

ED64^{SP}

TOYO INTELLIGENT INVERTER

INSTRUCTION MANUAL



Preface

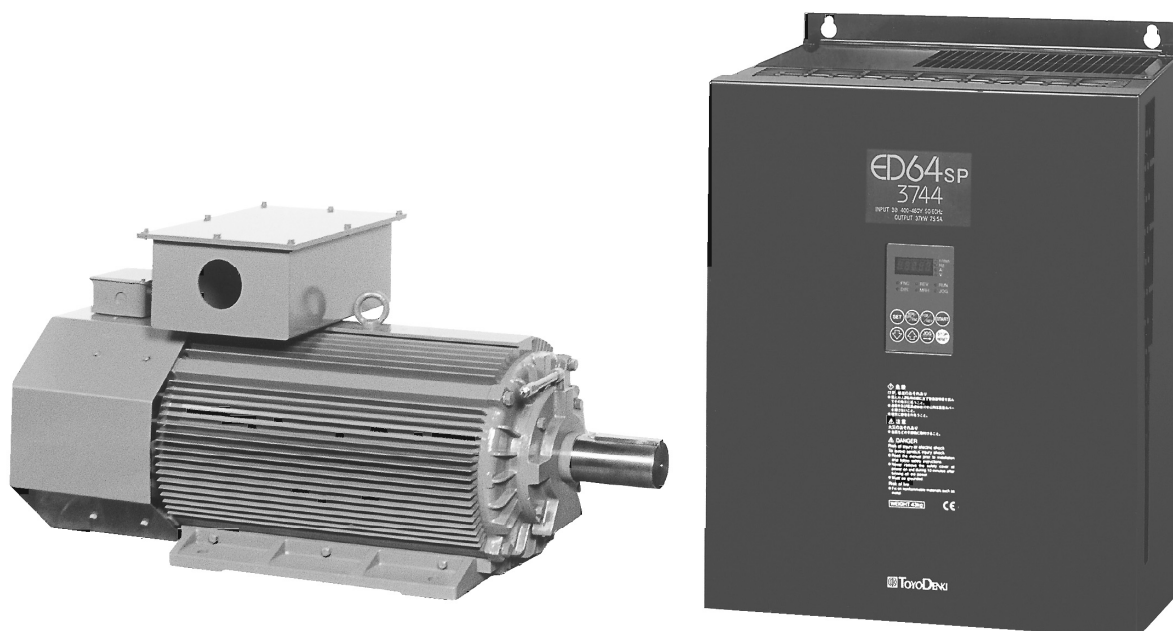
We thank you for your adoption of this time of "TOYO" ED Motor System.

Intelligent Inverter [ED64sp Series] is dedicated Inverter for driving of ED motor as well as an advanced type of conventional [ED64] Series, developed in order to control the synchronous motor (ED motor) [EDM Series], in which highly efficient permanent magnet is embedded. By adding of [ED64S (sensorless) mode], which can control motor speed without fitting of PG to motor, to the function of conventional [ED64], Inverter can be used in wider range of applications.

This Instruction Manual was made out in order for users to understand correct installation, wiring method, operation method, etc. at the time of use of Inverter [ED64sp] for driving ED motor. For proper handling of this Inverter, please read this Manual carefully before operation. As an Instruction Manual for motor [EDM Series] is also available in addition to this Manual for [ED64sp] in our ED Motor System, please read it together.

In addition to the standard function, [ED64sp] has characteristic functions such as [HC (super block) function], [Sequence (PLC) function], etc., which are able to be made out to the individual user's application and the most suitable system can be structured. When such functions are made out to meet user's own application, there may be a case that the handling method is different from that of standard system. Therefore, please take a priority in their dedicated Instruction Manual, Drawing, Test Report, etc., which will be supplied separately.

[ED64sp] Series are "upper compatible" with function of conventional [ED64] Series however, a part of setting numbers, etc. were changed and therefore, pay attention in case that ED64sp is used replacing with conventional ED64.



Please read surely the following precautions.

Safety precautions

Be sure to read carefully and thoroughly this Manual with other attached documents before installation, operation, maintenance and inspection of the Inverter so as to use it correctly. Please use the Inverter after the acquirement of all of knowledge on the equipment, safety information and the matters to be attended.

In this Manual, the rank of safety precautions are classified into DANGER and CAUTION.



DANGER

: Misoperation could result in dangerous situation and in death or heavy injury.



CAUTION

: Misoperation could result in dangerous situation and in medium/minor injuries, and in damage to the materials only but there is a possibility that misoperation may cause serious result depending on the condition.

As all cautions include important contents, be sure to follow them thoroughly.



CAUTION [as to installation]

- Mount the Inverter on the noninflammable material such as metal, etc.
There is a fear of fire.
- Don't put the inflammable material near to the Inverter.
There is a fear of fire.
- Don't take front cover at the time of carrying.
There is a fear of injury by dropping.
- Install the Inverter at endurable place against weight.
There is a fear of injury by dropping.
- Don't install and operate damaged Inverter, or Inverter of which parts are omitted.
There is a fear of injury.



DANGER [as to wiring]

- Make wiring after confirmation of OFF of input power source.
There is a fear of electric shock and fire.
- Connect earth wire surely.
There is a fear of electric shock and fire.
- Wiring work should be done by persons specialized in electric engineering work.
There is a fear of electric shock and fire.
- Make wiring surely after installation of main body.
There is a fear of electric shock and fire.



CAUTION [as to wiring]

- Never connect AC power source to output terminals (U, V, W).
There is a fear of injury and fire.
- Confirm the coincidence of rated voltage of the product and voltage of AC power source.
There is a fear of injury and fire.
- Never connect resistor directly to between $\oplus 1 \sim \ominus$ and $\oplus 2 \sim \ominus$ or $\oplus 1 \sim \oplus 2$ of DC terminals.
There is a fear of fire.

Please read surely the following precautions.



DANGER [as to operation]

- Surely after fitting the front cover, turn ON input power source. Also, don't remove the cover during power supply.
There is a fear of electric shock.
- Don't operate the switch by wet hand.
There is a fear of electric shock.
- Don't touch Inverter terminals even if Inverter is stopped, during power supply to Inverter.
There is a fear of electric shock.
- Do not touch Inverter terminals while ED motor is running.
- As stop button is effective for the signal only which designated operation point, please prepare emergency stop switch separately.
There is a fear of injury.
- If alarm is reset keeping the input of operation signal, Inverter restart suddenly and therefore, reset the alarm after confirmation of no operation signal.
There is a fear of injury.



CAUTION [as to operation]

- Don't touch radiation fin and radiation resistor since they become hot much.
There is a fear of burn.
- Since operation of Inverter can be set from low speed until high speed, operate Inverter confirming enough the permissible range of motor and machine.
There is a fear of injury.
- In case of need of hold-brake, please prepare it separately.
There is a fear of injury.



DANGER [as to maintenance/inspection, exchange of parts]

- Inspection should be done after turning off of input power and passing of 10 minutes or more from confirmation of stop of motor. Also, check DC voltage between ⊕1~⊖ or ⊕2~⊖ and confirm that it is less than 30V.
There is a fear of electric shock, injury and fire.
- Confirm the coincidence of rated voltage of product and voltage of AC power source.
There is a fear of electric shock.
- Maintenance/inspection and exchange of parts should be done by designated persons only.
Use insulated tools at the time of maintenance/inspection.
There is a fear of electric shock and injury.



DANGER [others]

- Never remodel the Inverter.
There is a fear of electric shock and injury.

General Cautions

Since there are cases that illustrations in this Manual are shown in the state of removing the safety cover or shield for the purpose of explanation of the details, please restore such safety materials to the state as before and operate in accordance with the Manual, at the time of operation of product.
Safety precautions and specifications written in the Manual are subject to change for improvement without notification in advance, for which please understand.

CONTENTS

Chapter 1	Guides before use	1
	1. Handling method	1
	2. Circuit composition	5
	3. Terminal specification	6
Chapter 2	For operation of ED64sp	7
	1. Confirmation before operation	7
	2. As to DIP Switch on the control P.C.Board (VFC2001)	9
	3. Function of console panel (SET64)	10
	4. As to auto-tuning	16
	5. Test operation method	23
	6. Alteration of Inverter control mode	25
	7. Operation at the time of replacement of P.C.Board	26
Chapter 3	Explanation of function setting items	27
	1. Table of ED64sp setting items	28
	2. Explanation of setting items	36
Chapter 4	Selection of peripheral devices and options	77
	1. Selection guide	77
	2. Input/output devices and wiring	78
	3. AC Reactor (Option)	80
	4. Noise filter	81
	5. DC Reactor	84
	6. VF61R Sine wave converter	84
	7. Dynamic brake control unit (DB Unit)	84
Chapter 5	Function-up option	87
	1. Extension cable and metal fitting	87
	2. Isolated input card : IO64	88
	3. Isolated input output card : IO64	88
	4. Motor temperature compensation : T/V61V	89
Chapter 6	Communication system up option	89
	1. OPCN64 : OPCN-1(JPCN-1) compliance	89
	2. ASYC64 : Complied with RS232C/RS485 start-stop synchronous serial communication	90
	3. DNET64 : Complied with DeviceNet	90
	4. PBUS64 : Complied with PROFIBUS	90
Chapter 7	System-up option	91
	1. HC function	91
	2. Sequence(PLC) function	91
	3. Trace back monitor function	91
	4. Trend monitor function	91
	5. Console data set function	91
Chapter 8	Maintenance, Inspection	92
	1. ED64sp protection display and trouble shooting	92
	2. Periodical inspection	100
	3. Insulation resistance test	101
Chapter 9	Standard specifications	102
	1. Common specifications	102
	2. Table of types	104
	3. Table of capacities	105
	4. Outline dimensions	106
	5. DC Reactor (Standard • Option)	109
Chapter 10	Necessary information to us in the inquiry from customers	110

Chapter 1 Guides before use

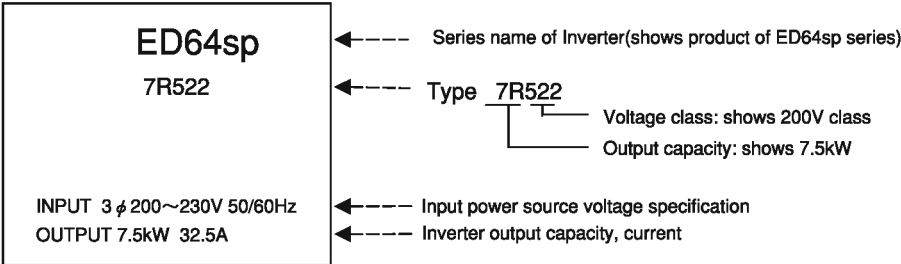
1. Handling method

1—1. Acceptance inspection

Upon receipt of the product, please confirm the following points.

- (1) Whether specifications and accessories, spare parts, options are properly in accordance with your order.
Please check the type of Inverter unit by Series Mark on the surface of cover.

Surface of cover Indication example of the type



- (2) Whether any damages during transportation are found in the received Inverter.
- (3) Whether looseness or drop out of screw is found.
If any problem is found, please contact us or our distributor.

! SAFETY PRECAUTIONS

Please read [Instruction Manual] carefully before use and operate Inverter correctly.
Our Inverter is not designed and manufactured for use in any equipment or system that is applied in an environment affecting human life. If you intend to use the product for specific applications such as passenger mobile, medical, aerospace, nuclear control or submarine relay equipment or system, please contact us.
Our product is manufactured under strict quality control however, a safety device or system must be used with the product when applied to any facility in which failure of the Inverter to perform can be reasonably expected to cause a problem critical to human life or its loss. When using the Inverter with any load other than 3-phase AC motor, please contact us.
ED64 is to be used for our ED motor exclusively and it cannot be used for other motors than ED motor, for which please pay attention.
This product requires electrical work, which must be done by qualified expert.

1—2. Opening of front cover

In case of operation of DIP Switch SW1 on P.C.Board by maintenance inspection and auto-tuning, open front cover by the following order.

1-2-1. In case of ED64 of 7.5kW or less using resin panel and cover.

- (1) Remove the fixing screws at the lower part of front cover.
- (2) When the lower part of front cover is pulled to this side, cover opens to about 90 degrees.
- (3) When front cover is pushed to the inside in the state of fully opened, cover can be fixed.

1-2-2. In case of ED64 of 11kW or over using metallic panel and cover.

- (1) Remove the fixing screws at the lower part of front cover.
- (2) When front cover is opened to about 45 degrees, remove the insertion at the hitching of upper part of cover. Then, front cover can be removed.

! CAUTION [as to drive operation]

- In case of opening of cover just after operation, please wait until going off of [CHG] lamp on main circuit printed board.
Housing of VF64 of 7.5kW or less is resin panel. Pay attention since giving an excessive force could result in breakage.

**CAUTIONS at the replacement of parts**

- Don't disassemble immoderately.
- After reassembly, confirm that every units were correctly assembled.
- If assembly is not correct, there is a fear of fire.
- Specially if flat cable was not correctly inserted, control circuit may not work normally, for which please pay attention.
- As to tightening of screws, please do it surely.

1—3. Installation place of the unit

Conditions of installation place affect much the service life and reliability of the Inverter unit. Avoiding the places shown below, please use Inverter in the operating conditions written in the catalog.

- (1) Moist or dusty place. Place exposed to water or oil drips. Uses of Inverter at such places make circuit insulation deteriorate and service life of parts shorten.
- (2) If service temperature is too high, life of condenser and fan motor is shortened.
- (3) When Inverter is used at the place exposed to corrosive gas, mal-contact of connectors, disconnection of wires, breakage of parts will occur.
- (4) When Inverter is used at the vibrative place, mal-contact of connectors, disconnection of wires, breakage of parts will occur.
- (5) In case that Inverter is used at the place of ambient temperature of less than 0 °C, warm it by heater, etc. up to 0 °C or more at starting. If it is warmed to 0 °C or more after starting by its own generation of heat, there is no problem.

**CAUTION [as to installation]**

- Install the Inverter on the nonflammable material such as metal, etc.
There is a fear of fire.
- Don't put the inflammable material near to the Inverter.
There is a fear of fire.
- Don't take front cover of the Inverter at the time of carrying.
There is a fear of injury by dropping.
- Install the Inverter at an endurable place against weight.
There is a fear of injury by dropping.
- Don't install and operate damaged Inverter, or Inverter of which parts are omitted.
There is a fear of injury.

1—4. Installation method of the unit

In case of use of ED64sp Inverter installing in the control panel, etc., install it as stated below.

**As to installation method**

- If Inverter is not installed properly, there is a fear of electric shock and fire.

(1) Installation direction

Install ED64sp Inverter vertically with the series mark ED64sp set at the upper side. If it is installed laterally, ventilation is prevented and there may be a case of rising of temperature. Route of suction/exhaust must be considered enough. Cooling fan in the unit sucks air from the lower side and exhaust it to the upper side. Please provide enough space so that ventilation is not prevented by wiring duct, etc.

(2) In case of installation of Inverter placing its fin-part at the rear outside of control panel

Types of capacity of ED64sp-3722, 3744 or less can be installed placing their cooling fin-part at the rear outside of control panel.

ED64sp-4522, 4544 or over also can be installed as stated above but air of inside and outside cannot be insulated enough.

As to heat generation amount of other than fin part, please consult with us.

(3) Example of energy loss of Inverter.

Energy loss of ED64sp Inverter is 2.5~5% of the capacity of motor load.

EXAMPLE $3.7\text{kW} \times 5\% = 185\text{W}$ In case that motor load is 3.7kW, loss is 185W.

Percentage of energy loss to Inverter capacity is as shown below.

2.2~37kW	: 5%	45~55kW	: 4%
75~90kW	: 3%	110~315kW	: 2.5%

Exhaust amount of heat generated from ED64sp Inverter in case of forced exhaust to the outside of panel by cooling fan fitted to control panel can be calculated by equation shown below.

$$Q = q / \{ \rho \cdot C \cdot (T_o - T_A) \}$$

Whereas, Q : Exhaust amount (m^3/s) q : Generated heat amount of ED64sp(kW)
 ρ : Density ($1.057 \sim 1.251 \text{kg}/\text{m}^3$) C : Specific heat ($1.0 \text{kJ}/\text{kg} \cdot ^\circ\text{C}$)
 T_o : Exhaust fan outlet temperature ($^\circ\text{C}$) T_A : Control panel suction hole temperature ($^\circ\text{C}$)

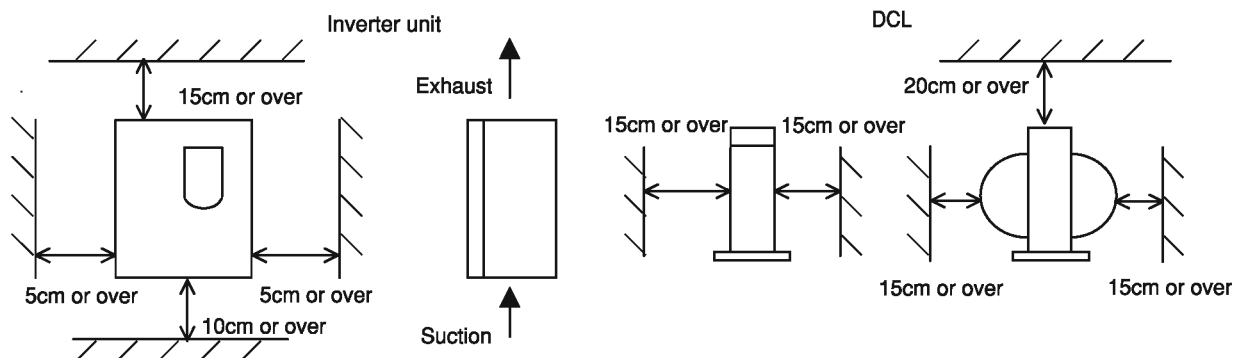
In case that ambient temperature of control panel is 40°C , it is necessary to make exhaust temperature to less than 50°C . Since temperature difference between suction and exhaust is 10°C , exhaust capacity of about $0.1 \text{m}^3/\text{s}$ is needed in order to exhaust the loss of 1kW.

