sets the duration of deceleration hold, range is 0.0 to 60.0 seconds.	✔	0.0	s
A156	PID sleep function action threshold	Sets the threshold for the action, set range 0.00 to 400.00 Hz	✔	0.00	Hz
A157	PID sleep function action delay time	Sets the delay time for the action, set range 0.0 to 25.5 seconds.	✔	0.0	s
A158	PID sleep function return threshhold	A156 to 400.0(Hz)	✔	0.00	Hz
A161	[VR] input active range start frequency	The output frequency corresponding to the analog input range starting point, range is 0.00 to 400.00 Hz	✔	0.00	Hz
A162	[VR] input active range end frequency	The output frequency corresponding to the current input range ending point, range is 0.00 to 400.00 Hz	✔	0.00	Hz
A163	[VR] input active range start %	The starting point (offset) for the current input range, range is 0. to 100.%	✔	0.	%
A164	[VR] input active range end %	The ending point (offset) for the current input range, range is 0. to 100.%	✔	100.	%
A165	[VR] input start frequency select	Two options; select codes: 00…Use offset (A161 value) 01…Use 0Hz	✔	01	–

[Function mode (b Group)]

Func. Code	Name	Description	Run Mode Edit	Defaults	
				Initial data	Units
b001	Restart mode on power failure / under-voltage trip	Select inverter restart method, Four option codes: 00…Alarm output after trip, no automatic restart 01…Restart at 0Hz 02…Resume operation after frequency matching 03…Resume previous freq. after freq. matching, then decelerate to stop and display trip info	✔	00	–
b002	Allowable under-voltage power failure time	The amount of time a power input under-voltage can occur without tripping the power failure alarm. Range is 0.3 to 25 sec. If under-voltage exists longer than this time, the inverter trips, even if the restart mode is selected.	✔	1.0	s
b003	Retry wait time before motor restart	Time delay after under-voltage condition goes away, before the inverter runs motor again. Range is 0.3 to 100.0 seconds.	✔	1.0	s
b004	Instantaneous power failure / under-voltage trip alarm enable	Three option codes: 00…Disable 01…Enable 02…Disable during stop and decelerates to a stop	✔	00	–
b005	Number of restarts on power failure / under-voltage trip events	Two option codes: 00…Restart 16 times 01…Always restart	✔	00	–
b007	Restart frequency threshold	Restart the motor from 0Hz if the frequency becomes less than this set value during the motor is coasting, range is 0.00 to 400.00Hz	✔	0.50	Hz
b008	Restart mode on over voltage / over current trip	Select inverter restart method, Four option codes: 00…Alarm output after trip, no automatic restart 01…Restart at 0Hz 02…Resume operation after frequency matching 03…Resume previous freq. after active freq. matching, then decelerate to stop and display trip info	✔	00	–
b010	Number of retry on over voltage / over current trip	Range is 1 to 3 times	✔	3	–
b011	Retry wait time on over voltage / over current trip	Range is 0.3 to 100.0 sec.	✔	1.0	s
b012	Level of electronic thermal	Set a level between 20% and 100% for the rated inverter current.	✔	Rated current for each inverter model *1	A
b212	Level of electronic thermal, 2nd motor		✔		A
b013	Electronic thermal characteristic	Select from three curves, option codes: 00…Reduced torque 01…Constant torque 02…Free setting	✔	01	–
b213	Electronic thermal characteristic, 2nd motor		✔	01	–
b015	Free setting electronic thermal ~freq.1	Range is 0 to β017Hz	✔	0	Hz
b016	Free setting electronic thermal ~current1	Range is 0.00 to inverter rated current Amps	✔	0.0	A
b017	Free setting electronic thermal ~freq.2	Range is β015 to β019Hz	✔	0	Hz
b018	Free setting electronic thermal ~current2	Range is 0.00 to inverter rated current Amps	✔	0.0	A
b019	Free setting electronic thermal ~freq.3	Range is β017 to 400Hz	✔	0	Hz
b020	Free setting electronic thermal ~current3	Range is 0.00 to inverter rated current Amps	✔	0.0	A
b021	Overload restriction operation mode	Select the operation mode during overload conditions, three options, option codes: 00…Disabled 01…Enabled for acceleration and constant speed 02…Enabled for constant speed only	✔	01	–
b221	Overload restriction operation mode, 2nd motor		✔	01	–

"b" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
b022	Overload restriction level	Sets the level of overload restriction, between 20% and 200% of the rated current of the inverter, setting resolution is 1% of rated current	✔	Rated current x 1.50	A
b222	Overload restriction level, 2nd motor		✔	Rated current x 1.50	A
b023	Deceleration rate at overload restriction	Sets the deceleration rate when inverter detects overload, range is 0.1 to 3000.0, resolution 0.1 seconds.	✔	1.0	s
b223	Deceleration rate at overload restriction, 2nd motor		✔	1.0	s
b024	Overload restriction operation mode 2	Select the operation mode during overload conditions, three options, option codes: 00…Disabled 01…Enabled for acceleration and constant speed 02…Enabled for constant speed only	✔	01	–
b025	Overload restriction level 2	Sets the level of overload restriction, between 20% and 200% of the rated current of the inverter, setting resolution is 1% of rated current	✔	Rated current x 1.50	A
b026	Deceleration rate 2 at overload restriction	Sets the deceleration rate when inverter detects overload, range is 0.1 to 3000.0, resolution 0.1 seconds.	✔	1.0	s
b027	OC suppression selection *	Two option codes: 00…Disabled 01…Enabled	✔	01	–
b028	Current level of active freq. matching	Sets the current level of active freq. matching restart, range is 0.2*inverter rated current to 2.0*inverter rated current, resolution 0.1 seconds.	✔	Rated current	A
b029	Deceleration rate of active freq. matching	Sets the deceleration rate when active freq. matching restart, range is 0.1 to 3000.0, resolution 0.1 seconds.	✔	0.5	s
b030	Start freq. of active freq. matching	Three option codes: 00…freq at previous shutoff 01…start from max. Hz 02…start from set frequency	✔	00	–
b031	Software lock mode selection	Prevents parameter changes, in five options, option codes: 00…all parameters except B031 are locked when [SFT] terminal is ON 01…all parameters except B031 and output frequency Φ001 are locked when [SFT] terminal is ON 02…all parameters except B031 are locked 03…all parameters except B031 and output frequency Φ001 are locked 10…High level access including B031 See appendix C for the accessible parameters in this mode.	✔	01	–
b034	Run/power ON warning time	Range is, 0.:Warning disabled 1. to 9999.: 10~99,990 hrs (unit: 10) 1000 to 6553: 100,000~655,350 hrs (unit: 100)	✔	0.	Hrs.
b035	Rotation direction restriction	Three option codes: 00…No restriction 01…Reverse rotation is restricted 02…Forward rotation is restricted	✘	00	–
b036	Reduced voltage start selection	Set range, 0 (disabling the function), 1 (approx. 4ms) to 250 (approx. 1s)	✔	3	–

