TOYODENKI

ED64A

Intelligent Inverter

Instruction Manual

Introduction

We thank you for purchasing our "***TOYO ED Motor System***".

The intelligent inverter "ED64A series" is RoHS complying inverter for Interior permanent magnet synchronous motor (ED motor) drive.

This instruction manual is designed to explain the correct procedures for installing, wiring and operating inverter for ED motor drive "ED64A". Carefully read this instruction manual prior to use. Also, ED motor system is provided with motor "EDM series" usage direction other than "ED64A", so please read together.

"ED64A" Inverter has many characteristic functions in addition to the standard ones. Complied with many applications, the most suitable system can be structured using many kinds of functions: "HC (Super-block) function" and "sequence (PLC) function" etc.

In such a case prefer the value written in the relevant instruction manual and test report, to the values shown separately.

Though "ED64A" series is upper compatible of the function of conventional "ED64A" series come parts such as 3022 and 3044 outline size are changed. Please be careful when using with changed to conventional "ED64A".

READ PRIOR TO USE

Safety precautions

Before installing, operating, maintaining and inspecting the inverter, carefully read this instruction manual and all other appendices, and handle it correctly. Before using it, get acquainted with the details of the devices, safety information and all safety instructions before use.

In this instruction manual, the safety instructions are classified into two ranks, WARNING and CAUTION.

⚠ **WARNING**	Indicates a hazardous situation which will result in death or serious injury if the inverter is handled improperly.
⚠ **CAUTION**	Indicates a hazardous situation which may result in moderate or minor injury or only in properly damage if the inverter is handled improperly. However, such a situation may lead to serious accidents depending on circumstances. These signal words indicate important instructions. Follow the instructions without fail.

⚠ CAUTION (Installation)

- Install the inverter on a metallic or nonflammable surface.
  Otherwise, it may cause a fire.
- Do not place flammable materials near the inverter.
  Doing so may cause a fire.
- Do not carry the inverter by the front cover.
  The inverter may drop and cause personal injury.
- Install the inverter on a surface that withstands its weight.
  Otherwise, it may drop and cause personal injury.
- Do not install or operate the inverter if it is damaged or have any of its parts missing.
  Operating the inverter in such a state may cause personal injury.

⚠ WARNING (Wiring)

- Before wiring, make sure that the input power is off.
  Failure to do so may cause an electric shock or a fire.
- Connect the earth wire surely.
  Failure to do so may cause an electric shock or a fire.
- The inverter shall be wired by electric engineering technicians.
  Wiring by unauthorized persons may cause an electric shock or a fire.
- Wire the inverter after installing the main body.
  Failure to do so may cause an electric shock or a fire.

⚠ CAUTION (Wiring)

- Do not connect AC power to the output terminals (U, V and W). Doing so may cause an injury or a fire.
- Check that the rated voltage of the product is identical with the voltage of AC power.
  If not, injury or a fire may occur.
- Do not connect a resistance directly to the DC terminal ⊕1 or between ⊕2 and ⊖ or ⊕1 and ⊕2.
  Doing so may cause a fire.

WARNING (Operation)

- Turn on the input power after fitting the front cover.
  Do not remove the cover while power is on. Doing so may expose you to shock hazard.
- Do not operate any switch with wet hands.
  Doing so may expose you to shock hazard.
- Do not touch the inverter terminal while power is on, even if the inverter is in the stopped state.
  Doing so may expose you to shock hazard.
- Do not touch the inverter terminal while the ED motor is running.
  Doing so may expose you to shock hazard.
- The stop button is effective only when the use of its function has been specified.
  Separately prepare an emergency stop switch. Failure to do so may cause an injury.
- If the alarm is reset with the operation signal kept input, the inverter will suddenly restart.
  Reset the alarm after making sure that the operation signal is off. Failure to do so may cause personal injury.

CAUTION (Operation)

- The radiating fin and the radiating resistance are hot. Do not touch them.
  Doing so may cause a burn.
- The inverter can be set to operate in a wide range of speed. Operate the inverter after sufficiently checking the allowable range of the motor and the machine. Failure to do so may cause personal injury.
- If a holding brake is necessary, separately prepare it. Failure to do so may cause personal injury.

WARNING (Maintenance, inspection and replacement of parts)

- Before inspecting the inverter, turn off the input power, and wait for 10 minutes or more to make sure that the motor is stopped.
  Check the DC voltage between ⊕1 and ⊖ or ⊕2 and ⊖ to confirm that the voltage is 30 V or less. Failure to do so may cause an electric shock, personal injury and a fire.
- Check that the rated voltage of the product is identical with the voltage of AC power.
  If not, personal injury or a fire may occur.
- Unauthorized persons shall not maintain or inspect the inverter or replace its parts.
  For maintenance and inspection, use insulated tools. If not, may cause an electric shock or personal injury.

WARNING (Other)

- Never modify the inverter.
  Doing so may cause an electric shock or personal injury.

General precautions

Some illustrations given in this instruction show the inverter from which the covers or safety shields have been removed to illustrate the details. Before operating the inverter, return the covers and shields to their positions as specified, and operate it in accordance with the manual.

These safety precautions and specifications stated in the manuals are subject to change without notice.

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Chapter 1 Before operation

1. Handling procedures

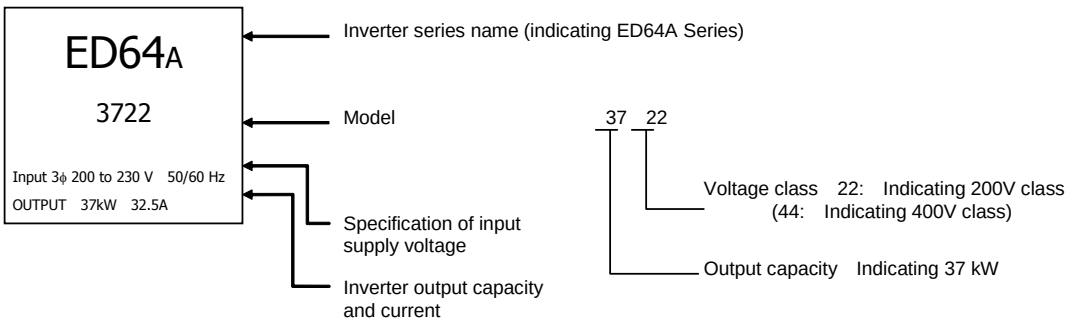
1-1. Checking when receiving

When receiving the product, check the following points.

(1) Check that the product specifications are proper and attachments, spare parts and optional parts are delivered as ordered.

Check the logo on the cover to confirm the type of the inverter unit.

Example of marking of type on cover



(2) Check if the product has not been damaged during transportation.

(3) Check if the screws are not loose or missing.

If any nonconformity is found, contact us or the distributor.

Safety precautions

Carefully read the instruction manual prior to use, and use the inverter correctly.

Our inverters are not designed or manufactured for the purpose of use in life-support machines or systems.

If you intend to use the product stated in this document for special purposes, such as passenger cars, medical devices, aerospace devices, nuclear energy controls and submarine relaying machines or systems, consult our sales department.

This product is manufactured under strict quality control. However, if it is used in critical equipment in which inverter failure may result in death or serial damage, provide safeguard to avoid serious accidents.

ED64A is only for our ED motor. Please note that this inverter can not be used to except for ED motor.

To use this product, electrical work is necessary. The electrical work must be done by qualified expert.

1-2. Opening the front cover

To operate the DIP switches on the control PCB for maintenance or auto-tuning, open the front cover in accordance with the following procedures.

(1) Remove the mounting screws at the bottom of the front cover.

(2) Open the front cover to about 45°, and disconnect the hooks at the top. Then, the cover can be removed.

CAUTION (Operation)

- When opening the cover right after operation, wait until the CHG lamp on the main circuit PCB goes out.

WARNING(Cautions when replacing part)

- Do not disassemble the inverter needlessly.
- After disassembling the inverter, check that the units are correctly assembled.
- Incorrect assembly may cause a fire.
- If the flat cable is not inserted correctly, the control circuit may malfunction. Carefully insert the cable.
- Tighten the screws securely.

1-3. Installation location

The conditions in the installation location affect the life and reliability of the inverter. Avoid using it in the following places. Use it under the conditions specified in the catalog.

(1) If the inverter is installed in a highly humid or dusty place, or in a place exposed to water or oil, the circuit insulation will be deteriorated, and the life of the parts will be shortened.

(2) If the working ambient temperature is too high, the life of the capacitor and cooling fan motor will be shortened.

(3) In a place with corrosive gas, connector contact failure, breaking of electric wires and damage of parts may be caused.

(4) In a place with heavy vibration, connector contact failure, breaking of electric wires and damage of parts may be caused.

(5) If the inverter is used at an ambient temperature of 0°C or less, use a heater to increase the temperature to more than 0°C at the start of the inverter. After the inverter starts, it generates heat by itself to more than 0°C and will operate normally.

CAUTION (Installation)

- Install the inverter on a metallic or nonflammable surface. Otherwise, it may cause a fire.
- Do not place flammable materials near the inverter. Doing so may cause a fire.
- Do not carry the inverter by the front cover. The inverter may drop and cause personal injury.
- Install the inverter on a surface that withstands its weight. Otherwise, it may drop and cause personal injury.
- Do not install or operate the inverter if it is damaged or any of its parts is missing. Operating the inverter in such a state may cause personal injury.

1-4. Installing the unit

To use ED64A inverter installed in a control panel, follow the state below.

WARNING(Installation procedure)

- Improper installation may cause an electric shock or a fire.

(1) Installation direction

Install ED64A inverter vertically with the logo “ED64A” up. If installed horizontally, it will not be ventilated sufficiently and will be overheated. Enough consideration must be given to the routes of suction and exhaust of air.

The cooling fan in the unit sucks air from the bottom and exhausts air to the top. Keep a sufficient space above the unit so that ventilation is not prevented by wiring ducts, etc.

(2) When installing the inverter with the fin out of the rear of the control panel

- ED64A-3722, 3744 or less can be installed on a control panel with the cooling fin out from the rear of the control panel.
- ED64A-4522, 4544 or more are also able to be installed on a control panel with the fin out from the control panel, but it cannot isolate air between the inside and outside of the panel.
- Consult us for the heat release values of parts other than the fin.

(3) Example of inverter loss

The loss of ED64A inverter is 2.5 to 5% of the motor load capacity.

Example: 37 kW × 5% = 1850 W When the motor load is 37 kW, the loss is 1850 W.

The percentages of loss corresponding to various inverter capacities are shown below.

11 to 37 kW:	5%	45 to 55 kW:	4%
75 to 90 kW:	3%	110 to 315 kW:	2.5%

When the heat generated by ED64A inverter is forcibly exhausted to the outside of the panel by the fan installed on the control panel, the amount of exhaust can be calculated by the following expression.

$Q = q / \{ \rho \cdot C \cdot (To - Ta) \}$

Q: Exhaust flow rate (m^3/s) q: Heat release value of ED64A(kW)

ρ: Density (1.057 to 1.251 kg/m^3) C: Specific heat (1.0 kJ/kg · °C)

To: Exhaust fan outlet temperature (°C) Ta: Control panel suction port temperature (°C)

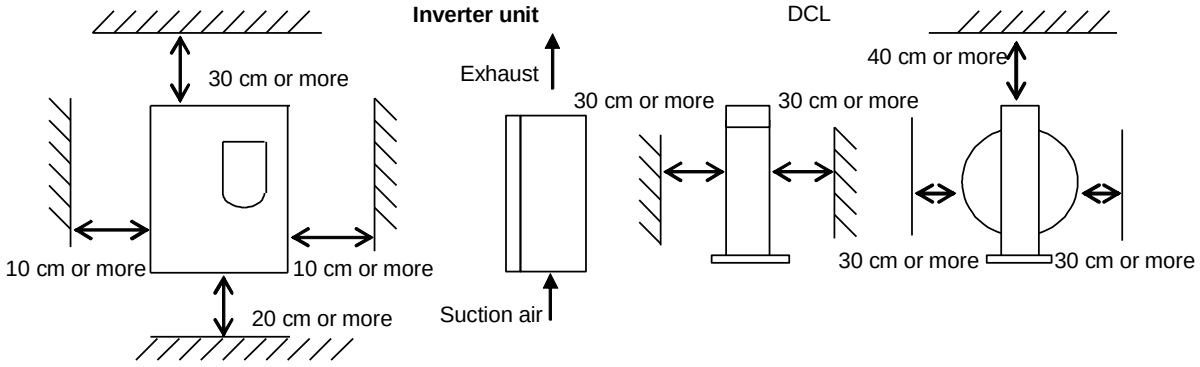
When the control panel ambient temperature is 40°C, to keep the exhaust temperature within 50°C, since the difference in temperature between suction air and exhaust is 10°C, an exhaust capacity of about 0.1 m^3/s is required to exhaust a loss of 1 kW.

(4) Securing of cooling space

- When installing ED64A inverter main unit and DCL (DC reactor), keep cooling spaces as shown in the following figure.

  If there are heat sources around the inverter, arrange them appropriately so that the heat does not affect the cooling of the unit.

- When ED64A inverter is installed in a control panel, ventilate the panel to keep the temperature in the panel within 50°C. (If the ambient temperature is high, the reliability of the inverter will be degraded.)



(5) Cautions

- The DC reactor (DCL) can become hot (may become over 100°C). Keep a sufficient distance from other devices.
- Surely exhaust the heat generated by the inverter and DCL to the outside of the panel. Prevent the exhaust from the inverter to circulate in the panel.
- If a dynamic braking unit is used, install the resistor on the outside of the panel as possible.
- Avoid using the inverter in a considerably coarse environment.

1-5. Cautions when wiring

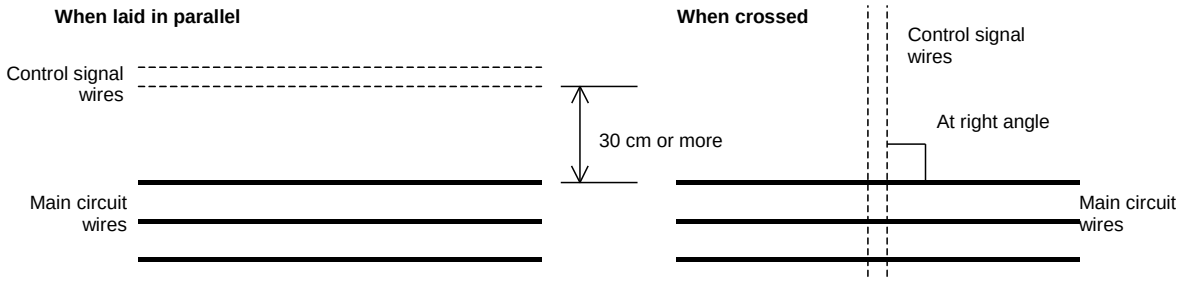
(1) Input the predetermined voltage to the inverter input terminal.

If 400V is input to a 200V class inverter, the inverter will be damaged.

(2) IGBT is used as inverter elements, and the inverter is operated at a high frequency. Therefore, it generates much noise. When wiring the inverter, pay attention to the following points.

- Lay the main circuit wires and the control signal wires apart from each other. If they are laid in parallel, lay them at a distance of 30 cm or more.

- If the wires are crossed, lay them in perpendicular.
- To prevent influence of the noise on other equipments, we recommend laying the main circuit wires in a steel conduit pipe or a metallic pipe.



(3) To prevent interference by noise, use shielded wires or twisted shielded wires for control signal wires.

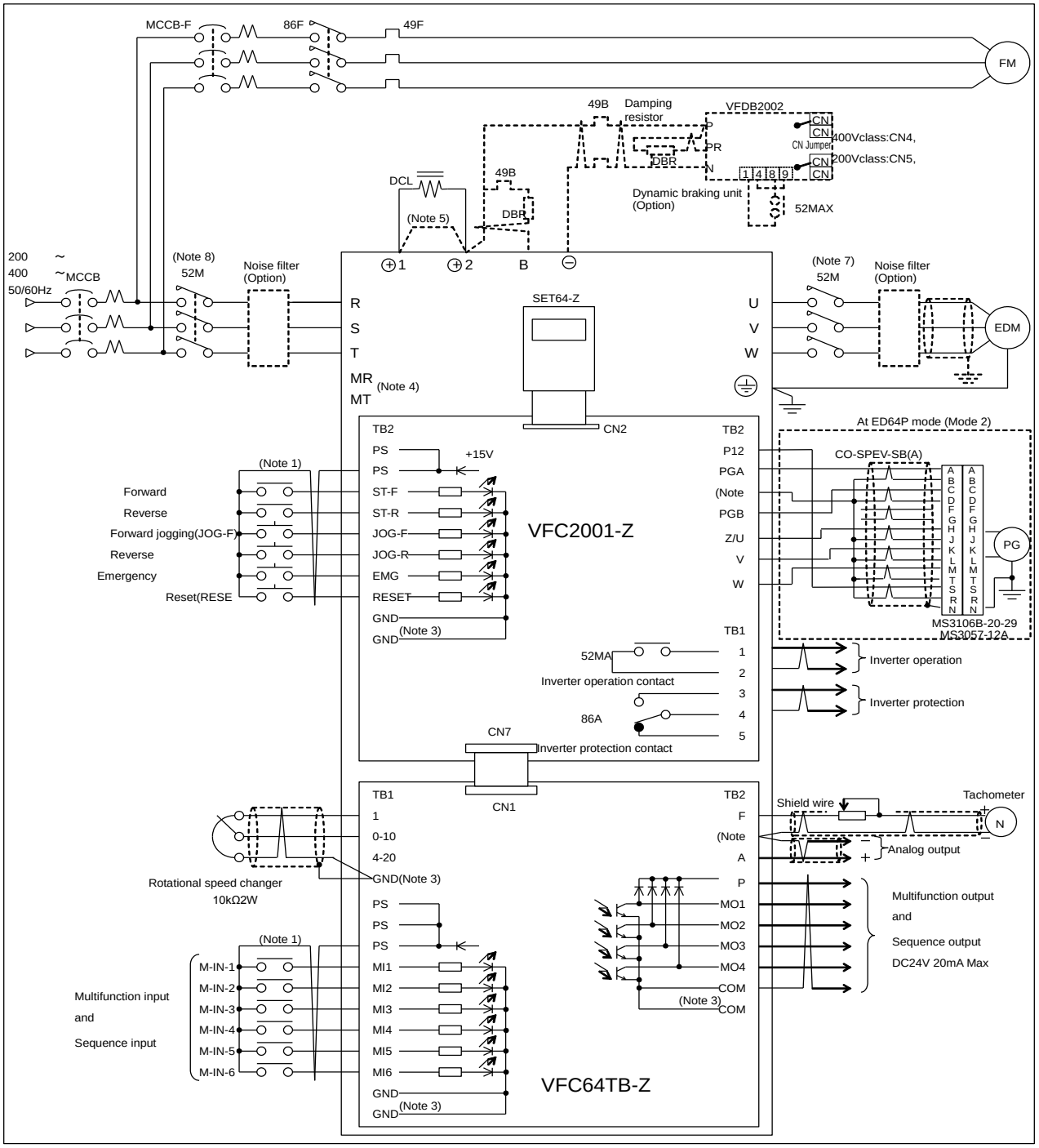
(4) To set the speed from the outside of the control panel, house the signal wires in a steel conduit pipe or a metallic pipe.

(5) As for the main circuit wire size, see “Input/output of wiring” of Chapter4 section2.

(6) When shielded wires are used for output wiring or the wiring length exceeds 300 m, and the ED64A inverter is operated by a DC brake, the inverter may be damaged or may not work owing to resonance of leakage capacitor of the inverter output wiring to the ground and input power inductance. In this case, consult us.

Earth-leakage circuit breaker
ED64A inverter uses IGBT as main circuit elements. Large leakage current is caused by high carrier frequency. Use an earth-leakage circuit breaker especially for the inverter.

2. Connection



(Note 1) Control input terminal (ST-F to RESET) and multi-function input terminal are able to do GND common input (sink input). In this case, detach the jumper pin of the VFC2001-Z-control PCB from [CN_SO] and attach to [CN_SI]. These are set to PS common input [source input] at the point of shipment.

(Note 2) PG is only for ED64P (with UVWAB-PG) mode, ED64V (with ABZ-PG) mode, the drawing above shows connection of ED64P mode. When using ED64V mode, see the separate drawing given.

(Note 3) Never earth the GND and COM terminals of the control circuit.

(Note 4) The AC power terminals (MR and MT) for control circuit are provided on inverters of model 1122 and1144 or over. (Normally, it is unnecessary to connect the terminal to power source. It will be connected only when action like protection display is necessity without main circuit power.)

(Note 5) On 200V class inverters of model 1122 or lower and 400V class inverters of model 1544 or lower, the terminals ⊕1 and ⊕2 are short-circuited (when DCL is not used).

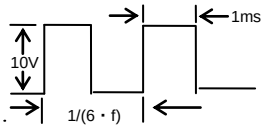
(Note 6) When the thermal relay of the brake resistance (DBR) functions, disconnect the inverter input power.

(Note 7) Install the main circuit contactor (52M) according to your conditions of use. ED motor generates voltage from the motor itself when the motor is rotating while the inverter is stopped, so for your safety, we recommend installing contactor to the output side. In this case, output side contactor will open/close from the 52M relay of the inverter.

(Note 8) When installing the main circuit contactor (52M) on the inverter input side, wait at least 10 minutes from reapplying power.

3. Terminal block and specifications

Device	Terminal No.	Use	Description
Main circuit	R · S · T	AC input	Connect to AC power.
	U · V · W	Inverter output	Connect to ED motor.
	⊕ 1	For connection of DCL on +side	On inverters of model ED64A-1122 and model ED64A-1544 or less without DCL, ⊕1 and ⊕2 are short-circuited.
	⊕ 2	For connection of DCL on -side and dynamic brake resistor (thermal relay) connecter. Or for +side input of sine wave converter use.	Dynamic brake resistor, thermal relay connecting terminal +Terminal when using sine wave converter.
	B	For dynamic brake resistor (thermal relay) connecter	Collector terminal for built-in dynamic braking transistor of ED64A-1122 and ED64A-1544 or less.
	⊖	For connection of DB unit. Or for –side input of sine wave converter use.	Connecting terminal between N terminal of the dynamic braking unit (DB unit) -Terminal when using sine wave converter.
	⏚	Earth	Connect to the earth. When a noise filter (NF) is used, connect to the earth terminal of NF.
Control circuit	MR, MT	Control circuit power input (AC)	Provided to capacity of types ED64A-1122, ED64A-1144 or more. (Can be operated without connecting. Use these terminals to do protection indication when the main circuit input is closed.)
VFC2001-Z terminal block TB 2	PS	External signal power supply (+15v)	Input terminal (input current 3mA) for inverter control signal and multi-functional input. Or for input terminal of sequence function.
	ST-F	Forward running signal	
	ST-R	Reverse running signal	
	JOG-F	Forward jogging signal	
	JOG-R	Reverse jogging signal	
	EMG	Emergency stop signal	
	RESET	Reset signal	
	GND	External signal power supply (0v)	
	P12	Power source for PG(+12v)	Connect to PG (A,B,U,V,W phase (ED64p mode) / A,B,Z phase mode (ED64V mode)) Recommendable cable : Twist pair shield wire CO-SPEV-SB (A) 7p-0.5SQ (Products of Hitachi Cable Co.) (Note 1) For connecting to the PG of ED motor, option of straight plug (MS3106B-20-29S) and cable clamp (MS30570-12A) (products of JAE) are necessary.
	GND	Power source for PG(0v)	
	PGA	A-phase signal for PG	
	PGB	B-phase signal for PG	
	Z/U	U-phase signal for PG (Z-phase signal at ED64V)	
	V	V-phase signal for PG	
	W	W-phase signal for PG	
VFC2001-Z terminal block TB1	1,2	Contact output of running	Operate when inverter is running (52MA :contact 1A, AC230V 0.5A)
	3,4,5	Contact output of the protective indication.	Operate when protective operation of the inverter. (86A: contact 1C, AC230V 0.5A) [Close] between 4 to 3, [Open] between 4 to 5 during protective operation
VFC64TB-Z terminal block TB1	1	Power source for speed setting (+10V)	Use 10kΩ dial for speed command
	0-10	Speed command voltage input	Input impedance 150kΩ
	GND	Speed setting power source (0V)	Never earth this terminal
	4-20	4-20mA speed command input	Input resistance 250Ω
	PS	External signal power supply (+15V)	Max. output current (18mA)
	GND	External signal power supply (0V)	Never earth this terminal
	MI1	For input signal for multi-function input and sequence function	Max. input voltage DC24V Max. input current 3mA
	MI2		
	MI3		
	MI4		
	MI5		
	MI6		

Device	Terminal No.	Use	Description
VFC64TB-Z Terminal block TB2	P	For output signal for multi-function output and sequence function	Connect P terminal to external power source (DC) Terminals MO1 to MO4 are open collector output Max. voltage DC24V / Max. current 20mA COM terminal is emitter common terminal of open collector output. (Recommendable relay for multi-function output : OMRON G7T-112-DC24V)
	MO1		
	MO2		
	MO3		
	MO4		
	COM		
	F	For output frequency meter, tachometer or divide frequency of PG output. (Measure by DC voltmeter or digital counter)	Output waveform  f : Frequency conversion value of rotation speed DC voltage is DC3.6V / 60 Hz (at top ≦120Hz) 1/2 or 1/4 when selecting PG output. Divide frequency of PG pulse output (Duty 1:1) Max output current 5mA (For more detail see Chapter 3 setting item G-09)
	A	For analog output	Output voltage 0~±10V　Max. output current 1mA
	GND	For 0V signal of terminal F,A	Never earth 0V terminal of F,A terminals

Chapter 2 Operation of ED64A

1. Checking before operation

1-1. Control mode

ED64A inverter has the following three modes.

(1) With PG which has 5 signals (A, B, U, V and W phase) for speed/magnetic pole position sensor. (ED64P mode)

(2) With PG which has 3 signals (A, B and Z phase) for speed sensor. (ED64V mode)

(3) Without speed sensor. (ED64S mode)

Conforming to the specification of the ED motor, select and use the most suitable control mode. The selected control mode can be checked on the console display when power is turned on or by the setting item S-01. Also, our ED motor uses A, B, U, V and W phase PG for speed/position sensor. So, usually “ED64P mode” for with sensor and “ED64S mode” for without sensor is used. “ED64V mode” is for particular use.

Note) Normally control mode is set to the one indicated at ordering when shipping. If you want to change control mode, look section 6 “Changing inverter control mode” of Chapter2.

1-2. Auto-tuning

Sense ED motor has permanent magnet built-in, electrical constant of the motor and magnetic pole position (d-axis position) are necessary. ED64A is provided with an auto-tuning function to measure these data and automatically set them in the parameters. Perform auto-tuning before starting ED64A operation. (As for the auto-tuning procedures, see 4 “Auto-tuning” in Chapter 2.)

Safety precautions

- Perform “auto- tuning” surely before operating, even when in case of changing combination of ED64A and ED motor. Magnetic pole position (d-axis) will change according to the mounting position of PG, even with ED motor of same type.
- Perform “auto-tuning” surely before restarting, after PG of ED motor is exchanged. In case of having difficulty in separating load machine from the motor, perform “d-axis measurement auto-tuning”.
- If the magnetic pole position parameter of inverter and ED motor is corresponding, it may rotate in unexpected direction. Please be careful.

1-3. Changing rotation direction

ED motor runs in CW direction (clockwise when viewed from anti-transmission side) with normal running command. To run in CCW direction (counterclockwise when viewed from anti-transmission side) with normal running command, switch the motor wires connected to the phase V and W. At ED64P and ED64V mode, additional to the signals V, W of PG, signals A and B also need to be exchanged.

Because magnet (d-axis) position viewed from inverter change when rotation direction is changed, A-30 (d-axis position) must be set again. Normally perform d-axis measurement auto-tuning described in section 4 “Auto-tuning” in Chapter 2. In case of having difficulty in performing auto-tuning, calculate A-30 setting at the point of rotation direction change by the following expression and set. (There is no necessity resetting A-30 at ED64S mode)

ED64P mode:

A-30 setting =[A-07 (PG pulse count) setting] / [A-06 (motor pole count) setting] × 4 - [setting of A-30 before change]

Add [A-07 (PG pulse count) setting] / [A-06 (motor pole count) setting] × 8 if the value became negative.

ED64V mode:

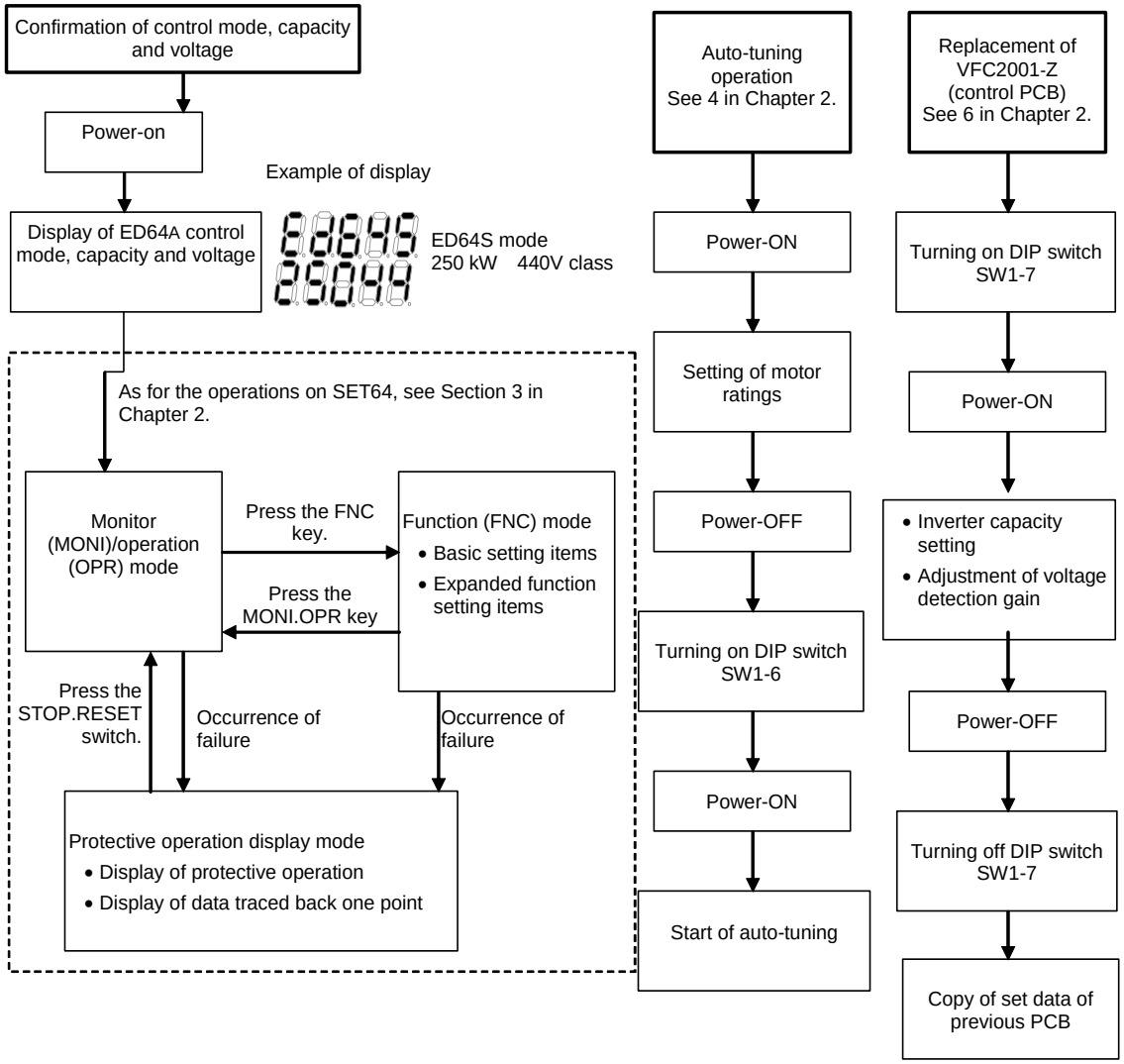
A-30 setting=[A-07 (PG pulse count) setting] / [A-06 (motor pole count) setting] × 8 - [setting of A-30 before change]

(Replace A-06 to L-05, A-07 to L-06 and A-30 to L-21 when using the 2nd motor)

1-4. Replacing control PCB VFC2001-Z to spare parts

To make the new PCB applicable to the presently used inverter, it is necessary to set the inverter capacity, motor rating (shown on the nameplate) and auto-tuning data and adjust the gains at the analog circuit points, such as the center block DC voltage detecting point. (See section 7 “Operation when replacing PCB” of Chapter 2.)

1-5. Operations and outline



2. Switches and LEDs on control PCB (VFC2001-Z)

2-1. Functions of DIP switch SW1

To initialize the memory, set the capacity of the inverter to be used and perform auto-tuning, it is necessary to operate the DIP switch SW1. The functions of the DIP switch SW1 are listed in the following table.

DIP switch	ON	OFF
SW1-1	Setting data cannot be written.	Setting data can be written.
SW1-2	Clear the data on failures and protective operations in the past (protection history, data traced back one point and traced-back data).	Normal
SW1-3	Not used	Normal
SW1-4	Changing control mode (ED64P, ED64V, ED64S)	Normal
SW1-5	DC mode auto-tuning or d-axis auto-tuning when both SW1-5 and SW1-6 ON. Full mode auto-tuning when SW1-5:OFF,SW1-6:ON	Normal operation
SW1-6		
SW1-7	Initialization of set data and setting of inverter capacity	Normal operation
SW1-8	Monitor mode for adjustment by us (Normally, do not turn on this toggle.)	Normal

2-2. About confirm LED of CPU operation

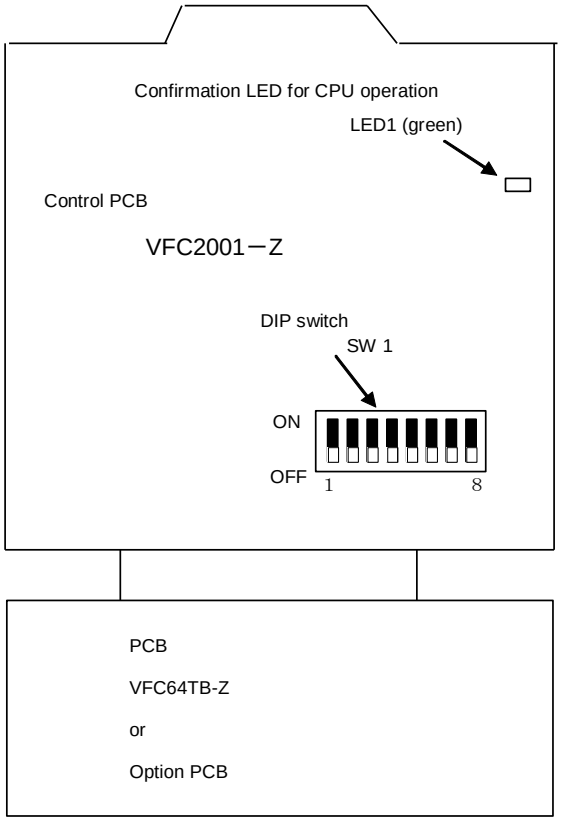
VFC2001-Z is provided with LED lamp (LED1) to confirm state and power of CPU.

State of LED1	Power/operation state of CPU
Flash about every 1 second	CPU in normal operation
Continuously on	Writing flash memory (HC / Sequence function),or CPU in abnormal operation.
Continuously off	CPU power off, or CPU in abnormal operation

2-3. Mounting position of DIP switch and confirmation LED of CPU operation

Take off front cover of ED64A inverter, open the mounting board of standard console (SET64-Z) and you will find the control PCB VFC2001-Z.

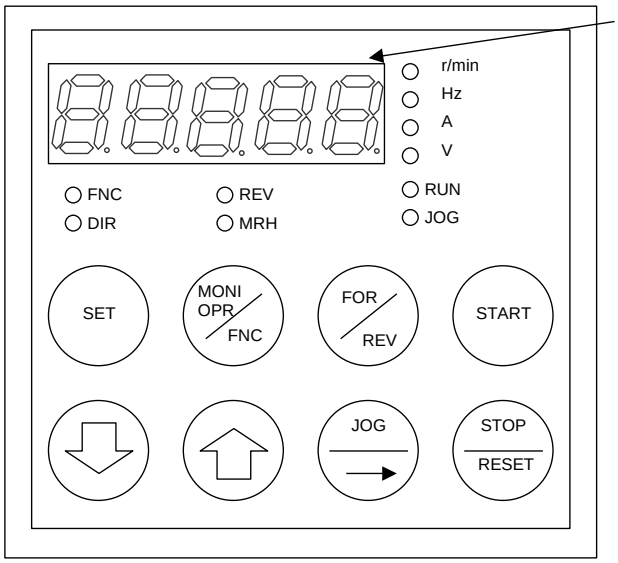
DIP switch (SW1) and confirmation LED of CPU operation are mounted on this VFC2001-Z PCB as shown on the picture.



3. Functions of console panel (SET64-Z)

ED64A is standard provided with a console panel (SET64-Z) with a 5-digit LED indicator, eight operation key buttons, unit LEDs and status indicating LEDs. With the console, you can operate the inverter, read and write various functions setting data, monitor the operation status, display the details of operations of protective devices, trace the data one point back and read the protective operation history data. In addition, the console panel is used to initialize the inverter memory, set the inverter capacity and start the auto-tuning.

- **Panel front face**



- **LED display: 7-segment 5-digit display**

  Display of characters and numbers

  Operation monitor and display of function code (number), selected function and set data, protective operation and protective operation history

- **Display of unit (LED display)**
- **Display of status (LED display)**

  FNC: On when the FUNCTION mode (function setting mode) has been selected.

  DIR: On when any of the START and JOG keys on the console panel has been selected

  REV: On when REV (reverse rotation) has been selected.

  MRH: On when MRH has been selected. (MRH function is used to accelerate or decelerate during the operation by ↑, ↓ keys or from external connect)

  RUN: On while the inverter is running (flashing while the inverter is decelerating to stop or the DC brake is being applied).

  JOG: On while the inverter is jogging (also RUN is on).

- **Operation keys**

SET

< In FUNC (function setting) mode >
- To enter the selected setting item number
- To write the set data

< In MONI · OPR (monitor · operation) mode >
- To switch the monitor item

< Upon protective operation >
- To read data traced one point back

MONI OPR / FNC

Switching between MONI · OPR mode and FUNC mode

< In FUNC (function setting) mode >
- To switch to the MONI · OPR mode

< In MONI · OPR (monitor · operation) mode >
- To switch to the FUNC mode

FOR / REV

< In MONI · OPR (monitor · operation) mode >
- To switch the normal rotation and reverse rotation commands when START or JOG on the console panel is effective ("REV" LED is turned on when the reverse rotation command is selected)

START

< In MONI · OPR (monitor · operation) mode >
- To run the inverter when the console has been selected as the operation command setting site

↑

< In FUNC (function setting) mode >
- To increment the number at the current digit by one when the setting item number is selected or data is set

< In MONI · OPR (monitor · operation) mode >
- The console has been set by speed command setting site to accelerate with this key, at MRH mode

↓

< In FUNC (function setting) mode >
- To decrement the number at the current digit by one when the setting item number is selected or data is set

< In MONI · OPR (monitor · operation) mode >
- The console has been set by speed command setting site to decelerate with this key, at MRH mode

JOG

< In FUNC (function setting) mode >
- To shift the selected digit one place to the right.

< In MONI · OPR (monitor · operation) mode >
- To operate the inverter when the console has been selected as the jogging command setting site

STOP / RESET

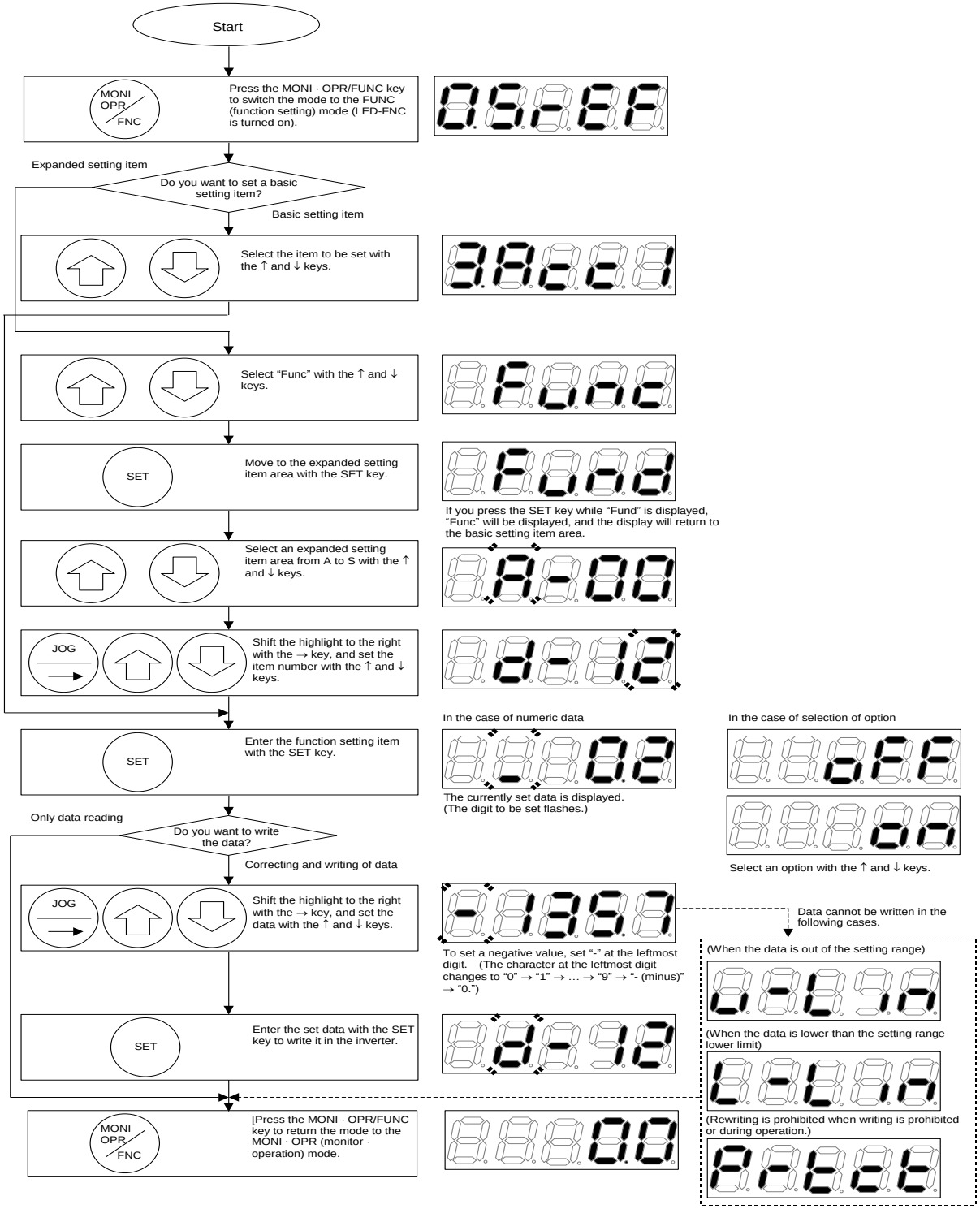
To stop the inverter when it has been started by the START key on the console panel.