(4) To secure cooling space

As to installation of ED64sp Inverter main body and DCL (DC Reactor), secure the cooling space making the figures below as criterion (The figures are example of ED64sp of less than 7.5kW. Secure double of space for ED64sp of more than 11kW).

Also, if peripheral devices generate heat, install them making no influence to the cooling of the unit.

In case that ED64sp Inverter is installed in the control panel, ventilate to make the temperature in panel to less than 50°C (If ambient temperature is high, reliability falls).



(5) Matters to be attended

- As DC Reactor (DCL) becomes hot (there is a case to exceed 100°C), secure enough space between DCL and other devices.
- Exhaust generated heat of Inverter and DCL to the outside of panel surely. Also, arrange not to circulate the exhaust air of Inverter in panel.
- In case of use of dynamic brake unit, install brake resistor at outside of panel to the utmost.
- Avoid use of Inverter unit at the place of extremely bad environment.

1—5. Cautions on wiring

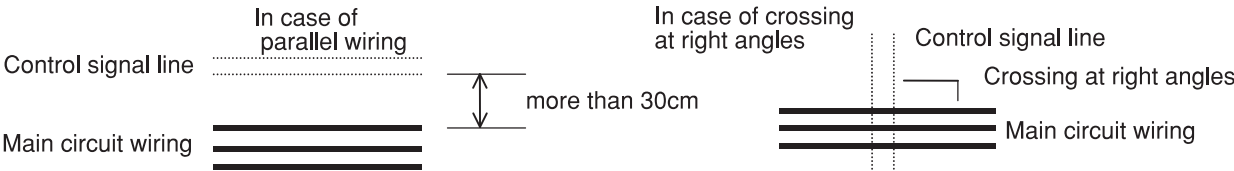
(1) Input the specified voltage to the input terminal of Inverter.

If 400V is inputted to the Inverter of 200V class, Inverter is broken.

(2) Since Inverter is operated by high frequency using IGBT as its element, it generates noise much.

Pay attention on the following points at wiring work.

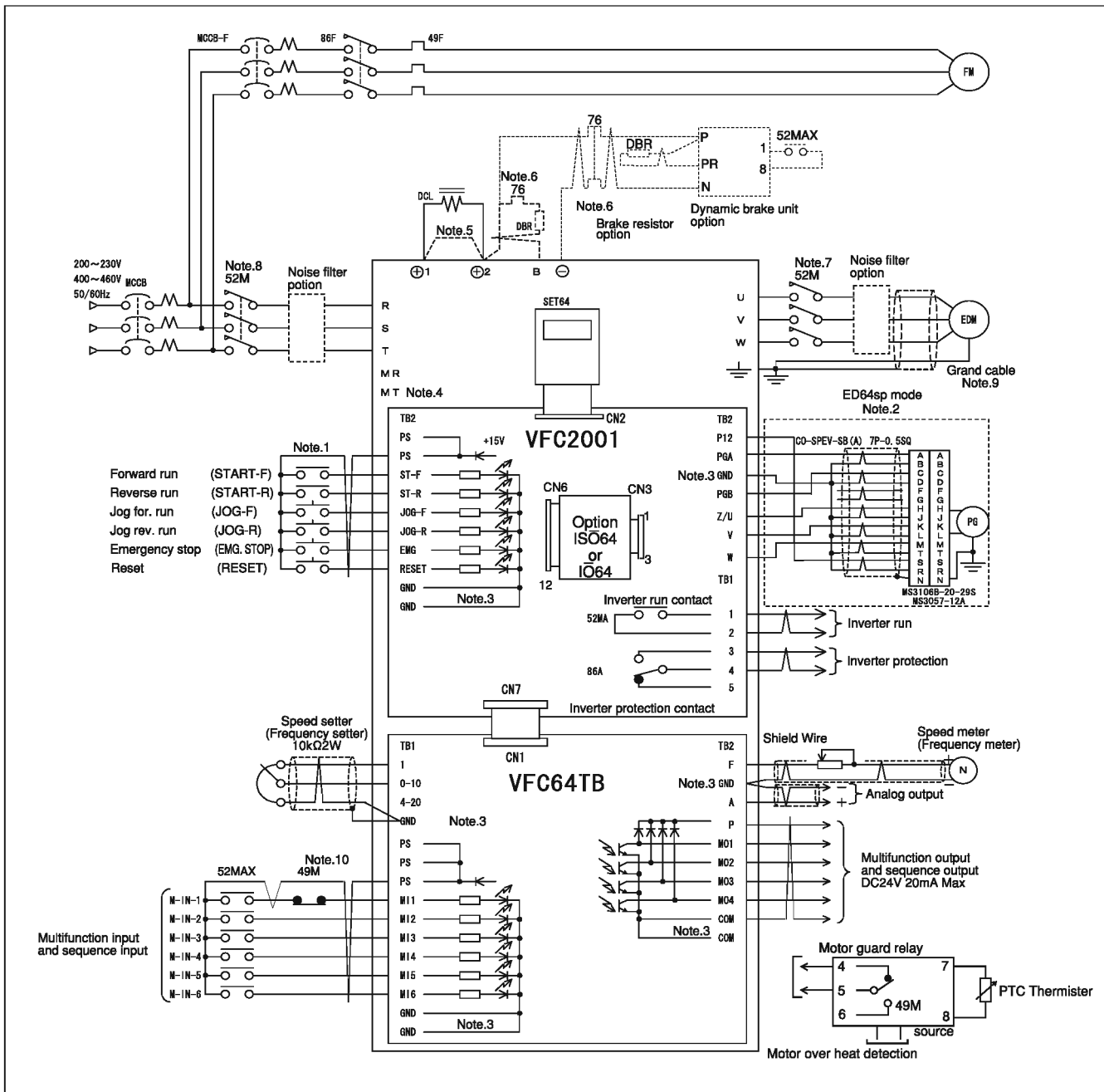
- Make wiring of main circuit wires and control signal line separately. In case of parallel wiring, apart them more than 30cm each other.
- In case of crossing, cross them at right angles.
- As a measure against noises to other equipments, it is recommendable to place main circuit wiring in conduit pipe or metallic pipe.



- (3) In order to prevent entering of noise, use shielded wire or twisted wire for control signal line.
- (4) In case that speed is set at outside of control panel, lay signal line containing in the conduit pipes or metallic pipes.
- (5) As to wire size of main circuit wiring, see [Input/Output devices and wiring] of Chapter 4, item 2.
- (6) In case that shielded wire is used for output wiring or wiring length is over 300m and when ED64sp Inverter is operated by its DC excitation function, there may be a case that Inverter is broken or it does not work normally caused by leakage capacitance to earth of output wiring of Inverter and resonance phenomenon of input power source inductance. In such case please contact us.

As to earth leakage circuit breaker
IGBT is used for main circuit element of ED64sp Inverter. Since leak current increases caused by high carrier frequency, use earth leakage circuit breaker of exclusive use for Inverter.

2. Circuit composition



(Note 1) Control input terminals (ST-F - RESET) and multifunction input terminals (M11 - M16) can also be arranged to GND common input (sink input). In this case, remove jumper pin on VFC2001 P. C. Board from [CN SO] and fit to [CN SI]. (Standard factory default setting is PS common input (source input).)

(Note 2) PG is to be fitted in ED64P(UVWAB- with PG) mode and ED64V(ABZ- with PG) mode only. (Fig. shows connection of ED64P mode. In case of use in ED64V mode, see connection diagram to be supplied separately.)

(Note 3) Never connect GND, COM terminal of control circuit with earth.

(Note 4) AC power source terminal (MR, MT) for control circuit is equipped in the Inverter of 1122, 1144 or over. (It is unnecessary to connect with power source ordinary. It is connected only when control circuit power source is required to turn on, such as execution of protection display)

(Note 5) Terminals ⊕1 and ⊕2 of Inverters of less than 1122 in 200V class and 1544 in 400V class are shorted. (in case of without DCL)

(Note 6) When thermal relay of dynamic resistor (DBR) tripped, break Inverter input.

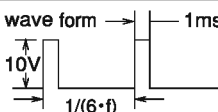
(Note 7) Mount main circuit connector (52M) in accordance with use condition of customer. In case of ED motor, voltage is generated from motor itself if motor is running even when Inverter is stopped. Therefore, it is recommendable to mount Contactor at the output side for safety. In this case, output side Contactor is switched by 52MA relay of Inverter.

(Note 8) PG is used in the mode of vector control with speed sensor.

(Note 9) About the processing of the ground cable and the shield part
Please use not IV cable but the cables which consist of more conductor such as KIV cable or MLFC cable (CV cable). And please use 2 or more ground cables and put them into metallic pipes with the main circuit cables between inverter and motor. Then connect a ground cable of metallic pipes themselves with the earth terminal of inverter as processing of grounding metallic pipes.

(Note 10) Please set the parameter of multifunction input terminal (1) [C-01] to external failure signal1 [15] for this figure.

3. Terminal specification

Kind	Terminal number	Application	Explanation of content
Main circuit	R·S·T	AC input	Connect with AC power source
	U·V·W	Inverter output	Connect with 3-phase motor
	⊕1	For connection of DCL +side	Short between ⊕1~⊕2 in case of no use of DCL in Types of less than ED64sp-1122 and ED64sp-1544
	⊕2	For connection of DCL -side and of dynamic brake resistor (thermal relay) or for +side input when sine wave converter is used.	Terminal for connection of dynamic brake resistor (thermal relay) ⊕side terminal of DC power source when sine wave converter is used
	B	For connection of dynamic brake resistor (thermal relay)	Terminal of Type of less than ED64sp-1122 and ED64sp-1544. Collector terminal of built-in transistor for dynamic brake
	⊖	For connection of dynamic brake unit or for +side input when sine wave converter is used.	Terminal to connect with N terminal of dynamic brake unit (DB-UNIT) ⊖side terminal of DC power source when sine wave converter is used
	⏚	Earth	Surely connect with earth. Connect with earth terminal of NF when noise filter(NF)is used
Control circuit	MR·MT	Control circuit power source input	Equipped with Types of ED64sp-1122,ED64sp-1144(Inverter can be operated without connection of this circuit. It is used in case of execution of protection display, etc. in status of close of main circuit input)
VFC2001 Terminal block TB2	PS	Power source (+15V side) for external signal	To be used as terminal for input (input current 3mA) of Inverter operation signal or as input signal terminal for sequence function
	ST-F	Forward run signal	
	ST-R	Reverse run signal	
	JOG-F	Jog forward run signal	
	JOG-R	Jog reverse run signal	
	EMG	Emergency stop(output is OFF by[close])	
	RESET	Reset	
	GND	Power source for external signal (0V side)	Connect with PG (A,B,U,V,W phase (ED64Pmode)/(A,B,Z phase(ED64Vmode)) Recommendable cable: Twist pair shielded wire CO-SPEV-SB(A)7P-0.5SQ(Hitachi Densen Co.) Note 1: Straight plug (MS3106B-20-29S) and cable clamp (MS3057-12A) of Nihon Kohku Denshi Co. are necessary option for connection with PG of ED motor.
	P12	Power source for PG(+12V side)	
	GND	Power source for PG (0V side)	
	PGA	A-phase signal of PG	
	PGB	B-phase signal of PG	
	Z/U	U-phase signal of PG(Z phase signal in case of ED64V)	
	V	V-phase signal of PG	
	W	W-phase signal of PG	
VFC2001 Terminal block TB1	1-2	Contact output during running of Inverter	Output during running of Inverter (52MA contact 1A, AC230V 0.5A)
	3、4、5	Contact output of protective operation of Inverter	Output of protective operation of Inverter (86A contact, 1C, AC230V 0.5A) [Close] between 4-3 and [Open] between 4-5 by protective operation
VFC64TB Terminal block TB1	1	Power source (+10V) for speed setting	Use dial of 10kΩ for speed command
	0-10	Speed command voltage input	Input impedance 150kΩ
	GND	Power source (0V) for speed setting	Never connect with earth
	4-20	4-20mA speed command input	Input resistance 250Ω
	PS	Multifunction input terminal (+15V)	Max. output current (18mA)
	GND	Multifunction input terminal (0V)	Never connect with earth
	MI1	For input signal of multifunction input and sequence function	Max. input voltage DC24V Input current 3mA
	MI2		
	MI3		
	MI4		
	MI5		
	MI6		
VFC64TB Terminal block TB2	P	For output signal of multifunction output and sequence function	P terminal is connected with external power source(DC) MO1~MO4 terminals are of open collector output. Max. voltage DC24V / Max. current 20mA COM terminal is emitter common terminal of open collector output. (Recommendable relay for multifunction output : OMRON G7T-112S-DC24V)
	MO1		
	MO2		
	MO3		
	MO4		
	COM		
	F	Output for rotation speedometer or frequency division PG output (Measure by DC voltmeter or digital counter)	Output wave form  1ms F is frequency conversion value of rotation speed. DC voltage is DC3.6V/60Hz (at TopF≤120Hz) At PG output selection: 1/2 or 1/4 pulse output. Output current is Max 5mA (See Chapter 3, setting item G-09)
	A	Analog output voltage	Output voltage 0~±10V, Output current Max. 1mA
	GND	For 0V terminal of terminals F, A	Never connect 0V terminal of above F, A terminals with earth

Chapter 2 For operation of ED64sp

1. Confirmation before operation

1—1. As to control mode

ED64sp Inverter has following 3 modes:-

- 1) [ED64P] mode using PG which has 5 signals of A, B, U, V, W phases as a speed/pole position sensor.
- 2) [ED64V] mode using PG which has 3 signals of A, B, Z phases as a speed sensor.
- 3) [ED64S] mode which does not use speed/pole position sensor.

Note) This ED64 Inverter has not [ED64V] mode and [ED64S] mode.

Depending on the specifications of ED motor to be used, select and use these modes. Selected control mode can be confirmed by console display at the time of turning on of power or setting item [S-01]. In our standard ED motor, A, B, U, V, W phases PG is used for speed/position sensor. Therefore, [ED64P mode] is used in case of "with sensor" and [ED64S mode] is used in case of "sensorless" ordinary. [ED64V mode] is for special application.

Note) Ordinary, we supply this Inverter being set in the control mode instructed at the time of order. In case of change of control mode, see [CHAPTER 2, Item 6. Change of Inverter control mode]

1—2. As to auto-tuning

Since ED motor incorporates permanent magnet, magnetic pole position information (d-axis position) of permanent magnet is necessary in addition to the electrical constant of motor, which was necessary for vector control of conventional induction motor. In case of ED64, Inverter itself measures these information and auto-tuning function mounted in it sets the said information in parameter automatically. Before operation of ED64, surely execute auto-tuning (as to operation method of auto-tuning, see [Chapter 2, Item 4, Operation of auto-tuning]).



Safety precaution

- * If combination of ED64sp and ED motor was changed, surely execute auto-tuning before operation. Even ED motors of same type, magnetic pole position (d-axis) varies depending on the mounting position of PG.
- * When PG of ED motor was replaced, surely execute auto-tuning before re-operation. If it is difficult to separate the motor from load machine, execute d-axis auto-tuning.
- * If magnetic pole position parameter of Inverter and magnetic pole position of ED motor do not coincide, motor may rotate to unexpected direction, for which please pay attention.

1—3 As to change of direction of rotation

ED motor rotates CW (clockwise seen from the opposite of drive shaft side) by forward run command. For making CCW (counterclockwise seen from the opposite of drive shaft side) by forward run command, replace the connection of V, W phases among the connection to motor. In case of use in ED64P, ED64V modes, signals of V, W as well as A, B also of PG are needed to be replaced.

When direction of rotation is changed, magnet (d-axis) position seen from Inverter is also changed and therefore, it is necessary to set A-30 (d-axis position) newly. Ordinary, d-axis measurement auto-tuning written in [CHAPTER 2, Item 4. As to Auto-tuning] is executed. If execution of auto-tuning is difficult, A-30 setting at the time of change of rotation direction is calculated by the formula shown below and is set. (In case of ED64S mode, it is unnecessary to set A-30 newly)

ED64P mode :

A-30 setting = [A-07 (No. of PG pulse) setting] / [A-06(No. of motor pole) setting] x 4- [A-30 setting before change]

However, if setting value is minus value, [A-07 (No. of PG pulse) setting] / [A-06 (No. of motor pole) setting] x 8 is added.