"b" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
b037	Function code display restriction	Five option codes: **00**…Full display **01**…Function-specific display **03**…Data comparison display **04**…Basic display **05**…Monitor display only	✔	00	–
b038	Initial display selection	**000**…Func. code that SET key pressed last displayed.(*) **001~060**…d001~d060 displayed **201**…F001displayed **202**…B display of LCD operator (In case of Digital operator, same **000** setting)	✔	001	–
b050	Controlled deceleration on power loss	Four option codes: **00**…Disabled **01**…Decelerates to a stop **02**…Decelerates to a stop with DC bus voltage controlled **03**…Decelerates to a stop with DC bus voltage controlled, then restart	✘	00	–
b051	DC bus voltage trigger level of ctrl. decel.	Setting of DC bus voltage to start controlled decel. operation. Range is 0.0 to 400.0	✘	220.0	V
b052	Over-voltage threshold of ctrl. decel.	Setting the OV-LAD stop level of controlled decel. operation. Range is 0.0 to 400.0	✘	360.0	V
b053	Deceleration time of ctrl. decel.	Range is 0.10 to 300.00 seconds.	✘	1.00	s
b054	Initial freq. drop of ctrl. decel.	Setting of initial freq. drop. Range is 0.00 to 10.00 Hz	✘	0.00	Hz
b060	Maximum-limit level of window comparator (O/OI)	Set range, {Min.-limit level (β061) + hysteresis width (β062)x2} to 100 %	✔	100.	%
b061	Minimum-limit level of window comparator (O/OI)	Set range, 0 to {Max.-limit level (β060) - hysteresis width (β062)x2}maximum of 100 %	✔	0.	%
b062	Hysteresis width of window comparator (O/OI)	Set range, 0 to {Max.-limit level (β060) - Min.-limit level (β061)}/2 % (Maximum of 10%)	✔	0.	%
b070	Operation level at O/OI disconnection	Set range, 0 to 100%, or "no" (ignore)	✔	no	-
b078	Watt-hour clearance	Two option codes: **00**…OFF **01**…ON (press STR then clear)	✔	00	-
b079	Watt-hour display gain	Set range is, 1.to1000.	✔	1.	
b082	Start frequency	Sets the starting frequency for the inverter output, range is 0.01 to 9.99 Hz	✔	0.50	Hz
b083	Carrier frequency	Sets the PWM carrier (internal switching frequency), range is 2.0 to 15.0 kHz	✔	2.0	kHz
b084	Initialization mode (parameters or trip history)	Select initialized data, four option codes: **00**…Initialization disabled **01**…Clears Trip history **02**…Initializes all Parameters **03**…Clears Trip history and initializes all parameters	✘	00	–
b085	Country for initialization	Select default parameter values for country on initialization, two option codes: **00**…Mode 1 **01**… Mode 2	✘	00	–
b086	Frequency scaling conversion factor	Specify a constant to scale the displayed frequency for Δ007 monitor, range is 0.01 to 99.99	✔	1.00	–
b087	STOP key enable	Select whether the STOP key on the keypad is enabled, three option codes: **00**…Enabled **01**…Disabled always **02**… Disabled for stop	✔	00	–
b088	Restart mode after FRS	Selects how the inverter resumes operation when free-run stop (FRS) is cancelled, two options: **00**…Restart from 0Hz **01**…Restart from frequency detected from real speed of motor (freq. matching)	✔	00	–

