N700E INSTRUCTION MANUAL (For sizes N700E-055LF/HF through N700E-3500HF)

CAUTION FOR UL/cUL REQUIREMENTS

- -THE HYUNDAI HEAVY INDUSTRY N700E INVERTER UL FILE NUMBER IS E205705. CONFIRMATION OF UL LISTING CAN BE FOUND ON THE UL WEB SITE : www.ul.com
- -DO NOT CONNECT OR DISCONNECT WIRING, OR PERFORM SIGNAL CHECKS WHILE THE POWER SUPPLY IS TURNED ON.
- -THERE ARE LIVE PARTS INSIDE THE INVERTER. NEVER TOUCH THE PRINTED WIRING BOARD(PWB) WHILE THE POWER SUPPLY IS TURNED ON.
- -[WARNING] THE BUS CAPACITOR DISCHARGE TIME IS 5 MINUTES. BEFORE STARTING WIRING OR INSPECTION, SWITCH POWER OFF, WAIT FOR MORE THAN 5 MINUTES, AND CHECK FOR RESIDUAL VOLTAGE BETWEEN TERMINAL P(+) AND N(-) WITH A METER ETC., TO AVOID HAZARD OF ELECTRICAL SHOCK.

-[SHORT CIRCUIT RATING] THIS INVERTER IS SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN ______ARMS SYMMETRICAL AMPERES, 480 VOLTS FOR HF TYPE AND 240 VOLTS FOR LF TYPEMAXIMUM.

BRANCH CIRCUIT SHORT CIRCUIT PROTECTION SHALL BE PROVIDE BY FUSE ONLY *1 see each Model for exact kA

5KA	N700E-055LF/075LFP ~ N700E-370HF/450HFP All Model
10KA	N700E-450HF/550HFP ~ N700E-1320HF/1600HFP All Model
18KA	N700E-1600HF/2000HFP ~ N700E-2200HF/2500HFP All Model
30KA	N700E-2800HF/3200HFP ~ N700E-3500HF/3800HFP All Model

-[OVER SPEED PROTECTION] THIS INVERTER DOES NOT PROVIDE OVER SPEED PROTECTION.

-[MOTOR OVER LOAD PROTECTION] THIS INVERTER PROVIDES MOTOR OVER LOAD PROTECTION.OVER LOAD PROTECTION LEVEL IS 20~120% OF FULL LOAD CURRENT. THE PROTECTION LEVEL MAY BE ADJUSTED BY CODE B04.REFER TO THE N700E USER GUIDE OR CATALOG.

- [MOTOR OVERTEMPERATURE] MOTOR OVERTEMPERATURE SENSING IS NOT PROVIDED BY THE DRIVE.

-[ENVIRONMENT]

MAXIMUM AMBIENT	40°C
TEMPERATURE	(WHEN CARRIER FREQUENCY EQUAL TO OR LESS THAN
	DEFAULT VALUE)
AMBIENT HUMIDITY	90% RH OR LESS(NO CONDENSING)
STORAGE	-20~60°C
TEMPERATURE	
VIBRATION	5.9m/s'OR LESS
ALTITUDE	ALTITUDE 1,000m OR LESS
AMBIENCE	INDOORS(NO CORROSIVE AND FLAMMABLE GASES,
	OIL MIST, DUST AND DIRT)
POLLUTION DEGREE	2

SAFETY

FOR THE BEST RESULTS WITH N700E SERIES INVERTER, READ THIS MANUAL AND ALL OF THE WARNING SIGN ATTACHED TO THE INVERTER CAREFULLY BEFORE INSTALLING AND OPERATING IT, AND FOLLOW THE INSTRUCTION EXACTLY. KEEP THIS MANUAL HANDY FOR YOUR QUICK REFERENCE.

DEFINITIONS AND SYMBOLS

A SAFETY INSTRUCTION (MESSAGE) IS GIVEN WITH A HAZARD ALERT SYMBOL AND A SIGNED WORD, **WARNING** or **CAUTION**.

EACH SIGNAL WORD HAS THE FOLLOWING MEANING THROUGHOUT THIS MANUAL.



THIS SYMBOL MEANS HAZARDOUS HIGH VOLTAGE. IT USED TO CALL YOUR ATTENTION TO ITEMS OR OPERATIONS THAT COULD BE DANGEROUS TO YOU OR OTHER PERSONS OPERATING THIS EQUIPMENT. READ THESE MESSAGES AND FOLLOW THESE INSTRUCTIONS CAREFULLY.



THIS IS THE "SAFETY ALERT SYMBOL". THIS SYMBOL IS USED TO CALL YOUR ATTENTION TO ITEMS OR OPERATIONS THAT COULD BE DANGEROUS TO YOU OR OTHER PERSONS OPERATING THIS EQUIPMENT. READ THESE MESSAGES AND FOLLOW THESE INSTRUCTIONS CAREFULLY.



WARNING INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, CAN RESULT IN SERIOUS INJURY OR DEATH.



CAUTION INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, CAN RESULT IN MINOR TO MODERATE INJURY, OR SERIOUS DAMAGE OF PRODUCT. THE MATTERS DESCRIBED UNDER **CAUTION** MAY, IF NOT AVOIDED, LEAD TO SERIOUS RESULTS DEPENDING ON THE SITUATION. IMPORTANT MATTERS ARE DESCRIBED IN **CAUTION** (AS WELL AS WARNING), SO BE SURE TO OBSERVE THEM.

NOTENOTES INDICATE AN AREA OR SUBJECT OF SPECIAL MERIT, EMPHASIZING EITHER THE PRODUCT`S CAPABILITIES OR COMMON ERRORS IN OPERATION OR MAINTENANCE.



HAZARDOUS HIGH VOLTAGE

MOTOR CONTROL EQUIPMENT AND ELECTRONIC CONTROLLERS ARE CONNECTED TO HAZARDOUS LINE VOLTAGE.

WHEN SERVICING DRIVES AND ELECTRONIC CONTROLLERS, THERE MIGHT BE EXPOSED COMPONENTS WITHCASES OR PROTRUSIONS AT OR ABOVE LINE POTENTIAL.

EXTREME CARE SHOULD BE TAKEN TO PRODUCT AGAINST SHOCK. STAND ON AN INSULATING PAD AND MAKE IT A HABIT TO USE ONLY ONE HAND WHEN CHECKING COMPONENTS.

ALWAYS WORK WITH ANOTHER PERSON IN CASE AN EMERGENCY OCCURS. DISCONNECT POWER BEFORE CHECKING CONTROLLER OR PERFORMING MAINTENANCE.

BE SURE EQUIPMENT IS PROPERLY GROUNDED. WEAR SAFETY GLASSES WHENEVER WORKING ON AN ELECTRIC CONTROLLER OR ROTATING ELECTRICAL EQUIPMENT.

PRECAUTION



WARNING : THIS IS EQUIPMENT SHOULD BE INSTALLED, ADJUSTED AND SERVICED BY QUALIFIED ELECTRICAL MAINTENANCE PERSONAL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THE EQUIPMENTS AND THE HAZARDS INVOLVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULTSIN BODILY INJURY.



WARNING : THE USER IS RESPONSIBLE FOR ENSURING THAT ALL DRIVEN MACHINERY, DRIVE TRAIN MECHANISM NOT SUPPLIED BY HYUNDAI AND PROCESS LINE MATERIAL ARE CAPABLE OF SAFE OPERATION AT AN APPLIED FREQUENCY OF 150% OF THE MAXIMUM SELECTED FREQUENCY RANGE TO THE AC MOTOR. FAILURE TO DO SO CAN RESULT IN DESTRUCTION OF EQUIPMENT AND INJURY TO PERSONNEL SHOULD A SINGLE POINT FAILURE OCCUR.



WARNING : FOR PROTECTION, INSTALL AN EARTH LEAKAGE BREAKER WITH A HIGH FREQUENCY CIRCUIT CAPABLE OF LARGE CURRENTS TO AVOID AN UNNECESSARY OPERATION.

THE GROUND FAULT PROTECTION CIRCUIT IS NOT DESIGNED TO PROTECT PERSONAL INJURY.



CAUTION: HEAVY OBJECT. TO AVOID MUSCLE STRAIN OR BACK INJURY, USE LIFTING AIDS AND PROPER LIFTING TECHNIQUES WHEN REMOVING OR REPLACING.



CAUTION : THESE INSTRUCTIONS SHOULD BE READ AND CLEARLY UNDERSTOOD BEFORE WORKING ON N700E SERIES EQUIPMENT.



CAUTION : PROPER GROUNDS, DISCONNECTING DEVICES AND OTHER SAFETY DEVICES AND THEIR LOCATION ARE THE RESPONSIBILITY OF THE USER AND ARE NOT PROVIDED BY HYUNDAI.



CAUTION : BE SURE TO CONNECT A MOTOR THERMAL SWITCH OR OVERLOAD DEVICES TO THE N700E SERIES CONTROLLER TO ASSURE THAT INVERTER WILL SHUT DOWN IN THE EVENT OF AN OVERLOAD OR AN OVERHEATED MOTOR



CAUTION: ROTATING SHAFTS AND ABOVE GROUND ELECTRICAL POTENTIALS CAN BE HAZARDOUS.

THEREFORE, IT IS STRONGLY RECOMMENDED THAT ALL ELECTRICAL WORK CONFORM TO THE NATIONAL ELECTRICAL CODES AND LOCAL REGULATIONS. ONLY QUALIFIED PERSONNEL SHOULD PERFORM INSTALLATION, ALIGNMENT AND MAINTENANCE. FACTORY RECOMMENDED TEST PROCEDURES, INCLUDE IN THE INSTRUCTION MANUAL, SHOULD BE FOLLOWED. ALWAYS DISCONNECT ELECTRICAL POWER BEFORE WORKING ON THE UNIT.

NOTE : POLLUTION DEGREE 2

THE INVERTER MUST BE USED IN THE ENVIRONMENT OF THE POLLUTION DEGREE 2. TYPICAL CONSTRUCTIONS THAT REDUCE THE POSSIBILITY OF CONDUCTIVE POLLUTION ARE,

 THE USE OF AN UNVENTILATED ENCLOSURE.
 THE USE OF A FILTERED VENTILATED ENCLOSURE WHEN THE VENTILATION IS FAN FORCED THAT IS, VENTILATION IS ACCOMPLISHED BY ONE MORE BLOWERS WITHIN THE ENCLOSURE THAT PROVIDE A POSITIVE INTAKE AND EXHAUST.

CAUTIONFOR EMC (ELECTROMAGNETIC COMPATIBILITY)

TO SAFETY THE EMC DIRECTIVE AND TO COMPLY WITH STANDARD, FOLLOWS THE CHECKLIST BELOW.

WARNING

THIS EQUIPMENT SHOULD BE INSTALLED, ADJUSTED, AND SERVICED BY QUALIFIED PERSONAL FAMILIAR WITH CONSTRUCTION AND OPERATION OF THE EQUIPMENT AND THE HAZARDS INVOLVED.

FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

- 1. THE POWER SUPPLY TO N700E INVERTER MUST MEET THESE SPECIFICATIONS
 - a. VOLTAGE FLUCTUATION ±10% OR LESS.
 - b. VOLTAGE IMBALANCE ±3% OR LESS.
 - c. FREQUENCY VARIATION ±4% OR LESS.
 - d. VOLTAGE DISTORTION THD = 10% OR LESS
- 2. INSTALLATION MEASURE :
 - a. USE A FILTER DESIGNED FOR N700E INVERTER
- 3. WIRING
 - a. SHIELDED WIRE (SCREENED CABLE) IS REQUIRED FOR MOTOR WIRING, AND THE LENGTH MUST BE LESS THAN 20 METERS.
 - b. THE CARRIER FREQUENCY SETTING MUST BE LESS THAN 5KHZ TO SATISFY EMC REQUIREMENTS.
 - c. SEPARATE THE MAIN CIRCUIT FROM THE SIGNAL/PROCESS CIRCUIT WIRING.
 - d. IN CASE OF REMOTE OPERATING WITH CONNECTOR CABLE, THE INVERTER DOES NOT CONFORM TO EMC
- 4. ENVIRONMENTAL CONDITIONS WHEN USING A FILTER, FOLLOW THESE GUIDELINES:
 - a. AMBIENT AIR TEMPERATURE : -10 +40°C
 - b. HUMIDITY : 20 TO 90% RH(NON-CONDENSING)
 - c. VIBRATION : 5.9 M/S² (0.6G) 10 55HZ (N700E-5.5 ~ 380KW)
 - d. LOCATION : 1000 METERS OR LESS ALTITUDE, INDOORS. (NO CORROSIVE GAS OR DUST)

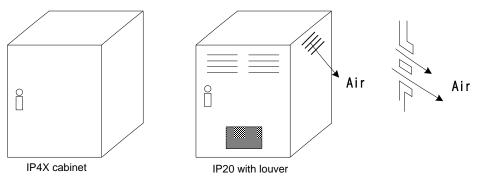
CONFORMITY TO THE LOW VOLTAGE DIRECTIVE (LVD)

THE PROTECTIVE ENCLOSURE MUST CONFORM TO THE LOW VOLTAGE DIRECTIVE. THE INVERTER CAN CONFORM TO THE LVD BY MOUNTING INTO A CABINET OR BY ADDING COVERS AS FOLLOWS.

1. CABINET AND COVER

THE INVERTER MUST BE INSTALLED INTO A CABINET WHICH HAS THE PROTECTION DEGREE OF TYPE IP2X.

IN ADDITION THE TOP SURFACES OF CABINET ARE EASILY ACCESSIBLE SHALL MEET AT LEAST THE REQUIREMENTS OF THE PROTECTIVE TYPE IP4X, OR WHICH IS CONSTRUCTED TO PREVENT SMALL OBJECTS FROM ENTERING INVERTER.





UL WARNINGS AND CAUTIONS MANUAL FOR N700E SERIES

THIS AUXILIARY INSTRUCTION MANUAL SHOULD BE DELIVERED TO THE END USER.

1. WIRING MARKING FOR ELECTRICAL PRACTICE AND WIRE SPECIFICATIONS "USE COPPER CONDUCTOR ONLY, 75°CWITH A TORQUE RATING.

2. TIGHTENING TORQUE AND WIRE RANGE

TIGHTENING TORQUE AND WIRE RANGE FOR FIELD WIRING TERMINALS ARE MARKED ADJACENT TO THE TERMINAL OR ON THE WIRING DIAGRAM.

MODEL NAME			RING
	TIGHTENINGTORQUE	WIRE RANGE	TERMINAL SIZE
N700E-(Heavy Duty/Normal	[LB-IN]	(AWG)	MAXIMUM
Duty)	10.1		WIDE [mm]
N700E-055LF/075LFP	12.4	8	10.6
N700E-075LF/110LFP	12.4	8	10.6
N700E-110LF/150LFP	26.6	6	13
N700E-150LF/185LFP	26.6	4	13
N700E-185LF/220LFP	35.4	3	17
N700E-220LF	35.4	1	17
N700E-055HF/075HFP	12.4	12	10.6
N700E-075HF/110HFP	12.4	10	10.6
N700E-110HF/150HFP	12.4	8	10.6
N700E-150HF/185HFP	26.6	8	13
N700E-185HF/220HFP	26.6	8	13
N700E-220HF/300HFP	26.6	6	13
N700E-300HF/370HFP	35.4	4	17
N700E-370HF/450HFP	35.4	2	17
N700E-450HF/550HFP	58.4	1	22
N700E-550HF/750HFP	58.4	2/0	22
N700E-750HF/900HFP	58.4	4/0	29
N700E-900HF/1100HFP	58.4	300 (kcmil)	29
N700E-1100HF/1320HFP	105.7	350 (kcmil)	30
N700E-1320HF/1600HFP	105.7	400 (kcmil)	30
N700E-1600HF/2000HFP	113	4/0*2P	38
N700E-2200HF/2500HFP	113	300 (kcmil)*2P	38
N700E-2800HF/3200HFP	113	4/0*4P	38
N700E-3500HF/3800HFP	113	300 (kcmil)*4P	38

*RECOMMENDED RING TERMINAL SIZE (UL LISTED) FOR 055LF~110LF:MAXIMUM WIDE 12mm

3. FUSE SIZE

DISTRIBUTION FUSE SIZE MARKING IS INCLUDED IN THE MANUAL TO INDICATE THAT THEUNIT SHALL BE CONNECTED WITH AN UL LISTED INVERSE TIME, RATED 600V WITH THECURRENT RATINGS OR AN UL LISTED FUSE AS SHOWN IN THE TABLE BELOW.

MODEL NAME	FUSE [A]	Manufacturer
N700E-055LF/075LFP	30	-
N700E-075LF/110LFP	40	-
N700E-110LF/150LFP	60	-
N700E-150LF/185LFP	80	-
N700E-185LF/220LFP	100	-
N700E-220LF	125	-
N700E-055HF/075HFP	15	-
N700E-075HF/110HFP	20	-
N700E-110HF/150HFP	30	-
N700E-150HF/185HFP	40	-
N700E-185HF/220HFP	50	-
N700E-220HF/300HFP	60	-
N700E-300HF/370HFP	80	-
N700E-370HF/450HFP	100	-
N700E-450HF/550HFP	125	-
N700E-550HF/750HFP	150	-
N700E-750HF/900HFP	200	-
N700E-900HF/1100HFP	250	-
N700E-1100HF/1320HFP	300	-
N700E-1320HF/1600HFP	400	-
N700E-1600HF/2000HFP	A50P800-4	Ferraz
N700E-2200HF/2500HFP	A50P1000-4	Ferraz
N700E-2800HF/3200HFP	A50P1200-4	Ferraz
N700E-3500HF/3800HFP	A50P1200-4	Ferraz

DEFINITIONS AND SYMBOLS

A SAFETY INSTRUCTION (MESSAGE) INCLUDES A HAZARD ALERT SYMBOL AND A SIGNAL WORD, DANGER OR CAUTION. EACH SIGNAL WORD HAS THE FOLLOWING MEANING :

THIS SYMBOL IS THE "SAFETY ALERT SYMBOL." IT OCCURS WITH EITHER OF TWO SIGNAL WORDS : DANGER OR CAUTION, AS DESCRIBED BELOW.

DANGER : INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, CAN RESULT IN SERIOUS INJURY OR DEATH.

CAUTION : INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, CAN RESULT IN MINOR TO MODERATE INJURY, OR SERIOUS DAMAGE TO THE PRODUCT.

THE SITUATION DESCRIBED IN THE CAUTION MAY, IF NOT AVOIDED, LEAD TO SERIOUS RESULTS. IMPORTANT SAFETY MEASURES ARE DESCRIBED IN CAUTION (AS WELL AS DANGER), SO BE SURE TO OBSERVE THEM.

NOTE : INDICATES AN AREA OR SUBJECT OF SPECIAL MERIT, EMPHASIZING EITHER THE PRODUCT'S CAPABILITIES OR COMMON ERRORS DURING OPERATION OR MAINTENANCE.

1. Installation

- Be sure to install the unit on flame resistant material such as metal.
- Be sure not to place anything highly flammable in the vicinity..
- Do not carry unit by top cover, always carry by supporting base of unit.
- Be sure not to let foreign matter enter inverter such as cut wire refuse, spatter from welding, iron refuse, wire, dust, etc.
- Be sure to install inverter in a place which can bear the weight according to the specifications in the text. (Chapter 2. Installation and Wiring)
- Be sure to install the unit on a perpendicular wall which is not subject to vibration
- Be sure not to install and operate an inverter which is damaged or has parts which are missing..
- Be sure to install the inverter in an area which is not exposed to direct sunlight and is well ventilated. Avoid environments which tend to be high in temperature, high in humidity or to have dew condensation, as well as places with dust, corrosive gas, explosive gas, highly flammable gas, grinding-fluid mist, salt damage, etc.

2. Wiring

Failure to comply with the following could result in electrical shock, fire, or other harm to personnel or machinery. Be sure to comply.

- Be sure to ground the unit.
 Wiring work should be carried out by qualified electricians.
- Implement wiring after checking that the power supply is off. After installing the main body, carry out wiring. Do not remove the rubber bushing where wiring connections are made. Due to the possibility that a wire may be damaged, shorted or may have a ground fault with the edge of the wiring cover.

- Make sure that the input voltage is: 200 to 240V +/- 10%, 50/60Hz 400 to 480V +/- 10%, 50/60Hz
- For single phase input applications, de-rating of the drive will be required for safe and reliable operation. Please contact World Wide Electric for sizing assistance and proper drive selection. Be sure not to connect AC power supply to the output terminals(U, V, W). Be sure not to connect a resistor to the DC terminals(PD, P and N) directly.
- Be sure to install an earth leakage breaker or the fuse(s) which is(are) the same phase as the main power supply in the operation circuit.
- As for motor leads, earth leakage breakers, and electromagnetic contactors, be sure to use equivalent ones with the specified capacity(rated).
 Do not stop operation by switching off the electromagnetic contactors on the primary or secondary sides of the inverter..
- Fasten the screws to the specified torque. Check so that there is no loosening of screws.

3. Control and operation

- While the inverter is energized, be sure not to touch the main terminal or to check the signal or add or remove wires and/or connectors.
- Be sure to turn on the power supply with the front case is closed. While the inverter is energized, be sure not to open the front case.
- Be sure not to operate the switches with wet hands.
- While the inverter is energized, be sure not to touch the inverter terminals even while the unit is not running.
- If the retry mode is selected, it may suddenly restart during the trip stop.
 Be sure not to approach the equipment. (Be sure to design the equipment so that personnel safety will be secured even if equipment restarts.)
- Be sure not to select retry mode for equipment running up and down or traversing because there is output free-running mode in term of retry.
- Even if the power supply is cut for a short period of time, the inverter may restart operation after the power supply is restored if the operation command is given. If a restart may incur danger to personnel, be sure to make a circuit so that it will not restart after power recovery.
- The stop key is valid only when a function is on. Ensure that there is a hard wired emergency stop that is separate from the stop key of the inverter.
- With the operation command on, if the alarm reset is ordered, the inverter can restart suddenly. Be sure to set the alarm reset after checking the operation command is off.
- Be sure not to touch the inside of the energized inverter or to put a shorting bar into it.

Failure to comply with the following could result in electrical shock, fire, or other harm to personnel or machinery. Be sure to comply.

- The cooling fins will have a high temperature. Be sure not to touch them.
- Low to high speed operation of the inverter can be easily set. Be sure to operate it after checking the tolerance of the motor and machine.
- Install an external breaking system if needed.
- If a motor is operated at a frequency outside of the standard setting value (50Hz/60Hz), be sure to check the speeds of the motor and the equipment with each manufacturer, and after getting their consent, operate them.
- Check the following before and during the test run.
 Was the direction of the motor correct?
 Did the inverter trip for on acceleration or deceleration?
 Were the RPM and frequency motor correct?
 Were there any abnormal motor vibrations or noises?
- The AC reactor must be installed When the power is not stable to avoid damage to the inverter.

4. Maintenance, inspection and part replacement

- After turning off the input power supply, do not perform the maintenance and inspection for at least 10 minutes.
- Make sure that only qualified persons will perform maintenance, inspection and/or part replacement.
 (Before starting the work, remove metallic objects(wristwatch, bracelet, etc.) from a worker.
 (Be sure to use insulated tools.)

5. Others

Failure to comply with the following could result in electrical shock, fire, or other harm to personnel or machinery. Be sure to comply.

• Never modify the unit.

 Heavy object(over 15kg). To avoid muscle strain or back injury, use lifting aids and proper lifting techniques when removing or replacing.

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1. GENERAL DESCRIPTION

1.1 Inspection upon Unpacking

1.1.1 Inspection of the unit

Please open the package, remove the inverter, please check the following items.

- If you discover any unknown parts or the unit is damaged, please contact World Wide Electric. (1) Make sure that the package contains one operation manual for the inverter.
- (2) Make sure that there was no damage (broken parts in the body) during transportation of the unit.
- (3) Make sure that the product is the one you ordered by checking the label specification.

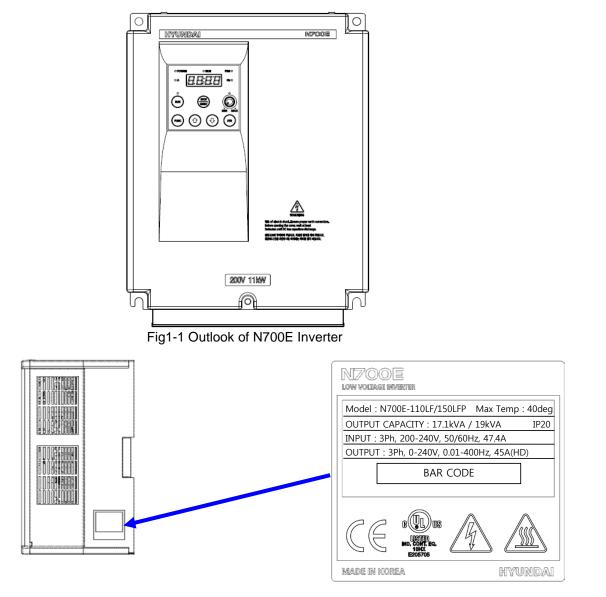


Fig1-2 Contents of Specification label

1.1.2 Instruction manual

This instruction manual is the manual for the N700E inverters. Before operation of the inverter, read the manual carefully. After reading this manual, keep it on hand for future reference

1.2 Questions and Warranty of the Unit

1.2.1 Questions on Unit

- If you have any questions regarding damage to the unit, unknown parts or for general inquiries, please contact World Wide Electric with the following information.
- (1) Inverter Model
- (2) Production Number (Serial No.)
- (3) Date of purchase
- (4) Reason for Calling
 - ① Damaged part and its condition etc.
 - ② Unknown parts and their contents etc.