ED64V mode :

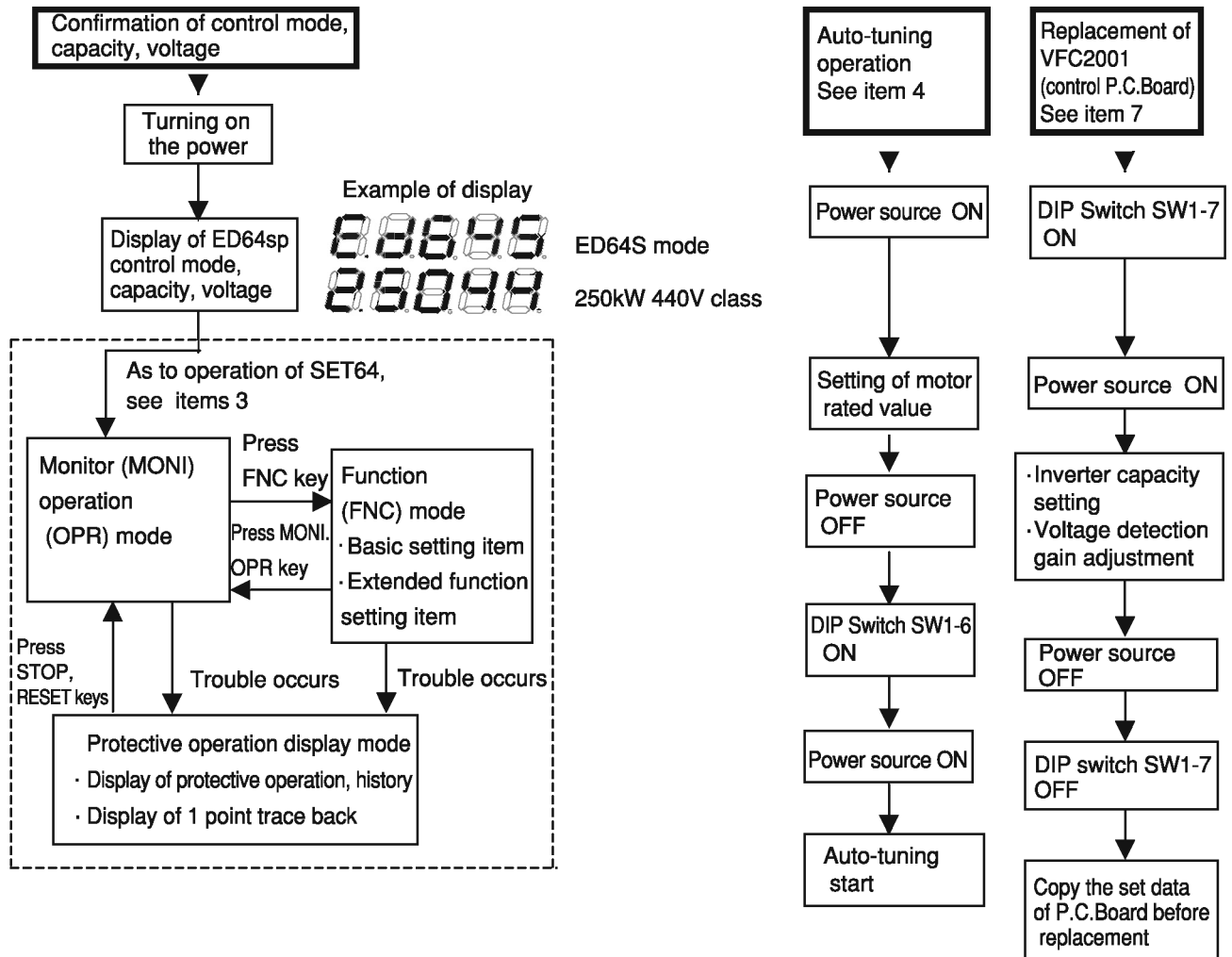
A-30 setting = [A-07 (No. of PG pulse) setting] / [A-06(No. of motor pole) setting] x 8- [A-30 setting before change]

(In case of use of 2nd motor, A-06, A-07, A-30 should be read as L-05, L-06, L-21, respectively.)

1—4. As to replacement of control P.C.Board VFC2001 with spare board

In order to fit the spare P.C.board to the Inverter of present use, it is necessary to do setting of Inverter capacity, motor ratings (values in name plate), auto-tuning data as well as gain-adjustment of analog circuit part such as intermediate part DC voltage detection, etc. (See [Chapter 2, Item 7, Operation at the time of replacement of P.C.board]).

1—5. Kind and summary of operation



2. As to DIP Switch on the control P.C.Board (VFC2001)

2—1. Function of DIP Switch SW1

- (1) It is necessary to operate DIP Switch SW1 at the times of initializing of memory, capacity setting of Inverter to be used and execution of auto-tuning.
- (2) Functions of DIP Switch SW1 are as per table below.

Table of functions of DIP Switch SW1

DIP Switch	When SW1 is set at ON	When SW1 is set at OFF
SW1-1	Inhibition of data writing	Possible to write the data
SW1-2	Error, protective operation data in the past (Clear the protection history, 1 point trace back, trace back data)	Ordinary
SW1-3	Unused	Inhibit to rewrite setting data from communication option
SW1-4	Change of control mode (ED64P, ED64V, ED64S)	Ordinary
SW1-5	DC mode auto-tuning or d-axis auto-tuning when both SW1-5 and SW1-6 are set at ON. Full mode auto-tuning when SW1-5 is OFF and SW1-6 is ON	Ordinary operation
SW1-6		
SW1-7	Initializing of set data, Capacity setting of Inverter	Ordinary operation
SW1-8	Monitor mode for our adjustment (Don't turn to ON ordinary)	Ordinary

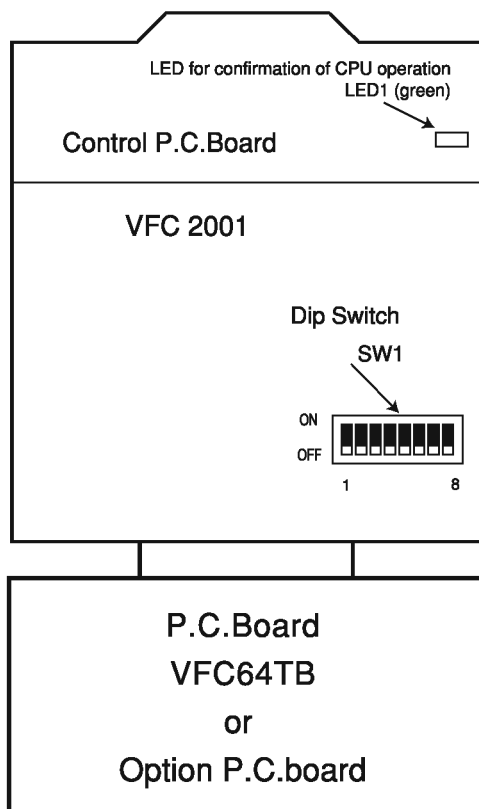
2—2 As to LED for confirmation of CPU operation

On the P.C.Board VFC2001, LED lamp (LED1) to confirm power source and status of CPU is mounted.

Status of LED1	Status of power source and operation of CPU
Blinks every about 1 sec.	CPU in ordinary operation
Continuous lighting	During flash memory writing (HC function / Sequence function), or CPU operation abnormal.
Continuous lights-out	CPU power source OFF, or CPU operation abnormal

2—3 Fitting position of DIP switch and LED for confirmation of CPU operation

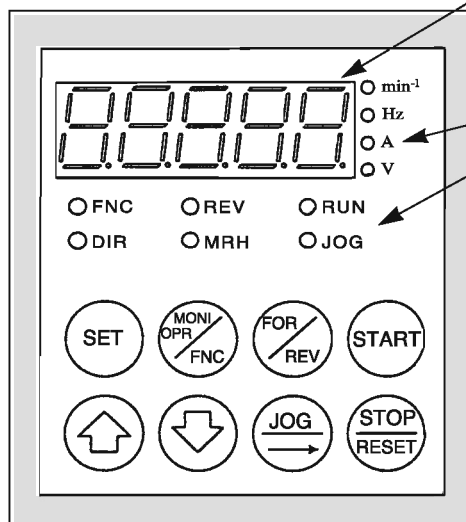
Remove front cover of ED64sp Inverter and open the fitting board of standard console (SET64). Then, control P.C.Board VFC2001 is found. DIP switch (SW1) and LED for confirmation of CPU operation (LED1) are found at the positions shown in the Fig. above.



3. Function of console panel (SET64)

Mounting the console panel (SET64) which has LED display of 5 digits, 8 operation keys, unit LED and status display as the standard equipment, ED64sp can do operation, readout-write of setting data of each function, monitoring of status of operation, display of content of protection and 1-point trace back at the time of protective operation and readout of protection history. Moreover, initializing of memory of Inverter, setting of Inverter capacity, starting operation of auto-tuning can be done by console panel.

●Front surface of panel



●LED display window : 7 segments 5 digits display

Display of letter and numerical value.

Operation monitor/ Display of function symbol (No.)/selection of function • setting data/ protective operation/ protection history, etc.

●Unit display (LED display)

●Status display (LED display)

FNC : LED goes on when FUNCTION mode (function setting mode) is selected.

DIR : DIR: LED goes on when any one of [START], [JOG] keys of console panel is selected for console panel operation.

REV : LED goes on when REV (reverse) is selected.

MRH : LED goes on when function of MRH is selected.

(MRH function is the function to operate accel/decel during running by keys or by external contacts)

RUN : LED goes on when Inverter is running. (LED blinks during decel stop, at initial excitation and during DC braking)

JOG : LED goes on when Inverter is jog-running.

(RUN also goes on simultaneously)

●Operation keys



<At the time of FUNC (function setting) mode>

- Decision of selection of setting number
- Writing of setting data

<At the time of MONI, OPR (monitor, operation) mode>

- Changeover of monitoring item

<At the time of protective operation>

- Readout of 1-point trace back data



<At the time of FUNC (function setting) mode>

- When setting number and setting data are set, increase the figure of selection digit by +1.

<At the time of MONI, OPR (monitor, operation) mode>

- When console is set at speed command position selection and at the time of MRH mode, accelerate by this key.



Changeover of MONI, OPR mode and FUNC mode

<At the time of FUNC (function setting) mode>

- Change to MONI, OPR mode.

<At the time of MONI, OPR (monitor, operation) mode>

- Change to FUNC mode.



<At the time of FUNC (function setting) mode>

- When setting number and setting data are set, increase the figure of selection digit by -1.

<At the time of MONI, OPR (monitor, operation) mode>

- When console is set at speed command position selection and at the time of MRH mode, decelerate by this key.



<At the time of MONI, OPR (monitor, operation) mode>

- Change for. run / rev. run command when [START] or [JOG] of console panel is effective.

(LED [REV] goes on by rev. run command selection)



<At the time of FUNC (function setting) mode>

- Shift the selection digit for operation to the right by 1 digit.

<At the time of MONI, OPR (monitor, operation) mode>

- When console is set at jog command setting position selection, operate Inverter.



<At the time of MONI, OPR (monitor, operation) mode>

- Operate the Inverter when console is set at operation command setting position selection.

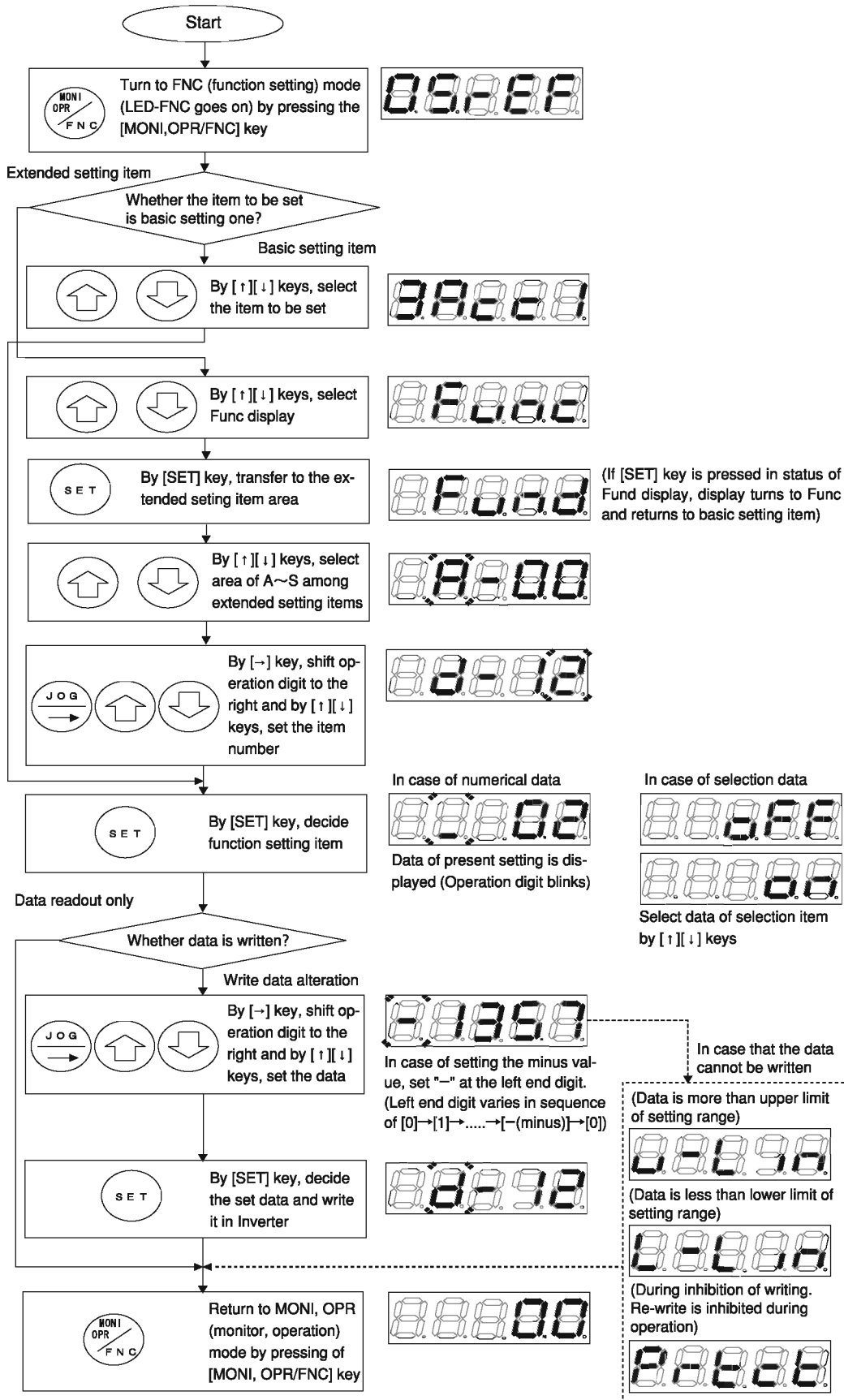


Stop the Inverter during operation by console panel [START] key.

Protective operation is reset during protective operation.

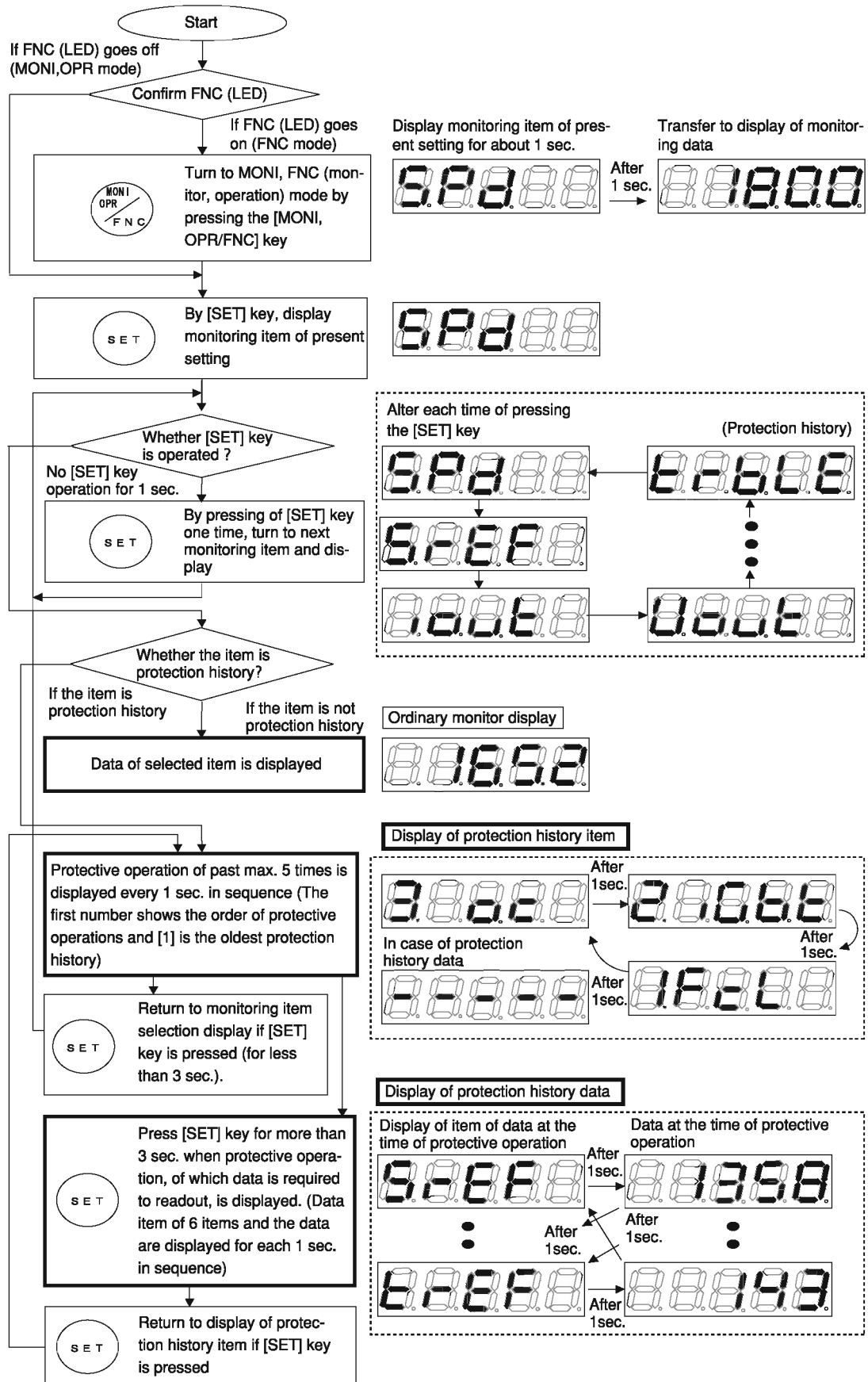
3—1. Operation of readout/writing of function setting data

In the function setting items of ED64sp, basic setting items and extended setting items are prepared. In the basic setting items, comparatively well used setting items were picked up and collected and in the extended setting items, items were collected dividing into the areas of (A~S) of each relative items. Readout/writing of the data of basic setting items and extended setting items are executed under following procedure.
(As to the table of function setting items, see Chapter 3)



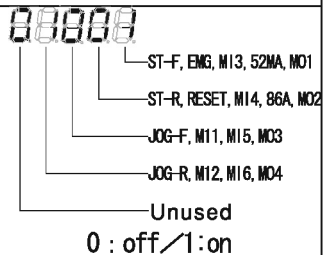
3—2 Operation of monitor data selection

ED64sp can monitor the data such as rotation speed, current, voltage, etc. by LED display of console panel. Also, it can readout protective operation history of past max. 5 times and data such as rotation speed, voltage, current, etc. at the time of protective operation. Selection of items to be monitored is done under following procedure.



