

Thank you for purchasing our Doesa VF1A series of inverters. The purpose of this Instruction Manual is to provide handling information in handling, setting up and operating of the Doesa VF1A series of inverters. Do not use this product until you have full knowledge of the product, safety information and instructions from this Instruction Manual and related documents.

[Related Documents]

- Doesa VF1A series Instruction Manual (Detailed Version) B-2301
- Doesa VF1A series User's Manual B-2302
- Doesa VF1A series RS-485 Communication User's Manual B-2303

This manuals can be downloaded in PDF form from QR code in right figure.

Instruction Manual QR code



IDEC CORPORATION

Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual. In no event will IDEC CORPORATION be liable for any direct or indirect damages resulting from the application of the information in this manual.

First Edition, March 2022 **B-2300(0)**
INR-S147-2476a-E

CAUTION

- Disposal**
- Treat the inverter as an industrial waste when disposing of it.
 - Otherwise injuries could occur.
- Storage**
- In case of storing this product for certain period of time, review the environmental conditions and follow the guidance described in Instruction Manual (Detailed Version).

Chapter 1 BEFORE USING THE INVERTER

1.1 Acceptance Inspection

Unpack the package and check the following:

- An inverter and the following accessories are contained in the package.
 - Accessories
 - DC reactor (for ND-mode inverters of VF1A-G139AS4.
 - Keypad rear cover (with three screws for securing the keypad)
 - Instruction Manual
 - Wiring guide (for VF1A-G12A0S4 or below)
- The inverter has not been damaged during transportation—there should be no dents or parts missing.
- The inverter is the type you ordered. You can check the type and specifications on the main nameplate. (The main and sub nameplates are attached to the inverter as shown on Figure 1.1-1.)

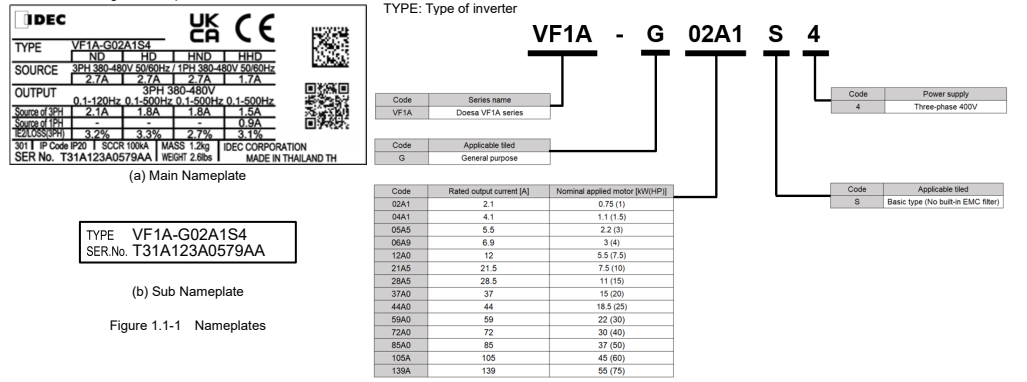
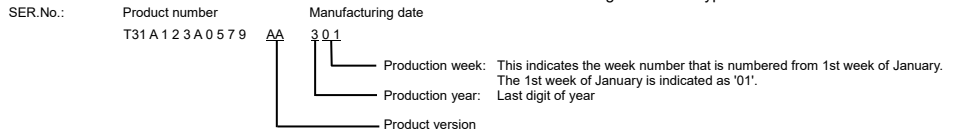


Figure 1.1-2 Type of inverter



If you suspect the product is not working properly or if you have any questions about your product, contact your IDEC representative.

Chapter 2 INSTALLATION AND WIRING

2.1 Usage environment

Install the inverter in an environment that satisfies the requirements listed in Table 2.1-1.

Item	Specifications
Site location	Indoors
Ambient temperature	Standard (Open Type) • -10 to +50°C (14 to 122°F) (HHD/HND spec.) (Note 1), -10 to +40°C (14 to 104°F) (HD/ND spec.)
Relative humidity	5 to 95% RH (No condensation)
Atmosphere	The inverter must not be exposed to dust, direct sunlight, corrosive gases, flammable gases, oil mist, vapor or water drops. Pollution degree 2 (IEC60664-1) (Note 2) The atmosphere can contain a small amount of salt (0.01 mg/cm ³ or less per year). The inverter must not be subjected to sudden changes in temperature that will cause condensation to form.
Altitude	1,000 m (3,300 ft) max. (Note 3) Vibration
Atmospheric pressure	86 to 106 kPa
Vibration	3 mm (Max. amplitude), 2 to less than 9 Hz 9.8 m/s ² 9 to less than 20 Hz 2 m/s ² 20 to less than 55 Hz 1 m/s ² 55 to less than 200 Hz

- (Note 1) When inverters are mounted side-by-side without any clearance between them (VF1A-G72A0S4 or below), the ambient temperature should be within the range from -10 to +40°C.
(Note 2) Do not install the inverter in an environment where it may be exposed to lint, cotton waste or moist dust or dirt which will clog the heat sink of the inverter. If the inverter is to be used in such an environment, install it in a dustproof panel of your system.
(Note 3) If you use the inverter in an altitude above 1,000 m (3,300 ft), you should apply an output current derating factor as listed in Table 2.1-2.

Altitude	Output current derating factor
1,000 m or lower (3,300 ft or lower)	1.00
1,000 to 1,500 m (3,300 to 4,900 ft)	0.97
1,500 to 2,000 m (4,900 to 6,600 ft)	0.95
2,000 to 2,500 m (6,600 to 8,200 ft)	0.91
2,500 to 3,000 m (8,200 to 9,800 ft)	0.88

2.2 Installation

2.2.1 Installation Surface

Please install the inverter on non-combustible matter such as metals. Also, do not mount it upside down or horizontally.

Install on non-combustible matter such as metals.

Risk of fire exists

2.2.2 Surrounding Space

Secure the space shown in Figure 2.2-1 and Table 2.2-1. When enclosing VF1A in cabinets, be sure to provide adequate ventilation to the cabinet, as the surrounding temperature may rise. Do not contain it in small enclosures with low heat dissipation capacity.

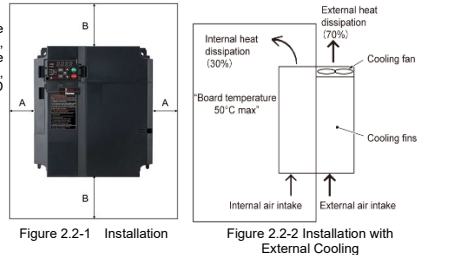
Installation of Multiple Inverters

When installing 2 or more units in the same equipment or cabinet, generally mount them to the side of each other, not above each other. When the inverters are mounted above each other, attach partitioning boards to prevent that the heat dissipated from the lower inverter affects the upper inverter. For types VF1A-G72A0S4 or below and for ambient temperature below 40°C only, the units can be installed side by side without any spacing between them. (30°C or lower for ND and HD)

Applicable Capacity	A	B	C
VF1A-G72A0S4 or below	10 (0.39)	100 (3.9)	0 *1
VF1A-G85A0S4 or above	50 (1.97)		100 (3.9)

*1: A clearance of 50 mm is required to use RJ-45 connector.

C: Space in front of the inverter unit



Installation with External Cooling

The external cooling installation reduces the generated heat inside the panel by dissipating approximately 70% of the total heat generated (total heat loss) by mounting the cooling fins protruding outside the equipment or cabinet. Installation with external cooling is possible for types VF1A-G21A5S4 to VF1A-G72A0S4 by adding attachments (optional) for external cooling, and for types VF1A-G85A0S4 or above by moving the mounting bases. (Please refer to the Doesa VF1A series User's Manual for the external dimensions drawing of the external cooling attachment (optional)). Prevent lint, wastepaper, wood shavings, dust, metal scrap, and other foreign material from entering the inverter or from attaching to the cooling fins.

Risk of fire and risk of accidents exists

2.2.3 Removal and attachment of the front cover/ terminal cover and wiring guide

Always remove the RS-485 communication cable from the RJ-45 connector before removing the front cover.

Risk of fire and risk of accidents exists.

- Types VF1A-G12A0S4 or below
 - Loosen the screws of the terminal cover. To remove the terminal cover, put your finger in the dimple of the terminal cover and then pull it up toward you.
 - Pull out the wiring guide toward you.
 - After routing the wires, attach the wiring guide and the terminal cover reversing the steps above.