"b" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
b089	Automatic carrier frequency reduction	Three option codes: 00…Disabled 01…Enabled, depending on the output current 02…Enabled, depending on the heat-sink temperature	✗	00	–
b091	Stop mode selection	00(Dec and Stop) / 01(FRS)	✓	00	–
b094	Initialization target data setting	00(ALL parameters)/ 01(expect terminal andcommunication data)	✗	00	–
b100	Free V/F setting, freq.1	Set range, 0 ~ value of β102	✗	0.	Hz
b101	Free V/F setting, voltage.1	Set range, 0.0 ~ 300.0V	✗	0.0	V
b102	Free V/F setting, freq.2	Set range, value of β100 ~β104	✗	0.	Hz
b103	Free V/F setting, voltage.2	Set range, 0.0 ~ 300.0V	✗	0.0	V
b104	Free V/F setting, freq.3	Set range, value of β102 ~β106	✗	0.	Hz
b105	Free V/F setting, voltage.3	Set range, 0.0 ~ 300.0V	✗	0.0	V
b106	Free V/F setting, freq.4	Set range, value of β104 ~β108	✗	0.	Hz
b107	Free V/F setting, voltage.4	Set range, 0.0 ~ 300.0V	✗	0.0	V
b108	Free V/F setting, freq.5	Set range, value of β108 ~β110	✗	0.	Hz
b109	Free V/F setting, voltage.5	Set range, 0.0 ~ 300.0V	✗	0.0	V
b110	Free V/F setting, freq.6	Set range, value of β108 ~β112	✗	0.	Hz
b111	Free V/F setting, voltage.6	Set range, 0.0 ~ 300.0V	✗	0.0	V
b112	Free V/F setting, freq.7	Set range, β110 ~ 400	✗	0.	Hz
b113	Free V/F setting, voltage.7	Set range, 0.0 ~ 300.0V	✗	0.0	V
b130	Deceleration overvoltage suppression enable	00…Disabled 01…Enabled 02…Enabled with accel. 03…when CONST/DEC	✓	00	–
b131	Decel. overvolt. suppress level	DC bus voltage of suppression. Range is: 200V class…330 to 390	✓	360	V
b132	Decel. overvolt. suppress const.	Accel. rate when b130=02. Set range: 0.10 ~ 30.00 seconds.	✓	1.00	s
b133	Decel. overvolt. suppress proportional gain	Proportional gain when b130=01. Range is: 0.00 to 5.00	✓	0.20	–
b134	Decel. overvolt. suppress integral time	Integration time when b130=01. Range is: 0.0 to 150.0 seconds.	✓	1.0	s
b150	Display ex.operator connected	When an external operator is connected via RS-422 port, the built-in display is locked and shows only one "d" parameter configured in: 001 ~ 050	✓	001	–
b160	1st parameter of Dual Monitor	Set any two "d" parameters in b160 and b161, then they can be monitored in d050. The two parameters are switched by up/down keys. Set range: 001 ~ 018	✓	001	–
b161	2nd parameter of Dual Monitor		✓	002	–
b163	Frequency set in monitoring	Two option codes: 00…Freq. set disabled 01…Freq. set enabled	✓	01	–
b164	Automatic return to the initial display	10 min. after the last key operation, display returns to the initial parameter set by β038. Two option codes: 00…Disable 01…Enable	✓	00	–

Func. Code	Name	Description	Run Mode Edit	Initial data	Units
	"b" Function			Defaults	
b165	Ex. operator com. loss action	Five option codes: 00…Trip 01…Trip after deceleration to a stop 02…Ignore 03…Coasting (FRS) 04…Decelerates to a stop	✔	02	–
b166	Data Read/Write select	00… Read/Write OK 01… Protected	✔	00	–
b180	Initialization trigger (*)	This is to perform initialization by parameter input with β084, β085 and β094. Two option codes: 00…Initialization disable 01…Perform initialization	✘	00	–

[Function mode (C Group)]

Func. Code	Name	Description	Run Mode Edit	Initial data	Units
	"C" Function			Defaults	
C001	Input [1] function	Select input terminal [1] function, 34 options (see next section)	✔	00 [FW]	–
C002	Input [2] function	Select input terminal [2] function, 34 options (see next section)	✔	01 [RV]	–
C003	Input [3] function	Select input terminal [3] function, 34 options (see next section)	✔	02 [CF1]	–
C004	Input [4] function	Select input terminal [4] function, 34 options (see next section)	✔	03 [CF2]	–
C005	Input [5] function	Select input terminal [5] function, 34 options (see next section)	✔	18 [RS]	–
C011	Input [1] active state	Select logic conversion, two option codes: 00…normally open [NO] 01…normally closed [NC]	✔	00	–
C012	Input [2] active state		✔	00	–
C013	Input [3] active state		✔	00	–
C014	Input [4] active state		✔	00	–
C015	Input [5] active state		✔	00	–
C021	Output [11] function	27 programmable functions available for logic (discrete) outputs (see next section)	✔	01 [FA1]	–
C026	Alarm relay function	27 programmable functions available for logic (discrete) outputs (see next section)	✔	05 [AL]	–
C027	[FM] terminal selection (Pulse/PWM output)	9 programmable functions: 00…Output frequency (PWM) 01…Output current (PWM) 03…Output frequency (Pulse train) 04…Output voltage (PWM) 05…Input power (PWM) 06…Electronic thermal load ratio (PWM) 07…LAD frequency (PWM) 08…Output current (Pulse train) 10…Heat sink temperature (PWM)	✔	07	–
C030	Digital current monitor reference value	Current with digital current monitor output at 1,440Hz Range is 20%~200% of rated current	✔	Rated current	A
C031	Output [11] active state	Select logic conversion, two option codes: 00…normally open [NO] 01…normally closed [NC]	✔	00	–
C036	Alarm relay active state		✔	01	–
C038	Output mode of low current detection	Two option codes: 00…During acceleration, deceleration and constant speed 01…During constant speed only	✔	01	–