(Table of selective monitor display items)

Content of monitoring	Selection item display	Unit	Remarks
Motor speed		min ⁻¹	Displays motor speed (operation (arith.) speed in case of ED64S mode).
Speed setting value		min ⁻¹	Displays setting value before accel/decel control
Output current		A	Output current is effective value
Torque command		%	Displays torque command, which is inputted to torque control part, after setting of the limit.
DC voltage		V	Displays DC part voltage.
Output voltage		V	Effective value of output line voltage
Output frequency		Hz	Displays output frequency.
Overload counter		%	Displays overload(OL) or overtorque (OT) counter value. Protective operation at 100% of this value
Line speed		min ⁻¹	Displays line speed by ratio of becoming (n-00) setting value at top speed.
Motor temperature		°C	Possible to display only when T/61V option is mounted
Input terminal check 1		—	Terminal status display of JOG-R, JOG-F, ST-R, ST-F
Input terminal check 2		—	Terminal status display of MI2, MI1, RESET, EMG
Input terminal check 3		—	Terminal status display of MI6, MI5, MI4, MI3
Output terminal check 1		—	Trip status display of 86A, 52MA relays
Output terminal check 2		—	Output status display of MO4, MO3, MO2, MO1
Main body program version		—	Displays version of program of main unit (Example: ED64-02-A1→H02A1)
Sequence version		—	Displays creation date of sequence ladder (Example: 2001-09-28 → H1928)
Super block version		—	Displays creation date of super block (Example: 2001-09-28 → H1928)
Monitor for analog gain adjustment		—	Displays detection value of inputted voltage at the time of analog input adjustment
Special monitor for adjustment		—	(Special monitor for our adjustment)
Display of protection history		—	Readout of history of operated protection items of past 5 times and data at the time of protective operation



(Table of protective operation and protection history)

Content of monitoring	Selection item display	Unit	Remarks
Speed command value		min ⁻¹	Displays the value after accel/decel control (Pay attention as it differs from monitor display)
Motor speed		min ⁻¹	Motor speed (operation (arith.) speed in case of ED64S mode)
Output current (Note)		A	Displays max. value among absolute values of instantaneous value of 3 phase current (It differs from monitor display. In case of sinusoidal wave, it is about effective value if divided by $\sqrt{2}$)
Output voltage		V	Effective value of output line voltage
DC voltage		V	DC part voltage
Torque command		%	Displays torque command, which is inputted to torque control part, after setting of the limit.

Note) There is a case that output current may not be the current at the time of protective operation exactly when current varied by rapid rise such as output shortcircuit, etc. since output current displays the current of just before protective operation among sampled values obtained at every operation (arith.) cycle, for which please understand.

3—3. Operation by SET64

Run/jog operation of ED64sp can be done by console panel(SET64). Its procedure is shown below. (For operation of ED64sp parameter setting by auto-tuning needed in advance. Please see Chater 2, item 4[As to auto-tuning])

Operation of console (SET64) key

By settings of b-15~18, select operation command position at [console (SET64)]. (DIR-LED goes on)

Turn to MONI,OPR (monitor, operation) mode by [MONI,OPR/FNC] key. (MONI,OPR mode by going off of FNC LED)

Select command of for. run / rev. run by [FOR/REV] key. (Rev. run by going on and for. run by going off of REV-LED)

Run by [START] key and jog by [JOG] key.

LED display

● FNC ○ REV ○ RUN
● DIR ○ MRH ○ JOG

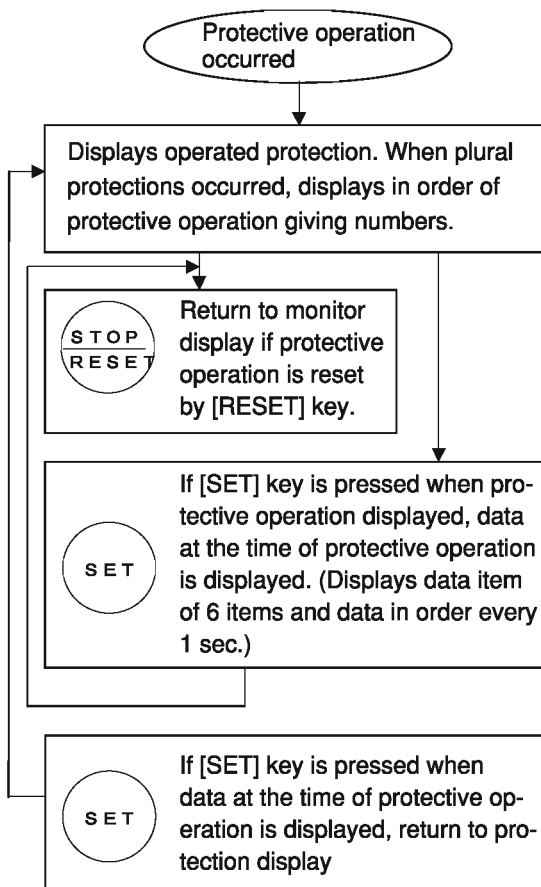
○ FNC ● REV ○ RUN
● DIR ○ MRH ○ JOG

○ FNC ● REV ○ RUN
● DIR ○ MRH ○ JOG

○ FNC ● REV ● RUN
● DIR ○ MRH ● JOG

3—4. Display of SET64 at the time of protective operation

When protection operated, SET64 transfers to the mode which displays operated protection even that it was in any mode. In case that plural protections occurred, SET64 displays in order of detected protective operation, giving numbers. Protective operation can be reset by [RESET] key operation during display of protective operation. (However, in case that status of protection continues, reset cannot be done during input of command such as run-jog, etc.) Pressing [SET] key during display of protective operation, the data at the time of protective operation can be read.



Displays occurred protection

after 1 sec.

Monitor mode display

after 1 sec.

At the time of plural protective operations, displays in order giving numbers.

after 1 sec.

Possible to reset even when terminal block [RESET] is ON.
When power failure (uV) only and 86A relay does not trip, auto. reset by operation command is OFF.

Data display at the time of protective operation (1 point trace back)

(Protection history)

Display of item of data at the time of protective operation

after 1 sec.

Data at the time of protective operation

after 1 sec.

after 1 sec.

after 1 sec.

after 1 sec.

after 1 sec.

Note) If [MONI,OPR/FNC] is pressed when protective operation is displayed, it is possible to transfer to MONI or FNC mode, avoiding protective operation display temporarily.

3—5 Table of protective operation

Table of protective operation is as shown below. As to measures at the time of protective operation, see [Chapter 7, Maintenance and Inspection]

LED display	Content of protection	Explanation of protection
EEEEEE	Overcurrent protection	Operates when instantaneous value of output current became 3.6 times or more of Inverter rated current
EEEEEE	IGBT protective operation	Protective operation by overcurrent of IGBT, Fin overheat, etc. (22kW or less, 75kW or over)
EEEEEE	IGBT(U) protective operation	Protective operation by overcurrent of U-phase IGBT, Fin overheat, etc. (30~55kW)
EEEEEE	IGBT(V) protective operation	Protective operation by overcurrent of V-phase IGBT, Fin overheat, etc. (30~55kW)
EEEEEE	IGBT(W) protective operation	Protective operation by overcurrent of W-phase IGBT, Fin overheat, etc. (30~55kW)
EEEEEE	DC part overvoltage	Operates when DC part voltage exceeded 400V (200V class) / 800V(400V class)
EEEEEE	Overload protection	Operates when output current effective value exceeded 150% of motor rating for 1 min.
EEEEEE	DC fuse blown	Operates when fuse of DC part was blown
EEEEEE	Start stall	Operates when Inverter is inactive even 10 sec. passed after input of run/jog command
EEEEEE	Overspeed protection	Operates when motor speed exceeded overspeed setting (for.or rev.)
EEEEEE	Undervoltage (power failure)	Operates when DC voltage lowered to 180V (200V class) / 360V (400V class) or less during running
EEEEEE	Overtorque protection	Operates when output torque exceeded 150% 1min. of the rated torque (when overtorque protection is ON)
EEEEEE	Unit overheat	Operates when fin at output part overheated, etc (75kW or over only)
EEEEEE	Storage memory error	Operates when sum value of set data of EEPROM storage does not coincide (check at the time of turning on the power)
EEEEEE	Option error	Operates in case of improper activation of communication option at ON time of use of communication option (J-00)
EEEEEE	Communication time out error	Communication error between communication option and communication master station (time out)
EEEEEE	Speed control error	Operates in case that deviation between motor speed and command value (speed control input) exceeded set value (console setting) when function of speed control error detection (F-08) was at ON time (Vector control mode only)
EEEEEE	Motor overheat	Operates in case that motor temperature exceeded 150 °C at ON time of motor overheat selection (F-12) under use of T/V61V option.
EEEEEE	Slave unit error of parallel units	Operates by occurrence of error (overcurrent, etc.) at slave unit of parallel units
EEEEEE	FCL operation	Operates when instantaneous current limit (FCL) continued for 10 sec.(2 sec. at near 0Hz)
EEEEEE	Setting error 0	Operates when run/jog command or auto-tuning start command is inputted in the status that setting of values in motor name plate is improper
EEEEEE	Setting error 1	Operates when run/jog command is inputted in the status that PG pulse setting, vector control (motor constant) and current control setting are improper.
EEEEEE	Setting error 2	Operates when run/jog command is inputted in the status that speed control related settings such as overspeed setting, MRH upper/lower limit speed, etc. are improper.
EEEEEE	Setting error 3	Operates when run/jog command is inputted in the status that setting of relevance of input/output gain is improper.
EEEEEE	PG (phase)error 1	Operates when error of U,V,W signals of PG is detected in ED64P mode.
EEEEEE	PG (phase)error 2	Operates when connection error of U,V,W signals of PG is detected in ED64P mode.
EEEEEE	PG (phase)error 3	Operates when connecting to reverse direction of phase sequence of U,V,W signals and that of A, B signals of PG is detected in ED64P mode.
EEEEEE	PG (phase)error 4	Operates in case that no variation is found in U,V,W signals of PG even after rotation of more than 1 cycle in electric phase in ED64P mode or no input of Z signal of PG even after more than one rotation in ED64V mode, both after turning on of power.
EEEEEE	PG (phase)error 5	Operates when connection of A, B signals and direction of motor rotation is reverse and it is detected during auto-tuning, in ED64P mode and in ED64V mode.
EEEEEE	PG (phase)error 6	Operates when internal phase operation (arith.) is abnormal owing to erroneous connection of U,V,W signals or erroneous setting of d-axis position setting (A-30), in ED64P mode or in ED64V mode.
EEEEEE	PG (phase)error 7	Operates when phase operation (arith.) is abnormal at starting, in ED64S mode or in ED64V mode.
EEEEEE	Sensorless start error	Operates when phase detection at starting is failed, in ED64S mode or in ED64V mode.
EEEEEE	External failure 1	Operates when external failure 1 of multifunction input is inputted
EEEEEE	External failure 2	Operates when external failure 2 of multifunction input is inputted
EEEEEE	External failure 3	Operates when external failure 3 of multifunction input is inputted
EEEEEE	External failure 4	Operates when external failure 4 of multifunction input is inputted
EEEEEE	Console communication error1	Displays when communication between console (SET64) and main body is abnormal (communication time-out abnormal).
EEEEEE	Console communication error2	Displays when communication between console (SET64) and main body is abnormal (communication sum-check abnormal (to be detected at console side)).
EEEEEE	Console communication error3	Displays when communication between console (SET64) and main body is abnormal (communication sum-check abnormal (to be detected at main body side)).
EEEEEE	Emergency stop contact ON	Displays when operation command is inputted at ON time of input contact of emergency stop

4. As to auto-tuning

For controlling of ED motor, information such as electric constant of motor inside such as resistance, inductance, etc. and pole position of permanent magnet, etc. are needed. ED64sp has [auto-tuning] function. By this function, Inverter itself measures these necessary parameters for operation and sets them automatically as the parameters. In case that these necessary parameters for driving of motor is not set in ED64sp, it is necessary to execute [auto-tuning] and set the parameters. In auto-tuning, following 3 kinds can be selected.

[Full mode auto-tuning] ... Measures all necessary parameters for [auto-tuning].

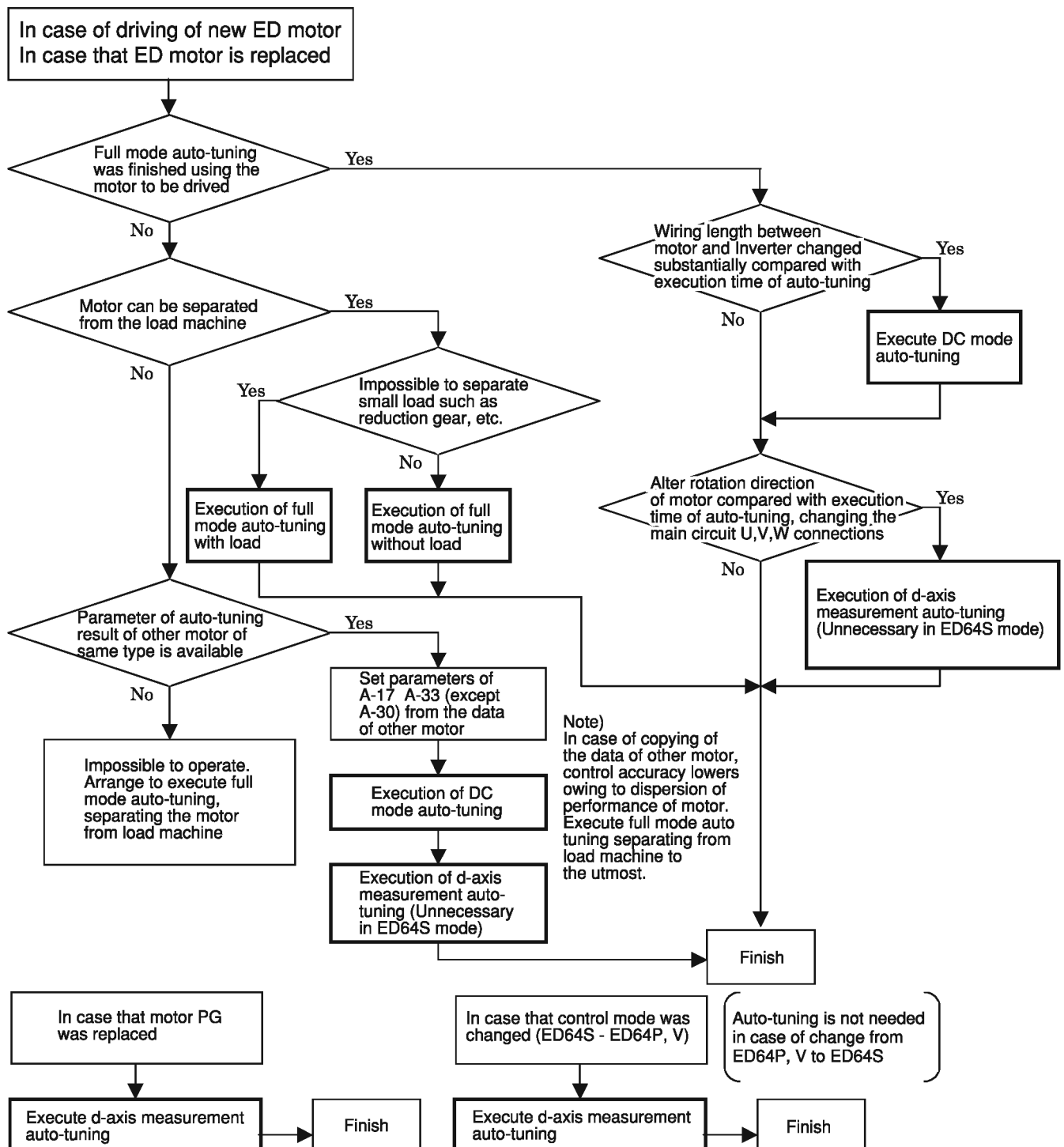
[DC mode auto-tuning] ... Measures primary resistance and dead time only.