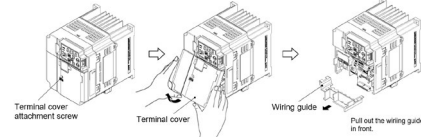


Figure 2.2-3 Removal of the Terminal Cover and the Wiring Guide (for VF1A-G04A1S4)

- Types VF1A-G21A5S4 to VF1A-G44A0S4
 - Loosen the screws of the terminal cover. To remove the terminal cover, put your finger in the dimple of the terminal cover and then pull it up toward you.
 - Pull out the wiring guide toward you.
 - After routing the wires, attach the wiring guide and the terminal cover reversing the steps above.

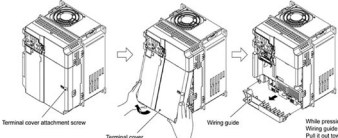


Figure 2.2-4 Removal of the Terminal Cover and the Wiring Guide (for VF1A-G28A5S4)

- Types VF1A-G59A0S4 / VF1A-G72A0S4
 - Loosen the screws of the front cover. Hold both sides of the front cover with the hands, slide the cover downward, and pull. Then remove it to the upward direction.
 - Push the wiring guide upward and pull. Let the wiring guide slide and remove it.
 - After routing the wires, attach the wiring guide and the front cover reversing the steps above.

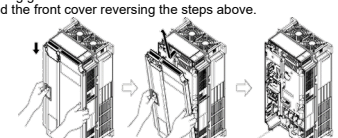


Figure 2.2-5 Removal of the Front Cover and the Wiring Guide (for VF1A-G72A0S4)

CAUTION

Thank you for purchasing our Doesa VF1A series of inverters.

- This product is designed to drive a three-phase induction motor and three-phase permanent magnet synchronous motor. Read through this Instruction Manual and be familiar with the handling procedure for correct use.
- Improper handling might result in incorrect operation, a short life, or even a failure of this product as well as the motor.
- Deliver this manual to the end user of this product. Keep this manual in a safe place until this product is discarded.
- For instructions on how to use an optional device, refer to the instruction and installation manuals for that optional device.
- Drawings in this manual may be illustrated without covers or safety shields for explanation of detail parts. Restore the covers and shields in the original state and observe the description in the manual before starting operation.

WARNING

Application

- VF1A is designed to drive a three-phase induction motor. Do not use it for single-phase motors or for other purposes.
- Fire or an accident could occur.**
- VF1A may not be used for a life-support system or other purposes directly related to the human safety.
- Though VF1A is manufactured under strict quality control, install safety devices for applications where serious accidents or material losses are foreseen in relation to the failure of it.

An accident could occur.

- Installation**
- Install the inverter on a nonflammable material such as metal.
 - Otherwise fire could occur.**
 - Do not place flammable matter nearby.
 - Doing so could cause fire.**
 - Inverters VF1A-G85A0S4 or above, whose protective structure is IP00, involve a possibility that a human body may touch the live conductors of the main circuit terminal block. Inverters to which an optional DC reactor is connected also involve the same. Install such inverters in an inaccessible place.
 - Otherwise, electric shock or injuries could occur.**

Wiring

- If no zero-phase current (earth leakage current) detection device such as a ground-fault relay is installed in the upstream power supply line, in order to avoid the entire power supply system's shutdown undesirable to factory operation, install a residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) individually to inverters to break the individual inverter power supply lines only.
- When wiring the inverter to the power source, insert a recommended molded case circuit breaker (MCCB) or residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) (with overcurrent protection) in the path of each pair of power lines to inverters. Use the recommended devices within the recommended current capacity.
- Use wires in the specified size.
- Tighten terminals with specified torque.
- When there is more than one combination of an inverter and motor, do not use a multicore cable for the purpose of handling their wirings together.
- Do not connect a surge killer to the inverter's output (secondary) circuit.
- Be sure to connect an optional DC reactor (DCR) when the capacity of the power supply transformer exceeds 500 kVA and is 10 times or more the inverter rated capacity.
- Otherwise, a fire could occur.**

- Ground the inverter in compliance with the national or local electric code.
- Be sure to ground the inverter's grounding terminals G.
- Otherwise, an electric shock or a fire could occur.**
- Qualified electricians should carry out wiring.
- Be sure to perform wiring after turning the power OFF.
- Otherwise, an electric shock could occur.**
- Be sure to perform wiring after installing the inverter unit.
- Otherwise, an electric shock or injuries could occur.**

Ensure that the number of input phases and the rated voltage of the product match the number of phases and the voltage of the AC power supply to which the product is to be connected.

- Otherwise, a fire or an accident could occur.**
- Do not connect the power supply wires to output terminals (U, V, and W).
- When connecting a DC braking resistor (DBR), never connect it to terminals other than terminals P(+) and N(-).
- Doing so could cause fire or an accident.**

In general, sheaths of the control signal wires are not specifically designed to withstand a high voltage (i.e., reinforced insulation is not applied). Therefore, if a control signal wire comes into direct contact with a live conductor of the main circuit, the insulation of the sheath might break down, which would expose the signal wire to a high voltage of the main circuit. Make sure that the control signal wires will not come into contact with live conductors of the main circuit.

- Doing so could cause an accident or an electric shock.**
- Before changing the switches or touching the control circuit terminal symbol plate, turn OFF the power and wait at least five minutes for inverters VF1A-G72A0S4 or below, or at least ten minutes for inverters VF1A-G85A0S4 or above. Make sure that the LED monitor and charging lamp are turned OFF. Further, make sure, using a multimeter or a similar instrument, that the DC link bus voltage between the terminals P(+) and N(-) has dropped to the safe level (+25 VDC or below).
- Otherwise, an electric shock could occur.**

Operation

- Be sure to mount the front cover before turning the power ON. Do not remove the cover when the inverter power is ON.
- Otherwise, an electric shock could occur.**
- Do not operate switches with wet hands.
- Doing so could cause electric shock.**
- If the auto-reset function has been selected, the inverter may automatically restart and drive the motor depending on the cause of tripping. Design the machinery or equipment so that human safety is ensured at the time of restarting.
- Otherwise, an accident could occur.**

If the stall prevention function (current limiter), automatic deceleration (anti-regenerative control), or overload prevention control has been selected, the inverter may operate with acceleration/deceleration or frequency different from the commanded ones. Design the machine so that safety is ensured even in such cases.

- The key on the keypad is effective only when the keypad operation is enabled with function code F02 (= 0, 2 or 3). When the keypad operation is disabled, prepare an emergency stop switch separately for safe operations.
- Switching the run command source from keypad (local) to external equipment (remote) by turning ON the "Enable communications link" command LE disables the key. To enable the key for an emergency stop, select the STOP key priority with function code H96 (= 1 or 3).
- If any of the protective functions have been activated, first remove the cause. Then, after checking that the all run commands are set to OFF, release the alarm. If the alarm is released while any run commands are set to ON, the inverter may supply the power to the motor, running the motor.
- Otherwise, an accident could occur.**

If you enable the "Restart mode after momentary power failure" (Function code F14 = 3 to 5), then the inverter automatically restarts running the motor when the power is recovered.

- Design the machinery or equipment so that human safety is ensured after restarting.**
- If the user configures the function codes wrongly without completely understanding the User's Manual, the motor may rotate with a torque or at a speed not permitted for the machine.
- Starting auto-tuning involves motor rotation. Sufficiently check that motor rotation brings no danger beforehand.
- An accident or injuries could occur.**

Even if the inverter has interrupted power to the motor, if the voltage is applied to the main circuit input terminals L1/R, L2/S, L3/T, L1/L and L2/N, voltage may be output to inverter output terminals U, V, and W.