To reset the protective device under operation

3-1. Procedures for reading and writing function setting data

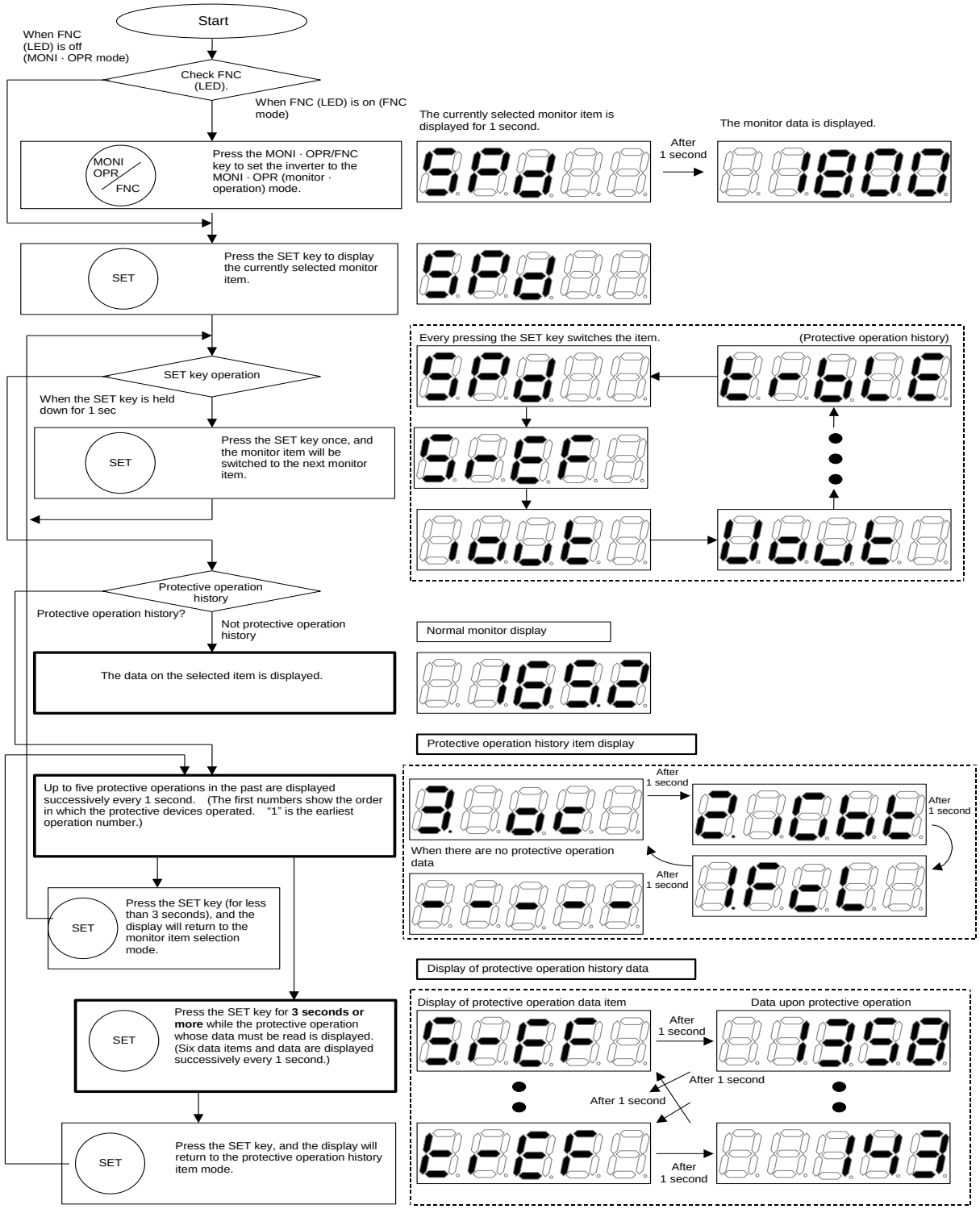
For ED64A, fundamental setting items and functional setting items are prepared. The fundamental setting items include setting items necessary for individual operation of the inverter. The functional setting items are classified according to operation type into the areas A to S. The data of the fundamental setting items and functional setting items are read and written in accordance with the following procedures.

(The list of the functional setting items is given in Chapter 3.)



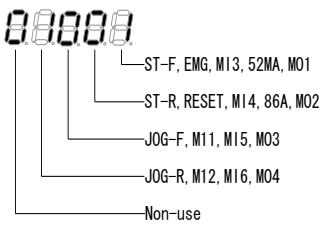
3-2. Procedures for selecting monitor data

On ED64A, you can monitor data on rotational speed, current and voltage with the LED display on the console panel. In addition, it is possible to read the history of up to five protective operations in the past and the data on rotational speed, voltage and current recorded when the protective operations were performed. Select the item to be monitored in accordance with the following procedures.



(List of selectable monitor display items)

Monitored data	Displayed code	Units	Remarks
Motor rotational speed	SPd	r/min	Display motor speed. (Calculation speed at ED64S mode)
Rotational speed set value	SrEF	r/min	Display rotational speed set value before acceleration/ deceleration control.
Output current	Aout	A	Display effective value of output current.
Torque command	trEF	%	Display torque command to be input to the torque controller after limit processing.
DC voltage	Vdc	V	Display voltage on the DC block.
Output voltage	Vout	V	Effective value of voltage between output wires.
Output frequency	Fout	Hz	Display output frequency.
Overload counter	oLcnt	%	Display overload (OL) or over-torque. Protective operation when the value reaches 100%.
Line speed	LSPd	m/min	Display line speed, with ratio of setting value (n-00) at top rotational speed.
Motor temperature	tEMP	℃	Able to display only when option unit T/61V is mounted.
Input terminal check1	I1cH	—	Display terminal state of JOG-R,JOG-F,ST-R,ST-F
Input terminal check2	I2cH	—	Display terminal state of MI2,MI1,RESET,EMG
Input terminal check3	I3cH	—	Display terminal state of MI6,MI5,MI4,MI3
Output terminal check1	oAcH	—	Display operational state of 86A and 52MA relays
Output terminal check2	o2cH	—	Display output state of MO4,MO3,MO2,MO1
Main unit program version	UEr	—	Display version of the main unit. (ex: ED64-02-A1---H02A1)
Sequence version	UEr99	—	Display date of the sequence ladder execution. (ex: 2007-09-28---H7928)
Super-block version	UEr98	—	Display date of the Super-block execution. (ex: 2007-10-02---H7A02)
Monitor for analog gain adjustment	GAdJ	—	Display detected value of voltage input during the adjustment of analog input.
Special monitor for adjustment	SPdSP	—	（Special monitor for adjustment for us）
Protective operation history display	trbLE	—	Readout history of five protective operations in the past and of the data when the operated.



(Months display: Oct..---A, Nov.---B, Dec.---C)

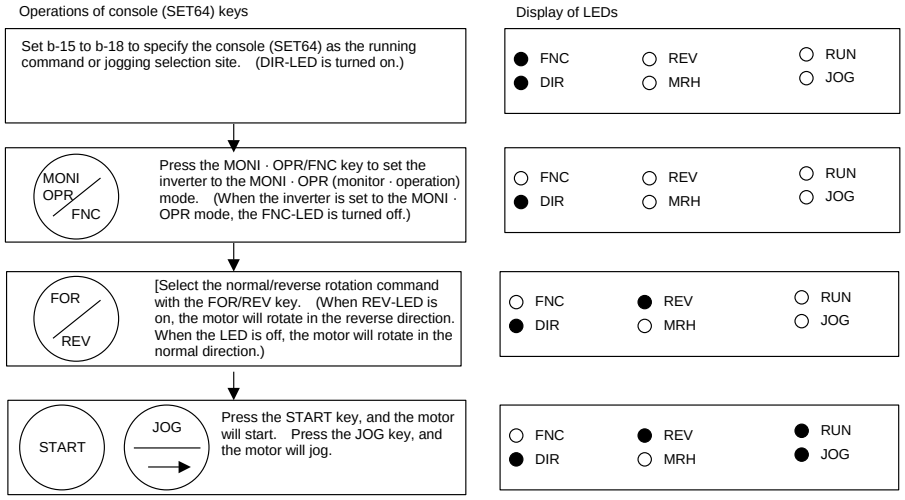
(List of data obtained upon execution of protective operations)

Monitor data	Display code	Unit	Remarks
Rotational speed command value	SrEF	r/min	Value after acceleration/deceleration control is displayed. (Note that value differs from the one shown on the monitor)
Motor rotational speed	SPd	r/min	Motor speed (calculation speed at ED64S mode)
Output current Note）	Aout	A	Display max. current of 3 phase (absolute). (Note that value differs from the one shown on the monitor. In case of sine wave, approximate effective value can be obtained by dividing by 1.41)
Output voltage	Vout	V	Effective value of voltage between output wires
DC voltage	Vdc	V	Voltage on DC block
Torque command	trEF	%	Torque command to be input to the torque controller after limit processing is displayed.

Note) Because the values are sampled at every calculation cycle and the current just before the execution protective operation is displayed as the output current, if the current increases quickly owing to output short-circuiting, etc., the correct current value at the occurrence of protective operation may not be displayed.

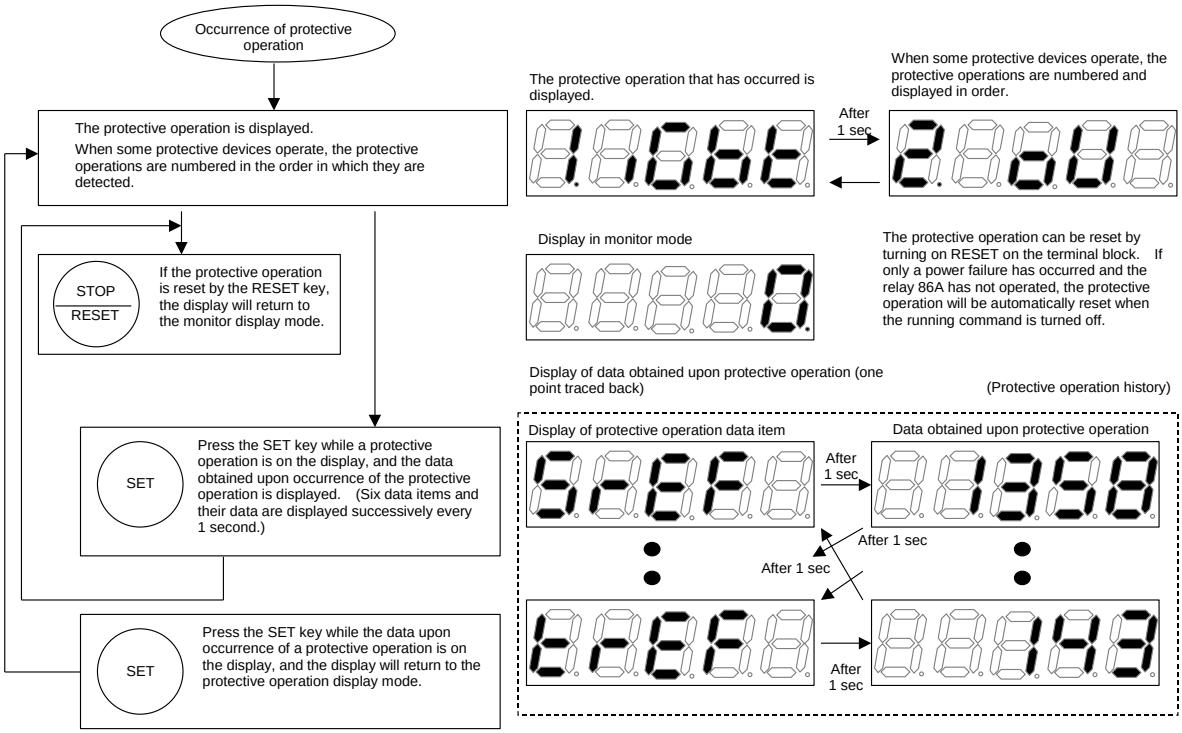
3-3. Operation through SET64-Z

ED64A is able to running operate by the console panel (SET64-Z). The operating procedures are shown below. (To operate ED64A, parameters must be set through auto-tuning in advance. See 4 “Auto-tuning” of Chapter 2.)



3-4. Display on SET64-Z upon protective operation

In any mode, when a protective device operates, SET64-Z enters the protective operation display mode. When some protective devices operate, the protective operations are numbered in the order in which they are detected. Each protective operation can be reset by pressing the RESET key while the protective operation is on the display. (However, it cannot be reset while the protection is kept effective or a running or jogging command is kept input.) Pressing the SET key while the protective operation is on the display reads the data obtained when the protective device operated.

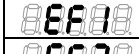
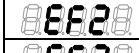


Note) If the MONI · OPR/FNC key is pressed in the protective operation display mode, the console temporarily exits the protective operation display mode and enters the MONI or FNC mode.

3-5. List of protective operations

A list of protective operations is given below. As for the processing upon occurrence of each protective operation, see Chapter 7 “Maintenance.”

Protective operation code	Protective operation	Details of protective operation
oc	Overcurrent protection	Operates when the instantaneous value of output current is 3.6 times or more the inverter rated value
GbE	IGBT protection	Operates with IGBT over-current and fin overheating (less than 22kW or more than 75kW)
GE1	IGBT(U) protection	Operates with U phase IGBT over-current and fin overheating (30kW to 65kW)
GE2	IGBT(V) protection	Operates with V phase IGBT over-current and fin overheating (30kW to 65kW)
GE3	IGBT(W) protection	Operates with W phase IGBT over-current and fin overheating (30kW to 65kW)
oU	Overvoltage on DC block	Protects when the DC block voltage exceeds 400V (200V class) or 800V (400V class).
oL	Overload protection	Protects when output current effect value is kept higher than 150% of motor rated value for a minute.
Fu	DC fuse blowout	Operates when fuse of DC block blows out
StrF	Starting failure	Operates when motor does not start over 10 seconds after a running or jogging command is input.
oS	Overspeed protection	Operates when the motor speed exceed (forward or reverse) setting speed. (only at vector control mode)
uU	Voltage down (under voltage)	Operates when DC voltage goes below 180V(200Vclass)/360V(400Vclass)
ot	Overtorque protection	Protects when output torque is 150% of the rated torque for 1minute (when over-torque protective operation is ON)
oH	Unit overheat	Operates when fin in the output block overheats (only over 75kw)
cS2	Memory trouble	Sum of setting data in EEPROM is not same (check when turning the power on)
oPEr	Option error	Operates when error happens to communicational option (J-00) when it is ON
tS	Communication time-out error	Communication error occur between communicational option and master station (time-out)
SPdE	Speed control error	Operates when deviation of motor speed and command value (speed control input) exceeds the setting (console setting) with speed control error detection (F-08) is ON
inoH	Motor overheating	Operates when the motor temperature exceeds 150℃ while T/V61V option is in use and motor overheat protection (F-12) is ON
SLF	Parallel slave trouble	Operates when trouble (over-current etc.) occur to slave unit of parallel machine.
FcL	FCL operation	Operates when flash current limiter (FCL) continue for 10 seconds (2 seconds near 0Hz)
SEt0	Setting error 0	Operates when running/jogging or auto-tuning command is input to an improper motor rating state.
SEt1	Setting error 1	Operates when running/jogging command is input to an improper PG pulse setting, vector control (motor constant), or current control setting state. (Starting without auto-tuning etc.)
SEt2	Setting error 2	Operates when running/jogging command is input to speed control-related setting such as over-speed, MRH upper/lower limitspeed in improper state.
SEt3	Setting error 3	Operates when running/jogging command is input to analog input/output gain related setting in improper state.
PEr1	PG (phase) error 1	Operates when error of U, V, W signals of PG are detected at ED64P mode.
PEr2	PG (phase) error 2	Operates when connection error of U, V, W signals of PG are detected at ED64P mode.
PEr3	PG (phase) error 3	Operates when reverse direction connection of phase sequence of U, V, W signals and A, B signals of PG are detected at ED64P mode.
PEr4	PG (phase) error 4	Operates when there is no change for the U, V, W signals of PG for rotation of more than a period at ED64P mode, or no Z signal input for more than a rotation at ED64V mode, after input of power source.
PEr5	PG (phase) error 5	Operates when state that the connection of A, B signals and motor rotational direction is reversed is detected during auto-tuning, at ED64P and ED64V mode.
PEr6	PG (phase) error 6	Operates when there is internal phase calculation error according to the misconnection of U, V, W signals or miss setting of d-axis position setting (A-30) at ED64P and ED64V mode.

Protective operation code	Protective operation	Details of protective operation
	PG (phase) error 7	Operates when there is internal phase calculation error at starting of ED64S and ED64V mode
	Starting error without sensor	Operates when there is a failure of phase detection at starting of ED64S and ED64V mode
	External failure1	Operates when external failure 1 of multi-function input is input.
	External failure2	Operates when external failure 2 of multi-function input is input.
	External failure3	Operates when external failure 3 of multi-function input is input.
	External failure4	Operates when external failure 4 of multi-function input is input.
	Console communication trouble 1	Display when trouble occur with communication between the console (SET64-Z) and the main unit (communication time-out error)
	Console communication trouble 2	Display when trouble occur with communication between the console (SET64-Z) and the main unit (communication sum check error (detect by console))
	Console communication trouble 3	Display when trouble occur with communication between the console (SET64-Z) and the main unit (communication sum check error (detect by main unit))
	Emergency stop contact ON	Display when operation command is input during the input contact of emergency stop is ON.

4. Auto-tuning

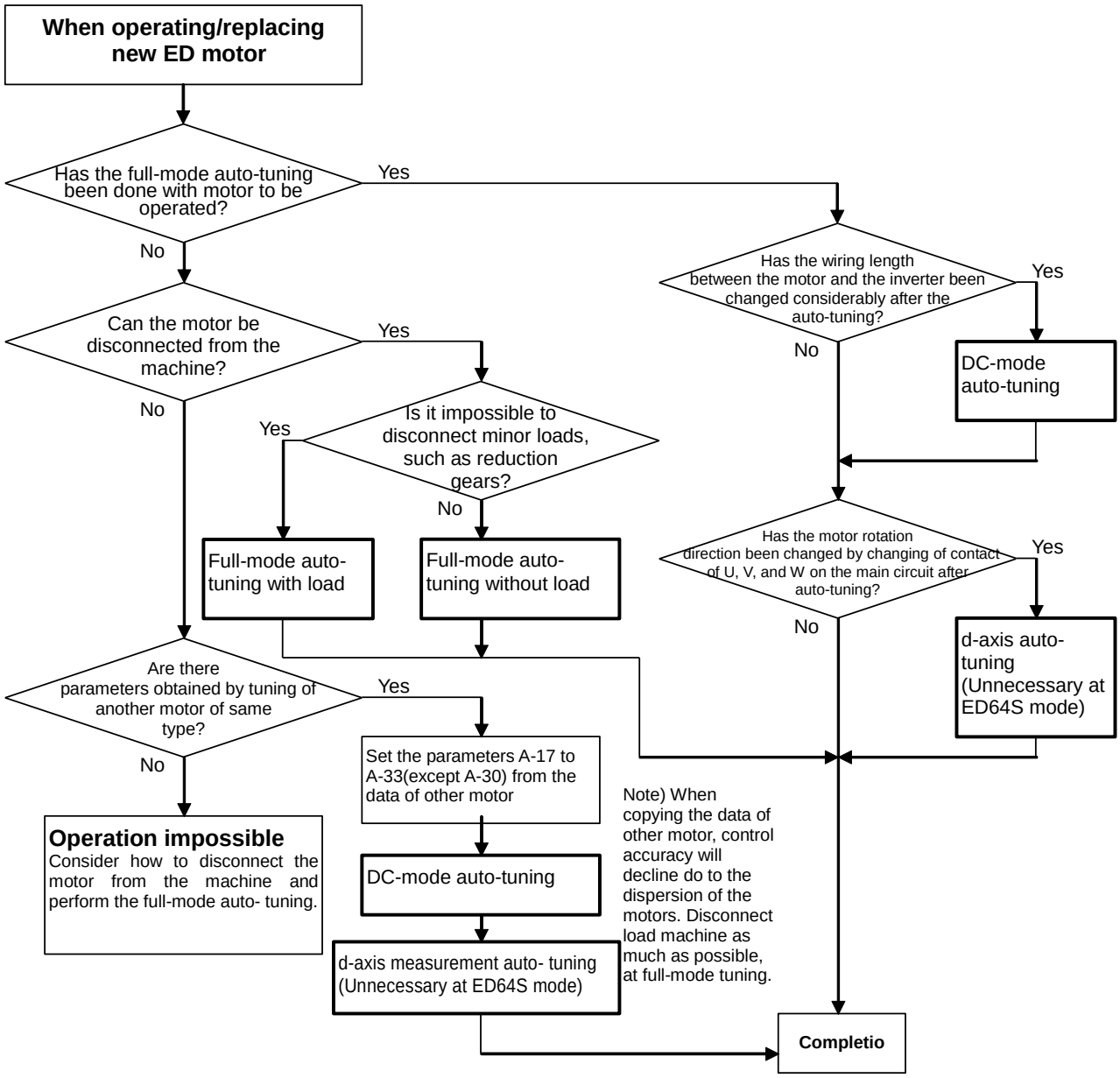
ED64A inverter needs information of motor (electric constant etc.) such as motor resistance and inductance and magnetic pole position of permanent magnet to control. ED64 is provided with an auto-tuning function that measures these parameters necessary for operation and automatically set the parameters. If these parameters necessary to operate the motor have not been set in ED64A, you must perform the auto-tuning to set the parameters. Either of the following auto-tuning modes can be selected.

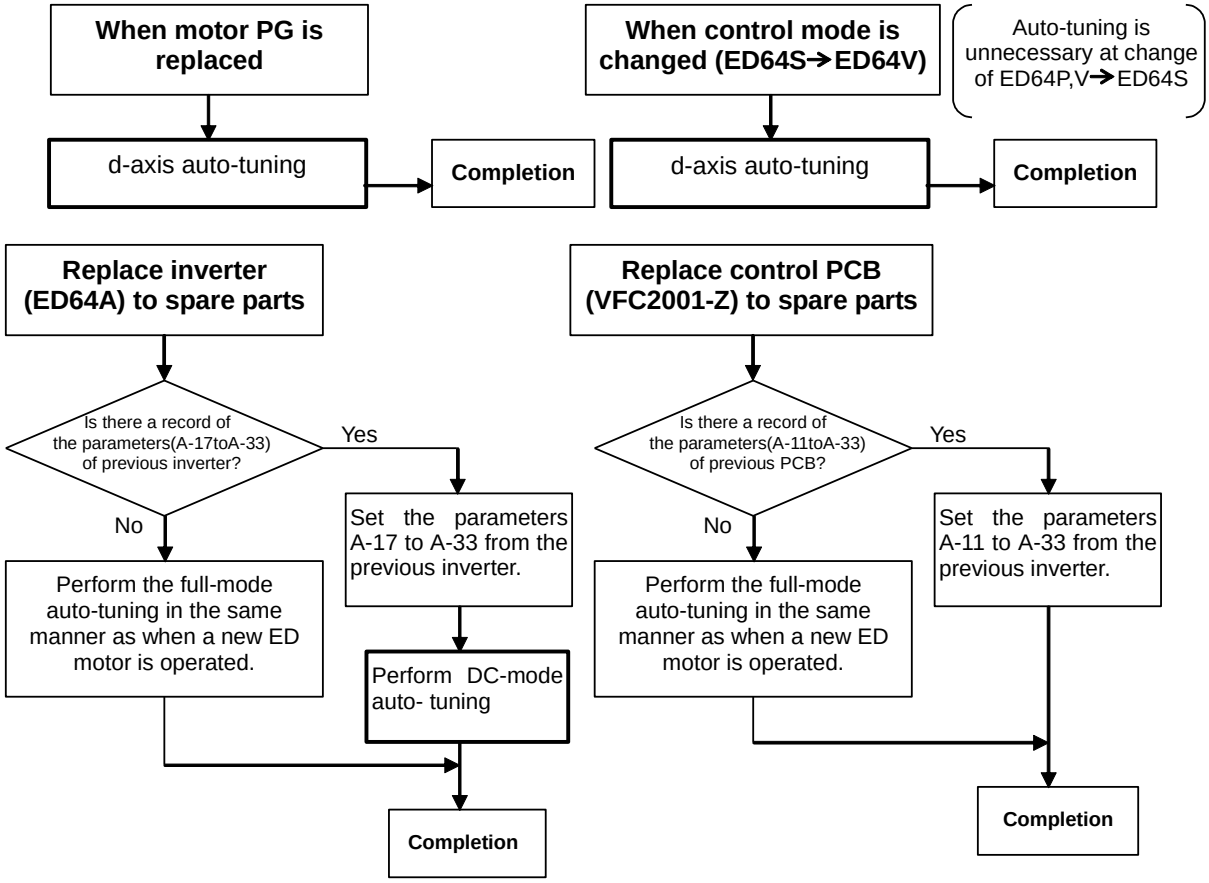
* Full-mode auto-tuning: All necessary parameters are measured.
* DC-mode auto-tuning: Only the primary resistance and dead time are measured.
* D-axis measurement auto-tuning: Measure only pole (d-axis)

Select the optimum auto-tuning mode in accordance with the following procedures.

4-1. Selection of auto-tuning mode

Select the auto-tuning mode in accordance with the following flowchart.





The following table shows the measurement parameters in each mode of auto-tuning, conditions to perform, and operations during auto-tuning of ED64A.

	Full-mode auto-tuning	**DC-mode auto-tuning**	**d-axis measurement auto-tuning**
Measurement parameters	Dead time compensation (A-11 to 16) Primary motor resistance (A-17) d-axis inductance (A-18) q-axis inductance (A-19) Magnetic flux (A-20) d-axis position (Magnet pole position) (A-30) d-axis pulse range (A-32) d-axis pulse voltage range (A-33) Magnetic pole decision method selection (A-31) Motor iron leakage conductance (A-21) Lq changing rate at 30 to 120% q-axis current (A-22 to 25) Lq changing rate at 30 to 120% d-axis current (A-26 to 29)	Dead time compensation (A-11 to 16) Primary motor resistance (A-17) (When replacing the inverter unit owning to a failure, copy the parameters A-18 to 33 beside the previous items by using PC tool or console (SET64-Z))	d-axis position (Magnet pole position) (A-30) (Parameters of A-11 to 29 and A-31 to 33, beside the previous, has to be set by previous) Note) ED64A (without sensor) mode dose not use this tuning. (A-30 setting is unnecessary)
Condition to perform auto-tuning	Both motor rated values and PG pulse count is set. The ED motor to be measured must be in a single unit state disconnected from the load machine (load for reduction gear is okay with selecting “with load”).	Both motor rated values and PG pulse count is set. Load machine is disconnected, machine brake of the load machine is off.	Both motor rated values and PG pulse count is set. Perform full-mode automatic measurement beforehand and set data beside “d-axis position”
Motor operation during auto-tuning (in the case of 6-pole motor)	After the motor rotates 2 times, accelerated to about 80% of the rated rotational speed. Normal direction running without load. Selectable with load.	The motor may rotate 2/3 time. (720° at electrical degree). Rotation direction is selectable.	Rotates up to 20° (60° at electrical degree) at ED64P mode. Maximum motor axis will rotate once at ED64V mode.

4-2. Preparation for auto-tuning

Before performing the auto-tuning, it is necessary to set the motor rated values (shown on the motor nameplate) and the carrier frequency to be used in the following setting numbers. (As for the setting procedures, see 3-1 “Procedures for reading/writing function setting data” in Chapter 2.)

NO.	Item	Setting range	No.	Item	Setting range
A-00	Max. rotational speed	300 to 14700	A-04	Rated motor current	40 to 150% of INV rated current
A-01	Min. rotational speed	0 to max. rotational speed (A-00)	A-05	Rated motor rotational speed	67 to 100% of max. rotational speed
A-02	Motor rated capacity	3 rank below the INV rated capacity to INV rated capacity	A-06	Selection of motor pole count	2 pole to 12 pole
A-03	Motor rated voltage	140 to 230V (200Vclass) 280 to 460V (400Vclass)	A-07	PG pulse count	60 to 3600 (unnecessary for ED64S)
			A-08	PWM carrier frequency	2.0 to 14.0kHz

(INV in the table refer to the rate of inverter used)

4-3. Full-mode auto-tuning procedures

This section explains the full-mode auto-tuning procedures. Full-mode auto-tuning measures all parameters from A-11 to A-33 automatically. Before performing the auto-tuning, disconnect the motor from the load machine.

In case the reduction gear is not connectable owning to the motor with reduction gear etc., select ”full-mode auto-tuning with load”. (Only for small loads such as reduction gear. Disconnect from load machine.) In this case, selection of rotation direction during auto-tuning is also possible. Select the auto-tuning of the rotation direction set according to the reduction gear. (Normal direction at normal operation)

Select auto-tuning with load at A-10 “Selection of tuning”

	Item	Setting range
A-10	Selecting tuning (full-mode auto-tuning)	0: Normal 1: Auto-tuning with load (normal run) 2: Auto-tuning with load (reverse run)

(Full-mode auto-tuning procedures)

1) Wire the motor (disconnected from the load machine) to the inverter. Wire the PG. (Wiring of PG is unnecessary at ED64S mode.)
2) Turn on power to the inverter, and set the parameters A-00 to A-08 according to the motor nameplate.
3) Select “0: Normal”,”1: With load (normal run)” or ”2: With load (reverse run)” to set to A-10 “Tuning selection”
4) Once turn off power, open the unit cover, and turn on the DIP switch (SW1) number 6 on the inverter control PCB VFC2001-Z.
5) Close the unit cover, and reapply power. If an input MC is on the main circuit, turn on power to the input MC. (“tUn” will be displayed on the console.)
6) Press the JOG key on the console, and the auto-tuning will start. (“tUnSt” will be displayed.)
7) The auto-tuning will finish in few minutes (depending on the motor capacity). (“tUnEd” will be displayed on the console.)
8) Turn off power to the inverter, open the unit cover, and turn off the DIP switch (SW1) number 6.
9) Close the unit cover, reapply power, and make sure that the data of the parameters A-11 to A-33 have been updated.

(Data to be automatically measured during full-mode auto-tuning)

No.	Item	Unit	No.	Item	Unit	No.	Item	Unit
A-11	Dead time compensation value (phase U, +side)	—	A-19	Motor q-axis inductance	mH	A-27	Lq changing rate at 60% d-axis current	%
A-12	Dead time compensation value (phase U, -side)	—	A-20	Motor magnetic flux	Wb	A-28	Lq changing rate at 90% d-axis current	%
A-13	Dead time compensation value (phase V, +side)	—	A-21	Motor iron loss conductance	mmho	A-29	Lq changing rate at 120% d-axis current	%
A-14	Dead time compensation value (phase V, -side)	—	A-22	Lq changing rate at 30% q-axis current	%	A-30	d-axis position (only for ED64P,V)	
A-15	Dead time compensation value (phase W, +side)	—	A-23	Lq changing rate at 60% q-axis current	%	A-31	Selecting magnetic pole decision mode without sensor	

No.	Item	Unit	No.	Item	Unit	No.	Item	Unit
A-16	Dead time compensation value (phase W, -side)	—	A-24	Lq changing rate at 90% q-axis current	%	A-32	d-axis measurement pulse width	ms
A-17	Primary motor resistance	mΩ	A-25	Lq changing rate at 120% q-axis current	%	A-33	d-axis measurement pulse voltage amplitude	
A-18	Motor d-axis inductance	mH	A-26	Lq changing rate at 30% d-axis current	%			

Safety precautions

- Perform the full-mode auto-tuning with the motor in the single unit state disconnected from the load machine. During tuning, the motor will rotate at about 80% of the rated speed, and, therefore, can cause accidents. If it has loads, correct tuning may not be performed.
- Just after the start of the full-mode tuning, the motor does not rotate at a high speed because it is under DC test. However, voltage is on the motor. Be careful not to touch it. It may cause an electric shock.
- In the full-mode tuning, after the DC test for about 1 minute (depending on the capacity) at the start, the motor will start. Be careful not to come close to the motor until the end of tuning (or a tuning error) is displayed.

4-4. DC-mode auto-tuning procedures

This section explains the DC-mode auto-tuning procedures. In the DC-mode auto-tuning, the dead time compensation values A-11 to A-17 and the motor primary resistance are automatically measured. During measurement, motor will rotate about 2/3 in normal direction (at 6 pole motor). If there is problem when the load machine rotates, disconnect the load machine before measuring. Also if operating with load machine connected, take off the machine brake of load machine side.

At DC-mode auto-tuning/d-axis auto-tuning, A-32 “Tuning selection” will be item selecting from DC-mode and d-axis measurement mode, compared from full-mode auto-tuning. When performing DC-mode auto-tuning, set 0 to A-10.

	Item	Setting range
A-10	Selecting tuning (DC-mode/d-axis mode auto- tuning)	0: DC-mode auto-tuning 1: d-axis measurement auto-tuning with load (normal run) 2: d-axis measurement auto-tuning with load (reverse run)

(DC-mode auto-tuning procedures)

1) Wire the motor to the inverter.
2) Turn on power to the inverter, and set the parameters A-00 to A-08 according to the motor nameplate. And set “0 (DC mode)” to A-10 (Tuning selection)
3) Once turn off power, open the unit cover, and turn on the DIP switch (SW1) numbers 5 and 6 on the inverter control PCB VFC2001-Z.
4) Close the unit cover, and reapply power. If an input MC is on the main circuit, turn on power to the input MC. (“tunnd” will be displayed on the console.)
5) Press the JOG key on the console, and the auto-tuning will start. (“tunSt” will be displayed.)
6) The auto-tuning will be finished in few minutes (depending on the motor capacity). (“tunEd” will be displayed on the console.)
7) Turn off power to the inverter, open the unit cover, and turn off the DIP switch (SW1) numbers 5 and 6.
8) Close the unit cover, reapply power, and make sure that the data of the parameters A-11 to A-17 have been updated.

(Data to be automatically measured during DC-mode auto-tuning)

No.	Item	Unit	No.	Item	Unit	No.	Item	Unit
A-11	Dead time compensation value (phase U, +side)	—	A-14	Dead time compensation value (phase V, -side)	—	A-17	Primary motor resistance	mΩ
A-12	Dead time compensation value (phase U, -side)	—	A-15	Dead time compensation value (phase W, +side)	—			
A-13	Dead time compensation value (phase V, +side)	—	A-16	Dead time compensation value (phase W, -side)	—			

Data of A-18 to A-23 except for the data shown above must be set separately.

Safety precautions

- In the DC-mode tuning, voltage is on the motor during DC test. It can cause an electric shock. Take care not to touch it.
- Even in the DC mode, the motor slowly rotates in normal direction. Pay attention to the machine for in case of tuning with the load machine connected, load machine will also move.

4-5. d-axis measurement auto-tuning procedure

This section explains the d-axis measurement auto-tuning procedures. D-axis measurement auto-tuning measures only d-axis PG pulse of A-30. When auto-tuning, motor will rotate up to 20° at ED64P mode (6 pole motor) and up to 360° at ED64V mode in normal or reverse direction. (Direction is selectable at A-10) If there is problem when the load machine rotates, disconnect the load machine before measuring. Also if operating with load machine connected, take off the machine brake of load machine side. (Correct tuning cannot be done if the load machine does not rotate)

At DC-mode auto-tuning/d-axis measurement auto-tuning, A-10 "Tuning selection" will be item selecting from DC-mode and d-axis measurement mode, compared from full-mode auto-tuning. When performing d-axis measurement auto-tuning, make A-10 to "1 (d-axis measurement mode (normal))" or "2 (d-axis measurement mode (reverse))". Because ED64S (without sensor) mode does not use A-30 setting, d-axis measurement auto-tuning is not possible.

(d-axis measurement auto-tuning procedures)

1) Wire the motor to the inverter.
2) Turn on power to the inverter, and confirm that parameters A-00 to A-08 of the motor rated value etc., and previous auto-tuning value A-11 to A-33 (except for A-30) are set.
3) Set 1 or 2 (d-axis mode) to A-10 (auto-measuring mode)
4) Once turn off power, open the unit cover, and turn on the DIP switch (SW1) numbers 5 and 6 on the inverter control PCB VFC2001-Z.
5) Close the unit cover, and reapply power. If an input MC is on the main circuit, turn on power to the input MC. ("tunRA" will be displayed on the console.)
6) Press the JOG key on the console, and the auto-tuning will start. ("tunSE" will be displayed.)
7) The auto-tuning will be finished in a minute (depending on the load machine). ("tunEd" will be displayed on the console.)
8) Turn off power to the inverter, open the unit cover, and turn off the DIP switch (SW1) numbers 5 and 6.
9) Close the unit cover, reapply power, and make sure that the data of the parameters A-30 have been updated.

(Data to be automatically measured during d-axis measurement auto-tuning)

No.	Item	Unit	No.	Item	Unit	No.	Item	Unit
A-30	d-axis position pulse	—						

Data of A-11 to 29 and A-31 to 33 except for the data shown above has to be set beforehand.

Safety precautions

- In the d-axis measurement tuning, voltage is on the motor. It can cause an electric shock. Take care not to touch it.
- Even in the d-axis measurement mode, the motor slowly rotates in normal direction. Pay attention to the machine for in case of tuning with the load machine connected, load machine will also move.

4-6. Troubles during auto-tuning

If any trouble occurs during tuning, the trouble is displayed on the console, and the inverter stops.

1) When "SEt0" is displayed

The setting of any of A-00 to A-08 may be improper. Review the settings, and redo the tuning from the beginning.

2) When "tUn" and "Err88" are displayed alternately. (The 88 part displays error code 01 to 99)

This indicates that a trouble occurred during tuning or the results of tuning are abnormal. Check the inverter capacity setting, the settings of A-00 to A-08 and the wiring between the inverter and the motor, and check that the motor is not locked by the brake and loads are not connected to the motor (only in the full-mode). 2 digit number following Err is the error code. See error code table below.

3) When "PGE8" is displayed. (8 part will be 1 to 5)

Input error from the PG. Check if there if any error to the wiring from PG, connection, PG pulse count setting (A-07) and PG itself and then redo from the beginning. (Only for ED64P and ED64V mode.)

4) When another protection is displayed

This indicates that a protective device operated during auto-tuning. See "Chapter 7 Error! The original of the reference is not found" and remove the causes of the trouble. Then, redo the tuning from the beginning.

(Table of error code at tuning failure)

Error code	Meaning of error	Major check items
01	The motor cannot rotate during auto-tuning	Is there no brake applied to the motor? Is there no large load applied to the motor? Is the PG connected properly?
02	Data was not set at the DC test	Is the wired correct? Is the rated current etc. set properly?
03	Overflow occurred during calculation of primary resistance	Is the adjustment of DC voltage done? Is the matching of motor and inverter proper? Is the setting of inverter capacity correct?
04	Overflow occurred as the result of calculation of primary resistance	
11 to 16	Overflow occurred at calculation of dead time	
20 to 24	Overflow at calculation of Lq or Lq changing rate (30, 60, 90 or 120%)	
30 to 34	Overflow at calculation of Ld or Ld changing rate (30, 60, 90 or 120%)	
40, 41	d-axis pulse width setting or d-axis pulse amplitude setting error	Is the matching of motor and inverter proper? Is the rated current etc. set properly?
51	Overflow during calculation of iron loss conductance	Is **A-00～A-08** set correctly?
50	Motor is not accelerating	Is there no excessive load applied to the motor?
60	Pole direction determination cannot be done by d-axis auto-tuning	Is the motor not locked? Is the PG correctly wired?
61	No motor rotation by d-axis auto-tuning	
98	Others	---
99	1) STOP key is pressed during auto-tuning 2) Under voltage during auto-tuning 3) Protective operation during auto-tuning (this code is displayed after the protective operation is reset)	Remove the cause of under voltage and protective operation

4-7. Second motor auto-tuning (Only when using second motor function)

ED64A is provided with "second motor function" to operate 2 motors with 1 inverter. When operating second motor, change all the wiring of PG and inverter-motor with contactor or relay etc. shift to second motor by motor rate of internal inverter, memorized beforehand by multi-function input function (see Chapter 3) .

At here, the procedure of auto-tuning of second motor is shown.

When using second motor function, turn on the L-00 second motor function selection, and set second motor rate (shown on motor nameplate) to L-01 to L-08 of the following.

No.	Item	Setting range	No.	Item	Setting range
L-00	Selecting 2nd motor use	OFF/ON	L-03	2nd motor rated current	40 to 150% of INV rated current
L-01	2nd motor rated capacity	3 rank bellow INV rated capacity to INV rated capacity	L-04	2nd motor rated rotational speed	67 to 100% of Max. rotational speed
L-02	2nd motor rated voltage	140 to 230(200Vclass) 280 to 460(400Vclass)	L-05	Selection of 2nd motor pole count	2 pole to 12 Pole
			L-06	2nd motor PG pulse count	60 to 3600 (Unnecessary for ED64S)

(Rated INV in the table refer to the rate of inverter used)

Layout “second motor select” to multi-function input terminal, and turn the terminal ON (see Chapter 3). Operate full-mode, DC-mode auto-tuning and d-axis measurement mode auto-tuning in this state just as same as the direction of auto-tuning of the usual motor. Result of auto-tuning will be set to L-08 to L-24 shown below, instead of setting of A-17 to A-33. (Dead time compensation value (A-11 to A-16) will not be set at second motor auto-tuning, because it is inverter’s own data. Also use A-10 for the selection of auto-tuning just as same as for normal motor.)

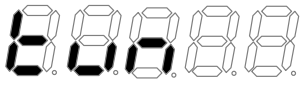
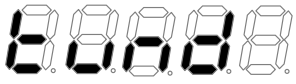
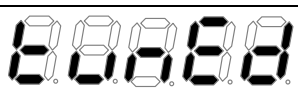
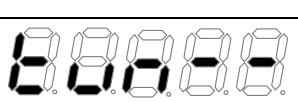
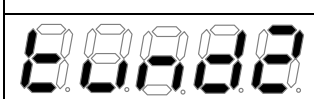
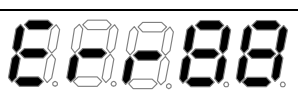
(Data to be automatically measured during second motor auto-tuning)

No.	Item	Unit	No.	Item	Unit
L-08	2nd motor primary resistance	mΩ	L-17	2nd motor changing rate at 30% d-axis current	%
L-09	2nd motor d-axis inductance	mΩ	L-18	2nd motor changing rate at 60% d-axis current	%
L-10	2nd motor q-axis inductance	mH	L-19	2nd motor changing rate at 90% d-axis current	%
L-11	2nd motor magnetic flux	mH	L-20	2nd motor changing rate at 120% d-axis current	%
L-12	2nd motor iron loss conductance	%	L-21	2nd motor d-axis position (ED64P, V mode only)	--
L-13	2nd motor changing rate at 30% q-axis current	%	L-22	2nd motor pole determination mode without sensor	--
L-14	2nd motor changing rate at 60% q-axis current	%	L-23	2nd motor d-axis measurement pulse width	ms
L-15	2nd motor changing rate at 90% q-axis current	%	L-24	2nd motor d-axis measurement pulse voltage amplitude	--
L-16	2nd motor changing rate at 120% q-axis current	%			

At second motor auto-tuning display of the console would be ”tunE2”→”tunE2”,
“tunE2”→”tunE2” and “tunE2”→”tunE2”

4-8. Display on console during auto-tuning

The following table shows the LED display on the console (SET64-Z) during auto-tuning.

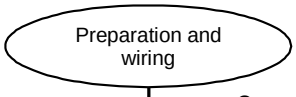
LED display	Meaning of display	LED display	Meaning of display
	Preparation for Full-mode auto-tuning		Preparation for 2nd motor d-axis measurement auto-tuning
	Preparation for DC-mode auto-tuning		During auto-tuning
	Preparation for d-axis measurement auto-tuning		Normal termination of auto-tuning
	Preparation for second motor full-mode auto-tuning		Abnormal termination of auto-tuning (failure) (Display alternately)
	Preparation for second motor DC-mode auto-tuning		

5. Procedures for test running

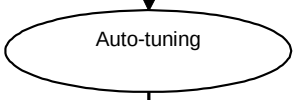
During test running, at first, test the motor in the disconnected state. After ensuring that the motor operates normally, connect the motor to the machine, and adjust the speed control gain. This section explains the procedures for test running using the console panel.

5-1. Test running of motor in disconnected state

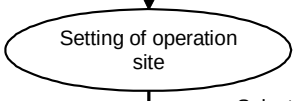
At first, test the motor in the disconnected state.



Connect the inverter and the power supply (R, S and T), and connect the inverter and the motor (U, V and W). Connect earth wires to the earth terminals (⏚), connect the DCL (if necessary), and wire the inverter and the PG. (Wiring of PG is for ED64P, V mode only)
(See 2 “Connection” in Chapter 1.)



Set the maximum rotational speed (maximum frequency) and motor ratings (A-00 to A-10), and perform the full-mode auto-tuning.
(See 4 “Auto-tuning” in Chapter 2.)

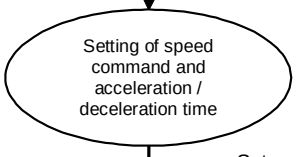


Select the console panel (SET64-Z) as the running command and speed command operating site. Set the items as shown below.

(Expanded setting items in area b) (The items are set as shown below before shipment.)

No.	Item	Setting
b-15	Selecting setting site in interlock mode	Set to 1 (console)
b-16	Selecting rotational speed command setting site	Set to 0 (interlock)
b-17	Selecting speed command site	Set to 0 (interlock)
b-18	Selecting jogging command site	Set to 0 (interlock)

(See 3.1 “Procedures for reading and writing function setting data” in Chapter 2.)