"C" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
C039	Low current detection level	Set the level of low load detection, range is 0.00 to 2.00*inverter rated current	✔	Rated current	A
C040	Output mode of overload warning	Two option codes: 00…During accel., decel. and constant speed 01…During constant speed only	✔	01	–
C041	Overload warning level	Sets the overload warning signal level between 0% and 200% (from 0 to two time the rated current of the inverter)	✔	Rated current x 1.15	A
C241	Overload warning level, 2nd motor		✔	Rated current x 1.15	A
C042	Frequency arrival setting for acceleration	Sets the frequency arrival setting threshold for the output frequency during acceleration, range is 0.00 to 400.00 Hz	✔	0.00	Hz
C043	Frequency arrival setting for deceleration	Sets the frequency arrival setting threshold for the output frequency during deceleration, range is 0.00 to 400.00 Hz	✔	0.00	Hz
C044	PID deviation level	Sets the allowable PID loop error magnitude (absolute value), SP-PV, range is 0.0 to 100%	✔	3.0	%
C052	PID FBV output high limit	When the PV exceeds this value, the PID loop turns OFF the PID second stage output, range is 0.0 to 100%	✔	100.0	%
C053	PID FBV output low limit	When the PV goes below this value, the PID loop turns ON the PID second stage output, range is 0.0 to 100%	✔	0.0	%
C061	Electronic thermal warning level	Set range is 0 to 100% Setting 0 means disabled.	✔	90	%
C063	Zero speed detection level	Set range is 0.00 to 100.00Hz	✔	0.00	Hz
C064	Heat sink overheat warning	Set range is 0 to 110 °C	✔	100.	°C
C070	Selection of OPE/Modbus	00 (OPE) / 01 (Modbus)	✘	00	–
C071	Communication speed	Five option codes: 04…4,800 bps 05…9,600 bps 06…19,200 bps 07…38,400 bps	✔	05	bps
C072	Modbus address	Set the address of the inverter on the network. Range is 1 to 247	✔	1.	–
C074	Communication parity	Three option codes: 00…No parity 01…Even parity 02…Odd parity	✔	00	–
C075	Communication stop bit	Two option codes: 01…1 bit 02…2 bit	✔	1	–
C076	Communication error select	Selects inverter response to communications error. Five options: 00…Trip 01…Decelerate to a stop and trip 02…Disable 03…Free run stop (coasting) 04…Decelerates to a stop	✔	02	–
C077	Communication error time-out	Sets the communications watchdog timer period. Range is 0.00 to 99.99 seconds. 0.0 = disabled	✔	0.00	s
C078	Communication wait time	Time the inverter waits after receiving a message before it transmits. Range is 0. to 1000. m seconds.	✔	0.	ms
C081	O/OI input span calibration	Scale factor between the external frequency command on terminals L–O /OI(voltage/current input) and the frequency output, range is 0.0 to 200%	✔	100.0	%

"C" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
C091	Debug mode enable *	Displays debug parameters. Two option codes: **00**…Disable **01**…Enable **<Do not set>** (for factory use)	✔	00	–
C101	Up/Down memory mode selection	Controls speed setpoint for the inverter after power cycle. Two option codes: **00**…Clear last frequency (return to default frequency Φ001) **01**…Keep last frequency adjusted by UP/DWN	✔	00	–
C102	Reset selection	Determines response to Reset input [RS]. Three option codes: **00**…Cancel trip state at input signal ON transition, stops inverter if in Run Mode **01**…Cancel trip state at signal OFF transition, stops inverter if in Run Mode **02**…Cancel trip state at input ON transition, no effect if in Run Mode	✔	00	–
C103	Restart mode after reset	Determines the restart mode after reset is given, two option codes: **00**…Start with 0 Hz **01**…Start with freq. matching	✔	00	–
C104	UP/DWN clear mode	Freq. set value when UDC signal is given to the input terminal, two option codes: **00**…0 Hz **01**…Original setting (in the memory at power on)	✔	00	–
C105	FM gain adjustment	Set range is 50 to 200%	✔	100.	%
C130	Output [11] on delay	Set range is 0.0 to 100.0 seconds.	✔	0.0	s
C131	Output [11] off delay		✔	0.0	s
C140	Relay output on delay	Set range is 0.0 to 100.0 seconds.	✔	0.0	s
C141	Relay output off delay		✔	0.0	s
C142	Logic output 1 operand A	All the programmable functions available for logic (discrete) outputs except LOG1 , no	✔	00	–
C143	Logic output 1 operand B		✔	00	–
C144	Logic output 1 operator	Applies a logic function to calculate [LOG] output state, Three options: **00**…[LOG] = A AND B **01**…[LOG] = A OR B **02**…[LOG] = A XOR B	✔	00	–
C151	Button sensitivity selection	0 to 250 / no	✔	10	–
C152	Scroll sensitivity selection	1 to 20	✔	10	–
C155	Ground fault detection	00(OFF) / 01(ON)	✔	1	–
C157	Out phase loss detection	00(OFF) / 01(ON)	✔	0	–
C160	Input [1] response time	Sets response time of each input terminal, set range:	✔	1.	–
C161	Input [2] response time	**0** (x 2 [ms]) to **200** (x 2 [ms]) (0 to 400 [ms])	✔	1.	–
C162	Input [3] response time		✔	1.	–
C163	Input [4] response time		✔	1.	–

"C" Function			Run Mode Edit	Defaults	
Func. Code	Name	Description		Initial data	Units
C164	Input [5] response time		✔	1.	–
C169	Multistage speed determination time	Set range is 0. to 200. (x 10ms)	✔	0.	ms

Input Function Summary Table – This table shows all thirty-four intelligent input functions at a glance. For detailed description of these functions, related parameters and settings, and example wiring diagrams, please refer to the QRG (Quick Reference Guide).