- Even if the motor is stopped due to DC braking or preliminary excitation, voltage is output to inverter output terminals U, V, and W.
- An electric shock may occur.**
- The inverter can easily accept high-speed operation. When changing the speed setting, carefully check the specifications of motors or equipment beforehand.
- Otherwise, injuries could occur.**

Maintenance and inspection, and parts replacement

- Before proceeding to the maintenance/inspection jobs, turn OFF the power and wait at least five minutes for inverters VF1A-G72A0S4 or below, or at least ten minutes for inverters VF1A-G85A0S4 or above. Make sure that the LED monitor and charging lamp are turned OFF. Further, make sure, using a multimeter or a similar instrument, that the DC link bus voltage between the terminals P(+) and N(-) has dropped to the safe level (+25 VDC or below).
- Otherwise, an electric shock could occur.**
- Always carry out the daily and periodic inspections described in the Instruction/User's Manual. Use of the inverter for long periods of time without carrying out regular inspections could result in malfunction or damage, and an accident or fire could occur.
- It is recommended that periodic inspections be carried out every one to two years, however, they should be carried out more frequently depending on the usage conditions.
- It is recommended that parts for periodic replacement be replaced in accordance with the standard replacement frequency indicated in the User's Manual. Use of the product for long periods of time without replacement could result in malfunction or damage, and an accident or fire could occur.
- Contact outputs (30A/B/C) use relays, and may remain ON, OFF, or undetermined when their lifetime is reached. In the interests of safety, equip the inverter with an external protective function.
- Otherwise, an accident or fire could occur.**

- Maintenance, inspection, and parts replacement should be made only by qualified persons.
- Take off the watch, rings and other metallic objects before starting work.
- Use insulated tools.
- Otherwise, an electric shock or injuries could occur.**
- Never modify the inverter.
- Doing so could cause an electric shock or injuries.**

CAUTION

- Installation**
- Do not support the inverter by its front cover during transportation.
 - Doing so could cause a drop of the inverter and injuries.**
 - Prevent lint, paper fibers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter or from accumulating on the heat sink.
 - When changing the positions of the top and bottom mounting bases for external cooling, use only the specified screws.
 - Otherwise, a fire or an accident might result.**
 - Do not install or operate an inverter that is damaged or lacking parts.
 - Doing so could cause fire, an accident or injuries.**

Wiring

- The inverter, motor and wiring generate electric noise. Be careful about malfunction of the nearby sensors and devices. To prevent them from malfunctioning, implement noise control measures.
- Otherwise an accident could occur.**

Operation

- Do not touch the heat sink and braking resistor because they become very hot.
- Doing so could cause burns.**
- The DC brake function of the inverter does not provide any holding mechanism.
- Injuries could occur.**

Ensure safety before modifying the function code settings. Run commands (e.g., "Run forward" **FWD**), stop commands (e.g., "Coast to a stop" **BX**), and frequency change commands can be assigned to digital input terminals. Depending upon the assignment states of those terminals, modifying the function code setting may cause a sudden motor start or an abrupt change in speed.

- When the inverter is controlled with the digital input signals, switching run or frequency command sources with the related terminal commands (e.g., **SS1**, **SS2**, **SS4**, **SS8**, **H2/Hzt**, **Hz/PID**, **IVS**, and **LE**) may cause a sudden motor start or an abrupt change in speed.
- Ensure safety before modifying customizable logic related function code settings (U codes and related function codes) or turning ON the "Cancel customizable logic" terminal command **CLC**. Depending upon the settings, such modification or cancellation of the customizable logic may change the operation sequence to cause a sudden motor start or an unexpected motor operation.
- An accident or injuries could occur.**

(4) Types VF1A-G85A0S4 or above

- Loosen the screws of the front cover. Hold both sides of the front cover with the hands and slide it upward to remove.
- After routing the wires, align the front cover top edge to the screw holes and attach the cover reversing the steps in Figure 2.2-6.

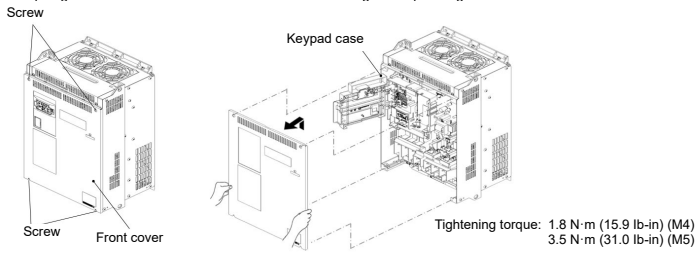


Figure 2.2-6 Removal of the front cover (for VF1A-G139AS4)

2.2.4 Terminal arrangement and screw specifications

2.2.4.1 Arrangement of the main circuit terminals

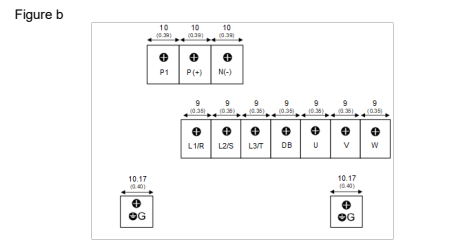
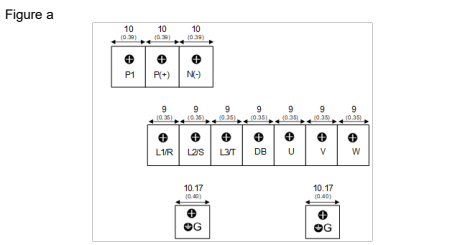
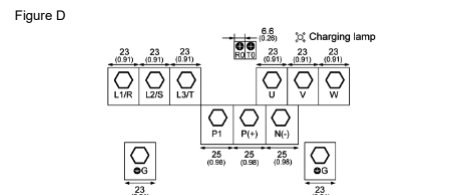
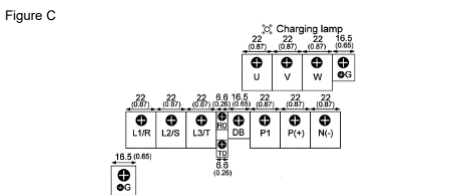
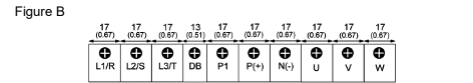
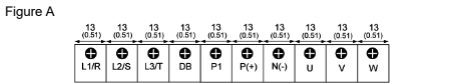
The specifications for the screws used in the main circuit wiring and the wire sizes are shown below. Exercise caution as the terminal position varies depending on inverter capacity. In the diagram in "2.2.4.2 Terminal layout diagram (main circuit terminal)", the two ground terminals (G) are not differentiated for the input side (primary side) and the output side (secondary side). Also, use crimped terminals with insulating sleeves compatible for main circuit or terminals with insulating tubes. The recommended wire sizes are shown depending on cabinet temperature and wire type.

Table 2.2-2 Screw Specifications

Power System	Inverter type	See item 2.2.4.2	Screw specifications					
			Main circuit		Grounding		Auxiliary power input for control [R0, T0]	
			Screw size (driver size)	Tightening torque N·m (lb-in)	Screw size (driver size)	Tightening torque N·m (lb-in)	Screw size	Tightening torque N·m (lb-in)
Three-phase 400 V	VF1A-G02A1S4	Fig. a	M4	1.2 (10.6)	M4	1.8 (15.9)	-	-
	VF1A-G04A1S4							
	VF1A-G05A5S4							
	VF1A-G06A9S4	Fig. b	M5	3.0 (26.6)	M5	3.0 (26.6)	-	-
	VF1A-G12A0S4							
	VF1A-G21A5S4	Fig. A	M5	3.0 (26.6)	M5	3.0 (26.6)	-	-
	VF1A-G28A5S4							
	VF1A-G37A0S4	Fig. B	M6 (No. 3)	5.8 (51.3)	M6 (No. 3)	5.8 (51.3)	-	-
	VF1A-G44A0S4							
	VF1A-G59A0S4	Fig. C	M6 (No. 3)	5.8 (51.3)	M6 (No. 3)	5.8 (51.3)	-	-
VF1A-G72A0S4								
VF1A-G85A0S4	Fig. D	M8	13.5 (119)	M8	13.5 (119)	M3.5	1.2 (10.6)	
VF1A-G105A5S4								
VF1A-G139AS4								

2.2.4.2 Terminal layout diagram (main circuit terminal)

The following terminals will have high voltage when power is ON.
 Main circuit: L1/R, L2/S, L3/T, L1/L, L2/N, P1, P(+), N(-), DB, U, V, W, R0, T0, R1, T1
 Insulation level
 Main circuit - Casing : Basic insulation (overvoltage category III, degree of contamination 2)
 Main circuit - Control circuit : Enhanced insulation (overvoltage category III, degree of contamination 2)
Risk of electric shock exists



2.2.5 Recommended wire size (main circuit terminals)

HHD Mode, Ambient temperature: Below 50°C, Wire type: 75°C wire

Table 2.2-3 Recommended Wire Sizes, Ambient temperature: Below 50°C, Wire type: 75°C wire

Power System	Std Applicable Motor (kW)	Inverter type	Recommended wire size (mm ²)				
			Main power supply input [L1/R, L2/S, L3/T]	Ground terminal [G]	Inverter output [U, V, W]	For DC reactor connection [P1, P(+)]	For braking resistor connection [P(+), DB]
Three-phase 400 V	0.4	VF1A-G02A1S4	2	2	2	2	2
	0.75	VF1A-G04A1S4	2	2	2	2	2
	1.5	VF1A-G05A5S4	2	2	2	2	2
	2.2	VF1A-G06A9S4	2	2	2	2	2
	3.7	VF1A-G12A0S4	2	2	2	2	2
	5.5	VF1A-G21A5S4	2	2	2	2	2
	7.5	VF1A-G28A5S4	2	2	2	2	2
	11	VF1A-G37A0S4	2	3.5	3.5	2	2
	15	VF1A-G44A0S4	3.5	5.5	5.5	3.5	2
	18.5	VF1A-G59A0S4	5.5	8*1	5.5	5.5	2
22	VF1A-G72A0S4	5.5	14	5.5	8*1	2	
30	VF1A-G85A0S4	14	14	8	14	-	
37	VF1A-G105A5S4	14	22	8	14	22	
45	VF1A-G139AS4	22	38	8	22	-	

The recommended wire sizes for the main circuit terminals assume using 75°C 600 V HIV wire.
 *1 For compatible crimped terminals, please use model 8-L6 by JST Mfg. Co., Ltd. or equivalent.