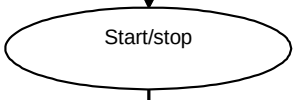
Set an appropriate speed command and acceleration/deceleration time in the following items.

(Basic setting times)

No.	Item	Setting range	Unit
0.SrEF	Set rotational speed	−Max. rotational speed to max. rotational speed	r/min
3.Acc1	Acceleration time	0.0 to 3600.0	sec
4.Dec1	Deceleration time	0.0 to 3600.0	sec

Note) The acceleration/deceleration time is the time required to accelerate/decelerate from 0 to max. rotational speed / from max. rotational speed to 0.

(See 3.1 “Procedures for reading and writing function setting data” in Chapter 2.)



Press the MONI · OPR/FNC key to set the inverter to the MONI · OPR mode (FNC-LED is turned off), and press the START key. The motor will be accelerated at the rate set in 3.Acc1 to the speed set in 0.SrEF. If the STOP key is pressed, the motor will be decelerated at the rate set in 4.Dec1. (When 0 (free stop) has been specified in b-03, if the STOP key is pressed, the motor will stop after free running.)

(See 3.3 “Operation through SET64-Z” in Chapter 2.)

5-2. Adjustment of speed control gain

After the completion of test running of the single motor, connect the motor to the machine, and adjust the speed control gain.

(1) Setting of inertia moment

Since ED64A uses MFC control combining feedforward control and cancellation for speed control, robust speed control can be realized by setting the inertia moment.

For 9.ASrJ (speed control inertia moment), specify 20 to 100% of the sum of the motor rotor inertia moment and the load machine inertia moment. (When the motor and the load machine are connected through belts, the inertia moment of the load machine is not included, and the sum of the motor rotor inertia moment and the inertia moment of the pulley connected to the motor shaft is used as the inertia moment. When a large number of gears are used and abnormal noise from gear clash may be caused by backlash, set a lower value, or set E-06 and E-07 to OFF to disable the cancellation and feedforward control.)

Fundamental setting	Item	Setting range	Unit
9.ASrJ	Speed control inertia moment	0 to 65535	gm^2

Note 1) 9.ASrJ must be set in gm^2. Set the value obtained by multiplying the value determined in kgm^2 by 1000.

Note 2) The inertia moment must be set in 9.ASrJ. Do not set GD^2. (1/4 of the value of GD^2)

The following table shows the inertia moments of standard ED motors. As for motors not listed below, contact us.

Type	Rotor inertia moment (gm^2)	Type	Rotor inertia moment (gm^2)	Type	Rotor inertia moment (gm^2)
EDM1711V	17	EDM2221V	71	EDM3111V	313
EDM1721V	25	EDM2231V	83	EDM3121V	393
EDM1911V	32	EDM2721V	175	EDM3131V	470
EDM2211V	60	EDM2751V	222		

(2) Adjustment of speed control proportional gain and speed control integration time constant

Run the motor connected with the machine, and adjust the 7.ASrP (speed control proportional gain) and 8.ASri (speed control integration time constant).

- When the rotational speed is set to an appropriate running speed and the motor is operated at the constant speed
  1) If the speed is changed by load fluctuation on the load machine:
     → Increase ASrP.
  2) If the speed fluctuates even when the motor is operated at the constant speed:
     → Decrease ASri (increase the speed).
  3) If the speed oscillates and abnormal noise from gear clash occurs:
     → Decrease ASrP, and increase ASri (decrease the speed).
- When the speed command is changed step by step
  1) If the speed response is slow: → Increase ASrP.
  2) If the speed overshoots: → Decrease ASrP.
  3) When the speed oscillates: → Decrease ASrP, and increase ASri (decrease the speed).

Fundamental setting	Item	Setting range	Unit
7.ASrP	Speed control proportional gain	3 to 50	
8.ASri	Speed control integration time constant	20 to 10000	ms

Note 1) Unlike in the case of normal PI control, when this control method is used, the apparent integration time changes as the P gain (speed control proportional gain) changes. Therefore, normally, adjust ASrP keeping ASri as default. If the speed cannot be controlled by adjusting only ASrP, adjust ASri.

6. Changing inverter control mode

ED64A is installed with 3 modes: ED64P (with speed/magnetic pole position sensor) mode, ED64V (with speed sensor) mode and ED64S (without speed/magnetic pole position sensor) mode. The mode will be set to the specification of the ED motor of normal use.

Control mode can be changed by following 2 ways, in case when control mode different from the requested is set or when the mode without sensor is needed owning to the failure of PG installed to the ED motor.

(1) Initialize the set data and change mode.

See (Memory initializing procedures) of 7-1 “Procedures for setting inverter capacity and DC voltage detection gain.” and initialize the control mode you want to change.

This procedure suits when operating inverter in control mode different from set right now, because initializes all the data. After the mode change, data setting and auto-tuning with the new motor is necessary.

(2) Change only the control mode with set data as present.

Operate the following “Operation of control change mode” of 6-1 and can change only the control mode. When operating in this procedure, there will be no change to the data, except for the ones that changes the range by the control mode change (note2). Result of auto-tuning will also remain, so if the motor is same, auto-tuning is not needed. (But when shifting to ED64P or ED64V mode after auto-tuning is done in ED64S mode, d-axis measurement auto-tuning is needed because d-axis position is not set. Use this procedure when changing from ED64S mode is needed owning to the failure of PG etc. (Note1, note2))

6-1 Operation of changing control mode

1) Turn OFF power of the inverter.
2) Remove the cover, turn on DIP switch (SW1)-4 on VFC2001-Z PCB.
3) Close the cover, and turn on power.
4) After  is displayed in the display window,  flashes. Press [SET] key
5)  is displayed. After selecting the mode to be used with ↑ and ↓ keys, press the [SET] key.
( ＝without sensor mode,  =with speed sensor mode,
 =with speed/magnetic pole position sensor mode)
6)  is displayed. This means the changing of control mode has been completed.
7) Turn OFF power of the inverter.
8) Remove the cover, and turn off the DIP switch (SW1)-4.
9) Close the cover.

Note 1) When shifting the mode to ED64S mode from ED64P or V mode, control accuracy of speed and toque, response characteristics will deteriorate. Please be careful when using ED64P or V mode in need of accuracy and response.

Note 2) Setting item written below will change the value when control mode changes.

Display	Item	ED64S⇔ED64V	ED64S⇔ED64P	ED64P⇔ED64V
0.SrEF	Setting rotational speed	To the initialized value	To the initialized value	No change
A-01	Minimum rotational speed	To the initialized value	To the initialized value	No change
A-10	Tuning selection	To the initialized value	To the initialized value	To the initialized value
E-08	Starting speed at variable structure proportional gain	To the initialized value	To the initialized value	No change
E-09	Variable structure proportional gain minimum ratio	To the initialized value	To the initialized value	No change
G-09	6F output selection	To the initialized value	To the initialized value	No change

7. Operations after replacement of PCB

This section explains the operations to be performed after replacement of the control PCB (VFC2001-Z).

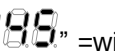
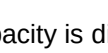
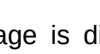
- Induction motor drive inverter (VF64) and inverter for ED motor drive (ED64A) use same control PCB (VFC2001-Z) but different control software is written inside. Control PCB for VF64A can not be used to ED64A. (ED64A control PCB has soft version code ED64-XX-XX (XX-XX are number or alphabet) on the surface of IC18)
- When ordering spare or replacement parts of control PCB, please designate "for ED64A"

When VFC2001-Z is individually delivered as a spare part, the parameters of the board are at initialized value. Setting the parameters appropriately to the inverter are necessary in use.

7-1. Procedures for setting inverter capacity and DC voltage detection gain

The inverter capacity and DC voltage detection gain can be set by initializing the memory.

(Memory initializing procedures)

1) Turn OFF power to the inverter.
2) Remove the cover, and turn on the DIP switch (SW1)-7 on the PCB VFC2001-Z.
   Fit a DC voltmeter or a tester between terminal block ⊕ 2 and⊖.
3) Close the cover, and turn on power.
4) After "  " is displayed in the display window, "  " flashes. Press the SET key.
5) "  " is displayed. After selecting the mode to be used with the ↑ and ↓ keys, press the SET key.
   ("  " =without sensor mode, "" =with speed sensor mode, "" = with speed/magnetic pole position sensor mode)
6) The capacity is displayed like "  ." Set the capacity of ED64A to be used using the ↑ and ↓ keys, and press the SET key to enter the capacity.
7) The voltage is displayed such as "  ." Measure the current DC voltage, set the measured DC voltage using the JOG/→ key and ↑ and ↓ keys, and enter the value with the SET key. Then, the DC voltage detection gain is calculated from the detected DC voltage value and the set value, and the calculated gain is automatically set in S-00. (If the DC voltage detection gain must be adjusted after initialization, adjust S-00 directly.)
8) After "  " is displayed for several ten seconds, "  " is displayed. This means the memory initialized.
9) Turn off power to the inverter.
10) Remove the cover, and turn off the DIP switch (SW1)-7. Remove the DC voltmeter or tester fitted in Step (2).
11) Close the cover.

⚠ Safety precautions

- For measurement of DC voltage, use a DC voltmeter (or tester) that can measure voltage of 500 V or more (200V class) or 1000 V or more (400V class).
- High voltage is applied to the DC voltmeter (or tester). The voltage measurement shall be performed by electricians.

7-2. Adjusting external analog input gain

Setting items below are adjusting gain of analog input. See setting item area G of Chapter 3 before adjusting.

Display	Item	Setting area	Initialize data	Unit
G-00	+ side adjusting gain of analog input	50.00 to 150.00	100.00	%
G-01	- side adjusting gain of analog input	50.00 to 150.00	100.00	%

Chapter 3 Explanation of function setting items

ED64A inverter can be operated by setting its functions on the standard console panel (SET64-Z). The setting items for ED64A are classified into fundamental setting items and functional setting items. The functional setting items are grouped into areas A to S according to function type as shown below to facilitate invocation of the functions.

Classification	Area	Setting item （area）	Remarks
Fundamental setting items	Fund	Set rotational speed, jogging rotational speed acceleration/deceleration time 1,2 speed control gain	
Functional setting items	A-xx	Max. rotational speed, motor rate, motor constant setting area	Indispensable setting area
	b-xx	Operation mode and operation sequence selection area	Set when selecting operation mode, HC function, sequence function, operating site.
	c-xx	Setting area related to multi-function output	Set when using multi- function output
	d-xx	Acceleration/deceleration setting, rotation speed jump function, MRH function	Set when using S-curve accel./decel., 3rd and 4th accel./decel., rotational speed jump, MRH function
	E-xx	Setting area related to torque limit, torque command characteristics, speed control, vector control	Set when using torque limit, torque command characteristics and temperature compensation function, cancellation and feedforword functions off, adjust variable structure speed control gain and current control gain.
	F-xx	Setting area related to built-in DB operation, protective function, trace-back function	Set when using built-in DB, protective function for over-speed, over-frequency, over-torque, speed control error, trace-back in HC function
	G-xx	Setting area for analog input/output	Set when selecting analog input gain adjustment, analog input characteristics, analog output
	H-xx	Setting area related to program operation, preset operation	Set when using program operation, preset rotational speed function
	i-xx	Drooping control, machine loss compensation setting area	Set when using drooping control, machine loss compensation
	J-xx	Setting area for communication option	Set when using communication option
	L-xx	2nd motor parameters 2nd motor speed control gain setting area	Set when using 2nd motor function
	n-xx	Monitor adjustment area	Effective when using line monitor
	P-xx	Super-block constant setting area	Set when using HC function (Super-block)
	S-xx	Inverter capacity, DC voltage gain	Set when adjusting Inverter capacity, DC voltage gain

Note) If the value of the setting items in the chart differs depending on the control mode, the effective control mode: (ED64S), (ED64V) and (ED64P) will be written in the column. Column with no particular writing is for all modes.

1. List of ED64A setting items

1-1. Fundamental setting area

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
0.SrEF	Setting rotational speed	- max. speed to max. speed	(ED64S) 18 (ED64P,V) 0	r/min	○
1.FJoG	Jogging speed in normal direction	Min. speed to 300	24	r/min	○
2.RJoG	Jogging speed in reverse direction	-300 to -Min. speed	-24	r/min	○
3.Acc1	Acceleration time (1)	0.0 to 3600.0	30.0	sec	○
4.dEc1	Deceleration time (1)	0.0 to 3600.0	30.0	sec	○
5.Acc2	Acceleration time (2)	0.0 to 3600.0	0.3	sec	○
6.dEc2	Deceleration time (2)	0.0 to 3600.0	0.3	sec	○
7.ASrP	Speed control proportional gain (1)	3 to 50	15	-	○
8.ASrI	Speed control integration time constant	20 to 10000	40	ms	○
9.ASrJ	Speed control system inertia moment	0 to 65535	10	gm^2	○

1-2. Area A (max. motor speed, motor rating and parameter setting area)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
A-00	Max. rotational speed	300 to 14700	1800	r/min	×
A-01	Min. rotational speed	0 to Max. rotational speed	(ED64S) 12 (ED64P,V) 0	r/min	○
A-02	Rated motor capacity	3 rank below rated inverter capacity to rated inverter capacity	0.0	kW	×
A-03	Rated motor voltage	(200Vclass) 140 to 230V/ (400Vclass) 280 to 460V	0	V	×
A-04	Rated motor current	40% to 150% of rated inverter current	0.0	A	×
A-05	Rated motor rotational speed	67% to 100% of max. rotational speed	0	r/min	×
A-06	Motor pole count	2 to 12[Pole]	6	Pole	×
A-07	PG pulse count	60 to 3600 (cannot change at ED64S mode)	600	P/R	×
A-08	PWM carrier frequency	2.0 to 14.0	6.0	kHz	×
A-09	q-axis pulse magnetic determination method current	50 to 200 (% to the motor rated current)	50	%	×
A-10	Tuning selection	(Full-mode auto-tuning) 0:normal, 1:with load (normal) 2:with load (reverse) (DC/d-axis measurement auto-tuning) 0: DC 1:d-axis measurement (normal) 2:d-axis measurement (reverse)	0	-	×
A-11	Dead time compensation (Phase U, +side)	0 to 400	0	-	×
A-12	Dead time compensation (Phase U, -side)	0 to 400	0	-	×
A-13	Dead time compensation (Phase V, +side)	0 to 400	0	-	×
A-14	Dead time compensation (Phase V, -side)	0 to 400	0	-	×
A-15	Dead time compensation (Phase W, +side)	0 to 400	0	-	×

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
A-16	Dead time compensation (Phase W, -side)	0 to 400	0	-	×
A-17	Motor primary resistance	(Setting range vary depending on the inverter capacity)	0	mΩ	×
A-18	Motor d-axis inductance		0	mΩ	×
A-19	Motor q-axis inductance		0	mH	×
A-20	Motor magnetic flux	0.001 to 9.999	0.000	mH	×
A-21	Motor iron loss inductance	0.0 to 300.0	0.0	Wb	○
A-22	Lq changing rate of 30% q-axis current	-100.0 to 100.0	0.0	%	×
A-23	Lq changing rate of 60% q-axis current	-100.0 to 100.0	0.0	%	×
A-24	Lq changing rate of 90% q-axis current	-100.0 to 100.0	0.0	%	×
A-25	Lq changing rate of 120% q-axis current	-100.0 to 100.0	0.0	%	×
A-26	Lq changing rate of 30% d-axis current	-100.0 to 100.0	0.0	%	×
A-27	Lq changing rate of 60% d-axis current	-100.0 to 100.0	0.0	%	×
A-28	Lq changing rate of 90% d-axis current	-100.0 to 100.0	0.0	%	×
A-29	Lq changing rate of 120% d-axis current	-100.0 to 100.0	0.0	%	×
A-30	d-axis position	0 to 30000 (-1 refer to setting of not yet done) (Cannot change at ED64S mode)	-1	-	×
A-31	Selecting magnetic pole determination method	0: q-axis pulse magnetic pole determination method (1) 1: q-axis pulse magnetic pole determination method (2) 2: d-axis pulse magnetic pole determination method	0	-	×
A-32	d-axis measurement width	-12.7 to 12.7	0.0	ms	×
A-33	d-axis measurement pulse amplitude	0: 30% 1: 50% 2: 75% 3: 100%	0	-	×

1.3 Area b (operation mode and operation sequence setting area)

Standard console LED display	Setting item	Setting area (option)	Initialize data	Unit	Rewriting during running
b-00	Selecting use of HC (Super-block) function	0 :OFF(non-use), 1 :ON(in use)	OFF	-	×
b-01	Selecting control mode (Speed/torque/precedence)	0 :Speed control (ASR)mode 1 :Precedence of torque in －side 2 :Precedence of torque in ＋side 3 :Torque control (ATR) mode 4 :Contact conversion of speed/ torque control	0	-	×
b-02	Selecting high-efficiency mode	1 :ON (high-efficiency mode on)	ON	-	×
b-03	Selecting stop mode	0 :Fee stop 1 :Deceleration stop 2 :Deceleration stop with DC brake	1	-	○
b-04	Stop detection rotational speed	0 to 300	30	r/min	○
b-05	DC brake operating time	0.0 to 10.0	0.0	sec	○
b-06	DC brake gain	0.1 to 500.0	(ED64S) 40.0 (ED64P,V) 100.0	%	○
b-07	Selecting jogging stop mode	0 :Free stop 1 :Deceleration stop 2 :Deceleration stop with DC brake	1	-	○
b-08	Stop detection speed during jogging	0 to 300	30	r/min	○
b-09	Speed control proportional gain (2)	3 to 100	15	-	○
b-10	Selecting jogging proportional gain	0 : Speed control proportional gain (1) 1 : Speed control proportional gain (2) 2 : Selecting special mode	0	-	○
b-11	Selecting restart after instantaneous under voltage	0 :ON(use), 1 :OFF(non-use)	OFF	-	×

Standard console LED display	Setting item	Setting area (option)	Initialize data	Unit	Rewriting during running
b-12	Selecting reverse rotation prohibition mode	0 :Normal 1 :Prohibit running in reverse direction of the command 2 :Prohibit running in reverse rotation	0	-	×
b-13	Regenerative stall preventive function selection of use	0 :OFF(non-use), 1 :ON(use)	OFF	-	×
b-14	Selecting use of Sequence (PLC) function	0 :OFF(non-use), 1 :ON(use)	OFF	-	×
b-15	Selecting command input site	0 :Terminal block 1 :Consol (SET64-Z) 2: Digital communication option (OPCN64 etc.)	1	-	×
b-16	Selecting rotational speed command input site	0 : According to the setting of b-15 1 : Terminal block 2 : Console (SET64-Z) 3 : Digital communication option (OPCN64 etc.) 4 :Analog input option (ISO64,IO64-Z） 5 :BCD input option (BCD64)	0	-	×
b-17	Selecting running command input site	0 :According to the setting b-15 1 :Terminal block 2 :Console (SET64-Z) 3 Digital communication option (OPCN64etc.)	0	-	×
b-18	Selecting jogging command input site	0 :According to the setting of b-15 1 :Terminal block 2 :Console (SET64-Z) 3 :Digital communication option (OPCN64etc.）	0	-	×
b-19	Selecting torque command input site	0 :Terminal block 1 :Analog option (ISO64,IO64-Z) 2 :Digital communication option (OPCN64etc.）	1	-	×
b-20	Free starting maximum rotational speed (only ED64P, ED64V mode)	100 to 150 (% to the motor rated rotational speed (A-05)) (cannot change at ED64S mode)	100	%	○
b-21	Inverter maximum output voltage	80 to 200 (motor rated voltage (% to A-03))	100	%	○

1-4. Area c (setting area related to multi-function input/output)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
c-00	Selecting multi-function input site	0 :Terminal block 1: Digital communication option (OPCN64 etc.)	0	-	×
c-01	Selecting multi-function input terminal (1) function	0: Selecting preset rotational speed 1 1: Selecting preset rotational speed 2 2: Selecting preset rotational speed 3 3 :Selecting accel./decel. time 1 4 :Selecting accel./decel. time 2 5 :Rotational speed up (MRH mode) 6 :Rotational speed down (MRH mode) 7 :Hold rotational speed 8 :Prohibit S-curve accel./decel. 9 : Max. rotational speed reduction 10:Drooping control non-operation	0	-	×
c-02	Selecting multi-function input terminal (2) function		1	-	×
c-03	Selecting multi-function input terminal (3) function		3	-	×
c-04	Selecting multi-function input terminal (4) function		4	-	×
c-05	Selecting multi-function input terminal (5) function		7	-	×
c-06	Selecting multi-function input terminal (6) function		13	-	×

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
		11:Selection of torque control 12:Reverse running command 13:DC brake command 14: — 15:External failure signal 1 (protective relay 86A active) 16:External failure signal 2 (protective relay 86A active) 17:External failure signal 3 (protective relay 86A active) 18:External failure signal 4 (protective relay 86A active) 19:External failure signal 1 (protective relay 86A inactive) 20:External failure signal 2 (protective relay 86A inactive) 21:External failure signal 3 (protective relay 86A inactive) 22:External failure signal 4 (protective relay 86A inactive) 23:Traceback external trigger 24:Select 2nd motor 25:Emergency stop (B contact) 26:Program step operation run 27:Selecting terminal block of rotational speed command			
c-07	Selecting multi-function output terminal (1) function	0 :Program operation finish 1 :Rotational speed detection (1) (Speed = detection speed) 2 :Rotational speed detection (1) (Speed >= detection speed) 3 :Rotational speed detection (1) (Speed <= detection speed) 4 :Rotational speed detection (2) (Speed = detection speed) 5 :Rotational speed detection (2) (Speed >= detection speed) 6 :Rotational speed detection (2) (Speed <= detection speed) 7 :Complete of accel./decel. 8 :Torque detection 9 :Absolute value torque detection 10:Under voltage failure 11:Overload pre-alarm 12:Retrying 13:Reverse running 14:Protective operation code 15:Sum check error	7	-	×
c-08	Selecting multi-function output terminal (2) function		1	-	×
c-09	Selecting multi-function output terminal (3) function		0	-	×
c-10	Selecting multi-function output terminal (4) function		8	-	×
c-11	Detected rotational speed (1)	-Max. rotational speed to Max. rotational speed	0	r/min	○
c-12	Detected rotational speed (2)	-Max. rotational speed to Max. rotational speed	0	r/min	○
c-13	Rotational speed detecting range	0 to 600	0	r/min	○
c-14	Detected torque command (with polarity)	-205 to 205	0	%	○
c-15	Detected torque command (absolute value)	0 to 205	0	%	○
c-16	Overload pre-alarm operating level setting	0 to 100	50	%	○
c-17	Max. speed reduction ratio	50.0 to 100.0	90.0	%	○

1-5. Area d (acceleration/deceleration setting, rotational speed jump function and MRH function)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
d-00	Selecting acceleration/ deceleration time at normal running	0: Accel./decel. time (1) 1: Accel./decel. time (2) 2: Accel./decel. time (3) 3: Accel./decel. time (4)	0	-	×
d-01	Selecting acceleration/ deceleration time at jogging		1	-	×
d-02	Acceleration time (3)	0.0 to 3600.0	30.0	sec	○
d-03	Deceleration time (3)	0.0 to 3600.0	30.0	sec	○
d-04	Acceleration time (4)	0.0 to 3600.0	30.0	sec	○
d-05	Deceleration time (4)	0.0 to 3600.0	30.0	sec	○
d-06	Selecting use of S-curve acceleration/deceleration	0: OFF (non-use) 1: ON (use)	OFF	-	×
d-07	S-curve accel. start-up time (1)	0.0 to 60.0	0.1	sec	○
d-08	S-curve accel. completion time (1)	0.0 to 60.0	0.1	sec	○
d-09	S-curve decel. Start-up time (1)	0.0 to 60.0	0.1	sec	○
d-10	S-curve decel. completion time (1)	0.0 to 60.0	0.1	sec	○
d-11	S-curve accel.start-up time (2)	0.0 to 60.0	0.1	sec	○
d-12	S-curve accel. completion time (2)	0.0 to 60.0	0.1	sec	○
d-13	S-curve decel. Start-up time (2)	0.0 to 60.0	0.1	sec	○
d-14	S-curve decel. complete time (2)	0.0 to 60.0	0.1	sec	○
d-15	Selecting speed deviation restriction command	0: OFF (non-use) 1: ON (use)	OFF	-	○
d-16	Max. deviation in normal direction	0.0 to 100.0	5.0	%	○
d-17	Max. deviation in reverse direction	-100.0 to 0.0	-5.0	%	○
d-18	Jump rotational speed (1)	0 to Max. rotational speed	0	r/min	○
d-19	Jump rotational speed (2)	0 to Max. rotational speed	0	r/min	○
d-20	Jump rotational speed (3)	0 to Max. rotational speed	0	r/min	○
d-21	Jump rotational speed (4)	0 to Max. rotational speed	0	r/min	○
d-22	Jump rotational speed range	0 to 300	0	r/min	○
d-23	Selecting use of MRH function	0 :OFF(non-use) 1:ON(use)	OFF	-	×
d-24	MRH maximum speed	MRH minimum speed (d-25) to Max. rotational speed	300	r/min	○
d-25	MRH minimum speed	-Max. rotational speed to MRH maximum speed (d-24)	0	r/min	○

1-6 Area E (setting area related to torque limit, torque command characteristics, speed control and vector control)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
E-00	Normal powering torque limit value	0 to 150 (change from 0 to 200% depending on the motor)	150	%	○
E-01	Normal regenerative torque limit value	-150 to 0 (change from -200 to 0% depending on the motor)	-150	%	○
E-02	Reverse powering torque limit value	-150 to 0 (change from -200 to 0% depending on the motor)	-150	%	○
E-03	Reverse regenerative torque limit value	0 to 150 (change from 0 to 200% depending on the motor)	150	%	○
E-04	(Not used)	------	100.0	%	-
E-05	Selecting torque command mode (%/absolute value)	0: Command in % 1: Command in absolute value	0	-	×
E-06	Selecting use of ASR cancellation	0: OFF (non-use) 1: ON (use)	ON	-	×
E-07	Selecting use of ASR feed forward	0: OFF (non-use) 1: ON (use)	ON	-	×
E-08	Starting speed at variable structure proportional gain	0.01 to 100.00	(ED64S)5.00 (ED64P,V)0.01	%	○
E-09	Variable structure proportional gain minimum ratio	0 to 100	(ED64S)20 (ED64P,V)100	%	○
E-10	q-axis current control P gain	0.0 to 200.0	80.0	%	○

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
E-11	q-axis current control I gain	0.0 to 75.0	15.0	%	○
E-12	d-axis current control P gain	0.0 to 200.0	80.0	%	○
E-13	d-axis current control I gain	0.0 to 75.0	15.0	%	○
E-14	Restart prohibition time	100 to 999	100	ms	○
E-15	Selecting use of temperature compensation function	0: OFF (non-use) 1: ON (use)	OFF	-	×

1-7. Area F (built-in DB operation, protective functions and trace-back setting area)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
F-00	Built-in DB operation level	200V class 320.0 to 360.0 400V class 640.0 to 720.0	340.0 680.0	V	○
F-01	Setting of over-speed in normal direction	0 to max. rotational speed × 1.5	1900	r/min	×
F-02	Setting of over-speed in reverse direction	- max. rotational speed × 1.5 to 0	-1900	r/min	×
F-03	Setting of overload protection	20 to 110	100	%	○
F-04	FCL level setting	80 to 125	100	%	○
F-05	Selection of over-torque protective function	0: OFF (non-use) 1: ON (use)	ON	-	×
F-06	Over-torque protective operation level setting	110 to 205	150	%	○
F-07	Over-torque protective operation reference torque	50 to 105	105	%	○
F-08	Selecting use of speed control error function	0: OFF (non-use) 1: ON (use)	OFF	-	×
F-09	Speed range for detection of speed control error on normal direction	50 to 500	100	r/min	○
F-10	Speed range for detection of speed control error on reverse direction	-500 to -50	-100	r/min	○
F-11	Not used	-	0	-	–
F-12	Selecting motor overheat protective operation	0: OFF (non-use) 1: ON (use)	OFF	-	×
F-13	Selecting protective relay (86A) operation during under voltage	0: OFF (non-use) 1: ON (use)	OFF	-	×
F-14	Setting of protection retry count	0 to 5	0		○
F-15	Traceback pitch	1 to 100	1	ms	○
F-16	Traceback trigger point	1 to 99	80	-	○
F-17	Traceback ch1 selection	0 to 64	0	-	○
F-18	Traceback ch2 selection	0 to 64	0	-	○
F-19	Traceback ch3 selection	0 to 64	0	-	○
F-20	Traceback ch4 selection	0 to 64	0	-	○
F-21	Traceback ch5 selection	0 to 64	0	-	○
F-22	Traceback ch6 selection	0 to 64	0	-	○
F-23	Traceback ch7 selection	0 to 64	0	-	○
F-24	Traceback ch8 selection	0 to 64	0	-	○
F-25	Traceback ch9 selection	0 to 64	0	-	○
F-26	Traceback ch10 selection	0 to 64	0	-	○
F-27	Traceback ch11 selection	0 to 64	0	-	○
F-28	Traceback ch12 selection	0 to 64	0	-	○

1-8. Area G (analog input/output setting area)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
G-00	Analog setting adjustment gain on + side	50.00 to 150.00	100.00	%	○
G-01	Analog setting adjustment gain on - side	50.00 to 150.00	100.00	%	○
G-02	Selecting analog speed command signals	0 :0 to ±10V (bi-pole) 1 :0 to 10V (uni-pole) 2 :4 to 20mA 3 :Pulse train	1	-	×
G-03	Analog speed command maximum rotational speed	Absolute value of (G-04) to 100.0	100.0	%	○
G-04	Analog speed command minimum rotational speed	-(G-03) to (G-03)	0.0	%	○
G-05	Analog input 0 limit voltage	0.000 to 1.000	0.000	V	○
G-06	Analog output selection	0 :Output voltage 1 :Output current 2 :Torque command 3 :Motor rotational speed 4 :Rotational speed command 5 :Output super-block 6 :Calibration 7 :Internal monitor (For adjustment by us)	1	-	×
G-07	Analog output adjustment gain	50.0 to 150.0	100.0	%	○
G-08	Analog output adjustment offset	-50.0 to 50.0	0.0	%	○
G-09	Pulse/frequency output selection	0 :PG output (Duty 1:1) (Only selectable at ED64P, V) 1 :Output frequency (6F-output) 2 :Motor rotational speed (6F-output) 3 :Calibration (6Foutput)	2	-	×
G-10	Isolated analog setting adjustment gain	50.00 to 150.00	100.00	%	○
G-11	Selecting isolated analog input signals	0 :0 to 100V 1 :4 to 2mA	0	-	×
G-12	Isolated analog setting top rotational speed	Absolute value of (G-13) to 100.0	100.0	%	○
G-13	Isolated analog setting bottom rotational speed	-(G-12) to (G-12)	0.0	%	○
G-14	Isolated torque command input adjustment gain	50.0 to 150.0	100.0	%	○
G-15	Isolated torque command input adjustment offset	-50.0 to 50.0	0.0	%	○

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
G-16	Selecting isolated analog output	0 :Output voltage 1 :Output current 2 :Torque command 3 :Motor rotational speed 4 :Rotational speed command 5 :Output super-block 6 :Calibration 7 :Internal monitor (For adjustment by us) 8 :Output voltage (4-20mA output) 9 :Output current (4-20mA output) 10:Torque command (4-20mA output) 11:Motor rotational speed (4-20mA output) 12:Rotational speed command (4-20mA output) 13:Output Super-block (4-20mA output) 14:Calibration (4-20mA output)	1	-	×
G-17	Isolated analog output adjustment gain	50.0 to150.0	100.0	%	○
G-18	Isolated analog output adjustment offset	-50.0 to 50.0	0.0	%	○
G-19	Temperature compensation option adjustment offset	-20.0 to 20.0	0.0	-	○
G-20	Temperature compensation option adjustment gain	50.0 to 150.0	100.0	-	○

1-9. Area H (setting area related to program operation and preset operation)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
H-00	Preset rotational speed 1	-Max. rotational speed to Max. rotational speed	0	r/min	○
H-01	Preset rotational speed 2		0	r/min	○
H-02	Preset rotational speed 3		0	r/min	○
H-03	Preset rotational speed 4		0	r/min	○
H-04	Preset rotational speed 5		0	r/min	○
H-05	Preset rotational speed 6		0	r/min	○
H-06	Preset rotational speed 7		0	r/min	○
H-07	Preset rotational speed 8		0	r/min	○
H-08	Selecting program operation mode	0 :OFF (non-use), 1 :One-time 2 :End-less	0	—	×
H-09	Selecting program operation time unit	0 :sec, 1 :min, 2 :hour	0	—	×
H-10	Program operation time 1	0.0 to 3600.0	0.0	—	○
H-11	Program operation time 2		0.0	—	○
H-12	Program operation time 3		0.0	—	○
H-13	Program operation time 4		0.0	—	○
H-14	Program operation time 5		0.0	—	○
H-15	Program operation time 6		0.0	—	○
H-16	Program operation time 7		0.0	—	○
H-17	Program operation time 8		0.0	—	○
H-18	Selecting program accel./decel. operation time 1	0 : Accel./decel. time (1) 1 : Accel./decel. time (2) 2 : Accel./decel. time (3) 3 : Accel./decel. time (4)	0	—	×
H-19	Selecting program accel./decel. operation time 2		0	—	×
H-20	Selecting program accel./decel. operation time 3		0	—	×
H-21	Selecting program accel./decel. operation time 4		0	—	×

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
H-22	Selecting program accel./decel. operation time 5		0	—	×
H-23	Selecting program accel./decel. operation time 6		0	—	×
H-24	Selecting program accel./decel. operation time 7		0	—	×
H-25	Selecting program accel./decel. operation time 8		0	—	×

1-10. Area i (drooping control, machine loss compensation setting area)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
i-00	Selecting use of drooping control	0 :OFF(non-use) 1 :On(use)	OFF	—	×
i-01	Drooping start rotational speed	0.0 to 100.0	0.0	%	○
i-02	Rotational speed of drooping mode change	0.0 to 100.0	0.0	%	○
i-03	Drooping rate	0.0 to 50.0	0.0	%	○
i-04	Drooping start torque	0.0 to 90.0	0.0	%	○
i-05	Selecting machine loss compensation	0 :OFF(non-use) 1 :ON(use)	OFF	—	×
i-06	Machine loss offset value	0 to 100	0	%	○
i-07	Machine loss tilt	0 to 100	0	%	○

1-11. Area J (communication option setting area)

Standard console LED display	Setting item		Setting range (option)	Initialize data	Unit	Rewriting during running
J-00	Selecting use of communication option		0 :OFF(non-use), 1 :ON(use)	OFF	-	×
J-01	ASYC64-Z communication speed		0 :1200bps 1 :2400bps 2 :4800bps 3 :9600bps 4 :19200bps 5 :38400bps	4	-	×
J-02	OPCN64 communication speed		0 :125kbps 1 :250kbps 2 :500kbps 3 :1Mbps	3	-	×
J-03	PBUS64 slave station address		0 to 126	2	-	×
J-04	OPCN64 option input OPCN64→master station) number of frames		3 to 19	14	-	×
J-05	OPCN64 option output (master station→ OPCN64) number of frames		2 to 12	6	-	×
J-06	Selecting loading BCDIN64 input		0 :Auto 1 :Edge trigger operation 2 :Level trigger operation	0	-	×
J-07	Selecting use of BCDIN64 input polarity signal		0 :Not using polarity bit 1 :Using polarity bit	0	-	×
J-08	Selecting ASYC64-Z/PBUS64 communication mode		(At ASYC64-Z) 0 :Standard communication mode 1 :Positioning mode 1 2 :Positioning mode 2 (At PBUS64) 0 :PROFIDRIVE mode 1 :Toyo original mode 2 :Special mode	0	-	×
J-09	Positioning speed 0	Effective only when using ASYC64-Z in positioning mode	16 to 200 (Cannot change at ED64S)	100	r/min	○
J-10	Positioning speed 1		16 to 200 (Cannot change at ED64S)	100	r/min	○
J-11	Positioning accelerating speed		0.1 to10.0 (Cannot change at ED64S)	0.5	sec	○

Standard console LED display	Setting item		Setting range (option)	Initialize data	Unit	Rewriting during running
J-12	Positioning decelerating speed		0.1 to 10.0 (Cannot change at ED64S)	0.5	sec	○
J-13	Creeping speed		2 to 16 (Cannot change at ED64S)	2	r/min	○
J-14	Pulse count of creeping movement period		40 to 400 (Cannot change at ED64S)	40	-	○
J-15	Stop pulse number		-50 to 50 (Cannot change at ED64S)	0	-	○
J-16	Selecting emergency stop positioning		0 :OFF(non-use), 1:ON(use) (Cannot change at ED64S)	OFF	-	×
J-17	DNET64 Output Assembly Setting instance number		0 :Instance No.20 1 :Instance No.21 2 to 10:(For our original communication mode)	0	-	×
J-18	DNET64 Input Assembly Setting instance number		0 :Instance No.70 1 :Instance No.71 2 to 15:(For out original communication mode)	0	-	×
J-19	Setting DNET64 Speed Scale		-126 to 127	3	-	×
J-20	Setting DNET64 Monitor Data No.		0 to 119	0	-	○

1-12. Area L (second motor parameter, second motor speed control gain setting area)

Standard console LED display	Setting item	Setting area (option)	Initialize data	Unit	Rewriting during running
L-00	Selecting use of 2nd motor function	0 :OFF(non-use), 1 :ON(use)	OFF	—	×
L-01	2nd motor rated capacity	3 ranks below inverter rated capacity to inverter rated capacity	0.00	kW	×
L-02	2nd motor rated voltage	(200Vclass) 140 to 230V/ (400Vclass) 280 to 460V	0	V	×
L-03	2nd motor rated current	40% to 150% of inverter rated current	0.0	A	×
L-04	2nd motor rated rotational speed	67 to 100% of Max. rotational speed	0	r/min	×
L-05	2nd motor pole	2 to 12[Pole]	6	Pole	×
L-06	2nd motor PG pulse	60 to 3600 (Cannot change at ED64S)	600	-	×
L-07	2nd motor q-axis pulse magnetic determination current	50 to 200 (% to the motor rate current) (Cannot change at ED64S)	50	%	×
L-08	2nd motor primary resistance	(Setting range will vary depending on the inverter capacity)	0.0	mΩ	×
L-09	2nd motor d-axis inductance		0	mH	×
L-10	2nd motor q-axis inductance		0	mH	×
L-11	2nd motor magnetic flux	0.001 to 9.999	0.000	Wb	×
L-12	2nd motor iron loss conductance	0.0 to 300.0	0.0	mmho	○
L-13	2nd motor Lq changing rate of 30% q-axis current	-100.0 to 100.0	0.0	%	×
L-14	2nd motor Lq changing rate of 60% q-axis current	-100.0 to 100.0	0.0	%	×
L-15	2nd motor Lq changing rate of 90% q-axis current	-100.0 to 100.0	0.0	%	×
L-16	2nd motor Lq changing rate of 120% q-axis current	-100.0 to 100.0	0.0	%	×
L-17	2nd motor Lq changing rate of 30% d-axis current	-100.0 to 100.0	0.0	%	×
L-18	2nd motor Lq changing rate of 60% d-axis current	-100.0 to 100.0	0.0	%	×
L-19	2nd motor Lq changing rate of 90% d-axis current	-100.0 to 100.0	0.0	%	×
L-20	2nd motor Lq changing rate of 120% d-axis current	-100.0 to 100.0	0.0	%	×
L-21	2nd motor d-axis position (magnetic pole position)	0 to 30000 (-1 of initialized value means unset) (Cannot change at ED64S)	-1	-	×

Standard console LED display	Setting item	Setting area (option)	Initialize data	Unit	Rewriting during running
L-22	Selecting 2nd motor magnetic pole determination method	0:q-axis pulse magnetic pole determination method (1) 1: q-axis pulse magnetic pole determination method (2) 2: d-axis pulse magnetic pole determination method	0	-	×
L-23	2nd motor d-axis measurement pulse width	-12.7 to 12.7	0	-	×
L-24	Selecting 2nd motor d-axis measurement pulse voltage amplitude	0:30% 1:50% 2:75% 3:100%	0	-	×
L-25	2nd speed control proportional gain	3 to 100	15	-	○
L-26	2nd speed control integral constant	20 to 10000	40	ms	○
L-27	2nd speed control inertia moment	0 to 65535	10	gm^2	○

1-13. Area n (monitor adjustment area)

Standard console LED display	Setting item	Setting range (option)		Initialize data	Unit	Rewriting during running
n-00	Line speed monitor adjustment	0.0 to 2000.0		0.0	-	○
n-01	Adjustment monitor output (ch2) gain	0 to 32767	Monitor setting items for our internal test Normally, keep them initialized	1	-	○
n-02	Adjustment monitor output (ch1) gain	0 to 32767		1	-	○
n-03	Adjustment monitor output (ch2) address (H side)	H0000 to HFFFF		H0000	-	○
n-04	Adjustment monitor output (ch2) address (L side)	H0000 to HFFFF		H0000	-	○
n-05	Adjustment monitor output (ch1) address (H side)	H0000 to HFFFF		H0000	-	○
n-06	Adjustment monitor output (ch1) address (L side)	H0000 to HFFFF		H0000	-	○
n-07	Adjustment monitor display address (H side)	H0000 to HFFFF		HFFFF	-	○
n-08	Adjustment monitor display address (L side)	H0000 to HFFFF		HF900	-	○
n-09	Selecting adjustment monitor display	0 :HEX display 1 :DEC display (Without symbols) 2 :DEC display (With symbols)		2	-	○

1-14. Area o (area for adjustment by supplier)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
o-00 to 64	For internal adjustment by us	For our internal adjustment. Normally keep them initialized.	-	-	–

1-15. Area P (area for setting Super-block constant)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
P-000 to 259	Setting Super-block constant	Look extra number “Directions for Super-block”	-	-	○

1-16. Area S (inverter capacity and DC voltage gain)

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
S-00	VDC detection gain	80.0 to 120.0 (adjusted before shipment)	-	%	×

Standard console LED display	Setting item	Setting range (option)	Initialize data	Unit	Rewriting during running
S-01	Inverter control mode (only reading)	ED64S (without sensor mode) ED64V (with speed sensor mode) ED64P (with speed/magnetic sensor mode)	-	-	×
S-02	Inverter capacity/voltage class (only readout)	2r222 to 18022 2R244 to 50044	-	-	×

2. Explanation of setting items

2-1. Fundamental setting area

Often-used items to run the inverter are organized in fundamental setting area. Other settings are organized in related area A to S of functional setting area.

(Note 1) Among the units used in the following tables, the standard console can display only four units, r/min, Hz, A and V. Other units are not displayed.

Rotational speed

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit (Note 1)
0.SrEF	Setting rotational speed	- max. speed to max. speed	1	18(ED64S) 0(ED64V,P)	r/min
1.FJoG	Jogging speed in normal direction	Min. speed to 300	1	24	r/min
2.rJoG	Jogging speed in reverse direction	-300 to - min. speed	1	-24	r/min

0.SrEF

Item for setting the running rotational speed on the console. This item is effective when the console is specified in b-15 (command input site), the mode is specified in b-16 and when the console is specified as the rotational speed command input site in b-16. (See the “Area b” section.)

1.FJoG/2.rJoG

Set the jogging rotational speed in the normal and reverse directions.

Acceleration/deceleration time setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
3.Acc1	Acceleration time (1)	0.0 to 3600.0	0.1	30.0	sec
4.dEc1	Deceleration time (1)	0.0 to 3600.0	0.1	30.0	sec
5.Acc2	Acceleration time (2)	0.0 to 3600.0	0.1	0.3	sec
6.dEc2	Deceleration time (2)	0.0 to 3600.0	0.1	0.3	sec

Set the time for the speed to increase from 0 to the maximum rotational speed (A-00) and the time for the speed to decrease from the maximum rotational speed (A-00) to 0.

ED64A has 4 levels of acceleration and deceleration time (the acceleration and deceleration time parameters (3) and (4) are set in d-02 to d-05), and the time can be switched by setting, multi-function input from the outside or program running. (At shipment, 3.Acc1 and 4.dEc1 are settings for regular running, and 5.Acc2 and 6.dEc2 are settings for jogging. As for the details of acceleration/deceleration time settings, see the “Area d” section.)

Speed control gain

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
7.ASrP	Speed control proportional gain (1)	3 to 50	1	15	-
8.ASri	Speed control integration time constant	20 to 10000	1	40	ms
9.ASrJ	Speed control system inertia moment	0 to 65535	1	10	gm^2

ED64A controls the speed by MFC control combining feed-forward control and cancellation using disturbance torque observer.