1.2.2 Warranty for the unit

- (1) The warranty period of the unit is one year after the purchase date. However the warranty will be void if the fault is due to;
 - ① Incorrect use as directed in this manual, or attempted repair by unauthorized personnel.
 - 2 Any damage sustained other than from transportation (Which should be reported immediately).
 - ③ Using the unit beyond the limits of the specifications.
 - ④ Natural Disasters : Earthquakes, Lightning, etc
- (2) The warranty is for the inverter only, any damage caused to other equipment by malfunction of the inverter is not covered by the warranty.
- (3) Any examination or repair after the warranty period (one-year) is not covered. And within the warranty period any repair and examination which results in information showing the fault was caused by any of the items mentioned above, the repair and examination costs are not covered. If you have any questions regarding the warranty, please contact either World Wide Electric.

1.3 Appearance

1.3.1 N700E-055LF/075LFP ~ N700E-220HF/300HFP



Fig1-3 Appearance from the front

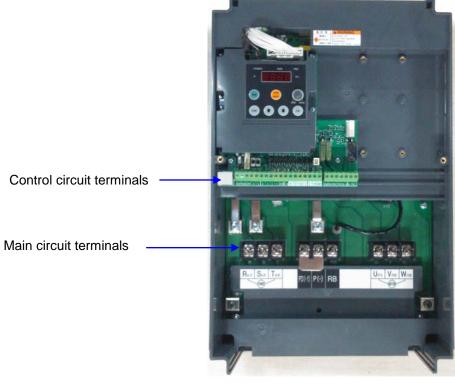


Fig1-4 Front cover removed

1.3.2 N700E-300HF/370HFP ~ N700E-1320HF/1600HFP



Fig1-5 Appearance from the front

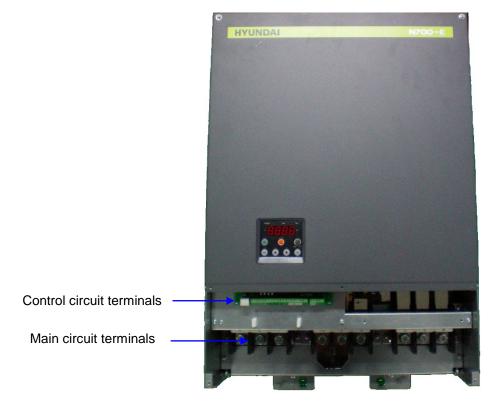


Fig1-6 Front cover removed

1.3.3 N700E-1600HF/2000HFP ~ N700E-2200HF/2500HFP

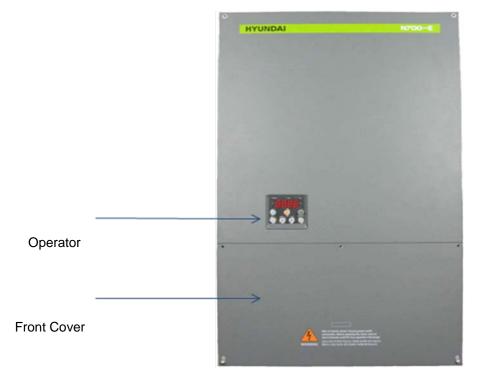


Fig1-7 Appearance from the front

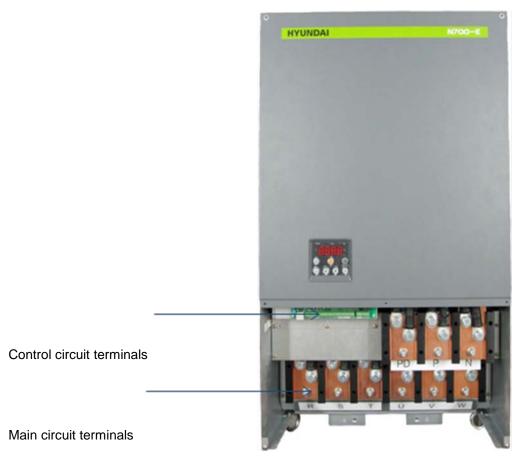
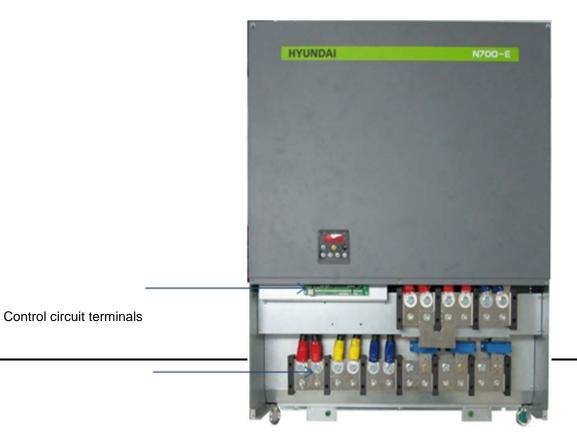


Fig1-8 Front cover removed

1.3.4 N700E-2800HF/3200HFP ~ N700E-3500HF/3800HFP



Fig1-9 Appearance from the front



Main Circuit Terminals

Fig1-10 Front cover removed

2. Installation and Wiring

2.1 Installation

- Be sure to install the unit on flame resistant material such as metal. Be sure not to place anything flammable in the vicinity.
- Do not carry the unit by the top cover, always carry by supporting the base of unit.
- Be sure not to let foreign matter enter such as cut wire refuse, spatter from welding, iron refuse, wire, dust, etc.
- Be sure to install the inverter in a place which can bear the weight according to the specifications in the text.
- Be sure to install the unit on a perpendicular wall which is not subject to vibration..
- Be sure not to install and operate an inverter which is damaged or parts of which are missing..
- Be sure to install the inverter in an area which is not exposed to direct sunlight and is well ventilated. Avoid environments which tend to be high in temperature, high in humidity or to have dew condensation, as well as places with dust, corrosive gas, explosive gas, inflammable gas, grinding-fluid mist, salt damage, etc.

2.1.1 Installation

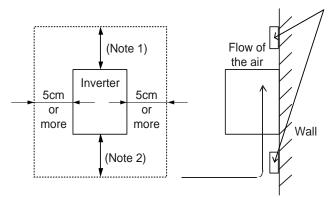
(1) Transportation

This inverter has plastic parts. So handle with care. Do not over tighten the wall mounting fixings as the mountings may crack, causing is a risk of falling. Do not install or operate the inverter if there appears to be damaged or parts missing.

(2) Surface for the mounting of inverter

The temperature of the inverter heatsink can rise very high.

The surface, to which the inverter will be mounted, must be made of a non-flammable material(i.e. steel) due to the possible risk of fire. Attention should also be made to the air gap surrounding the inverter. Especially, when there is a heat source such as a breaking resistor or reactor.



Ensure proper spacing for ventilation to prevent the unit from overheating.

(Note1)

10cm or more for 5.5kW to 55kW inverter 30cm or more for 75kW to 132kW inverter 50cm or more for 160kW to 375kW inverter

Fig 2- 1Surface for the mounting of inverter

(3) Operating Environment-Ambient Temperature

The ambient temperature surrounding the inverter should not exceed the allowable temperature range (14 to 122° F, -10 to 50° C).

The temperature should be measured in the air gap surrounding the inverter, shown in the diagram above. If the temperature exceeds the allowable temperature, component life will become shortened especially in the case of the Capacitors.

(4) Operating Environment-Humidity

The humidity surrounding the inverter should be within the limit of the allowable percentage range (20% to 90% / RH).

Under no circumstances should the inverter be in an environment where there is the possibility of moisture entering the inverter.

Also avoid having the inverter mounted in a place that is exposed to the direct sunlight.

(5) Operating Environment-Air

Install the inverter in a place free from dust, corrosive gas, explosive gas, combustible gas, mist of coolant and sea damage.

(6) Mounting Position

Mount the inverter in a vertical position using screws or bolts. The mounting surface should also be free from vibration and can easily hold the weight of the inverter.

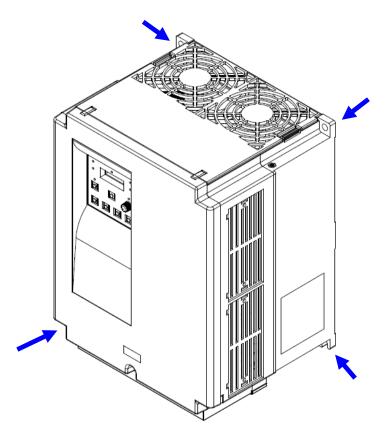


Fig 2-2Mounting Position

(7) Ventilation within an Enclosure

If you are installing one or more inverters in an enclosure a ventilation fan should be installed. Below is a guide to the positioning of the fan to take the airflow into consideration. The positioning of inverter, cooling fans and air intake is very important.

If these positions are wrong, airflow around the inverter decreases and the temperature surrounding the inverter will rise. So please make sure that the temperature around is within the limit of the allowable range.

(8) External cooling of inverter

It is possible to install the inverter so that the heatsink is outside of the back of the enclosure. This method has two advantages, the cooling of the inverter is greatly increased and the size of the enclosure will be smaller.

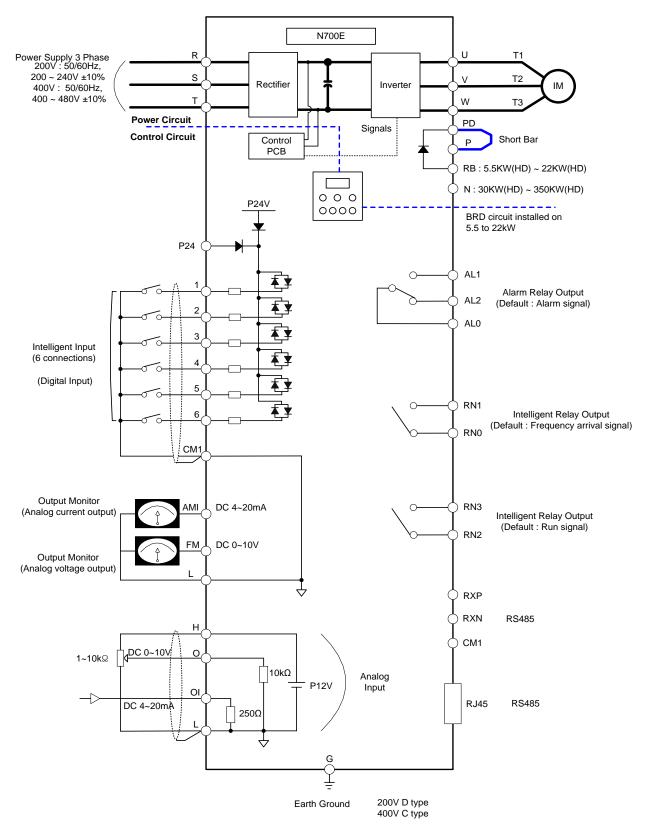
To install it with the heatsink outside of the enclosure, a metal fitting option is required to ensure heat transfer. Do not install in a place where water, oil, mist, flour, and/or dust etc. can come in contact with the inverter as there are cooling fans fitted to the heatsink.

2.2 Wiring

Failure to comply with the following could result in electrical shock, fire, or other harm to personnel or machinery. Be sure to comply.

- Be sure to ground the unit.
- Wiring work should be carried out by qualified electricians.
- Implement wiring after checking that the power supply is off.
- After mounting the inverter, carry out wiring.
- Do not remove the rubber bushings where wiring connections are made. (5.5 to 22kW) Due to the possibility that a wire may be damaged, shorted or may have a ground fault with the edge of the wiring cover.

- Make sure that the input voltage is: 200 to 240V +/- 10%, 50/60Hz (Model : N700E-055LF/075LFP~220LF) 400 to 480V +/- 10%, 50/60Hz (Model : N700E-055HF/075HFP~3500HF/3800HFP)
- For single phase input applications, de-rating of the drive will be required for safe and reliable operation. Please contact World Wide Electric for sizing assistance and proper drive selection.Be sure not to connect AC power supply to the output terminals(U, V, W).
- Be sure not to connect a resistor to the DC terminals(PD, P) directly. Be sure to set a earth leakage breaker or the fuse(s) which is(are) the same phase as the main power supply in the operation circuit.
- As for motor leads, earth leakage breakers, and electromagnetic contactors, be sure to use equivalent ones with the specified capacity(rated).
- Do not stop operation by switching off the electromagnetic contactors on the primary or secondary sides of the inverter.
 Fasten the screws to the specified torque. Check so that there is no loosening of screws.



2.2.1 Terminal Connection Diagram (sink type)

Fig.2-3 Terminal Connection Diagram (sink type)

Symbol	Terminal Name	Explanation of contents	
R,S,T (L1,L2,L3)	Main power	Connect alternating power supply. When using regenerative converter and RG series, don't connect.	
U,V,W (T1,T2,T3)	Inverter output	Connect three-phase motor.	
PD,P (+1,+)	D.Creactor	Remove the short bar between PD and P, connect optional Power factor reactor (DCL).	
P, RB (+, -)	External braking resistor	Connect optional External braking resistor. (Please install the optional External braking resistor for 5.5~22k model.)	
P, N External braking Unit Connect optional External braking Unit (Please install the optional External braking Unit for 30~350kW model.)			
G	Inverter earth terminals	Grounding terminal.	
Table 2-1Explanation of main circuit terminals			

(1) Explanation of main circuit Terminals

(2) Control circuit Terminals

Signal	Terminal Symbol	Terminal name	Terminal function
	P24	Interface power	24VDC ±10%, 35mA
	6 (RS)	Intelligent Input Terminal	
	5 (AT)	Forward run command(FW)	
	4 (CF2)	Reverse run command(RV), multi-speed commands1-4(CF1-4),2-stage accel/decel	Contact input : Close : ON
	3 (CF1)	(2CH),	(operating)
Input	2 (RV)	Reset(RS),Terminal software lock(SFT),	Open : OFF(stop)
signal	1 (FW)	Unattended start protection(USP) ^(Noté2) , Current input selection(AT),Jogging operation(JG), External trip(EXT), 3 wires input(STA,STP,F/R) Up/Down(Up, Down), Local/Remote By-pass Operation (O/R, T/R), PID Integral Reset(PIDIR), PID Disable(PIDD)	Minimum ON TIME :12msor more
	CM1	Common terminal for input or monitor signal	
Monitor signal Frequency	FM	Analog Monitor (Frequency, Current, Voltage, Power)	Analog voltage output
	AMI	Analog Monitor (Frequency, Current, Voltage, Power)	Analog current output
	Н	Frequency power	12VDC
	0	Frequency command power terminal (voltage)	0-10VDC, Input Impedance 10kΩ
command signal	OI	Frequency command terminal (current)	4-20mA, Input Impedance250Ω
	L	Analog power common	
No.1 Channel Communication terminal	RJ-45	Basic Communication connect	Basic RS-485 Communication terminal
No.2 Channel	RXP	RS-485 Communication + terminal	No.2 Channel RS-485
Communication terminal	RXN	RS-485 Communication - terminal	Communication terminal

N700E INSTRUCTION MANUAL

Signal	Terminal Symbol	Terminal name	Terminal function
Output	RN0 RN1	Intelligent output terminal: Run status signal(RUN), Frequency arrival	Contact rating: AC 250V2.5A (resistor load) 0.2A (inductor load)
signal	signal RN2 RN3	signal(FA1), Set frequency arrival signal(FA2), Overload advance notice signal(OL), PID error deviation signal(OD), Alarm signal(AL)	DC 30V 3.0A (resistor load) 0.7A (inductor load)
Intelligent Output signal	AL0 AL1 AL2	Alarm output terminal: Run status signal(RUN), Frequency arrival signal(FA1), Set frequency arrival signal(FA2), Overload advance notice signal(OL), PID error deviation signal(OD), Alarm signal(AL) Alarm output signals : at normal status, power off : AL0-AL2 (closed) at abnormal status : AL0-AL1 (closed) AL0 AL1 AL2	Contact rating: AC 250V2.5A (resistor load) 0.2A (inductor load) DC 30V 3.0A (resistor load) 0.7A (inductor load)

Table2-2Control circuit Terminals

2.2.2 Main circuit wiring

(1) Warning on wiring

When carrying out work on the inverter wiring make sure to wait for at least ten minutes before you remove the cover. Be sure to verify that the charge lamp is not illuminated.

A final check should always be made with a voltage meter.

After removing the power supply, there is a time delay before the capacitors will dissipate their charge.

- ① Main power terminals (R(L1), S(L2) and T(L3))
 - Connect the main power terminals (R(L1), S(L2) and T(L3)) to the power supply through an electromagnetic contactor or an earth-leakage breaker.
 N700 recommends connecting the electromagnetic contactor to the main power terminals, because when the protective function of the inverter operates, it isolates the power supply and prevents the spread of damage and accident.
 - This unit is for a three-phase power supply. If you require a single phase power supply unit, please contact World Wide Electric for proper sizing.
 - The inverter enters into the following condition at the occurrence of open phase if it is selected open phase protection is valid :
 - R phase, S phase or T phase, open phase condition:
 - It becomes single-phase operation condition. Trip operation, such as a deficiency voltage or over current, may occur.
 - Don't use it under open phase condition. A converter module may be damaged as a result of the following conditions. Use caution when
 - an unbalance of the power supply voltage is more than 3%
 - Power supply capacity is more than 10 times of the capacity of inverter and case beyond 500kVA.
 - A drastic change in the power supply
 - (Example) Turning on/off of the power supply should not be done more than three times in one minute. It has the possibility of damaging the inverter.
- 2 Inverter output terminals (U(T1), V(T2), and W(T3))
 - Using a heavier gauge wire can prevent the voltage drop.

Particularly when outputting low frequencies, the torque of the motor will be reduced by the voltage drop of the wire.

Do not install power factor correction capacitors or a surge absorber to the output.

The inverter will trip or sustain damage to the capacitors or the surge absorber.

- In the case of the cable length being more than 65 feet, it is possible that a surge voltage will be generated and damage to the motor is caused by the floating capacity or the inductance in the wire. When an EMC filter is to be installed, please contact World Wide Electric.
- In the case of two or more motors, install a thermal relay to each motor.
- Make the RC value of the thermal relay the value of 1.1 times of motor rated electric current.

③ Direct current reactor (DCL) connection terminals (PD, P)

- These are the terminals to connect the current reactor DCL (optional) to help improve the power factor.
- The short bar is connected to the terminals when shipped from the factory, if you are to connect a DCL you will need to disconnect the short bar first.
- When you do not use a DCL, do not disconnect the short bar.
- ④ External braking resistor connection terminals (P, RB) for units 30KW and smaller.
 - The regenerative braking circuit (BRD) is built-in as standard
 - When braking is required, install an external-braking resistor to these terminals.

- The cable length should be less than 16 feet, and twist the two connecting wires to reduce inductance.
 - Do not connect any other device other than the external braking resistor to these terminals.
- When installing an external braking resistor make sure that the resistance is correctly rated to limit the current drawn through the BRD (Dynamic Braking Module).
- (5) Regenerative breaking unit connection terminals (P,N) for units larger than 30KW.
 - Inverters rated more than 30KW do not contain a BRD circuit. If regenerative braking is Required an external BRD circuit (Option) is required along with the resistor (Option)
 - Connect external regenerative braking unit terminals (P,N) to terminals (P,N) on the inverter.
 - The braking resistor is then wired into the External Braking unit and not directly to the Inverter.
 - The cable length should be less than 5 meters, and twist the connecting wires to reduce Inductance.
- 6 Earth Ground (G)
 - Make sure that you securely ground the inverter and motor for prevention of electric shock.
 - The inverter and motor must be connected to an appropriate safety earth ground and follow all local electrical codes.
 - In case connecting 2 or more inverters, use caution not to create a ground loop situation which may cause the inverter to malfunction.

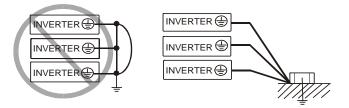
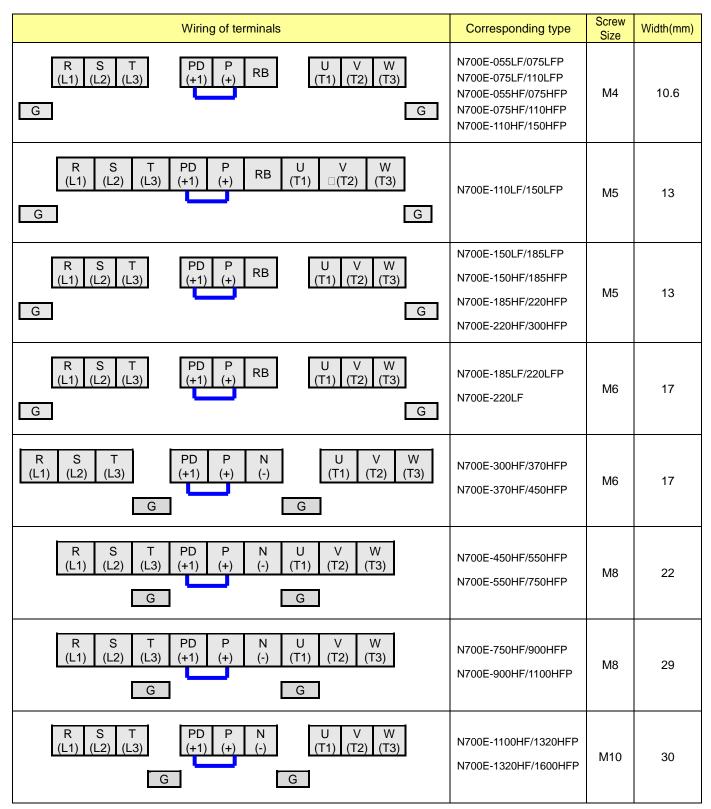


Fig. 2-4 Earth Ground (G)

(2) Wiring of main circuit terminals

The wiring of main circuit terminals for the inverter are in the following pictures.



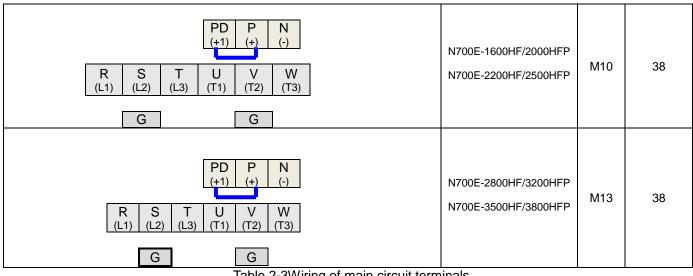


Table 2-3Wiring of main circuit terminals

Fuse

(3) Applicable Tools

- Note1 : The applicable equipment is for HYUNDAI standard four pole squirrel cage motor.
- Note2 : Be sure to consider the capacity of the circuit breaker to be used.
- Note3 : Be sure to use larger wire for power lines if the distance exceeds 20m.
- Note4 : Be sure to use an grounding wire same size of power line or similar.
- Note5 : Use 0.75mm² for AL relay and RN relay.

Separate by the sum(wiring distance from inverter to power supply, from inverter to motor for the sensitive current of leakage breaker (ELB)

	<u> </u>
Wiring distance	Sensitive Current(mA)
100m and less	50
300m and less	100
TILO 10 111 1	P 7 11 P 7

Table2-4Sensitive current according to wiring distance

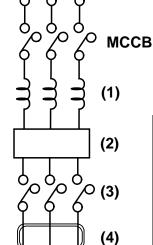
Note6 : When using CV line and wiring by rigid metal conduit, leak flows.

Note7 : IV line is high dielectric constant. SO the current increase 8 times.

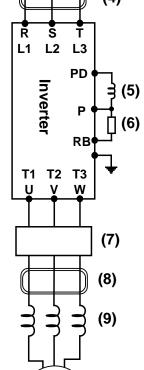
Therefore, use the sensitive current 8 times as large as that of the left list. And if the distance of wire is over 100m, use CV line.

	Name	Function
(1)	Input reactor (harmonic control, electrical coordination, power-factor improvement)	This part is used when the unbalance voltage rate is 3% or more and power supply is 500 kVA or more, and there is a rapid change in the power supply. It also improves the power factor.
(2)	Noise filter for Inverter	This part reduces common noise generated between the power supply and the ground, as well as normal noise. Put it in the primary side of inverter.
(3)	Radio noise filter (zero-phase reactor)	Using the inverter may cause noise on the peripheral radio through the power lines. This part reduces noise.
(4)	Input radio noise filter (capacitor filter)	This part reduces radiation noise emitted from wire at the input.
(5)	DC reactor	This part control harmonic from inverter.
(6)	Breaking resistor Regenerative breaking unit	This part is used for applications that need to increase the brake torque of the inverter or to frequently turn on and off and to run high inertia load.
(7)	Output noise filter	This part reduces radiation noise emitted from wire by setting between inverter and motor. And it reduces wave fault to radio and TV, it is used for preventing malfunction of sensor and measuring instruments.
(8)	Radio noise filter (Zero-phase reactor)	This part reduces noise generated at the output of the inverter. (It is possible to use for both input and output.)
(9)	Output alternation reactor Reducing vibration, thermal Relay, preventing Misapplication	Running motors with the inverter generates vibration greater than that with commercial power supply. This part installed between the inverter and motor reduces torque ripple. When the cable length between the inverter and motor is long (10m or more), a countermeasure for a malfunction of the thermal relay by harmonic due to switching on inverter is taken by inserting reactor. There is the way to use current sensor instead of thermal relay.
	LCR filter	Sine-wave filter at the output.