2.2.6 Screw specifications and recommended wire size (control circuit terminals)

The screw specifications and wire sizes to be used for control circuit wiring are shown below. The control circuit terminal board differs depending on the destination.

Table 2.2-4 Screw Specifications and Recommended Wire Sizes

Terminal symbol	Screw specification		Allowable wire sizes	Driver (shape of tip)	Removal size of wire cover	Gauge size to insert wire
	Size	Tightening torque				
30A, 30B, 30C EN1, EN2	M3	0.5 N·m (4.43 lb-in)	0.14 to 1.5 mm ² (AWG26 to 16)	Minus (0.6mm×3.5mm)	6 mm (0.24 in)	A1 *1
Others	M2	0.19 N·m (1.68 lb-in)	0.25 to 1 mm ² (AWG24 to 18)	Minus (0.4mm×2.5mm)	5 mm (0.20 in)	φ1.6

* Recommended rod terminal: Phoenix Contact Refer to Table 2.2-5 for details. *1 Defined according to IEC/EN 60947-1.

Table 2.2-5 Recommended Rod Terminals

Screw size	Wire size	Type	
		With insulating collar	Without insulating collar
M3	0.25 mm ² (AWG24)	AI 0.25-6 BU	A 0.25-7
		AI 0.34-6 TQ	A 0.34-7
	0.34 mm ² (AWG22)	AI 0.5-6 WH	A 0.5-6
		AI 0.75-6 GY	A 0.75-6
	0.5 mm ² (AWG20)	AI 1-6 RD	A 1-6
		AI 1.5-6 BK	A 1.5-7

Note) When sizes exceeding the recommended wire sizes are used, the front cover may be pushed outward depending on the number of wires, causing erroneous operation of the keypad.

2.2.7 Basic connection diagram

(Exp.) Model VF1A-G□□□□S4, Standard terminal block board

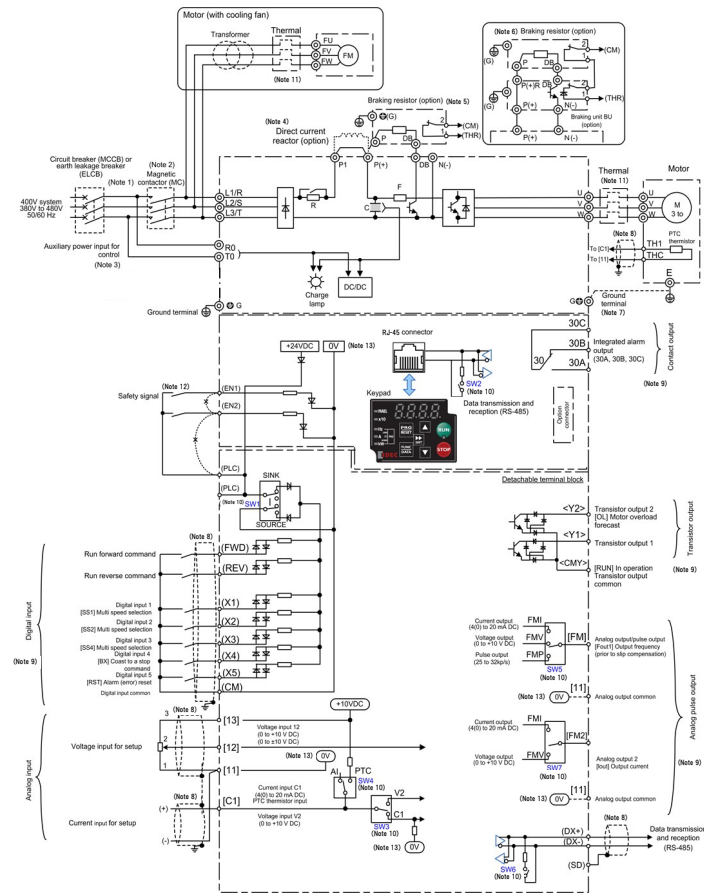


Figure 2.2-7 Standard Terminal Block Board

- Install recommended circuit breakers (MCCB) or residual-current-operated protective device (RCD) earth leakage breakers (ELCB) (with overcurrent protective function) on the inputs of each inverter (primary side) for wiring protection. Do not use breakers which exceed the recommended rated current.
- Install recommended magnetic contactors (MC) as necessary on each inverter as these will be used to disconnect the inverter from the power supply separately from the MCCB or RCD / the ELCB. Additionally, when installing coils such as MC or solenoid coil to the inverter, connect surge absorbers in parallel.
- When it is desired to retain the alarm signal for the activation of the protective function even inverter main power supply is shut off, or when it is desired continuous display of the keypad, connect this terminal to the power supply. The inverter can be operated without connecting power to this terminal (applicable for types VF1A-G59A0S4 or above).
- Remove the shorting bar between the inverter main circuit terminals P1-P(+) before connecting the direct current reactor (DCR) (option).
 Use the direct current reactor (option) when the power supply transformer capacity is above 500 kVA and the transformer capacity is over 10 times the rated capacity of the inverter, or when "thyristor load exists" in the same power system.
- Types VF1A-G72A0S4 or below have built-in braking transistors, allowing direct connection of braking resistors between P(+)-DB.
- When connecting braking resistors to types VF1A-G85A0S4 or above, always add the braking unit (option). Connect the braking unit (option) between P(+)-N(-). Auxiliary terminals [1] and [2] have polarity. Please connect as shown in the diagram.
- This terminal is used for grounding the motor. Grounding the motor using this terminal is recommended in order to suppress inverter noise.
- Use twisted lines or shielded lines for the control signals.
 Generally, the shielded line requires grounding, but when the effect of externally induced noise is large, connecting to [CM] may suppress the effect of noise. Separate the line from the main circuit wiring and do not enclose in the same duct. (Separation distance of over 10 cm is recommended.) When crossing the main circuit wiring, make the intersection perpendicular.
- The various functions listed for terminals[X1] to [X5](digital inputs), terminals [Y1] to [Y2](analog output), and terminal [FM] (monitor output) show the functions assigned as factory default.
- The slide switches on the control printed circuit board define the settings for the inverter operation.
- Make the circuit breakers (MCCB) or the magnetic contactors (MC) trip by the thermal relay auxiliary contacts (manual recovery).
- Shorting bars are connected between the safety function terminals [EN1], [EN2], and [PLC] as factory default. Remove the shorting bars when using this function.
- [OV] and [OV] are separated and insulated.
- Charge lamp does not exist in the inverters VF1A-G44A0S4 or below.

2.2.8 Description of terminal functions

2.2.8.1 Main circuit terminal

Table 2.2-6 Functional Description of Main circuit terminals

Classification	Terminal symbol	Terminal name	Specification
Main circuit	L1/R, L2/S, L3/T	Main power input	Terminals to connect Three-phase power source.
	L1/L, L2/N	Main power input	Terminals to connect Single-phase power source.
	U, V, W	Inverter output	Terminals to connect Three-phase motors.
	P (+), P1	For direct current reactor connection	Terminals to connect DC reactor (DCR) for power factor enhancement. It must be connected in the following cases: ND mode: Types VF1A-G139AS4.
	P (+), N (-)	For direct current bus connection	Terminals to connect direct current intermediate circuit of other inverters and PWM converters.
	P (+), DB	For braking resistor connection	Terminals to connect a braking resistor (optional). Wiring length: Below 5 meters. (Types VF1A-G72A0S4 or below)
	G	For inverter chassis (case) grounding	Grounding terminal for inverter chassis (case).
R0, T0	Auxiliary power input for control circuit	When it is desired to retain the alarm signal for the activation of the protective function even inverter main power supply shut off or when continuous display of the keypad is desired, connect this terminal to the power supply. (Types VF1A-G59A0S4 or above)	

2.2.8.2 Control circuit terminal

Table 2.2-7 shows the functional explanations for the control circuit terminals. The connection method of the control circuit terminals differs depending on the functional code setting matching the purpose of inverter operation. Properly wire such that the impact of noise generated by the main circuit wiring is reduced.