7.ASrP

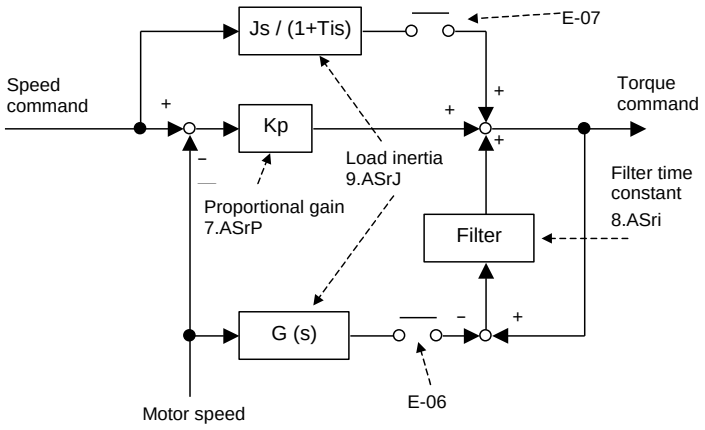
Set the speed control proportional gain.

8.ASri

Set the filter time constant corresponding to the speed control integration gain.

9.ASrJ

Set the inertia moment in gm^2 for cancellation of speed control and feed-forward control. Normally, input 20 to 100% of sum of the value obtained by converting the load inertia moment to the motor axis and the inertia moment of the motor itself. In case of abnormal noise from gear lash caused by large gear backlash or the belt vibration when motor is connected through belt, reduce the setting, or specify non-use of cancellation and feed-forward in E-06 and E-07.



Speed control block

Selecting high-order function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
Func	Selecting functional area	(Press the SET key, and Fund will be displayed. One of the areas A to S can be selected by using the ↑ and ↓ keys.)	-	-	-

While this item selection code is on the display, press the SET key (the code on the display will change to Fund), and you can set the high-order function setting items (setting item areas A to S).

2-2. Setting item area A (setting of max. motor speed, motor ratings and parameters)

This area includes the motor parameters necessary for ED64A inverter to control the motor. Before operating ED64A, set the parameters appropriately to the motor and system to be used.

A-11 to **A-33** are automatically set by performing the auto-tuning. Before starting the regular operation, combine the inverter with the motor to be used, and perform the auto-tuning to set the parameters **A-11** to **A-33**.

Max. and min. motor speed

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-00	Max. rotational speed	300 to 14700	1	1800	r/min
A-01	Min. rotational speed	0 to Max. rotational speed (A-00)	1	18(ED64S) 0(ED64P,V)	r/min

For **A-00**, set the maximum speed (absolute value) at which the motor will be operated. The inverter will control the motor using this setting as 100% (reference). Set the speed in the range from 1 to 1.5 times the rated speed of the motor to be used. If the motor will be used only at a speed lower than its rated speed, set the rated motor speed as the max. speed. (Do not set a value higher than the speed equivalent to a frequency of 240 Hz (14400 for 2-pole motor, 7200 for 4-pole motor and 4800 for 6-pole motor).)

For **A-01**, set the minimum speed at which the motor will be operated. In the speed control mode, even if a speed command with an absolute value lower than this value is input, the speed is restricted to this speed. (However, when the motor is operated in the torque control mode according to the selection of control mode in **b-01**, this setting is ineffective.)

Setting of motor ratings

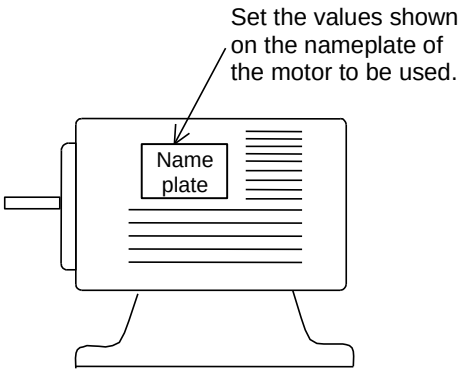
Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-02	Rated motor capacity	3 rank lower than rated inverter capacity to rated capacity	Note 1)	0.0	kW
A-03	Rated motor voltage	140 to 230 (200V class) 280 to 460 (400V class)	1	0	V
A-04	Rated motor current	40 to 150% of rated inverter current	Note 1)	0.0	A
A-05	Rated motor speed	67 to 100% of max. motor speed	1	0	r/min
A-06	Motor pole count	2 to 12 [pole]	-	6	Pole

Note 1) Depending on inverter type

For the items **A-02** to **A-07**, set the rated values shown on the motor nameplate or data sheet. These settings will be used for operating and auto-tuning (automatic measurement of constants). Set them before performing the auto-tuning. (If the auto-tuning is performed before these parameters are set, a setting error **(SEt0)** will occur.) Set the values given on the motor nameplate shown in the figure or the motor data sheet.

If the motor will be used in the constant output (power constant) area, specify the base speed for the rated speed in **A-05**. At a speed lower than the setting in **A-05**, the motor will be in the torque constant control area, and at a speed higher than the rated speed, it will be in the power constant control area

If the motor has two rated voltage or current values, set the larger value within the speed range to be used in **A-03** or **A-04**



Motor nameplate

Setting of PG pulse count (for ED64P and ED64V only)

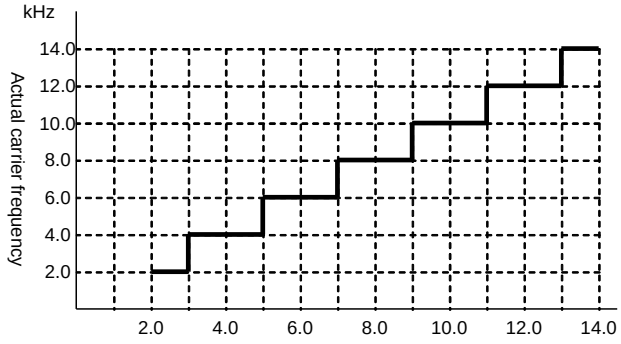
Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-09	Motor PG pulse count	60 to 3600	1	600	P/R

In **A-08**, specify the pulse count of the PG directly connected to the shaft of the motor to be used. (ED64S mode cannot be set in this section.)

Setting of PWM carrier frequency

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-10	PWM carrier frequency	2.0 to 14.0	0.1	6.0	kHz

This setting is the modulation carrier frequency of the inverter voltage output PWM. To synchronize torque control and PWM period, PWM carrier frequency is made to change in pitch of 2.0 kHz. The relation between the setting of **A-08** and the actual PWM carrier frequency is as in the chart below.



A-08 PWM carrier frequency setting (kHz)

At ED64A, PWM carrier frequency is set to 6kHz normally. Also contact us when setting 8kHz for models of 37kW inverter capacity or 6kHz or more for models of over 37kW, for reduction of load is necessary.

q-axis pulse magnetic pole determination current

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-09	q-axis magnetic pole determination current	50 to 200 (% to the motor rated current)	1	50	%

When A-31 selecting magnetic pole determination method, is “q-axis pulse magnetic pole determination method”, determinate the direction of the magnetic pole by running the set current at the starting of the ED64S and ED64V mode. If ED64P mode and A-31 will not be used when they are at “d-axis pulse magnetic pole determination method”, leave them at the initialized value. See section “relation of magnetic pole determination” for more details.

Selecting auto-tuning mode

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-10	Tuning selection	(Full mode auto-tuning) 0: Normal 1:With load (normal) 2: With load (reverse) (DC/d-axis mode auto-tuning) 0: DC mode 1:d-axis measurement (normal) 2: d-axis measurement (reverse)		0	-

A-10 is to select mode at auto-tuning. See “section 4 Auto-tuning of Chapter 2”. This setting will not influence at normal operation.

Items to be set by auto-tuning

The following setting items (**A-11** to **A-33**) are set by performing the auto-tuning.

(Dead time compensation values for IGBT elements in inverter)

Display	Details	Setting range (option)	Setting resolution	Default	Unit
A-11	Dead time compensation value (phase U, + side)	0 to 400	1	0	-
A-12	Dead time compensation value (phase U, - side)	0 to 400	1	0	-
A-13	Dead time compensation value (phase V, + side)	0 to 400	1	0	-
A-14	Dead time compensation value (phase V, - side)	0 to 400	1	0	-
A-15	Dead time compensation value (phase W, + side)	0 to 400	1	0	-
A-16	Dead time compensation value (phase W, - side)	0 to 400	1	0	-

In **A-11** to **A-16**, the dead time compensation values for the IGBT elements of each phase in the inverter are set to accurately calculate the output voltage to be used for control operation. Since each of phases U, V and W has an element on each of the + and - sides, a dead time compensation value is prepared for each of the 6 elements. Optimum values are set through auto-tuning. These items are set in the full-mode auto-tuning or DC-mode auto-tuning.

(Electric constants of motor)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-17	Motor primary resistance	(The setting ranges and resolutions vary depending on the inverter capacity.)	-	0	mΩ
A-18	Motor d-axis inductance			0	mH
A-19	Motor q-axis inductance			0	mH
A-20	Motor magnetic flux	0.001 to 9.999	0.001	0.000	mb
A-21	Motor iron loss conductance	0.0 to 300.0	0.1	0.0	mmho
A-22	Lq changing rate of 30% q-axis current	-100.0 to 100.0	0.1	0.0	%
A-23	Lq changing rate of 60% q-axis current	-100.0 to 100.0	0.1	0.0	%
A-24	Lq changing rate of 90% q-axis current	-100.0 to 100.0	0.1	0.0	%
A-25	Lq changing rate of 120% q-axis current	-100.0 to 100.0	0.1	0.0	%
A-26	Ld changing rate of 30% d-axis current	-100.0 to 100.0	0.1	0.0	%
A-27	Ld changing rate of 60% d-axis current	-100.0 to 100.0	0.1	0.0	%
A-28	Ld changing rate of 90% d-axis current	-100.0 to 100.0	0.1	0.0	%
A-29	Ld changing rate of 120% d-axis current	-100.0 to 100.0	0.1	0.0	%

Electric constant of inside ED motor needed to for control calculation.

In **A-17**, primary winding resistance value of 1 phase of the motor is set. But, because resistance of the wiring between inverter and motor are also included in primary resistance, value of the sum of inside motor and the wiring is set. Therefore, if the wiring length changes drastically after the tuning, perform tuning again. This item is set at full mode auto-tuning or DC mode auto-tuning.

In **A-18** and **A-19**, d-axis and q-axis inductance are set. Because the inductance change according to the current by the saturation, set inductance near 0 current. This item is set at full mode auto-tuning.

In **A-20**, interlinkage to the primary winding of built-in permanent magnet inside rotor of ED motor is set. This item is set at full mode auto-tuning.

In **A-21**, value referring to the conductance of iron loss inside ED motor is set. This item is set at full mode auto-tuning.

A-21 to **A-29** are set with 30%, 60%, 90% and 120% changing rate (correction rate) of current of d-axis and q-axis inductance. **A-18** and **A-19** and these setting values are used to calculate actual inductance and perform control operation. This item is set at full mode auto-tuning.

(d-axis position (magnetic pole)setting)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-30	d-axis position (magnetic pole position)	0 to 30000	1	-1	—

In **A-30**, angle from the reference position angle of PG and position angle of magnetic pole built-in rotor is set in PG pulse count. Perform auto-tuning at every motor, for the value changes depending on the mounting angle of PG, even with motor of same type. Redoing auto-tuning is also necessary when reverse running the motor after switching the connection of U, V and W. This item will not be set after auto-tuning in ED64S mode. -1 means the setting in undone from the initializing value, the protective operation will be performed and the motor will stop if started in ED64P or ED64V mode from this state. This item is set at full mode auto-tuning or d-axis auto-tuning in ED64P or ED64V mode.

(Magnetic pole determination related setting)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
A-31	Selecting magnetic pole determination method	0: q-axis pulse magnetic pole determination method (1) 1: q-axis pulse magnetic pole determination method (2) 2: d-axis pulse magnetic pole determination method	-	0	—
A-32	d-axis measurement pulse width	-12.7 to 12.7	0.1	0.0	mS
A-33	d-axis measurement pulse voltage amplitude	0:30% 1 50% 2:75% 3:100%	-	0	-

Settings related to the magnetic pole direction determination of d-axis measurement auto-tuning and magnetic pole determination at in ED64S mode or the first starting without sensor after turning on the power at ED64V mode.

ED64A is provided with 2 types of magnetic pole determination method: d-axis pulse magnetic pole determination method and q-axis pulse magnetic pole determination method.

When full mode auto-tuning is performed, the magnetic pole determination method suited to the characteristics of the motor to be used will be set automatically to **A-31**. q-axis pulse magnetic pole determination method (1) and (2) refers to the difference of the determination condition, both will operate as q-axis pulse magnetic pole determination method.

<Setting of d-axis pulse magnetic pole determination method>

A-32 and **A-33** are efficient when **A-31** becomes d-axis magnetic pole determination method as a result of auto-tuning. In **A-32** pulse time width at d-axis pulse magnetic determination method is set. When this value is at minus side, it shows that the polarity to be determined has minus characteristics. This item is set at full mode auto-tuning.

<Setting of q-axis pulse magnetic pole determination method>

A-09 setting is efficient when **A-31** is at without sensor starting (starting of ED64S mode or the first starting after turning on the power of ED64V mode) of q-axis magnetic pole determination method (1) or (2) as a result of auto-tuning. (d-axis measurement auto-tuning will not be used)

In **A-09**, command value of q-axis pulse current in % to the motor rated current is set. Normally it should be 50% of initialized value, but in case when "without sensor starting error (SLSE)" protection operates according to the condition of load, adjust this setting drastically. If the adjustment is too large, the shock at starting may appear big.

CAUTION (starting method of ED64S and ED64V mode)

- Magnetic pole determination method (A-31) is changeable by hand, but there is possibility of misjudging the magnetic pole and generate the torque reverse from the command direction. Normally do not change the value, set at auto-tuning.
- The rotor may reverse rotate few times at q-axis pulse magnetic pole determination method. Can not use with systems that may have trouble with few reverse rotation.
- In case, with systems that have trouble with few reverse rotations, A-31 becomes q-axis pulse magnetic pole determination as a result of auto-tuning, contact us.

2-3. Setting item area b (selecting operation mode and operation sequence)

Selecting HC (Super-block) function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-00	Selecting use of H C(Super-block) function	0 :OFF(non-use), 1 :ON(use)	-	OFF	—

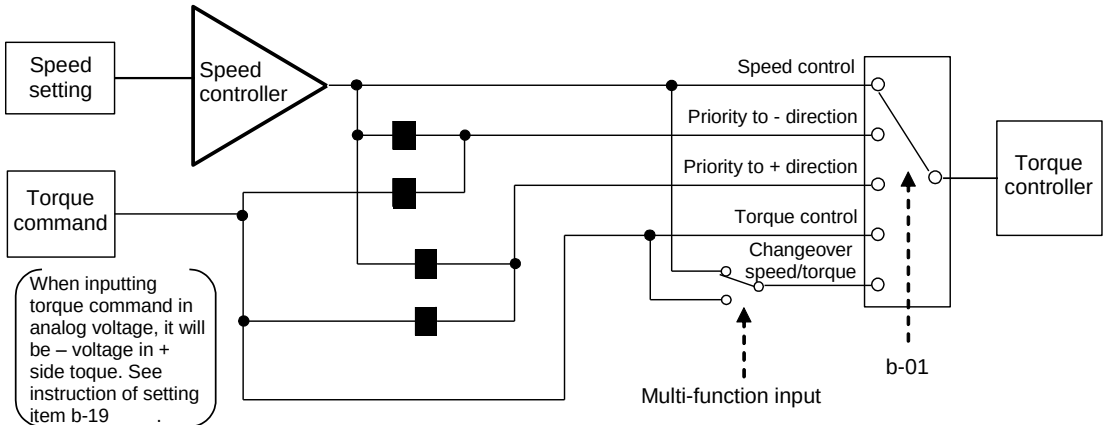
Turn ON when using HC (Super-block) function. Normally keep OFF

For details of Super-block function, see Super-block direction in extra number "PC tool manual"

Selecting control mode (speed control/torque control) (Vector control)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-01	Selecting control mode	0: Speed control (ASR) mode 1: Priority to torque command in - direction 2: Priority to torque command in + direction 3: Torque control (ATR) mode 4: Speed/torque control changeover by contact	-	0	-

Select control mode (speed control/torque control/priority). It is possible to combine the setting with multi-function input to switch the mode through an external contact.

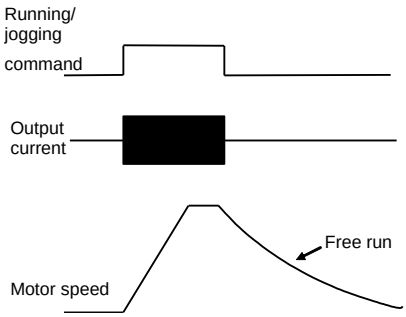
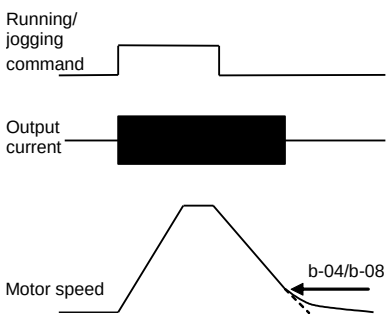
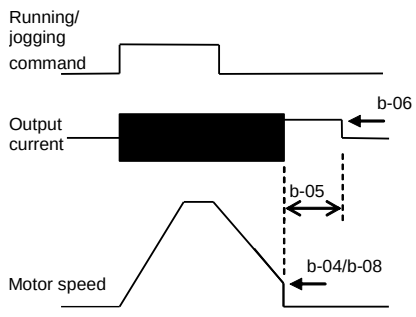


Selecting control mode

Setting of stop mode

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-03	Selecting stop mode	0 : Free stop 1 : Deceleration stop 2 : Deceleration stop with DC brake	-	1	-
b-04	Stop rotational speed	0 to 300	1	30	r/m
b-05	DC brake operation time	0.1 to 10.0	0.1	0.0	sec
b-06	DC brake gain	0.1 to 500.0	0.1	40.0 (ED64S) 100.0 (ED64P, V)	%
b-07	Selecting jogging stop mode,	0 : Free stop 1 : Deceleration stop 2 : Deceleration stop with DC brake	-	1	-
b-08	Stop rotational speed at jogging	0 to 300	1	30	r/m

Select the operation at running/jogging command off. (When b-01 is set with other than 0, it will always be free stop)

Free stop	**Deceleration stop**	**Deceleration stop with DC brake**
Stops voltage output when running/jogging command is off Note)	After decelerating to the speed of **b-04/b-08** according to the deceleration time, stops voltage output.	After decelerating to the speed of **b-04/b-08** according to the deceleration time, put DC brake with the time of **b-05**. Adjust DC brake power by **b-06.**
		

Note) ED motor generates voltage proportional to the rotational speed from the built-in permanent magnet even in the free running state. In areas which the generated voltage is higher than the DC voltage of the inverter (during operation in the power constant area etc.), even if the free stop mode has been selected, the control is continued and voltage is kept output until the speed is reduced until the generated voltage is lower than the DC voltage. (In case of using power constant area and disconnection of output voltage is needed immediately after turning off power, put output MC between motor and inverter, and operate by 52MA relay of ED64A.)

Change of speed control gain during jogging

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-09	Speed control proportional gain (2)	3 to 100	1	15	-
b-10	Selecting proportional gain during jogging	0: Speed control proportional gain (1) 1: Speed control proportional gain (2) 2: Selecting special mode	-	0	-

During jogging, a proportional gain (P gain) different from that during regular running can be used. Select the proportional gain during jogging (**b-10**), and the gain will change to the proportional gain specified in the fundamental setting item "**7.ASrP**" at the start of jogging, and the speed can be controlled based on the proportional gain specified in **b-09**. (Special mode for specific use will be set when 2 is specified at **b-10**. Normally do not set to 2.)

Setting of operation at restart after instantaneous power failure/under voltage

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-11	Selecting restart after instantaneous under voltage	0: ON (use) 1: OFF (non-use)	-	OFF	-

Select the processing to be performed after restoration of power when operation is suspended owing to a under voltage.

OFF: Operation will not be restarted after power restoration (the inverter will be kept stopped). To restart, it is necessary to once turn off the running (jogging) command and turn it on again.

ON: Operation will be automatically restarted after power restoration. When the inverter is operated through contact signals or digital option command, the running command to the inverter must be kept on. If the power does not restore with operation command to the inverter on of more than 10 seconds, and restart cannot be done, starting failure (StrF) protection will operate.)

Reverse rotation prohibition mode setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-12	Selecting reverse rotation prohibition mode	0: Regular 1: Prohibit rotation in reverse direction from command 2: Prohibit reverse rotation	-	0	-

Prohibit reverse rotation.

Regular (b-12 = 0): Regular operation mode. The rotation direction is not restricted.

Prohibition of rotation in reverse direction to command (b-12 = 1): Prohibits rotation of the motor in the reverse direction from the direction indicated by the running command at the start of the inverter. (Once the motor starts, rotating in reverse direction to the direction indicated at the start is prohibited until the inverter stops. Even if the normal rotation command and the reverse rotation command are switched after the start, the prohibited direction will not change till the inverter stop.)

	When the speed command is given		When torque is controlled
	Speed command with + value	Speed command with - value	
Normal rotation start	Running in normal direction	Limitation to + min. speed	Minus torque is limited to 0 on the reverse rotation side.
Reverse rotation start	Running in reverse direction	Limitation to - min. speed	Plus torque is limited to 0 on the normal rotation side.

Prohibition of reverse rotation (b-12＝2) : Prohibit reverse rotation of the motor, regardless of the running command. (The direction which the motor rotates when the phase sequence of the inverter output voltage is U → V → W is regarded as the normal direction). The speed command in the reverse direction is limited to the + min. speed.

Note) When “prohibit rotation in reverse direction to command” or “prohibit reverse direction” is selected, speed control characteristics may degrade by the torque limit of the reverse direction. Select “regular” in this case.

Setting of regenerative stall preventive function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-13	Selecting use of regenerative stall preventive function	0: OFF (non-use) 1: ON (use)	-	OFF	-

When the DC voltage exceeds the [DB operation level (**F-00**) + 5V (10V in the case of 400V class)], prevent tripping caused by over-voltage protective (0V) operation by limiting the torque command (-direction at normal rotation, + direction at reverse rotation) to 0, or stop deceleration if decelerating. When using option DB unit to operate this function, set DB operation level (**F-00**) of function setting items and DB operation level of DB unit to the same level.

Selecting sequence (PLC) function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-14	Selecting Sequence (PLC) function	0: OFF (non-use) 1: ON (use)	-	OFF	-

Select the use of Sequence (PLC) function provided in ED64A

For details see sequence editor usage direction in separate volume.

Selecting rotational speed, running, jogging command input site

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-15	Selecting command input site	0: Terminal block 1: Console (SET64-Z) 2: Digital communication option	-	1	-
b-16	Selecting rotational speed command input site	0: According to the setting of b-15 1: Terminal block 2: Console (SET64-Z) 3: Digital communication option 4: Analog input option 5: BCD input option	-	0	-
b-17	Selecting running command input site	0: According to the setting of b-15 1: Terminal block 2: Console (SET64-Z) 3: Digital communication option	-	0	-
b-18	Selecting jogging command input site		-	0	-

Select operating site for running/jogging command. These input sites can be set all together by **b-15**. Input operate site of each command by combination of setting of **b-16** to **b-18** are in following table.

		Selecting command input site (b-15)		
		0: Terminal block	1: Console	2: Digital communication option
Rotational speed / frequency command (setting of **b-16**)	0: According to b-15	VFC64TB-Z PCB terminal [0-±10] or [4-20]	[0.SrEF] setting	Speed command through communication
	1: Terminal block	VFC64TB-Z PCB terminal [0-±10] or [4-20]	VFC64TB-Z PCB terminal [0-±10] or [4-20]	VFC64TB-Z PCB terminal [0-±10] or [4-20]
	2: Console (SET64-Z)	[0.SrEF] setting	[0.SrEF] setting	[0.SrEF] setting
	3: Digital communication option	Speed command through communication	Speed command through communication	Speed command through communication
	4:Analog input option	ISO64,IO64-Z option	ISO64,IO64-Z option	ISO64,IO64-Z option
	5:BCD input option	BCD64 option	BCD64 option	BCD64 option
Running command (setting of **b-17**)	0: According to b-15	VFC2001-Z PCB Terminal [ST-F], [ST-R]	Console [START] and [FOR/REV] keys	Running command through communication
	1: Terminal block	VFC2001-Z PCB Terminal [ST-F], [ST-R]	VFC2001-Z PCB Terminal [ST-F], [ST-R]	VFC2001-Z PCB Terminal [ST-F], [ST-R]
	2: Console (SET64-Z)	Console [START] and [FOR/REV] keys	Console [START] and [FOR/REV] keys	Console [START] and [FOR/REV] keys
	3: Digital communication option	Running command through communication	Running command through communication	Running command through communication
Jogging command (setting of **b-18**)	0: According to b-15	VFC2001-Z PCB Terminal [JOG-F], [JOG-R]	Console [JOG], [FOR/REV] key	Jogging command through communication
	1: Terminal block	VFC2001-Z PCB Terminal [JOG-F], [JOG-R]	VFC2001-Z PCB Terminal [JOG-F], [JOG-R]	VFC2001-Z PCB Terminal [JOG-F], [JOG-R]
	2: Console (SET64-Z)	Console [JOG], [FOR/REV] key	Console [JOG], [FOR/REV] key	Console [JOG], [FOR/REV] key
	3: Digital communication option	Jogging command through communication	Jogging command through communication	

- When terminal block is specified for speed command, switching between terminal block [0-±10] (voltage input of 0 to ±10 or 0 to +10 V) and terminal block [4-20] (current input of 4 to 20 mA) is performed by changing the setting of **G-02**.
- When “selecting use of Super-block function” (b-00) is ON, rotational speed/frequency command will be outputted from Super-block regardless of this selection.
- When “selecting use of sequence” is ON, running/jogging command will be output of sequence function regardless of this selection.

Selecting torque command input site

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-19	Selecting torque command input site	0: Terminal block 1: Analog option 2: Digital communication option	-	1	-

Specify the torque command input site in the torque control mode.

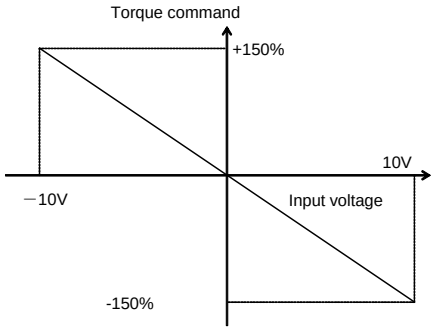
Terminal block : Input from VFC64TB-Z PCB terminal[0-±10]

Analog option **:** Input of ISO64/IO64-Z option

Digital communication option : Torque command through OPCN64,DNET64 etc.

Torque command characteristics of input from terminal block or analog option will be like the graph right.

(Note) Because detection of VFC64TB-Z PCB terminal [0-± 10] input is slightly slower (every 1ms), use analog option when high-speed response is needed.



Torque command input characteristics

Maximum rotational speed at free starting (ED64P, ED64V mode only)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-20	Max. rotational speed at free starting	100 to 150	1	100	%

Set the maximum speed for the motor under free rotation could start in % to the rated motor speed **A-05**. (This item cannot be set at ED64S mode.)

Note) ED motor generates voltage under free rotation because of built-in permanent magnet. If the rotating at the rated motor speed **A-05** or more, the voltage generated by the motor may exceed the DC voltage of the inverter depending on the supply voltage and the motor type. In such state of starting, it may become out of control, and may lead to protective operation. Therefore, normally, set this item to 100% to prevent free start at a speed higher than **A-05**.

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
b-21	Max. output voltage of inverter	80 to 200	1	100	%

Limit output voltage of the inverter. Set the % to the motor rated voltage **A-03**.

If the output voltage exceeds the setting of **A-21** owing to electromotive force of the permanent magnet in the ED motor while the motor speed is increasing, weaken the magnetic flux and limit the output voltage.

2-4 Setting item area c (related to multi-function input/output)

Multi-function input

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
c-00	Selecting multi-function input site	0 : Terminal block 1 : Digital communication option	-	0	-
c-01	Selecting function of multi-function input terminal (1)	0: Selecting preset rotational speed 1 1: Selecting preset rotational speed 2 2: Selecting preset rotational speed 3 3: Selecting accel./decel. time 1 4: Selecting accel./decel. time 2 5: Rotational speed up command (MRH mode) 6: Rotational speed down command (MRH mode) 7: Rotational speed hold 8: Prohibit S-curve accel./decal.	-	0	-
c-02	Selecting function of multi-function input terminal (2)		-	1	-
c-03	Selecting function of multi-function input terminal (3)		-	3	-
c-04	Selecting function of multi-function input terminal (4)		-	4	-
c-05	Selecting function of multi-function input terminal (5)		-	7	-
c-06	Selecting function of multi-function input terminal (6)		-	13	-

		9 : Max. rotational speed reduction 10: Inactivation of drooping control 11: Selecting torque control 12: Reverse running command 13: DC brake command 14: - 15: External failure signal 1 (Protective relay 86A active) 16: External failure signal 2 (Protective relay 86A active) 17: External failure signal 3 (Protective relay 86A active) 18: External failure signal 4 (Protective relay 86A active) 19: External failure signal 1 (Protective relay 86A inactive) 20: External failure signal 2 (Protective relay 86A inactive) 21: External failure signal 3 (Protective relay 86A inactive) 22: External failure signal 4 (Protective relay 86A inactive) 23: Traceback external trigger 24: Selecting 2nd motor 25: Emergency stop (B contact) 26: Program step operation 27: Selecting rotational speed command terminal block			

Set the input signals to the multi-function input terminals.

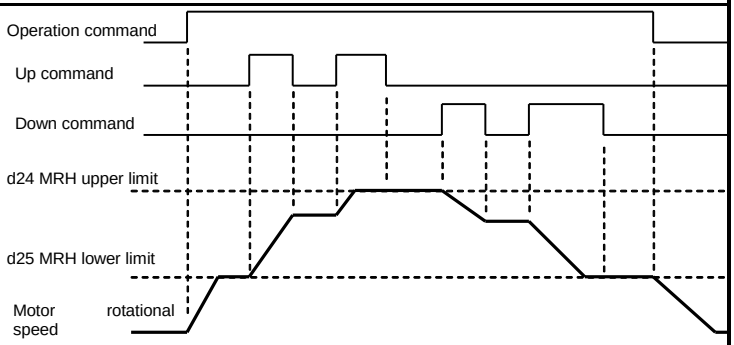
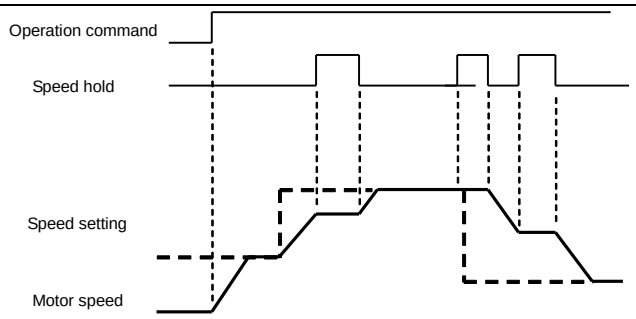
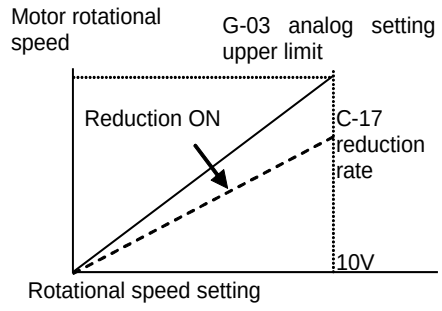
When 1 is specified for **c-00**, bit signals input from the digital communication option are selected as the input signals to the following functions of the multi-function input. When 0 is specified for **c-00**, multi-function input terminal (1) to (6) (terminal block [M11] to [M16]) on the VFC64TB-Z PCB are set as the input signal terminals to the functions of the multi-function input set in **c-01** to **c-06**. (Input of functions not selected for any terminals is regarded as OFF.)

Note) However, when use of sequence function **b-14** is ON, setting above will be ignored and multi-function input terminal (1) to (6) (terminal block [M11] to [M16]) on the VFC64TB-Z PCB will become input terminal of sequence function. At this time each function of following multi-function input will be controlled from output of sequence function.

Multi-function input items

Item	Explanation of function
Preset rotational speed setting	Operation with selecting settings of preset rotational speed command 1 to7 is possible by using 3 inputs: Selecting preset rotational speed 1 to 3 (Preset rotational speed is shared with settings of program operation. However, preset rotational speed command 8 is for program operation only. Cannot be used in preset)

Preset rotational speed setting 3	Preset rotational speed setting 2	Preset rotational speed setting 1	Rotational speed command
OFF	OFF	OFF	Normal setting (Preset not used)
OFF	OFF	ON	H-00(Preset rotational speed command 1)
OFF	ON	OFF	H-01(Preset rotational speed command 2)
OFF	ON	ON	H-02(Preset rotational speed command 3)
ON	OFF	OFF	H-03(Preset rotational speed command 4)
ON	OFF	ON	H-04(Preset rotational speed command 5)
ON	ON	OFF	H-05(Preset rotational speed command 6)
ON	ON	ON	H-06(Preset rotational speed command 7)

<table>
<tr><th>Item</th><th>Explanation of function</th></tr>
<tr><td>Acceleration / deceleration time setting</td><td>Conversion of accel./decel. time is possible by using inputs of “Selecting accel./ decel. time” 1 to 2 (d-06 (Selecting use of S-curve accel./decel.) has to be ON to use S-curve accel./decel..)
<table>
<tr><th>Accel./decel. time setting 2</th><th>Accel./decel. time setting 1</th><th>Accel./decel. time to be selected (Including S-curve accel./decal.)</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Normal(Accel./decel. time set at d-00)</td></tr>
<tr><td>OFF</td><td>ON</td><td>Accel./decel. time (1) (5.Acc2, 6.dEc2 or d-11 to 14)</td></tr>
<tr><td>ON</td><td>OFF</td><td>Accel./decel. time (2) (d-02, d-03 (No S-curve accel./decel.))</td></tr>
<tr><td>ON</td><td>ON</td><td>Accel./decel. time (3) (d-04, d-05 (No S-curve accel./decel.))</td></tr>
</table></td></tr>
<tr><td>Rotational speed UP, DOWN command (MRH mode)</td><td>By b-15, b-16 and turning d-23 (selecting use of MRH function) ON, selecting terminal block for rotational speed to make up/ down command will be possible. (However, rotational speed will be limited by d-24, d-25 (MRH upper/ lower limit) When rotational speed is over limit, will automatically reduce speed without any command. Operating backward is possible by setting minus value for lower limit.)</td><td> 
</td></tr>
<tr><td>Rotational speed hold</td><td>If this signal is turned on while the inverter is accelerating/ decelerating the motor, the inverter will stops acceleration/ deceleration and holds the current speed.
When the signal is turned off, it will restart accelerating/ decelerating.
(If deceleration stopping by the stop command, the hold function is ineffective)</td><td> 
</td></tr>
<tr><td>Prohibition of S-curve acceleration/ deceleration</td><td colspan="2">Even during S-curve acceleration/deceleration run with d-06 (selecting use of S-curve acceleration/ deceleration) on, if this signal is turned on, S-curve acceleration/deceleration will forcibly prohibited and the motor will accelerate/decelerate normally.</td></tr>
<tr><td>Max. rotational speed reduction</td><td>When the terminal block had been selected as the rotational speed command input site, if this signal is turned on, the speed is decreased based on the setting of c-17 (max. rotational speed reduction ratio) as shown in the figure. This signal must be turned on/off in the stopped state. Even if the signal is switched during running, the speed mode is not switched until the motor stops. (This function is effective only for analog input from the terminal block)</td><td> 
</td></tr>
<tr><td>Drooping control inactivation</td><td colspan="2">This signal will inactivate i-00 (selecting drooping control) even if the drooping control is ON (see setting item i for drooping control）</td></tr>
<tr><td>Selecting torque control</td><td colspan="2">When b-01 (selecting control mode) is 4 (change-over contact of speed/torque control) changeover between speed and torque control is possible by this signal. OFF for speed control, ON for torque control. (see setting item b area)</td></tr>
<tr><td>Reverse running command</td><td colspan="2">Turning ON this signal will shift the normal/reverse rotation of running/jogging command. (normal→reverse, reverse→normal)</td></tr>
<tr><td>DC brake command</td><td colspan="2">Turning ON this signal will make the DC brake to run DC current to the motor. Each can be adjusted by b-06 (DC brake gain). After the signal is OFF, and time set in b-05(DC brake time) has past, it will stop. When running/jogging command is input at same time, running/jogging command will be prior.</td></tr>
<tr><td>External failure signal (protective operation relay (86A) active)</td><td colspan="2">Inverter protective stop is possible by inputting failure signal of periphery equipment to this signal. When external failure signal 1 to 4 is ON, inverter will intercept output and put ON protective operation relay (86A). [EF1] to [EF4] will be displayed on console at same time. Also trace-back will be triggered by this signal. To release protective operation, perform protective operation reset. (see setting item F)</td></tr>
</table>

Item	Explanation of function
External failure signal (protective operation relay (86A) inactive)	Same as above, but protective operation relay (86A) is inactive. Also trace-back will not be triggered. In this case, turn OFF each command of inverter of running/jogging/DC brake and it will automatically release protective operation.
Trace-back external trigger	Normally trace-back is triggered at failure or protective operation, but triggering forcibly is possible by inputting this signal. (see setting item F for trace-back)
Selecting 2nd motor	Put ON **L-00** (selecting use of 2nd motor) and this signal, to use each 2nd motor parameters set in setting item L, instead of motor parameter set in setting item A. See setting item L for details of 2nd motor use.
Emergency stop (B contact)	With emergency stop signal of B contact input, stops with contact open. (Therefore to use this function to any terminal block, contact must be closed or it will become emergency stop and will not operate).
Program step operation	When this signal is ON during program operation, it will forcibly proceed to next step even when program time has not passed. See setting item H area for program operation.
Selecting rotational speed command terminal block	When this signal is ON, regardless of settings **b-15,b-16** (selecting rotational command input site), it will forcibly make command input site to terminal block (VFC64TB-Z [0-±10] or terminal [4-20]) This signal is prior when selecting preset rotational speed is input at same time.

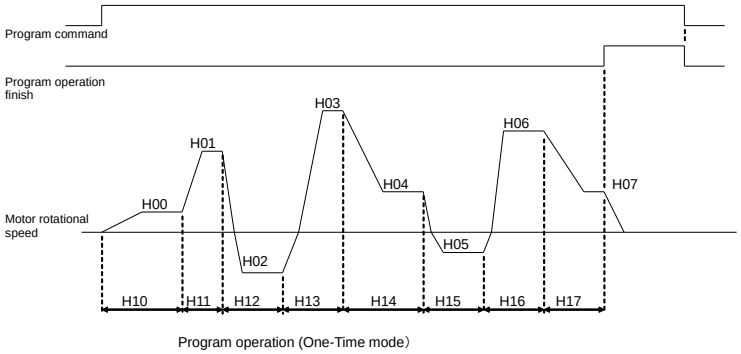
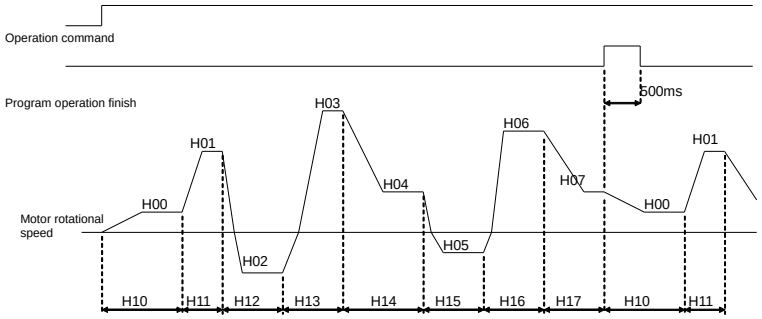
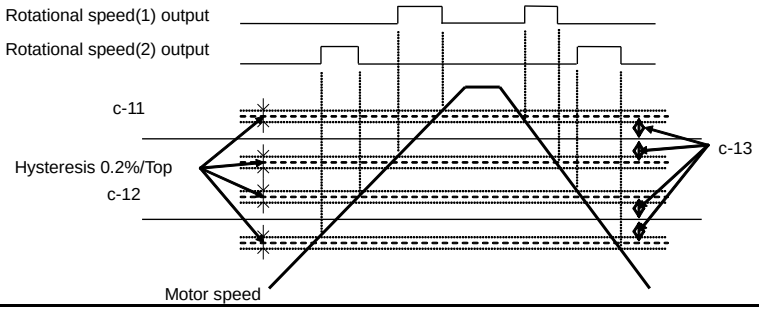
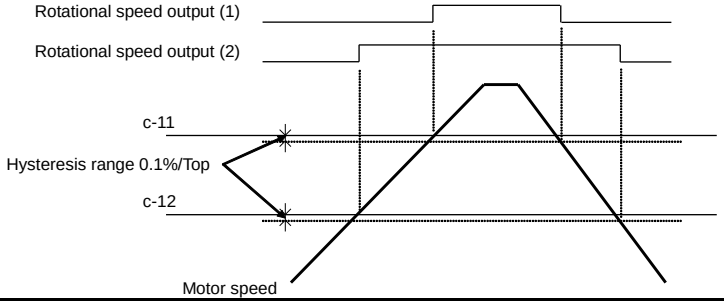
Multi-function output

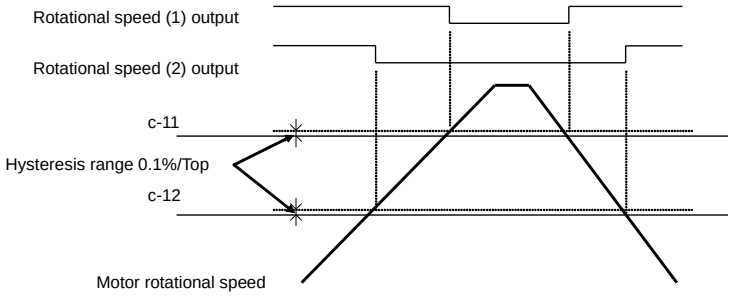
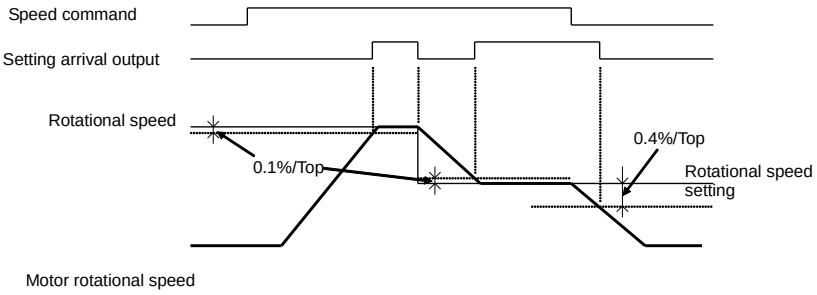
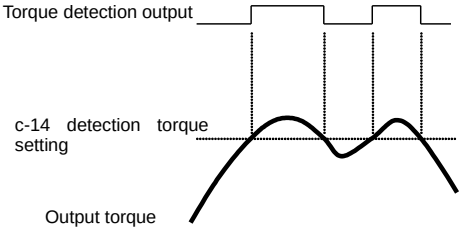
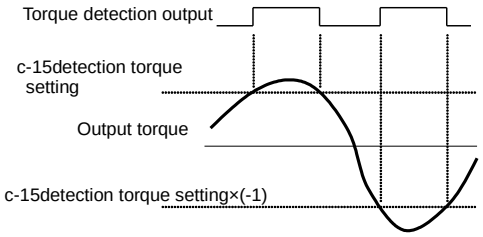
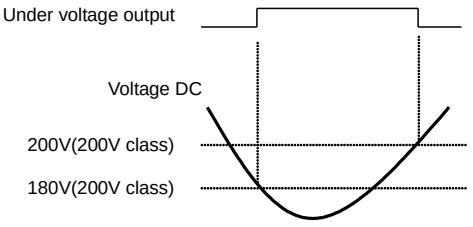
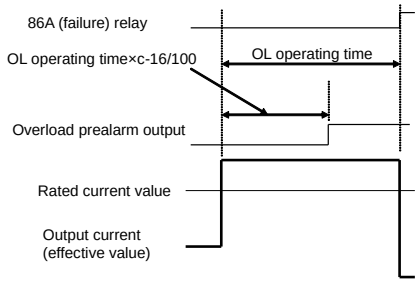
Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
c-07	Selecting function of multi-function output terminal (1)	0: End program operation 1: Rotational speed detection(1) (Speed = detection setting) 2: Rotational speed detection(1) (Speed >= detection setting) 3: Rotational speed detection(1) (Speed <= detection setting) 4: Rotational speed detection(2) (Speed = detection setting) 5: Rotational speed detection(2) (Speed >= detection setting) 6: Rotational speed detection(2) (Speed <= detection setting) 7: Completion of accel/decel 8: Torque detection 9: Absolute value torque detection 10:Under voltage 11:Overload prealarm 12:Retrying 13:Reverse running 14:Protective operation code 15:sum check error	-	7	-
c-08	Selecting function of multi-function output terminal (2)		-	1	-
c-09	Selecting function of multi-function output terminal (3)		-	0	-
c-10	Selecting function of multi-function output terminal (4)		-	8	-

Each multi-function output terminal (1) to (4) (terminal block [MO1] to [MO4]) on VFC64TB-Z PCB is set as output terminal block of each function to be set at multi-function of c-07 to c-10 (terminal block [MO1] to [MO4] in open collector output)

Note) However, when selecting use of sequence function (b-14) is ON, settings above will be ignored and multi-function output terminal (1) to (4) (terminal block [MO1] to [MO4]) on VFC64TB-Z PCB will be output terminal from sequence function.