Table 2-5Optional accessories for improved performance



3-ph Input



Motor

(4) Common applicable tools

			Power lines	External	0		Apr	olicable Too	ols
Class	Motor Output (HP)	Inverter model	R,S,T U,V,W, P,PD,N (AWG,kcmil)	resister between P and RB (AWG)	Screw size of Terminal	Torque (N∙m)	Leak bro (MCC		Electro- magnetic Controller (MC)
	7.5	N700E- 055LF/075LFP	More than8	8	M4	1.2	UCB100R	50A	HiMC32
	10	N700E- 075LF/110LFP	More than 8	8	M4	1.2	UCB100R	50A	HiMC32
230V	15	N700E- 110LF/150LFP	More than 6	8	M5	3.0	UCB100R	75A	HiMC50
Class	20	N700E- 150LF/185LFP	More than 4	4	M5	3.0	UCB100R	100A	HiMC65
	25	N700E- 185LF/220LFP	More than 3	4	M6	4.5	UCB250S	150A	HiMC80
	30	N700E-220LF	More than 1	4	M6	4.5	UCB250S	150A	HiMC110
	7.5	N700E- 055HF/075HFP	More than12	10	M4	1.2	UAB30C	30A	HiMC18
	10	N700E- 075HF/110HFP	More than10	10	M4	1.2	UAB30C	30A	HiMC18
	15	N700E- 110HF/150HFP	More than8	8	M4	1.2	UCB100R	50A	HiMC32
	20	N700E- 150HF/185HFP	More than 8	6	M5	3.0	UCB100R	50A	HiMC40
	25	N700E- 185HF/220HFP	More than 8	6	M5	3.0	UCB100R	75A	HiMC40
	30	N700E- 220HF/300HFP	More than 6	6	M5	3.0	UCB100R	75A	HiMC50
	40	N700E- 300HF/370HFP	More than 4	-	M6	4.5	UCB100R	100A	HiMC65
	50	N700E- 370HF/450HFP	More than 2	-	M6	4.5	UCB250S	100A	HiMC80
	60	N700E- 450HF/550HFP	More than 1	-	M8	6.0	UCB250S	150A	HiMC110
460V Class	75	N700E- 550HF/750HFP	More than 2/0	-	M8	6.0	UCB250S	175A	HiMC130
	100	N700E- 750HF/900HFP	More than 4/0	-	M8	6.0	UCB400S	250A	HiMC180
	125	N700E- 900HF/1100HFP	More than 300(kcmil)	-	M8	6.0	UCB400S	250A	HiMC220
	150	N700E- 1100HF/1320HFP	More than 350(kcmil)	-	M10	10.0	UCB400S	350A	HiMC260
	200	N700E- 1320HF/1600HFP	More than 400(kcmil)	-	M10	10.0	UCB400S	350A	HiMC300
	250	N700E- 1600HF/2000HFP	More than 4/0*2P	-	M10	10.0	UCB800S	700A	HiMC400
	300	N700E- 2200HF/2500HFP	More than 300 (kcmil)*2P	-	M10	10.0	UCB800S	800A	HiMC500
	400	N700E- 2800HF/3200HFP	More than 4/0*4P	-	M10	10.0	UCB1000S	1000A	HiMC630
	450	N700E- 3500HF/3800HFP	More than 300 (kcmil)*4P	-	M10	10.0	UCB1250S	1250A	HiMC800

Table 2-6Common applicable tools for N700E inverters(Heavy Duty)

			Power lines	External	0		Ар	plicable To	ols
Class	Motor Output (HP)	Inverter model	R,S,T U,V,W, P,PD,N (AWG,kcmil)	resister between P and RB (AWG)	Screw size of Terminal	Torque (N∙m)	Leak bre (MCC		Electro- magnetic Controller (MC)
	10	N700E- 055LF/075LFP	More than 8	8	M4	1.2	UCB100R	50A	HiMC32
	15	N700E- 075LF/110LFP	More than 8	8	M5	3.0	UCB100R	75A	HiMC50
230V Class	20	N700E- 110LF/150LFP	More than 6	4	M5	3.0	UCB100R	100A	HiMC65
	25	N700E- 150LF/185LFP	More than 4	4	M6	4.5	UCB250S	150A	HiMC80
	30	N700E- 185LF/220LFP	More than 3	4	M6	4.5	UCB250S	150A	HiMC110
	10	N700E- 055HF/075HFP	More than12	10	M4	1.2	UAB30C	30A	HiMC18
	15	N700E- 075HF/110HFP	More than10	8	M4	1.2	UCB100R	50A	HiMC32
	20	N700E- 110HF/150HFP	More than8	6	M5	3.0	UCB100R	50A	HiMC40
	25	N700E- 150HF/185HFP	More than 8	6	M5	3.0	UCB100R	75A	HiMC40
	30	N700E- 185HF/220HFP	More than 8	6	M5	3.0	UCB100R	75A	HiMC50
	40	N700E- 220HF/300HFP	More than 6	-	M6	4.5	UCB100R	100A	HiMC65
	50	N700E- 300HF/370HFP	More than 4	-	M6	4.5	UCB250S	100A	HiMC80
	60	N700E- 370HF/450HFP	More than 2	-	M8	6.0	UCB250S	150A	HiMC110
	75	N700E- 450HF/550HFP	More than 1	-	M8	6.0	UCB250S	175A	HiMC130
460V Class	100	N700E- 550HF/750HFP	More than 2/0	-	M8	6.0	UCB400S	250A	HiMC180
	125	N700E- 750HF/900HFP	More than 4/0	-	M8	6.0	UCB400S	250A	HiMC220
	150	N700E- 900HF/1100HFP	More than 300(kcmil)	-	M10	10.0	UCB400S	350A	HiMC260
	200	N700E- 1100HF/1320HFP	More than 350(kcmil)	-	M10	10.0	UCB400S	350A	HiMC300
	250	N700E- 1320HF/1600HFP	More than 400(kcmil)		M10	10.0	UCB800S	700A	HiMC300
	300	N700E- 1600HF/2000HFP	More than 4/0*2P	-	M14	10.0	UCB800S	700A	HiMC300
	400	N700E- 2200HF/2500HFP	More than 300 (kcmil)*2P	-	M14	10.0	UCB800S	800A	HiMC400
	450	N700E- 2800HF/3200HFP	More than 4/0*4P	-	M14	10.0	UCB1000S	1000A	HiMC500
	500	N700E- 3500HF/3800HFP	More than 300 (kcmil)*4P	-	M14	10.0	UCB1250S	1250A	HiMC630

Table 2-7Common applicable tools for N700E inverters(Normal Duty, P-type)

2.2.3 Terminal connection diagram

(1) Terminal connection diagram

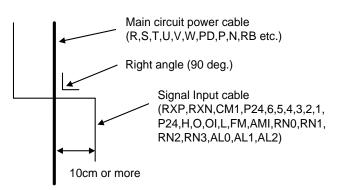
① The control circuit terminal of inverters is connected with the control board in unit.

NS RXP RXN CM1 6 5 4 3 2 1 CM1 P24 H 0 0.1 L L FM AMI RN0 RN1 RN2 RN3 AL0 A	RS 485		RX	RXN	CM1	6	5	4	3	2	1	CM1	P24	Η	0	01	L	L	FM	AMI	R	10	RN1	RN2	RN3	AL0	AL1	AL2
---	-----------	--	----	-----	-----	---	---	---	---	---	---	-----	-----	---	---	----	---	---	----	-----	---	----	-----	-----	-----	-----	-----	-----

Fig 2-5Terminal connection diagram

(2) Wiring

- Above control signals are insulated to its power lines(R, S, T, U, V, W). Do not connect those signals to power lines or ground.
- ② Use twisted screened cable, for the input and output wires of the control circuit terminals. Connect the screened cable to the common terminal.
- ③ Limit the connection wires to 65 feet.
- ④ Separate the control circuit wiring from the main power and relay control wiring.

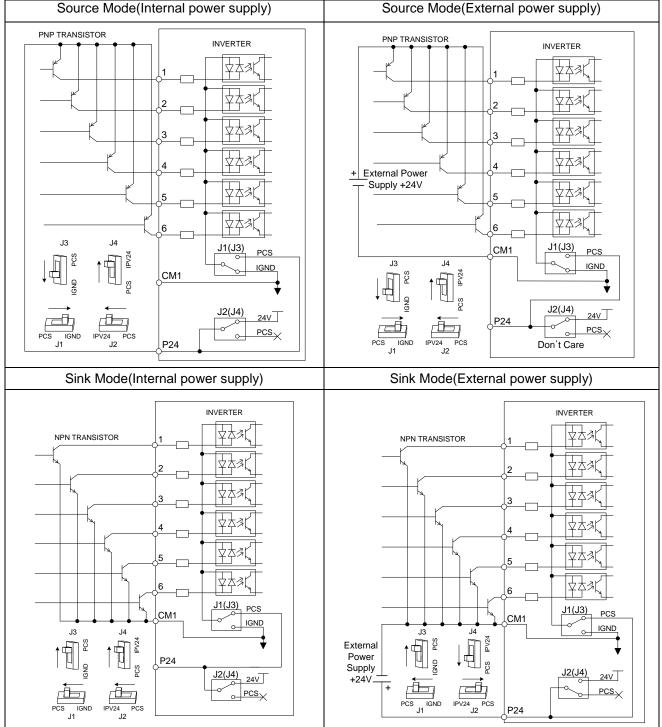


- 5 When using relays for the FW terminal or an intelligent input terminal use a control relay that is designed to work with 24Vdc.
- ⁽⁶⁾ When a relay is used as an intelligent output, connect a diode for surge protection parallel to the relay coil.
- ⑦ Do not short the analog voltage terminals H and L or the internal power terminals P24 and all CM1's. Otherwise there is risk of Inverter damage.
- 8 When connecting a thermistor to the TH and all CM1's terminal, twist the thermistor cables and separate them from the rest. Limit the connection wires to 65 feet

(3) Connection to the programmable logic controller output(sequencer)

-J1(J3) : Selection switch for operating mode(Sink mode, Source mode)

-J2(J4) : Selection of signal power source(Internal 24Vdc, External 24Vdc)



- The connection to the input programmable logic controller (sequencer)

Fig 2-6Input terminal and PLC connection

note) 5.5kW(HD) ~ 22kW(HD) : Switch J3, J4 30kW(HD) ~ 350kW(HD) : Switch J1, J2 (4) Connection to the programmable logic controller input(sequencer)

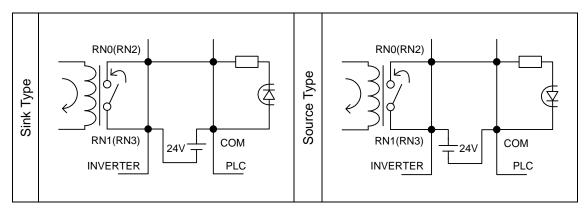


Fig 2-7 Output terminal and PLC connection

(5) 2NDcommunication RS-485 terminating resistor

The termination resistor of the RS-485 communication is for purpose of preventing the distortion and Attenuation of the communication line and this resistor means the Impedance matching resistor in long-distance transport of RS-485 Data. The termination resistor is inserted only in the final stage in single line.

<Terminating resistance selection switch (SW7)> Default : Terminating resistance Off

RS-485 Terminating resistance On :

RS-485 Terminating resistance Off :

3. Operation

Failure to comply with the following could result in electrical shock, fire, or other harm to personnel or machinery. Be sure to comply.

- Be sure not to touch the main terminal or to check the signal add or remove wires and/or connectors.
- Be sure not to turn the input power supply on until after front case is closed. While the inverter is energized, be sure not to remove the front cover.
- Be sure not to operate the switches with wet hands.
- While the inverter is energized, be sure not to touch the inverter terminals even while the unit is not running.
 If the retry mode is selected, it may suddenly restart during the trip stop.
 Be sure not to approach the equipment.(Be sure to design the equipment so that personnel safety will be secured even if equipment restarts.)
- Be sure not to select retry mode for up and down equipment or traveling equipment, because there is an output free-running mode in term of retry.
 Even if the power supply is cut for a short period of time, the inverter may restart operation after the power supply is restored if the operation command is given.
 If a restart may incur danger to personnel, be sure to make a circuit so that it will not restart after power recovery.
- The stop key is valid only when a function is on. Ensure that there is a hard wired emergency stop that is separate from the stop key of the inverter. With the operation command on, if the alarm reset is ordered, the inverter can restart suddenly. Be sure to set the alarm reset after checking the operation command is off.
- Be sure not to touch the inside of the energized inverter or to put a bar into it.

Failure to comply with the following could result in electrical shock, fire, or other harm to personnel or machinery. Be sure to comply.

- The cooling fins will have high temperature. Be sure not to touch them. Low to high speed operation of the inverter can be easily set. Be sure to operate it after checking the tolerance of the motor and machine.
- Install an external breaking system if needed.
 If a motor is operated at a frequency higher than standard setting value(50Hz / 60Hz), be sure to check the speeds of the motor and the machine from their manufacturers. After getting their consent, operate them.

3.1 Operating

This inverter requires two different signals in order for the inverter to operate correctly. The inverter requires both an operation setting and a frequency setting signal. The following indicates the details of each method of operation and necessary instructions for operation.

EXTERNAL WIRING

3.1.1 Operation setting and a frequency setting by the terminal control

- (1) This is the method which controls the inverter by connecting the control circuit terminals with signals from the outside(the frequency setting, the starting switch etc.).
- (2) The operation is started when the operation setting (FW, REV) is turned ON while the input power is turned ON.

(Note) The methods of setting the frequency with the terminal are the voltage setting and the current setting. Both are selective. The control circuit terminal list shows necessary things for each setting.

- 1 The operation setting : switch, relay, etc.
- 2 The frequency setting: signals from volume or external (DC 0 \sim 10V, 4 \sim 20mA etc.)

KEYPAD

3.1.2 Operation setting and frequency setting with the digital operator

- (1) This is the method of operation from the digital operator, which is supplied with the inverter as standard, or the optional remote operator keypad (OPE. KEYPAD) and volume (OPE. VOL).
- (2) When the inverter is being controlled by digital operator, the terminals (FW, REV) are not available. Frequency can be also controlled by digital operator.

BOTH

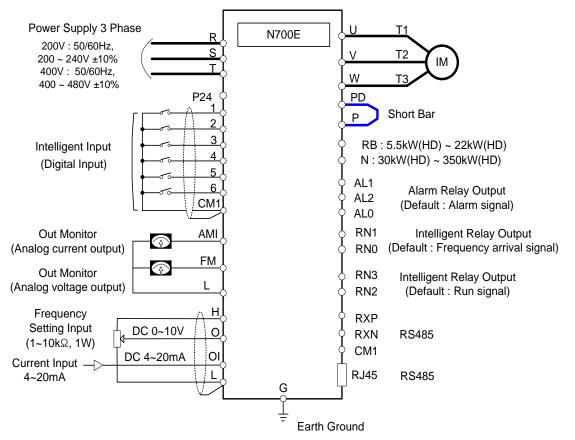
3.1.3 Operation setting and frequency setting from both the digital operator and the terminal operator

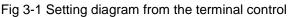
- (1) This is the method of inverter operating from both of the above two operating methods.
- (2) The operation setting and the frequency setting can be done through the digital operator and the terminal operator.

3.2 Test Run

This is an example of a common connection. Please refer to 4.1 Digital Operator, for the detailed use of the digital operator.

3.2.1 To input the operation setting and the frequency setting from the terminal control





(Procedure)

- (1) Please make sure that the connections are secured correctly.
- Turn the MCCB on to supply power to the inverter. (The LED "POWER" on the operator should illuminate)
- (3) Set the terminal with the frequency setting selection. Set A01 as the indication code, press the (FUNC) key once. (Code values are shown) Set 1(Terminal) with (UP/DOWN) key, press the (STR) key once to set the operation setting for the operator.(Indication code turns back to A01.)
- Set terminal with the operation setting selection.
 Set A02 as indication code, press the (FUNC) key once.
 Set 1(terminal) with the (UP/DOWN) key, press the (STR) key once to set the operation setting for the operator. (Indication code turns back to A02.)
- (5) Set Monitor mode When monitoring the output frequency, set indication code to d001, and press the (FUNC) key. Or when monitoring the operation direction, set indication code to d04, and press the (FUNC) key.
- (6) Input starting operation setting. Turn ON between [FW(1)] and [CM1] of terminal. Apply voltage [O] and [L] of terminal to start operation.
- (7) Input ending operation setting. Turn OFF between [FW(1)] and [CM1] to slowly stop.

3.2.2 Operation setting and the frequency setting from the digital operator

(Remote operator is also same use.)

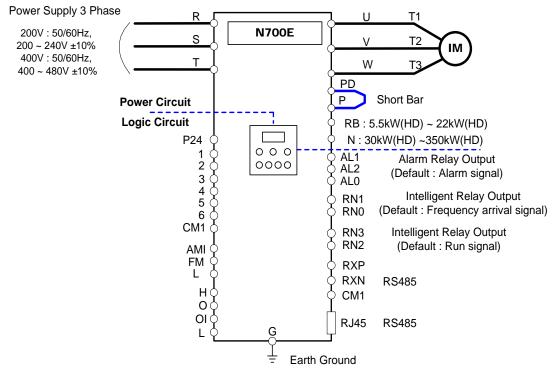


Fig 3-2 Setting diagram from the digital operator

(Procedure)

- (1) Please make sure that connection is right.
- (2) Turn the MCCB on to supply power to the inverter. (The LED "POWER" on the operator should illuminate)
- (3) Set the operator with the frequency setting selection.
 - Set A01 as indication code, press the (FUNC) key once. (Code values are shown)
 - ② Set 2(OPE KEYPAD) with (UP/DOWN) key, press the (STR) key once to set the operation setting for the operator. (Indication code turns back to A01.) [Setting method by OPE-N7]
- (4) Set the operator with the operation setting selection. Set A02 as the indication code, press the (FUNC) key once. Set 2(OPE) with (UP/DOWN) key, press the (STR) key once to set the operation setting for the operator. (Indication code turns back to A02.)
- (5) Set the output frequency
 - ① Set F001 as indication code, by pressing the (FUNC) key once. (Code values are shown.)
 - ② Set to the desired output frequency with the (UP/DOWN) key, press the (STR) key once to store it.
- (6) Set Monitor mode
 - ① When monitoring the output frequency, set indication code to d001, and press the (FUNC) key once. Or when monitoring the operation direction, set indication code to d04, press the (FUNC) key once.
- (7) Press the (RUN) key to start operating. (The "RUN" lamp turns on a light, and the indication changes in response to the monitor mode set.)
 (8) Press the (STOP) key to decelerate to a stop.

(When the frequency returns to 0, the RUN lamp light will switch off.).

4. Parameter Code List

4.1 About Digital Operator (DOP7 / ROP7)

4.1.1 Name and contents of each part of Standard-type digital operator

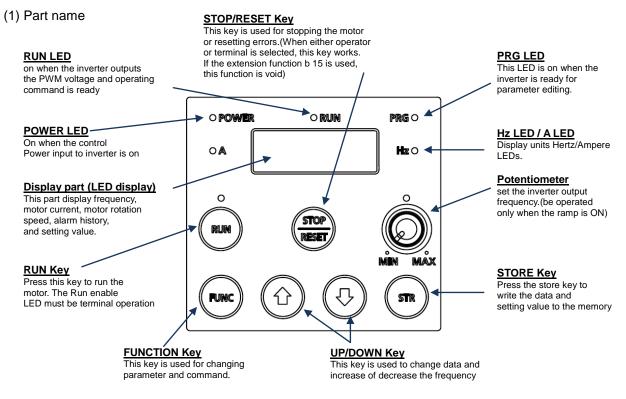
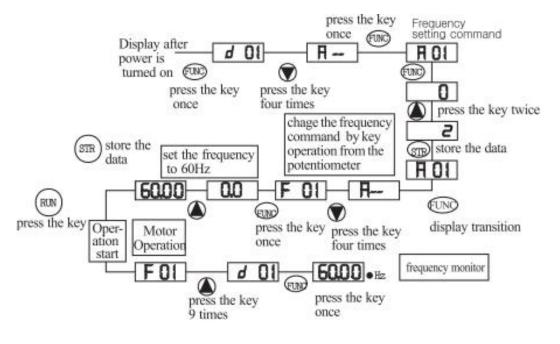
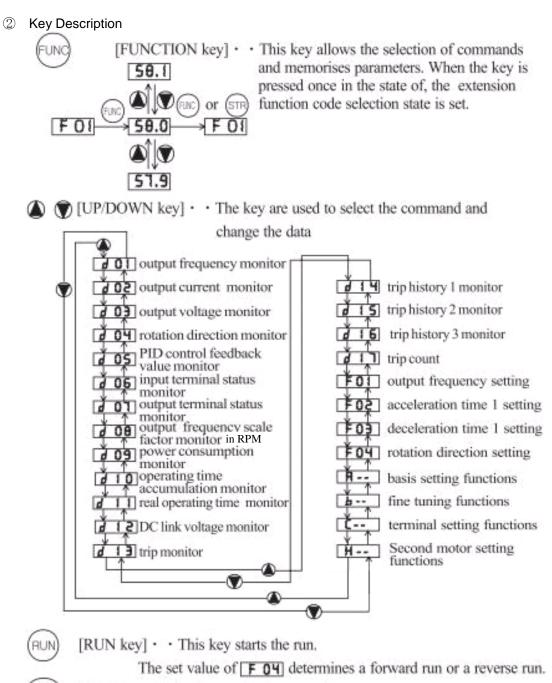


Fig.4-1 LED Type Digital Operator

(2) Operation procedure

① Example where frequency is set from potentiometer to the standard operator and the equipment starts running)

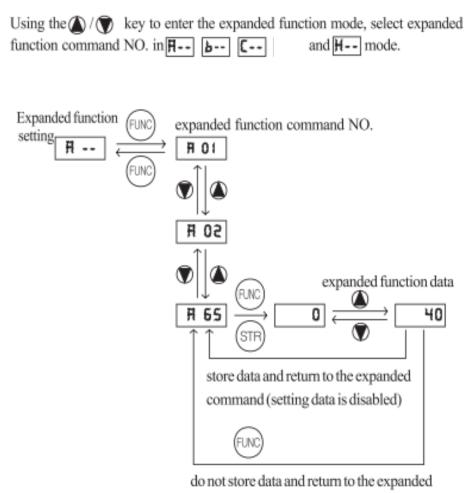




[STOP/RESET key] · · This key stops the run

When a trip occurs, this key becomes the reset key.

③ Extended function mode navigation map



command (setting data is disabled)

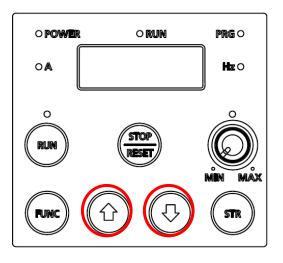
④ Display description:

When the inverter is running, one of the display groups can appear according to the setting value of b30 (display code setting)

4.1.2 Key Definition and Operation of "SHIFT"

Definition : The "SHIFT" function is enabled when you press both up and down keys simultaneously. The left most 7-segment digit blinks if you press the store key, the blinking segment moves to the right digit. When the 'store' key is pressed, it moves to the right digits again. When the right most digit is blinking and you press the 'store' key, it will turn back to the function of code display.

- 1. Display digit movement
- Press the UP key and DOWN key at the same time in data setting mode.
 - \rightarrow Change Scroll-mode to Shift-mode



2. Data setting method

Stop in target group using UP/DOWN key \rightarrow Press the function key, Change to data setting mode.