Table 2.2-7 Functional Description of Control circuit terminals

Classification	Terminal symbol	Terminal name	Specification	
Analog input	[13]	Power supply for the potentiometer	The terminal is used for the power supply (DC+10 V 10 mA Max) for the external frequency command potentiometer (variable resistor: 1 to 5 kΩ). Connect variable resistors larger than 1/2 W.	
	[12]	Analog setup voltage input	(1) Frequency is set up according to the external analog voltage input command value. Normal operation • DC0 to +10 V/0 to 100% (DC0 to +5 V/0 to 100%) • DC0 to ±10 V/0 to ±100% (DC0 to ±5 V/0 to ±100%) Reverse operation • DC+10 to 0 V/0 to 100% (DC+5 to 0 V/0 to 100%) • DC+10 to 0 V/0 to ±100% (DC+5 to 0 V/0 to ±100%) (2) The terminal can be assigned to PID command, feedback signal of PID control, auxiliary frequency setup, ratio setup, torque limit setup, and analog input monitor aside from the frequency setup by analog input. (3) Hardware specification * Input impedance: 250 (kΩ), Up to DC 30 mA can be input. However, input exceeding DC±10 V will be recognized as DC±10 V.	
	[C1]	Analog setup current input (C1 function)	(1) Frequency is set up according to the external analog current input command value. Normal operation • DC4 to 20 mA/0 to 100%)-100% to 0 to 100% • DC0 to 20 mA/0 to 100%)-100% to 0 to 100% Reverse operation • DC20 to 4 mA/0 to 100%)-100% to 0 to 100% • DC20 to 0 mA/0 to 100%)-100% to 0 to 100% (2) The terminal can be assigned to PID command, feedback signal of PID control, auxiliary frequency setup, ratio setup, torque limit setup, and analog input monitor aside from the frequency setup by analog input. (3) Hardware specification * Input impedance: 250 (kΩ), Up to DC 30 mA can be input. However, input exceeding DC 20 mA will be recognized as DC 20 mA.	
		Analog setup voltage input (V2 function)	(1) Frequency is set up according to the external analog voltage input command value. SW3 must be switched on the printed circuit board. Normal operation • DC0 to +10 V/0 to 100% (DC0 to +5 V/0 to 100%) • DC0 to +10 V/-100 to 0 to 100% (DC0 to +5 V/-100 to 0 to 100%) Reverse operation • DC+10 to 0 V/0 to 100% (DC+5 V to 0 V/0 to 100%) • DC+10 to 0 V/-100 to 0 to 100% (DC+5 to 0 V/-100 to 0 to 100%) (2) The terminal can be assigned to PID command, feedback signal of PID control, auxiliary frequency setup, ratio setup, torque limit setup, and analog input monitor aside from the frequency setup by analog input. (3) Hardware specification * Input impedance: 22(kΩ), Up to DC+15 V can be input. However, input exceeding DC+10 V will be recognized as DC+10 V.	
		PTC thermistor input (PTC function)	PTC (Positive Temperature Coefficient) thermistor for motor protection can be connected. SW3 (C1/V2 Switch) and SW4 (PTC/AI Switch) must be switched on the printed circuit board.	
		Analog input monitor (AI function)	The analog input monitor can be used to monitor the status of peripheral instruments using communication by inputting the analog signals of various sensors such as temperature sensors. Data can be converted to physical property values such as temperature and pressure by using display factors and shown on the keypad display.	
		Analog input common	The terminal is the common terminal for analog input signals (terminals [12], [13], [C1]). The terminal is insulated from terminals [CM], [CMY].	
	Digital input	[X1]	Digital input 1	(1) Various signals (coast to a stop command, external alarm, multi-speed selection, etc) set up by function codes E01 to E05, E98, E99 can be set up.
		[X2]	Digital input 2	(2) Input mode, sink/source can be switched using SW1.
		[X3]	Digital input 3	(3) The operating mode of the various digital input terminals when connected with terminal CM (sink mode) / PLC (source mode) can be switched to "ON when shorted with CM/PLC (active ON)" or "OFF when shorted with CM/PLC (active OFF)".
[X4]		Digital input 4	(4) Digital input terminal [X5] can be set up as a pulse train input terminal by changing the function code.	
[X5]		Digital input 5/pulse train input	Maximum wiring length 20 meters	
[FWD]		Run forward command	30 kHz: When connected to open collector output pulse generator	
[REV]		Run reverse command	100 kHz: When connected to complementary output pulse generator	
[EN1]	Enable input	(1) When terminals [EN1]-[PLC] or terminals [EN2]-[PLC] are OFF, the inverter output transistors stop switching (safe torque off: STO). Be sure to operate terminals [EN1] and [EN2] simultaneously; otherwise an E_{LC} alarm is issued and the operation of the inverter will be disabled. To enable the Enable function, remove the short bar. (2) The input mode for terminals [EN1] and [EN2] is fixed to source. The mode cannot be switched to sink. (3) Short terminals [EN1]-[PLC] and [EN2]-[PLC] using shorting bars when the enable input function is not used (Keep the shorting bar connected).		
[PLC]	Programmable controller signal power source	(1) The terminal is used for connecting the output signal power source of the programmable controller (rated voltage DC +24 V (power supply voltage fluctuation range: DC +22 to +27 V) maximum 100 mA). (2) The terminal can also be used for the power source for the load connected to the transistor outputs. For details, refer to the page on "Transistor outputs".		
[CM]	Digital common	This terminal is the common terminal for digital input signals. This terminal is insulated from terminals [11] and [CMY].		

Classification	Terminal symbol	Terminal name	Specification
Analog output/pulse output	[FM]	Analog monitor FMV function FMI function	This terminal outputs analog direct current voltage DC0 to 10 V or analog direct current DC4 to 20 mA / DC0 to 20mA monitor signal. The output form (FMV/FMI) can be switched using SW5 on the printed circuit board and function code F29. The signal content can be chosen in the function code F31 data setting among the following items. • Output frequency 1 (before slip compensation) • Output frequency 2 (after slip compensation) • Output current • Output voltage • Output torque • Load factor • Input power • PID feedback value • Actual speed/estimated speed • DC link bus voltage • Universal AO • Motor output • Calibration (+) • PID command (SV) • PID output (MV) • Position error in master-follower operation • Inverter heat sink temperature • PG feedback value • Customizable logic output signal 1 to 10 • Allowable impedance for connection: Min 5 kΩ (at DC to 10 V output) (up to 2 analog volt meters (DC0 to 10 V, input impedance 10 kΩ) can be connected.) • Allowable impedance for connection: Max 500 Ω (at DC4 to 20 mA/DC0 to 20 mA) • Gain adjustable range: 0 to 300%
	[11]	Pulse monitor FMP function	The terminal outputs pulse signal. Signal content can be chosen same as for the FMV function by function code F31 setting. The output form (FMP) can be switched using SW5 on the printed circuit board and function code F29. • Allowable impedance for connection: Min. 5 kΩ (at DC to 10 V output) (up to 2 analog volt meters (DC0 to 10 V, input impedance 10 kΩ) can be connected.) • Pulse duty: Approximately 50%, pulse rate: 25 to 32000 p/s (at full scale)
Transistor outputs	[Y1]	Transistor output 1	(1) Various signals (running signal, frequency reached signal, overload forecast signal, etc) set up by function code E20, E21 can be output. (2) The operating mode of the transistor output terminals [Y1], [Y2] can be switched to "ON (active ON) at signal output" or "OFF (active OFF) at signal output".
	[Y2]	Transistor output 2	
Contact output	[CMY]	Transistor output common	This terminal is the common terminal for transistor output signals. This terminal is insulated from terminals [CM] and [CMY].
	[30A/B/C]	Integrated alarm output	(1) When the inverter stops with an alarm, output is generated on the relay contact (1C). Contact rating: AC250 V 0.3 A cosφ = 0.3, DC48 V 0.5 A. (2) Terminals can be switched to "Terminals (30A to 30C) shorted (excitation: active ON) at ON signal output" or "Terminals (30A to 30C) open (non-excitation: active OFF) at ON signal output".
Communication	RJ-45 connector for keypad connection	RS-485 communication port 1	(1) Used to connect the keypad. The power to the keypad will be supplied from the inverter through this connector. (2) Also can be used to connect a computer, programmable controller, etc by RS-485 communication, after removing the keypad. • Pins 1, 2, 7, and 8 are assigned as power supply source for the keypad. When connecting this RJ-45 connector to other devices, do not use these pins.
	RJ-45 connector for RS-485	RS-485 communication port 2	Can be used to connect a computer, programmable controller, etc by RS-485 communication.