Multi-function output item

Items	**Function explanation** (”Top” in diagram refers to **A-00** max. rotational speed)
Program operation finish	Output when last step of program operation is finished. (One-time mode) After finish keep outputting until operation command is broken.  Program operation (One-Time mode） (Endless mode) Output 500ms after 1 rotation.  Program operation(Endless mode）
Rotational speed detection (1) (2) (speed = detection setting)	Output ON when motor rotational speed conform setting of **c-11**, **c-12** and range of ±**c-13**. For output, 0.2% of hysteresis range is set up for max. rotational speed. 
Rotational speed detection (1) (2) (speed >= detection setting)	Output ON when motor rotational speed gets larger than settings of **c-11**, **c-12.** (Speed is detected with code, not in absolute value) 

Items	**Function explanation** ("Top" in diagram refers to **A-00** max. rotational speed)
Rotational speed detection (1) (2) (Speed <= detection setting)	Output ON when motor rotational speed / frequency gets smaller than settings of **c-11, c-12**. (Speed is detected with code, not absolute value.) 
Completion of acceleration / deceleration	Output ON when rotational speed of motor reach ±0.1% of speed command value. 
Torque detection	Output ON when torque command gets larger than setting of **c-14.** 
Detecting absolute value torque	Output ON when absolute value of torque command gets larger than setting of **c-15** 
During under voltage	Output ON when voltage of DC part is lower than 180V (360V for 400V class) OFF when over 200V (400V for 400V). (However, it will be OFF when control PCB has no power supply) 
Overload pre-alarm	Start counting at overload state, when the counter which overload protection or over-torque protection operates at 100% exceeds the level set at **c-16** (overload pre-alarm operation level) output is ON. (For example, when over-current protection operates at 150% current for 60 sec. set **c-16** to 50% and set output current to 150% like shown in the diagram, overload protection will operate at 30 sec.(50% of 60 sec.)) 

Items	**Function explanation** ("Top" in diagram refers to **A-00** max. rotational speed)
Retrying	Output ON, 10 sec. after protective operation retry. See setting item F for protective operation retry.
Reverse running	ON when motor is reverse running. (To prevent chattering near 0 speed, 12r/min (ED64S mode) or 1.8r/min (ED64P mode and ED64V mode) have hysteresis)
Protective operation code	When failure or protection operates, output code of protection that operated by using 4 multi-function output terminal. (To use this function, all 4 terminals must have "protective operation code" set.) Output code list

Details	**MO1**	**MO2**	**MO3**	**MO4**	**Details**	**MO1**	**MO2**	**MO3**	**MO4**
Overcurrent protection	ON	OFF	OFF	OFF	Speed control error	ON	ON	ON	OFF
Protection of IGBT	OFF	ON	OFF	OFF	Motor overheat	OFF	OFF	ON	OFF
Protection of IGBTU	OFF	ON	OFF	OFF	Parallel slave trouble	OFF	ON	OFF	OFF
Protection of IGBTV	OFF	ON	OFF	OFF	FCL operation	OFF	OFF	ON	OFF
Protection of IGBTW	OFF	ON	OFF	OFF	Setting error 0	ON	ON	OFF	ON
DC over-voltage	ON	ON	OFF	OFF	Setting error 1	ON	ON	OFF	ON
Overload protection	OFF	OFF	ON	OFF	Setting error 2	ON	ON	OFF	ON
DC fuse blowout	ON	OFF	ON	OFF	Setting error 3	ON	ON	OFF	ON
Starting failure	OFF	ON	ON	OFF	PG (phase) error	ON	ON	ON	OFF
Over-speed protection	ON	ON	ON	OFF	Starting error without sensor	OFF	OFF	ON	OFF
Voltage shortage (under voltage)	OFF	ON	OFF	ON	External failure 1	OFF	OFF	ON	ON
Over-torque protection	OFF	OFF	ON	OFF	External failure 2	ON	OFF	ON	ON
Unit overheat	OFF	ON	OFF	OFF	External failure 3	OFF	ON	ON	ON
Option error	OFF	OFF	OFF	ON	External failure 4	ON	ON	ON	ON
Communication timeout error	ON	OFF	OFF	ON					

Settings of multi-function input/output

Display	**Details**	**Setting range (option)**	**Setting resolution**	**Initialize data**	**Unit**
c-11	Detected rotational speed (1)	-max. rotational speed to +max. rotational speed	1	0	r/min
c-12	Detected rotational speed (2)	-max. rotational speed to +max. rotational speed	1	0	r/min
c-13	Rotational speed detection range	0 to 600	1	0	r/min
c-14	Detection torque command (with polarity)	-205 to 205	1	0	%
c-15	Detection torque command (absolute value)	0 to 205	1	0	%
c-16	Setting operation level of overload pre-alarm	0 to 100	1	50	%
c-17	Max. rotational speed reduction rate	50.0 to 100.0	0.1	90.0	%

Setting data to be used for each multi-function input/output. For details see items of multi-function input/output.

2-5 Setting item area d (acceleration/deceleration setting, rotational speed jump function, and MRH function)

Selecting and setting of acceleration/deceleration time

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
d-00	Selecting acceleration/deceleration time during normal running	0: Acceleration/deceleration time (1) 1: Acceleration/deceleration time (2) 2: Acceleration/deceleration time (3) 3: Acceleration/deceleration time (4)	-	0	-
d-01	Selecting acceleration/deceleration time during jogging		-	1	-
d-02	Acceleration time (3)	0.0 to 3600.0	0.1	30.0	sec
d-03	Deceleration time (3)	0.0 to 3600.0	0.1	30.0	sec
d-04	Acceleration time (4)	0.0 to 3600.0	0.1	30.0	sec
d-05	Deceleration time (4)	0.0 to 3600.0	0.1	30.0	sec
d-06	Selecting use of S-curve acceleration/deceleration	0: OFF (non-use) 1: ON (use)	-	OFF	-
d-07	S-curve accel. start-up time (1)	0.0 to 60.0	0.1	0.1	sec
d-08	S-curve accel. complete time (1)	0.0 to 60.0	0.1	0.1	sec
d-09	S-curve decel. start-up time (1)	0.0 to 60.0	0.1	0.1	sec
d-10	S-curve decel. complete time (1)	0.0 to 60.0	0.1	0.1	sec
d-11	S-curve accel. start-up time (2)	0.0 to 60.0	0.1	0.1	sec
d-12	S-curve accel. complete time (2)	0.0 to 60.0	0.1	0.1	sec
d-13	S-curve decel. start-up time (2)	0.0 to 60.0	0.1	0.1	sec
d-14	S-curve decel. complete time (2)	0.0 to 60.0	0.1	0.1	Sec

Select the acceleration/deceleration time settings for regular running and jogging in **d-00** and **d-01**. Setting of acceleration/deceleration time of normal running can also be changed by multi-function input. This setting will be invalid when program is operating. See setting item c (multi-function) and setting item area H (program operation)

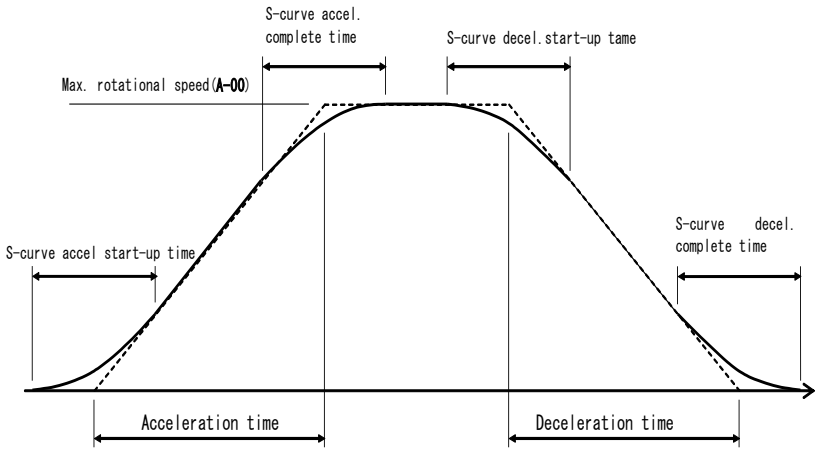
Acceleration/deceleration time to be selected

Settings in **d-00** and **d-01** or settings by multi-function input	Acceleration time	Deceleration time	S-curve accel. start-up	S-curve accel. complete time	S-curve decel. start-up time	S-curve decel. complete time
0:Accel./decel. time (1)	**3.Acc1**	**4.dEc1**	**d-07**	**d-08**	**d-09**	**d-10**
1:Accel./decel. time (2)	**5.Acc2**	**6.dEc2**	**d-11**	**d-12**	**d-13**	**d-14**
2:Accel./decel. time (3)	**d-02**	**d-03**	0.0	0.0	0.0	0.0
3:Accel./decel. time (4)	**d-04**	**d-05**	0.0	0.0	0.0	0.0

* **3.Acc1, 4.dEc1, 5.Acc2** and **6.dEc2** are fundamental setting items.

* When the acceleration/deceleration time (3) or (4) is selected, all S-curve acceleration and deceleration time settings are 0.0.

Each acceleration and deceleration time setting, like shown in the following diagram, is time in which the acceleration/deceleration speed and time for S-curve of 0⇔the max. rotational speed/frequency setting. When the S-curve acceleration/deceleration function is used, **d-06** (selecting use of S-curve acceleration/deceleration) must be set to ON. If the item is OFF, S-curve acceleration/deceleration cannot be performed even if the S-curve acceleration/deceleration times are set.



Time chart of acceleration and deceleration
(S-curve acceleration and deceleration)

Speed deviation limiting function during acceleration and deceleration

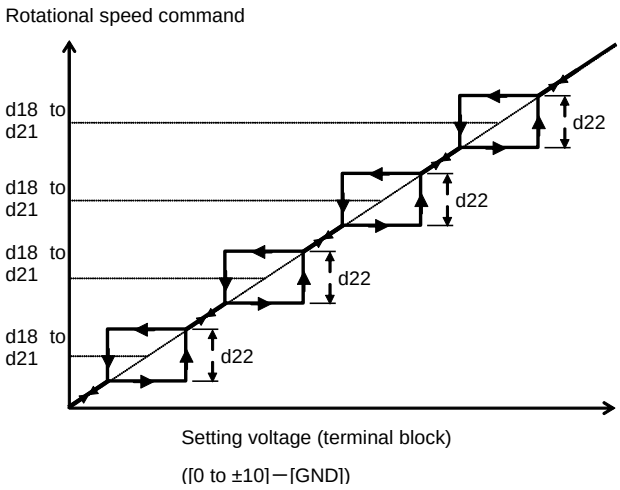
Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
d-15	Selecting speed deviation limiting command	0: OFF 1: ON	-	OFF	-
d-16	Max. deviation in normal direction	0.0 to 100	0.1	5.0	%
d-17	Max. deviation in reverse direction	-100.0 to 0.0	0.1	-5.0	%

When **d-15** is set to ON, the motor speed and the acceleration/deceleration control output are limited according to the deviations set in **d-16** (normal direction) and **d-17** (reverse direction). When load is suddenly reduced by speed reduction owing to torque restriction during speed control operation, this function prevents rapid acceleration caused by sudden change in load and supply voltage and restores the speed at a gradient set in the acceleration/deceleration time. (Note that setting of an excessively low deviation restricts the acceleration and deceleration.)

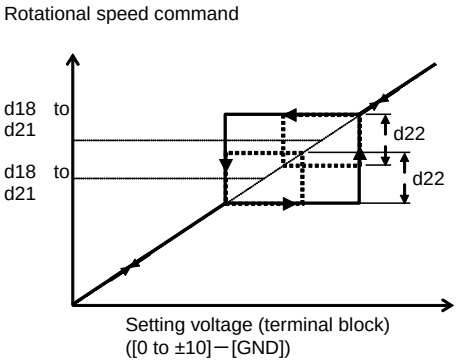
Rotational speed command jump function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
d-18	Jump rotational speed (1)	0 to max. rotational speed	1	0	r/min
d-19	Jump rotational speed (2)	0 to max. rotational speed	1	0	r/min
d-20	Jump rotational speed (3)	0 to max. rotational speed	1	0	r/min
d-21	Jump rotational speed (4)	0 to max. rotational speed	1	0	r/min
d-22	Jump rotational speed range	0 to 300	1	0	r/min

This function makes rotational speed command jump to avoid resonance point speed of load machine. At jumping point, make speed command to jump like hysteresis shown in the next diagram. Because rotational speed command to input acceleration/deceleration control is jumping, it will pass inside jump range gradient of acceleration/deceleration time setting during acceleration/deceleration



Rotational speed / frequency command jump function



When jumping point overlaps

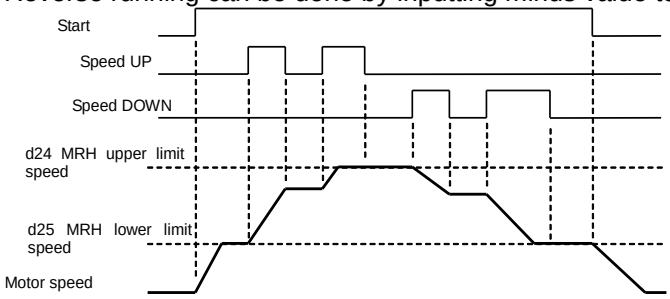
MRH (acceleration/deceleration by contact) mode

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
d-23	Selecting use of MRH function	0 :OFF(non-use), :ON(use)	－	OFF	－
d-24	MRH max. speed	MRH lower limit speed (d-25) to (max. rotational speed)	1	300	r/min
d-25	MRH min. speed	(-max. rotational speed) to MRH upper limit speed (d-24)	1	0	r/min

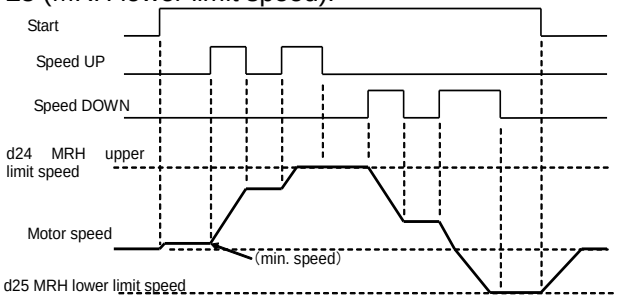
Acceleration/deceleration control by contact is possible, when **d-23** is ON (MRH mode). At this time, by settings of **b-15** and **b-16,** operation command input site is selectable. Up/down command of speed is possible by console keys ↑ and ↓ , when input site of multi-function input contact is terminal block.

Rotational speed will accelerate/decelerate UP with command input of **d-24** (MRH upper limit speed) and DOWN with command input of **d-25** (MRH lower limit speed). When there is no UP/DOWN signal, or both signal input, speed will be preserved. However, when speed is not between setting of **d-24** and **d-25**, accelerate/decelerate automatically to **d-24** or **d-25.**

Reverse running can be done by inputting minus value to **d-25** (MRH lower limit speed).



When MRH lower limit speed is plus setting



When MRH lower limit speed is minus setting

(Note) When signal of preset “selecting rotational speed” and “selecting rotational speed command input site” is input during MRH mode, command of “selecting rotational speed” will be prior.

2-6 Setting item area E (setting related to torque limit, torque command characteristics and speed control)

Torque limiter

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
E-00	Normal powering torque limit value	0 to 150 (Note)	1	150	%
E-01	Normal regenerative torque limit value	-150 to 0 (Note)	1	-150	%
E-02	Reverse powering torque limit value	-150 to 0 (Note)	1	-150	%
E-03	Reverse regenerative torque limit value	0 to 150 (Note)	1	150	%

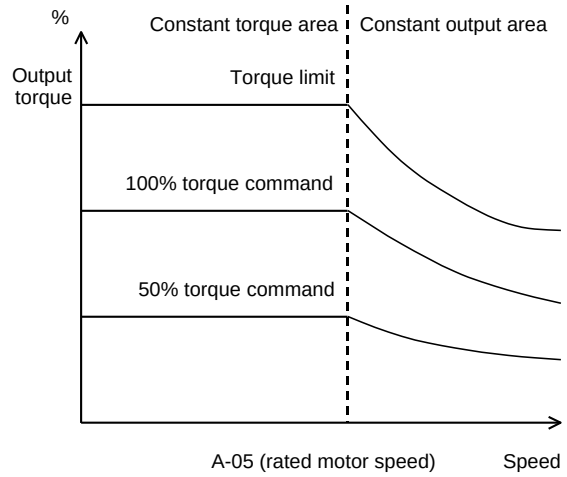
The torques in the normal and reverse directions on the powering and regenerative sides can be set. When a torque command exceeds any of these settings, the torque is limited to the setting.

(Note) The maximum (minimum) value of the setting range varies to up to 200 (down to -200) depending on the rated motor current. When using a motor identical to the inverter capacity to the used, normally set the limit to up to 150% (down to -150%).

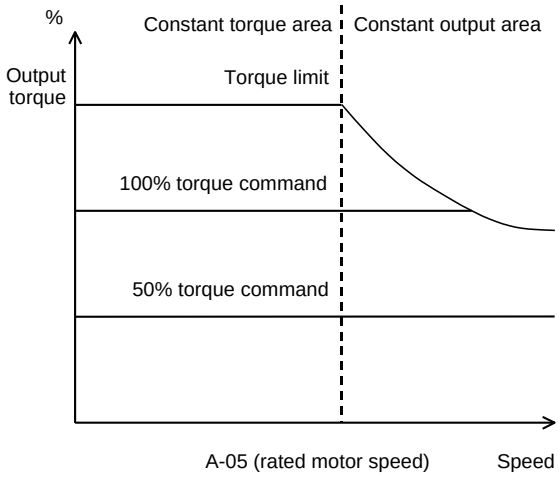
Torque command mode selection

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
E-05	Selecting torque command mode in constant output area	0: Command in % 1: Command in absolute value	-	0	-

Select the torque command characteristics in the constant output area.



Even if the torque command is uniform, the output torque lowers in reverse proportion to the speed in the constant output area to keep the output uniform.



Even in the constant output area, the output torque is uniform if the command is uniform. (The torque limit lowers to keep the constant output.)

Speed control (ASR) selection

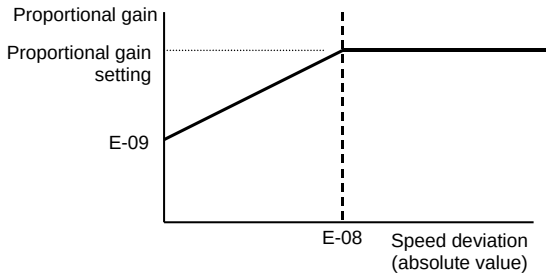
Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
E-06	Selecting use of ASR cancellation	0: OFF (non-use) 1: ON (use)	-	ON	-
E-07	Selecting use of ASR feedforward	0: OFF (non-use) 1: ON (use)	-	ON	-

ED64A establishes robust speed control (MFC control) by combining cancellation using disturbance observer and feedforward. These cancellation and feedforward functions can be individually turned off. (If both of them are turned off, the speed control is identical with the conventional PI control.) (See the explanation of speed control gain in the fundamental setting item section.)

Adjusting variable structure proportional gain

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
E-08	Speed at start of change in variable structure proportional gain	0.01 to 100.00	0.01	(ED64S) 5.00 (ED64P,V) 0.01	%
E-09	Variable structure proportional gain min. ratio	0 to 100	1	(ED64S) 20 (ED64P,V)100	%

Adjust the variable structure proportional gain that changes the proportional gain according to the deviation between speed command and motor speed.



Variable structure proportional gain

Adjustment of current control gains (Common)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
E-10	q-axis current control p gain	0.0 to 200.0	0.1	80.0	-
E-11	q-axis current control I gain	0.0 to 75.5	0.1	15.0	-
E-12	d-axis current control P gain	0.0 to 200.0	0.1	80.0	-
E-13	d-axis current control I gain	0.0 to 75.5	0.1	15.0	-

These parameters are current control gains. Normally, leave them as initialized.

Setting restart prohibition time

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
E-14	restart prohibition time	100 to 999	1	100	ms

Set the shortest time of restarting from inverter stop. Normally, leave them as initialized.

Motor temperature compensation (use of T/V61V option)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
E-15	Selecting motor temperature compensation optional function	0: OFF (non-use) 1: ON (use)	-	OFF	-

Resistance value of stator coils of ED motor and magnetic flux of permanent magnet vary depending on the temperature. ED64A is provided with temperature identification function to calculate and compensate these variations, but identification calculation before operation or during low speed running cannot be done. Therefore, shortage of torque at starting may happen. Turn ON this item when mounting temperature sensor to compensate by detected temperature for improving torque at starting.

Note) To use this function, the T/V61V option and motor temperature sensor are necessary. When these devices are not provided, set this item to OFF. As for the T/V61V option, see “Motor temperature detection option, T/V61V” in Chapter 5.

2-7 Setting item area F (setting of built-in DB operation, protective function and trace-back)

Built-in DB operation level

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-00	Built-in DB operation level	320 to 360 (200 V class)	1	340	V
		640 to 720 (400 V class)	2	680	V

F-00 is for setting operation level of built-in DB transistor. When the DC voltage exceeds this setting, turns on built-in DB transistor and turns off when the voltage falls below the setting. Normally, leave the level as initialized. If the supply voltage is so high that the DB transistor turns on not in the brake mode, increase the setting.

This setting is interlock with the operation level of regenerative stall preventive function. (See item **b-13**).

Also, when this transistor is used with regenerative converter (VF61R or VF64R), set this item to 360V (200V class) or 720V (400V class).

(Note) ED64A-2R222 to 1122 (200V class), 2R244 to 1544 (400V class) has built-in DB transistor, and by connecting thermal relay or DB resistor to main circuit terminal block [+2]-[B], dynamic brake (DB) is possible.

Overspeed protection setting

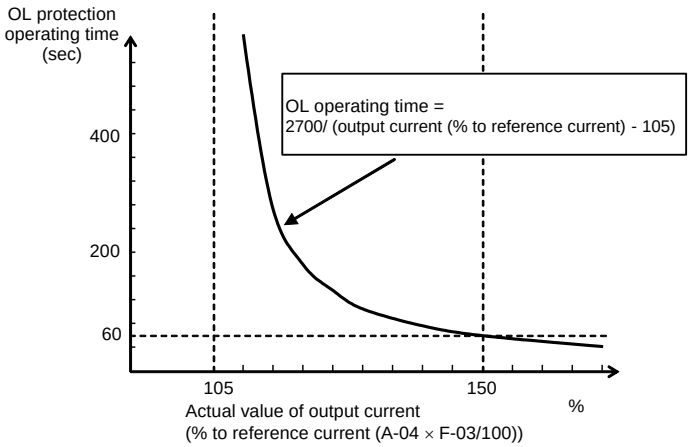
Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-01	Overspeed setting in normal direction	0 to max. rotational speed (A-00) × 1.5	1	1900	r/min
F-02	Overspeed setting in reverse direction	- max. rotational speed (A-00) × 1.5 to 0	1	-1900	r/min

When the motor speed exceeds any of these settings, the over-speed protective function operates to trip the inverter. Set the speeds in the normal and reverse directions separately. (When the maximum rotational speed (**A-00**) is changed, reexamine these settings. If a value 1.5 times or more the maximum speed is set, a setting error occurs.)

Overload protection setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-03	Overload protection setting	20 to 110	1	100	%

Set the reference current value for overload protection as a ratio to the rated motor current (**A-04**). When the actual value of the inverter output current exceeds 105% of this reference current, an overloaded state is detected, and the overload protection counter starts to operate. The overload protection (OL) operates according to the curve on which it works for 60 seconds at 150% as shown in the following drawing.



Overload protection (OL) operating time

Note: The overload protection counter can be monitored on the console. (The counter's value is compared with the over-torque protection counter's value, and the larger value is displayed.)

The overload counter's value increases with time in the overload state, and, when the value reaches 100%, the overload protection functions to trip the inverter.

An OL pre-alarm function is available. The function outputs a signal when the overload counter's value exceeds a given point. (See the setting item c: Multi-function output)

FCL (fast current limit) level setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-04	FCL level setting	80 to 125	1	100	%

Set the FCL (fast current limit) value. Normally, set the value to 100%.

When instantaneous current of 2.86 times the inverter rated current value detects to any of the phases, the FCL function once turns off the output of all phases to protect the inverter. (After the current reduces, the inverter output will be automatically turned on.) If the output is turned on and off by this FCL function continuously for 10 seconds or more (for the shortest time of 2 seconds at an output frequency of 10 Hz or less), the protective operation for continuous FCL function trips the inverter.

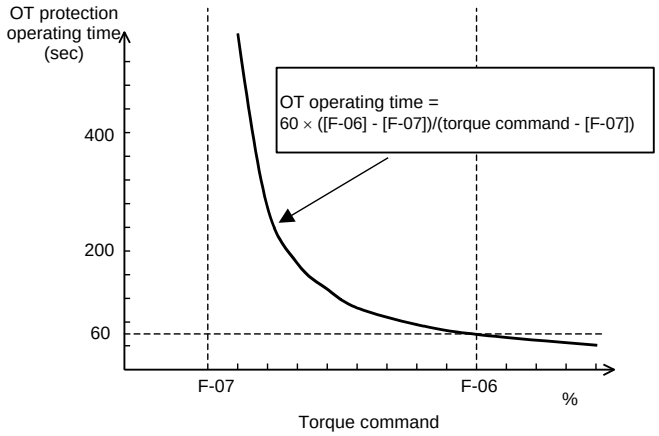
Overtorque protection

Display	Details	Setting range (option)	Setting resolution	Initialized data	Unit
F-05	Selecting over-torque protective function	0: OFF (non-use) 1: ON (use)	-	ON	-
F-06	Over-torque protective operation level setting	110 to 205	1	150	%
F-07	Over-torque protective operation reference torque	50 to 105	1	105	%

Set the over-torque protection parameters. **F-05** is an item to determine whether to enable or disable the protective operation.

When **F-05** is set to ON, if the torque command exceeds the reference torque set in **F-07**, an over-torque state is detected, and the over-torque protection counter starts to operate. The over-torque protection (OT) operates according to the curve on which it works for 60 seconds when the torque command reaches the setting of **F-06** as shown in the figure.

The torque command used in this protection can compensate by subtracting machine loss from actual torque command. (See machine loss compensation in setting item i.)



Over-torque protection (OT) operating time

Note: As stated in the section of the overload protection, the over-torque counter can be monitored on the console. (The counter's value is compared with the overload protection counter's value, and the larger value is displayed.)

The over-torque counter's value increases with time in the over-torque state, and, when the value reaches 100%, the over-torque protection functions to trip the inverter.

An OT pre-alarm function is available. The function outputs a signal when the over-torque counter's value exceeds a given point. (See setting item c: multi-function output.)

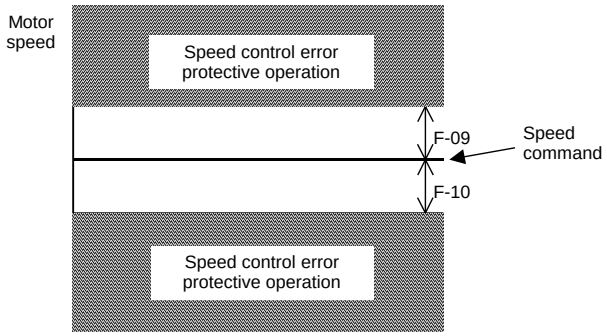
Speed control error protection setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-08	Selecting use of speed control error function	0: OFF (non-use) 1: ON (use)	-	OFF	-
F-09	Speed control error detection range on normal side	50 to 500	1	100	r/min
F-10	Speed control error detection range on reverse side	-500 to -50	1	-100	r/min

F-08 is a parameter to determine whether to enable or disable the speed control error protection.

When the use of the speed control error protective function has been specified, if the motor speed in response to the speed command (SPD_REF) exceeds the range from SPD_REF+[**F-10**] to SPD_REF+[**F-09**] ([**F-10**] is a negative value), a speed control error occurs, and the inverter trips.

This function works when a trouble occurs in the speed controller or PG or the speed drops owing to the load torque exceeding the torque limit.



Range of operation of speed control error protective function

The reference speed command is the selected speed command in the speed control mode (**b-01** = 0) or the speed command input from [0-±10] terminal block (or [4-20]) of VFC64TB terminal block in other modes.

Motor overheat protection (use of T/V61V option)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-12	Selection of motor overheat protective operation	0: OFF (non-use) 1: ON (use)	-	OFF	-

Determine whether to enable or disable the motor overheat protection. When this function is set to ON, if the motor temperature exceeds 150°C, the inverter is tripped.

Note) To use this function, the T/V61V option and a temperature sensor in the motor are necessary. If these devices are not provided, set this parameter to OFF. As for the T/V61V option, see 3 “Motor temperature detection option, T/V61V” in Chapter 5.

Protective relay (86A) operation during under voltage

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-13	Selecting operation of protective relay (86A) during under voltage	0: OFF (non-use) 1: ON (use)	-	OFF	-

Select the operation of the protective relay (86A) to be performed when the inverter detects an under voltage.

OFF: Even if an under voltage is detected, the protective relay does not function, and the under voltage status is reset only by turning off the running (jogging or DC brake) command after power restoration. When **b-11** (selecting restart function after instantaneous stop) is ON, the inverter will be automatically reset and restarted after power restoration.

ON: When an under voltage is detected, the protective relay functions to trip the inverter. In this case, it is necessary to reset the protective relay through the reset terminal or reset key in the same manner as when other protective operations are made. Even if **b-11** (selecting restart function after instantaneous stop) is set to ON, the inverter will not be automatically restarted.

Protective retry function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-14	Setting of protection retry count	0 to 5	1	0	-

When a protective operation occurs, automatic reset of the protective operation and automatic restart are repeated the number of times set in **F-14**. The automatic reset is performed 1 second after the occurrence of the protective operation, and then the automatic restart is made. If the protective operation recurs within 10 seconds after restart, the retry counter is incremented by 1. If the counter’s value is less than the setting of **F-14,** the protective operation is reset again, and the inverter is restarted. If the protective operation does not recur in 10 seconds after restart, retry is successful, and the retry counter is cleared.

Note) A retry can be made after occurrence of protective operation against over-voltage, fuse blowout, over-speed, under voltage (when 86A is on), option error and external failure. Against other troubles, retry is not allowed for reasons of safety.

Trace-back function setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
F-15	Trace-back pitch	1 to 100	1	1	ms
F-16	Trace-back trigger point	1 to 99	1	80	-
F-17	Selection of trace-back ch1	0 to 64	1	0	-
F-18	Selection of trace-back ch2	0 to 64	1	0	-
F-19	Selection of trace-back ch3	0 to 64	1	0	-
F-20	Selection of trace-back ch4	0 to 64	1	0	-
F-21	Selection of trace-back ch5	0 to 64	1	0	-
F-22	Selection of trace-back ch6	0 to 64	1	0	-
F-23	Selection of trace-back ch7	0 to 64	1	0	-
F-24	Selection of trace-back ch8	0 to 64	1	0	-
F-25	Selection of trace-back ch9	0 to 64	1	0	-
F-26	Selection of trace-back ch10	0 to 64	1	0	-
F-27	Selection of trace-back ch11	0 to 64	1	0	-
F-28	Selection of trace-back ch12	0 to 64	1	0	-

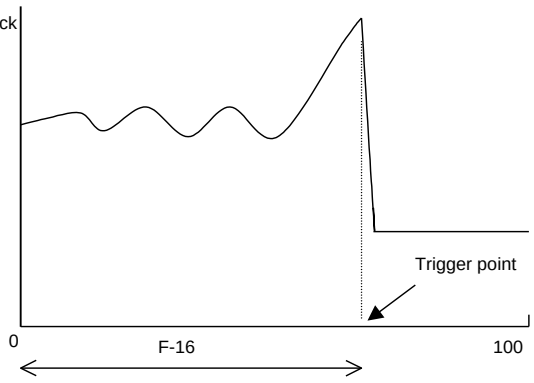
ED64A incorporates a trace-back function to store, read and analyze control data on current and voltage upon occurrence of protective operation to promptly recover the motor. By initializing, the trace-back function stores data on current and voltage. In addition, the function can assign the data output from each Super-block, when using HC function.

F-15: Set the trace-back interval.

F-16: Set the trace-back trigger point.

F-17 to F-28: Determine which data to be traced back on each channel, data in the inverter or other variables.

Note) The trace-back pitch and trace-back point must be set before sampling data to be traced back upon occurrence of protective operation.



Setting of trace-back point

Setting in **F-17 to F-28**	0		1 to 64	
	Recorded data	Dimension	Recorded data	Dimension
ch1	U-phase current	(3536 / Inv. rated current value)	Output RAM of Super-block (1 to 64) (Settings of **F-17** to **F-28** will be as selection of output RAM.)	20000/100%
ch2	V-phase current			
ch3	W-phase current			
ch4	DC voltage	10/1V (200V class) 5/1V (400V class)		
ch5	Output voltage			
ch6	Motor speed	20000 / max. speed		
ch7	Speed command (after acceleration/deceleration command)			
ch8	Torque command	5000/100%		
ch9	(Data for our test running)			
ch10	(Data for our test running)			
ch11	(Data for our test running)			
ch12	(Data for our test running)			

Note) Traced back data can be read on a personal computer using the PC tool software (optional). See “trace-back monitor usage direction” in “PC tool manual [I]”

2-8. Setting item area G (analog input/output setting and gain adjustment)

Analog input (VFC64TB-Z PCB [0-±10], [4-20] terminal input) adjustment

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-00	Analog setting adjustment gain on +side	50.00 to 150.00	0.01	100.00	%
G-01	Analog setting adjustment gain on -side	50.00 to 150.00	0.01	100.00	%

Adjustment gain of analog input of VFC64TB-Z PCB [0-±10] and [4-20] terminal. Gain of **G-00**, when voltage is input in + side, or **G-01** when input in –side is efficient. Normally adjustment is already done at the point of shipment, but readjustment is needed after initializing PCB. (This item is efficient to both, using rotational speed command or torque command as input.)

＜Procedures of adjustment of gain＞

1) Select [88888] of console monitor

2) Input +10V between [0-±10] and [GND]

3) Adjust **G-00** to display 10.000 in the monitor

4) Input -10V between [0-±10] and [GND]

5) Adjust **G-01** to display 10.000 in the monitor (Monitor will display absolute value even when minus voltage is input)

Note 1) Adjusting to display 5.000 at 20mA input of 4-20mA input adjustment and make to display 10.000 at 150 kHz of pulse train input

Note 2) Adjustment 4) to 5) of minus side is not necessary if minus side setting is not going to be used.

Analog rotational speed command (VFC64TB-Z PCB [0-10], [4-20] terminal input) characteristic setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-02	Selecting analog speed command characteristics	0: 0 to ±10V(bi-polarity) 1: 0 to 10V(uni-polarity) 2: 4 to 20mA 3: Pulse train (0 to 150kHz)	-	1	-
G-03	Analog speed command upper limit	Absolute value of (G-04) to 100.0	0.1	100.0	%
G-04	Analog speed command characteristics	－(G-03) to (G-03)	0.1	0.0	%

Note) Set **G-03**, **G-04** with % to the max. rotational speed (**A-00**)

Set the characteristics when using [0-±10] and [4-20] terminal blocks as rotational speed command of VFC64TB-Z PCB. (See items **b-15**, **b-16** for setting selection of speed command site. When using as torque command input, characteristics will become 0 to±10V (-10V: 150%, +10V: -150%) disregarding of the setting)

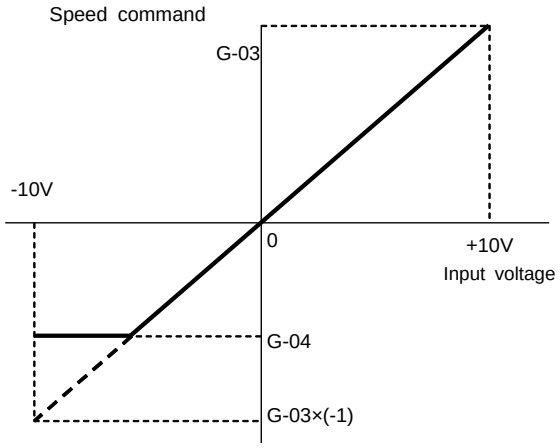
G-02 sets speed command input to either one of voltage input (bi-polarity/uni-polarity), current input or pulse train input. SW1, SW2 on VFC64TB-Z are also needed to be changed. **G-02** setting, SW1, 2 setting and terminal block to input setting signal are written in the chart below.

Setting input to be used	Voltage input （0－±10V）	Voltage input （0－＋10V）	Current input （4－20mA)	Pulse train input （0－150kHz）
G-02setting	0	1	2	3
VFC64TB-Z-SW1	OFF	OFF	OFF	ON
VFC64TB-Z-SW2	OFF	OFF	OFF	ON
Input terminal block	[0-±10] terminal block	[0-±10] terminal block	[4-20] terminal block	[0-±10] terminal block

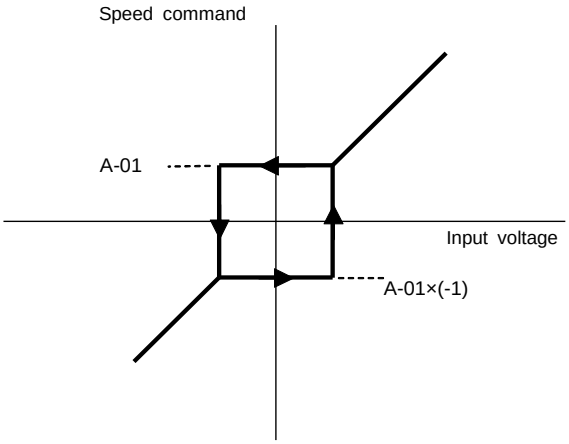
Followings are description of speed command characteristics to the selected setting input.

1) Voltage input (0 to±10V) (G02 =0)

Reverse running is possible by making command input voltage to minus voltage. (When operating in reverse direction command, reverse running in + voltage, normal running in -voltage.) Characteristic is became setting of **G-03** at +10V input, minus value of setting **G-03** at -10V input, and minus value over setting of **G-04** will be limited. (Therefore if using to the maximum of minus, setting of **G-04** has to be -100%) When **A-01** (min. rotational speed) is other than 0, absolute value will be limited not to be less than this rotational speed. In this case, when characteristics line passes near 0V, it will be hysteresis characteristics like shown below. (At starting time, min. rotational speed will be normal at normal running, reverse at reverse running.)



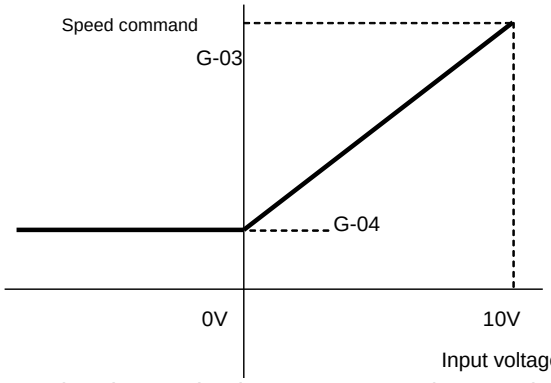
1-1) When selecting voltage input (0 to ±10V)



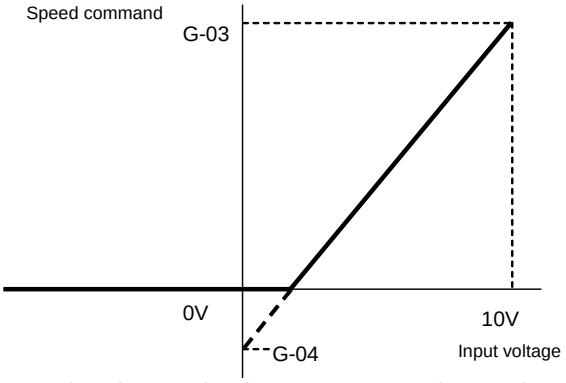
1-2) Min. rotational speed hysteresis characteristics near 0V (**A-01**)

2) Voltage input (0 to+10V) (G02=2)

Characteristic become setting of **G-04** at 0V input, and setting of **G-03** at 10V, effective only at plus voltage and will be limited to **G-04** (When minus value is set to **G-04**, it will be limited to 0) When **A-01** (min. rotational speed) is other than 0, absolute value will be limited not to be less than this rotational speed. For speed command, there is only normal running. For reverse running, use reverse running command.



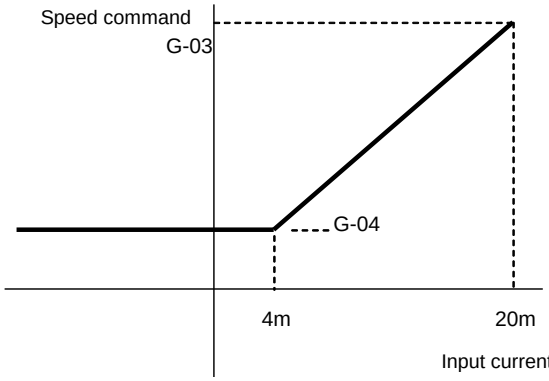
2-1) When selecting 0 to +10V (G04>=0)



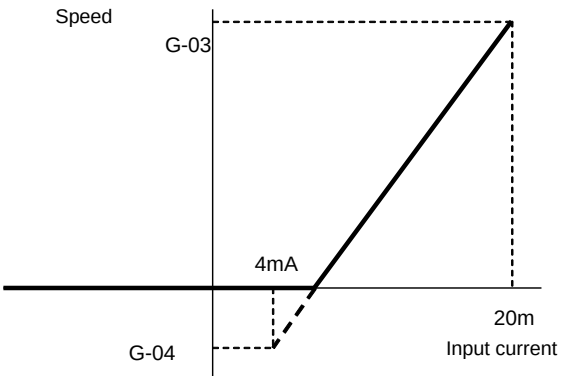
2-2) When selecting 0 to +10V (G04<0)

3) Current input (4 to 20mA) (G02=2)

Characteristic become setting of **G-04** at 0V input, and setting of **G-03** at 10V, effective only at plus side current and will be limited to **G-04** (When minus value is set to **G-04**, it will be limited to 0) When **A-01** (min. rotational speed) is other than 0, absolute value will be limited not to be less than this rotational speed. For speed command, there is only normal running. For reverse running, use reverse running command.



3-1) When selecting 4 to 20mA (G04>=0)



3-2) When selecting 4 to 20mA (G04<0)

4) Pulse train input (G0=3)

To use pulse train, turn ON, SW1,2 on VFC64TB-Z-PCB and input duty 1:1 pulse signal at 1-15V in terminal between [0-±10]-[GND]. Setting characteristic is as same as voltage input (0 to+10V). Read (0 to+10V) as 0-150kHz.

Analog input 0 limit function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-05	Analog input 0 limit voltage	0 to 1.000	0.001	0	V

Function to make the command forcibly to 0, when absolute value of command input voltage inputted to VFC64TB-Z [0-±10] goes below this setting. Use when voltage does not become perfectly 0 caused by drift etc. of analog circuit, even when set to 0. (Effective to both speed command and torque command use.)