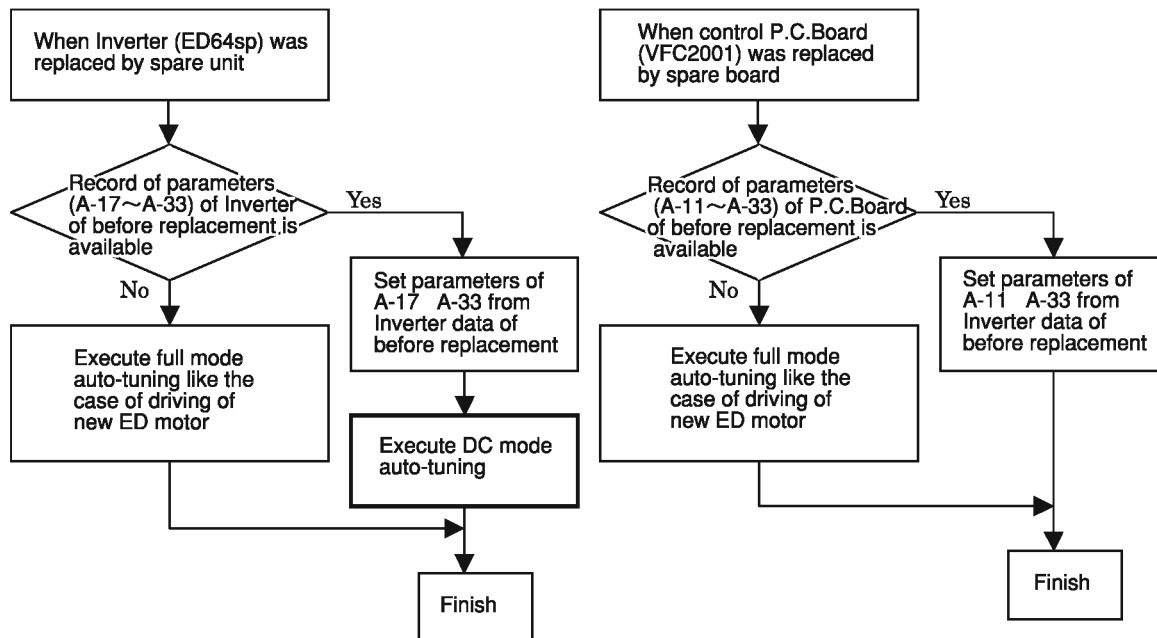
[d-axis auto-tuning] ... Measures magnetic pole (d-axis) position only.

Select the mode of suitable auto-tuning by undermentioned procedure.

4-1. Selection of auto-tuning mode

Select auto-tuning mode in accordance with the flow-chart shown below.





Measurement parameter, Execution condition, Motor operation during auto-tuning of each mode of auto-tuning of ED64sp are as per table below.

	Full mode auto-tuning	DC mode auto-tuning	d-axis measurement auto-tuning
Measuring parameter	Dead time compensation amount (A-11~16) Motor primary 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 measuring pulse width (A-32) d-axis measurement pulse voltage amplitude(A-33) Magnet pole decision system selection (A-31) Motor iron loss conductance (A-21) Lq rate-of change at the time of 20~120% q-axis current (A-22~A-25) Ld rate-of change at the time of 20~120% d-axis current (A-26~A-29)	Dead time compensation amount (A-11~16) Motor primary resistance(A-17) (When Inverter unit is replaced owing to trouble, etc., take copy of Inverter setting value of before replacement by PC tool or console (SET64) for setting of A-18 A-33 of other than above.)	d-axis position(magnet pole position)(A-30) (It is necessary that values of A-11 ~A-29 A31~A-33 of other than above have already been set) Note This tuning is not used in ED64S (sensorless) mode as setting of A-30 is unnecessary.
Conditions for execution of auto-tuning	* Each rated value of motor and PG pulse number should have been set * ED motor to be measured should be alone, separated from load machine. Load of about reduction gear is O.K. by selection of "with load".	* Each rated value of motor and PG pulse number should have been set * Load machine should have been separated or mechanical brake of load machine should have been taken off	* Each rated value of motor and PG pulse number should have been set * By execution of full mode auto-measuring in advance, data other than [d-axis position of PG] should have been set
Motor rotation during auto-tuning (when 6 poles motor)	After making about 2 rotations slowly accelerate till about 80% speed of rated rotation speed. Direction of rotation is forward run in case of "without load". Selective in case of "with load".	Make 2/3 rotation slowly (720 degree by electrical angle) Direction of rotation is selective.	In ED64P mode, motor rotates about max. 20° (60° by electric angle) In ED64V mode, motor shaft rotates max. one round.

4-2. Preparation before execution of auto-tuning

Before execution of auto-tuning, it is necessary to set the rated values of motor (described on the name plate of motor) and carrier frequency to be used, in the setting numbers (A-00~08) of the table below.

(As to setting method, see [CHAPTER 2, Item 3-1, Read/write operation of function setting data])

Display	Content of setting	Setting range	Display	Content of setting	Setting range
A-00	Max. speed	300~14700	A-04	Motor rated current	40~150% of INV rated current
A-01	Min. drive speed	0~Max. speed (A-00)	A-05	Motor rated speed	67~100% of max. speed
A-02	Motor rated capacity	3 ranks down from INV rated capacity~INV rated capacity	A-06	Motor pole selection	2~12 pole
A-03	Motor rated voltage	140~230V (200V class) 280~460V (400V class)	A-07	No. of PG pulse	60~3600(Unnecessary in ED64S)
			A-08	PWM carrier frequency	2.0~14.0 kHz

(" INV rating " in the table shows the rating of Inverter to be used.)

4-3. Operation method of full mode auto-tuning

Here, operation method of full mode auto-tuning is explained. In full mode auto-tuning, all of A-11~A-33 are measured automatically. Execute auto-tuning, separating the load machine from motor.

In case of motor with reduction gear and if that reduction gear cannot be separated from motor, [full mode auto-tuning with load] can be selected. (It is possible at the time of small load only of reduction gear or the like. Separate the motor from load machine.) In this case, selection of rotation direction during auto-tuning is also possible. In case that rotation direction is fixed by reduction gear, etc, select auto-tuning of that direction. (In ordinary time, motor makes forward run) For auto-tuning with load, select it by A-10 [Tuning selection].

	Item	Setting range
A-10	Tuning selection (at the time of full mode auto-tuning)	0: Ordinary 1: Auto-tuning with load (for. run) 2: Auto-tuning with load (rev. run)

Note) In case of auto-tuning with load, iron loss conductance is set at 0.

(Operation procedure of full mode auto-tuning)

- 1) Connect motor with Inverter in status that motor is separated from load machine. Also, make wiring of PG.(Wiring of PG is unnecessary in ED64S mode)
- 2) Turn on the power to Inverter and set the setting of A-00~A-08 by name plate of the motor, etc.
- 3) Select and set [0: Ordinary] [1: With load (for. run)] [With load (rev. run)] at A-10 [Tuning selection].
- 4) Turning off the power once, open the unit cover and turn to ON No.6 of (SW1) of DIP-SW (DIP Switch) on control VFC2001 P.C.Board of Inverter.
- 5) Close the unit cover and turn on the power again. When input MC is in main circuit, close input MC also.
(" E00000 " is displayed on console)
- 6) When console [JOG] key is pressed, auto-tuning starts. (" E00000 " is displayed)
- 7) In several minutes (time differs depending on capacity), auto-tuning ends. (" E00000 " is displayed on console)
- 8) Turning off the power to Inverter, open the unit cover and turn to OFF No.6 of DIP-SW (SW1).
- 9) Closing the unit cover, turn on the power again and confirm that each setting data of A-11~A-33 were renewed.

Data, which are automatically measured by full mode atuo-tuning

No.	Item	Unit	No.	Item	Unit	No.	Item	Unit
A-11	Dead time compensation quantity (U phase +side)	—	A-19	Motor q-axis inductance	mH	A-27	Lq rate-of change at the time of 120% q-axis current	%
A-12	Dead time compensation quantity (U phase -side)	—	A-20	Motor Magnetic flux	Wb	A-28	Ld rate-of change at the time of 30% d-axis current	%
A-13	Dead time compensation quantity (V phase +side)	—	A-21	Motor iron loss conductance	mho	A-29	Ld rate-of change at the time of 60% d-axis current	%
A-14	Dead time compensation quantity (V phase -side)	—	A-22	d-axis measuring pulse width	%	A-30	d-axis position	—
A-15	Dead time compensation quantity (W phase +side)	—	A-23	iron loss conductance	%	A-31	Sensorless magnetic pole decision mode selection	—
A-16	Dead time compensation quantity (W phase -side)	—	A-24	Lq rate-of change at the time of 30% q-axis current	%	A-32	d-axis measuring pulse width	ms
A-17	Motor primary resistance	mΩ	A-25	Lq rate-of change at the time of 60% q-axis current	%	A-33	d-axis measurement	—
A-18	Motor d-axis inductance	mH	A-26	Lq rate-of change at the time of 90% q-axis current	%			



Safety precautions

- Execute full mode auto-tuning in status of motor alone, separating from load machine surely. It is dangerous since motor runs until about 80% of the rated speed at the time of tuning. Also, if loaded, there is a case that normal tuning cannot be executed.
- At the time just after full mode auto-tuning, motor does not run fully since DC test is being done however, voltage is impressed to motor. Pay attention as there is a fear of electric shock.
- In case of full mode tuning, motor starts after execution of DC test for about 1 minute (time differs depending on capacity) after starting of this tuning. Do not go near the motor until turning of display to tuning end (or tuning error).

4—4. Operation method of DC mode auto-tuning

Here, operation method of DC mode auto-tuning is explained. In DC mode auto-tuning, dead time compensation amount of A-11~A-17 and motor primary resistance are measured automatically.

At the time of automatic measuring, motor rotates slowly to forward direction max. about 2/3 rotation (in case of motor of 6 poles). In case that problem may occur when load machine rotates, measure separating from load machine. In case of measuring under status of being connected with load machine, take off the mechanical brake of load machine side.

In case of DC mode / d-axis measuring mode auto-tuning, A-32 [Tuning selection] will be selection item of DC mode and d-axis measuring mode, different from the time of full mode auto-tuning. In case of DC mode auto-tuning, select 0 in A-10.

Display	Item	Setting range
A-10	Tuning selection (at the time of DC mode / d-axis measuring mode auto-tuning)	0: DC mode auto-tuning 1: d-axis measuring mode auto-tuning (for. run) 2: d-axis measuring mode auto-tuning (rev. run)

(Operation method of DC mode auto-tuning)

- 1) Connect the motor with Inverter.
- 2) Turn on the power to Inverter and set the settings of A-00~A-08 by motor name plate, etc. and set A-10 (tuning selection) at [0 (DC mode)].
- 3) Turning off the power once, open the unit cover and turn to ON both Nos.5, 6 of DIP-SW (SW1) on Inverter control P.C.Board VFC2001.
- 4) Close the unit cover and turn on the power again. When input MC is in main circuit, close input MC also.
("EEEE" is displayed on console)
- 5) When console [JOG] key is pressed, auto-tuning starts. ("EEEE" is displayed on console)
- 6) In several minutes (time differs depending on capacity), auto-tuning ends. ("EEEE" is displayed on console)
- 7) Turning off the power to Inverter, open the unit cover and turn to OFF Nos.5, 6 of DIP-SW.
- 8) Closing the unit cover, turn on the power again and confirm each setting data of A-11~A-17 were renewed.

(The data which are automatically measured by DC mode auto-tuning)

Display	Item	Unit	Display	Item	Unit	Display	Item	Unit
A-11	Dead time compensation amount (U phase +side)	—	A-14	Dead time compensation amount (V phase -side)	—	A-17	Motor primary resistance	m Ω
A-12	Dead time compensation amount (U phase -side)	—	A-15	Dead time compensation amount (W phase +side)	—			
A-13	Dead time compensation amount (V phase +side)	—	A-16	Dead time compensation amount (W phase -side)	—			

The data of A-18~A-33 of other than above are needed to be set separately.



Safety precautions

- In case of DC mode tuning, voltage is impressed to motor even during execution of DC test. Pay attention since there is a fear of electric shock.
- Even in DC mode, motor rotates slowly to forward direction. In case of tuning in the status of being connected with load machine, pay attention since load machine also is operated.

4—5. Operation method of d-axis measuring mode auto-tuning

Here, operation method of d-axis measuring mode auto-tuning is explained. In d-axis measuring mode auto-tuning, d-axis PG pulse only of A-30 is measured. At the time of automatic measurement, motor rotates to forward run side or reverse run side up to max. about 20 degree (in case of 6 pole motor) in case of ED64P mode and max. 360 degree in case of ED64V mode. (rotation direction can be set by A-10). In case that problem may occur when load machine rotates, measure separating from load machine. In case that measuring is done under the status of being connected with load machine, take off the mechanical brake of load machine side. (Tuning cannot be done normally in the status that load machine does not rotate.)

In case of DC mode / d-axis measuring mode auto-tuning, A-10 is selection item of DC mode and d-axis measuring mode, different from the time of full mode auto-tuning. In case of d-axis measuring mode auto-tuning, select [1 (d-axis measuring mode (for. run))] or [2 (d-axis measuring mode (rev. run))] of A-10.

In ED64S (sebsorless) mode, d-axis measurement auto-tuning cannot be executed as A-30 setting is not used. (Operation method of d-axis measuring mode auto-tuning)

- 1) Connect the motor with Inverter.
- 2) Turn on the power to Inverter and confirm that A-00~A-08 of motor rating value, etc. and A-11~A-33 (except A-30) of former auto-tuning values have been set.
- 3) Set A-10 (auto-measuring mode) at 1 or 2 (d-axis measuring mode).
- 4) Turning off the power once, open the unit cover and turn to ON both Nos.5, 6 of DIP-SW (SW1) on control VFC2001 P.C.Board.
- 5) Close the unit cover and turn on the power again. When input MC is in main circuit, close input MC also.
(" **ERRP** " is displayed on console)
- 6) When console [JOG] key is pressed, auto-tuning starts. (" **ERRSE** " is displayed on console)
- 7) In several tens sec. (time differs depending on load machine), auto-tuning ends. (" **ERRER** " is displayed on console)
- 8) Turning off the power to Inverter, open the unit cover and return to OFF Nos.5, 6 of DIP-SW (SW1).
- 9) Closing the unit cover, turn on the power to Inverter again and confirm that setting data of A-30 were renewed.

(The data which are automatically measured by d-axis measuring mode auto-tuning)

Display	Item	Unit	Display	Item	Unit	Display	Item	Unit
A-30	d-axis position pulse	—						

The data of A-11~A-29,A-31~A33 of other than above is needed to be set in advance.



Safety precautions

- In d-axis measuring mode tuning, voltage is impressed to motor. Pay attention since there is a fear of electric shock.
- Even in d-axis measuring mode, motor rotates to forward or reverse direction slowly. In case of tuning in the status of being connected with load machine, pay attention since load machine also is operated.

4—6. Error during auto-tuning

If error occurred during auto-tuning, error is displayed on console and Inverter stops.

- 1) When **SEED** is displayed
Error in setting of A-00~A-08 can be considered. Look at setting again and redo from the start.
- 2) If **ERRP** and **ERRSE** are displayed alternately (Part of **ERR** displays error code **00~99**), it means occurrence of error during tuning or in tuning result. Redo after confirmation of Inverter capacity setting, Setting of A-00 A-08, wiring between Inverter~motor as well as whether motor is locked by brake, etc. and whether load is not connected with motor (full mode only), etc. Figure of 2 digits after Err is error code. Please refer the Table of error code shown below.
- 3) When **ERRP** is displayed (8 part of **ERR**)
It is abnormal input from PG. Confirm the wiring from PG, connection, setting of pulse number of PG (A-07) and whether there is any abnormality in PG main unit, and redo from the start. (ED64P,ED64V mode only)
Shows that protection operated during auto-tuning. Referring Chapter 7, item 1 [ED64 protection display and troubleshooting], avoid individual cause and redo from the start.

4) Other protection displays

Shows that protection operated during auto-tuning. Referring Chapter 7, item 1 [ED64 protection display and troubleshooting], avoid individual cause and redo from the start.

(Table of error code at the time of failure of tuning)

Error code	Meaning of error	Main checking items
01	Motor cannot be run by auto-tuning	Whether motor is braked. Whether large load is charged to motor. Whether PG is wired correctly.
02	Data was not set at DC test	Whether wiring is correct. Whether rated current, etc. are set correctly.
03	Overflow occurred during primary resistance operation (arith.)	Whether DC voltage is adjusted. Whether combination of motor and Inverter is proper. Whether capacity setting of Inverter is correct.
04	Overflow occurred in primary resistance operation (arith.) result	
11~16	Overflow occurred in dead time operation (arith.)	
20~24	Overflow occurred in Lq, Lq rate-of change (30, 60, 90, 120%) operation (arith.)	
30~34	Overflow occurred in Ld, Ld rate-of change (30, 60, 90, 120%) operation (arith.)	Whether combination of motor and Inverter is proper. Whether rated current, etc. are set correctly.
40, 41	d-axis pulse width setting, d-axis pulse amplitude setting abnormal	
50	Overflow in iron loss conductance operation (arith.)	Whether A-00 A-08 are set correctly.
51	Motor does not accelerate	Whether excessive load is charged to motor.
60	Magnetic pole direction cannot be discriminated in d-axis measurement auto-tuning	Whether motor is locked Whether PG is wired correctly.
61	Motor cannot be rotated in d-axis auto-tuning	
98	Others	---
99	1) Pressed stop key during auto-tuning 2) Power failure occurred during auto-tuning 3) Protective operation occurred during auto-tuning (This display after protection reset)	Remove causes of power failure and of protective operation

4—7. Auto-tuning of 2nd motor (in case only of use of 2nd motor function)

ED64sp has [2nd motor function] which enables 1 Inverter to use 2 motors alternately. When using of 2nd motor, change over all of wiring between Inverter and motor, and wiring of PG by contactor, relay, etc. and change over to 2nd motor which memorized in advance the motor constant of inside of Inverter, by multifunction input function (see Chapter 3). Here, operation method of auto-tuning of 2nd motor is explained.