Input Function Summary Table				
Option Code	Terminal Symbol	Function Name	Description	
00	FW	FORWARD Run/Stop	ON	Inverter is in Run Mode, motor runs forward
			OFF	Inverter is in Stop Mode, motor stops
01	RV	Reverse Run/Stop	ON	Inverter is in Run Mode, motor runs reverse
			OFF	Inverter is in Stop Mode, motor stops
02	CF1 *1	Multi-speed Select, Bit 0 (LSB)	ON	Binary encoded speed select, Bit 0, logical 1
			OFF	Binary encoded speed select, Bit 0, logical 0
03	CF2	Multi-speed Select, Bit 1	ON	Binary encoded speed select, Bit 1, logical 1
			OFF	Binary encoded speed select, Bit 1, logical 0
04	CF3	Multi-speed Select, Bit 2(MSB)	ON	Binary encoded speed select, Bit 2, logical 1
			OFF	Binary encoded speed select, Bit 2, logical 0
06	JG	Jogging	ON	Inverter is in Run Mode, output to motor runs at jog parameter frequency
			OFF	Inverter is in Stop Mode
07	DB	External DC braking	ON	DC braking will be applied during deceleration
			OFF	DC braking will not be applied
08	SET	Set (select) 2nd Motor Data	ON	The inverter uses 2nd motor parameters for generating frequency output to motor
			OFF	The inverter uses 1st (main) motor parameters for generating frequency output to motor
09	2CH	2-stage Acceleration and Deceleration	ON	Frequency output uses 2nd-stage acceleration and deceleration values
			OFF	Frequency output uses standard acceleration and deceleration values
11	FRS	Free-run Stop	ON	Causes output to turn OFF, allowing motor to free run (coast) to stop
			OFF	Output operates normally, so controlled deceleration stop motor
12	EXT	External Trip	ON	When assigned input transitions OFF to ON, inverter latches trip event and displays $E\,12$
			OFF	No trip event for ON to OFF, any recorded trip events remain in history until reset
13	USP	Unattended Start Protection	ON	On power up, the inverter will not resume a Run command (mostly used in the US)
			OFF	On power up, the inverter will resume a Run command that was active before power loss
15	SFT	Software Lock	ON	The keypad and remote programming devices are prevented from changing parameters
			OFF	The parameters may be edited and stored
18	RS	Reset Inverter	ON	The trip condition is reset, the motor output is turned OFF, and power up reset is asserted
			OFF	Normal power-ON operation
20	STA	Start (3-wire interface)	ON	Starts the motor rotation
			OFF	No change to present motor status
21	STP	Stop (3-wire interface)	ON	Stops the motor rotation
			OFF	No change to present motor status
22	F/R	FWD, REV (3-wire interface)	ON	Selects the direction of motor rotation: ON = FWD. While the motor is rotating, a change of F/R will start a deceleration, followed by a change in direction

Input Function Summary Table				
Option Code	Terminal Symbol	Function Name		Description
			OFF	Selects the direction of motor rotation: OFF = REV. While the motor is rotating, a change of F/R will start a deceleration, followed by a change in direction
23	PID	PID Disable	ON	Temporarily disables PID loop control. Inverter output turns OFF as long as PID Enable is active (A071=01)
23	PID	PID Disable	OFF	Has no effect on PID loop operation, which operates normally if PID Enable is active (A071=01)
24	PIDC	PID Reset	ON	Resets the PID loop controller. The main consequence is that the integrator sum is forced to zero
24	PIDC	PID Reset	OFF	No effect on PID controller
27	UP	Remote Control UP Function (motorized speed pot.)	ON	Accelerates (increases output frequency) motor from current frequency
27	UP	Remote Control UP Function (motorized speed pot.)	OFF	Output to motor operates normally
28	DWN	Remote Control Down Function (motorized speed pot.)	ON	Decelerates (decreases output frequency) motor from current frequency
28	DWN	Remote Control Down Function (motorized speed pot.)	OFF	Output to motor operates normally
29	UDC	Remote Control Data Clearing	ON	Clears the UP/DWN frequency memory by forcing it to equal the set frequency parameter F001. Setting X101 must be set=00 to enable this function to work
29	UDC	Remote Control Data Clearing	OFF	UP/DWN frequency memory is not changed
31	OPE	Operator Control	ON	Forces the source of the output frequency setting A001 and the source of the Run command A002 to be from the digital operator
31	OPE	Operator Control	OFF	Source of output frequency set by A001 and source of Run command set by A002 is used
32	SF1	Multi-speed Select, Bit operation Bit 1	ON	Bit encoded speed select, Bit 1, logical 1
32	SF1	Multi-speed Select, Bit operation Bit 1	OFF	Bit encoded speed select, Bit 1, logical 0
33	SF2	Multi-speed Select, Bit operation Bit 2	ON	Bit encoded speed select, Bit 2, logical 1
33	SF2	Multi-speed Select, Bit operation Bit 2	OFF	Bit encoded speed select, Bit 2, logical 0
34	SF3	Multi-speed Select, Bit operation Bit 3	ON	Bit encoded speed select, Bit 3, logical 1
34	SF3	Multi-speed Select, Bit operation Bit 3	OFF	Bit encoded speed select, Bit 3, logical 0
39	OLR	Overload Restriction Source Changeover	ON	Perform overload restriction
39	OLR	Overload Restriction Source Changeover	OFF	Normal operation
50	ADD	ADD frequency enable	ON	Adds the A145 (add frequency) value to the output frequency
50	ADD	ADD frequency enable	OFF	Does not add the A145 value to the output frequency
51	F-TM	Force Terminal Mode	ON	Force inverter to use input terminals for output frequency and Run command sources
51	F-TM	Force Terminal Mode	OFF	Source of output frequency set by A001 and source of Run command set by A002 is used
53	KHC	Clear watt-hour data	ON	Clear watt-hour data
53	KHC	Clear watt-hour data	OFF	No action
65	AHD	Analog command hold	ON	Analog command is held
65	AHD	Analog command hold	OFF	Analog command is not held
83	HLD	Retain output frequency	ON	Retain the current output frequency
83	HLD	Retain output frequency	OFF	No retention
84	ROK	Permission of Run command	ON	Run command permitted
84	ROK	Permission of Run command	OFF	Run command is not permitted
86	DISP	Display limitation	ON	Only a parameter configured in β038 is shown
86	DISP	Display limitation	OFF	All the monitors can be shown
no	no	No function	ON	(input ignored)
no	no	No function	OFF	(input ignored)

Output Function Summary Table – This table shows all functions for the logical outputs (terminals [11] and [AL]) at a glance. For detailed descriptions of these functions, related parameters and settings, and example wiring diagrams, please refer to the QRG (Quick Reference Guide).