Press the UP key and DOWN key at the same time. \rightarrow First number is flashing on the left

Change the data using UP/DOWN key \rightarrow Press the Store-key \rightarrow Third number is flashing

Change the data using UP/DOWN key \rightarrow Press the Store-key

 \rightarrow Second number is flashing

Change the data using UP/DOWN key \rightarrow Press the Store-key

→ First number is flashing

Change the data using UP/DOWN key $\,\rightarrow\,$ Press the Store-key

 $\rightarrow\,$ Target function code is setting

4.2 Function List

4.2.1 Monitor Mode (d-group)

Func- code	Name	Description
d01	Output Frequency	Real-time display of output frequency to motor, from 0.00 to 400.0 Hz, "Hz" LED ON
d02	Output Current	Real-time display of output current to motor Range is 0.0 to 9999A, "A" LED ON.
d03	Output Voltage	Real-time display of output voltage to motor
d04	Rotation Direction	Three different indications: "F" Forward Run "□" Stop "r" Reverse Run
d05	PID Feedback	Displays the scaled PID process variable (feedback) value (A50 is scale factor)
d06	Intelligent Input Terminal Status	Displays the state of the intelligent input terminals:
d07	Intelligent Output Terminal Status	Displays the state of the intelligent output terminals:
d08	RPM Output	0 ~ 65530 (RPM) (=120 x d01 x b14) /H14
d09	Power Consumption	0 ~ 999.9 (kW)
d10	Drive Run Time(hours)	0 ~ 9999 (hr)
d11	Drive Run Time(minutes)	0 ~ 59 (min)
d12	DC Bus Voltage	0 ~ 999 (V)

Func- code	Name	Description
d13	last fault	Displays information concerning the last fault event Fault reason ↓ press the UP key Output frequency at last fault event ↓ press the UP/DOWN key Output current at last fault event ↓ press the UP/DOWN key DC link voltage at last fault event ↓ press the FUNC key "d13" display ·No trip event
d14	Previous Fault 1	Displays the previous Fault 1 event
d15	Previous Fault 2	Displays the previous Fault 2 event
d16	Previous Fault 3	Displays the previous Fault 3 event
d17	Trip Count	Displays the trip accumulation count

4.2.2 Trip & Warning monitor mode (d-group)

4.2.3 Basic Function Mode

Func- code	Name	Run-time Edit	Description	Defaults
F01	Frequency Setting	Ο	Standard default target frequency that determines constant motor that deter-mines constant motor speed. Parameter range is 0.00 to 400.0Hz unless drive is configured for sensorless vector control. Then the parameter range is 0.00 to 300.0Hz. (1) frequency setting from UP/DOWN key of digital operator. (2) Multi-step speed By combining frequency reference and intelligent input terminal ON/ OFF, up to 16 step of speed can be set. (3) Remote operator (NOP), control terminal input (O-L, OI-L). Frequency reference by the local potentiometer can be monitored	volume setting value
F02	Accel Time 1	0	0.1 ~ 3000sec Minimum 0.1 ~ 999.9 by 0.1sec setting range 1000 ~ 3000 by 1sec	30.0sec
F03	Decel Time 1	0	0.1~3000sec Minimum 0.1 ~ 999.9 by 0.1sec setting range 1000 ~ 3000 by 1sec	30.0sec
F04	Rotation Direction	Х	Two options: select codes: 0 Forward run 1 Reverse run	0
A	Extended function of A group setting	-	Basic setting functions setting range : A01 \sim A85.	-
b	Extended function of b group setting	-	Fine tuning functions Setting range :b01 \sim b33	-
C	Extended function of C group setting	-	Terminal setting functions Setting range :C01 ~ C27	-
H	Extended function of H group setting	-	Sensorless vector setting functions Setting range :H01 \sim H11.	-

Note) If you set the carrier frequency less than 2kHz, the acceleration / deceleration times are delayed approximately 500 msec.

Func- code	Name	Run-time Edit	Description	Defaults
Bas	sic parameter setting	gs		
A01	Frequency Command	х	Sets the source for the Frequency command: : 0 Keypad potentiometer 1 Control terminal input 2 Standard operator 3 Remote operator(1 ST comm-RJ45 connector) 4 Remote operator(2 ND comm-terminal strip)	0
A02	Run Command	X	Sets the source for the Run command: 0 Standard operator 1 Control terminal input 2 Remote operator(1 ST comm-RJ45 connector) 3 Remote operator(2 ND comm-terminal strip)	0
A03	Base Frequency	Х	Settable from 0 to maximum frequency in units of 0.01Hz	60.00Hz
A04	Maximum Frequency	Х	Settable from the base frequency [A03] up to 400Hz, configurable in units of 0.01 Hz. In sensorless vector control, parameter is settable up to 300Hz	60.00Hz
Ana	alog Input Settings			
A05	Analog Input Min Frequency(O, OI)	Х	Defines the start frequency provided when analog input is 0V (4mA), configurable in units of 0.01Hz . Range is 0 to Maximum frequency(A04) Frquency (A06) (A05) (A05) (A07) (A07) (A08) 10V 20mA	0.00Hz
A06	Analog Input Max Frequency(O, OI)	х	End frequency provided when analog input is 10V(20mA) can be set in units of 0.01Hz. setting range is 0 to maximum frequency(A04)	0.00Hz
A07	Analog Input Offset Min (O, OI)	х	The starting point(offset) for the active analog input ($0 \sim 10V$, $4mA \sim 20mA$) . The range is from 0 to 100% in units of 0.1%	0.0%

Func- code	Name	Run-time Edit	Description	Defaults
A08	Analog Input Offset Max (O, OI)	х	The ending point(offset) for the active analog input ($0 \sim 10V$, $4mA \sim 20mA$) . The range is from 0 to 100% in units of 0.1%	100.0%
A09	Analog Input Start Frequency	x	Two options: select codes: 0 start at start frequency 1 start at 0Hz Frquency (A06) (A06) (A09=0) (A09=1) (A07) (A08) 4V 4mA ← Analog input → 20mA	0
A10	Analog Input Sampling Rate	Х	Range $n = 1$ to 8, where $n =$ number of samples for average	4
Mu	Iti-speed Frequency	Setting		
A11 ~ A25	Multi-Speed Frequency Setting	0	Defines the first speed of a multi-speed profile, range is 0 to maximum frequency(A04) in units of 0.01Hz. Setting range is 1-speed(A11) to 15-speed(A25). Speed0:volume setting value	speed1:5Hz speed2:10Hz speed3:15Hz speed4:20Hz speed5:30Hz speed6:40Hz speed7:50Hz speed8:60Hz etc. 0Hz
A26	Jog Frequency	0	Defines the speed when jogging. The frequency anges from 0.5 to 10.00Hz n units of 0.01Hz. The jog frequency provides safety during manual operation.	0.50Hz
A27	Jog Frequency Stop Mode	X	Defines how the drive stops the motor: 0 Coast to Stop 1 Ramp to Stop (depens on decel time) 2 DC injection braking (DC injection braking must be enabled)	0
V/F	Characteristics			
A28	Boost Mode		0 Manual torque boost 1 Automatic torque boost	0

Func- code	Name	Run-time Edit	Description	Defaults
A29	Manual Torque Boost Voltage	0	Sets boost voltage level when run is applied. Range is from 0.0 to 50.0%.Be aware that excessive torque boost can cause motor damage and inverter trip. Maximum output voltage Set (A29) (A30) Frequency in [%] Base frequency	1.0%
A30	Manual Torque Boost Frequency	0	Sets the boost frequency breakpoint when in manual torque boost mode.Range is 0.0 to 100.0%	10.0%
A31	V/F Fixed Curve	х	Two available V/F curves: 0 Constant torque 1 Reduced torque(Variable Torque) 2 Sensorless vector control 100 8% Constant torque Constant torque 0 Output Frequency 100.0%	0
A32	V/F Gain	0	Sets output voltage gain of the inverter. Range is from 20 to 110%	100.0%
DC	Injection Braking	Settings		
A33	DC Injection Braking	x	When enabled, DC injection braking applies a force to aid in stopping the motor 0 Disable 1 Enable	0
A34	DC Injection Braking Frequency	x	Sets the frequency level at which DC injection braking occurs, The range is 0.50 to 10.00 Hz in units of 0.01Hz	0.50Hz

Func- code	Name	Run-time Edit	Description	Defaults
A35	DC Injection Braking Delay Time	Х	Sets a delay from the end of Run command to start DC injection braking process (motor coasts until DC injection braking begins) Range is 0.0 to 5.0sec in units of 0.1sec	0.0sec
A36	DC Injection Braking Force	х	Sets the level of DC injection braking force. Configurable from0.0 to 100% in units of 0.1%	50.0% (≤22kW) 10.0% (≥30kW) 7.0% (≥160kW)
A37	DC Injection Braking Time	Х	Sets the time duration that the DC injection braking will be applied to the motor. Range is 0.0 to 10.0 seconds in units of 0.1 sec	0.0sec
Fre	quency-related Fun	ctions		
A38	Frequency Upper Limit	х	Sets a limit on output frequency less than the maximum frequency(A04). Range is frequency lower limit(A39) to maximum frequency(A04) in units of 0.01Hz.	0.00Hz
A39	Frequency Lower Limit	х	Sets a limit on output frequency greater than zero. Range is 0.00 to frequency upper limit(A38) in units of 0.01Hz	0.00Hz
A40 A42 A44	Skip Frequency	х	Up to 3 output frequencies can be defined for the output to skip past to avoid motor resonances.Range is 0.00 to maximum frequency(A04) in units of 0.01Hz	0.00Hz

Func- code	Name	Run-time Edit	Description	Defaults
A41 A43 A45	Skip Frequency Bank	х	Defines the distance from the skip frequency at which the jump around occurs. Range is0.00 to 10.00Hz in units of 0.01Hz	0.00Hz

Func- code	Name	Run-time Edit	Description	Defaults
	tomatic Voltage Reg		AVR) Function	
A52	AVR Function Selection	X	Automatic (output) voltage regulation, selects from three type of AVR functions three option codes: 0 Constant ON 1 Constant OFF 2 OFF during deceleration The AVR feature keeps the inverter output waveform at a relatively constant amplitude during power input fluctuations	2
A53	Motor Input Voltage	Х	230V class inverter settings: 200/220/230/240 460V class inverter settings: 380/400/415/440/460/480	LF Model 230V HF Model 460V
See	cond Acceleration a	nd Decel	eration Functions	
A54	Accel Time 2	0	Sets the rate of acceleration for all speed increases., Range is 0.1 to 3000 sec. Accel Time 2 can be set by the [2CH] terminal input or frequency transition setting	30.0sec
A55	Decel Time 2	0	Sets the rate of deceleration for all speed decreases., Range is 0.1 to 3000 sec. Decel Time 2 can be set by the [2CH] terminal input or frequency transition setting	30.0sec
A56	Accel/Decel Select	х	Two options for switching from 1st to 2nd Accel/Decel: 0 2CH input from terminal 1 transition frequency \check{O} ACC2 ACC2 ACC1 C ACC1 C C ACC1 C C C C C C C C C C	0
A57	Accel ½ Select Frequency	Х	Output frequency at which Accel 1 switches to Accel 2. Range is 0.00 to maximum frequency(A04) in units of 0.01Hz.	0.00Hz
A58	Decel 1/2 Select Frequency	х	Output frequency at which Decel 1 switches to Decel 2. Range is 0.00 to maximum frequency(A04) in units of 0.01Hz.	0.00Hz

Func- code	Name	Run-time Edit	Description	Defaults
A59	Accel Curve	X	Set the characteristic curve of Accel 1 and Accel 2, 0 Linear 1 S-curve 2 U-curve U-curve U-curve 0 Output Frequency Target	0
A60	Decel Curve	х	Set the characteristic curve of Decel 1 and Decel 2. 0 Linear 1 S-curve 2 U-curve	0
A61	Input Voltage Offset	о	Sets the voltage offset for external Analog input signal. Range is -10.0 to 10.0 [%]	0.0%
A62	Input Voltage Gain	Ο	Sets the voltage gain for external Analog input signal Range is 0.0 to 200.0 [%]	100.0%
A63	Input Current Offset	0	Sets the current offset for external Analog input signal Range is -10.0 to 10.0 [%]	0.0%
A64	Input Current Gain	ο	Sets the current gain for external Analog input signal Range is 0.0 to 200.0 [%]	100.0%
A65	FAN Operation Mode	x	Configures the FAN operation mode 0: Always ON 1: ON when the drive is running	0

Func- code	Name	Run-time Edit	Description	Defaults
PIC	Control(Note3)			
A70	PID Function Enable	x	Enables PID function and Feed Forward Function. 0 PID control disable 1 PID control enable 2 F/F control enable	0
A71	PID Reference	Ο	Displays the PID reference. If parameter A72 = 2. Adjust the PID reference from UP/DOWN key 0.0 to 100.0% in units of 0.01%	0.00%
A72	PID Reference Source	x	Selects the source for the PID reference: 0 Keypad potentiometer 1 Control terminal input 2 Standard operator 3 Remote operator(communication)	2
A73	PID Feed-back Source	x	Selects the source for the PID feedback: 0 "OI" (current input) 1 "O" (voltage input)	0
A74	PID P Gain	0	Sets the proportional gain that is applied to the deviation between the reference and the feedback signal. 0.1 to 1000% in units of 0.1%	100.0%
A75	PID I Gain	0	Set the integral time to output the accumulated PID error value. 0.0 to 3600sec in units of 0.1sec	1.0sec
A76	PID D Gain	Ο	Sets the output value to the variation of the PID input. 0.00 ~ 10.00sec in units of 0.01sec	0.0sec
A77	PID Err Limit	0	Sets the max/min PID input(error) as a percentage of the maximum error. 0.0 ~ 100.0% in units of 0.1%	100.0%
A78	PID Output High Limit	0	Set the max PID output as a percentage of the maximum output frequency (A04). -100.0 ~ 100.0% in units of 0.1%	100.0%
A79	PID Output Low Limit	0	Sets the min PID output as a percentage of the maximum output frequency (A04). When set to 0.00%, the low limit is disabled. -100.0 ~ 100.0% in units of 0.1%	0.0%

Func- code	Name	Run-time Edit	Description	Defaults
A80	PID Output Invert	х	Two options : select codes 0 PID Output Invert disable 1 PID Output Invert enable	0
A81	PID Scale Factor	х	PID scale factor (multiplier), 0.1 to 1000% in units of 0.1%	100.0%
A82	Pre PID Frequency(note4)	х	0.0 to Max Frequency(A04) in units of 0.01Hz. When A82 equals "0", Pre-PID function is disabled.	0.00Hz
A83	Sleep Frequency(note5)	х	0.00 to Max Frequency(A04) in units of 0.01Hz	0.00Hz
A84	Sleep/Wake Delay Time(note5)	Х	0.0 to 30.0sec in units of 0.1sec	0.0sec
A85	Wake Frequency(note5)	х	Sleep frequency(A83) to Max Frequency(A04) in units of 0. 01Hz	0.00Hz

Note 3: PID feedback control

The PID(Proportional, Integral, Differential) control function is designed to regulate the CFM for a fan, the GPM for a pump, the pressure inside a room, etc

[Input method of target value signal and feedback signal]

Set the reference signal according to the PID reference setting method(A72). Set the feedback signal according to analog voltage input (0 to 10V) or analog current input (4 to20mA). To use analog current [OI-L] for the target value, set the [AT] terminal to ON.

[PID gain adjustment]

If the response is not stabilized in a PID control operation, adjust the gains as follows according to the symptom of the inverter.

- The change of controlled variable is slow even when the target value is changed.
- \rightarrow Increase P gain [A74]
- The change of controlled variable is fast, but not stable.
- \rightarrow Decrease P gain[A74]
- It is difficult to make the target value match with the controlled variable.
- \rightarrow Decrease I time [A75]
- Both the target value and the controlled variable are not stable.
- \rightarrow Increase I time[A75]
- The response is slow even when the P gain is increased.
- \rightarrow Increase D time[A76]
- The response is not stabilized due to oscillation even when the P gain is increased.
- \rightarrow Decrease D time[A76]

The figure below is a more detailed diagram of the PID control.

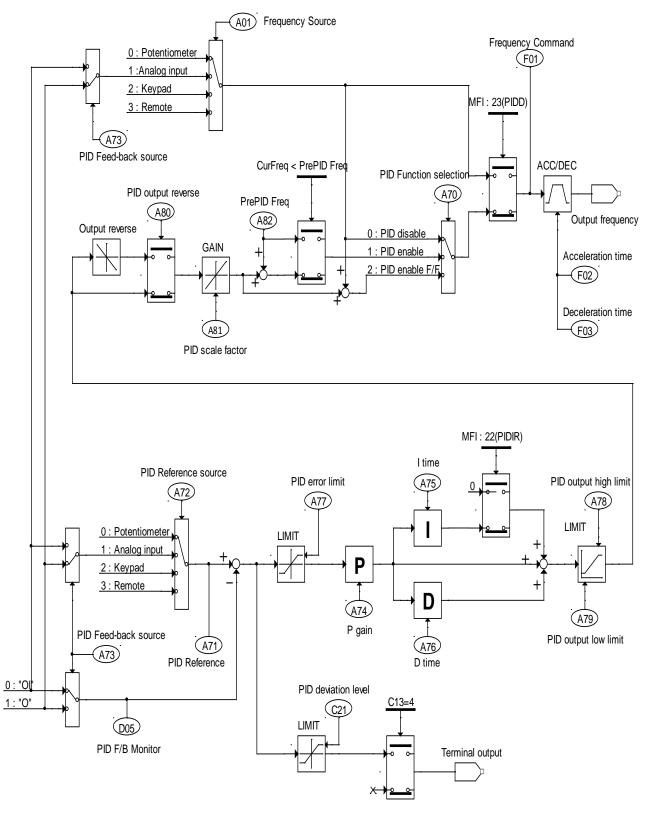
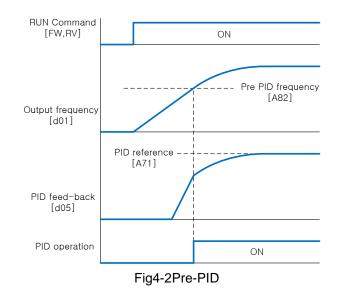


Fig4-1 PID diagram

Note 4:Pre-PID

The Pre PID function is activated in Function code A82 (Pre PID Frequency). When the run signal occurs, the inverter operates in the form of Open loop. If the output frequency reaches the Pre PID Frequency, it operates in Closed loop (PID control).



Note 5:Sleep and Wake Function

The sleep function is activated when the output frequency falls below the Sleep Frequency(A83) set point for the Sleep Delay Time(A84). If output frequency rises above the Sleep Frequency, the sleep/wake delay time is reset. The inverter has stopped the motor in Sleep mode. When the PID output frequency rises above the Wake up Frequency(A85) for the Sleep/Wake Delay Time(A84), the inverter restarts the motor.

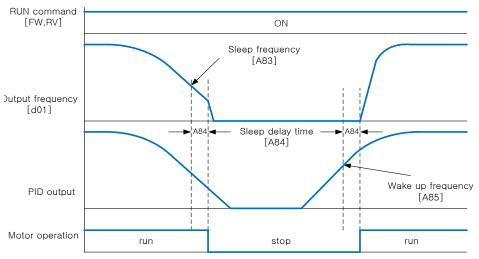


Fig4-3Sleep and Wake Function

4.2.5 Expanded function mode of b group

Func- code	Name	Run-time Edit	Description	Defaults
	start Mode			
b01	Restart Mode	х	 Select inverter restart method: 0 Fault output after trip, no automatic restart 1 Restart at 0Hz 2 Resume operation after frequency matching 3 Resume previous freq. after freq. matching, then decelerate to stop and display trip info. Restart trip is over current, overvoltage and under voltage. Over current and over voltage trip restart up to 3 times, under voltage trip restart up to 10time. 	0
b02	Line Loss Ride-thru	х	The amount of time a power input under voltage can occur without tripping the power failure fault. Range is 0.3 to 1.0sec. If under-voltage exists longer than this time, the inverter trips, even if the restart mode is selected. This function depends on the machine and load conditions Before using this function, user must perform verification test.	1.0sec
b03	Line Loss Ride-thru Run Delay	Х	Time delay after under-voltage condition goes away, before the inverter runs motor again. Range is 0.3 to 10.0 seconds.	1.0sec
Ele	ctronic Thermal Ove	erload Fa	ult Setting	
b04	Motor Thermal Overload Level	х	Set a level between 20% and 120% of the rated motor current. Setting range- 0.2× (inverter rated current) \sim 1.2×(inverter rated current).	100.0%
b05	Motor Thermal Overload Profile	Х	Select cooling method for motor: 0Cooling fan is mounted on the motor shaft (Self-cool) 1Cooling fan is powered by independent source (Forced-cool)	1

Func- code	Name	Run-time Edit	Description	Defaults
	erload Restriction	Lait		
b06	Overload/Overvoltage Restriction Mode	x	Select overload or overvoltage restriction modes 0 Overload, overvoltage restriction mode OFF 1 Only overload restriction mode ON 2 Only overvoltage restriction mode ON 3 Overload /overvoltage restriction mode ON	3
b07	Overload Restriction Level	х	Sets the level for overload restriction, between 20% and 200% of the rated current of the inverter. Setting range 0.2x(inverter rated current) ~ 2.0x(inverter rated current)	HD : 180% ND : 150% (≤132kW) HD : 150% ND : 120% (≥160kW)
b08	Overload Restriction Decel Rate	x	Set the deceleration rate when inverter detects overload. Range is 0.1 to 10.0 sec and resolution is 0.1 sec Motor current Output frequency (b08)	1.0sec
So	ftware Lock Mode			
b09	Software Lock Mode	x	 Prevents parameter changes. 0 All parameters except b09 are locked when SFT from terminal is on 1 All parameters except b09 and out- put frequency F01 are locked when SFT from terminal is ON 2 All parameters except b09 are locked 3 All parameters except b09 and output frequency F01 setting are locked 	0

Func- code	Name	Run-time Edit	Description	Defaults
Oth	her Function			
b10	Start Frequency	х	Sets the starting frequency for the inverter output. Range is 0.50 to 10.00Hz in units of 0.01Hz	0.50Hz
b11	Carrier Frequency	0	Sets the PWM carrier frequency. Range is Refer to 'Carrier frequency ranges of different types. ^(Note7)	(Note6)
b12	Initialization Mode	х	Select the type of initialization to occur.: 0 Trip history clear 1 Parameter initialization (Initialization Exception) (b13) : Country code (A53) : Rated Motor Voltage	0
b13	Country Code Initialization	х	Select default parameter values for country on initialization. 0 Korea version 1 Europe version 2 US version	
b14	RPM Scale Factor	0	Specify a constant to scale the displayed RPM for [d08] monitor. Range is 0.01 to 99.99 in units of 0.01	1.00
b15	STOP Key Functionality	х	Select whether the STOP key on the keypad functions when control is from the terminal strip 0 Stop enabled 1 Stop disabled	0
b16	Resume on FRS cancellation mode	х	Select how the inverter resumes operation when the free- run stop (FRS) is cancelled, two options: 0 Restart from 0Hz 1Restart from frequency detected from real speed of motor	
b17	Modbus Node ID	Х	Sets the Node ID for Modbus Communications. Range is 1 to 32.	1
b18	Ground Fault Detection	х	Select the function and level of ground fault 0 :Do not detect ground fault. 0.0~100.0% : Detect ground fault as the % level of rated current.	
b19	Speed Search Current	0	Controls the starting current level during speed search on the basis of the motor rated current. The Current Suppression Level of the controller is set from 90 % to 180%	

Func- code	Name	Run-time Edit	Description	Defaults
Oth	ner Function			
b20	Speed Search, Voltage Increase	0	In case of the lower starting current level during speed search motion on the basis of the motor rated current, the increase level of the output voltage is set from 10 % to 300%	100%
b21	Speed Search, Voltage Decrease	0	In case of the higher starting current level during speed search motion on the basis of the motor rated current, the decrease level of the output voltage is set from 10 % to 300%	100%
b22	Speed Search, Speed Decrease	0	Controls the speed decrease level during speed search motion. The speed decrease level of the controller is set from 1.0 to 200.0% (Operator display : 10 ~ 2000)	100.0% (1000)
b23	Frequency Match	0	Select the starting operation method 0 : 0Hz Starting operation 1 : Frequency matching & start operation	0
b24	Fault Relay Configuration	0	 Fault Relay configuration mode. 0 : Inactive incase of low voltage failure 1 : Active in case of voltage failure (Inactive in case of restart mode) 2 : Active in case of all failure occurred include LV failure 3 : Active in case of voltage failure (In case of low voltage failure, automatic restart). 	0
b25	Stop Mode	0	Selects the method of stopping the motor when the inverter is given a stop command. 0 : a Ramp to stop 1 : Coast to stop	0
b26	HD/ND Configuration	Х	"Rated Power" and "Over load tolerance" are different from these two types. In the application for FANs or Centrifugal PUMPs choose "Normal Duty". 0 : Heavy Duty(CT Type) 1 : Normal Duty(VT-Type)	0

Func- code	Name	Run-time Edit	Description	Defaults
b27	Input Phase Loss	х	 A function that detects phase loss in the input AC source. Detection is performed using the fluctuation in the main circuit's DC voltage. Also, in the case of degradation in the main capacitor, this message could be occurred. To set the detection time of input phase loss, "code b27" is used. (0 ~ 30 in sec) When b27 equals "0", input phase loss function is disabled. 	
Oth	ner Function			
b28	Communication Time Out	0	 This function detects communication time out in case of communication cut off. To set the detection time of time out, "code b28" is used. 0: No detect time out 0~60 : Detect time out when communication cut off [Unit : second] 	0
b29	Communication Operation Mode	0	Set the communication time out operation mode 0 : Always active 1 : Active in case of inverter is running	0
b30	Power On Display Parameter	0	Set Initial parameter to display after power on. "d01 ~ d13" is used.(1 ~ 13)	
b31	2 nd Comm Baud Rate	х	Setting 2nd RS485 channel baud rate 1:2400bps 2:4800bps 3:9600bps 4:19200bps	
BR	D(Dynamic braking)	Function		
b32	BRD Configuration	х	 Three options: select codes: 0 :Disable : BRD doesn't operate 1 :During run : Enable (BRD operates.) During stop : Disable (BRD doesn't operate.) 2 :During run, stop, Enable (BRD operates.) 	1
b33	BRD Duty Cycle	х	Sets the BRD duty cycle, range is 0.0 to 50.0% in units of 0.1%. When inverter exceeds the duty cycle, a fault occurs. BRD using ratio(%) = $\frac{(t1 + t2 + t3)}{100 \text{ sec}} \times 100$ BRD operation ON ON ON ON	10.0%

Footnotes for the preceding tables

Note6:Carrier frequency factory setting in types of Inverter load and model.