At the time of use of 2nd motor function, turn to on L-00 2nd motor function use selection and set rating values (written in motor name plate) of 2nd motor in (L-01~L-08) of the table below.

Display	Item	Setting range	Display	Item	Setting range
L-00	Use-selection of 2nd motor function	OFF/ON	L-03	2nd motor rated current	40~150% of INV rated current
L-01	2nd motor rated capacity	3 ranks down from INV rated capacity~INV rated capacity	L-04	2nd motor rated speed	67~100% of max. speed
			L-05	Motor pole selection	2pole~12pole
L-02	2nd motor rated voltage	200V class : 140~230V 400V class : 280~460V	L-08	No. of 2nd motor PG pulse	60~3600 (Unnecessary in ED64S)

("INV rating " in the table shows the rating of Inverter to be used.)

Allocate [2nd motor selection] to multifunction input terminal and turn to on the allocated terminal.(see Chapter 3) In this status, execute full mode auto-tuning, DC mode auto-tuning and d-axis measuring mode auto-tuning like explanation of ordinary motor. Result of auto-tuning is set in L-08~L-24 of the table below, in lieu of setting of A-17~A-33.

(However, dead time compensation amount (A-11~A-16) is not set in case of 2nd motor auto-tuning since it is the data of Inverter itself. For tuning selection, A-10 is used like ordinary auto-tuning)

(The data which are automatically measured by 2nd motor auto-tuning)

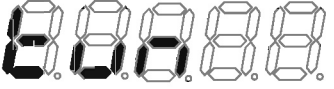
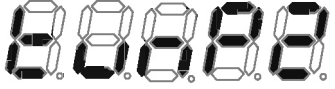
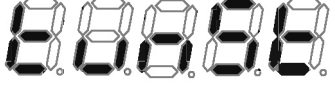
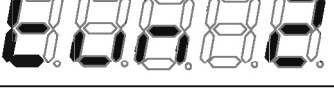
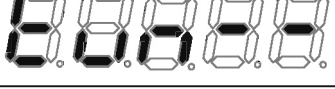
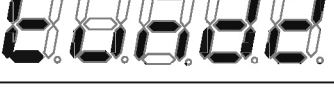
Display	Item	Unit	Display	Item	Unit
L-08	2nd motor primary resistance	mΩ	L-17	2nd motor Ld rate change at the time of 30% d-axis current	%
L-09	2nd motor d-axis inductance	mH	L-18	2nd motor Ld rate change at the time of 60% d-axis current	%
L-10	2nd motor q-axis inductance	mH	L-19	2nd motor Ld rate change at the time of 90% d-axis current	%
L-11	2nd motor magnetic flux	Wb	L-20	2nd motor Ld rate change at the time of 120% d-axis current	%
L-12	2nd motor iron loss conductance	mho	L-21	2nd motor d-axis position	—
L-13	2nd motor Lq rate change at the time of 30% q-axis current	%	L-22	Sensorless magnetic pole decision mode selection	—
L-14	2nd motor Lq rate change at the time of 60% q-axis current	%	L-23	2nd motor d-axis measuring pulse width	ms
L-15	2nd motor Lq rate change at the time of 90% q-axis current	%	L-24	2nd motor d-axis measuring pulse voltage amplitude	—
L-16	2nd motor Lq rate change at the time of 120% q-axis current	%			

Display of console at the time of 2nd motor auto-tuning is as shown below.

[] → [], [] → [], [] → [].

4—8. Console display during auto-tuning

Shown below is LED display of console (SET64) during auto-tuning.

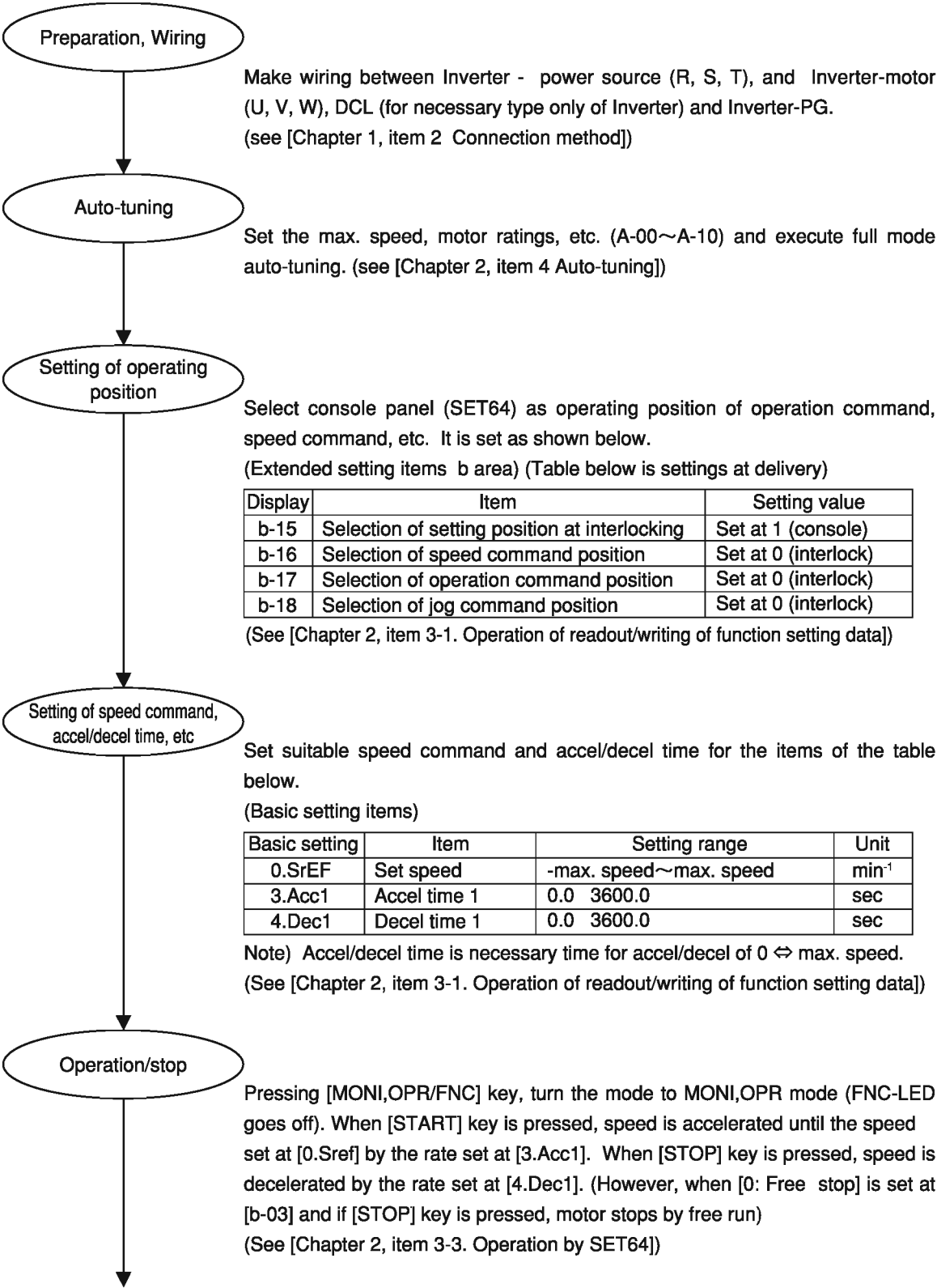
L E D display	Meaning of display	L E D display	Meaning of display
	Preparation of full mode auto-tuning		Preparation of 2nd motor d-axis measuring auto-tuning
	Preparation of DC mode auto-tuning		During auto-tuning
	Preparation of d-axis measuring auto-tuning		Normal end of auto-tuning
	Preparation of 2nd motor full mode auto-tuning		Abnormal end (failure) of auto-tuning (displays alternately)
	Preparation of 2nd motor DC mode auto-tuning		

5. Test operation method

In case of test operation, motor alone is tested first. After confirming of its normal operation, connect it with machine and adjust gain, etc. of its speed control. Here, test operation method using console panel is explained.

5—1. Test operation of motor alone

First of all, execute test operation by motor alone.



5—2. Adjustment of speed control gain

After test operation of motor alone, connect the motor with machine and adjust speed control gain.

(1) Setting of inertia moment

ED64sp uses MFC control which combines feedforward and cancellation for speed control and is able to do robust control by setting of inertia moment. In 9.ASrJ (speed control inertia moment), set 20~100% of added value of "inertia moment of rotor of motor" and "inertia moment of load machine". (In case of belt connection, ASrJ does not include inertia moment of load machine but includes that of rotor of motor + that of pulley connected with motor shaft. When there is a fear of abnormal sound by backlash of gears in case of many gears, set small value or make cancellation and feedback no use, turning E-06, E-07 to OFF.)

Basic setting	Item	Setting range	Unit
9.ASrJ	Speed control inertia moment	0~65535	gm ²

Note 1) Setting unit of 9.ASrJ is "gm²". Set the value of 1000 times of the value calculated by "kgm²".

Note 2) Setting of 9.ASrJ is inertia moment and not GD². (It is 1/4 of the value of GD²)

Inertia moment of standard ED motor is as shown below. As to the others than the table below, please ask us.

Type	Inertia moment (gm ²) of rotor	Type	Inertia moment (gm ²) of rotor	Type	Inertia moment (gm ²) of rotor
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, speed control integral time constant.

Operating the motor in the status of being connected with machine, adjust 7.ASrP (speed control proportional gain) and 8.ASri (speed control integral time constant).

* In case of operation at a fixed speed in the designated speed setting.

- 1) If speed fluctuates by load fluctuation of load machine side :→ Make ASrP larger.
- 2) If speed fluctuates even in the operation at a fixed speed :→ Make ASrP smaller (faster).
- 3) If speed vibrates and abnormal sound is generated from gear, etc. :→ Make ASrP smaller and ASri larger (slower).

* In case that speed command is changed step by step.

- 1) If response of speed is late :→ Make ASrP larger.
- 2) If speed overshoots :→ Make ASrP smaller.
- 3) If speed vibrates :→ Make ASrP smaller and ASri larger (slower).

Basic setting	Item	Setting range	Unit
7. ASrP	Speed control proportional gain	3~ 50	
8. ASri	Speed control integral time constant	0~ 10000	ms

Note 1) Differing from ordinary PI control, virtual integral time also varies if P gain (speed control proportional gain) is varied in this control system. Therefore, keep ASri at initial value ordinary and adjust ASrP.

If variation exceeds the range of adjustment of ASrP, adjust ASri.

6. Alteration of Inverter control mode

ED64sp incorporates following 3 modes:- ED64P (with speed/pole-position sensor) mode ED64V (with speed sensor) mode ED64S (speed/pole-position sensorless) mode and is set beforehand conforming to the specifications of ED motor to be used ordinary. In cases that different control mode from the required one is set and user want to operate Inverter in sensorless mode temporarily owing to trouble of PG fitted to motor, control mode can be altered by the method of following 2 kinds.

- (1) In case of alteration of control mode, returning the set data to the initial values. Execute "memory initializing operation" specified in [7-1. Setting operation of Inverter capacity, DC voltage detection gain] and initialize in the required control mode to alter. Since all set data are initialized, this is suitable method in case of use of Inverter of spare unit, etc. in the different application from the already set control mode. After alteration of mode, it is necessary to execute setting of data and auto-tuning with motor to be combined newly.
- (2) In case of alteration of control mode only, keeping the set data as it is. Alteration of control mode only can be done by execution of [6-1. Alteration of control mode] shown below. Setting data at this time is not altered except the data (No.2) of a part, of which setting range is changed depending on the control mode. Since auto-tuning values remain unchanged, it is not necessary to do auto-tuning again if motor is not replaced. (However, in case of changeover to ED64P or ED64V mode after auto-tuning in ED64S mode, [d-axis measurement mode auto-tuning] is necessary to be executed since [d-axis position] is not set. This method is recommendable in case that the alteration to [ED64S] mode is required temporarily owing to the trouble of PG, etc. (Note 1, Note 2)

6—1. Operation of control mode alteration

- 1) Turn power source of Inverter to OFF.
- 2) Remove the cover and turn DIP Switch (SW1)-4 on VFC2001 P.C.Board to ON.
- 3) Close the cover and turn power source to ON.
- 4) Since  blinks after display of  in display window, press [SET] key at this point of time.
- 5) Since present control mode such as  is displayed, press [SET] key again after selection of the mode to use by [] keys. ( = Sensorless mode,  = With sensor mode,  = With speed/pole-position sensor mode)
- 6) When  is displayed, alteration of control mode ends.
- 7) Turn power source of Inverter to OFF.
- 8) Remove the cover and turn DIP Switch (SW1)-4 to OFF.
- 9) Close the cover.

Note 1) By alteration from ED64P, V modes to ED64S mode, Speed, Control accuracy of torque and Response characteristic deteriorate. Therefore, pay attention in case of use for applications which need accuracy and response of ED64P, V modes.

Note 2) As to the setting items of the table below, setting value is altered by alteration of control mode, for which please pay attention.

Display	Item	ED64S = ED64V	ED64S = ED64P	ED64P = ED64V
0.SrEF	Set speed	Alter to initial value	Alter to initial value	No alteration
A-01	Minimum speed	Alter to initial value	Alter to initial value	No alteration
A-10	Tuning selection	Alter to initial value	Alter to initial value	Alter to initial value
E-08	Variable structure proportion variation start speed	Alter to initial value	Alter to initial value	No alteration
E-09	Variable structure proportion minimum gain ratio	Alter to initial value	Alter to initial value	No alteration
G-09	F output selection	Alter to initial value	Alter to initial value	No alteration

7. Operation at the time of replacement of P.C.Board

Here, procedure at the time of replacement of control P.C.Board (VFC2001) is explained.

* Same control P.C.Board (VFC2001/VFC64) is used in the Inverter (ED64sp) for driving of ED motor and in the Inverter (VF64) for driving of induction motor, but control software written in that board is different. Pay attention since control P.C.Board for VF64 cannot be used for ED64sp. (In case of control P.C.Board for ED64sp, software version symbol stuck on the surface of IC18 is ED64-XX-XX (XX-XX are figure or alphabet)).

* In case of placing of order for control P.C.Board as spare parts and replacement parts, please designate as [For ED64sp].

Since VFC2001 supplied in the status of P.C.Board alone such as spare parts, etc. is of initializing value at the time of forwarding from factory, that board is necessary to be set to meet the Inverter of customer's present use.

7—1. Setting operation of Inverter capacity and DC voltage detection gain

Inverter capacity and DC voltage detection gain can be set by initializing operation of memory.

(Initializing operation of memory)

1) Turn off the power to Inverter.

2) Remove the cover and turn DIPSW(SW1)-7 on VFC2001 to ON.

DC voltmeter or tester is mounted between terminal block $\oplus 2 \sim \ominus$.

3) Close the cover and turn on the power.

4) Since EEEE is blinked after display of

$\text{EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE}$ on display window, press [SET] key at that time.

5) Since is displayed as EEEE selection is used by [$\uparrow$], [$\downarrow$] keys, press [SET] key again.

(EEEE Sensorless mode EE With speed sensor mode EE With speed/pole-position sensor mode)

6) Since capacity is displayed such as EEEE , press [SET] key conforming to the capacity of ED64sp, which is used by [$\uparrow$], [$\downarrow$] keys, and set the capacity. (18R522 and 18R544 are displayed as EE and EE , respectively.

7) Since display turns to EEEE , etc., measure present DC voltage and set the measured DC voltage by [JOG/→] key and [$\uparrow$], [$\downarrow$] keys, and set by [SET] key.

At that time, DC detection gain is calculated by detection value and set value of DC voltage, and Inverter is set at S-00 automatically. (If it is necessary to adjust DC voltage detection gain after initializing, adjust S-00 directly.)

8) When EEEE is displayed after display of EEEE for several tens sec., initializing of memory ends.

9) Turn off the power to Inverter.

10) Remove the cover and turn DIPSW(SW1)-7 to OFF. Also remove DC voltmeter or tester, which were mounted at the time of aforesaid item 2).

11) Close the cover.



Safety precautions

* As to DC voltmeter (or tester) for measuring of DC voltage, please use that which can measure 500V or over in case of 200V series and 1000V or over in case of 400V series.

* High voltage is impressed to DC voltmeter (or tester). Voltage measuring should be done by qualified expert.

7—2. Adjustment of external analog input gain

Setting items shown below are adjustment gain of analog input. Adjust them referring to Chapter 3, Setting item G area.

Display	Item	Setting range	Data at initializing	Unit
G-00	Analog input +side adjustment gain	50.00~150.00	100.00	%
G-01	Analog input -side adjustment gain	50.00~150.00	100.00	%

Chapter 3 Explanation of function setting items

ED64sp Inverter can set undermentioned standard functions by standard console panel SET64.

Functions of ED64sp are classified to [basic setting item] and [extended setting item] is further classified to the areas shown below in order to make calling of function easily.[Extended setting items] are further classified to groups of [A area] ~ [S area] depending on each relative items in order to make calling of function easily.