Chapter 3 OPERATION USING THE KEYPAD

Refer to the Doesa VF1A series User's Manual, Chapter 3 for details of the keypad.

3.1 Names and Functions of Keypad Components

The keypad allows you to run and stop the motor, display various data, configure function code data, and monitor I/O signal states, maintenance information and alarm information.

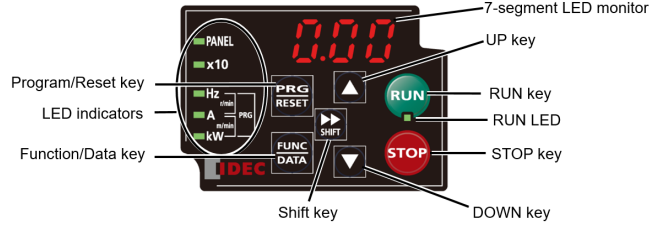


Table 3.1-1 Overview of Keypad Functions

Item	LED Monitor, Keys, and LED Indicators	Functions
LED Monitor		Four-digit, 7-segment LED monitor which displays the followings according to the operation modes. ■ In Running mode: Running status information (e.g., output frequency, current, and voltage) When a light alarm occurs, L-al is displayed. ■ In Programming mode: Menus, function codes and their data ■ In Alarm mode: Alarm code, which identifies the alarm factor that has activated the protective function.
Operation Keys		Program/Reset key which switches the operation modes of the inverter. ■ In Running mode: Pressing this key switches the inverter to Programming mode. ■ In Programming mode: Pressing this key switches the inverter to Running mode. ■ In Alarm mode: Pressing this key after removing the alarm factor resets the alarm and switches back to Running mode.
		Function/Data key which switches the operations you want to do in each mode as follows: ■ In Running mode: Pressing this key switches the information to be displayed concerning the status of the inverter (output frequency (Hz), output current (A), output voltage (V), etc.). When a light alarm is displayed, holding down this key resets the light alarm and switches back to Running mode. ■ In Programming mode: Pressing this key displays the function code or establishes the data entered with and keys. ■ In Alarm mode: Pressing this key displays the details of the problem indicated by the alarm code that has come up on the LED monitor.
		RUN key. Press this key to run the motor.
		STOP key. Press this key to stop the motor.
		UP and DOWN keys. Press these keys to select the setting items and change the function code data displayed on the LED monitor.
LED Indicators		Lights when running with a run command entered by the , by terminal command FWD or REV, or through the communications link.
		Lights when the inverter is ready to run with a run command entered by the (F02 = 0, 2, or 3). In Programming and Alarm modes, however, pressing the cannot run the inverter even if this indicator lights.
		These three LED indicators identify the unit of numeral displayed on the LED monitor in Running mode by combination of lit and unlit states of them. Unit: Hz, A, kW, r/min and m/min Refer to the Doesa VF1A series User's Manual, "3.3.1 Monitoring the running status" for details. While the inverter is in Programming mode, the LEDs of Hz and kW light. (Hz kW)
		Lights when the data to display exceeds 9999. When this LED lights, the "displayed value x 10" is the actual value.

3.2 Destination setting

For inverter type VF1A-G□□□S4, the destination value (function code H101) is "5: Americas" by the factory default. By setting the destination, basic function codes such as rated voltage, rated frequency, etc. are initialized to general values in each region (Table 3.2-1). If the destination value setting is changed, it can be changed with **DEST** in the program mode menu or function code H101. If the destination is reset by **DEST**, all function codes are initialized to the factory defaults. If the destination is set by H101, only the function codes in Table 3.2-1 are initialized to the values in Table 3.2-1. The destination can be selected from the regions of Japan, Asia, China, Europe, Americas and Korea.

If the function code set including the destination setting function code (H101) is copied with the data copy function or the VFD Doesa loader, manual destination setting is not required.
Set the destination as shown below.

- With **DEST** displayed, press key first.
- The current destination value is displayed first. For other regions, while pressing key and press key to select the destination.
- After selecting the destination, **DEST** is displayed by pressing key and the destination setting is completed. Then, is displayed.

Table 3.2-1 Initial value for each destination

Destination	Americas	Europe	China	Asia	Japan	Korea
LED display	amer	eU	chn	asia	jpn	kor
H101:Destination	5	4	3	2	1	7
F03:Maximum output frequency 1				60.0Hz (200V)	60.0Hz	
F04:Base frequency 1	60.0Hz	50.0Hz	50.0Hz	50.0Hz (400V)	50.0Hz	60.0Hz
F05:Rated voltage at base frequency 1						
F06:Maximum output voltage 1	230/460V	200/400V	200/380V	220/415V	200/400V	220/380V
F14:Restart mode after momentary power failure (Mode selection)	0	0	1	1	1	1
F44:Current limiter (Level)	130%	130%	130%	130%	180/160%	130%
E31:Frequency detection 1 (Level)					60.0Hz	
E36:Frequency detection 2 (Level)	60.0Hz	50.0Hz	50.0Hz	60.0Hz (200V)	60.0Hz	60.0Hz
E54:Frequency detection 3 (Level)				50.0Hz (400V)	50.0Hz	
P99:Motor 1 selection	1	0	0	0	0	0
H96:STOP key priority/ Start check function	3	0	0	0	0	0
A01:Maximum output frequency 2						
A02:Base frequency 2	60.0Hz	50.0Hz	50.0Hz	60.0Hz (200V)	60.0Hz	60.0Hz
A03:Rated voltage at base frequency 2						
A04:Maximum output voltage 2	230/460V	200/400V	200/380V	220/415V	200/400V	220/380V
A39:Motor 2 selection	1	0	0	0	0	0
K01:Multifunction keypad (Language selection)	1	1	6	1	0	1

Chapter 4 FUNCTION CODES

The PDF manual can be downloaded from below QR code
For more information of Function codes list



Chapter 5 ALARM CODES

The PDF manual can be downloaded from below QR code
For more information of Alarm codes list



Quick Set Up Function Code Table

Code	Name	Data setting range
F01	Frequency setting 1	0: Keypad key operation (/ key), 1: Analog voltage input (Terminal [12]) (from 0 to ±10 VDC) 2: Analog current input (Terminal [C1] (C1 function)) (4 to 20mA DC, 0 to 20mA DC) 3: Analog voltage input (Terminal [12]) + Analog current input (Terminal [C1] (C1 function)) 5: Analog voltage input (Terminal [C1] (V2 function)) (0 to 10 VDC) 7: UP/DOWN control, 8: Keypad key operation (/ key) (With balanceless bumpless) 10: Pattern operation, 11: Digital input/output interface card (option) *5 12: Pulse train input
F02	Operation method	0: Keypad operation (rotation direction input: terminal block) 1: External signal (digital input) 2: Keypad operation (forward rotation), 3: Keypad operation (Reverse rotation)
F03	Maximum output frequency 1	25.0 to 500.0 Hz
F04	Base frequency 1	25.0 to 500.0Hz
F05	Rated voltage at base frequency 1	0 : AVR disable (output voltage proportional to power voltage) 160 to 500V : AVR operation
F06	Maximum output voltage 1	160 to 500V : AVR operation
F07	Acceleration time1	0.00 to 6000 s
F08	Deceleration time1	* 0.00 is for acceleration and deceleration time cancel (when performing soft-start and stop externally)
F09	Torque boost 1	0.0 to 20.0% (% value against base frequency voltage 1)
F10	Electronic thermal overload protection for motor 1 (Select motor characteristics)	1: Enable (For a general-purpose motor with self-cooling fan) 2: Enable (For an inverter-driven motor (FV) with separately powered cooling fan)
F11	(Overload detection level)	0.00 (disable), current value of 1 to 135% of inverter rated current (inverter rated current dependent on F80)
F14	Restart mode after momentary power failure (Mode selection)	0: Trip immediately 1: Trip after a recovery from power failure 2: Trip after momentary deceleration is stopped 3: Continue to run (for heavy inertia load or general load) 4: Restart from frequency at power failure (for general load) 5: Restart from starting frequency
F16	(Lower limit)	0.0 to 500.0Hz
F26	Motor sound (Carrier frequency)	ND mode • 0.75 to 10 kHz (VF1A-G02A1S4 to VF1A-G59A0S4) • 0.75 to 6 kHz (VF1A-G72A0S4 or above) HD/HND mode • 0.75 to 16 kHz (VF1A-G02A1S4 to VF1A-G59A0S4) • 0.75 to 10 kHz (VF1A-G72A0S4 to VF1A-G139A0S4) • 0.75 to 16 kHz
E52	Keypad (Menu display mode)	0: Function code data setting mode (Menu 0, Menu 1, and Menu 7) 1: Function code data check mode (Menu 2 and Menu 7) 2: Full-menu mode
P02	(Rated capacity)	0.01 to 1000 kW (At P99 = 0 or 4, 15), 0.01 to 1000 HP (At P99 = 1)
P03	(Rated current)	0.00 to 2000A
P04	(Auto-tuning)	0: Disable, 1: Stop tuning, 2: Rotation tuning, 5: Stop tuning(%R1, %X)
P99	Motor 1 selection	0: Motor characteristics 0 1: Motor characteristics 1 (HP rating IIm) 4: Other IIm, 20: Other motors (PMSMs), 21: Motor characteristics