Heavy Duty (b26 = 0)	Normal Duty (b26 = 1)
D.UKHZ	2.0kHz
0.01-11-	
3.UKHZ	2.0kHz
2.0kHz	2.0kHz
	5.0kHz 3.0kHz

%By setting up b26=1, All models have the same carrier frequency2.0kHz.

Note7:Carrier frequency ranges of different inverter types

Model	Range(kHz)
N700E-055LF/075LFP~150LF/185LFP	10 160
N700E-055HF/075HFP~150HF/185HFP	1.0 ~16.0
N700E-185LF/220LFP~220LF	4.0.40.0
N700E-185HF/220HFP~1320HF/1600HFP	1.0 ~10.0
N700E-1600HF/2000HFP~3500HF/3800HFP	1.0~4.0

XIf N700E-1600HF/2000HFP~3500HF/3800HFPare used more than 2kHz carrier frequency, they must derate as much as 5%/kHz of rated current.

Table 4-1The relay operation("AL" mode) and restart in case of overvoltage trip and over current trip.						
b24 b01	b24=0 (The alarm relay inactive operation in case of low voltage failure)	b24=1 (The alarm relay active operation in case of low voltage failure)	b24=2 (The alarm relay active operation in case of all failure occurred including LV failure)	b24=3 (The alarm relay active operation incase of VFD failure)		
b01=0 (Alarm output after trip)	The alarm relay has t	he active operation	after trip occurred.			
b01=1 (Restart at 0Hz)	 The VFD may attem up to 3 times it starts restart attempts. When the restart co times, the operation s alarm relay has the a 	at 0 Hz after auto unter reaches "4" stops and the	 The VFD may attempt to restart itself up to 3 times it starts at 0 Hz after auto restart attempts. When the restart counter reaches "4" times, the operation stops. In case of all trips alarm relay has the active operation. 	 The VFD may attempt to restart itself up to 3 times it starts at 0 Hz after auto restart attempts. When the restart counter reaches "4" times, the operation stops and alarm relay has active operation. 		
b01=2 (Resume operation after frequency matching)	-The VFD may attem up to 3 times in frequ mode after auto resta - When the restart co times, the operation s alarm relay has the a	ency matching irt attempts. unter reaches "4" stops and the	 The VFD may attempt to restart itself up to 3 times it starts in frequency matching mode after auto restart attempts. When the restart counter reaches "4" times, the operation stops. In case of all trips alarm relay has active operation. 	-The VFD may attempt to restart itself up to 3 times it starts in frequency matching mode after auto restart attempts. - When the restart counter reaches "4" times, the operation stops and the alarm relay has the active operation.		
b01=3 (Resume previous freq. after freq. matching, then decelerate to stop and display trip info)	-The VFD may attem in frequency matching -After auto restart atte decelerate to stop an info. - The alarm relay has operation.	g mode. empts, it d display the trip	 The VFD may attempt to restart itself in frequency matching mode. After auto restart attempts, it decelerate to stop display the trip info. In case of all trips alarm relay has active operation 	-The VFD may attempt to restart itself up to 3 times in frequency matching mode after auto restart attempts. - When the restart counter reaches "4" times, the operation stops and the alarm relay has the active operation		

Table4-2The relay operation("AL" mode) and restart in case of under voltage trip				
b24 b01	b24=0 (The alarm relay inactive operation in case of low voltage failure)	b24=1 (The alarm relay active operation in case of low voltage failure)	b24=2 (The alarm relay active operation in case of all failure occurred including LV failure)	b24=3 (The alarm relay active operation incase of VFD failure)
b01=0 (Alarm output after trip)	The alarm relay has the inactive operation after trip occurred.	The alarm relay has the active operation after trip occurred.		
b01=1 (Restart at 0Hz)	 The VFD may attempt to restart itself up to 10 times, it starts at 0 Hz after auto restart attempts. When the restart counter reaches "11" times, the operation stops and the alarm relay has the inactive operation. 	 The VFD may attempt to restart itself up to 10 times it starts at 0 Hz after auto restart attempts. When the restart counter reaches "11" times, the operation stops and the alarm relay has the active operation. 	 The VFD may attempt to restart itself up to 10 times it starts at 0 Hz after auto restart attempts. When the restart counter reaches "11" times, the operation stops. In case of all trips alarm relay has the active operation. 	- The VFD may attempt to restart itself continually, it starts at 0 Hz after auto restart attempts. - After the 11times trip occurred, the alarm relay has the active operation and then the VFD may attempt to restart itself.
b01=2 (Resume operation after frequency matching)	 The VFD may attempt to restart itself up to 10 times in frequency matching mode after auto restart attempts. When the restart counter reaches "11" times, the operation stops and the alarm relay has the inactive operation. 	 The VFD may attempt to restart itself up to 10 times in frequency matching mode after auto restart attempts. When the restart counter reaches "11" times, the operation stops and the alarm relay has the active operation. 	 The VFD may attempt to restart itself up to 10 times in frequency matching mode after auto restart attempts. When the restart counter reaches "11" times, the operation stops. In case of all trips alarm relay has the active operation. 	-The VFD may attempt to restart itself continually, in frequency matching mode after auto restart attempts. - After the 11 times trip occurred, the alarm relay has the active operation and then the VFD may attempt to restart itself.
b01=3 (Resume previous freq. after freq. matching, then decelerate to stop and display trip info)	 The VFD may attempt to restart itself in frequency matching mode. After auto restart attempts, it decelerate to stop and display the trip info. The alarm relay has the inactive operation. 	 The VFD may attempt to restart itself in frequency matching mode. After auto restart attempts, it decelerate to stop and display the trip info. The alarm relay has the active operation. 	 The VFD may attempt to restart itself in frequency matching mode. After auto restart attempts, it decelerate to stop and display the trip info. In case of all trips alarm relay has active operation 	 The VFD may attempt to restart itself in frequency matching mode. After auto restart attempts, it decelerate to stop and display the trip info. The alarm relay has the active operation.

4.2.0				
Func- code	Name	Run-time Edit	Description	Defaults
	ut Terminal Function	Ean		
C01	Intelligent Input Terminal 1	X	Select function for terminal 1 0: Forward run command(FW) 1 : Reverse run command(RV) 2 : 1st multi-speed command(CF1) 3 : 2nd multi-speed command(CF2) 4 : 3rd multi-speed command(CF3) 5 : 4th multi-speed command(CF4) 6 : Jogging operation command(JG) 8 : 2-stage acceleration/deceleration command(2CH) 9 : Free-run stop command(FRS) 10 : External trip(EXT) 11 : Unattended start protection(USP) 12 : Software lock function(SFT) 13 : Analog input current/voltage selection signal(AT) 14 : Reset(RS) 15 : Start(STA) 16 : Keep(STP) 17 : Forward/reverse(F/R) 18 : Remote control UP(UP) 19 : Remote control UP(UP) 19 : Remote control DOWN(DOWN) 20 : Local Keypad Operation(O/R) 21 : Local Terminal Input Operation(T/R) 22 : PID Integral Reset(PIDIR) 23 : PID Disable(PIDD)	0
C02	Intelligent Input Terminal 2	х	Select function for terminal 2 See C01 parameter	1
C03	Intelligent Input Terminal 3	х	Select function for terminal 3 See C01 parameter	2
C04	Intelligent Input Terminal 4	х	Select function for terminal 4 See C01 parameter	3
C05	Intelligent Input Terminal 5	х	Select function for terminal 5 See C01 parameter	13
C06	Intelligent Input Terminal 6	х	Select function for terminal 6 See C01 parameter	14

4.2.6 Expanded Function Mode of C Group

Func- code	Name	Run-time Edit	Description	Defaults		
Inp	ut Terminal Status			_		
C07	Input Terminal 1 (NO/NC)	x	Select logic convention: 0 normally open [NO] 1 normally closed [NC]	0		
C08	Input Terminal 2 (NO/NC)	x	Select logic convention: 0 normally open [NO] 1 normally closed [NC].	0		
C09	Input Terminal 3 (NO/NC)	х	Select logic convention: 0 normally open [NO] 1 normally closed [NC]	0		
C10	Input Terminal 4 (NO/NC)	х	Select logic convention 0 normally open [NO] 1 Normally closed [NC].	0		
C11	Input Terminal 5 (NO/NC)	х	Select logic convention: 0 normally open [NO] 1 Normally closed [NC].	0		
C12	Input Terminal 6 (NO/NC)	х	Select logic convention: 0 normally open [NO] 1 Normally closed [NC].	0		
Output Terminal and related Function						
C13	Alarm Relay Configuration	х	Select function for Alarm relay output 0 RUN (Run signal) 1 FA1 (At Frequency command) 2 FA2 (At Frequency set point) (Refer to C22 & C23) 3 OL (Motor Overload alarm) (Refer to C21) 4 OD (PID Output Error alarm) (Refer to C24) 5 FLT (Fault signal)	5		
C14	4 Intelligent Terminal Relay X (RN0-RN1)		Select function for terminal RN0-RN1 0 RUN (Run signal) 1 FA1 (At Frequency command) 2 FA2 (At Frequency set point) (Refer to C22 & C23) 3 OL (Motor Overload alarm) (Refer to C21) 4 OD (PID Output Error alarm) (Refer to C24) 5 FLT (Fault signal)	1		
C15	Intelligent Terminal Relay (RN2-RN3)	х	Select function for terminal RN2-RN3 0 RUN(Run signal) 1 FA1 (At Frequency command) 2 FA2 (At Frequency set point) (Refer to C22 & C23) 3 OL (Motor Overload alarm) (Refer to C21) 4 OD (PID Output Error alarm) (Refer to C24) 5 FLT (Fault signal)	0		
C16	Output Terminal RN0-RN1 a/b contact setting	х	Select logic convention, two option codes: 0 (normally open) [NO] 1 (normally closed) [NC]	0		

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Func- code	Name	Run-time Edit	Description	Defaults		
C17	Output Terminal RN2-RN3 Configuration	Х	Select logic convention, two option codes: 0 (normally open) [NO] 1 (normally closed) [NC]	0		
C18	FM Output Configuration	х	Select function for terminal FM. 0 output frequency monitor 1 output current monitor 2 output voltage monitor 3 output power monitor	0		
C19	FM Gain	0	Range is 0 to 250.0, resolution is 1			
C20	FM Offset	0	Range is -3.0 to 10.0%resolution is 0.1	0.0%		
C21	Motor Overload Alarm	Х	Sets the motor overload alarm level. Range is 10% and 200% of the inverter rating. Resolution is 0.1%. Motor current Over load signal output	100.0%		
C22	At Frequency Acceleration Set point	X	Sets the At Frequency level for the drive's output relays. Setting range is 0.00 to maximum frequency(A04), resolution is0.01Hz	0.00Hz		
C23	Deceleration arrival signal frequency setting	х	Sets the At Frequency set point during deceleration. Range is 0.00 to maximum frequency(A04) Resolution is 0.01Hz	0.00Hz		
C24	PID deviation level setting	Х	Sets the allowable PID loop error magnitude. Setting range is 0.0 to 100.0%, resolution is 0.01%	10.0%		

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Func- code	Name	Run-time Edit	Description	Defaults
C25	Output Configuration	х	Select function for terminal AMI. 0 output frequency monitor 1 output current monitor 2 output voltage monitor 3 output power monitor	1
C26	AMI Gain	0	Range is 0 to 250.0, resolution is 1	100.0%
C27	AMI Offset	0	Range is -99.9 ~ 100.0% resolution is 0.1	0.0%

4.2.7 Expanded Function mode of H Group

Func- code	Name	Run-time Edit	Description	Defaults
H01	Auto-Tuning Mode	x	Two States for auto-tuning function, option codes: 0 Auto-tuning OFF 1 Auto-tuning ON	0
H02	Motor Data	x	Two selections, option codes: 0Use standard motor data 1Use auto-tuning data	0
Н03	Motor Capacity	X	2.2H : 460V / 3HP 3.7H : 460V / 5HP 5.5H : 460V / 7.5HP 7.5H : 460V / 10HP 2.2L : 230V / 3HP 11H : 460V / 15HP 3.7L : 230V / 5HP 1 5H : 460V / 20HP 5.5L : 230V / 7.5HP 7.5L : 230V / 10HP 11L : 230V / 15HP 30H : 460V / 30HP 15L : 230V / 20HP 37H : 460V / 40HP 15L : 230V / 25HP 22L : 230V / 25HP 30L : 230V / 30HP 30L : 230V / 40HP 75H : 460V / 100HP 90H : 460V / 125HP 110H : 460V / 150HP 132H : 460V / 200HP 160H : 460V / 250HP 200H : 460V / 250HP 200H : 460V / 250HP 200H : 460V / 300HP 250H : 460V / 300HP 250H : 460V / 400HP 320H : 460V / 400HP 320H : 460V / 450HP 380H : 460V / 450HP	
H04	Motor Poles Setting	x	2/4/6/8	4
H05	Motor Rated Current	x	Range is 0.1 – 800.0A	-
H06	Motor Flux Current	x	Range is 0.1 – 400.0A	-
H07	Motor Rated Slip	х	Range is 0.01 – 10.0%	-
H08	Motor Resistance R1	х	Range is 0.001 - 30.00Ω	_
H09	Transient Inductance	х	Range is 0.01 – 100.0mH	-
H10	Motor ResistanceR1	Х	Range is 0.001 - 30.00Ω	-
H11	Transient Inductance auto tuning data	х	Range is 0.01 – 100.0mH	-

* When B26 is set to 1, this motor series is displayed.(200H,250H,320H)

5. Using intelligent terminals

5.1 Intelligent terminal lists

Т	erminal	Terminal	Description				
	symbol	name	Description				
	FW (0)	Forward RUN/STOP terminal	SWF switch ON(closed) :Forward run OFF(open) : stop				
	RV (1)	Reverse RUN/STOP terminal	SWR switch RV 0 FW BWF 0N OFF 0FF ON(closed) :Reverse CM1 2 1 BWF 0N OFF 0FF run OFF(open) :stop Stop OFF 0N OFF OFF				
	CF1 (2)	1	P C-speed 3-speed 2-speed C				
	CF2 (3)	Multi-speed 2 frequency commanding] 1-speed Image: CM1				
	CF3 (4)	terminal 3	CF1 ON ON ON Terminal1 : FW CF2 ON ON Terminal 2 : RV Terminal 3 : CF1 Terminal 3 : CF1				
I (1~6)	CF4 (5)	4	FW ON Terminal 4 : CF2 RV Terminal 5 : AT [4-Stage speed] Terminal 6 : RS				
Termina	JG (6)	Jogging	Jogging operation				
Intelligent Input Terminal (1~6)	2CH (8)	2-stage acceleration /deceleration	The acceleration or deceleration time is possible to change considering the system.				
elliger	FRS (9)	Free-run stop	The inverter stops the output and the motor enters the free- run state. (coasting)				
Int	EXT (10)	External trip	It is possible to enter the external trip state				
	USP (11)	Unattended start prevention	Restart prevention when the power is turned on and the inverter is in the RUN state.				
	SFT (12)	Terminal soft- ware lock	The data of all the parameters and functions except the output frequency is locked.				
	AT (13)	Current input selection	The [AT] terminal selects the inverter uses the voltage [O] or current [OI] input terminals for external frequency control.				
	RS (14)	Reset	If the inverter is in Trip Mode, the reset cancels the Trip Mode.				
	STA (15)	Start	3-Wire input Start.				
	STP (16) F/R	Кеер	3-Wire input Keep				
	(17) UP	Forward/Reverse Remote control	3-Wire input F/R.				
	(18) DOWN	UP Remote control	Remote control UP				
	(19)	DOWN	Remote control DOWN				

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Т	erminal	Terminal		
	symbol	name	Description	
	O/R (20)	Local Keypad By-pass Operation	Frequency command is changed to the keypad potentiometer (like as A01 = 0) and Run command is changed to Standard Operator (like as A02 = 0).	
	T/R (21) Local Terminal Input By-pass Operation		Frequency command is changed to the control terminal input (like as $A01 = 1$) and Run command is changed to the control terminal input (like as $A02 = 1$).	
	PIDIR(22)	PID Integral Reset	The accumulated Integral term of the PID controller reset	
	PIDD(23)	PID Disable	PID control On/Off selection	
	CM1	Signal source for input	Common terminal for intelligent input terminals.	
	P24	External power supply terminal for input	External power connection terminal for intelligent input terminals.	
Ō	н	Frequency command power terminal	 When assign 13[AT signal] to code C01~C06 AT signal OFF : It is possible to command frequency using voltage signal terminal O-L(0~10V) 	
commanding	0	Frequency commanding terminal(voltage commanding)	 AT signal ON : It is possible to command frequency using current signal terminal OI-L(4~20mA) When not assign 13[AT signal] to code C01~C06 It is possible to commend frequency use the algebraic sum of both the voltage and current input 	
Frequency	OI	Frequency commanding terminal(current command)	 Frequency limit by frequency order method : Voltage input order(DC 0~10V) A61 : Minimum frequency(0Hz), A62:Maximum frequency(Enable to A04 Setting value) 	
Ľ	L	Frequency command common terminal	Current input order(4~20mA) A63 : Minimum frequency(0Hz), Maximum frequency(Enable to A04 Setting value)	
Monitor signal	FM	FM output (voltage)	Analog output frequency monitor/ analog output current monitor/ analog output voltage monitor/analog output power monitor	
Mor sig	AMI	AMI output (current)	Analog output frequency monitor/ analog output current monitor/ analog output voltage monitor/analog output power monitor	

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	minal	Tern	ninal name	Description		
Sy	mbol		Run signal (RUN)	When the [RUN] signal is selected, the inverter outputs a signal on that terminal when it is in the RUN mode.	Output terminal specification	
output terminal	RN0- RN1, RN2-	11,	Frequency Arrival signal (FA1, FA2)	Frequency arrival [FA1][FA2] signals is indicated when the output frequency accelerates and decelerates to arrive at a constant frequency. Frequency For set value FA1 ON at Time FA1 ON at FA2 Time FA2 Time	250VAC, 2.5A (Resistive load) 30VDC, 3A (Resistive load)	
Intelligent	RN3		Overload advance notice signal (OL) PID control error deviation signal	When the output current exceeds a preset value, the [OL] terminal signal turns on. When the PID loop error magnitude the preset value, the [OD] terminal signal turns on.		
			(OD) Alarm signal (AL)	The inverter alarm signal is active when a fault has occurred.		
		AL1	Run signal (RUN)	When the [RUN] signal is selected, the inverter outputs a signal on that terminal when it is in the RUN mode.	Output terminal specification 250V AC 2.5A (resistor 1oad)	
output terminal	AL0 AL1 AL2			Frequency Arrival signal (FA1, FA2)	Frequency arrival [FA1][FA2] signals is indicated when the output frequency accelerates and decelerates to arrive at a constant frequency. Frequency Fol set value FA1 ON at Time FA2 Time Time Time Time Time Time Time Time	(inductor load) 0.2A (inductor load) 30V DC 3.0A(resistor 1oad) 0.7A(inductor load) (minimum 100V AC 10mA, 5V DC 100mA)
			Overload advance notice signal (OL)	When the output current exceeds a preset value, the [OL] terminal signal turns on.	Contact At normal status, power off	
			PID control error deviation signal (OD)	When the PID loop error magnitude the preset value, the [OD] terminal signal turns on.	(initial setting value) : Al0 - AL1(closed) At abnormal status : AL0 - AL2(closed)	
			Alarm signal (AL)	The inverter alarm signal is active when a fault has occurred.		

5.2 Monitor terminal function

Monitor terminal function [FM] (analog)

• The inverter provides an analog output terminal primary for frequency monitoring on terminal [FW] (output frequency, Output current, and output voltage monitor signal).

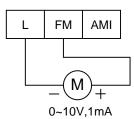
•Parameter C18selects the output signal data.

When using the analog motor for monitoring, use scale reactor C19and C20toadjust the [FM] output so that the maximum frequency in the inverter corresponds to full-scale reading at the motor.

(1) output frequency monitor signal

The [FM] output varies with the inverter output frequency.

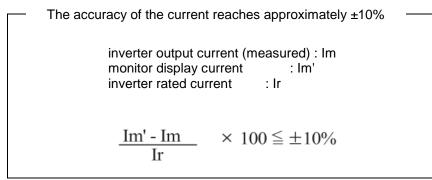
The signal on [FM] reaches full scale when the inverter outputs the maximum frequency.



- Note) This is a dedicated indicator and it cannot be used as a line speed signal. The indicator accuracy after adjustment is about ±5% (Depending on the meter, the accuracy may exceed this value)
- (2) output current monitor signal

The [FM] output varies with the inverter output current to the motor.

The signal on [FM] reaches full scale when the inverter output current reaches 200% of the rated inverter current.



(3) output voltage monitor signal

The [FM] output varies with inverter output voltage.

The signal on [FM] reaches full scale when the inverter output voltage reaches 100% of the rated inverter voltage.

(4) output power monitor signal

The [FM] output varies with inverter output voltage.

The signal on [FM] reaches full scale when the inverter output power reaches 200% of the rated Inverter power.

Monitor terminal function [AMI] (analog)

• The inverter provides an analog output terminal primary for frequency monitoring on terminal [FW] (output frequency, Output current, output voltage monitor signal).

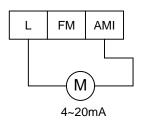
•Parameter C25 selects the output signal data.

When using the analog motor for monitoring, use scale reactor C26 and C27 to adjust the [AMI] output so that the maximum frequency in the inverter corresponds to full-scale reading at the motor.

(1) output frequency monitor signal

The [AMI] output varies with the inverter output frequency.

The signal on [AMI] reaches full scale when the inverter outputs the maximum frequency.



Note) This is dedicated indicator, so that it cannot be used as a line speed signal. The indicator accuracy after adjustment is about $\pm 5\%$

(Depending on the meter, the accuracy may exceed this value)

(2) output current monitor signal

The [AMI] output varies with the inverter output current to the motor.

The signal on [FM] reaches full scale when the inverter output current reaches 200% of the rated inverter current.

The accuracy of the current reaches approximately $\pm 10\%$ inverter output current (measured) : Im monitor display current : Im' inverter rated current : Ir $\underline{Im' - Im}_{Ir} \times 100 \leq \pm 10\%$

(3) output voltage monitor signal

The [AMI] output varies with inverter output voltage.

The signal on [AMI] reaches full scale when the inverter output voltage reaches 100% of the rated inverter voltage.

(4) output power monitor signal

The [AMI] output varies with inverter output voltage.

The signal on [AMI] reaches full scale when the inverter output power reaches 200% of the rated Inverter power.

5.3 Intelligent Input Terminal Function

Forward Run/Stop [FW] and Reverse Run/Stop Command [RV]

- When you initiate the Run command via the terminal [FW], the inverter executes the Forward Run command (high) or Stop command (low)
- When you initiate the Run command via the terminal [RV], the inverter executes the Reverse Run command (high) or Stop command (low).

Option Code	Terminal Symbol	Function Name State		Description			
0	0 EW Forward Run/Stop		ON	Inverter is in Run Mode, motor runs forward			
0	I VV	Forward Run/Stop	OFF	Inverter is in Run Mode, motor stop			
1	RV	Reverse Run/Stop	ON	Inverter is in Run Mode, motor runs reverse			
	IXV	Reverse Run/Stop	OFF	Inverter is in Run Mode, motor runs stop			
Valid for		C01,C02,C03,C04, C05,C06		Example:			
Require	Required setting A02=01						
Notes:				RV FW			
 When the Forward Run and Reverse Run commands are active at the same time, the inverter enters the Stop Mode. When a terminal associated with either[FW] or [RV] function is configured for normally closed, the motor starts rotation when that terminal is disconnected or otherwise has no input voltage. Set the parameter[A02] to 1 				CM1 6 5 4 3 2 1 P24 SWR SWF			



DANGER : If the power is turned on and the Run command is already active, the motor starts rotation and is dangerous! Before turning power on, confirm that Run command is not active.

Multi-Speed Select [CF1][CF2][CF3][CF4]

• The inverter provides storage parameters for up to 16 different target frequencies (speeds) that The motor output uses for steady-state run condition.

These speeds are accessible through programming four of the intelligent terminals as binary-encoded inputs CF1 to CF4 per the table .

These can be any of the six inputs, and in any order.

You can use fewer inputs if you need eight or less speeds.

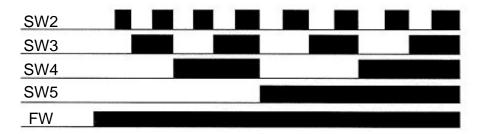
Note : When choosing a subset of speeds to use, always start at the top of the table, and with the least-significant bit: CF1, CF2, etc.