Setting related to analog output (VFC64-Z PCB [A] terminal block)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-06	Selecting analog output	0: Output voltage 1: Output current 2: Torque command 3: Motor rotational speed 4: Rotational speed command 5: Super-block output 6: Calibration 7: Internal monitor (for our testing)	-	1	-
G-07	Analog output adjustment gain	50.0 to 150.0	0.1	100.0	%
G-08	Analog output adjustment offset	-50.0 to 50.0	0.1	0.0	%

Setting for data selecting, offset adjustment, and gain adjustment of analog output from between [A]-[GND] terminal block on VFC64TB-Z PCB

Analog output selected at G-06

	Selecting item	Output voltage		Selecting item	Output voltage
0	Output voltage	7.5V/200V (200V class) 7.5V/400V (400V class)	4	Rotational speed command (After accel./decel. control)	10V / max. rotational speed (**A-00**)
1	Output current effective value	5V/ Inverter rated current	5	Super-block output	5V/ 20000 (100%) (Note)
2	Torque command	5V/100%	6	Calibration	Output 5V
3	Motor rotational speed	10V/ max. rotational speed (**A-00**)	7	(For our adjustment)	----------

Note) When Super-block output is selected, value output by HC (Super-block) function to variable AnOutSb will be outputted at rate of 5V / 20000.

Selecting rotational counter (VFC64TB-Z PCB [f] terminal block) output

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-09	Selecting pulse/frequency output	0: PG output (Duty1:1)(ED64P,V only) 1: - 2: Motor rotational speed (6F output) 3: Calibration (6F output)	-	2	-

Select the signal to output to between [f]-[GND] terminal block on VFC64TB-Z PCB

0: PG output

Frequency divide waveform of PG (B-phase) and output as signal of (0-10V). Selecting from 1/2 or 1/4 frequency dividing is possible by SW3 on VFC64TB-Z PCB. (SW3: OFF: 1/2, ON: 1/4) (Note: Not selectable with ED64S mode)

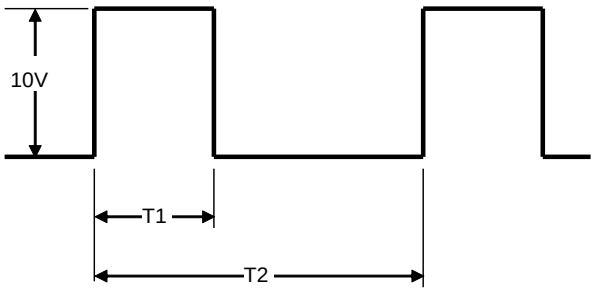
2: Motor rotational speed, 3: Calibration

When these are selected, frequency signal (6F signal) 6 times the frequency conversion value will be output from [f]-[GND] terminal block as shown in the figures below.
In case of selecting motor rotational speed, frequency conversion value F will be calculated as:

F = (Motor rotational speed) / 60×(Motor pole count) / 2 (Hz)

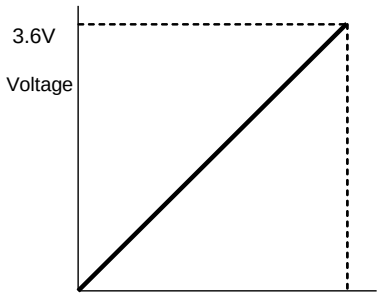
For calibration, frequency conversion value of max. rotational speed (**A-00**) will be outputted. Make pulse count to 1/6 frequency dividing, when using digital type frequency/ rotation counter.

In case of using DC voltmeter, make it as average of 6F signal output, and adjust to the rate of the diagram “frequency-voltage characteristic”. (However, when frequency conversion value of max. rotational speed, or max. frequency exceed 120 Hz, it will be 1/2 of rate, exceeding 240Hz will be 1/4 of rate.)



(Maximum output:5mA)

6F signal output waveform



Frequency (conversion value) 60Hz

Frequency-voltage characteristic

(When frequency conversion value of max. rotational speed is lower than 120Hz)

T1, T2 above are:

T1=1ms (Frequency conversion value of max. rotational speed is lower than 120Hz)
=0.5ms (Frequency conversion value of max. rotational speed is lower than 240Hz)
=0.5ms (When frequency conversion value of max. rotational speed exceed 240Hz)

T2=1/ (6×F) F: Output frequency or frequency conversion value

Isolated speed analog input adjustment (ISO64, IO64-Z option)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-10	Isolated analog setting adjustment gain	50.00 to 150.00	0.01	100.00	%
G-11	Selecting isolated analog input characteristic	0：0 to +10V 1：4 to 20mA	-	0	-
G-12	Isolated analog setting upper limit speed	Absolute value of (G-13) to 100.0	0.1	100.0	%
G-13	Isolated analog setting lower limit speed	－(G-12) to (G-12)	0.1	0.0	%

Note) **G-12**, **G-13** is set by % to max. rotational speed (**A-00**)

Set the input to use between terminal blocks [1]-[3] of ISO64 option PCB or between terminal blocks [1]-[2] of IO64-Z option PCB as speed command.

See items **G-00** to **G-04**, for characteristics of the setting are as same as analog input of VFC2001-Z-PCB. However minus voltage input and pulse train input can not be used. Also this setting is for speed command input. For SW1 of IO64-Z-PCB, or IO64-Z-PCB, turn OFF when inputting at 0 to +10V, turn ON when using at 4-20mA. (Just after setting of **G-10**, 88888 of console monitor displays input voltage of terminal block [1] of ISO64 option PCB, or IO64-Z option PCB. Because resolution of input calculation is low, compared to [0-±10] terminal input of VFC64TB-Z PCB, ripple of about ±0.01 occurs at display of 88888.)

Note) Between terminal [1]-[2] of IO64-Z option PCB is connected to both speed command input (0 to +10V / 4 to 20mA) and torque command input (-10 to +10). When using between terminal [1]-[2] of IO64-Z option PCB as speed command input adjust to **G-11** to **G-13**, when using as torque command input adjust the following **G-14** to **G-15**.

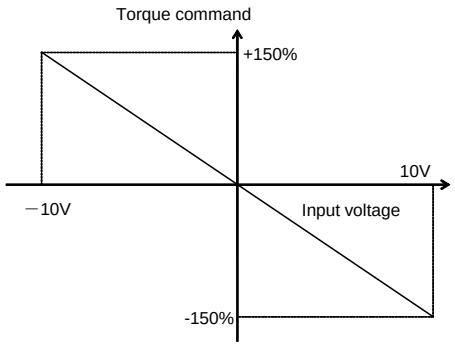
Isolated torque command analog input adjustment (ISO64, IO64－Z option)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-14	Isolated torque command input adjustment gain	50.0 to 150.0	0.1	100.0	%
G-15	Isolated torque command input offset adjustment quantity	-50.0 to 50.0	0.1	0.0	%

Adjust gain and offset when using between terminal blocks [4]-[3] of ISO64 option PCB or between terminal blocks [1]-[2] of IO64-Z option PCB as torque command. Because this input can get data faster than other analog input by 12 bit A/D converter, use to isolate torque witch needs high-speed response.

G-14: Adjustment gain for input. Effective to both plus and minus side.
G-15: Offset adjustment. Adjust to make torque command to 0 at 0V input.

(Just after setting of **G-14**, 8888 of console monitor displays input of voltage to this between terminal blocks [4]-[3] of ISO64 option PCB.)



Torque command input characteristics

Isolated analog output adjustment (IO64-Z option)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-16	Selecting isolated analog output	0 : Output voltage 1 : Output current 2 : Torque command 3 : Motor speed 4 : Rotational speed command 5 : Super-block output 6 : Calibration 7 : Internal monitor (for our testing) 8 : Output voltage (4-20mA) 9 : Output current (4-20mA) 10:Torque command (4-20mA) 11:Motor speed (4-20mA) 12:Rotational speed command (4-20mA) 13:Super-block output(4-20mA) 14:Calibration(4-20mA)	-	1	-
G-17	Isolated analog output adjustment gain	50.0 to 150.0	0.1	100.0	%
G-18	Isolated analog output offset adjustment quantity	-50.0 to 50.0	0.1	0.0	%

Adjustment for offset, gain and setting of analog output between terminal blocks [3]-[4] of IO64−Z option PCB.
To select analog signal to output see the following table.

	±10V output		4−20mA output	
	IO64−Z-SW2=3		IO64−Z-SW2=1	
	G-16 setting	Output voltage rate	G-16 setting	Output current rate
Output voltage	0	7.5V/200V (200Vclass) 7.5V/400V (400Vclass)	8	16mA/200V (200V class) 16mA/400V (400V class)
Output current	1	5V/ Inverter rated current	9	12mA/ Inverter rated current
Torque command	2	5V/100%	10	12mA/100%
Motor speed	3	10V/ max. rotational speed (A-00)	11	20mA/ max. rotational speed (A-00)
Rotational speed command	4	10V/ max. rotational speed (A-00)	12	20mA/ max. rotational speed(A-00)
Super-block output	5	5V/20000(100%)	13	12mA/20000(100%)
Calibration	6	Outputs 5V	14	Outputs 12mA

Note1) When selecting 4-20mA output, data will be outputted in absolute value since output turns to uni-polarity on + side.

Note2) When Super-block output is selected, value output to variable IsoOutSb by HC (Super-block) function will be outputted with rate of 5V/20000 or 12mA/20000.

Motor temperature detection adjustment (T/V61V option)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
G-19	Temperature compensation option adjustment offset	-20.0 to 20.0	0.1	0.0	%
G-20	Temperature compensation option adjustment gain	50.0 to 150.0	0.1	100.0	%

Adjust the offset and gain of the motor temperature compensation option (T/V61V).

< Procedures for adjusting T/V61V >

To use T/V61V, adjust it in accordance with the following procedures.

(1) Set the setting item **E-15** “selecting use of motor temperature compensation” or **F-12** “selecting motor overheat protective operation” to ON.

(2) Change the monitor item to the motor temperature in the monitor mode.

(3) Disconnect the wires between the T/V61V terminal block and the motor, and short-circuit [2] and [3].

(4) Insert the jumper block on the T/V61V PCB into JP2 (Fig. A).

(5) Adjust the setting item **G-19** “Temperature compensation option adjustment offset” so that the motor temperature displayed on the monitor is 0.

(6) Remove the jumper block on the T/V61V PCB from JP2, and insert it into JP1 (Fig. B).

(7) Adjust the setting item **G-20** “Temperature compensation option adjustment gain” so that the motor temperature displayed on the monitor is 130.5.

(8) Disconnect [2] and [3] on the terminal block, wire the terminal block and the motor, and return the jumper block to its original position (Fig. C).

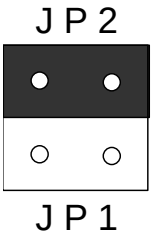


Fig. A Inserting into JP2

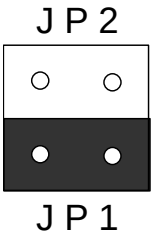


Fig. B Inserting into JP1

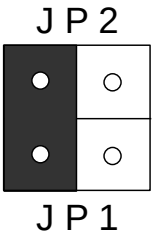


Fig. C Returning to original position

2-9. Setting item area H (setting related to program operation/preset operation)

Preset/program operation speed command

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
H-00	Preset rotational speed 1	−max. rotational speed to max. rotational speed	1	0	r/min
H-01	Preset rotational speed 2		1	0	r/min
H-02	Preset rotational speed 3		1	0	r/min
H-03	Preset rotational speed 4		1	0	r/min
H-04	Preset rotational speed 5		1	0	r/min
H-05	Preset rotational speed 6		1	0	r/min
H-06	Preset rotational speed 7		1	0	r/min
H-07	Preset rotational speed 8		1	0	r/min

Setting for preset operation function selected by multi-function input signal or rotational speed command of program operation function. See setting area c (multi-function input/output) for selecting preset operation by multi-function input signal

Note) Preset operation function can only select 7 speeds, “(**H-00**) preset rotational speed 1” to ”(**H-06**) preset rotational speed 7”. “(**H-07**) preset rotational speed 8” is only for program operation function use.

Selection of program operation mode

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
H-08	Selecting program operation mode	0 : OFF 1 : One-Time 2 : End-less	-	0	-

0: OFF Does not perform program operation. (Normal operation)

1: One-time Perform each program operations, “(**H-00**) preset rotational speed 1” to” (**H-07**) preset rotational speed 8” one time and automatically stop. (If operation command is inputted over 10 seconds after automatic stop, starting failure will occur and inverter will stop)

2: End-less Repeat program operation until operation command is turned OFF. (Until [STOP] key is pressed at console operation)

Setting program operation time

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
H-09	Selecting program operation time unit	0: sec. 1: min. 2: hour	-	0	-
H-10	Program operation time 1	0.0 to 3600.0	0.1	0.0	-
H-11	Program operation time 2		0.1	0.0	-
H-12	Program operation time 3		0.1	0.0	-
H-13	Program operation time 4		0.1	0.0	-
H-14	Program operation time 5		0.1	0.0	-
H-15	Program operation time 6		0.1	0.0	-
H-16	Program operation time 7		0.1	0.0	-
H-17	Program operation time 8		0.1	0.0	-

H-09: Set time unit to settings **H-10** to **H-17**
H-10 to 17: Set the operation time of each steps of program operation. (Set 0.0 for time of steps not used)

Selecting acceleration / deceleration time of program operation

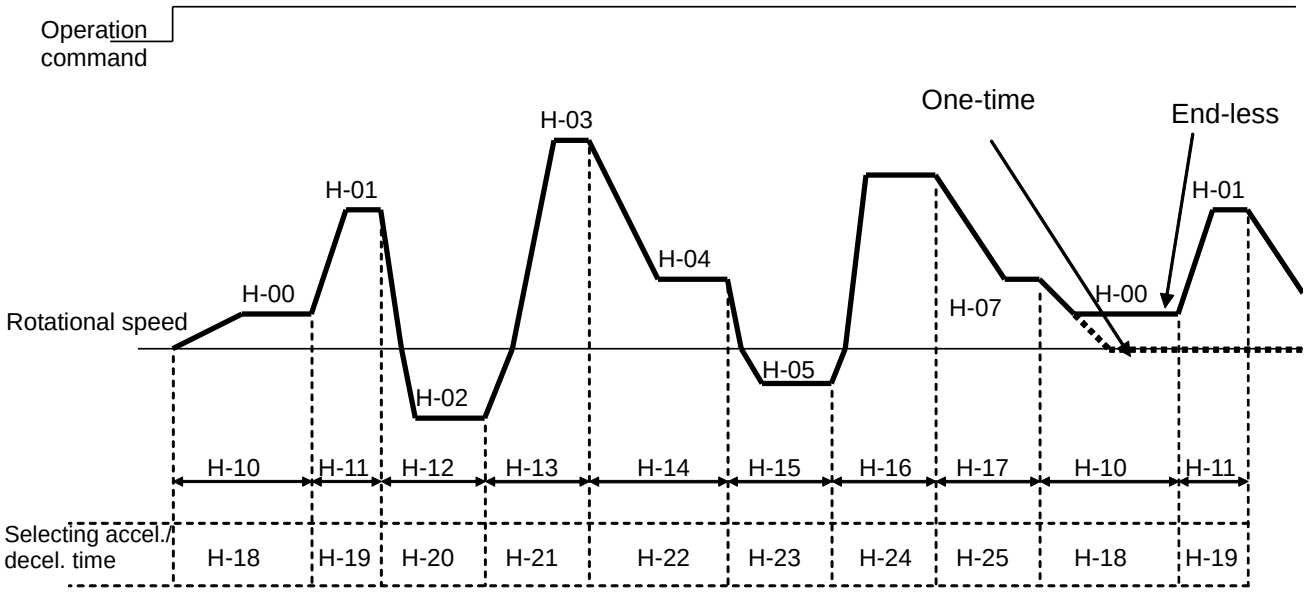
Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
H-18	Selecting program operation accel./decel. time 1	0: Accel./decel. time (1) 1: Accel./decel. time (2) 2: Accel./decel. time (3) 3: Accel./decel. time (4)	-	0	-
H-19	Selecting program operation accel./decel. time2		-	0	-
H-20	Selecting program operation accel./decel. time 3		-	0	-
H-21	Selecting program operation accel./decel. time 4		-	0	-
H-22	Selecting program operation accel./decel. time 5		-	0	-
H-23	Selecting program operation accel./decel. time 6		-	0	-
H-24	Selecting program operation accel./decel. time 7		-	0	-
H-25	Selecting program operation accel./decel. time 8		-	0	-

Selecting acceleration / deceleration time setting of each step will be done at **H-18** to **H-25**, regardless of settings of **d-00**, **d-01** or multi-function input (selecting acceleration /deceleration time) during program operation

Each time of acceleration/deceleration time to be selected

Selection of **H-18～25**	Acceleration time	Deceleration time	S-curve rise time	S-curve acceleration arrival time	S-curve fall time	S-curve deceleration arrival time
0: Accel./decel. time (1)	**3.Acc1**	**4.dEc1**	**d-07**	**d-08**	**d-09**	**d-10**
1: Accel./decel. time (2)	**5.Acc2**	**6.dEc2**	**d-11**	**d-12**	**d-13**	**d-14**
2: Accel./decel. time(3)	**d-02**	**d-03**	0.0	0.0	0.0	0.0
3: Accel./decel. time(4)	**d-04**	**d-05**	0.0	0.0	0.0	0.0

・**3. Acc1, 4.dEc1, 5.Acc2, 6.dEc2** are fundamental setting items.
・When acceleration time 3, 4 are selected, all of S-curve acceleration / deceleration will be 0.0.



Example of program operation pattern

2-10. Setting item area i (drooping control, machine loss compensation)

Setting drooping control

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
i-00	Selecting use of drooping control	0 :OFF(non-use),1 :ON(use)	-	OFF	-
i-01	Drooping start rotational speed	0.0 to 100.0	0.1	0.0	%
i-02	Drooping ratio changeover rotational speed	0.0 to 100.0	0.1	0.0	%
i-03	Drooping ratio	0.0 to 50.0	0.1	0.0	%
i-04	Drooping start torque	0.0 to 90.0	0.1	0.0	%

Note) **i-01** and **i-02** are set by % to max. rotational speed.

Settings for each drooping control used to balance torque of 2 motors.

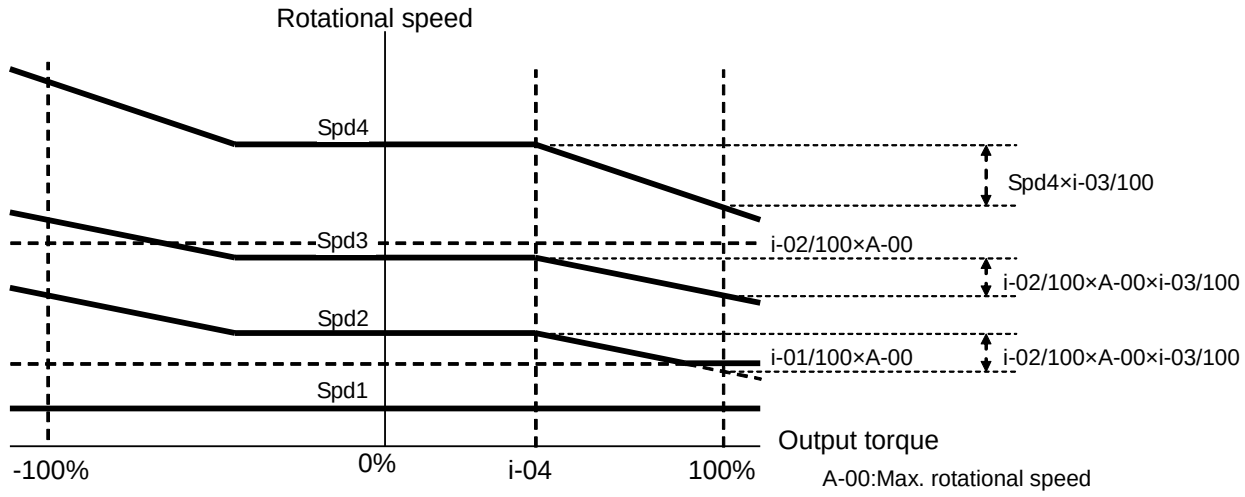
i-00: Select active / inactive of drooping control

i-01: Start drooping control at **i-01** or over. (When rotational speed becomes lower than this, as a result of drooping control, it will be limited according to this rotational speed.)

i-02: Set drooping value based on rotational speed command when its over **i-02**. **i-02** will be the boundary for drooping control method. (For drooping the whole range at ratio to rotational speed command, set **i-02**= 0.0 %. For drooping at ratio of max. rotational speed, set **i-02**=100.0%)

i-03: Set drooping value at rated torque command, based on ratio of drooping amount to boundary rotational speed (rotational speed command when rotational speed is **i-02** or over, setting of **i-02** when lower).

i-04: Does not droop below this torque.



Drooping control characteristics

Machine loss compensation setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
i-05	Selecting machine loss compensation	0 :OFF(non-use), 1 :ON(use)	-	OFF	-
i-06	Machine loss offset value	0 to 100	1	0	%
i-07	Machine loss inclination	0 to 100	1	0	%

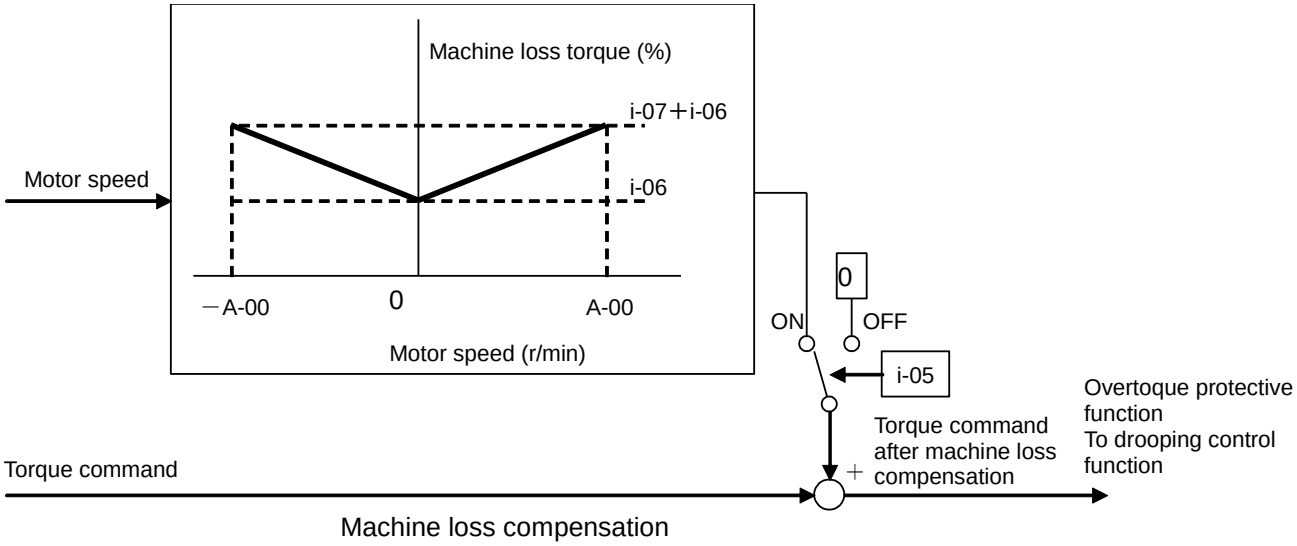
Torque command with machine loss compensation (machine loss value subtracted) can be used instead of torque command used at over-torque protection, or drooping control etc.

Note) Compensation for torque command input at torque control will not be done. Also compensation for torque command monitor display will not be done too.

i-05: Select active / inactive of machine loss compensation. (Overtorque or drooping control will be done without machine loss compensation, when inactive.)

i-06: Set machine loss offset value at 0 speed, with rated torque as 100%.

i-07: Set motor speed proportion value of machine loss at torque of max. rotational speed value.



Machine loss compensation

2-11. Setting item area J (communication option setting)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
J-00	Selecting use of communication option	0 :OFF(non-use), 1 :ON(use)	-	OFF	-
J-01	ASYC64-Z option communication baud-rate	0 :1200bps 1 :2400bps 2 :4800bps 3 :9600bps 4 :19200bps 5 :38400bps	-	4	-
J-02	OPCN64 option communication baudrate	0 :125kbps 1 :250kbps 2 :500kbps 3 :1Mbps	-	3	-
J-03	PBUS64 option slave station address	0 to 126	1	2	-
J-04	OPCN64 option input OPCN64→master station) number of frames	3 to 19	1	14	-

J-05	OPCN64 option output (master station→ OPCN64) number of frames		2 to 12	1	6	-
J-06	BCDIN64 selecting input loading		0 :Auto 1: Edge trigger operation 2: Level trigger operation	-	0	-
J-07	BCDIN64 selecting use of input polarity signal		0: Non-use of polarity bit 1: Use polarity bit	-	0	-
J-08	ASYC64-Z/PBUS64 selecting communication mode		(At ASYC64-Z) 0: Standard communication mode 1: Positioning mode 1 2: Positioning mode 2 (At PBUS64) 0: PROFIDRIVE mode 1: Toyo exclusive mode 2: Special mode	-	0	-
J-09	Positioning mode 0	Positioning mode efficient by using ASYC64-Z	16 to 200	1	100	r/min
J-10	Positioning mode 1		16 to 200	1	100	r/min
J-11	Positioning acceleration time		0.1 to 10.0	0.1	0.5	sec
J-12	Positioning deceleration time		0.1 to 10.0	0.1	0.5	sec
J-13	Creeping speed		2 to 16	1	2	r/min
J-14	Pulse count of creeping movement period		40 to 400	1	40	-
J-15	Stop pulse number		-50 to 50	1	0	-
J-16	Selecting positioning emergency stop		0:OFF,1:ON	-	OFF	-
J-17	DNET64 Output Assembly Setting instance number		0: Instance No.20 1: Instance No.21 2 to 10: (For our original communication mode)	-	0	-
J-18	DNET64 Input Assembly Setting instance number		0: Instance No.70 1: Instance No.71 2 to 15: (For out original communication mode)	-	0	-
J-19	DNET64 Speed Scale setting		-126 to 127	-	3	-
J-20	DNET64 Monitor Data No. setting		0 to 119	-	0	-

J-00: Determine whether to use the communication option. When this setting is OFF, the communication option cannot be established even if communication option is specified as the running command and speed command input sites (speed command will be 0). When this item is set to ON, option errors are checked. If communication option is turned ON, when disconnected, option error will occur and inverter is tripped. (Turn OFF this setting when using BCDIN64, for BCDIN64 is not communication option)

J-01 to **08**: Setting for ASYC64-Z (communication option of asynchronous RS485, RS422-A, RS232C), OPCN64 (OCPN-1 communication option), BCDIN64 (BCD input option) use. See directions of each function.

J-09 to **16:** Set the special mode used in ASYC64-Z option. Normally keep initialized.

J-17 to **20:** Setting for when DNET64 (DeviceNet communication option). See directions of DNET64 option.

2-12. Setting item area L (2nd motor parameter setting, 2nd speed control gain)

ED64A is provided with 2nd motor function, to use 2 different motor alternately changing by the contact, witch has rated value, constant and speed control system gain in advance. By turning ON “2nd motor function” of multi-function, each of following items data can be used instead of each data of normal motor.

Note) Changing of multi-function input should be done while inverter is stopped. During operation (includes DC braking, pre-excitation) does not accept.

Selecting use of 2nd motor function

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-00	Selecting use of 2nd motor	0 :OFF(non-use), 1 :ON(use)	-	OFF	-

2nd motor function will be efficient by turning ON this setting. When the setting is OFF, data will not change to the data of 2nd motor even when “selecting 2nd motor” of multi-function is ON.

Setting of 2nd motor rating

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-01	2nd motor rated capacity	3 ranks below inverter rated capacity to capacity	Note 1)	0.0	kW
L-02	2nd motor rated voltage	140 to 230(200V class) 280 to 460(400V class)	1	0	V
L-03	2nd motor rated current	40 to 150% of inverter rated current	Note 1)	0.0	A
L-04	2nd motor rated rotational speed	67 to 100% of max. rotational speed	1	0	r/min
L-05	2nd motor pole	2 to 12 [Pole]	-	4	Pole

Note 1) Vary depending on the inverter type

Set 2nd motor rating. These settings will be replaced at the time of selecting 2nd motor from settings **A-02** to **A-06** of normal motor. To perform auto-tuning of 2nd motor, these setting must be set in advance. (See items **A-02** to **A-06** for each detail)

2nd motor PG pulse count setting (ED64P and ED64V mode only)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-06	2nd motor PG pulse count	60 to 3600	1	600	P/R

Set PG pulse count of 2nd motor. This setting will be replaced at the time of selecting 2nd motor from settings **A-07** of normal motor. (See items **A-07** for detail.)

2nd motor q-axis pulse magnetic pole determination current

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-07	2nd motor q-axis pulse magnetic pole determination current	50 to 200 (% to the motor rated current)	1	50	%

Set q-axis pulse magnetic pole determination current of 2nd motor. This setting will be replaced at the time of selecting 2nd motor from setting A-09 of normal motor. (See item A-09 for detail)

Setting item by auto-tuning of 2nd motor (Common)
(2nd motor electric constant)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-08	2nd motor primary resistance	(Setting range and resolution differs depending on inverter capacity)	-	0	mΩ
L-09	2nd motor q-axis inductance			0	mH
L-10	2nd motor d-axis inductance			0	mH
L-11	2nd motor magnetic flux	0.001 to 9.999	0.001	0.0	Wb
L-12	2nd motor iron loss conductance	0.0 to 300.0	0.1	0.0	mmho
L-13	2nd motor Lq changing rate of 30% q-axis current	-100.0 to 100.0	0.1	0.0	%
L-14	2nd motor Lq changing rate of 60% q-axis current	-100.0 to 100.0	0.1	0.0	%
L-15	2nd motor Lq changing rate of 90% q-axis current	-100.0 to 100.0	0.1	0.0	%
L-16	2nd motor Lq changing rate of 120% q-axis current	-100.0 to 100.0	0.1	0.0	%
L-17	2nd motor Lq changing rate of 30% d-axis current	-100.0 to 100.0	0.1	0.0	%
L-18	2nd motor Lq changing rate of 60% d-axis current	-100.0 to 100.0	0.1	0.0	%
L-19	2nd motor Lq changing rate of 90% d-axis current	-100.0 to 100.0	0.1	0.0	%
L-20	2nd motor Lq changing rate of 120% d-axis current	-100.0 to 100.0	0.1	0.0	%

(d-axis position (magnetic pole position) setting)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-21	2nd motor d-axis position (magnetic pole position)	0 to 30000	1	-1	-

(Settings related to magnetic pole determination)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-22	Selecting 2nd motor magnetic pole determination method	0:q-axis pulse magnetic pole determination method (1) 1: q-axis pulse magnetic pole determination method (2) 2: d-axis pulse magnetic pole determination method	-	0	-
L-23	2nd motor d-axis measurement pulse width	-12.7 to 12.7	0.1	0.0	ms
L-24	Selecting 2nd motor d-axis measurement pulse voltage amplitude	0:30% 1:50% 2:75% 3:100%	-	0	-

Settings **L-08** to **L-24** are setting item for auto-tuning of 2nd motor. When auto-tuning with 2nd motor selected is operated, values measured in **L-08** to **L-24** will be set instead of **A-17** to **A-33**. The values will be set instead of **A-17** to **A-33** also during the operation. (For detail of the items, see each settings of normal motor and **A-17** to **A-33**)

(2nd motor speed control adjustment gain) (Vector control)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
L-18	2nd speed control proportional gain	3 to 100	1	15	-
L-19	2nd speed control integrated time constant	10 to 10000	1	40	ms
L-20	2nd speed control inertia moment	0 to 65535	1	10	gm^2

2nd motor uses speed control gain different from normal motor. When 2nd motor is selected, speed control gain is replaced to fundamental items 7.ASrP, 8.ASri, 9.ASrJ and **L-25** to **L-27** is used. (See each items of 7.ASrP, 8.ASri, 9.ASrJ for detail)

2nd motor auto-tuning

For operation instruction of auto-tuning of 2nd motor, see “2nd motor auto-tuning (Only when using 2nd motor function)”

(Note) With only 2nd motor auto-tuning performed, motor will not operate because **A-11** to **A-16** (dead time compensation value) is not set yet. Perform “normal motor auto-tuning” in advance.

2-13 Setting item area n (monitor setting)

Line speed setting

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
n-00	Line speed monitor adjustment	0.0 to 2000.0	0.1	0.0	-

Adjust the gain displayed on the console “line speed” monitor.

Set the line speed at the maximum rotational speed (**A-00**).

The line speed monitor displays the following speed:

Motor speed × (**n-00**) / (**A-00**)

Monitor setting for internal adjustment

Display	Details	Setting range (option)		Setting resolution	Initialize data	Unit
n-01	Output monitor for adjustment (ch2) gain	0 to 32767	Monitor setting items for our internal test. Normally keep them initialized.	1	1	-
n-02	Output monitor for adjustment (ch1) gain	0 to 32767		1	1	-
n-03	Output monitor for adjustment (ch2) address (H side)	H0000 to HFFFF		1	HFFFF	-
n-04	Output monitor for adjustment (ch2) address (L side)	H0000 to HFFFF		1	H0000	-
n-05	Output monitor for adjustment (ch1) address (H side)	H0000 to HFFFF		1	HFFFF	-
n-06	Output monitor for adjustment (ch1) address (L side)	H0000 to HFFFF		1	H0000	-
n-07	Monitor display for adjustment address (H side)	H0000 to HFFFF		1	HFFFF	-
n-08	Monitor display for adjustment address (L side)	H0000 to HFFFF		1	HF900	-
n-09	Selecting monitor display for adjustment	0 :HEX display 1 :DEC display (without signal) 2 :DEC display (with signal)		1	2	-

Function to confirm data of inside inverter with display of analog or console by setting internal address of CPU. (These monitor setting items are used for internal adjustment made by us. Normally, keep these settings as initialize.)

2-14 Setting item area o (for our adjustment area)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
o-00 to 65	For our internal adjustment	-------	-	-	-

“Setting item area o” is for our internal adjustment or special purposes and cannot be changed. Keep initialized (at the status of time of delivery). (Normally writing will become error even did so.)

2-15. Setting item P area (Super-block constant setting area)

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
P-000 to 259	Setting Super-block constant	See each directions for Super-block inside “PC tool manual ”	-	-	-

“Setting item area P” is constant setting area for Super-block function. See Super-block function directions for detail. (When Super-block function is not used, this function is not necessary)

2-16. Setting item S area (inverter capacity, DC detection gain)

VDC detection gain

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
S-00	VDC detection gain	80.0 to 120.0	0.1	-	%

Detection adjustment gain for DC voltage detected by ED64A. Adjust gain when display of console monitor “Vdc” and voltage between main circuit terminal block +2 to – is different.

Note) At the time of memory initializing, by inputting voltage between +2 to -, Vdc detection gain is calculated backward and set. Use this as usual.

When main circuit PCB (GAC2006-**, GAC2001 etc.) are replaced, there may be difference between display of “Vdc” and actual voltage between +2 to -, use this setting when VDC detection gain adjustment without initializing is wanted.

Inverter control mode

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
S-01	Inverter control mode (reading only)	ED64P, ED64V, ED64s	-	-	-

By reading this setting, inverter mode set can be confirmed.

ED64P : Control mode with speed/magnetic pole position sensor (A, B, U, and W phase PG)

ED64V : Control mode with speed sensor (A, B, and Z phase PG)

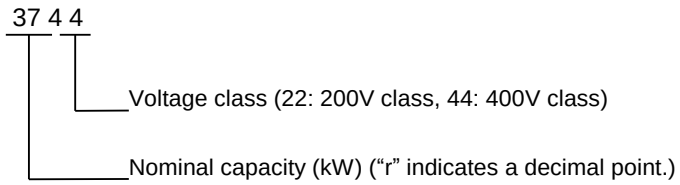
ED64S : Control mode without speed/magnetic pole position sensor

Note) This setting is a readout-only item, and cannot be written. (Constantly writing inhabited) See 6 “Change of inverter control mode” in Chapter 2 when changing control mode.

Inverter capacity and voltage class

Display	Details	Setting range (option)	Setting resolution	Initialize data	Unit
S-02	Inverter capacity and voltage class	1122 to 18022 1144 to 100044	-	-	-

Reading this setting indicates the set inverter capacity and voltage class.



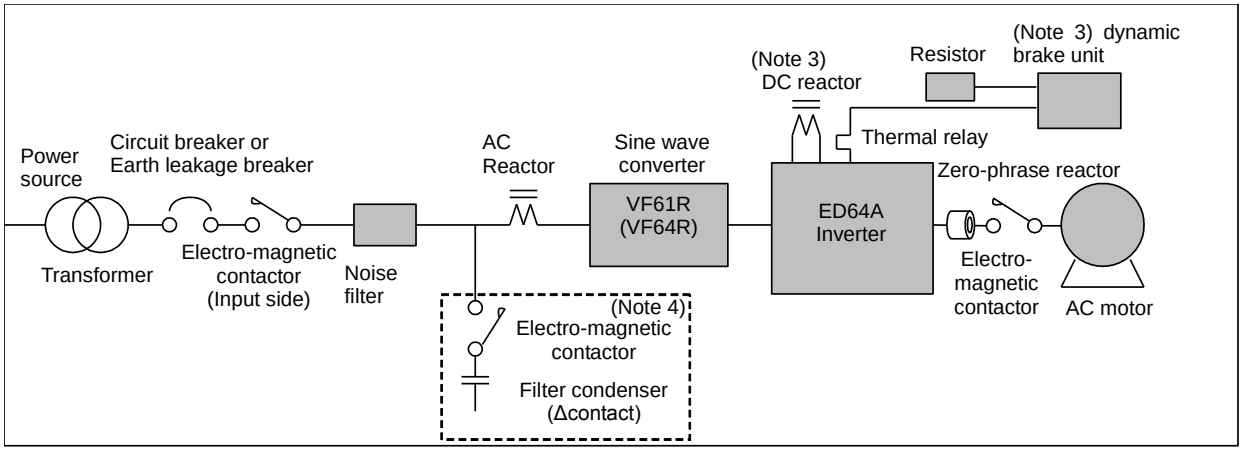
Note) This setting is a read-only item and cannot be written (constantly write inhibited). To change the inverter capacity and voltage class set on the PCB VFC2001-Z when replacing a part with the spare part, it is necessary to initialize the memory.

! CAUTION

If the inverter capacity and voltage class set on the PCB VFC2001-Z is not identical with the capacity and voltage class of the inverter provided with the PCB, the inverter cannot be controlled correctly, thereby causing accidents. Take care when changing the setting. (See 6 “Operations after replacement of PCB” in Chapter 2.)

Chapter 4 Selection and option

1. Selection guide



	Name	Type	Application	Remarks
Peri-pheral device	AC reactor	AL□□□	Apply for the case of input power factor improvement and suppression of distorted wave form.	For input side connection
	Noise filter	NF3□□□ FN3□□□	Apply for reduction of electro-magnetic noise generated form inverter NF3□□□ is noise filter for attenuation of high band. FN3□□□ is noise filter to comply with CE marking.	For input side connection
	DC reactor	DCL□□□	Apply for case of improvement of input power factor. Standard accessory of ED64A-1522, ED64A-2244 or over and option for inverter of less than these capacities.	Connect between ⊕1 to ⊕2
	Sine wave converter	VF61R□□□ (VF64R□□□)	Apply drastic improvement of power factor and improvement of power source regeneration braking, power source harmonic is necessary. ACL for converter is needed to use sine wave converter. See catalog, directions for each capacity of VF61R (VF64R).	Apply for inverter input side (VF64R is under development)
	Dynamic brake unit Resistor Thermal relay	VFDB□□□□ R□□□ TH-□□□	Apply when braking of inverter is necessary. At the time of application, use with dynamic brake unit, resistor and thermal relay. (Types of ED64A-1122 or less, and ED64A-1544 or less has dynamic brake unit built-in.)	Connect between ⊕2 to ⊖ Connect resistor and thermal relay between B to ⊕2 to types with dynamic brake built-in.

(Note1) See next page for selection of circuit breaker, input/output side electro-magnetic contactor, and size of wiring.
(Note2) Use earth leakage circuit breaker complied with harmonic.
(Note3) DCL is standard for 200V class 15kw (ED64A-1522) or over, 400V class 22kw (ED64A-2244) or over, option for capacity smaller than this. However, when using sine wave converter, DCL and dynamic breaking unit (including resistor and thermal relay) are unnecessary.
(Note4) Filter condenser and electro-magnetic contactor to make it efficient are necessary when using sine wave converter (VF61R or VF64R). Electro-magnetic contactor to make filter condenser efficient, should be ON when using sine wave converter, OFF when stopping.
(Note5) As for magnetic contactors of input and output, select and use them conforming to the applications. Because ED motor has built-in permanent magnet, voltage is generated during motor rotation, even when the inverter is stopped. When using power constant area or motor is rotated from other power, we recommend usage of electro-magnetic contactor for the output side for safety. In this case, make the magnetic contactor to operate at operation contact of the inverter (52MA)

2. Input/output device and wiring

200V class

Motor output (Note 2)	Inverter type	Input MCCB (Note5)	MC (Note 6) (Top tier: current bottom tier: apparatus examples)		Wiring size (mm²) (Note 7) (Top tier: Inside panel bottom tier: Outside panel)			
			Input side	Output side	Input side	Output side	DC input /DCL	Earth wire
11.0kW	ED64A-1122	75A	64A or more S-N65	41A or more S-N50	8.0 14	5.5 14	8.0 8.0	5.5
15.0kW	ED64A-1522	75A	61A or more S-N65	56A or more S-N65	8.0 14	8.0 14	14 14	5.5
18.5kW 22.0kW	ED64A-2222	100A	89A or more S-N95	81A or more S-N95	14 22	14 22	22 38	5.5
30.0kW	ED64A-3022	150A	120A or more S-N125	114A or more S-N125	22 38	22 38	38 38	14
37.0kW	ED64A-3722	175A	147A or more S-N150	137A or more S-N150	38 38	38 38	60 60	14
45.0kW	ED64A-4522	200A	180A or more S-N180	162A or more S-N180	38 60	38 60	60 80	22
55.0kW	ED64A-5522	250A	219A or more S-N220	217a or more S-N220	60 80	60 80	80 100	22
65.0kW 75.0kW	ED64A-7522	250A	296A or more S-N300	217A or more S-N300	80 150	80 100	100 150	22
90.0kW	ED64A-9022	400A	355A or more S-N400	330A or more S-N400	150 150	100 150	150 200	38

400V class

Motor output (Note 2)	Inverter type	Input MCCB (Note5)	MC (Note 6) (Top tier: current bottom tier: apparatus examples)		Wiring size (mm²) (Note 7) (Upper tier: Inside panel Lower tier: Outside panel)			
			Input side	Output side	Input side	Output side	DC input /DCL	Earth wire
11.0kW	ED64A-1144	40A	32A or more S-N35	21A or more S-N25	3.5 3.5	3.5 3.5	3.5 3.5	3.5
15.0kW	ED64A-1544	50A	44A or more S-N50	28A or more S-N35	5.5 3.5	3.5 3.5	5.5 5.5	3.5
18.5kW 22.0kw	ED64A-2244	50A	44A or more S-N50	41A or more S-N50	5.5 3.5	5.5 5.5	8.0 8.0	5.5
30.0kW	ED64A-2244	75A	60a or more S-N65	57A or more S-N65	8.0 8.0	8.0 8.0	14 14	5.5
37.0kW	ED64A-3744	100A	75A or more S-N80	69A or more S-N80	14 14	14 14	14 22	5.5
45.0kW	ED64A-4544	100A	89A or more S-N95	81A or more S-N95	14 22	14 14	22 38	14
55.0kW	ED64A-5544	125A	109A or more S-N125	108A or more S-N125	22 22	22 22	38 38	14
65.0kW 75.0kw	ED64A-7544	175A	147A or more S-N150	143A or more S-N150	38 38	38 38	38 60	14
90.0kW 110.0kw	ED64A-11044	250A	216A or more S-N220	203A or more S-N220	60 80	60 60	80 100	22
132.0kW 160.0kw	ED64A-16044	350A	311A or more S-N400	284A or more S-N300	80 100	80 100	150 150	22
200.0kW	ED64A-20044	500A	388A or more S-N400	361A or more S-N400	150 200	150 200	150 250	38
250.0kW	ED64A-25044	600A	480A or more S-N600	455A or more S-N600	150 250	150 250	250 150 × 2P	38
315.0kW	ED64A-31544	700A	604A or more S-N600	596A or more S-N600	250 150 × 2P	250 150 × 2P	150 × 2P 150 × 2P	50
375.0kW (Note 4)	ED64A-31544	800A	720A or more S-N800	600A or more S-N600	150 × 2P 150 × 2P	250 150 × 2P	150 × 2P 150 × 2P	50

(Note1) In this table, 200V class of input voltage is set to AC 200V, 400V class is set to AC400V.