Option Code	Terminal Symbol	Function Name	Description	
			Output Function Summary Table	
00	RUN	Run Signal	ON	When the inverter is in Run Mode
			OFF	When the inverter is in Stop Mode
01	FA1	Frequency Arrival Type 1–Constant Speed	ON	When output to motor is at the set frequency
			OFF	When output to motor is OFF, or in any acceleration or deceleration ramp
02	FA2	Frequency Arrival Type 2–Over frequency	ON	When output to motor is at or above the set freq., even if in accel (**X042**) or decel (**X043**) ramps
			OFF	When output to motor is OFF, or at a level below the set frequency
03	OL	Overload Advance Notice Signal 1	ON	When output current is more than the set threshold (**X041**) for the overload signal
			OFF	When output current is less than the set threshold for the deviation signal
04	OD	Output Deviation for PID Control	ON	When PID error is more than the set threshold for the deviation signal
			OFF	When PID error is less than the set threshold for the deviation signal
05	AL	Alarm Signal	ON	When an alarm signal has occurred and has not been cleared
			OFF	When no alarm has occurred since the last cleaning of alarm(s)
06	FA3	Frequency Arrival Type 3–Set frequency	ON	When output to motor is at the set frequency, during accel (**X042**) and decel (**X043**).
			OFF	When output to motor is OFF, or is not at a level of the set frequency
09	UV	Undervoltage	ON	Inverter is in Undervoltage
			OFF	Inverter is not in Undervoltage
11	RNT	Run Time Expired	ON	Total running time of the inverter exceeds the specified value
			OFF	Total running time of the inverter does not exceed the specified value
12	ONT	Power ON time Expired	ON	Total power ON time of the inverter exceeds the specified value
			OFF	Total power ON time of the inverter does not exceed the specified value
13	THM	Thermal Warning	ON	Accumulated thermal count exceeds the **X061** set value
			OFF	Accumulated thermal count does not exceed the **X061** set value
21	ZS	Zero Hz Speed Detection Signal	ON	Output frequency falls below the threshold specified in **X063**
			OFF	Output frequency is higher than the threshold specified in **X063**
27	ODc	Analog Voltage Input Disconnect Detection	ON	When the [O] input value < **B070** setting (signal loss detected)
			OFF	When no signal loss is detected
31	FBV	PID Second Stage Output	ON	Transitions to ON when the inverter is in RUN Mode and the PID Process Variable (PV) is less than the Feedback Low Limit (**X053**)
			OFF	Transitions to OFF when the PID Process Variable (PV) exceeds the PID High Limit (**X052**), and transitions to OFF when the inverter goes from Run Mode to Stop Mode
32	NDc	Network Disconnect Detection	ON	When the communications watchdog timer (period specified by **X077**) has time out
			OFF	When the communications watchdog timer is satisfied by regular communications activity
33	LOG	Logic Output Function 1	ON	When the Boolean operation specified by **X143** has a logical "1" result
			OFF	When the Boolean operation specified by **X143** has a

Output Function Summary Table

Option Code	Terminal Symbol	Function Name	Description	
				logical "0" result
41	FR	Starting Contact Signal	ON	Either FW or RV command is given to the inverter
			OFF	No FW or RV command is given to the inverter, or both are given to the inverter
42	OHF	Heat Sink Overheat Warning	ON	Temperature of the heat sink exceeds a specified value (**X064**)
			OFF	Temperature of the heat sink does not exceed a specified value (**X064**)
43	LOC	Low load detection	ON	Motor current is less than the specified value (**X039**)
			OFF	Motor current is not less than the specified value (**X039**)
50	IRDY	Inverter Ready Signal	ON	Inverter can receive a run command
			OFF	Inverter cannot receive a run command
51	FWR	Forward Rotation	ON	Inverter is driving the motor in forward direction
			OFF	Inverter is not driving the motor in forward direction
52	RVR	Reverse Rotation	ON	Inverter is driving the motor in reverse direction
			OFF	Inverter is not driving the motor in reverse direction
53	MJA	Major Failure Signal	ON	Inverter is tripping with major failure
			OFF	Inverter is normal, or is not tripping with major failure
54	WCO	Window Comparator for Analog Voltage Input	ON	Analog voltage input value is inside of the window comparator
			OFF	Analog voltage input value is outside of the window comparator
58	FREF	Frequency Command Source	ON	Frequency command is given from the operator
			OFF	Frequency command is not given from the operator
59	REF	Run Command Source	ON	Run command is given from the operator
			OFF	Run command is not given from the operator
60	SETM	2nd Motor Selection	ON	2nd motor is being selected
			OFF	2nd motor is not being selected
no	no	Not used	ON	-
			OFF	-

[Function mode (H Group)]

Func. Code	Name	Description	Run Mode Edit	Initial data	Units
H003	Motor capacity	Twelve selections: 0.1/0.2/0.4/0.55/0.75/1.1/1.5/2.2/3.0/3.7/4.0/5.5	✗	Specified by the capacity of each inverter model	kW
H203	Motor capacity, 2nd motor		✗		kW
H004	Motor poles setting	Five selections: 2 / 4 / 6 / 8	✗	4	poles
H204	Motor poles setting, 2nd motor		✗	4	poles
H006	Motor stabilization constant	Motor constant (factory set), range is 0 to 255	✓	100.	–
H206	Motor stabilization constant, 2nd motor		✓	100.	–

Appendix B: Monitoring Trip Events, History, and Conditions

1. Indication of the error

The microprocessor in the inverter detects a variety of fault conditions and captures the event, recording it in a history table. The inverter output turns OFF, or "trips" similar to the way a circuit breaker trips due to an over-current condition. Most faults occur when the motor is running (refer to the diagram to the right). However, the inverter could have an internal fault and trip in Stop Mode.
In either case, you can clear the fault by pressing the Reset key/terminal except some errors.
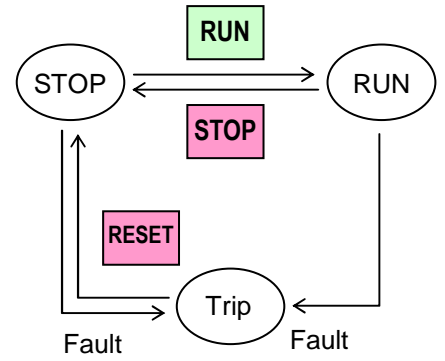
* How to remove the error condition
a) Pressing the [RUN/STOP/RESET] key. ([STOP/RESET] key on the operator.)
b) Intelligent input terminal is assigned reset (18: RS). And to operate the terminal.
c) A power cycle of the inverter.
Note) Error by a factor may not be canceled by a reset a),b). In this case, please go to c).