Multi apod	0	Control circ	uit termina	al
Multi-speed	SW5	SW4	SW3	SW2
Speed 0	OFF	OFF	OFF	OFF
Speed 1	OFF	OFF	OFF	ON
Speed 2	OFF	OFF	ON	OFF
Speed 3	OFF	OFF	ON	ON
Speed 4	OFF	ON	OFF	OFF
Speed 5	OFF	ON	OFF	ON
Speed 6	OFF	ON	ON	OFF
Speed 7	OFF	ON	ON	ON
Speed 8	ON	OFF	OFF	OFF
Speed 9	ON	OFF	OFF	ON
Speed 10	ON	OFF	ON	OFF
Speed 11	ON	OFF	ON	ON
Speed 12	ON	ON	OFF	OFF
Speed 13	ON	ON	OFF	ON
Speed 14	ON	ON	ON	OFF
Speed 15	ON	ON	ON	ON

Note : Speed 0 is set by the F01 parameter value.



Speed 0 Speed 1 Speed 2 Speed 3 Speed 4 Speed 5 Speed 6 Speed 7 Speed 8 Speed 9 Speed 10 Speed 11 Speed 12 Speed 13 Speed 14 Speed 15



			Contro	l circuit te	erminal	
Multi-speed	Set code	SW5	SW4	SW3	SW2	SW1
		CF4	CF3	CF2	CF1	FW
Speed 0	F01	OFF	OFF	OFF	OFF	ON
Speed 1	A11	OFF	OFF	OFF	ON	ON
Speed 2	A12	OFF	OFF	ON	OFF	ON
Speed 3	A13	OFF	OFF	ON	ON	ON
Speed 4	A14	OFF	ON	OFF	OFF	ON
Speed 5	A15	OFF	ON	OFF	ON	ON
Speed 6	A16	OFF	ON	ON	OFF	ON
Speed 7	A17	OFF	ON	ON	ON	ON
Speed 8	A18	ON	OFF	OFF	OFF	ON
Speed 9	A19	ON	OFF	OFF	ON	ON
Speed 10	A20	ON	OFF	ON	OFF	ON
Speed 11	A21	ON	OFF	ON	ON	ON
Speed 12	A22	ON	ON	OFF	OFF	ON
Speed 13	A23	ON	ON	OFF	ON	ON
Speed 14	A24	ON	ON	ON	OFF	ON
Speed 15	A25	ON	ON	ON	ON	ON

N700E INSTRUCTION MANUAL

Standard operator option code Set the parameter [C01~ C06] to [A11 ~ A25], F01 Option Terminal **Function Name** State Description Code Symbol Valid for inputs: C01,C02,C03,C04,C05,C06 Example: Required setting F01, A11 to A25 3 CF2 'F1 FW Notes : P24 3 2 1 CMI When programming the multi-speed setting sure to press the Store key each 5[SW4[SW3]SW2[SW time and then set the next multi-speed setting. Note that when the key is not pressed, no data will be set. • When a multi-speed setting more than 50Hz(60Hz) is to be set, it is necessary to program the maximum frequency A04 high enough to allow that speed.

•While using the multi-speed capability, you can monitor the current frequency with monitor Function F01 during each segment of a multispeed operation. There are two ways to program the speeds into the registers A20 to A25

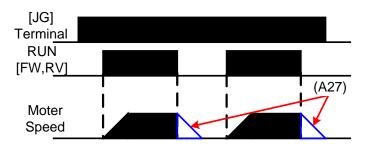
Programming using the CF switches, Set the speed by following these steps

- (1) Turn the Run command off(Stop Mode).
- (2) Turn each switch on and set it to Multi-speed n. Display the data section of F01.
- (3) Set an optional output frequency by pressing the \langle
- (4) Press the (STR) key once to store the set frequency. When this occurs, F01 indicates the output frequency of Multi-speed n.
- (5) Press the (FUNC)key once to confirm that the indication is the same as the set frequency.
- (6) When you repeat operations in (1) to (4), the frequency of Multi-speed can be set.

It can also be set as parameters A11 to A25

Jogging Command [JG]

•When the terminal [JG] is turned on and the Run command is issued, the inverter outputs the programmed jog frequency to the motor. Use a switch between terminals [CM1] and [JG] to activate the JG frequency.



•The frequency for the jogging operation is set by parameter <u>A26</u>.

•Set the value 1 (terminal mode) in A02 (Run command)

•Since jogging does not use an acceleration ramp, we recommend setting the jogging frequency in A26 to 5Hz or less to prevent tripping.

The type of deceleration used to end a motor jog is selectable by programming function A27 The options are: 0 : Free-run stop (coasting)

1 : Deceleration (normal level) and stop

2 : DC injection braking and stop

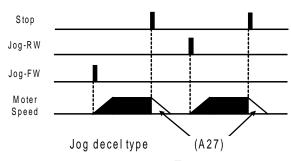
Option Code	Terminal Symbol	Function Name	Input State	Description
6	JG	Jogging	ON	Inverter is in Run Mode, output to motor runs at jog parameter frequency.
			OFF	Inverter is in Stop Mode.
Valid for i	nputs:	C01,C02,C03,C04	I,C05,C06	Example:
Required setting A02, A26, A27				
 Notes: •No jogging operation is performed when the set value of jogging frequency A26 is smaller than the start frequency B10 or the value is 0Hz. •Be sure to stop the motor when switching the function [JG] on or off. 			6 is or the	CM1 6 5 4 3 2 1 P24

Jogging Command [Communication]

• When the Rs-485 communication be using, jog function also can use as communication without terminals.

- The frequency for the jogging operation is
- set by parameter A26.

•Set the value 2(Rs-485) in A02(Run Command) •Since jogging does not use an acceleration ramp, we recommend setting the jogging frequency in A26 to 5Hz or cless to prevent tripping stop



0:Free-run stop 1:Deceleration stop 2:DC injection braking

Run command - frame construction

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	Rese	erved		JOG	RST	REV	FWD

Example

1. Jog – FW data frame

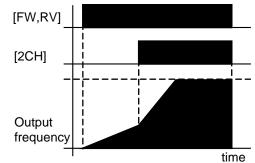
Node	Order	Parameter	Data	CRC Hi	CRC Lo
0x01	0x06	0x0002	0x0009	0xe8	0x0c

2. Jog - RW data frame

Node	Order	Parameter	Data	CRC Hi	CRC Lo
0x01	0x06	0x0002	0x000A	0xa8	0x0d

Two-stage Acceleration and Deceleration [2CH]

•When terminal [2CH] is turned on, the inverter changes the rate of acceleration and deceleration from the initial settings F02 (acceleration time1) and F03(deceleration time1) to use the second set of acceleration / deceleration values.



•When the terminal is turned off, the equipment is turned off, the equipment is returned to the original acceleration and deceleration time (F02 acceleration time1 and F03 deceleration time1). Use A54 (acceleration time2) and A55 (deceleration time2) to set the second stage acceleration and deceleration time.

•In the graph shown above, the [2CH] becomes active during the initial acceleration. This causes the inverter to switch from using acceleration 1 (F02) to acceleration 2 (A54)

Option Code	Terminal Symbol	Function Name	Input State	Description
8 2CH	Two-stage Acceleration	ON	Frequency output uses 2nd-stage acceleration and deceleration values	
0	2011	and Deceleration	OFF	Frequency output uses the initial acceleration 1 and deceleration 1 values
Valid for	Valid for inputs: C01,C02,C03,C04,C05,C06		C05,C06	Example:
Required setting A54, A55, A56				
Notes: •Function A56 selects the method for second stage acceleration. It must be 00 to select the input terminal method in order for the 2CH terminal assignment to operate.			al method	2CH FW CMI 6 5 4 3 2 1 P24

Free-run stop [FRS]

•When the terminal [FRS] is turned on, the inverter stops the output and the motor enters the free-run state (coasting).

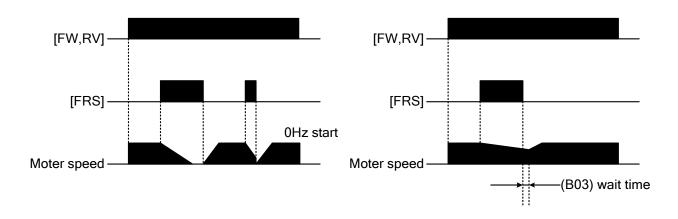
If terminal [FRS] is turned off, the output resumes sending power to the motor if the Run command is still active.

The free-run stop feature works with other parameters to provide flexibility in stopping and starting motor rotation.

•In the figure below, parameter B16 selects whether the inverter resumes operation form 0Hz (left graph) or the current motor rotation speed (right graph) when the [FRS] terminal turns off.

The application determines which is the best setting.

Parameter B03 specifies a delay time before resuming operation from a free-run stop. To disable this feature, use a zero delay time.



Option Code	Terminal Symbol	Function Name	Input State	Description
9	EDS	Eroo run Ston	ON	Causes output to turn off, allowing motor to free run (coast) to stop
9	FRS Free-run Stop	OFF	Output operates normally, so controlled deceleration stops motor	
Valid for	Valid for inputs: C01,C02,C03,C04,C05,C06		4,C05,C06	Example:
Require	Required setting b03, b16, C07 to C12		C12	
Notes: •When you want the [FRS] terminal to be active low(normally closed logic), change the setting (C07 to C12) which corresponds to the input (C01 to C06) that is assigned the [FRS] function			h	FRS FW CMI 6 5 4 3 2 1 P24

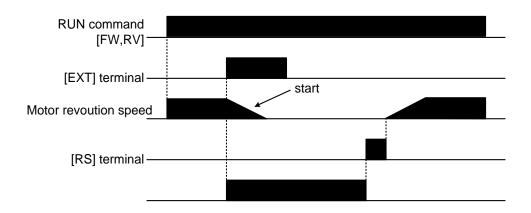
External Trip [EXT]

•When the terminal [EXT] is turned on, the inverter enters the trip state, indicates error code, E12 and stop the output.

This is a general purpose interrupt type feature, and the meaning of the error depends on what you connect to the [EXT] terminal. When the switch between the set terminals [EXT] and [CM1] is turned on, the equipment enters the trip state.

Even when the switch to [EXT] is turned off, the inverter remains in the trip state.

You must reset the inverter or cycle power to clear the error, returning the inverter to the Stop Mode.



Option Code	Terminal Symbol	Function Name	Input State	Description
		External Trin	ON	When assigned input transitions Off to On, inverter latches trip event and displays E12
10	EXT External Tri	External mp	OFF	No trip event for On to Off, any recorded trip events remain in history until Reset.
Valid for	Valid for inputs: C01,C02,C03,C04,C05,C06		4,C05,C06	Example:
Require	Required setting (none)			
 Notes: If the USP (Unattended Start Protection) feature is in use, the inverter will not automatically restart after cancelling the EXT trip event. In that case, it must receive enter Run command (off-to-on transition) 			he receive	CMI 6 5 4 3 2 1 P24

Unattended Start Protection [USP]

•If the Run command is already set when power is turned on, the inverter starts running immediately after power up.

The Unattended Start Protection (USP) function prevents that automatic start up, so that the inverter will not run without outside intervention.

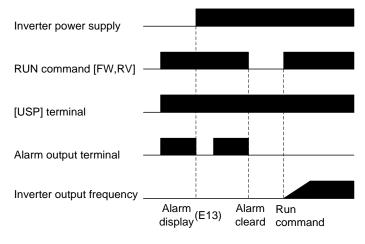
To reset an alarm and restart running, turn the Run commend off or perform a reset operation by the terminal[RS] input or the keypad Stop/reset key.

•In the figure below, the [UPS] feature is enabled. When the inverter power turns on, the motor does not start, even though the Run command is already active.

Instead, it enters the USP trip state, and displays E13 error code.

This forces outside intervention to reset the alarm by turning off the Run command.

Then the Run command can turn on again and start the inverter output.



Option Code	Terminal Symbol	Function Name	Input State	Description
11	USP	Unattended	ON	On power up, the inverter will not resume a Run command (mostly used in the Us)
	USF	Start Protection	OFF	On power up, the inverter will not resume a Run command that was active before power loss
Valid for	inputs:	C01,C02,C03,C04	4,C05,C06	Example:
Require	d setting	(none)		
 Notes: Note that when a USP error occurs and it is canceled by a reset from a [RS] terminal input, the inverter restarts running immediately. Even when the trip state is canceled by turning the terminal [RS] on and off after an under voltage protection E09 occurs, the USP function will be performed. When the running command is active immediately after the power is turned on, a USP error will occur. When this function is used, wait for at least three seconds after the power up to generate a Run command. 			nning yy iter rs, on, ction s after	CMI 6 5 4 3 2 1 P24

Software Lock [SFT]

•When the terminal [SFT] is turned on, all of the parameters and functions except the output frequency are locked (prohibited from editing). When the data is locked, the keypad keys cannot edit inverter parameters. To edit parameters again, turn off the [SFT] terminal input.

Option Code	Terminal Symbol	Function Name Input State		Description	
12	12 SFT Software Lock		ON	The keypad and remote programming devices are prevented from changing parameters	
			OFF	The parameters may be edited and stored	
Valid for	Valid for inputs: C01,C02,C03,C04,C05,C06			Example:	
Require	d setting	B09 (excluded fro	m lock)		
 When the [SFT] terminal is turned on, the output frequency can be set using the keypad potentiometer (A01=0) or a control terminal input (A01=1). When the output frequency source is the standard operator (A01=2) the [SFT] terminal will lock the frequency setting. It is possible to edit the frequency setting while the [SFT] terminal is active by setting b09 = 1. Software lock is also possible without using the [SFT] terminal setting (b09 = 2 or 3) 				SFT FW CMI 6 5 4 3 2 1 P24	

Analog Input Current / Voltage Select [AT]

•The [AT] terminal selects whether the inverter uses the voltage [O] or current [OI] input terminals for external frequency control.

When the switch between the terminals [AT] and [CM1] is on, the output frequency is set by applying a 4-20mA current input at [OI]-[L].

When the terminal is turned off, the output frequency is set by applying a 1-10V input signal at [O]-[L]. Note that you must also set parameter A 01 = 1 to enable the analog terminal set for controlling the inverter frequency.

Option Code	Terminal Symbol	Function Name Input State		Description	
40		Analog Input	ON	Terminal OI is enabled for current input. (uses terminal L for power supply return)	
13	AT	Voltage/current select	OFF	Terminal O is enabled for voltage input. (uses terminal L for power supply return)	
Valid for	Valid for inputs: C01,C02,C03,C04,C05,C06		4,C05,C06	Example:	
Require	Required setting A01=01				
Required setting A01=01 Notes: •If the [AT] is not assigned to any intelligent input terminal, then inverter uses the algebraic sum of both the voltage and current inputs for the frequency command •Be sure to set the target frequency source A01=01 to select the analog input terminals.			d current	AT SFT FW CMI 6 5 4 3 2 1 P24	
5.3.1					

Reset Inverter [RS]

•The [RS] terminal causes the inverter to execute the reset operation. If the inverter is in Trip Mode due do a fault, the reset cancels the Trip state and clears the fault. [RS]terminal Approx.30ms

12ms min

Alarm output-

•The input timing requirement for [RS] needs a 12 ms pulse width or greater. The alarm output will be cleared within 30 ms after the onset of the Reset command.

After the Reset command is given and the fault reset occurs, the motor will restart suddenly if the Run command is already active.

Be sure to set the fault reset after verifying that the Run command is off to prevent injury to personnel.

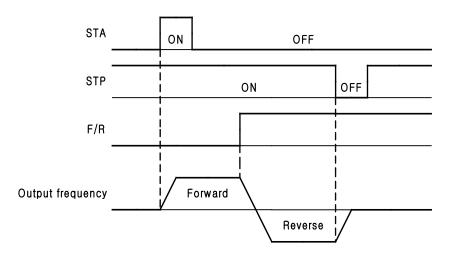
Option Code	Terminal Symbol	Function Name	Input State	Description
14		Reset Inverter	ON	The motor output is turned off, the fault is cleared (if it exists), and power up reset is applied
14	RS	Reset inverter	OFF	Normal power-on operation
Valid for	inputs:	C01,C02,C03,C04	4,C05,C06	Example:
Require	d setting	(none)		
Required setting (none) Notes: •When the control terminal [RS] input is present for more than 4 seconds, the inverter will fault with a Communication Error (E60) •The stop/reset key of the digital operator is valid only when an fault occurs. •Only the normally open contact [NO] can be set for a terminal configured with the [RS] function. The terminal cannot be used in the normally closed contact [NC] state. •The Stop/Reset key on the inverter is only operational for a few seconds after inverter power up when a hand-held remote operator is connected to the inverter. •If the [RS] terminal is turned on while the motor is running, the motor will be in free run stop mode. (coasting)			fault with a tor is valid can be set] function. ormally only verter operator is the motor	RS CMI 6 5 4 3 2 1 P24

3-Wire input function[STA,STP,F/R]

•This function is used when a momentary start/stop control is required.

•Set the Run Command A02 to 1 (control terminal).

•Assign 15 (STA), 16 (STP) and 17 (F/R) to three of the intelligent input terminals



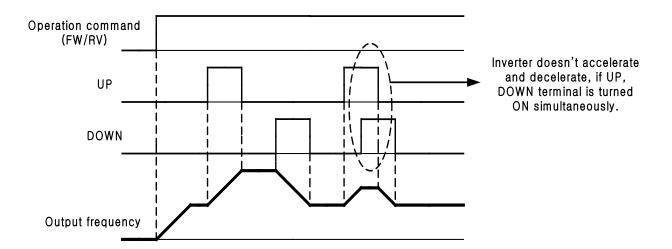
Option Code	Terminal Symbol	Function Name	Input State	Description
15	STA	3-Wire input	ON	Run
15	514	function	OFF	(No Action)
16	STP	3-Wire input	ON	Enables Run
10	function	OFF	Stop	
47	3-Wire input		ON	Motor runs in reverse direction when Run Command is given.
17	17 F/R	function	OFF	Motor runs in forward direction when Run Command is given
Valid for	inputs:	C01,C02,C03,C04	4,C05,C06	Example:
Require	d setting	A02=01		
 Notes: When the terminal is assigned STP terminal, FW terminal and also RV terminals become invalid. If all three inputs are not assigned this function will not operate. Be sure to set the run source setting A02=01 to select the analog input terminals. When using [STA] and [STP] motor direction is determined by [F/R] terminal, not F04 setting. 			minals.	SW3 SW2 Stop Switch (N.C) SW3 SW1 Run Switch (N.O) CM1 6 5 4 3 2 1 P24 F/R STP STA

UP/DOWN Function [UP,DOWN]

•The Inverter output frequency can be changed with the UP and DOWN intelligent input terminals.

• Assign 18 (UP) and 19(DN)to two of the intelligent input terminals 1~6

•This function will not operate when the external analog frequency command or the jogging operation is used. •Acceleration time operates according to F02, F03 when UP/DOWN terminal is ON.



Option Code	Terminal Symbol	Function Name	Input State	Description				
18	ПВ		ON	A Output frequency increases.				
10	UP UP Function		OFF	Motor output acts normally.				
19	DOWN	DOWN	ON	(Output frequency decreases.)				
19	DOWN	Function	OFF	Motor output acts normally.				
Valid for	Valid for inputs: C01,C02,C03,C04,C05,C06			Example:				
Require	d setting	A02=1 or 2		FW/RV 0/1 DOWN UP				
Notes: •Be sure to set the run source setting A02= 2.				SW4 SW2 SW1 CM1 6 5 4 3 2 1 P24				

By-pass Operation Function [O/R, T/R]

•The frequency command (A01) and run command (A02) can be by-passed to local keypad operation (O/R function (20)) or local terminal input (T/R function (21)) via the multi-function input.

•Assign 20 (O/R) or 21(T/R) to the intelligent input terminals 1~6 for the Local by-pass operation

•Acceleration time operates according to F02, F03 whether the local keypad or terminal input operation command is "on" or "off".

Option Code	Terminal Symbol	Function Name	Input State	Description
	20 O/R	Local Keypad By-pass Operation	ON	Frequency command is changed to the keypad potentiometer (as if $A01 = 0$) and Run command is changed to Standard Operator (as if $A02 = 0$).
20			OFF	Frequency command determined by the A01 setting and Run command determined by the A02 setting
21	T/R	Local Terminal Input By-pass	ON	Frequency command is changed to the control terminal input (as if $A01 = 1$) and Run command is changed to the control terminal input (as if $A02 = 1$).
		Operation	OFF	Frequency command determined by the A01 setting and Run command determined by the A02 setting.
Valid for inputs:		C01,C02,C03,C04,C05,C06		
Required setting		(none)		

Notes:

•When the C01 ~ C06 terminal input has both the O/R(20) and T/R(21) input definition and both of the terminal inputs are in the "ON" status, the O/R(20) operation is used and T/R(21) is ignored.

•When the inverter is in the running status and the O/R or T/R terminal input status is changed from "on" to "off" or "off" to "on", the inverter will be stopped whether the O/R and T/R command input is given or not. After the motor has stopped the inverter can be run again by issuing a run command.

After the by-pass operation command is given or cancelled and the motor will restart suddenly if the Run command is already active.

Be sure to set or reset the by-pass operation command after verifying that the Run command is off to prevent injury to personnel.

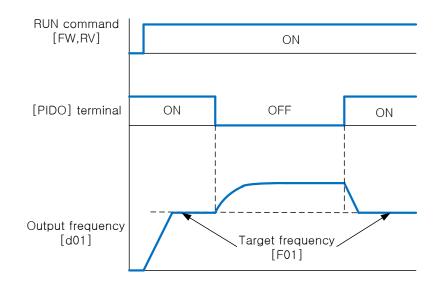
PID Integral Reset [PIDIR]

•When the terminal [PID Integral Reset] is turned on, the accumulated Integral term of the PID controller is reset.

Option Code	Terminal Symbol	Function Name	Input State	Description		
22	PIDIR	PID Integral Reset	ON	The accumulated Integral term of the PID controller is reset to zero.		
22	PIDIK	PID Integral Reset OFF		Normal power-on operation		
Valid for	Valid for inputs: C01,C02,C03,C04,C05		05,C06	Example:		
Require	Required setting A70=01 or 02			PIDIR		
 Notes: •The PID Integral Reset[PIDIR] is valid only when the PID controller is enabled. 			ly when	CM1 6 5 4 3 2 1 P24		

PID Disable [PIDD]

• When the terminal [PID Disable] is turned on, the inverter operates without PID control. The frequency command source is determined by A01 and function code F01 displays the target frequency. When the terminal [PID Disable] is turned off, the inverter operates with PID control.



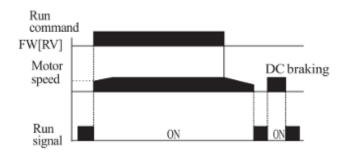
Option Code	Terminal Symbol	Function Name	Input State	Description				
23	PIDD	PID Disable	ON	PID controller is off.(PID Disable)				
23	PIDD	FID DISable	OFF	PID controller is on.(PID Enable)				
Valid for	Valid for inputs: C01,C02,C03,C04,C05,C06		4,C05,C06	Example:				
Require	Required setting F01,A01,A70=01 or 02			PIDD				
Notes: •The PID Disable [PIDD] is valid only when the PID controller is enabled (A70 = 1). • When the PIDD terminal is turned on, frequency command is determined by the A01 setting			, frequency					

5.4 Using Intelligent output terminals

Run Signal [RUN]

When the [RUN] signal is selected as an intelligent output terminal, the inverter changes the state of that relay when it is in the Run Mode.

Contact ratings can be found on page 2-7 of the manual.



Option Code	Terminal Symbol	Function Name	Input State	Description
0	RUN	Run signal	ON	when inverter is in Run Mode
0	RUN		OFF	when inverter Stop Mode
Valid for	inputs:	C13,C14,C15		
Require	d setting	(none)		
Notes:	Notes:			
 The inverter outputs the [RUN] signal whenever the inverter output exceeds the startfrequency. The start frequency is the initial inverter output frequency when itturns on. Output terminal RN0-RN1 is normally open by default. This can be changed to normally closed by setting C16 = 1. Output terminal RN2-RN3 is normally open by default. This can be changed to normally closed by setting C17 = 1. 			equency. er output Ily open by nally closed Ily open by	

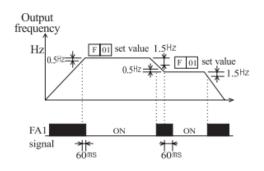
Frequency Arrival Signal [FA1]/[FA2]

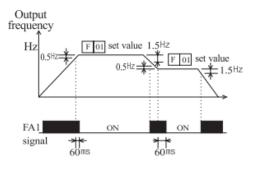
Frequency Arrival [FA1] and [FA2] signals indicate when the output frequency accelerates or decelerates to Beyond a specified frequency threshold.

Frequency Arrival [FA1] (Chart on Left) turns on when the output frequency accelerates to within 0.5Hz below target frequency or decelerates to within 1.5Hz of target frequency. The timing is modified by a small 60ms delay.

Frequency Arrival [FA2] (Chart on Right) uses thresholds for acceleration and deceleration to provide more timing flexibility than [FA1].

Parameter C22 sets the arrival frequency threshold for acceleration, and parameter C23 sets the thresholds for deceleration.