(Note2) Calculate with the combination of motor and the inverter in applicable capacity in standard or semi-standard EDM (base speed: 1200 min^{-1}, 1500min^{-1} and 1800min^{-1}) of 375kw or lower.

(Note3)

(Note4) 375kW motor shows only in case of constant torque area of motor of base speed: 1500min^{-1} and 1800min^{-1} only. For the case of more rotational speed or constant output area, applicable inverter will be ED64A-40044 (parallel specification).

(Note5) Input MCCB shows rated current value. Determine the breaking capacity of MCCB by power source capacity etc.

(Note6) Input/output MC is application example of necessary current capacity (upper tier) and Mitsubishi Elec. Co. (lower tier) products.
(Note7) Arrange wiring between ED64A and motor to make voltage drop to 2% or less. Wiring size are: inside panel size (wiring length of 3m by KIV of 5.5mm^2 or less and MLFC for 8mm^2 or more), Outside panel (wiring length of 30m by CV (CV-3 conductor cable))
(Note8) For clipping terminal, use R type standardized by Japan Industrial standard. (JIS C2805)

3. AC reactor (option)

Use table below for AC reactor of inverter input side.

200V class	
Inverter type	**AC reactor type**
ED64A-1122	AL70A97L
ED64A-1522	AL70A97L
ED64A-2222	AL105A64L
ED64A-3022	AL140A49L
ED64A-3722	AL173A39L
ED64A-4522	AL209A32L
ED64A-5522	AL253A27L
ED64A-7522	AL341A20L
ED64A-9022	AL416A17L

400V class	
Inverter type	**AC reactor type**
ED64A-1144	AL37A180L
ED64A-1544	AL55A122L
ED64A-2244	AL55A122L
ED64A-3044	AL7097L
ED64A-3744	AL84A80L
ED64A-4544	AL105A64L
ED64A-5544	AL140A49L
ED64A-7544	AL173A39L
ED64A-11044	AL253A27L
ED64A-16044	AL341A20L
ED64A-20044	AL503A14L
ED64A-25044	AL585A11L
ED64A-31544	AL850A8L

External form and dimension

Fig.A

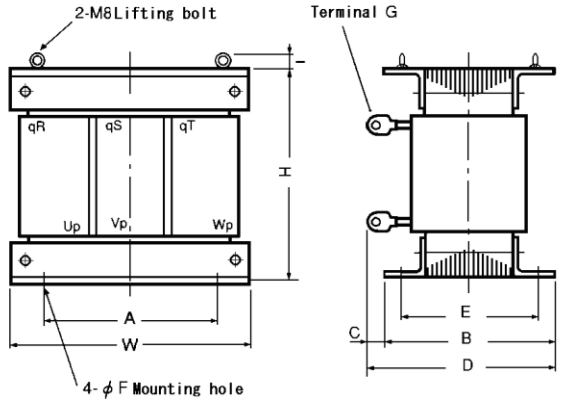
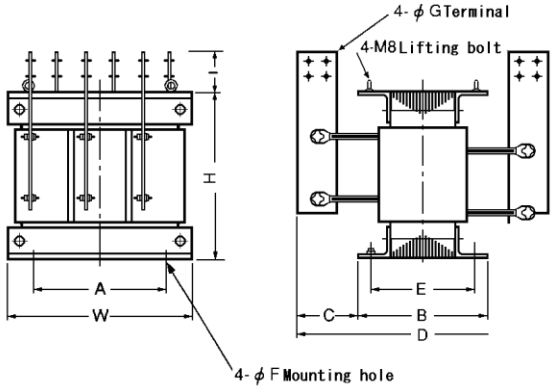


Fig.B



AL type	W	H	D	A	B	C	E	F	G	I	Fig.	weight
AL37A180L	170	110	125	100	85	40	70	7	M6	-	A	3.9
AL55A122L	170	110	135	100	95	40	70	7	M8	-	A	4.2
AL70A97L	170	110	135	100	95	40	75	7	M8	-	A	4.9
AL84A80L	170	110	135	100	95	40	75	7	M8	-	A	5.4
AL105A64L	190	140	155	100	105	50	75	7	M10	-	A	7.5
AL140A49L	190	150	155	100	105	50	75	7	M8	-	A	9.0
AL173A39L	190	150	170	100	110	60	80	7	M10	-	A	10
AL209A32L	220	180	175	115	115	60	90	7	M10	-	A	14
AL253A27L	250	200	198	160	138	60	100	7	M12	-	A	19
AL341A20L	220	180	200	150	140	60	90	7	M12	-	A	15
AL416A17L	280	235	240	150	160	70	120	10	M12	40	A	28
AL503A14L	300	265	228	150	170	70	130	10	M16	40	A	32
AL585A11L	300	255	280	180	150	130	112	10	M12	35	A	45
AL850A8L	350	335	342	250	172	170	122	15	M12	100	B	75

4. Noise filter

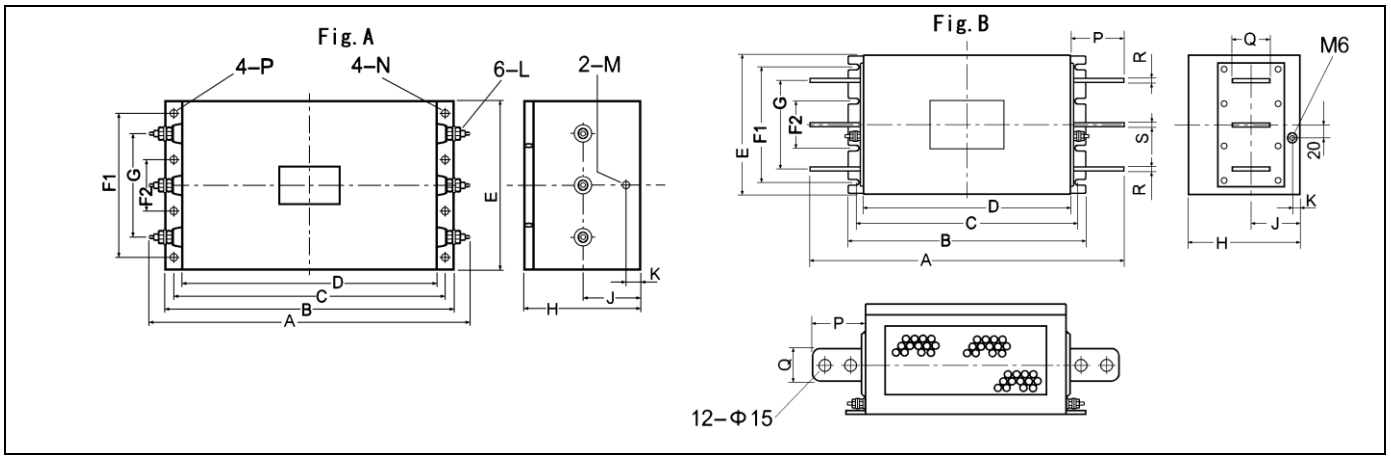
4-1. Noise filter (option)

Use the table below for noise filter of inverter input side. See next page for noise filter complying with CE marking.

200V class	
Inverter type	**Noise filter type**
ED64A-1122	NF3060A-CD
ED64A-1522	NF3060A-CD
ED64A-2222	NF3100A-CD
ED64A-3022	NF3150A-CD
ED64A-3722	NF3150A-CD
ED64A-4522	NF3200A-CD
ED64A-5522	NF3250A-CD
ED64A-7522	NF3400A-CD
ED64A-9022	NF3400A-CD

400V class	
Inverter type	**Noise filter type**
ED64A-1144	NF3030C-CD
ED64A-1544	NF3040C-CD
ED64A-2244	NF3050C-CD
ED64A-3044	NF3080C-CD
ED64A-3744	NF3080C-CD
ED64A-4544	NF3100C-CD
ED64A-5544	NF3150C-CD
ED64A-7544	NF3200C-CD
ED64A-11044	NF3250C-CD
ED64A-16044	NF3400C-CD
ED64A-20044	NF3500C-CD
ED64A-25044	NF3600C-CD
ED64A-31544	NF31000C-CD

External form and dimension



Type		Dimension (unit: mm)																		
200V class	400V class	A	B	C	D	E	F1	F2	G	H	J	K	L	M	N	P	Q	R	S	Fig
NF3010A-CD	NF3005C-CD	147	140	125	110	95	70	-	50	50	25	10	-	-	φ5.5	R2.25×6	-	-	-	A
NF3015A-CD	NF3010C-CD	167	160	145	130	110	80	-	60	70	35	15	-	-	φ5.5	R2.75×7	-	-	-	
NF3020A-CD	NF3015C-CD	167	160	145	130	110	80	-	60	70	35	15	-	-	φ5.5	R2.75×7	-	-	-	
-	NF3020C-CD	167	160	145	130	110	80	-	60	70	35	15	-	-	φ5.5	R2.75×7	-	-	-	
NF3030A-CD	-	175	160	145	130	110	80	-	60	70	35	15	M4	M5	φ5.5	R2.75×7	-	-	-	
NF3040A-CD	NF3030C-CD	215	200	185	170	120	90	-	70	70	35	15	M4	M5	φ5.5	R2.75×7	-	-	-	
-	NF3040C-CD	215	200	185	170	120	90	-	70	70	35	15	M4	M5	φ5.5	R2.75×7	-	-	-	
NF3050A-CD	NF3050C-CD	255	230	215	200	140	110	-	80	80	40	15	M4	M5	φ6.5	R2.75×8	-	-	-	
NF3060A-CD	NF3060C-CD	255	230	215	200	140	110	-	80	80	40	15	M4	M5	φ6.5	R2.75×8	-	-	-	
NF3080A-CD	NF3080C-CD	310	280	260	240	200	150	-	120	100	55	20	M6	M8	φ6.5	R2.75×8	-	-	-	
NF3100A-CD	NF3100C-CD	420	370	350	330	210	170	60	120	155	95	20	M10	M6	φ6.5	R3.25×8	-	-	-	
NF3150A-CD	NF3150C-CD	435	370	390	330	210	170	60	120	155	95	20	M12	M6	φ6.5	R3.25×8	-	-	-	
NF3200A-CD	NF3200C-CD	475	410	390	370	230	190	70	140	180	100	25		M6	φ6.5	R3.25×8	-	-	-	
NF3250A-CD	NF3250C-CD	475	410	390	370	230	190	70	140	180	100	25		M6	φ6.5	R3.25×8	-	-	-	
NF3400A-CD	-	450	340	310	280	220	180	80	146	170	85	18	-	-	-	80	45	4.5	4	B
-	NF3400C-CD	485	375	345	315	220	180	80	146	170	85	18	-	-	-	80	45	4.5	4	
-	NF3500C-CD	595	445	415	385	240	200	80	160	170	85	18	-	-	-	95	60	5	4.5	
-	NF3600C-CD	595	445	415	385	240	200	80	160	170	85	18	-	-	-	95	60	7	6	
-	NF31000C-CD	645	445	415	385	300	270	90	180	190	98	20	-	-	-	120	75	8	8	

5. DC reactor

DC reactor is separately supplied as option for ED64A-1122 or less of 200V class and ED64A-1544 or less of 400V class. ED64A-1522 or more of 200V class and ED64A-2244 or more of 400V class are separately supplied as standard equipment. See 4 of Chapter 8 for external dimension.

6. VF61R / VF64R sine wave converter

Sine wave converter able of power regeneration can be used when regenerating energy of brake-torque to the power, improvement of input power factor, and distortion factor. We provides VF61R or VF64R (under development) as sine wave converter unit series. For detail, see separate booklet “Usage direction of VF61R sine wave converter”, or contact us.

7. Dynamic braking unit (DB unit)

When brake-torque without using sine wave converter is needed, dynamic braking unit (DB unit) can be used to process the regenerated energy. For ED64, unit with capacity of 200V class of 11kw or less (ED64A-1122) and 400V class of 15kw or less (ED64A-1544) has built-in transistor for dynamic braking, and by adding resistance and thermal protective relay externally, dynamic braking is possible. For types with capacity more than these, use dynamic braking unit (DB unit). For detail, see separate booklet of DB unit, “Usage direction”

8. Standard corresponding

8-1. Compatible to European standard

This inverter's CE marking agree to low-voltage command and EMC command of Europe. Building in our inverter alone to the machine devise, does not mean suiting of the whole machine to the EMC (Electro-Magnetic Compatibility) command. To make the whole machine suite with CE marking, set as below and display.

Connect noise filter (European standard compatibles) to inverter input side, use inverter and noise filter inside metal control cabinet. Inverter and noise filter must be earthed. Noise filter does not need to be the one recommended in the chart below, if performance (attenuation characteristic) is same or more, application is possible.

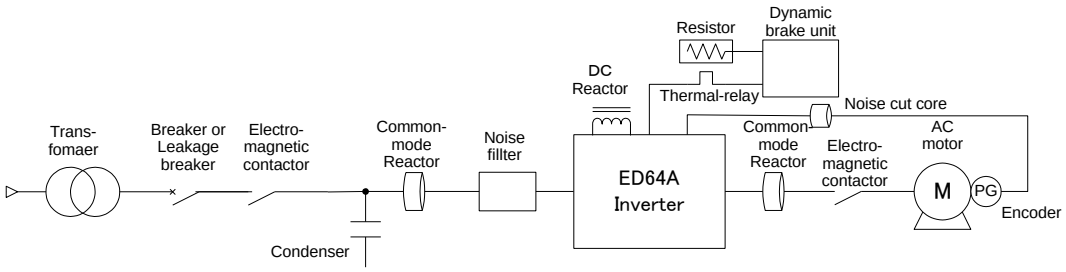
EMC standards suit to PDS (Power Drive System) below.

EMI (Emission) : Normative Standard EN61800-3 A11:2000

EMS (Immunity) : Normative Standard EN61800-3 A11:2000

To fit EMS (Emission) by standard EN55011 (emission related to industrial apparatus), except for input side noise filter, insert zero-phase reactor (core) to output side inverter unit in common mode (pass through bundled 3-phase 3 wires), put control cabinet-motor to metallic conduit etc. and wire as short as possible. (Separate input/output wiring)

Note: Allocate zero-phase reactor near output terminal, and wind the number of turn (T) in the table below.



CE corresponding noise filter (option)

Inverter Model	EN61800-3 EN55011 Input Noise Filter type
ED64A-1122	FN3258-75-52
ED64A-1522	FN3258-75-52
ED64A-2222	FN3258-100-35
ED64A-3022	FN3258-130-35
ED64A-3722	FN3258-180-40
ED64A-4522	FN3359-250-28
ED64A-5522	FN3359-250-28
ED64A-7522	FN3359-400-99
ED64A-9022	FN3359-400-99

Inverter Model	EN55011			
	EN61800-3 Input Noise Filter type	Input Y Condenser	Input Common-mode Reactor	Output Common-mode Reactor
ED64A-1144	FN3258-30-47			RC5060 x 3T
ED64A-1544	FN3258-42-47			RC5060 x 3T
ED64A-2244	FN3258-55-52			RC5060 x 2pcs x 3T
ED64A-3044	FN3258-75-52			RC5060 x 2pcs x 3T
ED64A-3744	FN3258-100-35			RC5060 x 2pcs x 3T
ED64A-4544	FN3258-100-35			F6045G x 1T
ED64A-5544	FN3258-130-35			F6045G x 1T
ED64A-7544	FN3258-180-40			F140100 x 2T
ED64A-11044	FN3359-320-99			F140100 x 2T
ED64A-16044	FN3359-400-99	0.3μF	Right to	F140100 x 2pcs x 1T
ED64A-20044	FN3359-600-99	0.3μF	Right to	F140100 x 3pcs x 1T
ED64A-25044	FN3359-600-99	0.3μF	Right to	F140100 x 3pcs x 1T
ED64A-31544	FN3359-1000-99	0.3μF	Right to	F140100 x 5pcs x 1T
ED64A-40044	FN3359-600-99 x 2pcs	0.3μF	Right to	F140100 x 6pcs x 1T
ED64A-50044	FN3359-600-99 x 2pcs	0.3μF	Right to	F140100 x 6pcs x 1T
ED64A-60044	FN3359-600-99 x 3pcs	0.3μF	Right to	F140100 x 9pcs x 1T
ED64A-75044	FN3359-600-99 x 3pcs	0.3μF	Right to	F140100 x 9pcs x 1T

Fig. 1

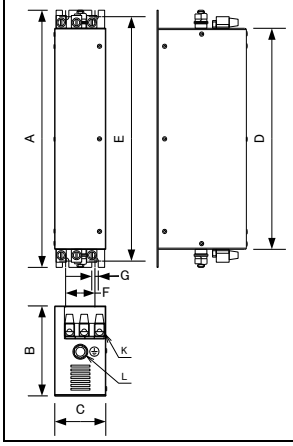


Fig. 2

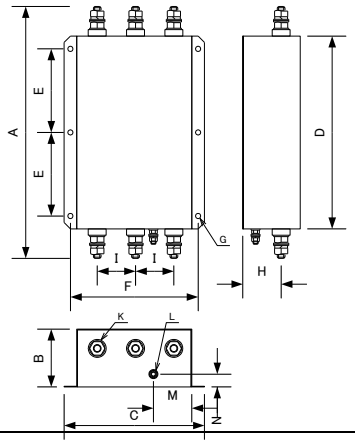
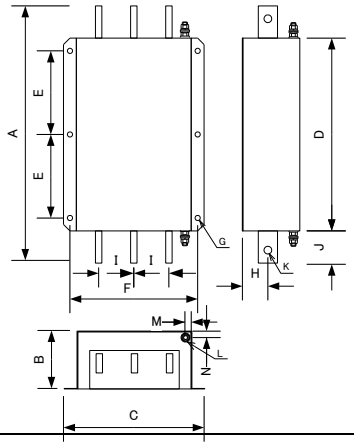
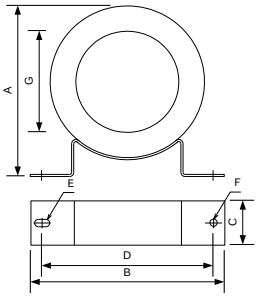


Fig. 3



Common mode reactor



Type	Fig	A	B	C	D	E	F	G	H	I	J	K	L	M	N	weight(kg)	Re-mark
FN3258-7-45	1	190	70	40	160	180	20	4.5	-	-	-	AWG12	M5	-	-	0.5	
FN3258-16-45	1	250	70	45	220	235	25	5.4	-	-	-	AWG12	M5	-	-	0.8	
FN3258-30-47	1	270	85	50	240	255	30	5.4	-	-	-	AWG8	M5	-	-	1.2	
FN3258-42-47	1	310	85	50	280	295	30	5.4	-	-	-	AWG8	M6	-	-	1.4	
FN3258-55-52	1	250	90	85	220	235	60	5.4	-	-	-	AWG4	M6	-	-	1.8	
FN3258-75-52	1	270	135	80	240	255	60	6.5	-	-	-	AWG4	M6	-	-	3.2	
FN3258-100-35	1	270	150	90	240	255	65	6.5	-	-	-	AWG1/0	M10	-	-	4.3	
FN3258-130-35	1	270	150	90	240	255	65	6.5	-	-	-	AWG1/0	M10	-	-	4.5	
FN3258-180-40	1	380	170	120	350	365	102	6.5	-	-	-	AWG4/0	M10	-	-	6.0	
FN3359-250-28	2	365	125	230	300	120	205	12	85	55	32	M10	M10	62.5	35	7.0	
FN3359-320-99	3	380	115	260	300	120	235	12	35	60	40	ϕ10.5	M12	20	20	10.5	
FN3359-400-99	3	380	115	260	300	120	235	12	35	60	40	ϕ10.5	M12	20	20	10.5	
FN3359-600-99	3	380	135	260	300	120	235	12	35	60	40	ϕ10.5	M12	20	20	11.0	
FN3258-1000-99	3	450	170	280	350	145	255	12	64	60	50	ϕ14	M12	25	25	18.0	

Common mode reactor

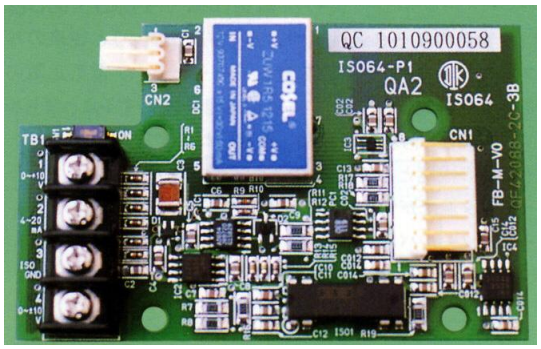
	A	B	C	D	E	F	G	weight(g)	remark
RC5060	67	115	19	95	5x10	ϕ5	38	200	
F6045GB	78	95	26	80	M5	M5	39.5	195	
F140100PB	162	181	42	160	7x14	7x14	95	1610	

Chapter 5 Function-up option

1. Insulation input card : ISO64

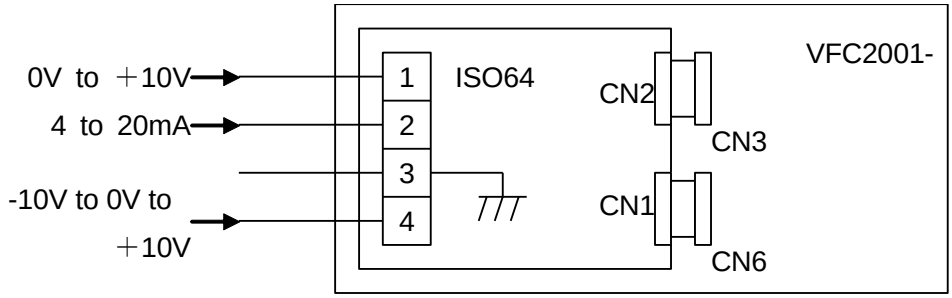
1-1. Specification

- Can be used as insulated speed command input and torque command input.
- Can be used as input of HC function
- Can be used as input of feedback signal of pressure control and wind value control.
  (Note 1) Select ISO64 or IO64-Z to use.



Function	Type of input	Input resistance	Input terminal	remark
Insulation analog input (1)	-10V to 0V to +10V	69kΩ	4-3(0V)	—
Insulation analog input (2)	0V to +10V	150kΩ	1-3(0V)	SW1-OFF
	4 to 20mA	250Ω	2-3(0V)	SW1-ON

1-2. Connection



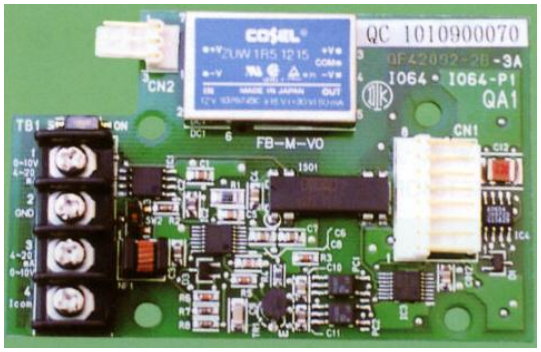
1-3. Adjustment procedures

Input gain of terminal block between [1]-[3] (between [2]-[3] when using 4-20mA), selecting, adjustment of characteristics can be performed by setting items G-10 to G-13. Also input gain, offset adjustment of terminal block between [4]-[3] are possible by setting items G-14, 15. See 2-8 “Insulation speed command analog input adjustment”, ”Insulation torque command analog input adjustment”, and ”Insulation analog output adjustment” of Chapter 3.

2. Insulation input/output card: IO64-Z

1-3. Specification

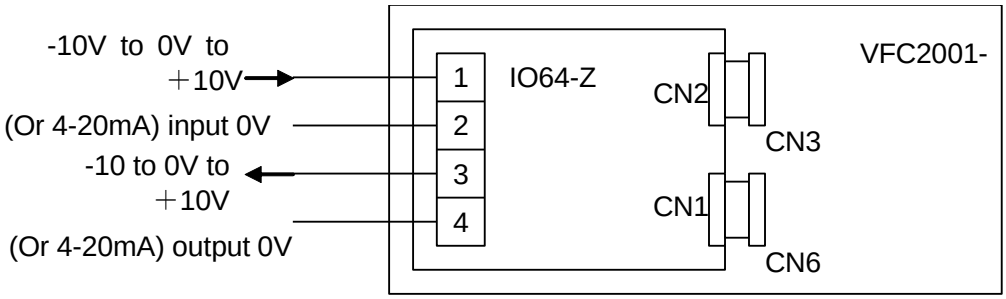
- Can be used as insulated speed command input and torque command input.
- Can be used as input of HC function
- Can be used as input/output signal of feedback signal of pressure control and wind value control.
  (Note 1) Select ISO64 or IO64-Z to use.
  (Note 2) Insulation analog input will be 0V to +10V at speed command input, and -10V to 0V when used at torque command input



Function	Type of input / output	Input resistance	Load resistance	Input / output terminal	Remark
Insulation analog input	-10V to 0V to +10V (Note)	150kΩ	—	1-2(0V)	SW1-OFF
	4 to 20mA	250Ω	—	1-2	SW1-ON
Insulation analog output	-10V to 0V to +10V	—	10kΩ以上	3-4(0V)	SW2=#3
	4 to 20mA	—	500Ω以下	3-4(0V)	SW2=#1

(Note) Minus voltage input is only for torque command input.

2-2. Connection



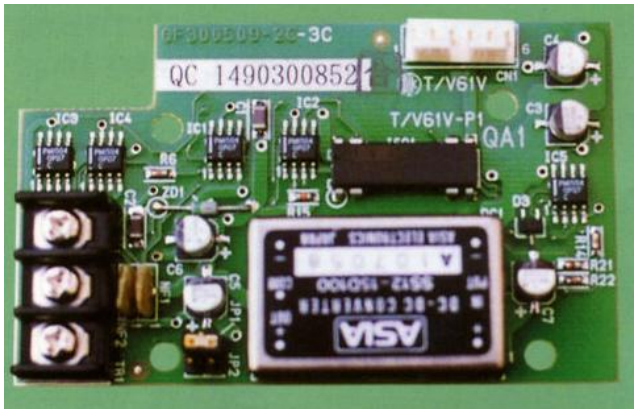
2-3. Adjustment procedure

Input gain of terminal block between [1]-[2], selecting and adjustment of characteristics can be performed by setting items G-10 to G-13. Also input gain, offset adjustment of terminal block between [3]-[4] are possible by setting items G-16 to 18. See 2-8 “Insulation speed command analog input adjustment”, ”Insulation torque command analog input adjustment”, and ”Insulation analog output adjustment” of Chapter 3.

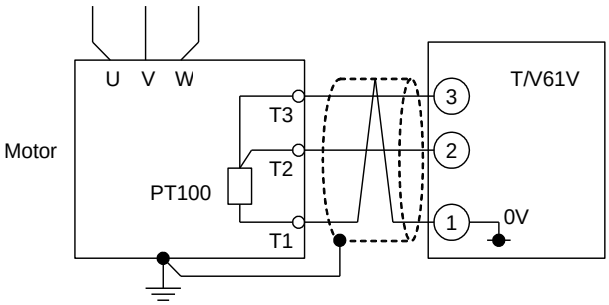
3. Motor temperature detection option : T/V61V

3-1. Function

- Displaying motor temperature on the monitor of ED64A possible by detecting the motor temperature.
- “Motor overheat protection” to protectively trip ED64A can be used when motor overheats.



3-2. Connection



(Note 1) Incase of fitting T/V61 option, temperature detector (3-wire thermometer resistor equivalent to PT100) must be mounted to the motor. Designate motor with temperature element.
(Note 2) Use twist shield cable wire for connection of temperature detector and T/V61 option.

3-3. Adjustment procedure

Offset of temperature detection input, adjustment of gain can be performed by setting items G-19 to G-20. See 2-8 ”Motor detection option adjustment” of Chapter 3 for setting procedure.

4. Structuring network

ED64A inverter can structure network with upper class computer by using options below.

4-1. OPCN-1 (JEMA-NET)

Type: OPCN64
OPCN64 option is option to connect upper class CPU system, PLC or personal computer to ED64A inverter with OPCN-1 protocol. Controlling and monitoring ED64A inverter from communication network is possible.
See separate booklet “Usage direction of OPCN64” for detail.

4-2. RS232C / RS485 start-stop synchronous serial communication

Type: ASYC64-Z
ASYC64 option is option to connect upper class CPU system, PLC or personal computer to ED64A inverter with RS232C/RS485 start/stop synchronous communication (max. 19200bps (RS232C)/ 38400bps (RS485)). Controlling and monitoring ED64A inverter from communication network is possible.
See separate booklet “Usage direction of ASYC64” for detail.

4-3. Device Net

Type: DNET 64
DNET 64 option is option to connect ED64A inverter to Device Net as slave apparatus.
See separate booklet “Usage direction of DNET 64” for detail.

4-4. PROFIBUS

Type: PBUS64
PBUS64 option is option to connect ED64A inverter to PROFIBUS-DP as slave apparatus.
See separate booklet “Usage direction of PBUS 64” for detail.

Chapter 6 System-up option

We prepared following system-up option using personal computer as the function to pursue the easiness in use of ED64A inverter. In order to use theses options, special technologies to structure the system is required. Also, PC tools (special editor etc.) (sold separately) to use on personal computer is needed. Therefor consult us in case of handling the said option.

1. HC function

HC function consists of:
1) Numerical value calculation part, called “Super-block”
2) Function to link mutual input/output between plural “Super-block”
3) Processing part to link the discretional data of input/output of “Super-block”

Link, about 30 kinds of “Super-block” prepared in ED64A advance in any way by using Super-block editor (sold separately) operated by personal computer, the most suitable motor drive system to the application can be structured.
For detail, see “Instruction manual for HC function” of separate booklet.

2. Sequence (PLC) function

This is function to edit sequence built in ED64A ladder circuit by sequence editor (sold separately) operated from personal computer, and control by replacing to normal sequence.
This function is able to structure the most suitable sequence to the application inside ED64A, and external PLC and part of relay circuit which was necessary can be omission.
For detail, see “Instruction manual for sequence editor” of separate booklet.

3. Trace back monitor function

Function to memorize the operation status of ED64A during protective operation and information of each phase current, voltage and another data measure for 16ch, inside inverter. By this function, cause analysis of inverter or system error, and release in short time will be possible. Trace back monitor function is a function to display memory data of trace-back by using “Trace back monitor tool soft” (sold separately) on the personal computer screen.
For detail, see “Usage manual for trace-back monitor” of separate booklet.

4. Trend monitor function

This is function to display internal data on real time, such as internal sequence signal (operation command, protective operation signal etc.), effective value of current, voltage and others of inside ED64A. Besides normal internal data, display of each output data of Super-block built-in by using HC function above is possible. Debug of circuit built-in by HC function is also possible other than checking system operation status. To use this function, “Trend monitor tool soft” (sold separately) to operate on personal computer is needed.
For detail, see “Usage manual for trend back monitor” inside “PC tool manual [Ⅰ]” of separate booklet.

5. Console data set function

This is function to read and write settings of ED64A console by personal computer at one place. Also, copying of setting data between inverter is possible. To use this function, “Console data set soft” (sold separately) to operate on personal computer is needed.
For detail, see “Usage manual for console data set” inside “PC tool manual [Ⅰ]” of separate booklet.

Chapter 7 Maintenace, inspection

1. ED64A protection display and trouble shooting

When abnormalities occure during operation, check LED display of console (SET64-Z) and protective display LED of each PCB. Study the cause by the trouble shooting of the following, and take appropriate measures.

Console LED display	Model	Protection display LED on PCB (75kW or more)				Protective operation contents	Major causes of protective operation	Major check points and remedy
		In single unit / parallel master unit		In parallel slave unit				
		PRIM 61	GAC 2001	PRIS 61	GAC 2001			
Fu	1122 to 9022, 1144 to 31544		—			Blowout of fuse in main circuit DC blocks inside unit.	* Connection of power supply to inverter output * IGBT(IPM) was damaged * Ground fault or short-circuit of the output wiring cable * Dynamic brake circuit damaged	* Check input/output wiring * Check conduction of IGBT(IPM) * Replace damaged part or fuse * Replace the unit
	15022 to 18022, 40044to 75044	FU	—	—	—	Fuse blowout in main circuit DC block in master unit		
		—	—	FU	—	Fuse blowout in main circuit DC block in slave unit		
oL	All models	—	—	—	—	Operates when 150% of the motor rated current detect for 1 min. or equally at inverter output.	* Load capacity is considerably high * Selected inverter and motor capacity are improper * Overload protection setting is improper * Wrong combination of inverter and motor * Motor rated current setting value (A-04) is improper	* Use of overload pre-alarm function (C-16) * Reduce the load, reexamine inverter/motor capacities. * Reexamine the overload protection (F-03) * Correct the combination of inverter and motor. * Set a new setting value of motor rated current setting
FcL	All models	—	—	—	—	Operates when 290% of the inverter rated current detect for several seconds at inverter output.	* Ground fault or short-circuit of the output wiring cable * Load capacity is considerably high * Current control gain is improper * Setting value of operation level is improper * Wrong combination of inverter and motor * Ground fault or short-circuit of the output wiring cable * Auto-tuning unperformed, setting value of auto-tuning is improper * Wrong combination of inverter and motor * Speed detection failure (ED64P,V mode)	* Check output wiring * Reduce the load, reexamine inverter/motor capacities. * Adjust current control gain (E10 to 13) * Reexamine FCL level (F-04) * Correct the combination of inverter and motor * Check output wiring * Perform full mode auto- tuning * Correct the combination of inverter and motor * Check PG wiring route, separate from main circuit wiring
oc	All models	—	—	—	—	Immediately operates when about 350% of the motor rated current detect at inverter output		
oH	7522 to 18022, 7544 to 100044	—	OH	—	—	Overheating of heat sink for IGBT module in unit, or input rectification diode module	* Trouble at cooling fan motor * Ambient temperature is high * Cooling space for unit is not enough * Unit installed in improper direction * DCL is not connected * Carrier frequency was set higher than the initial value * Malfunction of cooling fin temperature sensor	* Replace the cooling fan * Check installation environment, temperature rise in the control board * Secure sufficient cooling space * Install properly * Connect DCL * Set carrier frequency (A-08) below the initial data, or reduce load capacity * Conduction check of cooling fin temperature sensor (non-conduction is normal when fin temperature is low)

Console LED display	Model	Protection display LED on PCB (75kW or more)				Protective operation contents	Major causes of protective operation	Major check points and remedy
		In single unit / parallel master unit		In parallel slave unit				
		PRIM 61	GAC 2001	PRIS 61	GAC 2001			
oV	All models	—	—	—	—	Intermediate DC part over-voltage protection of unit (master unit for parallel model) (operates when DC voltage is 400V (200V class) / 800V (400V class))	* Ground fault or short-circuit of output wiring * Deceleration time is too short * Built-in DB operating voltage setting is improper * Malfunction of DB option * Abnormal rise of input supply voltage * The load inertia is high	* Check output wiring * Make deceleration time longer, use regenerative stall preventive function (b-13), or connect DB option * Adjust built-in DB operating voltage (F-00) * Replace DB option * Check input supply voltage * Use regenerative converter or DB option
iGbt	1122 to 2222, 1144 to 2244	—	—			Protection of IPM module in unit (IGBT element over-current, IGBT gate supply voltage drop, over heating of fin for IPM module or input rectification diode module)	* IGBT(IPM) was damaged * Ground fault or short-circuit of output wiring * Trouble at cooling fan motor * Ambient temperature is high * Cooling space for unit is not enough * Unit installed in improper direction * DCL not connected to model provided with DCL as standard * Carrier frequency was set higher than the initial value * Continuously operated in low frequency (10Hz or less) * Malfunction of GAC2006-** PCB	* Conduction check of IGBT(IPM) * Check output wiring * Replace cooling fan motor * Check installation environment, temperature rise in the control board * Secure sufficient cooling space * Install properly * Connect DCL * Set carrier frequency (A-08) below the initial data, or reduce load capacity * Reduce capacity according to the capacity reduction curve at low-frequency operation * Replace GAC2006-** PCB
	7522 to 18022, 7544 to 75044	—	OCU	—	—	Protection of U-phase IGBT module in unit from over-current or output over-current	* IGBT(IPM) was damaged * Ground fault or short-circuit of output wiring * Auto-tuning was improper * Load capacity is considerably high * Continuously operated in low frequency (10Hz or less) * Malfunction of GAC2001 PCB	* Conduction check of IGBT(IPM) * Check output wiring * Perform full mode auto-tuning * Reduce the load, reexamine inverter/motor capacities * Reduce capacity according to the capacity reduction curve at low-frequency operation * Replace GAC2001 PCB
		—	OCV	—	—	Protection of V- phase IGBT module in unit from over-current or output over-current		
		—	OCW	—	—	Protection of W-phase IGBT module in unit from over-current or output over-current		
		—	UV-G	—	—	IGBT gate supply voltage error (detects N side U-phase)	* Malfunction of GAC2001 PCB	* Replace GAC2001 PCB
	40044 to 75044	FCL-OC	—	—	—	Operates when current of 290% of the inverter rated current flows for about 2 seconds to master or slave unit output	* Ground fault or short-circuit of output wiring * Load capacity is considerably high * Current control gain is improper * Setting value of FCL operation level is improper * Speed detection failure (control with sensor)	* Check output wiring * Make accel. / decel. time longer * Reduce the load, reexamine inverter/motor capacities * Adjust current control gain (E10 to 13) * Reexamine FCL level (F-04) * Check PG wiring route, separate from main circuit wiring
iGt1	3022 to 5522 3044 to 5544					Protective operation for U-phase IPM in unit (IGBT element over-current, IGBT gate supply voltage drop, over heating of fin for IPM module or	* U, V, W phase IGBT (IPM) was damaged. * Ground fault or short-circuit of output wiring * Trouble at cooling fan motor * Ambient temperature is high * Cooling space for unit is not enough * Unit installed in improper direction * DCL is not connected	* Conduction check of IGBT(IPM) * Check output wiring * Replace cooling fan motor * Check installation environment, temperature rise in the control board * Secure sufficient cooling space * Install properly * Connect DCL
iGt2						Protective operation for V-phase IPM in unit		

Console LED display	Model	Protection display LED on PCB (75kW or more)				Protective operation contents		Major causes of protective operation	Major check points and remedy
		In single unit / parallel master unit		In parallel slave unit					
		PRIM 61	GAC 2001	PRIS 61	GAC 2001				
iGt3						Protective operation for W-phase IPM in unit	input rectification diode module, trouble at fan motor for ventila-tion in unit)	* Carrier frequency was set higher than the initial value * Continuously operated in low frequency (10Hz or less) * Malfunction of GAC2006-** PCB	* Set carrier frequency (A-08) below the initial data, or reduce load capacity * Reduce capacity according to the capacity reduction curve at low-frequency operation * Replace GAC2006-** PCB
StrF	All models	—	—	—	—	Operates in case of operation impossibility when 10 seconds have passed after running/jogging command have been input		* Running/jogging command was input for 10 seconds or more after detection of under voltage (power failure) * Running/jogging command was input for 10 seconds or more during input of emergency stop signal	* Turn ON "selecting re-start after instantaneous under voltage " (b-11) * Make sequence to turn off running/jogging command during input of emergency stop signal
oPEr	All models	—	—	—	—	Malfunction or connecting failure of communication option PCB		* Selecting use of communication option PCB (J-00) was ON, when communication option PCB was not connected * Malfunction of communication option PCB * Communication option PCB was not connected securely	* Turn OFF selecting use of communication option PCB (J-00) * Replace communication option PCB * Check the connection of communication option PCB and insertion of the connector
cS2	All models	—	—	—	—	EEPROM sum check error of VFC2001-Z PCB		* Mount VFC2001-Z PCB which was not initialized * Writing error to EEPROM owning to excessive noise * Defective of EEPROM parts	* Initialize VFC2001-Z PCB * Take measures against noise on wiring from VFC2001-Z PCB * Replace VFC2001-Z PCB (Once it becomes cS2, releasing is not possible unless VFC2001-Z is initialized)
ccEr1	All models	—	—	—	—	Communication time out error between VFC2001-Z PCB and console panel(SET64-Z)		* Console panel (SET64-Z) connection cable is broken or connector is not inserted properly * VFC2001-Z PCB is in program re-writing mode * Malfunction of VFC2001-Z PCB	* Check the insertion of the connector, replace connecting cable * Check that SW 3, 4 on VFC2001-Z PCB are OFF * Replace VFC2001-Z PCB
ccEr2	All models	—	—	—	—	Communication time out error between VFC2001-Z PCB and console panel		* Excessive noise entered extension cable connecting console panel (SET64-Z) * Malfunction ofVFC2001-ZPCB	* Take measures against noise on extension cable connecting console panel (SET64-Z) * Replace VFC2001-Z PCB
ccEr3	All models	—	—	—	—	Error in communication data received on VFC2001-Z PCB		* Console panel (SET64-Z) connection cable is broken or connector is not inserted properly * 2units was connected to the connecter for console panel (SET64-Z) at same time.	* Check the insertion of the connector, replace connecting cable * Connect only 1 unit to the connector for console panel (SET64-Z)
tS	All models	—	—	—	—	Communication time out error between communication option PCB and communication master station		* Malfunction of communication master station * Connection cable between communication option PCB and communication master station is broken or connector is not inserted properly	* Check the operation of communication master station * Check the insertion of the connector, replace connecting cable

Console LED display	Model	Protection display LED on PCB (75kW or more)				Protective operation contents	Major causes of protective operation	Major check points and remedy
		In single unit / parallel master unit		In parallel slave unit				
		PRIM 61	GAC 2001	PRIS 61	GAC 2001			
SLF	40044 to 75044	—	—	—	OH	Overheating of heat sink for IGBT modules in slave unit Overheating of heat sink for slave side input converter	* Trouble at slave unit cooling fan motor * Ambient temperature is high * Cooling space for unit is not enough * Unit installed in improper direction * Carrier frequency was set higher than the initial value * DCL is not connected * Malfunction of cooling fin temperature detecting sensor	* Replace cooling fan motor * Check installation environment, temperature rise in the control board * Secure sufficient cooling space * Install properly * Set carrier frequency (A-08) below the initial data, or reduce load capacity * Connect DCL * Conduction check of cooling fin temperature sensor (non-conduction is normal when fin temperature is low)
		—	—	—	OV-S	Intermediate DC part over-voltage protection of slave unit (operates when DC voltage is 400V (200V class) / 800V (400V class))	* Ground fault or short-circuit of output wiring * Deceleration time is too short * Malfunction of DB option * Abnormal rise of input supply voltage * The load inertia is high	* Check output wiring * Make deceleration time longer, use regenerative stall preventive function (b-13), or connect DB option * Replace DB option * Check input supply voltage * Use regenerative converter or DB option
		—	—	—	OCU	Protection of U- phase IGBT module in slave unit from over-current or output over-current	* IGBT(IPM) was damaged * Ground fault or short-circuit of output wiring * Auto-tuning was improper * Load capacity is considerably high * Continuously operated in low frequency (10Hz or less) * Malfunction ofVFC2001-Z PCB	* Conduction check of IGBT(IPM) * Check output wiring * Perform full mode auto-tuning * Reduce the load, reexamine inverter/motor capacities * Reduce capacity according to the capacity reduction curve at low-frequency operation * Replace GAC2001 PCB
		—	—	—	OCV	Protection of V- phase IGBT module in slave unit from over-current or output over-current		
		—	—	—	OCW	Protection of W- phase IGBT module in slave unit from over-current or output over-current		
		—	—	—	UV-G	IGBT gate supply voltage error in slave unit (detects N side U-phase)	* Malfunction of GAC2001 PCB	* Replace GAC2001 PCB
		—	—	—	OV-S	GAC2001 control supply voltage error in slave unit	* Malfunction of GAC2001 PCB	* Replace GAC2001 PCB
		PSCF	—	—	—	PRIM61, PRIS61 control supply voltage reduction or supply line disconnection	* Connection cable between master unit and slave unit is broken or connector is not inserted properly * Malfunction of PRIM61 PCB	* Check the insertion of the connector, replace connecting cable * Replace PRIM61 PCB
SPdE	All models (Only at vector control)	—	—	—	—	Operates when speed command value and deviation of motor rotational speed exceed from range of speed control error detection	* Setting value of speed detection range is improper * Torque was limited because the load was too large * Torque was limited because accel./decel. time was too short * Malfunction of external speed setter * Disconnection of PG line, malfunction of PG * Miss-connecting of PG * Miss-connecting between inverter output and motor	* Set proper speed range for detection speed range (F-09 to10) * Reduce the load * Make accel./decel. time longer * Check the operation of external speed setter * Check PG line, replace PG * Check connection between PG and VFC2001-Z PCB * Check connection between inverter and motor
EF1	All models	—	—	—	—	Input of external failure 1 of multi-function input	* External failure was input * Settings of multi-function is improper	* Check the input condition of external failure signal * Check the settings of multi-function input (C-00 to 06)
EF2	All models	—	—	—	—	Input of external failure 2 of multi-function input		
EF3	All models	—	—	—	—	Input of external failure 3 of multi-function input		
EF4	All models	—	—	—	—	Input of external failure 4 of multi-function input		