Kind of function	Area	Setting item (area)	Remarks
Basic setting item	Fund	Set speed, jog speed, accel/decel time 1- 2 , speed control gain	
Extended setting item	A	Max. speed, rated value and parameter setting area of motor	Essential setting area
	b	Selection area of drive mode, drive sequence	Setting at the time of operation mode selection, HC function use selection, Sequence function use selection, Operation position use selection
	c	Setting area of relatives of multifunction input/output	Setting at the time of use of multifunction input/output
	d	Selection area of accel/decel setting, speed setting, jump function, MRH function	Necessary to set at the time of use of S pattern accel/decel, 3rd and 4th accel/decel, Speed jump, MRH function
	E	Setting area of relatives of torque limiter, torque command characteristics, speed control, vector control, V/f control	Setting at the time of use of Torque limit, Torque command characteristic, Cancellation, Feedforward function off, Variable structure speed control gain, Current control gain adjustment, Temperature compensation function
	F	Built-in DB activation setting, protective function, trace back setting area	Setting at the time of use of Built-in DB, Overspeed, Overtorque, Speed control error protective function, HC function internal trace back
	G	Analog input / output setting, gain adjustment area	Setting at the time of Analog input gain adjustment, Analog input characteristic selection, Analog output selection
	H	Setting area of relatives of programmed drive, preset drive	Setting at the time of use of programmed operation, Preset speed command function
	i	Setting area of droop control, machine loss compensation	Setting at the time of use of Droop control, Machine loss compensation function
	J	Communication option setting area	Setting at the time of use of communication option
	L	Setting area of 2nd motor parameter, speed control gain	Setting at the time of use of 2nd motor function
	n	Monitor adjustment area	Effective at the time of use of Line monitor
	P	Super block constant setting area	Setting at the time of use of HC function (super block)
	S	Inverter capacity, DC voltage gain	Setting at the time of Confirmation of setting capacity, Re-adjustment of DC voltage gain

Note) In case that the value is different depending on the control mode in the table of setting items, control mode, in which only the value is effective, is written as (ED64S), (ED64V), (ED64P) in each column of the table.

The value, of which control mode is not written specially, is common to all modes.

1. Table of ED64sp setting items

Mark of rewriting during operation ○: Possible ×: Impossible					
Standard console LED display	Setting items	Setting range (selection items)	Initializing data by default	Unit	Rewriting during operation
1-1	Basic setting area				
0.SrEF	Set speed	~Max. speed~max. speed	(ED64S)18 (ED64P,V)0	min ⁻¹	○
1.FJoG	For. jog speed	Min. speed~300	24	min ⁻¹	○
2.rJoG	Rev. jog speed	~300~-min. speed	-24	min ⁻¹	○
3.Acc1	Accel time (1)	0.0~3600.0	30.0	sec	○
4.dEc1	Decel time (1)	0.0~3600.0	30.0	sec	○
5.Acc2	Accel time (2)	0.0~3600.0	0.3	sec	○
6.dEc2	Decel time (2)	0.0~3600.0	0.3	sec	○
7.ASrP	Speed control proportional gain (1)	3~50	15	—	○
8.ASrI	Speed control integrated time constant	20~10000	40	ms	○
9.ASrJ	Speed control system inertia moment	0~65535	10	gm ²	○
1-2	A area (Setting area of max. speed, rated value, parameter of motor)				
A-00	Max. speed	300~14700	1800	min ⁻¹	×
A-01	Min. speed	0~Max. speed	(ED64S)18 (ED64P,V)0	min ⁻¹	○
A-02	Motor rated capacity	3 ranks down from INV rated capacity ~INV rated capacity	0.0	kW	×
A-03	Motor rated voltage	200V class: 140~230V 400V class: 280~460V	0	V	×
A-04	Motor rated current	40~150% of INV rated current	0.0	A	×
A-05	Motor rated speed	67~100% of max. speed	0	min ⁻¹	×
A-06	Motor pole selection	2~12[Pole]	6	Pole	×
A-07	No. of PG pulse	60~3600(Always unchangeable in the time of ED64S)	600	P R	×
A-08	PWM carrier frequency	2.0~14.0	6.0	kHz	×
A-09	q-axis pulse magnetic pole decision current	50~200(% to motor rated current) (Always unchangeable in the time of ED64P)	50	%	×
A-10	Tuning selection(Effective only when auto-tuning is executed)	(at the time of full mode auto-tuning) 0: Ordinary, 1: With load (for. run), 2: With load (rev. run) (at the time of DC/d-axis mode auto-tuning) 0: DC, 1: d-axis measurement (for. run), 2: d-axis measurement (rev. run)	0	—	×
A-11	Dead time compensation amount (U phase +side)	0~400	0	—	×
A-12	Dead time compensation amount (U phase -side)	0~400	0	—	×
A-13	Dead time compensation amount (V phase +side)	0~400	0	—	×
A-14	Dead time compensation amount (V phase -side)	0~400	0	—	×
A-15	Dead time compensation amount (W phase +side)	0~400	0	—	×
A-16	Dead time compensation amount (W phase -side)	0~400	0	—	×
A-17	Motor primary resistance	Setting range differs, depending on Inverter capacity	0.0	mΩ	×
A-18	Motor d-axis inductance		0	mH	×
A-19	Motor q-axis inductance		0	mH	×
A-20	Motor magnetic flux	0.001~9.999	0.000	Wb	×
A-21	Conductance for motor iron loss	0.0~30.0	0.0	mho	×
A-22	Lq rate-of change at the time of 30% q-axis current	-100.0~100.0	0.0	%	×
A-23	Lq rate-of change at the time of 60% q-axis current	-100.0~100.0	0.0	%	×
A-24	Lq rate-of change at the time of 90% q-axis current	-100.0~100.0	0.0	%	×
A-25	Lq rate-of change at the time of 120% q-axis current	-100.0~100.0	0.0	%	×
A-26	Ld rate-of change at the time of 30% d-axis current	-100.0~100.0	0.0	%	×
A-27	Ld rate-of change at the time of 60% d-axis current	-100.0~100.0	0.0	%	×
A-28	Ld rate-of change at the time of 90% d-axis current	-100.0~100.0	0.0	%	×
A-29	Ld rate-of change at the time of 120% d-axis current	-100.0~100.0	0.0	%	×
A-30	d-axis position (Magnetic pole position)	0~30000 (-1 shows "before setting") (Always unchangeable in the time of ED64S)	-1	—	×
A-31	Selection of magnetic pole decision method	0:Magnetic pole decision method of q-axis pulse(1) 1:Magnetic pole decision method of q-axis pulse(2) 2:Magnetic pole decision method of d-axis pulse	0	—	—
A-32	d-axis measuring pulse with	-12.7~12.7	0.0	ms	×
A-33	d-axis measurement pulse voltage amplitude	0:30% 1:50% 2:75% 3:100%	0	—	×

Mark of rewriting during operation ○: Possible ×: Impossible

Standard console LED display	Setting items	Setting range (selection items)	Initializing data by default	Unit	Rewriting during operation
---------------------------------	---------------	---------------------------------	---------------------------------	------	-------------------------------

1—3 b area (Selection area of operation mode, operation sequence)

b-00	Selection of HC (super block) function	0 : OFF (unused) 1: ON (use)	OFF	—	×
b-01	Selection of control mode (speed/torque/priority)	0 : Speed control (ASR) mode 1 : Minus(-) direction of torque command has priority 2 : Plus(+) direction of torque command has priority 3 : Torque control (ATR) mode 4 : Contact changeover of speed/torque control	0	—	×
b-02	Selection of high efficiency mode	1 : ON(Always high efficiency mode - ON)	ON	—	×
b-03	Selection of stop mode	0 : Free stop 1 : Decel stop 2 : Decel stop with DC brake	1	—	○
b-04	Stop detection speed	0~300	30	min ⁻¹	○
b-05	DC brake actuation time	0.0~10.0	0.0	sec	○
b-06	DC brake gain	0.1~500.0	(ED64S)40.0 (ED64P,V)100	%	○
b-07	Selection of jog stop mode	0: Free stop 1: Decel stop 2: Decel stop with DC brake	1	—	○
b-08	Jog stop detection speed	0~300	30	min ⁻¹	○
b-09	Speed control proportional gain (2)	3~100	15	—	○
b-10	Selection of jog proportional gain	0: Speed control proportional gain (1) 1: Speed control proportional gain (2) 2: Special mode selection	0	—	○
b-11	Selection of restarting after instantaneous power failure	0: ON (use) 1: OFF (unused)	OFF	—	×
b-12	Selection of reverse run inhibition mode	0: Ordinary 1: Inhibition of rotation to reverse direction against command 2: Inhibition of reverse rotation	0	—	×
b-13	Selection of regeneration stall prevention function	0: OFF (unused) 1: ON (use)	OFF	—	×
b-14	Selection of sequence (PLC) function	0: OFF (unused) 1: ON (use)	OFF	—	×
b-15	Selection of command input position at interlocking	0: Terminal block 1: Console (SET64) 2: Digital communication option (RSH64 etc.)	1	—	×
b-16	Speed command input position selection	0: Interlock (by setting of b-15) 1: Terminal block 2: Console (SET64) 3: Digital communication option(RSH64 etc.) 4: Isolated analog input option(ISO64,IO64) 5: Input option of BCD(BCD64)	0	—	×
b-17	Selection of operation command input position	0: Interlock (by setting of b-15) 1: Terminal block 2: Console (SET64) 3: Digital communication option(RSH64 etc.)	0	—	×
b-18	Selection of jog command input position	0: Interlock (by setting of b-15) 1: Terminal block 2: Console (SET64) 3: Digital communication option(RSH64 etc.)	0	—	×
b-19	Selection of torque command input position	0: Terminal block 1: Analog option(ISO64,IO64) 2: Digital communication option(RSH64 etc.)	1	—	×
b-20	Free start max. speed(ED64P mode, ED64V mode only)	100~150 (% to motor rated speed (A-05)) (Always unchangeable in the time of ED64S)	100	%	○
b-21	Inverter max. output voltage	80~200 (% to motor rated voltage (A-03))	100	%	○

Mark of rewriting during operation ○: Possible X: Impossible

Standard console LED display	Setting items	Setting range (selection items)	Initializing data by default	Unit	Rewriting during operation
1-4	c area (Setting area of relevance of multifunction input/output)				
c-00	Selection of multifunction input position	0: Terminal block 1: Digital communication option(RSH64etc.)	0	—	×
c-01	Function selection of multifunction input terminal (1)	0: Preset speed command selection 1	0	—	×
c-02	Function selection of multifunction input terminal (2)	1: Preset speed command selection 2	1	—	×
c-03	Function selection of multifunction input terminal (3)	2: Preset speed command selection 3	3	—	×
c-04	Function selection of multifunction input terminal (4)	3: Accel/decel time selection 1	4	—	×
c-05	Function selection of multifunction input terminal (5)	4: Accel/decel time selection 2	7	—	×
c-06	Function selection of multifunction input terminal (6)	5: Speed up command (MRH mode) 6: Speed down command (MRH mode) 7: Speed hold 8: Inhibition of S pattern accel/decel 9: Reduction of max. speed 10: Droop control inactive 11: Torque control selection 12: Reverse run operation command 13: DC brake command 14: — 15: External failure signal 1 (protect. operation relay 86A active) 16: External failure signal 2 (protect. operation relay 86A active) 17: External failure signal 3 (protect. operation relay 86A active) 18: External failure signal 4 (protect. operation relay 86A active) 19: External failure signal 1 (protect. operation relay 86A inactive) 20: External failure signal 2 (protect. operation relay 86A inactive) 21: External failure signal 3 (protect. operation relay 86A inactive) 22: External failure signal 4 (protect. operation relay 86A inactive) 23: Trace back external trigger 24: Selection of 2nd motor 25: Emergency stop (B contact) 26: Advance of programed operation 27: Selection of speed command terminal block	13	—	×
c-07	Function selection of multifunction output terminal (1)	0: End of programed operation	7	—	×
c-08	Function selection of multifunction output terminal (2)	1: Speed detection (1) (speed = detection speed)	1	—	×
c-09	Function selection of multifunction output terminal (3)	2: Speed detection (1) (speed > = detection speed)	0	—	×
c-10	Function selection of multifunction output terminal (4)	3: Speed detection (1) (speed < = detection speed) 4: Speed detection (2) (speed = detection speed) 5: Speed detection (2) (speed > = detection speed) 6: Speed detection (2) (speed < = detection speed) 7: Setting reach 8: Torque detection 9: Absolute value torque detection 10: During power interruption 11: Overload pre-alarm 12: During retry 13: During reverse run 14: Protective operation code 15: Sum check error	8	—	×
c-11	Detection speed (1)	—max. frequency~+max. frequency	0.0	Hz	○
c-12	Detection speed (2)	—max. frequency~+max. frequency	0.0	Hz	○
c-13	Speed detection range	0.0~600	0.0	Hz	○
c-14	Detection torque command (with polarity)	—205~205	0	%	○
c-15	Detection torque command (absolute value)	0~205	0	%	○
c-16	Overload pre-alarm actuation level setting	0~100	50	%	○
c-17	Max. speed reduction rate	50.0~100.0	90.0	%	○

Mark of rewriting during operation ○: Possible ×: Impossible

Standard console LED display	Setting items	Setting range (selection items)	Initializing data by default	Unit	Rewriting during operation
1—5 d area (Accel/decel setting, speed jump function, MRH function)					
d-00	Accel/decel time selection	0: Accel/decel time 1	0	—	×
d-01	Jog accel/decel time selection	1: Accel/decel time 2	1	—	×
		2: Accel/decel time 3			
		3: Accel/decel time 4			
d-02	Accel time (3)	0.0~3600.0	30.0	sec	○
d-03	Decel time (3)	0.0~3600.0	30.0	sec	○
d-04	Accel time (4)	0.0~3600.0	30.0	sec	○
d-05	Decel time (4)	0.0~3600.0	30.0	sec	○
d-06	S pattern accel/decel time selection	0 : OFF (unused) 1: ON (use)	OFF	—	×
d-07	S pattern rise time (1)	0.0~60.0	0.1	sec	○
d-08	S pattern accel reach time (1)	0.0~60.0	0.1	sec	○
d-09	S pattern fall time (1)	0.0~60.0	0.1	sec	○
d-10	S pattern decel reach time (1)	0.0~60.0	0.1	sec	○
d-11	S pattern rise time (2)	0.0~60.0	0.1	sec	○
d-12	S pattern accel reach time (2)	0.0~60.0	0.1	sec	○
d-13	S pattern fall time (2)	0.0~60.0	0.1	sec	○
d-14	S pattern decel reach time (2)	0.0~60.0	0.1	sec	○
d-15	Speed deviation limit command selection	0 : OFF (unused) 1: ON (use)	OFF	—	○
d-16	Plus-direction deviation max. value	0.0 ~ 100	5.0	%	○
d-17	Minus-direction deviation max. value	-100.0 ~ 0.0	-5.0	%	○
d-18	Jump speed 1	0~max. speed	0	min ⁻¹	○
d-19	Jump speed 2	0~max. speed	0	min ⁻¹	○
d-20	Jump speed 3	0~max. speed	0	min ⁻¹	○
d-21	Jump speed 4	0~max. speed	0	min ⁻¹	○
d-22	Jump speed range	0 ~300	0	min ⁻¹	○
d-23	MRH function selection	0 : OFF (unused) 1: ON (use)	OFF	—	×
d-24	MRH upper limit speed	MRH lower limit speed (d-25)~max. speed	300	min ⁻¹	○
d-25	MRH lower limit speed	-max. speed~MRH upper limit speed (d-24)	0	min ⁻¹	○

1-6 E area (Setting area of relevance of torque limit, torque command characteristics, speed control, vector control)					
E-00	For. run powering torque limit value	0~150 (varies max. 0~200% depending on the motor)	150	%	○
E-01	For. run regeneration torque limit value	-150~0 (varies max.-200~0% depending on the motor)	-150	%	○
E-02	Rev. run powering torque limit value	-150~0 (varies max.-200~0% depending on the motor)	-150	%	○
E-03	Rev. run regeneration torque limit value	0~150(varies max. 0~200% depending on the motor)	150	%	○
E-04	(Unused)	—	100.0	%	—
E-05	Torque command mode selection (% / absolute value)	0: % command 1: Absolute value command	0	—	×
E-06	ASR cancelation selection	0 : OFF (unused) 1: ON (use)	ON	—	×
E-07	ASR feedforward selection	0 : OFF (unused) 1: ON (use)	ON	—	×
E-08	Variable proportional gain variation start speed	0.01~100.00	(ED64S) 5.00 (ED64P,V)0.01	%	○
E-09	Ratio of variable proportional minimum gain	0~100	(ED64S) 20 (ED64P,V)100	%	○
E-10	q-axis current control P gain	0.0~200.0	80.0	%	○
E-11	q-axis current control I gain	0.0~75.0	15.0	%	○
E-12	d-axis current control P gain	0.0~200.0	80.0	%	○
E-13	d-axis current control I gain	0.0~75.0	15.0	%	○
E-14	Re-start prohibition time	100~999	100	ms	○
E-15	Use selection of motor temperature compensation option	0:OFF(Unused) 1:ON(use)	OFF	—	×