Chapter 6 MAINTENANCE AND INSPECTION

6.1 Inquiries about Product and Guarantee

6.1.1 When making an inquiry

Upon breakage of the product, uncertainties, failure or inquiries, inform your IDEC representative of the following information.

- Inverter type. Refer to Chapter 1 "1.1 Acceptance Inspection (Nameplates and Inverter Type)".
- SER No. (serial number of equipment). Refer to Chapter 1 "1.1 Acceptance Inspection (Nameplates and Inverter Type)".
- Function codes and their data that you changed. Refer to the Doesa VF1A series User's Manual, Chapter 3 "3.4.2 Checking changed function codes "Data Checking: 2-1-2-2".
- ROM version. Refer to the maintenance item $S_{-}4$ in the Doesa VF1A series User's Manual, Chapter 3 "3.4.5 Reading maintenance information "Maintenance 2-1-2-2".
- Date of purchase
- Inquiries (for example, point and extent of breakage, uncertainties, failure phenomena, and other circumstances)

6.1.2 Product warranty

To all our customers who purchase IDEC products included in this documentation:

Please take the following items into consideration when placing your order.
When requesting an estimate and placing your orders for the products included in these materials, please be aware that any items such as specifications which are not specifically mentioned in the contract, catalog, specifications or other materials will be as mentioned below.
In addition, the products included in these materials are limited in the use they are put to and the place where they can be used, etc., and may require periodic inspection. Please confirm these points with your sales representative or directly with this company.
Furthermore, regarding purchased products and delivered products, we request that you take adequate consideration of the necessity of rapid receiving inspections and of product management and maintenance even before receiving your products.

6.1.2.1 Free of charge warranty period and warranty range

(1) Free of charge warranty period

- The product warranty period is "1 year from the date of purchase" or 18 months from the manufacturing date imprinted on the name plate, whichever date is earlier.
- However, in cases where the use environment, conditions of use, use frequency and times used, etc., have an effect on product life, this warranty period may not apply.
- Furthermore, the warranty period for parts restored by IDEC's Service Department is "6 months from the date that repairs are completed".

(2) Warranty range

- In the event that breakdown occurs during the product's warranty period which is the responsibility of IDEC, IDEC will replace or repair the part of the product that has broken down free of charge at the place where the product was purchased or where it was delivered. However, if the following cases are applicable, the terms of this warranty may not apply.
 - The breakdown was caused by inappropriate conditions, environment, handling or use methods, etc. which are not specified in the catalog, operation manual, specifications or other relevant documents.
 - The breakdown was caused by the product other than the purchased or delivered IDEC's product.
 - The breakdown was caused by the product other than IDEC's product, such as the customer's equipment or software design, etc.
 - Concerning the IDEC's programmable products, the breakdown was caused by a program other than a program supplied by this company, or the results from using such a program.
 - The breakdown was caused by disassembly, modifications or repairs affected by a party other than IDEC.
 - The breakdown was caused by improper maintenance or replacement using consumables, etc. specified in the operation manual or catalog, etc.
 - The breakdown was caused by a science or technical problem that was not foreseen when making practical application of the product at the time it was purchased or delivered.
 - The product was not used in the manner the product was originally intended to be used.
 - The breakdown was caused by a reason which is not this company's responsibility, such as lightning or other disaster.
- Furthermore, the warranty specified herein shall be limited to the purchased or delivered product alone.
- The upper limit for the warranty range shall be as specified in item (1) above and any damages (damage to or loss of machinery or equipment, or lost profits from the same, etc.) consequent to or resulting from breakdown of the purchased or delivered product shall be excluded from coverage by this warranty.

(3) Trouble diagnosis

As a rule, the customer is requested to carry out a preliminary trouble diagnosis. However, at the customer's request, this company or its service network can perform the trouble diagnosis on a chargeable basis. In this case, the customer is asked to assume the burden for charges levied in accordance with this company's fee schedule.

6.1.2.2 Exclusion of liability for loss of opportunity, etc.

Regardless of whether a breakdown occurs during or after the free of charge warranty period, this company shall not be liable for any loss of opportunity, loss of profits, or damages arising from special circumstances, secondary damages, accident compensation to another company, or damages to products other than this company's products, whether foreseen or not by this company, which this company is not responsible for causing.

6.1.2.3 Repair period after production stop, spare parts supply period (holding period)

Concerning models (products) which have gone out of production, this company will perform repairs for a period of 7 years after production stop, counting from the month and year when the production stop occurs. In addition, we will continue to supply the spare parts required for repairs for a period of 7 years, counting from the month and year when the production stop occurs. However, if it is estimated that the life cycle of certain electronic and other parts is short and it will be difficult to procure or produce those parts, there may be cases where it is difficult to provide repairs or supply spare parts even within this 7-year period. For details, please confirm at our company's business office or our service office.

6.1.2.4 Transfer rights

In the case of standard products which do not include settings or adjustments in an application program, the products shall be transported to and transferred to the customer and this company shall not be responsible for local adjustments or trial operation.

6.1.2.5 Service contents

The cost of purchased and delivered products does not include the cost of dispatching engineers or service costs. Depending on the request, these can be discussed separately.

6.1.2.6 Applicable scope of service

Above contents shall be assumed to apply to transactions and use of the country where you purchased the products.
Consult the local supplier or IDEC for details separately.

Chapter 7 COMPLIANCE WITH STANDARDS

7.1 Compliance with European Standards

The CE marking on IDEC products indicates that they comply with the essential requirements of the Electromagnetic Compatibility (EMC) Directive issued by the Council of the European Communities and Low Voltage Directive. Inverters that bear a CE marking are compliant with the Low Voltage Directive.

Table 7.1-1 Conformity with Standards

EMC Directives	EN61800-3 : 2018 Immunity : Second environment (Industrial) Emission : Applicable only when an optional EMC-compliant filter is attached : Category C2
Low Voltage Directive	EN61800-5-1 : 2007
Machinery Directive	EN ISO13849-1 : 2015 Cat.3/PL.e EN60204-1 : 2018(in extracts), Stop Category 0 EN61508-1 to -7 : 2010 SIL3 EN61800-5-2 : 2017 SIL3(Functional Safety-STO) EN62061 : 2005+AC:2010+A1:2013+A2:2015, SIL3
RoHS2	EN50581 : 2012 EN IEC63000 : 2018

7.1.1 Compatibility with Revised EMC Directive and Low Voltage Directive

In the revised EMC Directive (2014/30/EU) and Low Voltage Directive (2014/35/EU), it is necessary to clearly state the name and the address of manufacturers and importers to enhance traceability. Importers shall be indicated as follows when exporting products from IDEC to Europe.

Manufacturer	Importer in Europe
IDEC CORPORATION 2-6-84, Nishimiyahara, Yodogawa-ku, Osaka 532-0004, Japan	EU Authorized Representative: APEM SAS 55, Avenue Edouard Herriot BP1, 62303 Caussade Cedex, France UK Authorized Representative: APEN COMPONENTS LIMITED Drakes Drive, Long Crendon, Buckinghamshire, HP18 9BA, UK

Precaution when exporting to Europe

* Not all IDEC products in Europe are necessarily imported by the above importer. If any IDEC products are exported to Europe via another importer, please ensure that the importer is clearly stated by the customer.