[Standard panel]

The ALM (red) of the main body and LED indication of RUN (yellowish green) indicates error contents like a list shown below at the time of error outbreak.

Error contents	LED Lighting, Blinking	
	ALM LED	RUN LED
Over-current event	Lighting	Blinking
Over-voltage	Blinking : Same period	Blinking : Same period
Under-voltage	Blinking : Alternation	Blinking : Alternation
Over load	Lighting	Lighting
Major failure	Lighting	Lights out
Others	Blinking	Lights out

Note1) The Major fault: When a Memory error, Current detection error, CPU error, Ground fault
, Thermal detection error
Note2) The blinking is a period for 1s.

[Digital Operator (NES1-OP, OPE-S/SR/SBK/SRmini)]

Trip History and Inverter Status
We recommend that you first find the cause of the fault before clearing it. When a fault occurs, the inverter stores some important performance data at the moment of the fault. To access the data, use the monitor function (δxxx) and select δ081 details about the present fault. The previous 5 faults are stored in δ082 to δ086. Each error shifts δ081-δ085 to δ082-δ086, and writes the new error to δ081.

The following Monitor Menu map shows how to access the error codes. When fault(s) exist, you can review their details by first selecting the proper function: Δ081 is the most recent, and Δ086 is the oldest.

Trip history 1 (Latest)   Trip history 6

| δ081 | to | δ086 |

ESC / SET

E07.2	Error code
60.00	Output frequency
40	Output current
4002	DC bus voltage
15	Elapsed RUN time
18	Elapsed power-ON time

E07.2 — Trip cause / Inverter status at trip point

.0	Power up or initial processing
.1	Stop
.2	Deceleration
.3	Constant speed
.4	Acceleration
.5	0Hz command and RUN
.6	Starting
.7	DB; DC braking
.8	Overload restriction
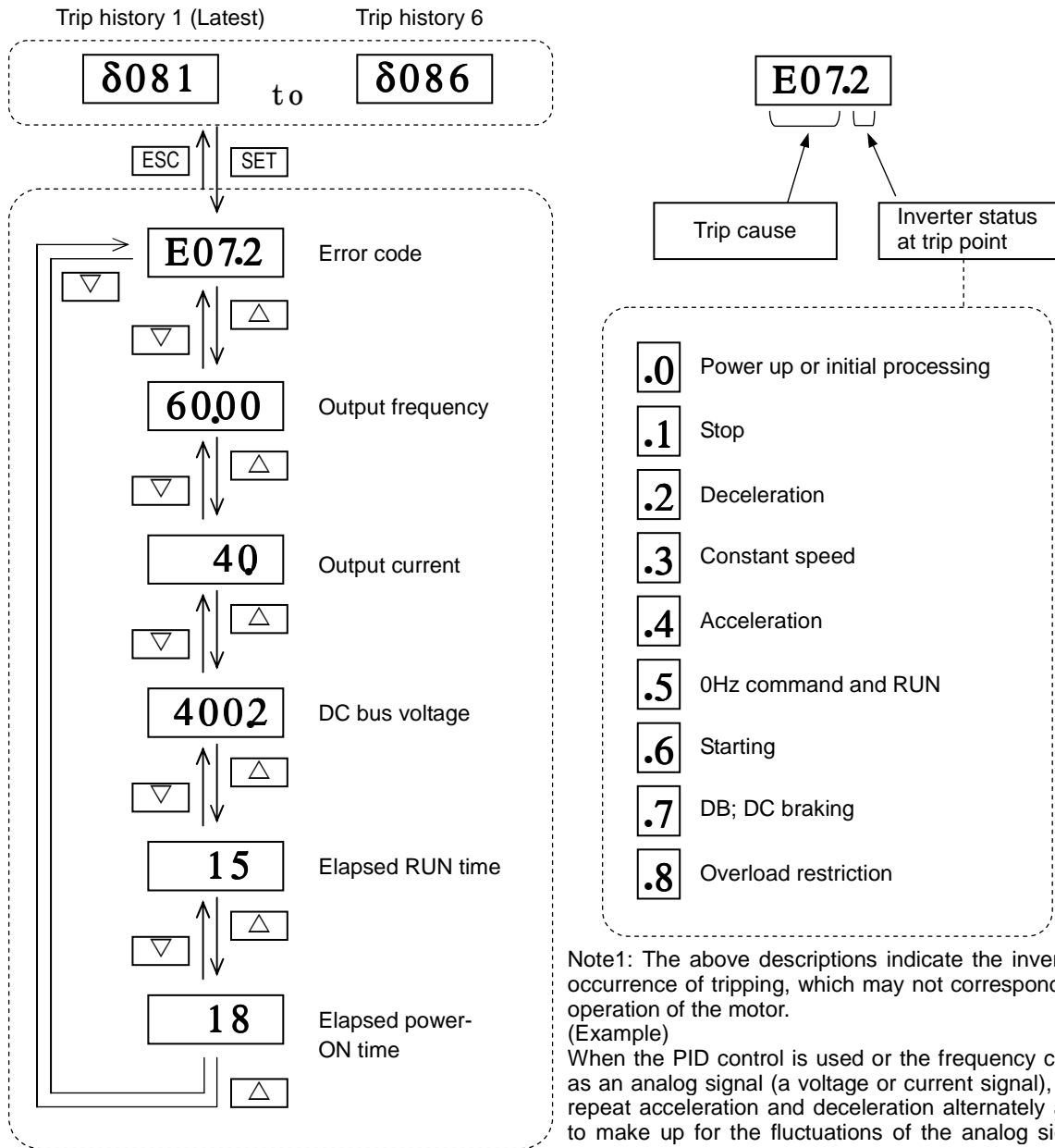
Note1: The above descriptions indicate the inverter status at the occurrence of tripping, which may not correspond to the apparent operation of the motor.
(Example)
When the PID control is used or the frequency command is input as an analog signal (a voltage or current signal), the inverter may repeat acceleration and deceleration alternately at short intervals to make up for the fluctuations of the analog signal, even if the motor is apparently running at constant speed.
In such cases, the inverter status at tripping may not correspond to the apparent operation of the motor.