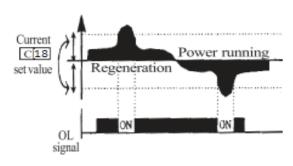




Option Code	Terminal Symbol	Function Name	Input State	Description
		Frequency arrival	ON	When output to motor is at the target frequency
1 FA1		type 1signal	OFF	When output to motor is off, accelerating or decelerating
2 FA2		Frequency arrival	ON	When output to motor accelerates beyond the threshold set at C22. The signal holds the ON state until the motor decelerates below the threshold set at C23
		type 2 signal	OFF	When output to motor is off, or during acceleration or deceleration before the respective thresholds are crossed
Valid for	Valid for inputs: C13,C14,C15,			
Require	Required setting C22, C23 (FA2 only)			
Notes:				
a frequ	ency betwe	leration, an arrival sigr en the set frequency s turned on.	iai at	
•At the time of deceleration, an arrival signal at a frequency between the set frequency +0.5Hz to -1.5Hz is turned on.				
 The delay time of the output signal is 60m(nominal). Output terminal RN0-RN1 is normally open by default. This can be changed to normally closed by setting C16 = 1. 				
•Output terminal RN1-RN2 is normally open by default. This can be changed to normally closed by setting C17 = 1				

Overload Advance Notice Signal [OL]

When the output current exceeds a preset value, the [OL] terminal signal turns on. Parameter C21 sets the overload signal threshold. The overload detection circuit operates during powered motor operation and during regenerative braking. The output circuits use relay output.



Option Code	Terminal Symbol	Function Name	Input State	Description
3		Overload advance notice signal	ON	when output current is more than the set threshold for the overload signal.
3	OL		OFF	when output current is less than the set threshold for the overload signal.
Valid for inputs: C13,C14,C15				
Require	Required setting C21			
Notes:	Notes:			
To cha set C2 •The ac as the [FM] te •Output This ca C16 = •Output	 The default value is 100%. To change the level from the default, set C21 (overload signal level). The accuracy of this function is the same as the function of the output current monitor on the [FM] terminal Output terminal RN0-RN1 is normally open by default. This can be changed to normally closed by setting C16 = 1. Output terminal RN1-RN2 is normally open by default. This can be changed to normally closed by setting C16 = 1. 			

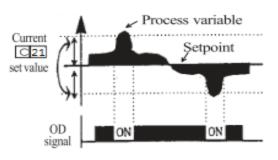
Output Deviation for PID Control [OD]

The PID loop error is defined as the magnitude(absolute value) of the difference between the Set point (target value) and the process Variable (actual value).

When the error magnitude exceeds the value of C21,

the [OD] terminal signal turns on.

Refer to the PID loop operation.



Option Code	Terminal Symbol	Function Name	Input State	Description
		Output deviation for PID control	ON	When PID error is more than theset threshold for the deviation signal
4	OD		OFF	When PID error is less than the set threshold for the deviation signal
Valid for	inputs:	C13,C14,C15		
Require	Required setting C24			
Notes:				
 The default difference value is set to 10%. To change the value, change parameterC24. (deviation level) Output terminal RN0-RN1 is normally open by default. This can be changed to normally closed by setting C16 = 1. Output terminal RN1-RN2 is normally open by default This can be changed to normally closed by setting C17 = 1 				

Fault Signal output [FLT]

The Inverter Fault Signal is active when a fault has occurred and it is in the Trip Mode. When the fault is cleared the Fault signal becomes inactive. The Fault Signal [FLT] can be assigned to any of the relay output terminals RN0-RN1, RN2-RN3 or AL0-AL1-AL2 (default).

Option Code	Terminal Symbol	Function Name	Input State	Description
5	FLT	Fault Cianal	ON	When an Fault Signal has occurred and has not been cleared
5		Fault Signal	OFF	When no Fault has occurred since the last Clearing of Fault(s)
Valid for	inputs:	C13,C14,C15		
Require	d setting	(none)		
Notes:				
[NC], a when t Theref used, s power •See the •When t the ala the ext •The sig	time delay he power is ore, when the set a delay of is turned on e description he inverter rm signal ou ernal control gnal output h	ne alarm contact outpu of about 2seconds whe	t is closed t is to be en the (page 7-29). off, s	

5.5 Alarm Terminal Function

Alarm Terminal [AL1, AL2-AL0]

The alarm output terminals are connected as shown below by default.

The relay contacts AL0 to AL1 are normally open, AL0 to AL2 normally closed.

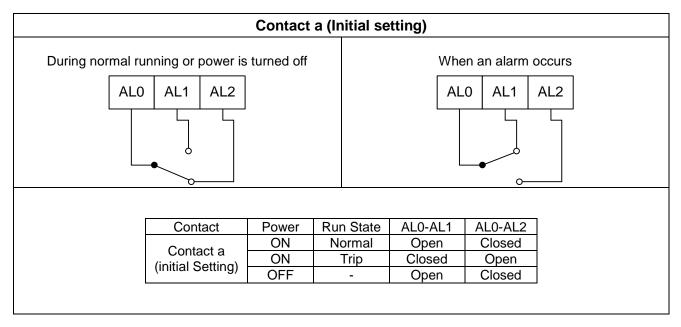
The table below uses "Normal" to mean the inverter has power and is in Run or Stop Mode.

The relay contact switches to the opposite position when a fault occurs and the inverter is in Trip Mode.

The relay contact switches to the default position when the trip is reset or power is off.

The alarm output terminals are programmable relays that can be programed to activate during any of the six output conditions. The activation condition can be set at C13:

- 0 = [RUN] Run signal
- 1 = [FA1] Frequency Arrival 1
- 2 = [FA2] Frequency Arrival 2
- 3 = [OL] Overload advanced signal
- 4 = [OD] Output Deviation for PID Control
- 5 = [FLT] Fault Signal (Default)



Contact specification

Maximum	Minimum
AC250V, 2.5A(Resistor load), 0.2A(Inductive load)	AC100V, 10mA
DC30V, 3.0A(Resistor load), 0.7A(Inductive load)	DC5V, 100mA

5.6 Sensorless Vector Control

Function description

The N700E inverter has a built-in auto-tuning algorithm.

The N700E inverter can be possible to do high-starting torque and high-precision operation. The required torque characteristic or speed control characteristic may not be maintained in case that the inverter capacity is more than twice the capacity of the motor in use .

Function setting method

Select the parameter A31 to 2 (sensorless vector control). Parameter H03 and H04 select motor capacity and poles (example 4 for 4-poles). Parameter H02 selects which data(standard data, auto-tuning data) of motor constants you want the inverter to use.

Auto-tuning(1)

Function description

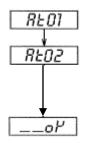
The auto-tuning procedure automatically sets the motor parameters related to sensorless vector control and automatic torque boost. Since these functions are dependent upon specific motor parameters, default motor parameters have been set at the factory.

An auto-tune is recommended before running in sensorless vector or automatic torque boost mode in order to achieve optimal performance

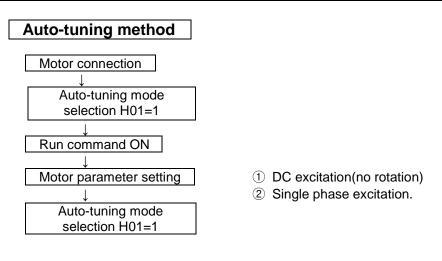
Auto-Tune Procedure

Follow the steps below to auto-tune the inverter, finally set the parameter H01.

- 1. F02, F03: Set to 30 s, the default for each parameter
- 2. H03: Set the motor rating
- 3. H04: set the motor poles
- 4. A01: set to 0 (frequency command source at potentiometer)
- 5. A03: set the base frequency(default is 60Hz)
- 6. F01: set the target frequency to 0Hz by turning the potentiometer all the way down. Verify this setting by looking at the value in F01.
- 7. A53: select the output voltage to the motor.
- 8. A33: set to 0 (disables DC injection braking).
- 9. H01: set to 1 (turns auto-tuning mode on).
- 10. After setting above parameters, press the RUN key on the standard operator.
- 11. The drive will run the auto-tuning procedure on the motor. During this procedure the motor may run up to 80% of full speed. During the auto-tune you will see the following messages on the screen:



- 12. When you see the last screen $(...0)^U$, for " oK") the auto-tune has successfully completed.
- a. If the display shows $\mathcal{E}_{\Gamma\Gamma}$ instead, the auto-tune has failed. Verify that the motor is wired properly
- 13. H02: set to 1 (uses auto-tune data)



End display Auto-tuning process completed : $__0$

Auto-tuning process failed : Err

Note 1.The default motor parameters of the N700E use standard data of a HYUNDAI 4-pole motor. If using sensorless vector or auto-torque boost with a different motor type, use the auto-tune feature to set the motor data.

Setting Method

(1) Digital panel

No	Name	Setting range	Descripti	on
H01	Auto-tuning mode selection	0/1	0 : Auto-tuning OFF 1 : Auto-tuning ON	
H02	Motor data setting	0/1	0 : Standard data 1: Auto-tuning data	
H03	Motor capacity	-	$\frac{L = 230V}{3L}$ $\frac{5L}{5L}$ $\frac{5L}{7.5L}$ $\frac{10L}{15L}$ $20L$ $25L$ $30L$ $40L$ Displays Motor Capacity in Horse Power(HP) and Low Voltage (L)/ High Voltage(H) Example: 40H = 40HP at 460V	H = 460V 3H 5H 7.5H 10H 15H 20H 25H 30H 40H 50H 60H 75H 100H 125H 150H 200H 250H *275H 300H *350H 400H *425H 450H 500H
H04	Motor poles	2/4/6/8	6 = 1200 RPM 8 = 90	00 RPM 0 RPM
H05	Rated motor current	0.1 –800.0A	Full Load Amps (FLA) of motor.	Used for motor
H06	No Load motor current	0.1 – 400.0A	Unit : A	
H07	Rated motor slip	0.01 – 10.00%	Unit : %	
H08/H10	Motor resistor R1	0.001~30.00 Ω	Used only during sensorless ve boost operation. H08 is used wh when H02 = 1.	•
H09/H11	Transient Inductance	0.01~100.0 mH	Used only during sensorless ve boost operation. H09 is used wh when H02 = 1.	

* When b26 is set to 1, this motor

capacity is displayed in the series.

When b26 = 0 this option is not available.

Fine Tuning

1. If satisfactory performance through auto-tuning cannot be fully obtained, adjust the motor constants for the observed symptoms according to the table below.

Symptom	Symptom	Adjustment	Parameter
	When low frequency (a few Hz) torque is insufficient.	Slowly increase the motor constant 1.2 times the auto-tune data.	H08/H10
Powered running (status with a	When the speed deviation is negative.	Slowly increase the rated motor slip up to 1.5 times original setting.	H07
accelerating torque)	When the speed deviation is positive.	Slowly decrease the rated motor slip down to 0.5 times original setting	H07
	When over current protection is operated at injection of load.	Slowly increase the motor no load current in up to 1.2 times original setting.	H06
Regeneration (status with a When low frequency		Slowly increase the motor constant R1 1.2 times the auto-tune data	H08/H10
(status with a decelerating torque)	(a few Hz) torque is insufficient.	Slowly increase the motor no load current in up to 1.2 times original setting	H06
		Decrease the carrier frequency.	b11

- 2. If the inverter capacity is more than twice the capacity of the motor in use, the inverter may not achieve its full performance specifications.
- 3. When DC injection braking is enabled (A33 = 1), the motor constant will not be accurately set. Therefore, disable DC injection braking (A33 = 0) before starting the auto-tuning procedure.
- The motor will rotate up to 80% of base frequency : do not attempt to adjust the frequency during auto-tuning
- 5. The motor and load must be stationary before initiating the auto-tune.
- Auto-tuning while the motor is rotating may produce inaccurate results.
- 6. If the auto-tuning procedure is interrupted by the stop command, the auto-tuning constants may be stored in the inverter incorrectly. It will be necessary to reset the inverter to factory defaults (b12 = 1 *NOTE: This will reset all inverter parameter back to the factory default)..

6. Protective function

The various functions are provided for the protection of the inverter itself, but they may also protection function when the inverter breaks down.

Name	Cause(s)			
Over current protection	When the inverter output current exceeds the rated current by more than approximately 200% during the motor locked or reduced in speed. Protection circuit activates, halting inverter output.			
Overload protection (Electronic thermal) Regenerative	When the inverter output current causes the motor to overload, the electronic thermal trip in the inverter cuts off the inverter output.			
Over voltage protection	If regenerative energy from the motor or the main power supply voltage is high, the protective circuit activates to cut off the inverter output when the voltage of DC link exceeds the specification	E07		
Communication error	Communication error between inverter and its operator. If the Reset signal persists for more than 4 seconds, it will occur.	E60		
Under-voltage protection	When input voltage drops below the low-voltage detection level, the control circuit does not function normally. So when the input voltage is below the specification, the inverter output is cut off.			
Output short-circuit	The inverter output was short-circuited. This condition causes excessive current for the inverter, so the inverter output is turned off.			
USP error	The USP error is indicated when the power is turned on with the Inverter in RUN state. (Enabled when the USP function selected)			
EEPROM	EEPROM The inverter output is cut off when EEPROM in the inverter has an error due to external noise, excessive temperature rise, or other factor			
External trip	External trip When the external equipment or unit has an error, the inverter receives the corresponding signal and cuts off the output.			
Input phase loss	A function that detects phase loss in the input AC source. Detection is performed using the fluctuation in the main circuit's DC voltage. Also, in the case of degradation of main capacitors it could be occurred.			
When the temperature in the main circuit increases due to cooling fanTemperature tripstop, the inverter output is cut off. (only for the model type with cooling fan)		E21		
Ground fault	ult When ground fault is detected on running condition, the output is cut off.			
Inverter Overload The power device IGBT is protected from over heat. The operating time of inverter is 1 minute with 150% load of HD or 120% load of ND. The operating time is changed depending on carrier frequency, load, ambient temperature and power rating.		E17		
Braking resistor overload protection	When BRD exceeds the usage ratio of the regenerative braking resistor, the over-voltage circuit activates and the inverter output is switched off.	E06		

Other display

Contents	Display
It is displayed when initialization of data is processing (It is not displayed when initialization of history is processing.)	 + b 12
There is no data available (Trip history, PID feedback data)	
The auto-tuning operation terminates normally.	RE01 RE02

7. Troubleshooting Tips

Sympto	om/condition	Probable Cause	Countermeasure
		 Is the frequency command source A01 parameter setting correct? Is the Run command source A02 parameter setting correct? 	 Make sure the parameter A01 setting correct? Make sure the parameter A02 setting correct?
		 Is power being supplied to terminals R, S and T? If so, the power lamp should be on. 	 Check terminals R, S and T then U, V, and W Turn on the power supply or check fuses.
	The inverter	Is there an error code E□□displayed?	•Press the Func key and determine the error type. Then clear the error(Reset).
The motor will not move	outputs U,V and W are not supplying voltage.	 Are the signals to the intelligent input terminals correct? Is the Run Command active? Is the[FW] terminal (or [RV]connected to CM1(via switch, etc.) 	 Verify the terminal functions for C01-C06 are correct. Turn on Run Command Supply 24V to [FW] or [RV] terminal, if configured. (Terminal mode selection)
		 Has the frequency setting for F01 been set greater than zero? Are the control circuit terminals H, O, and L connected to the potentiometer? 	 Set the parameter for F01to a safe, non-zero value. If the potentiometer is the frequency setting source, verify voltage at "O" > 0V
		 Is the RS(reset) function or FRS (free-run stop)function on? 	•Turn off the command(s)
Inverter outputs U,V,W are supplying voltage.		Is the motor load too heavy?Is the motor locked?	•Reduce load, and test the motor independently.
	rection of the r is reversed	 Are the connections of output terminal U, V, and W correct? Is the phase sequence of the motor forward or reverse with respect to U, V, and W? 	•Make connections according to the phase sequence of the motor. In general: FWD=U-V-W, and REV=U-W-V.
		 Are the control terminals [FW] and [RV]wired correctly? Is parameter F04 properly set? 	•Use terminal [FW] for [RV] is reverse. •Set motor direction in F04.
	notor speed ot reach the	•If using the analog input, is the current or voltage at "O" or "OI"?	 Check the wiring Check the potentiometer or signal generating device.
target frequency (desired speed)		•Is the load too heavy?	 Reduce the load. Heavy loads activate the overload restriction feature. (reduces output as needed)
The rotation is unstable		 Is the load fluctuation too great? Is the supply voltage unstable? Is the problem occurring at a particular frequency? 	 Increase the motor capacity (both inverter and motor) Fix power supply problem. Change the output frequency slightly, or use the jump frequency setting to skip the problem frequency.
The RPM of the motor does not match the inverter output frequency setting		 Is the maximum frequency setting A04 correct? Does the monitor function d01 display the expected output frequency? 	 Verify the V/F settings match motor specifications Make sure all scaling is properly set

Symptom/condition		Probable Cause	Countermeasure
Inverter data is not correct	No down- Load shave occurred.	 Was power turned off after a parameter edit but before pressing the store key? Edits to data are permanently stored at power down. Was the time from power off to power on less than six seconds? 	 Edit the data and press the store key once Wait six seconds or more before turning power off after editing data.
A param- eter will not change after an edit (roverts	The frequency setting will not change. Run/Stop does not operate.	•Was the standard operator mode and terminal mode changed correctly?	•Make sure the setting mode of [A01], [A02] is changed
(reverts to old setting)	True for all parameters.	 If you're using the[SET] intelligent input selection [b09] is the [SFT] Is switch 4(located on the back of the remote operator copy unit) on? 	 Change the state of the SFT input, and check the b09 parameter. (b09=0) Turn the switch off

Precautions for data setting

When changing any set data and pressing (STR) key to store the data, keep the equipment un-operated for 6 seconds or more after the selected method is executed. When any key is pressed, or the reset operation is performed, or the power is turned off within 6 seconds, correct data may not be set.

8. Maintenance and Inspection

Please read following safety messages before troubleshooting or performing maintenance on the inverter and motor system.

•Wait at least five(5) minutes after turning off the input power supply before performing maintenance of an inspection. Otherwise, there is the danger of electric shock.

•Make sure that only qualified personnel will perform maintenance, inspection, and part replacement. (Before starting to work, remove any metallic objects from your person (wristwatch, bracelet, etc.)) Be sure to use tools with insulated handles.

Otherwise, there is a danger of electric shock and/or injury to personnel.

8.1 General Precautions and Notes

•Always keep the unit clean so that dust of other foreign matter does not enter the inverter.

- •Take special care in regard to breaking wires of making connection mistakes.
- •Firmly connect terminals and connectors.
- •Keep electronic equipment away from moisture and oil. Dust, steel filings and other foreign matter can damage insulation, causing unexpected accidents, so take special care.
- •When removing connectors, never pull the wires (wires for the cooling fan and logic P.C. board.)
- Otherwise, there is danger of fire due to wire breakage and/or injury to personnel.

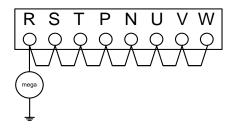
8.2 Inspection Items

(1)Daily inspection

(2) Periodic inspection (approximately once a year)

(3)Insulation resistance test (approximately once every two years)

Conduct the insulation resistance test by short circuiting the terminals as shown below.



• Never test the withstand voltage on the inverter.

The inverter has a surge protector between the main circuit terminals and the chassis ground.

We recommend that you stock spare parts to reduce down time, which include

Spare parts

Part description	Symbol	Qua	ntity	Note	
Part description	Symbol	Used	Spare	Note	
	FAN	2	2	5.5KW(HD) ~ 55KW(HD) 7.5KW(ND) ~ 75KW(ND)	
		3	3	75KW(HD) ~ 132KW(HD) 90KW(ND) ~ 160KW(ND)	
Cooling FAN		4	4	160KW(HD)~220KW(HD) 200KW(ND)~250KW(ND)	
		5	5	280KW(HD)~350KW(HD) 320KW(ND)~375KW(ND)	
Case		1	1	Front case Main case Bottom cover	

Monthly and Yeany Inspec			Inspe				
Item	Inspected	Check for	Cy Month	cle Year	Inspection Method	Criteria	
	Ambient environment	Extreme temperatures & humidity	V		Thermometer, hygrometer	Ambient temperature between -10 to 40 ℃, non-condensing	
Overall	Major devices	Abnormal vibration noise	V		Visual and aural	Stable environment for electronic controls	
	Power supply insulation	Voltage tolerance	V		Digital volt meter, measure between inverter terminals R, S, T	230V class: 200 to 240V 50/60Hz 460V class: 400 to 480V 50/60Hz	
	Ground Insulation	Adequate resistance		V	Digital volt meter, GND to terminals	1000V class Mega ohm meter	
	Mounting	No loose screws		V	Torque wrench	• M3:0.8~1.0Nm • M4:1.2~1.5Nm • M5:2.0~2.5Nm • M6:2.5~3.0Nm • M8:15.2~21.5Nm • M10:28.0~33.0Nm • M12: 39.0~50.0Nm	
	Components	Overheating		V	Thermal trip events	No trip events	
rcui	Housing	Dirt, dust		V	Visual	Vacuum dust and dirt	
Main circuit	Terminal block	Secure connections		V	Visual	No abnormalities	
2	Smoothing capacitor	Leaking swelling	V		Visual	No abnormalities	
	Relay(s)	Chattering		V	Aural	Single click when switching On or Off	
	Resistors	Cracks or discoloring		V	Visual	Use Ohm meter to check braking resistors	
	Cooling FAN	Noise	V		Power down, manually rotate	Rotation must be smooth	
	C C	Dust	V			Vacuum to clean	
Control	Overall	No odor, discoloring corrosion		V	Visual	No abnormalities	
circuit	Capacitor	No leaks or deformation	V		Visual	Undistorted appearance	
Display	LEDs	Legibility	V		Visual	All LED segments work	

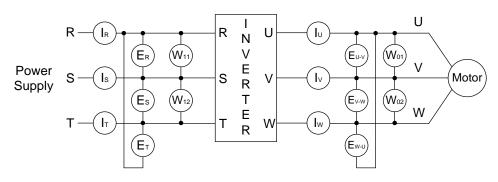
Monthly and Yearly Inspection Chart

Note1: The life of a capacitor is affected by the ambient temperature. Note2: The inverter must be cleaned periodically.

If dust accumulates on the fan and heat sink, it can cause overheating of the inverter.

8.3 General Inverter Electrical Measurements

The following table specifies how to measure key system electrical parameters. The diagrams on the next page show inverter-motor systems the location of measurement points for these parameters.



Parameter	Circuit location of measurement	Measuring instrument	Notes	Reference Value
Supply voltageE1	R-S, S-T, T-R (ER) (ES) (RT)	 ≮ Moving-coil type voltmeter or rectifier ≁ type voltmeter 	Fundamental wave effective value	Commercial supply voltage (230V class) 200-220V 5Hz 200-240V 6Hz
Supply current I1	R, S, T, Current (IR) (IS) (IT)	▲ Moving-coil type Ammeter	Total effective value	(460Vclass) 380-415V 5Hz 400-480V 6Hz
Supply power W1	R-S, S-T (W11) + (W12)	Electronic type wattmeter		
Supply power factor Pf1	output current I1, and	power factor from the output vo output power W ₁ $1 = \frac{W_1}{\sqrt{3} \cdot E_1 \cdot I_1} \times 100(\%)$		
Output voltage E0	U-V, V-W, W-U (E∪) (E∨) (Ew) → Rectifier type voltmeter value			
Output current Io	U, V, W Current (I∪) (I∨) (Iw)	⊀ Moving-coil type Ammeter	Total effective value	
Output power W0	U-V, V-W (W01) + (W02)	Electronic type wattmeter	Total effective value	
Output power factor Pf0	Calculate the output output current I_0 , and P_{f0}			

Note1: Use a meter indicating a fundamental wave effective value for voltage, and meters indicating total effective values for current and power.

Note2: The inverter output has a PWM waveform, and low frequencies may cause erroneous readings. However, the measuring instruments and methods listed above provide comparably accurate results.

Note3: A general-purpose digital volt meter (DVM) is not usually suitable to measure a PWM waveform (not pure sinusoid)

9. RS485 Communication

The communication between inverter and external controller can be done through RS-485 by use of the modular connector (RJ-45) located in inverter control board.

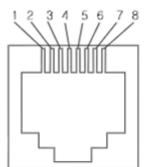
Function code	Minimum	Maximum	Initial Value	Unit	Description
b17	1	32	1	-	Setting the communication number
b31	1	4	3	-	9600bps
A01	0	4	0	-	3: Remote Operator(RJ-45)
A02	0	3	0	-	2: Remote Operator(RJ-45)

Item	Description	Remark
Interface	RS485	
Communication method	Half duplex	
Communication speed	9600	Fixing
Communication code	Binary code	
Data bits	8	Fixing
Parity	No.	Fixing
Stop bit	1	Fixing
Starting method	External request	Inverter is only slave part.
Wait time	10~1000ms	
Connection type	1 : N (Max32)	
Error check	Frame / CRC / CMD /	Communication number is
	MAXREQ / parameter	selected at b17

RS485

1stCommunication-RJ45

RJ-45 Port Connections



Pin No.	Signal Descriptions
1	
2	
3	RS - 485+
4	
5	
6	RS - 485-
7	24V
8	24V GND

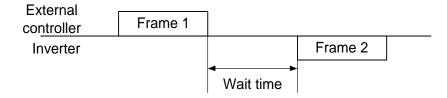
2nd Communication-Terminal

Function code	Minimum	Maximum	Initial Value	Unit	Description
b17	1	32	1	-	Setting the communication number
b31	1	4	3	-	9600bps
A01	0	4	0	-	4: Remote Operator(Terminal)
A02	0	3	0	-	3: Remote Operator(Terminal)

RXP	RXN
Transmit/Receive	Transmit/Receive
+side	-side

Communication sequence

The communication sequence is as follows



Frame start : Frame start is recognized by signal line data transmitted.