Console LED display	Model	Protection display LED on PCB (75kW or more)				Protective operation contents	Major causes of protective operation	Major check points and remedy
		In single unit / parallel master unit		In parallel slave unit				
		PRIM 61	GAC 2001	PRIS 61	GAC 2001			
oS	All models	—	—	—	—	Operates when motor rotational speed exceed over-speed setting (F-00, F-02)	* Malfunction of external speed setter * Overshoot by poor adjustment of speed control system gain * Load is smaller than torque command value at torque control mode * Setting value of over-speed setting is improper * Malfunction due to the noise of speed detection * Setting value of PG pulse count is improper * Setting of d-axis position is improper. Or d-axis measurement auto-tuning unperformed after PG replacement. * Auto-tuning unperformed, setting value of auto-tuning is improper * Wrong combination of inverter and motor	* Check operation of external speed setter. * Re-adjust speed control system gain (7.ASRP, 8.ASri, 9.ASrj) * Reexamine torque command value * Reexamine setting value of over-speed setting (F-01, 02) * Check PG wiring route, separate from main circuit wiring * Reexamine setting value of PG pulse count (A-07) * Perform d-axis measurement auto-tuning. * Perform full mode auto-tuning. * Correct the combination of inverter and motor
ot	All models	—	—	—	—	Start counting when torque command exceed 105%, operates when it reaches corresponding to 150% for 1 min.	* Malfunction of external torque command setter * Setting value related to over-torque protective function is improper * Load capacity is considerably high * Setting of d-axis position is improper. Or d-axis measurement auto-tuning unperformed after PG replacement. * Auto-tuning unperformed, setting value of auto-tuning is improper * Wrong combination of inverter and motor	* Check operation of external torque command setter * Reexamine settings related to over-torque protection function (F-05 to 07) * Reduce the load, reexamine inverter/motor capacities * Perform d-axis measurement auto-tuning. * Perform full mode auto-tuning. * Correct the combination of inverter and motor
inoH	All models	—	—	—	—	With motor temperature detective option is mounted, operates when motor temperature exceed 150 ℃	* Trouble at motor cooling fan motor * Motor ambient temperature is high * Disconnection of motor temperature detection wiring, noise invasion * Poor adjustment of motor temperature detection gain etc.	* Check motor cooling fan motor * Check the motor installation environment * Check motor temperature detection wiring, take measures against noise * Re-adjust motor temperature detection gain(G-19,20)
SEt0	All models	—	—	—	—	With status of improper motor rating value setting or carrier frequency setting, operates when running/jogging command or auto-tuning starting command is input	* Inverter capacity setting value is inappropriate to the main unit * Motor rating value setting and carrier frequency setting is improper * Though the use of 2nd motor is selected, setting of 2nd motor rating value has not been set * Auto-tuning was not performed after changing carrier frequency	* Redo from initializing memory, and set the inverter capacity appropriately to the main unit * Set the motor rating (A-02 to 06), carrier frequency (A-08) correctly and perform auto-tuning * Set 2nd motor rating correctly (L-01 to 05), and perform auto-tuning * Always perform auto-tuning after changing carrier frequency(A-08)

Console LED display	Model	Protection display LED on PCB (75kW or more)				Protective operation contents	Major causes of protective operation	Major check points and remedy
		In single unit / parallel master unit		In parallel slave unit				
		PRIM 61	GAC 2001	PRIS 61	GAC 2001			
SEt1	All models	—	—	—	—	Running/jogging command was input to state with improper PG pulse setting, vector control and setting related to current control	* Setting value of PG pulse count is improper (Only control with sensor) * Improper setting related to setting of current control gain * Auto-tuning has not been performed. Or auto-tuning was not performed correctly	* Reexamine setting value of PG pulse count (A-09) * Reexamine setting of gain related to current control (E-12 to 14) * Perform auto-tuning (perform for the 2nd motor when use of 2nd motor is selected)
SEt2	All models	—	—	—	—	Running/jogging command was input to state when setting related to speed exceeding the setting range	* Absolute value of over-speed/ over-torque settings (F-01, F-02) is exceeding 1.5 times the max. rotational speed/ frequency (A-00) * Other settings related to rotational speed/frequency are exceeding max. rotational speed/frequency (A-00)	* Reexamine setting value of (F-01, F-02) over-speed/ over-torque settings * Reexamine settings of rotational speed/frequency (when setting value is correct, redo from initializing VFC2001-Z PCB)
SEt3	All models	—	—	—	—	Running/jogging command was input to state with abnormal analog input/output gain setting	* Improper settings related to analog input/output gain	* Reexamine settings related to analog input/output gain (G-00 to 20) (when setting value is correct, redo from initializing VFC2001-Z PCB)
PEr1 to PEr6	All models	—	—	—	—	Operates when connection between PG and VFC2001-Z PCB was incorrect (ED64P,V mode)	* Disconnection of PG wiring * Trouble at PG * Misconnection between inverter output and motor * Setting value of PG pulse count is improper * Setting of d-axis position is improper. Or d-axis measurement auto-tuning unperformed after PG replacement. * Auto-tuning unperformed, setting value of auto-tuning is improper * Wrong combination of inverter and motor	* Check the PG line * Replace PG * Check connection between inverter and motor * Reexamine setting value of PG pulse count (A-07) * Perform d-axis measurement auto-tuning. * Perform full mode auto-tuning. * Correct the combination of inverter and motor
PEr7	All models	—	—	—	—	Error occurred during calculation of magnetic pole positioning calculation without sensor (ED64S mode)	* Auto-tuning unperformed after motor replacement of the motor. Or setting value of auto-tuning is improper * Wrong combination of inverter and motor	* Perform full mode auto-tuning * Correct the combination of inverter and motor
SLSE	All models	—	—	—	—	Operates when magnetic pole determination failure and starting at without position sensor failed (At ED64S, ED64V mode only).	* Setting value of q-axis pulse magnetic pole current (A-09) is small (when selecting magnetic pole determination method (A-31) is 0 or 1) * Improper settings of d-axis measurement pulse width (A-32) and d-axis measurement pulse voltage amplitude (A-31) (when selecting magnetic pole determination method (A-31) is 2)	* Adjust the setting value of q-axis pulse magnetic pole current (A-09) * Perform full mode auto-tuning
uV	200V class All models	—	—	—	—	When voltage of intermediate DC block of the unit becomes lower than about 180V during operation	* Under voltage (instantaneous power failure) of input power supply during operation * Open-phase of input power supply	* Turn ON “Selecting restart after instantaneous failure” (b-11) * Check input power supply
	400V class All models	—	—	—	—	When voltage of intermediate DC block of the unit becomes lower than about 360V during operation		
EnGon	All models	—	—	—	—	Display only when emergency stop input is ON	(Not protection display)	—

2. Periodic inspection

To keep the device in the best condition and fulfill its full function, inspect periodically at least every six months to check its details passed over in regular operation monitoring.

The device shall be maintained by persons having knowledge of electrical safety.

CAUTION (inspection)

- Never open the cover while input power is on.

  Doing so may cause an electric shock.
- Before inspecting, turn off power to the inverter, and make sure that the CHG checking LED on the main circuit PCB is off.

  Open the inverter cover, and you will find the LED.

  Failure to do so may cause an electric shock.

  Failure to do so may cause personal injury.
- The heat sink may be hot depending on working conditions.

  Take care when handling. It may cause a burn.

WARNING (maintenance, inspection and replacement of parts)

- Before inspecting, turn off input power, and wait for 10 minutes or more.
  Check the voltage between ⊕2 and ⊖ to confirm that the voltage is 30 V or less.
  Failure to do so may cause an electric shock.
- Unauthorized persons shall not maintain or inspect the device or replace its parts.
  [Before performing the work, remove metallic accessories (watch, ring, etc.).]
  Failure to do so may cause an electric shock or personal injury.

Periodic inspection table

Item to be inspected	Details of inspection
Appearance of unit	• Check for dirt and dust in the vent hole and heat sink, and clean them.
Cooling fan	• If dirt and dust have adhered to the cooling fan, clean the fan. Replace the fan according to the standard fan service life (about 30,000 hour).
Inside of unit	• Check the PCBs and other electronic components to confirm whether dirt and dust are not on them.
Terminal blocks and terminal screws	• Check that the terminal blocks and mounting screws are not loose, and retighten them.
Connectors	• Check that the connectors and terminals of the control PCB are not loose.
Wiring	• Check that the insulating coating of wires is not cracked or deformed.
Electrolytic capacitor	• If the electrolyte leaks or the capacitor has discolored, replace the capacitor. On condition that the device is operated for 12 hours a day at an average ambient temperature of 35°C or less, the standard lifetime of the capacitor is 5 years.

CAUTION (capacitor)

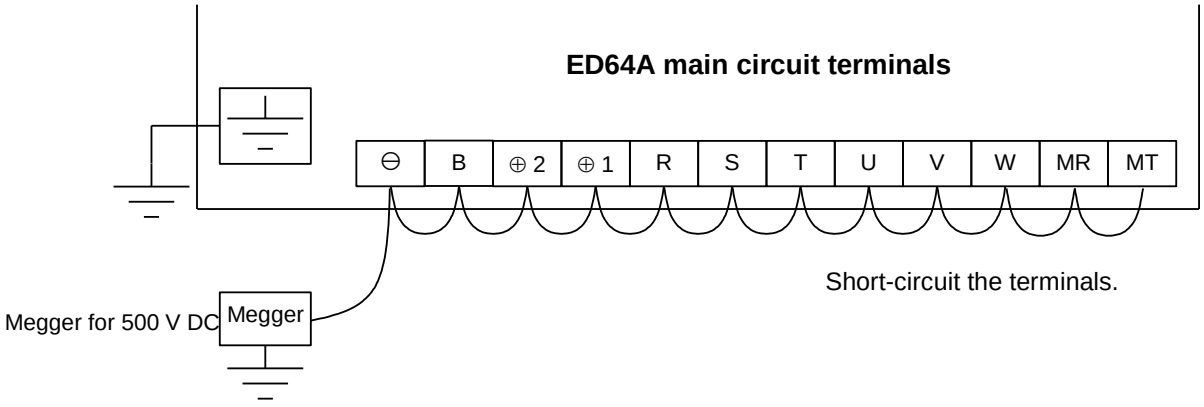
- When a spare inverter that has been stored for 3 years or more is used, before starting operation, age the electrolytic capacitor in the inverter. To age it, remove the inverter output line, and apply the rated AC input voltage to the inverter for about 8 hours.

  If the inverter is used without aging of the capacitor, the capacitor may be damaged, thereby causing a hazardous situation.

3. Insulation resistance test

(1) Clean the parts, and perform insulation resistance test with a 500V-DC megger. For the megger test, once remove all wires, and short-circuit the terminals on the main circuit terminal block as shown below.

(Do not test the control circuit with a megger.)



(2) After the preparation is complete, measure the insulation resistance between the terminal on the main circuit terminal block TB1 and the earth terminal (⏚).

(3) After the test, remove all short-circuiting lines.

4. Disposal

Replacement parts and maintenance parts shall be disposed of in accordance with governmental regulations.

Chapter 8 Standard specifications

1. Common specifications

The following table shows the specifications for the motor drive control units of ED64A.

Performance / function		ED64P mode (With speed/position sensor (UVWAB-PG) mode)	ED64V mode (With speed sensor (ABZ-PG) mode)	ED64S mode (Without sensor mode)
Power source rating		200V class: 200 to 230V,50/60Hz 400V class: 400 to 460V,50/60Hz		
Power source fluctuation		Voltage: ±10% frequency: ±5%		
Control method		High frequency space vector control system		Without speed/position sensor High frequency space vector control system
Maximum rotational speed / frequency		Until 245Hz or equivalent.		
Carrier frequency		Select from 2, 4, 6, 8, 10, 12, or 14kHz(6.0kHz normal value) 6kHz or over and reduction of capacity is needed		
Inverter efficiency		95% or over (rated output)		
Overload capacity		150% current for 1 min.		
Speed control range		1: 1000		1: 100 (Output frequency of 0.9Hz or over)
Speed accuracy	Digital input	±0.01%		±0.01% (1:10 speed range) ±0.1% (1:100 speed range)
	Analog input	±0.02%		±0.02%
Speed control method		MFC control (P control+feed forward control +cancellation control) (Individual ON/OFF for feed forward, cancellation is possible. Same as PI control with both OFF)		
Speed control response		400 rad/s (-3db)		200 rad/s (-3db)
Torque control accuracy		±5% or less (torque command: 0 to 100%) ±8% or less (torque command: over 100%) (output frequency 10Hz or more)		
Torque control response		2 krad/s (-3rb)		2 krad/s (-3rb)
Constant output range (PC range)		1:1.33 (Note1)		1:1.33 (Note1) But, free-run start from speed of voltage saturation area will not be compensated
Zero speed control		Possible		Unable
Starting torque		150 % or over		
Torque limit		Each 0 to 150 % setting range for: Normal powering, normal regenerating, reverse powering, reverse regenerating. (Possible to set up to 200 % by increasing the inverter capacity to the motor)		
Control performance	Acceleration / deceleration time	0.1 to 3600.0 sec. (Possible to changeover 4 kinds of settings from the terminal block, 2 of them are S-curve acceleration/deceleration time)		
	S-curve acceleration / deceleration time	0.0 to 60.0 sec. (Possible to changeover 2 kinds of settings from the terminal block)		
	Program operation	Possible to set up to 8 points (time unit: possible to changeover between hours, minutes, seconds. Range: 0.0 to 3600.0)		
	Rotation direction	Normal, reverse running possible(possible to select inhabitance of running opposite from the command)		
	Dynamic braking (DB)	200V class: 1122、400V class：1544 or less are built in with dynamic braking circuit (other capacities are with option) (brake resistor and thermal relay are option of external mounting)		
	Drooping control	Possible (with setting functions of drooping rate, drooping starting torque, etc.)		
	2nd motor operation	Possible to operate 2 motors alternately		
	Stop mode	Possible to select deceleration stop / DC brake after deceleration stop / free stop		
	DC braking	At deceleration stop: 0.0 to 10.0 sec.		
	Jogging operation	Min. rotational speed to 300r/min		
	Jump function	Possible to set 4 kinds of speed jump		

Performance / function		ED64P mode (With speed/position sensor (UVWAB-PG) mode)	ED64V mode (With speed sensor (ABZ-PG) mode)	ED64S mode (Without sensor mode)
Input / output signal	Control terminal block input	Possible to change between sink mode / source mode		
	Speed command	Terminal block: DC 0 to 10V or ±10V or 4 to 20 mA input non-isolated.		
	Operation signal	Normal run・reverse run・normal jog run・reverse jog run・emergency stop・reset		
	Speed detection signal	Speed detector(PG) (standard 600P/R DC12V A-phase, B-phase and U-phase, V-phase, W-phase)		
	Output for rotation speed meter	PMW pulse of 6 times the synchronous frequency of rotational speed output (analog meter connectable)		
	Analog voltage output	DC10V output voltage: output current / motor rotational speed / speed command etc.		
	Contact output (2 points)	Operate by drive or protective function all in one.		
	Multi-function input (contact input:6 points)	・Preset rotational speed time(7 kinds)・selecting acceleration/deceleration speed time (4 kinds) ・acceleration by contact・deceleration operation・hold of speed・inhabitation of S-curve acceleration / deceleration・droop control inactive・reverse run command・DC brake command・external failure signal (4 kinds)・trace-back external trigger・selecting 2nd motor・emergency stop B contact・program step operation・selecting speed command terminal block・speed / torque control change over etc.		
	Multi-function output (open collector output : 4 points)	・Rotational speed detection(2 points)・complete of acce/decel.・torque detection (2: with polarity, absolute value)・during under voltage・load pre-alarm・during retry・during reverse running・protective operation code・sum check error		
HC function (Super-block function)		Possible to control by combining Super-block: add/subtract・multiplication・comparator・primary delay・dead band・PI amplifier・feed forward・cancellation (modern control) diode preference ・simplified acceleration/deceleration・S-curve acceleration/deceleration・data selector・hysteresis nonlinear・pattern generator・1 bit selecting of data etc.		
Sequence function (PLC function)		Make sequence of run/stop or multi-function input/output confirming to the application		
		Input :terminal block 10contacts (by communication, input from upper CPU is possible		
		Output: 4 open collectors 2contact outputs (1a・1c) (by communication, output from upper CPU is possible)		
		Kinds of internal relay: master control relay 1 control relay IN 128 control relay OUT 128 Internal relay 30 latch relay 10 ON differentiation relay 10 O FF differentiation relay 10 ON delay timer 10 OFF delay timer 10		
Trace back function		Possible to memorize digital 12ch＋status of operation/protection × 100 points for past 2 times Memory contents: output current・output voltage・torque command・output of each Super-block etc.		
1 point trace-back function		Memorize data of past 5 times of protective operation history and 6 points of protective operation: output current, output voltage, torque command etc.		
Console panel		Indicator: 7 segment, 5 digit LED display Display: operation status / data monitor / function setting data / protective operation / protection history Unit indication: 4 LED status indication: 6 LED operation: 8 touch keys		
Protective function		・Output over-current・output overload (electric thermal)・DC part over-voltage・fin overheat・IGBT power source error・memory error・earth fault・over-speed・option error・starting failure・external failure・insufficient voltage・communication error・over-torque・speed control error・motor overheating・position / speed detector error etc.		
Safety indication		LED is on during charging		
Protective structure (JEM1030)		IP00 (open type)		
Ambient environment		Operating temperature: 0 to 50℃ Humidity: 20 to 90%RH (no condensation) Altitude: 1000m or less storage temperature: -20 to 60℃ Atmosphere: no harmful gas, metallic particle or oil Vibration: 5.9m/S² (0.6G or less 10 to 55Hz) conforming to JIS C0040		

Note 1) Constant output range is controllable up to 1: 1.5 by using with reduction of motor capacity.

2. List of models

Capacity range of ED64A

- 200V class: 2.2 to 90 kW 400V class: 2.2 to 500 kW
- Refer to Ed motor to ED64A models.

200V class (190V motor rated voltage)		**400V class (380V motor rated voltage)**	
ED motor capacity	**Inverter type**	**ED motor capacity**	**Inverter type**
11.0kW	ED64A-1122	11.0kW	ED64A-1144
15.0kW	ED64A-1522	15.0kW	ED64A-1544
18.5kW	ED64A-2222	18.5kW	ED64A-2244
22.0kW	ED64A-2222	22.0kW	ED64A-2244
30.0kW	ED64A-3022	30.0kW	ED64A-3044
37.0kW	ED64A-3722	37.0kW	ED64A-3744
45.0kW	ED64A-4522	45.0kW	ED64A-4544
55.0kW	ED64A-5522	55.0kW	ED64A-5544
65.0kW	ED64A-7522	65.0kW	ED64A-7544
75.0kW	ED64A-7522	75.0kW	ED64A-7544
90.0kW	ED64A-9022	90.0kW	ED64A-11044
		110.0kW	ED64A-11044
		132.0kW	ED64A-16044
		160.0kW	ED64A-16044
		200.0kW	ED64A-20044
		250.0kW	ED64A-25044
		315.0kW	ED64A-31544
		375.0kW(only in constant torque area)	ED64A-31544
		375.0kW	★ED64A-40044
		400.0kW	★ED64A-40044
		500.0kW	★ED64A-50044
		750.0kW	★★ED64A-75044

(Note1) Types with ★ mark indicates the use of two inverter units connected in parallel.
In the same way, ★★ mark indicates use of three.

(Note2) This list shows standard combinations. Consult us for there maybe a case different from the list above, depending on the motor.

3. List of capacities

3-1. Motor rated voltage of 200V

Type ED64A-*****					1122	1522	2222	3022	3722	4522	5522	7522	9022
Applicable motor capacity (kW) *1					11	15	22	30	37	45	55	75	90
Rated output current					46.0	62.5	87.0	121	146	185	222	280	340
Max. output voltage	200 to 230V（corresponding to input voltage）*2												
Input voltage	3 phase 3 wire 200 to 230V±10% 50/60Hz±5%												
Input power factor *3	about 0.7 (about 0.9)*4					about 0.9							
Input capacity (kVA) *5					22.2	21.3	30.9	41.4	51.0	62.3	76.1	103	124
DC reactor (DCL****)	Option					1522	2222	3022	3722	4522	5522	7522	9022
Cooling method	Forced air cooling												

3-2. Motor rated voltage of 400V

Type ED64A-*****					1144	1544	2244	3044	3744	4544	5544	7544	11044
Applicable motor capacity (kW) *1					11.0	18.5	22.0	30.0	37.0	45.0	55.0	75.0	110.0
Rated output current					24.0	32.5	46.0	62.5	75.5	92.5	111	146	210
Max. output voltage	380 to 460V（corresponding to input voltage）*2												
Input voltage	3 phase 3 wire 400 to 460V±10% 50/60Hz±5%												
Input power factor *3	about 0.7(about 0.9)*4						about 0.9						
Input capacity (kVA) *5					22.4	30.2	30.3	41.9	51.7	61.8	75.5	103	149
DC reactor (DCL****)	Option						2244	3044	3744	4544	5544	7544	11044
Cooling method	Forced air cooling												

Type ED64A-*****	16044	20044	25044	31544	40044	50044	75044	
Applicable motor capacity (kW) *1	160.0	200.0	250.0	375.0	400.0	500.0	750.0	
Rated output current	300	370	460	600	740	920	1380	
Max. output voltage	400 to 460V（corresponding to input voltage）*2							
Input voltage	3 phase 3 wire 400 to 460V±10% 50/60Hz±5%							
Input power factor *3	about 0.9							
Input capacity (kVA) *5	215	269	333	499	532	661	994	
DC reactor (DCL****)	16044	20044	25044	31544	20044 ×2	25044 ×2	2504 4X3	
Cooling method	Forced air cooling							

(*1) Shows in capacity of ED motor. (However, 375.0kW motor driven by 31544 is for constant torque area only.)

(*2) Voltage higher than AC input voltage cannot be output.

(*3) The value at the rated output is shown. However, they vary depending on the power supply impedance.

(*4) Inside ( ) is the value obtained when the optional DC reactor is connected.

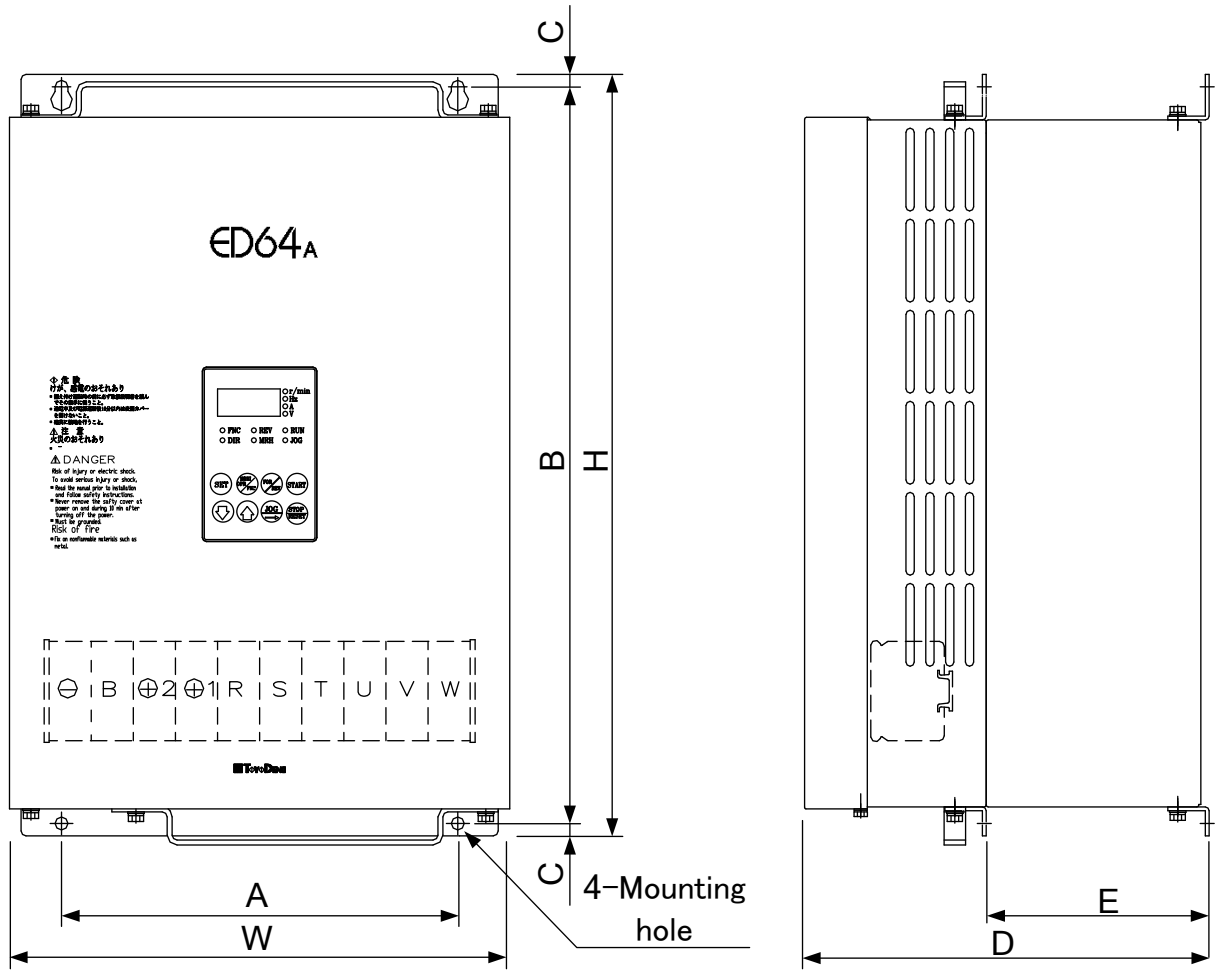
(*5) The values at the rated output of the applicable motors are shown (the values vary depending on the power source impedance).

(*6) Each ED64A-40044 and ED64A-50044 is unit parallel models of 2 units, ED64A-20044 and ED64A-25044.

4. Outline dimension

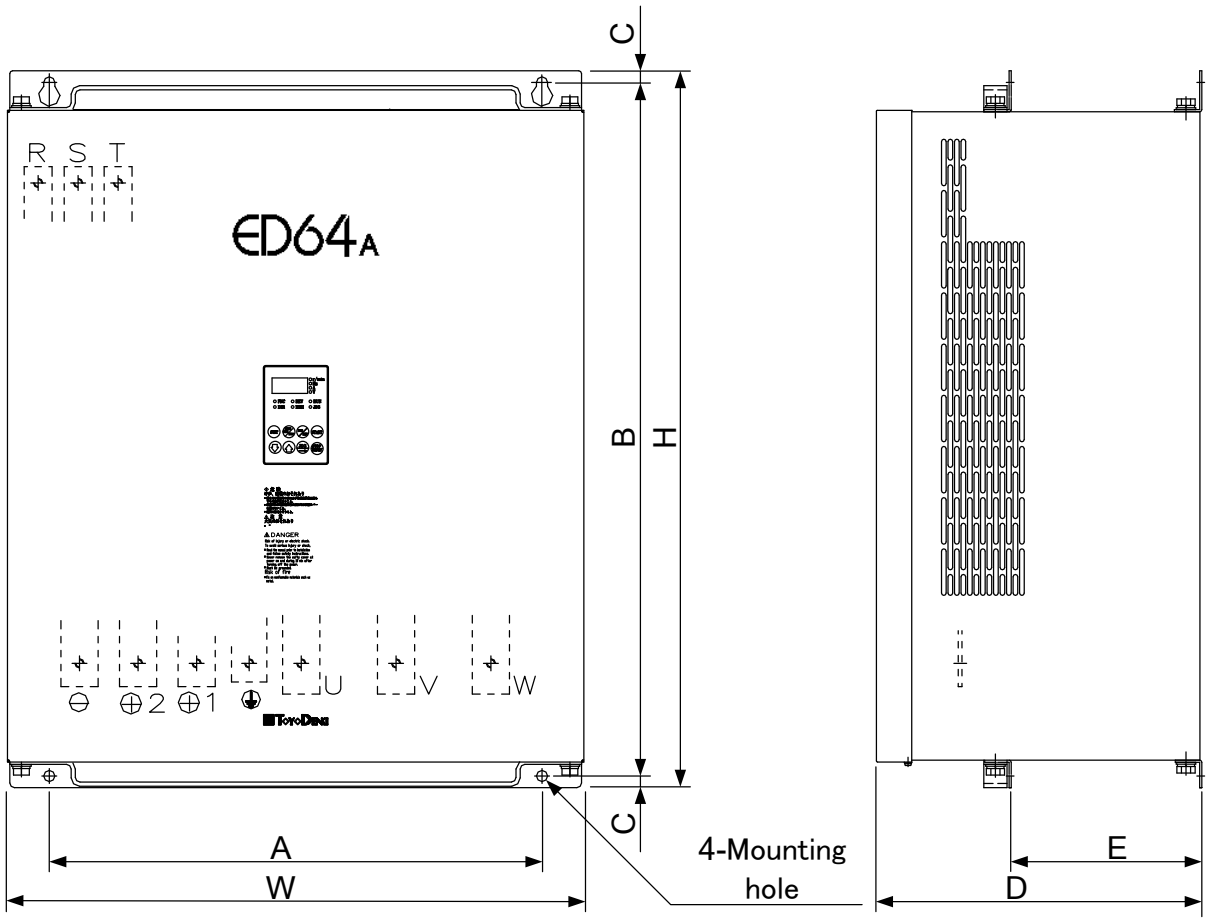
4-1. Main body

(1) ED64A-1122 to 3722,1144 to 3744(11 to 37kW)



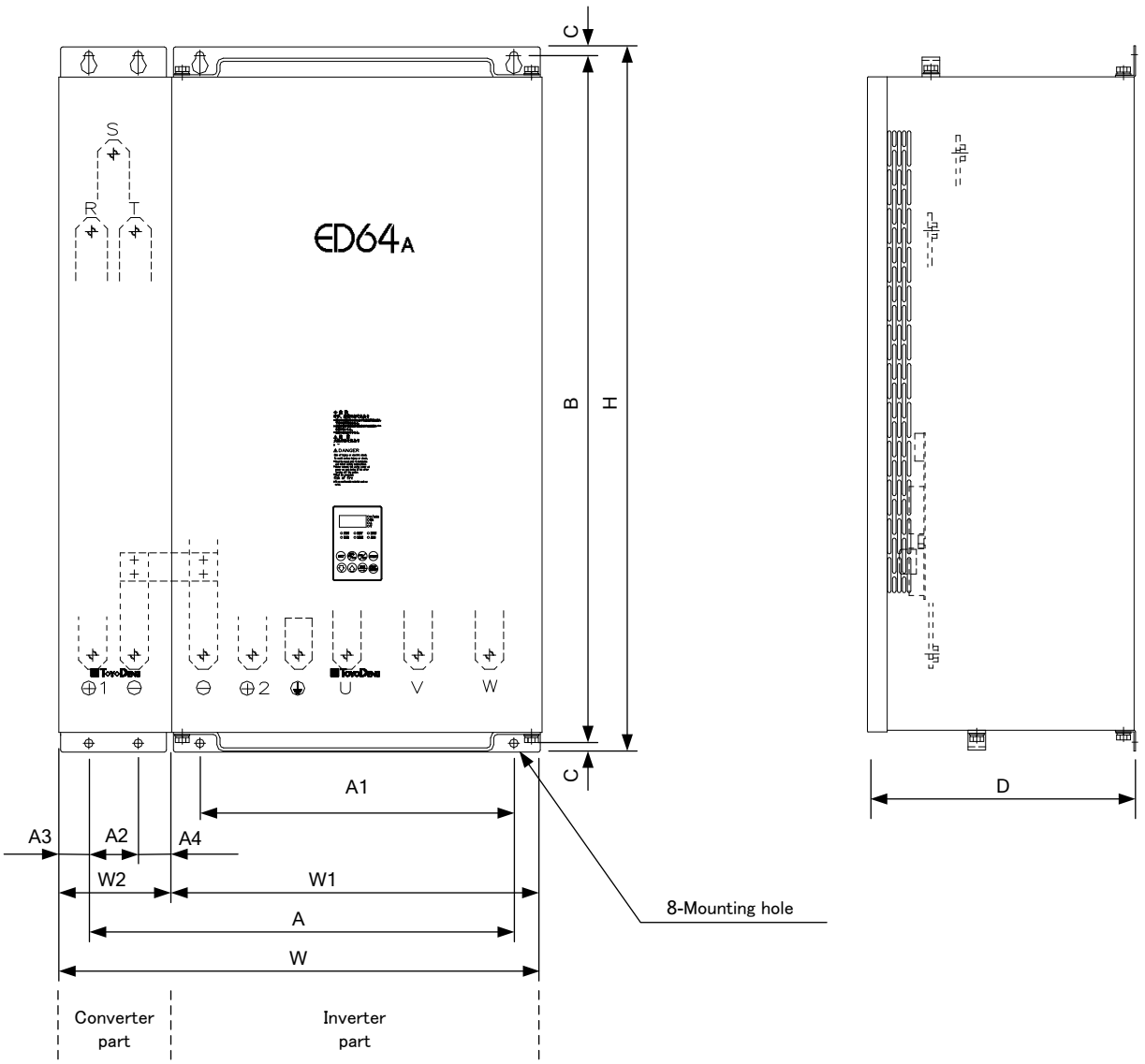
ED64 A	W	H	D	A	B	C	E	Terminal block					Mou-nting hole	Wei ght (kg)
								⊖, ⊕2, ⊕1	B	R,S,T, U,V,W, ⏚	MR, MS, MT	Cont-rol		
1122	250	410	245	190	395	7.5	135	M6	M6	M6	M4	M3	M6	17
1522	250	410	245	190	395	7.5	135	M6	M6	M6	M4	M3	M6	17
2222	303	460	245	240	445	7.5	135	M8	M8	M8	M4	M3	M6	20
3022	320	460	265	260	445	7.5	150	M8		M8	M4	M3	M6	27
3722	430	575	270	360	555	10	168	M10		M8	M4	M3	M8	
1144	250	410	245	190	395	7.5	135	M6	M6	M6	M4	M3	M6	16
1544	250	410	245	190	395	7.5	135	M6	M6	M6	M4	M3	M6	16
2244	303	460	245	240	445	7.5	135	M6	M6	M8	M4	M3	M6	21
3044	320	460	265	260	445	7.5	150	M8		M8	M4	M3	M6	25
3744	430	575	270	360	555	10	168	M8		M8	M4	M3	M8	

(2) ED64A-4522 to 9022,4544 to 16044(45 to 160kW)



ED64 A	W	H	D	A	B	C	E	Terminal block				Mou-nting hole	Wei ght (kg)
								⊖, ⊕2, ⊕1	R,S,T, U,V,W, ⏚	MR, MS, MT	Cont-rol		
4522	500	600	300	410	575	12.5	170	M9	M8	M4	M3	M6	
5522	500	600	300	410	575	12.5	170	M6	M6	M4	M3	M6	
7522	500	720	350	410	695	12.5	205	M10	M10	M4	M3	M6	75
9022	620	770	350	530	745	12.5	205	M10	M10	M4	M3	M6	91
4544	500	600	300	410	575	12.5	170	M9	M8	M4	M3	M8	
5544	500	600	300	410	575	12.5	170	M6	M6	M4	M3	M6	
7544	500	720	350	410	695	12.5	205	M8	M8	M4	M3	M6	61
11044	620	770	350	530	745	12.5	205	M8	M8	M4	M3	M6	79
16044	500	1000	350	410	975	12.5	205	M10	M8	M4	M3	M6	99

(3) ED64A-20044 to 31544(200 to 315kW)

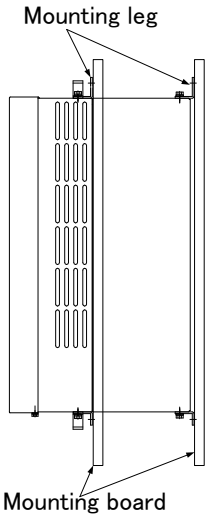


ED64A	W	W1	W2	H	D	A	A1	A2	A3	A4	B	C
20044	685	525	160	1000	380	(602.5)	445	70	45	45	975	12.5
25044	685	525	160	1000	380	(602.5)	445	70	45	45	975	12.5
31544	860	660	200	1130	499	(740.5)	520	100	49.5	50.5	1100	15

ED64A	Terminal block			Mounting hole	Weight (kg)
	⊖,⊕2,⊕1, R,S,T, U,V,W	MR,MT	Control Terminal		
20044	M12	M4	M3	M10	187
25044	M12	M4	M3	M10	194
31544	M12	M4	M3	M10	275

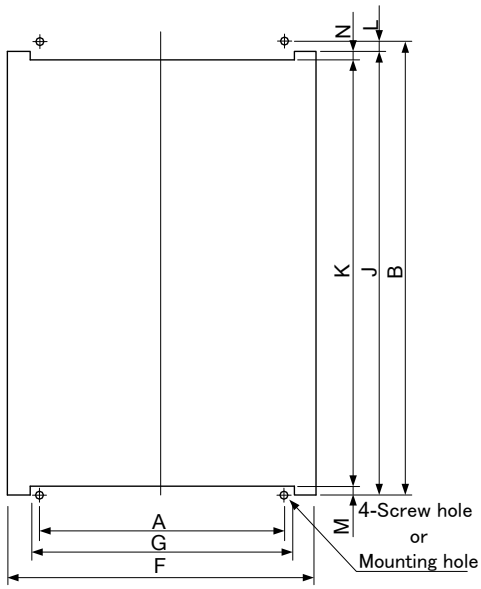
For the types of 200kW or over,inverter part and converter part can be mounted separately.

(3)Mounting method of outside intallation of cooling fin



(Note 1)　In case of using cooling fin installed outside, see ”◎ Panel cut dimensions of cooling fin of outside installation” (inquire use for 45 to 160kW) and "◎ Mounting method of outside installation of cooling fin” of left.

◎ Panel cut dimensions of cooling fin of outside installation(11 t0 37kW)



ED64A	F	G	A	B	J	K	L	M	N
1122	244	211	190	395	385	375	10	5	5
1522	244	211	190	395	385	375	10	5	5
2222	294	264	240	445	435	425	10	5	5
3022	314	284	260	445	435	425	10	5	5
3722	424	379	360	555	545	525	10	10	10
1144	244	211	190	395	385	375	10	5	5
1544	244	211	190	395	385	375	10	5	5
2244	294	264	240	445	435	425	10	5	5
3044	314	284	260	445	435	425	10	5	5
3744	424	379	360	555	545	525	10	10	10

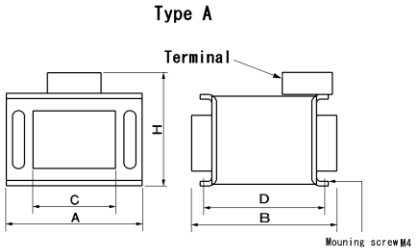
Color

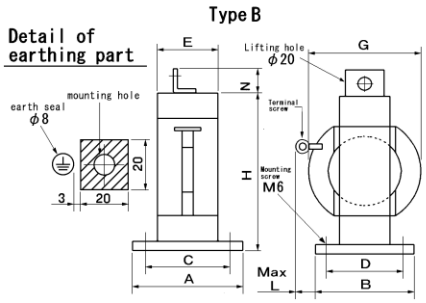
Inverter main body: Munsell 5B2/6 (dark blue)
Console: DIC727(wine red)

4-2. DC reactor (Standard / option)

For types of 200V class of ED64A-1522 or over and 400V class ED64A-2244 or over, DC reactor of separate installation is provided as standard. As for the types less than these capacities, DC reactor is optional.

●External and dimension





200V class (hatching part is option)

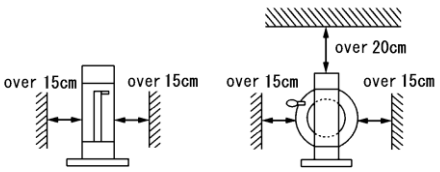
Inverter capacity	DC reactor type	Dimension (mm)										Type	Weight (kg)
		A	B	C	D	E	G	H	N	L	Terminal		
ED64A-1122	DCL1122	60	110	40	90	48	181	225	-	110	M6	B	5.0
ED64A-1522	DCL1522	60	110	40	90	48	169	206	-	110	M8	B	5.0
ED64A-2222	DCL2222	60	110	40	90	50	189	233	-	110	M10	B	6.0
ED64A-3022	DCL3022	90	120	70	100	75	180	221	-	110	M10	B	10
ED64A-3722	DCL3722	90	120	70	100	77	189	233	-	110	M10	B	10
ED64A-4522	DCL4522	110	125	90	105	81	176	220	-	110	M12	B	11
ED64A-5522	DCL5522	120	145	100	125	107	189	243	-	110	M12	B	15
ED64A-7522	DCL7522	110	125	90	105	92	213	267	-	120	M12	B	16
ED64A-9022	DCL9022	135	135	115	115	111	223	287	40	120	M12	B	20

400V class (hatching part is option)

Inverter capacity	DC reactor type	Dimension (mm)										Type	Weight (kg)
		A	B	C	D	E	G	H	N	L	Terminal		
ED64A-1144	DCL1544	106	100	80	75	-	-	150	-	-	M6	A	4.0
ED64A-1544	DCL1544	106	100	80	75	-	-	150	-	-	M6	A	4.0
ED64A-2244	DCL2244	60	120	40	100	48	210	254	-	110	M6	B	7
ED64A-3044	DCL3044	60	120	40	100	48	185	225	-	110	M6	B	7
ED64A-3744	DCL3744	90	120	70	100	75	205	249	-	110	M8	B	10
ED64A-4544	DCL4544	90	120	70	100	75	191	235	-	110	M10	B	10
ED64A-5544	DCL5544	110	125	90	105	92	195	245	-	110	M10	B	14
ED64A-7544	DCL7544	110	125	90	105	92	216	263	-	120	M10	B	16
ED64A-11044	DCL11044	135	135	115	115	117	219	283	40	120	M12	B	24
ED64A-16044	DCL16044	145	145	125	125	124	260	334	40	130	M12	B	28
ED64A-20044	DCL20044	145	145	125	125	130	256	330	40	130	M12	B	35
ED64A-25044	DCL25044	155	155	135	135	141	293	377	40	140	M16	B	40
ED64A-31544	DCL31544	155	155	135	135	142	320	404	40	210	M16	B	45

Caution at installation

Because DCL becomes hot, do not install device which will be influenced by heat near it. Also arrange not to circulate the heat of DCL in the panel.



Chapter 9 Cautions when consulting us

When making an order for replacement parts or asking technical questions, give the distributor or our office the following information.

1) Inverter type, capacity (kW) and input voltage (V)
2) Motor type, capacity (kW), rated rotational speed (min^{-1}), rated motor voltage and motor pole count
3) Serial number and software version number (Check the label IC18 on the control PCB VFC2001-Z.)
4) Details of failure and circumstances under which the failure occurred
5) Working conditions, load conditions, ambient conditions, date of purchase and operating circumstances
6) Agent name and name of department in charge of marketing

Request to distributors

When delivering your product incorporating this inverter, ensure the end user receives this manual.

When the adjustment values of this inverter are changed from the defaults, ensure the end user knows the changes.

TOYODENKI SEIZO K.K.

http://www.toyodenki.co.jp/

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TEL : +81-3-5202-8132 -6
FAX : +81-3-5202-8150

In addition, the contents of this the "operation manual" may be changed without a preliminary announcement by specification change of a product etc. Please understand that it may differ from the contents of the "operation manual" enclosed by the model of purchase, and the contents of the "operation manual" posted on our homepage.

Please have a look from our homepage about the newest "operation manual."

Contents of this manual are subject to change without notice.

TIM027[B]_20141030