7.2 Compliance with UL Standards and Canadian Standards (cUL certification)

Originally, the UL standards were established by Underwriters Laboratories, Inc. as private criteria for inspections/investigations pertaining to fire/accident insurance in the USA. Later, these standards were authorized as the official standards to protect operators, service personnel and the general populace from fires and other accidents in the USA. cUL certification means that UL has given certification for products to clear CSA Standards. cUL certified products are equivalent to those compliant with CSA Standards.

The inverter that UL/cUL mark is displayed are subject to the regulations set forth by the UL standards and CSA standards (cUL-listed for Canada) by installation within precautions listed below.

⚠ WARNING ⚠

High available fault current – damage warning:
The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

⚠ CAUTION ⚠

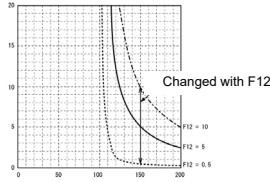
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.
- Solid state motor overload protection (motor protection by electronic thermal overload relay) is provided in each model. Use function codes F10 to F12 to set the protection level, refer to the description below.

F10 Electronic thermal overload protection for motor 1 (Select motor characteristics)

1: Enable (For a general-purpose motor with self-cooling fan)
2: Enable (For an inverter-driven motor with separately powered cooling fan)

F11 (Overload detection level) 0.00 (disable), current value of 1 to 135% of inverter rated current (Inverter rated current dependent on F80)

F12 (Thermal time constant) 0.5 to 75.0 min, Refer to the graph below.



- Use Cu wire only.
- Use R/C Appliance Wiring Material (AVLV2/8), rated min. 105°C/600V for control circuit if the control circuit wiring can touch to the main circuit part.
- Short circuit rating

For Models VF1A-G02A1S4 to VF1A-G44A0S4:

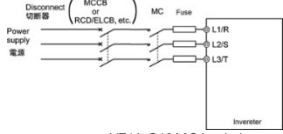
Suitable For Use On A Circuit Of Delivering Not More Than 100,000 rms Symmetrical Amperes, 480 Volts Maximum when protected by Class J or Class CC Fuses.

For Models VF1A-G59A0S4 or above:

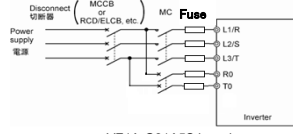
Suitable For Use On A Circuit Of Delivering Not More Than 100,000 rms Symmetrical Amperes, 480 Volts Maximum when protected by Class J or Class CC Fuses or a Circuit Breaker Having An Interrupting Rating Not Less Than 100,000 rms Symmetrical Amperes, 480 Volts minimum.

- Field wiring connections must be made by a UL Listed and CSA Certified closed-loop terminal connector sized for the wire gauge involved. Connector must be fixed using the crimp tool specified by the connector manufacturer.
- All circuits with terminals L1/R, L2/S, L3/T, L1/L, L2/N, R0, T0, R1, T1 must have a common disconnect and be connected to the same pole of the disconnect if the terminals are connected to the power supply.

Connection diagram of the three phase input type.



VF1A-G12A0S4 or below



VF1A-G21A5S4 or above

- Environmental Requirements

- 1 Type VF1A-G21A5S4 or above

• Maximum Surrounding Air Temperature / Maximum ambient temperature
The ambient temperature shall be lower than the values in the table below.

• Atmosphere
For use in pollution degree 2 environments (for Open-Type models).

- 2 Type VF1A-G12A0S4 or below

• Maximum Surrounding Air Temperature / Maximum ambient temperature
The ambient temperature shall be lower than the values in the table below.

• Atmosphere
For use in pollution degree 2 environments (for Open-Type models).

- 9 Plenum rated drives

UL Enclosed Type is Suitable for installation in a compartment handling conditioned air.

- 10 Functional Description of Control Circuit Terminals

A power source for connection to the integrated alarm output (30A, 30B, 30C) should be limited to overvoltage category II such as control circuit or secondary winding of power transformer.

Classification	Terminal Symbol	Terminal Name	Functional description
Contact output	{30A/B/C}	Integrated alarm output	When the inverter stops with an alarm, output is generated on the relay contact (1C). Contact capacitance: AC250 V 0.3A cosφ=1, DC30 V 0.5 A

- All models rated 380-480 V input voltage ratings shall be connected to TN-C system power source, i.e. 3-phase, 4-wire, wye (480Y/277V), so that the phase-to-ground rated system voltage is limited to 300V maximum.

12. Install UL certified fuses or circuit breaker between the power supply and the inverter, referring to the table below.

Power supply voltage	Nominal applied motor (kW) [HP]	Inverter type	HHD/HND/HND mode	Class J or CC fuse size (A) *4	Circuit breaker trip size (A) *5	Required torque lb-in (N·m)				Wire size AWG (mm ²)								
						Main terminal	Inverter's grounding	Aux. Control power supply	Aux. Fan power supply	Main terminal Cu Wire			Inverter's grounding	Aux. Control power supply				
										L1/R/L2/S/L3/T	U, V, W	Remarks						
Three-phase 400V	0.4 [1/2]	VF1A-G02A1S4	HHD	3	-	-	-	-	-	-	-	-	-	-	-	-	-	
	0.75 [1]	VF1A-G02A1S4	HND	6	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1.1 [1.5]	VF1A-G04A1S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G04A1S4	HND	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.5 [2]	VF1A-G05A5S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G05A5S4	HND	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.2 [3]	VF1A-G06A9S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G06A9S4	HND	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.0 [4]	VF1A-G12A0S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G12A0S4	HND	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5 [7.5]	VF1A-G21A5S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G21A5S4	HND	40	27 (3.0)	27 (3.0)	-	-	-	-	-	-	-	-	-	-	-	-
	7.5 [10]	VF1A-G28A5S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G28A5S4	HND	60	51.3 (5.8)	51.3 (5.8)	-	-	-	-	-	-	-	-	-	-	-	-
	11 [15]	VF1A-G37A0S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G37A0S4	HND	70	27 (3.0)	27 (3.0)	-	-	-	-	-	-	-	-	-	-	-	-
	15 [20]	VF1A-G44A0S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G44A0S4	HND	90	51.3 (5.8)	51.3 (5.8)	-	-	-	-	-	-	-	-	-	-	-	-
	18.5 [25]	VF1A-G59A0S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		VF1A-G59A0S4	HND	100	100	100	-	-	-	-	-	-	-	-	-	-	-	-
22 [30]	VF1A-G72A0S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	VF1A-G72A0S4	HND	125	119.4 (13.5)	119.4 (13.5)	-	-	-	-	-	-	-	-	-	-	-	-	
30 [40]	VF1A-G85A0S4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	VF1A-G85A0S4	HND	175	119.4 (13.5)	119.4 (13.5)	10.6 (1.2)	-	-	-	-	-	-	-	-	-	-	-	
37 [50]	VF1A-G105AS4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	VF1A-G105AS4	HND	200	119.4 (13.5)	119.4 (13.5)	-	-	-	-	-	-	-	-	-	-	-	-	
45 [60]	VF1A-G139AS4	HHD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	VF1A-G139AS4	HND	250	119.4 (13.5)	119.4 (13.5)	-	-	-	-	-	-	-	-	-	-	-	-	
55 [75]	VF1A-G105AS4	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	VF1A-G139AS4	ND	250	175	175	-	-	-	-	-	-	-	-	-	-	-	-	
75 [100]	VF1A-G139AS4	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	VF1A-G139AS4	ND	250	175	175	-	-	-	-	-	-	-	-	-	-	-	-	

Note: Control circuit terminals M2 tightening torque: 1.7 lb-in (0.19 N·m) ±10%

Recommended wire size: AWG26 to 18 (0.14 to 1 mm²)

M3 tightening torque: 4.4 to 5.3 lb-in (0.5 to 0.6 N·m), recommended wire size: AWG26 to 16 (0.14 to 1.5 mm²)

*1 No terminal end treatment is required for connection.

*2 Use 75°C (167°F) Cu wire only.

*3 The wire size of UL Open Type and Enclosed Type are common. Please contact us if UL Open Type exclusive wire is necessary.

*4 6 rms Amperes for aux. control power supply. There is no aux. control power supply in VF1A-G21A5S4 or below.

*5 5 rms Amperes for aux. control power supply. There is no aux. control power supply in VF1A-G21A5S4 or below.