Note2: During undervoltage, detailed information of the trip (historical trail) is not stored.

2. Error code

When you use the optional operator [NES1-OP, OPE-S/SR/SBK/SRmini], an error code will appear on the display automatically when a fault causes the inverter to trip. The following table lists the cause associated with the error. The following error code will not be displayed with the standard panel.

Error Code	Name	Cause(s)
E01	Over-current event while at constant speed	The inverter output was short-circuited, or the motor shaft is locked or has a heavy load. These conditions cause excessive current for the inverter, so the inverter output is turned OFF.
E02	Over-current event during deceleration	The dual-voltage motor is wired incorrectly.
E03	Over-current event during acceleration	
E04	Over-current event during other conditions	
E05	Overload protection (*1)	When a motor overload is detected by the electronic thermal function, the inverter trips and turns OFF its output.
E07	Over-voltage protection	When the DC bus voltage exceeds a threshold, due to regenerative energy from the motor.
E08	Memory error (*2)(*3)	When the built-in memory has problems due to noise or excessive temperature, the inverter trips and turns OFF its output to the motor.
E09	Under-voltage error	A decrease of internal DC bus voltage below a threshold results in a control circuit fault. This condition can also generate excessive motor heat or cause low torque. The inverter trips and turns OFF its output.
E10	Current detection error	If an error occurs in the internal current detection system, the inverter will shut off its output and display the error code.
E11	CPU error (*3)	A malfunction in the built-in CPU has occurred, so the inverter trips and turns OFF its output to the motor.
E12	External trip	A signal on an intelligent input terminal configured as EXT has occurred. The inverter trips and turns OFF the output to the motor.
E13	USP error	When the Unattended Start Protection (USP) is enabled, an error occurred when power is applied while a Run signal is present. The inverter trips and does not go into Run Mode until the error is cleared.
E14	Ground fault protection (*3)	The inverter is protected by the detection of ground faults between the inverter output and the motor upon during powerup tests. This feature protects the inverter, and does not protect humans.
E15	Input over-voltage protection	The inverter tests for input over-voltage after the inverter has been in Stop Mode for 100 seconds. If an over-voltage condition exists, the inverter enters a fault state. After the fault is cleared, the inverter can enter Run Mode again.
E19	Inverter thermal detection circuit error	When the thermal sensor in the inverter module is not connected.
E21	Temperature error	When the inverter internal temperature is above the threshold, the thermal sensor in the inverter module detects the excessive temperature of the power devices and trips, turning the inverter output OFF.
E30	Driver error	An internal inverter error has occurred at the safety protection circuit between the CPU and main driver unit. Excessive electrical noise may be the cause. The inverter has turned OFF the IGBT module output.
E34	Output phase loss protection	When a phase loss on its outputs is detected, the inverter output is turned off. (This detection is activated only when C157=01)
E38	Low-speed overload protection	If overload occurs during the motor operation at a very low speed, the inverter will detect the overload and shut off the inverter output.
E40	Operator connection error	When the connection between inverter and operator keypad failed, inverter trips and displays the error code.
E41	Modbus communication error	When "trip" is selected (C076=00) as a behavior in case of communication error, inverter trips when timeout happens.

*1: The inverter will not accept any reset command within about 10 seconds after tripping (i.e. after the protective function operates)
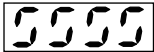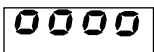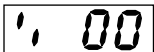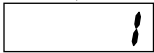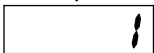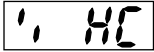
*2: The inverter will not accept any reset after a Memory error occurs with error code E08 displayed. Turn off the inverter power once. If error code E08 is displayed again when the inverter power is turned on subsequently, the internal memory device may have failed or some parameters may not have been stored correctly. In such cases, initialize the inverter, and then re-set the parameter.

*3: The inverter will not accept reset commands input via the RS terminal or entered by the STOP/RESET key. Therefore, turn off the inverter power.

3. Other Display for Digital operator

The other display for Digital operator is follows.
It is not displayed with the standard panel.

Name	Description	Display on digital operator
Reset	RS input is ON or STOP/RESET key is pressed.	Rotating _5555_
Waiting in under-voltage status	If the input voltage falls, the inverter will shut off its output, display the code shown on the right, and wait for the recovery of the input voltage. The inverter will display the same error code also during an instantaneous power failure. (remark) Inverter trips with under voltage when this status continues for 40 seconds.	- - - -
Waiting for retry	When the retry after instantaneous power failure or tripping has been enabled, the inverter displays the code shown on the right while awaiting retry after an instantaneous power failure or tripping.	_0000_
Power-off	The inverter displays the code shown on the right when the inverter power is turned off.	- - - -
Restricted operation command	When an operation direction has been restricted by the setting of "b035", the inverter will display the code shown on the right if the operation command specifying the restricted operation direction is input.	_0000_
During Initialization for the parameter	Display during initialization for the parameter. In case of the b085=0 (pattern 0)	', 00 ⇕ Blinking alternatively 1
	Display during initialization for the parameter. In case of the b085=1 (pattern 1)	', 01 ⇕ Blinking alternatively 1
During Initialization for trip history	Display during initialization for the trip history.	', HC
Empty trip history	If the inverter has not tripped before, the inverter displays.	. . . .
Communication error	If a problem occurs in the communication between the digital operator and inverter, the inverter will display the code shown on the right.	Blinking . . . .