Frame completion : Frame completion is recognized by no data during correspond 4, 5-character time.

Frame 1: Transmit from external controller to inverter.

Frame 2: Indication reflects from inverter to external controller

Communication frame type and form

External	contro	ller	tra	Insmit	frame	
-						

Communication number	Con	nmand	Parameter	Parameter C	Count	CRC Hi	CRC Lo
		Desi	cription	Data size		Specificati	ons
Communication number		Inverter Communication number		1 byte	1~32		
Command		Frame type		1 byte	0x03		
Parameter	Parameter Parameter		2 byte	1 st by 2 nd by	rte : Group yte : Index ^{(Note}	1)	
Parameter number	· · · · · · · · · · · · · · · · · · ·		2 byte	1 st byte : 0x00 2 nd byte : N(0x01~0x08))x08)	
CRC Hi		-		1 byte	Higher 8bit of 16bit CRC		
CRC Lo			-	1 byte	Lower 8bit of 16bit CRC		CRC

Inverter response frame

Communication number Order Byte Number Data	1 •••• Da	ta N CRC Hi	CRC Lo
---	-----------	-------------	--------

	Description	Data size	Specifications
Communication number	Inverter Communication number	1 byte	1~32
Command	Frame type	1 byte	0x03
Byte Number	Data Byte number	1 byte	Request parameter number x 2
Data 1	Parameter 1	2 byte	Parameter value
Data N	Parameter N	2 byte	Nth parameter value
CRC Hi	-	1 byte	Higher 8bit of 16bit CRC
CRC Lo	-	1 byte	Lower 8bit of 16bit CRC

* Frame Size = 5 + Request parameter number x 2

External transmit frame

Communication number		Order	Parameter	Data	CRC Hi	CRC Lo		
		Des	scription	Data size	Specifications			
Communication number		Target Inverter Communication number		1 byte	1~32			
Command	Command		me type	1 byte	0x06			
Parameter		Parameter		2 byte	1 st byte : Group 2 nd byte : Index ^(Note1)			
Data			Data	2 byte	Setting value ^(Note 2)			
CRC Hi			-	1 byte	Higher 8bit of 16	bit CRC		
CRC Lo			-	1 byte	Lower 8bit of 16bit CRC			

Inverter response frame

Communication	Order	Parameter	Data	CPCLA
number	Oldel	Falametei	Dala	

	Description	Data size	Specifications
Communication number	Target Inverter Communication number	1 byte	1~32
Command	Frame type	1 byte	0x06
Parameter	Parameter	2 byte	1 st byte : Group 2 nd byte : Index ^(Note1)
Data	Data	2 byte	Setting value is response (Note4)
CRC Hi	-	1 byte	Higher 8bit of 16bit CRC
CRC Lo -		1 byte	Lower 8bit of 16bit CRC

Note1 :Parameter setting

Basic parameter

1 st h	vte	·Fach	aroup	is	setting	
I D	yıc	.Laun	group	13	Setting	

Group	1 st byte	Group	2 nd byte
d	0x01	С	0x05
F	0x02	Н	0x06
А	0x03		
b	0x04		

2ndbyte :Parameter number setting. Ex) The case of A60 parameter reading or writing 1stbyte : 0x03 2ndbyte : 0x3C

Trip information

Trip information is 4 parameter.(output frequency, output current, DC link voltage at trip occurs)

	Trip Information	Previous first trip	Previous second trip	Previous third trip	Trip count
1 st byte	0x01	0x01	0x01	0x01	0x01
2 nd byte	0x0D	0x11	0x15	0x19	0x1D

Trip information items

	•	1	I contract of the second s
Trip data	Trip contents	Trip data	Trip contents
1	Over current trip	9	EEPROM trouble
2	Over voltage trip	10	Communication trouble
3	Under voltage trip	11	USP trip
4	Arm Short trip	12	GF trip
5	Reserved	14	IOLT trip
6	Inverter over heat trip	15	Input phase loss
7	Electric thermal trip	10	Braking resistor
8	External trip	- 18	Overload trip

Note2 :Data value setting

Data value is transmitted except decimal point.

Ex1) Output frequency

Parameter value	Communication data	Conversion hexadecimal
60.0Hz	6000	1 st byte : 0x17 2 nd byte : 0x70

Ex2) acc/dec time

Parameter value	Communication data	Conversion hexadecimal
10.0sec	100	1 st byte:0x00 2 nd byte:0x64

Note3 :Special parameter

Run command

Parameter

1stbyte : 0x00

2nd byte : 0x02

setting data

1st byte

~ j.e							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
			Rese	erved			

2nd byte

- 8910							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
		Reserved			RST	REV	FWD

Bit 0 :Forward command

Bit 1 :Reverse command

Bit 2 :Reset command

Frequency command

Parameter

1stbyte : 0x00 2nd byte : 0x04 setting data output frequency * 100 Ex) the case of output frequency command is 60.00Hz Data 6000 transmit 1stbyte : 0x17 2nd byte : 0x70

16bit CRC generation

The step of CRC generation is as follows:

- 1. All of 16-bit register is 1.0xffff

- 2. The exclusive OR of 16-bit register and 8-bit register.
 3. Shift right side 1bit 16-bit register
 4. If the result of step 3 is 1, exclusive OR 16-bit register and 0xa001.
- 5. Execute 8 times step 3 and step 4.
- 6. Execute step $2 \sim 6$ until data completion.
- 7. Exchange the step 6 result of higher 8bit and lower 8bit.

Ex)The case of D01 output frequency reading.

Byte 1	Byte 2	Byte 3 Byte 4		Byte 5	Byte 6
Communication Number	Command	Parar	neter	Paramete	er number
0x01	0x03	0x01 0x01		0x00	0x01

The sequence of addition Byte (01x01)

16-BIT REGISTER	MSB		I	-lag	
(Exclusive OR)	1111	1111	1111	1111	
01	0000	0001			
	1111	1111	1111	1110	
Shift 1	0111	1111	1111	1111	
Shift 2	0011	1111	1111	1111	1
Polynomial	1010	0000	0000	0001	
	1001	1111	1111	1110	
Shift 3	0100	1111	1111	1111	
Shift 4	0010	0111	1111	1111	1
Polynomial	1010	0000	0000	0001	
	1000	0111	1111	1110	
Shift 5	0100	0011	1111	1111	
Shift 6	0010	0001	1111	1111	1
Polynomial	1010	0000	0000	0001	
	1000	0001	1111	1110	
Shift 7	0100	0000	1111	1111	
Shift 8	0010	0000	0111	1111	1
Polynomial	1010	0000	0000	0001	
	1000	0000	0111	1110	

Byte 1~6	CRC of operation results
0x01	0x807e
0x03	0x3364
0x01	0x30e1
0x01	0x8831
0x00	0xd449
0x01	0x36d4

Change upper and lower 8 bit of result 0x36d4 : 0xd436

Byte7 :Upper 8 bit of CRC = 0xd4 Byte8 :Lower 8 bit of CRC = 0x36

10. Specification

10.1 Standard specification list

(1) 200V Class Specifications

Invert	ter Model		055LF/ 075LFP	075LF/ 110LFP	110LF/ 150LFP	150LF/ 185LFP	185LF/ 220LFP	220LF
Max. Applicabl	e motor	HD	7.5	10	15	20	25	30
(4P, HP) (Note1)		ND	10	15	20	25	30	-
	HD	200V	8.3	11.1	15.6	22.2	26.3	31.2
Rated		240V	10.0	13.3	18.7	26.6	31.6	37.4
capacity (kVA)	ND	200V	10.4	15.2	20.0	25.2	29.4	-
	ND	240V	12.5	18.2	24.1	30.3	35.3	-
Rated input vo	ltage		Three-phase 200~240V±10%, 50/60Hz±5%					
Rated output v	oltage ^{(Not}	e2)	Thr	ee-phase 20	0~240V (cor	responding	to input volta	ige)
Rated output		HD	24	32	45	64	76	90
current(A)	current(A) ND		30	44	50	73	85	-
Weight (Kg)			4.2	4.5	4.5	6.5	7.5	8
Protection Des	sign				IP:	20		

(2) 400V Class Specifications

Inver	ter Model		055HF/ 075HFP	075HF/	110HF/	150HF/	185HF/	220HF/
				110HFP	150HFP	185HFP	220HFP	300HFP
Max. Applicabl (4P, HP) (Note1	e motor	HD	7.5	10	15	20	25	30
(4P, HP) ^{(Note1})	ND	10	15	20	25	30	40
Rated	HD	380V	7.9	10.5	15.1	21.1	25.0	29.6
		480V	10.0	13.3	19.1	26.6	31.6	37.4
capacity (kVA)	ND	380V	10.4	15.2	20.0	25.6	29.7	39.4
	ND	480V	12.5	18.2	24.1	30.7	35.7	47.3
Rated input vo	ltage			Three-pha	ase 400~480)V±10%, 50/	60Hz±5%	
Rated output v	oltage (Not	ie2)	Thr	ee-phase 40	0~480V (cor	responding	to input volta	ige)
Rated output of		HD	12	16	23	32	38	45
(A) ND		15	22	29	37	43	57	
Weight (Kg)			4.2	4.5	4.5	7	7	7.5
Protection Des	sign				IP:	20		

Inverter Model			300HF/	370HF/	450HF/	550HF/	750HF/	900HF/	
			370HFP	450HFP	550HFP	750HFP	900HFP	1100HFP	
Max. Applicabl	e motor	HD	40	50	60	75	100	125	
(4P, HP) (Note1)	ND	50	60	75	100	125	150	
Rated	HD	380V	38.2	49.4	59.2	72.4	98.1	115.8	
	пυ	480V	48.2	62.4	74.8	91.5	123.9	146.3	
capacity (kVA)	ND	380V	48.4	58.8	72.7	93.5	111	135	
	ND	480V	58.1	70.1	87.2	112	133	162	
Rated input vo	Itage			Three-phase 400~480V±10%, 50/60Hz±5%					
Rated output v	oltage (No	te2)	Thr	Three-phase 400~480V (corresponding to input voltage)					
Rated output of	urrent	HD	58	75	90	110	149	176	
(A) ND		70	85	105	135	160	195		
Weight (Kg)			22	22	27	30	50	50	
Protection Des	ign				IP	00			

Invert	ter Model		1100HF/ 1320HFP	1320HF/ 1600HFP	1600HF/ 2000HFP	2200HF/ 2500HFP	2800HF/ 3200HFP	3500HF/ 3800HFP
Max. Applicabl	e motor	HD	150	200	200	300	400	450
(4P, HP) (Note1)	ND	200	200	250	350	450	500
	HD	380V	142.8	171.1	195	270	340	430
Rated	пυ	480V	180.4	216.2	230	315	400	500
capacity (kVA)	ND	380V	159	204	245	305	390	460
	ND	480V	191	245	285	360	470	550
Rated input vo	ltage		Three-phase 400~480V±10%, 50/60Hz±5%					
Rated output v	oltage (Not	e2)	Thr	ee-phase 40	0~480V (cor	responding	to input volta	ige)
Rated output c		HD	217	260	300	415	525	656
(A) ND		230	285	370	450	600	680	
Weight (Kg)			60	60	110	110	170	170
Protection Des	sign			IP00				

Footnotes for the preceding tables

Note 1. The applicable motor refers to HYUNDAI standard 3-phase motor (4-pole). To use other motors, care must be taken to prevent the rated motor current (50/60Hz) from exceeding the rated output current of the inverter.

Note 2. The output voltage decreases as the main supply voltage decreases (except for use of the AVR function). In any case, the output voltage cannot exceed the input power supply voltage.

(3) Common specifications for 200V/400V class

Inverter model			Common specifications for all model			
Control system ^(Note3)			Space vector modulation PWM system			
	Output freq range ^{(No}	uency ^{bte4})	0.01 ~400Hz			
F	requency acc	uracy ^(Note5)	Digital command $\pm 0.01\%$ for Max. frequency, analog frequency $\pm 0.1\%$ (25 ± 10 °C			
Fre	equency resol	ving power	Digital setting : 0.01HZ, Analog setting : Max. frequency / 1,000			
	Voltage/frec character		V/f control (constant torque, reduced torque), free V/f control			
	Overload cur	rent rate	Heavy Duty(150%, 60sec), Normal Duty(120%, 60sec)			
A	cceleration/De	eceleration	0.1 000.0 sec (Director, curve setting)			
	DC injection Braking		On starting and decelerating by stop command, inverter operates under operation setting frequency. Or inverter operates with external input (Breaking power, time, frequency can be set.)			
	Frequency	Operator Extend signal	Setting by up/down key Input voltage : DC0 \sim +10V (Input impedance 10K Ω) Input current : 4 \sim 20mA (Input impedance 200 Ω)			
Inal	Run/ StopOperator Extend signalRun / Stop key (Forward / Reverse function mode)Forward run / stop (1a connect, 1b selection possibility)					
Input Signal	Intelligent input terminal		FW(Forward), RV(Reverse), CF1~4(Multi-speed bit 1~4), RS(reset), AT(Analog input current/voltage selection signal), USP(USP function) EXT(external trip), FRS(free-run stop), JG(jogging), SFT(software lock), 2CH(2 nd acceleration), STA, STP, F/R(3-wire), UP, DOWN(Up/down), O/R, T/R(By-pass Operation), PIDIR(PID Integral Reset), PIDD(PID Disable)			

Inverter model		Common specifications for all model				
	Intelligent output terminal (RN0-RN1,RN2-RN3)	RUN(run status signal), FA1 (frequency arrival signal), FA2 (setting Frequency arrival signal),OL(overload advance notice signal), OD(PID error deviation signal), AL(alarm signal)				
gnal	Alarm output terminal					
Output Signal	FM output	Analog meter (DC0~10V full scale. Max · 1mA) Output frequency, output current, output voltage and output power				
	AMI output	Analog meter (4~20mA full scale. Max · 250Ω) Output frequency, output current, output voltage and output power				
Other functions		AVR function, curved accel/decel. profile, upper and lower limiters, 16-stage speed profile, fine adjustment of start frequency, carrier frequency change(0.5 to 16Khz), frequency jump, gain and bias setting, process jogging, electronic thermal level adjustment, retry function, trip history monitor, auto tuning(1), V/f characteristic selection, Speed Search automatic torque boost, frequency conversion display, USP function				
	Protection function	Over current, Over load(Electronic thermal), Over voltage, Inverter Over load(IOLT), Communication error, Under voltage, Output short circuit detection, USP error, EEPROM error, External error, Ground fault, Over heat, Input phase loss, Braking resistor overload				
tion	Ambient temperature	-10~40 $^\circ C$ (If ambient temperature is above 40 $^\circ C$, Carrier frequency should be lower than default value.)				
Standard specification	Storage temperature	-20~60℃				
d spe	Ambient humidity	Below 90%RH (Installed with no dew condensation)				
Indar	Vibration	5.9m/s²(0.6G). 10~55Hz				
Sta	Location	Under 1000m above sea level, indoors (Installed away from corrosive gasses dust)				
Option		Noise filter , DC reactor, AC reactor Remote operator, cable for remote operator, Braking resistor ^(Note6)				

Footnotes for the preceding table

Note 3 Control method setting A31 to 2 (sensorless vector control) Selected, set carrier frequency (b11) more than 2.1kHz.

Using motor less than half of the rated capacity, you cannot get enough performance.

Multiple motors cannot be driven by sensorless vector control.

- Note 4 To operate the motor over 50/60Hz, consult the motor manufacturer about the maximum allowable rotation speed. In case of sensorless control mode, it can be 300Hz
- Note 5 Inverter frequency could be exceeded 1.5Hz for the maximum frequency [A04] in the case of motor stabilization is required.
- Note 6. 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. And, the average deceleration torque varies with motor loss. This value decreases when operating beyond 50 Hz. If a large regenerative torque is required, the optional regenerative braking resistor should be used.

10.2 The selection of braking resistor and the breaking unit

- Resistor values shown in the following table is calculated on the basis of 150% of rated braking torque, 5% ED⁽¹⁾.
- Power rating of resistor should be doubled for resistor frequency 10% ED use. Additional braking unit should be installed for above

Inverter capacity	Ohm [Ω]	Wattage [W] ⁽²⁾
055LF/075LFP	17	1000
075LF/110LFP	17	1000
110LF/150LFP	17	1000
150LF/185LFP	8.7	2500
185LF/220LFP	6	3000
220LF	6	4000
055HF/075HFP	70	1200
075HF/110HFP	50	1200
110HF/150HFP	50	2000
150HF/185HFP	30	2500
185HF/220HFP	20	3000
220HF/300HFP	20	4000

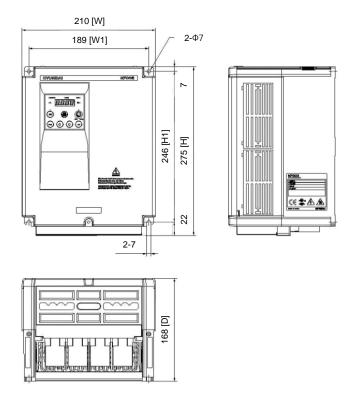
Recommended DB Resistors for the Rated Inverter Capacity (5% ED⁽¹⁾)

(1)ED is based on 100 seconds.

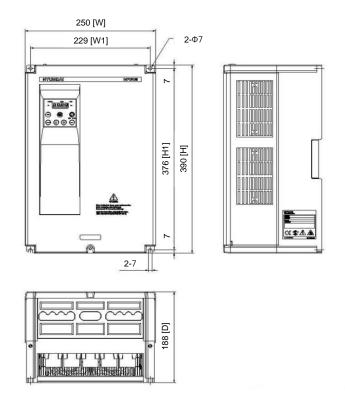
(2)Rated capacity is based on the self-cooling

10.3 Dimension

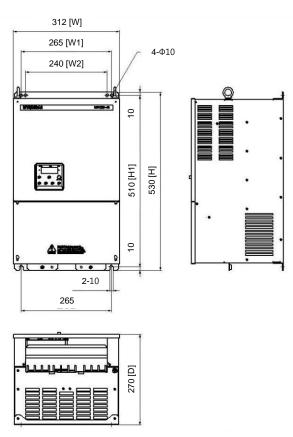
(1) N700E-055LF/075LFP, N700E-075LF/110LFP, N700E-110LF/150LFP, N700E-055HF/075HFP, N700E-075HF/110HFP and N700E-110HF/150HFP model external dimension.(mm)



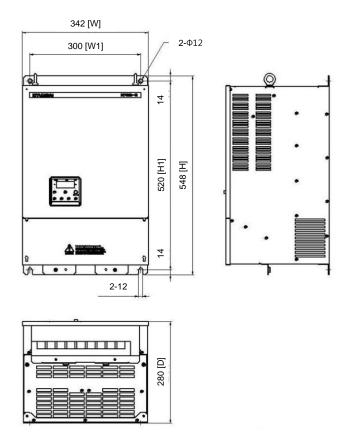
(2) N700E-150LF/185LFP, N700E-185LF/220LFP, N700E-220LF, N700E-150HF/185HFP, N700E-185HF/220HFP, N700E-220HF/300HFP model external dimension.(mm)



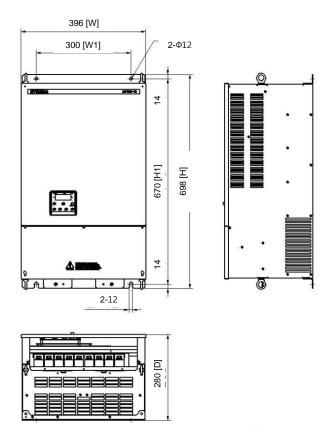




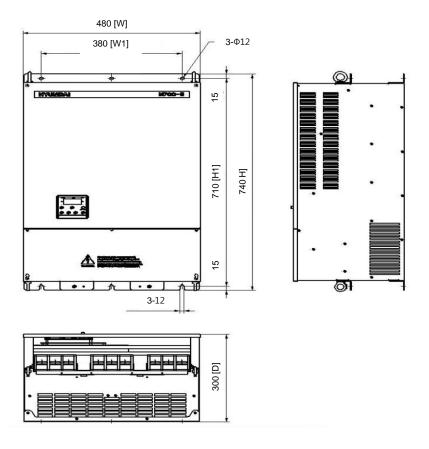
(4) N700E-450HF/550HFP, N700E-550HF/750HFP model external dimension.(mm)



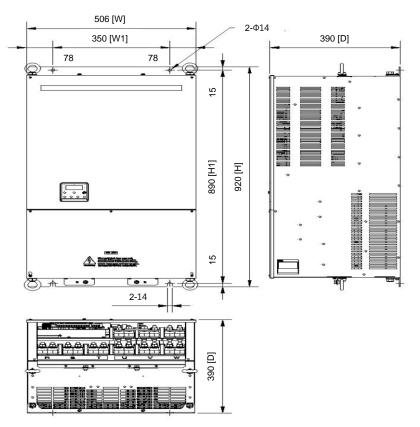
(5) N700E-750HF/900HFP, N700E-900HF/1100HFP model external dimension.(mm)



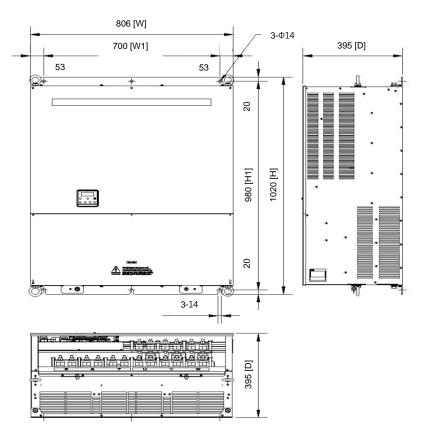
(6) N700E-1100HF/1320HFP, N700E-1320HF/1600HFP model external dimension.(mm)



(7) N700E-1600HF/2000HFP, N700E-2200HF/2500HFP model external dimension.(mm)



(8) N700E-2800HF/3200HFP, N700E-3500HF/3800HFP model external dimension.(mm)



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Madal	W(Width)	W1	W2	H(Height)	H1	D(depth)	ø	Weight
Model	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
N700E-055LF/075LFP	210	189	-	275	246	168	7	4.2
N700E-075LF/110LFP	210	189	-	275	246	168	7	4.5
N700E-110LF/150LF	210	189	-	275	246	168	7	4.5
N700E-150LF/185LF	250	229	-	390	376	188	7	6.5
N700E-185LF/220LF	250	229	-	390	376	188	7	7.5
N700E-220LF	250	229	-	390	376	188	7	8
N700E-055HF/075HFP	210	189	-	275	246	168	7	4.2
N700E-075HF/110HFP	210	189	-	275	246	168	7	4.5
N700E-110HF/150HFP	210	189	-	275	246	168	7	4.5
N700E-150HF/185HFP	250	229	-	390	376	188	7	7
N700E-185HF/220HFP	250	229	-	390	376	188	7	7
N700E-220HF/300HFP	250	229	-	390	376	188	7	7.5
N700E-300HF/300HFP	312	265	240	530	510	270	10	22
N700E-370HF/450HFP	312	265	240	530	510	270	10	22
N700E-450HF/550HFP	342	300	-	548	520	280	12	27
N700E-550HF/750HFP	342	300	-	548	520	280	12	30
N700E-750HF/900HFP	396	300	-	698	670	280	12	50
N700E-900HF/1100HFP	396	300	-	698	670	280	12	50
N700E-1100HF/1320HFP	480	380	-	740	710	300	12	60
N700E-1320HF/1600HFP	480	380	-	740	710	300	12	60
N700E-1600HF/2000HFP	506	350	-	920	890	390	14	110
N700E-2200HF/2500HFP	506	350	-	920	890	390	14	110
N700E-2800HF/3200HFP	806	700	-	1020	980	395	14	170
N700E-3500HF/3800HFP	806	700	-	1020	980	395	14	170

N700E INSTRUCTION MANUAL REVISION HISTORY TABLE

ELECTRO ELECTRIC SYSTEMS

No.	Revision contents	The Data of Issue	Version No.
1	First edition	12. 04	HHIS-WZ-PE-086(00)
2	B group function code (b02) changed	12.06	HHIS-WZ-PE-086(01)
3	Fuse table changed	12.10	HHIS-WZ-PE-086(02)
4	PID Function addition	13.01	HHIS-WZ-PE-086(03)
5	BRD Function addition	13. 04	HHIS-WZ-PE-086(04)
6	A revised edition of N700E EIO	13.06	HHIS-WZ-PE-086(05)
7	Function code description changed	13. 12	HHIS-WZ-PE-086(06)
8	Add jogging command by RS485	14. 02	HHIS-WZ-PE-086(07)