Mark of rewriting during operation ○: Possible X: Impossible

Standard console LED display	Setting items	Setting range (selection items)	Initializing data by default	Unit	Rewriting during operation
1-7 F area (Built-in DB operation setting, protective function, trace back setting area)					
F-00	Built-in DB operation level	200V class: 320~360V	340	V	○
		400V class: 640~720V	680	V	○
F-01	For. run side overspeed setting	0~max. speed x 1.5	1900	min ⁻¹	×
F-02	Rev. run side overspeed setting	-max. speed X 1.5~0	-1900	min ⁻¹	×
F-03	Overload protection setting	20~110	100	%	○
F-04	FCL level setting	80~125	100	%	○
F-05	Selection of overtorque protective function	0 : OFF (unused) 1: ON (use)	OFF	—	×
F-06	Overtorque protective operation level setting	110~205	150	%	○
F-07	Overtorque protective operation standard torque	50~105	105	%	○
F-08	Selection of speed control error function	0 : OFF (unused) 1: ON (use)	OFF	—	×
F-09	Speed control error for. run side detection speed range	50~500	100	min ⁻¹	○
F-10	Speed control error rev. run side detection range	-500~-50	-100	min ⁻¹	○
F-11	(Unused)	—	0	—	—
F-12	Selection of motor over-heat protective operation	0 : OFF (unused) 1: ON (use)	OFF	—	×
F-13	Selection of protective operation relay (86A) at power failure	0 : OFF (inactive) 1: ON (active)	OFF	—	×
F-14	Setting of times of protection retry	0~5	0	—	○
F-15	Trace back pitch	1~100	1	ms	○
F-16	Trace back trigger point	1~99	80	—	○
F-17	Trace back CH1 selection	0~64	0	—	○
F-18	Trace back CH2 selection	0~64	0	—	○
F-19	Trace back CH3 selection	0~64	0	—	○
F-20	Trace back CH4 selection	0~64	0	—	○
F-21	Trace back CH5 selection	0~64	0	—	○
F-22	Trace back CH6 selection	0~64	0	—	○
F-23	Trace back CH7 selection	0~64	0	—	○
F-24	Trace back CH8 selection	0~64	0	—	○
F-25	Trace back CH9 selection	0~64	0	—	○
F-26	Trace back CH10 selection	0~64	0	—	○
F-27	Trace back CH11 selection	0~64	0	—	○
F-28	Trace back CH12 selection	0~64	0	—	○
1-8 G area (Analog input/output setting area)					
G-00	Analog setting +side adjustment gain	50.00~150.00	100.00	%	○
G-01	Analog setting -side adjustment gain	50.00~150.00	100.00	%	○
G-02	Analog speed command characteristic selection	0 : 0~±10V (bipolarity)	1	—	×
		1 : 0~10V (unipolarity)			
		2 : 4~20mA			
		3 : Pulse train			
G-03	Analog speed command upper limit speed	Absolute value of (G-04)~100.00	100.00	%	○
G-04	Analog speed command lower limit speed	-(G-03)~(G-3)	0.00	%	○
G-05	Analog input 0 limit voltage	0.000~1.000	0	V	○
G-06	Analog output selection	0 : Output voltage	1	—	×
		1 : Output current			
		2 : Torque command			
		3 : Motor speed			
		4 : Speed command			
		5 : Super block output			
		6 : Calibration			
		7 : Internal monitor (for our adjustment)			
G-07	Analog output adjustment gain	50.0~150.0	100.0	%	○
G-08	Analog output adjustment offset	-50.0~50.0	0.0	%	○
G-09	6F output selection	0: PG output (Duty 1: 1)(ED64P,V only)	2	—	×
		1: —			
		2: Motor speed(6F output)			
		3: Calibration (6F output)			
G-10	Isolated analog setting adjustment gain	50.00~150.00	100.00	%	○
G-11	Isolated analog input characteristics selection	0 : 0~10V	0	—	×
		1 : 4~20mA			
G-12	Isolated analog setting upper limit speed	Absolute value of (G-13)~100.00	100.00	%	○

Mark of rewriting during operation ○ : Possible × : Impossible

Standard console LED display	Setting items	Setting range(selection items)	Initializing data by default	Unit	Rewriting during operation
G-13	Isolated analog setting lower limit speed	— (G-12)~(G-12)	0.00	%	○
G-14	Isolated torque command input adjustment gain	50.0~150.0	100.0	%	○
G-15	Isolated torque command input offset adjustment quantity	—50.0~50.0	0.0	%	○
G-16	Isolated analog output selection	0: Output voltage 1: Output current 2: Torque command 3: Motor speed 4: Speed command 5: Super block output 6: Calibration 7: Internal monitor (for our adjustment) 8: Output voltage (4~20mA) output 9: Output current (4~20mA) output 10: Torque command (4~20mA) output 11: Motor speed (4~20mA) output output 12: Speed command (4~20mA) 13: Super block output (4~20mA) output 14: Calibration (4~20mA) output		—	×
G-17	Isolated analog output adjustment gain	50.0~150.0	100.0	%	○
G-18	Isolated analog output offset adjustment quantity	—50.0~50.0	0.0	%	○
G-19	Temperature correction option offset adjustment quantity	—20.0~20.0	0.0	%	○
G-20	Temperature correction option gain adjustment quantity	50.0~150.0	10.0	%	○

1-9 H area (Setting area of relevance of programed operation / preset operation)

H-00	Preset speed 1	— max. speed~max. speed	0	min ⁻¹	○
H-01	Preset speed 2		0	min ⁻¹	○
H-02	Preset speed 3		0	min ⁻¹	○
H-03	Preset speed 4		0	min ⁻¹	○
H-04	Preset speed 5		0	min ⁻¹	○
H-05	Preset speed 6		0	min ⁻¹	○
H-06	Preset speed 7		0	min ⁻¹	○
H-07	Preset speed 8		0	min ⁻¹	○
H-08	Programed operation mode selection	0: OFF(unused) 1: One-Time 2: End-less	0	—	×
H-09	Programed operation time unit selection	0: sec 1: min 2: hour	0	—	×
H-10	Programed operation time 1	0.0~3600.0	0.0	—	○
H-11	Programed operation time 2		0.0	—	○
H-12	Programed operation time 3		0.0	—	○
H-13	Programed operation time 4		0.0	—	○
H-14	Programed operation time 5		0.0	—	○
H-15	Programed operation time 6		0.0	—	○
H-16	Programed operation time 7		0.0	—	○
H-17	Programed operation time 8		0.0	—	○
H-18	Programed operation accel/decel selection 1	0: Accel/decel time 1 1: Accel/decel time 2 2: Accel/decel time 3 3: Accel/decel time 4	0	—	×
H-19	Programed operation accel/decel selection 2		0	—	×
H-20	Programed operation accel/decel selection 3		0	—	×
H-21	Programed operation accel/decel selection 4		0	—	×
H-22	Programed operation accel/decel selection 5		0	—	×
H-23	Programed operation accel/decel selection 6		0	—	×
H-24	Programed operation accel/decel selection 7		0	—	×
H-25	Programed operation accel/decel selection 8		0	—	×

Mark of rewriting during operation ○ : Possible × : Impossible

Standard console LED display	Setting items	Setting range(selection items)	Initializing data by default	Unit	Rewriting during operation	
1-10 i area (Droop control, machine loss compensation setting area)						
i-00	Droop control use selection	0: OFF(unused) 1: ON(use)	OFF	—	×	
i-01	Droop start speed	0~100.0	0.0	%	○	
i-02	Droop ratio changeover speed	0~100.0	0.0	%	○	
i-03	Droop ratio	0~50.0	0.0	%	○	
i-04	Droop start torque	0~90.0	0.0	%	○	
i-05	Machine loss compensation selection	0: OFF(unused) 1: ON(use)	OFF	—	×	
i-06	Machine loss offset quantity	0~100.0	0	%	○	
i-07	Machine loss inclination	0~100	0	%	○	
1-11 J area (Communication option setting area)						
J-00	Use-selection of communication option	0: OFF(unused) 1: ON(use)	OFF	—	×	
J-01	ASYC64 option communication speed	0 : 1200bps 1 : 2400bps 2 : 4800bps 3 : 9600bps 4 : 19200bps 5 : 38400bps	4	—	×	
J-02	RSH64 option communication speed	0 : 125kbps 1 : 250kbps 2 : 500kbps 3 : 1Mbps	3	—	×	
J-03	PBUS64(PROFIBUS)option Slave office address	0~126	2	—	×	
J-04	Number of frame of RSH64 option input (RSH64 → master station)	3~19	14	—	×	
J-05	Number of frame of RSH64 option output (Master station→RSH64)	2~12	6	—	×	
J-06	BCDIN64 input readout selection	0: Automatic 1: Edge trigger operation 2: Level trigger operation	0	—	×	
J-07	Use selection of BCDIN64 input polarity signal	0: Polarity bit (unused) 1: Polarity bit (use)	0	—	×	
J-08	ASYC64/PBUS64 communication mode selection	0: Standard communication mode 1: Positioning mode 1 2: Positioning mode 2	0	—	×	
J-09	Positioning speed setting 0	Effective at the time of positioning mode using ASYC64	16~200 (Unchangeable in ED64S)	100	min ⁻¹	○
J-10	Positioning speed setting 1		16~200 (Unchangeable in ED64S)	100	min ⁻¹	○
J-11	Positioning accel time		0.1~10.0 (Unchangeable in ED64S)	0.5	sec	○
J-12	Positioning decel time		0.1~10.0 (Unchangeable in ED64S)	0.5	sec	○
J-13	Creep speed		2~16 (Unchangeable in ED64S)	2	min ⁻¹	○
J-14	No. of pulse of creep time transfer		40~400 (Unchangeable in ED64S)	40	—	○
J-15	No. of stop pulse		0~50 (Unchangeable in ED64S)	0	—	○
J-16	Positioning emergency stop selection		0:OFF(unused) 1:ON(use) (Unchangeable in ED64S)	OFF	—	×
J-17	DNET64 Output Assembly Instance number setting	0:Instance No.20 1:Instance No.21 2~10(for our original communication mode)	0	—	×	
J-18	DNET64 Input Assembly Instance number setting	0:Instance No.70 1:Instance No.71 2~15(for our original communication mode)	0	—	×	
J-19	Setting of DNET64 speed scale	-126~127	3	—	×	
J-20	Setting of DNET64 monitor ata No.	0~119	0	—	○	
1-12 L area (Setting area of 2nd motor parameter, speed control gain for 2nd motor)						
L-00	Use-selection of 2nd motor function	0: OFF(unused) 1: ON(use)	OFF	—	×	
L-01	2nd motor rated capacity	3 ranks down from INV rated capacity~INV rated capacity	0	kW	×	
L-02	2nd motor rated voltage	200V class: 140~230 400V class: 280~460	0	V	×	
L-03	2nd motor rated current	40~150% of Inverter rating current	0.0	A	×	
L-04	2nd motor rated speed	67~100% of max. speed	0	min ⁻¹	×	
L-05	2nd motor pole	2~12[Pole]	4	pole	×	

Mark of rewriting during operation ○ : Possible × : Impossible

Standard console LED display	Setting items	Setting range(selection items)	Initializing data by default	Unit	Rewriting during operation
L-06	No. of 2nd motor PG pulse	60~3600 (Always unchangeable in the time of ED64S)	600	—	×
L-07	q-axis pulse magnetic pole decision current of 2nd motor	50~200 (% to motor rated current) (Always unchangeable in the time of ED64P)	50	%	×
L-08	2nd motor primary resistance	Setting range differs, depending on Inverter capacity	0	mΩ	○
L-09	2nd motor d-axis inductance		0	mH	○
L-10	2nd motor q-axis inductance		0	Mb	○
L-11	2nd motor magnetic tiux	0.001~9.999	0.000	Wb	×
L-12	Iron loss conductance of 2nd motor	0.0~30.0	0.0	mho	○
L-13	Lq rate-of change at the time of 30% q-axis current	-100.0~100.0	0.0	%	×
L-14	Lq rate-of change at the time of 60% q-axis current	-100.0~100.0	0.0	%	×
L-15	Lq rate-of change at the time of 90% q-axis current	-100.0~100.0	0.0	%	×
L-16	Lq rate-of change at the time of 120% q-axis current	-100.0~100.0	0.0	%	×
L-17	Ld rate-of change at the time of 30% d-axis current	-100.0~100.0	0.0	%	×
L-18	Ld rate-of change at the time of 60% d-axis current	-100.0~100.0	0.0	%	×
L-19	Ld rate-of change at the time of 90% d-axis current	-100.0~100.0	0.0	%	×
L-20	Ld rate-of change at the time of 120% d-axis current	-100.0~100.0	0.0	%	×
L-21	2nd motor d-axis position (magnet pole position)	0~30000(-1 of initial value means before setting) (Always unchangeable in the time of ED64S)	-1	—	×
L-22	Magnet pole dccion system selection of 2nd motor	0:q-axis pulse magnetic pole decision system(1) 1:q-axis pulse magnetic pole decision system(2) 2:d-axis pulse magnetic pole decision system	0	—	×
L-23	d-axis measuring pulse width of 2nd motor	-12.7~12.7	0	—	×
L-24	d-axis measurement pulse voltage amplitude selection of 2nd motor	0:30% 1:50% 2:75% 3:100%	0	—	×
L-25	2nd speed control proportional gain	3~100	15	—	○
L-26	2nd speed control integrated time constant	20~10000	40	ms	○
L-27	2nd speed control inertia moment	0.0~65535	10	gm ²	○

1-13 n area (Monitor adjustment area)

n-00	Line speed monitor adjustment	0~20000	Keep initial values or- idinary as these are monitor setting for our test.	0.0	—	○
n-01	Output(ch2)gain of monitor for adjustment	0~32767		1	—	○
n-02	Output(ch1)gain of monitor for adjustment	0~32767		1	—	○
n-03	Output(ch2)address of monitor for adjustment(Hside)	H0000~HFFFF		H0000	—	○
n-04	Output(ch2)address of monitor for adjustment(Lside)	H0000~HFFFF		H0000	—	○
n-05	Output(ch1)address of monitor for adjustment(Hside)	H0000~HFFFF		H0000	—	○
n-06	Output(ch1)address of monitor for adjustment(Lside)	H0000~HFFFF		H0000	—	○
n-07	Display address of monitor for adjustment(Hside)	H0000~HFFFF		HFFFF	—	○
n-08	Display address of monitor for adjustment(Lside)	H0000~HFFFF		HF900	—	○
n-09	Display selection of monitor for adjustment	0:HEX display 1:DEC display(without code) 2:DEC display(with code)		2	—	○

1-14 o area(our adjustment area)

o-00~65	Our adjustment	Keep initial values as these are for our adjustment	—	—	—
---------	----------------	---	---	---	---

1-15 P area (Super block constant setting area)

P-000~259	Super block constant setting	See 「Manual of super block」 of separate issue	—	—	○
-----------	------------------------------	---	---	---	---

1-16 S area (Inverter capacity • DC voltage gain)

S-00	VDC detection gain	80.0 ~120.0(adjusted at the time of delivery)	—	%	×
S-01	Inverter control mode(readout only)	ED64S(sensorless mode) ED64V(mode with speed sensor) ED64P(Mode with speed/pole-position sensor)	—	—	×
S-02	Inverter capacity,voltage class(readout only)	2r222~18022 2R444~50044	—	—	×

2. Explanation of setting items

2—1. Basic setting items

In the basic setting items, comparatively well used items in the setting of ED64sp Inverter were picked up and collected. Since the other items were collected and explained in details in the Extended function setting items (A area~S area), please see them also.

(Note 1) Among "Units" in the tables, that which can be displayed by standard console are 4 kinds only of r/min, Hz, A, V and other Units are not displayed, for which please pay attention. (Other units are displayed by Option Console)

(1) Operation speed setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit (Note 1)
0.SrEF	Setting speed	— max. speed~max.speed	1	18(ED64S) 0(ED64P,V)	min ⁻¹
1.FJoG	Forward jog speed	min. speed ~300	1	24	min ⁻¹
2.rJoG	Reverse jog speed	—300 ~ — min. speed	1	—24	min ⁻¹

0.SrEF

Setting in case of operation speed setting by console. It will become effective in case that console is selected by b-15 as the (command input position at the time of interlock) and interlock is selected by b-16, and console is selected by b-16 as the speed command input position. (See items of b area)

1.FJoG/2.rJoG

Set jog speed at the times of forward jog and reverse jog respectively.

(2) Accel/decel time setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
3.Acc1	Accel time 1	0.0 ~ 3600.0	0.1	30.0	sec
4.dEc1	Decel time 1	0.0 ~ 3600.0	0.1	30.0	sec
5.Acc2	Accel time 2	0.0 ~ 3600.0	0.1	0.3	sec
6.dEc2	Decel time 2	0.0 ~ 3600.0	0.1	0.3	sec

Set accel. time from 0 to max. speed (A-00) and decel. time from max. speed (A-00) to 0, respectively. ED64sp Inverter has 4 kinds of accel/decel times (accel/decel times 3, 4 are d-02~d-05) and they can be changed over by setting or multifunction input from external, programed operation, etc. (3.Acc1, 4.dEc1 are ordinary operation and 5.Acc2, 6.dEc2 are jog operation in setting by default. For details of accel/decel times setting, please see item of Setting Item d also)

(3) Speed control gain

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
7.ASrP	Speed control proportional gain (1)	3 ~ 50	1	15	—
8.ASri	Speed control integration time constant	20 ~ 10000	1	40	ms
9.ASrJ	Speed control system inertia moment	0 ~ 65535	1	10	gm ²

In ED64sp, speed control is executed by MFC control combining feedforward and cancelation using disturbance torque observer.

7.ASrP

Set proportional gain of speed control.

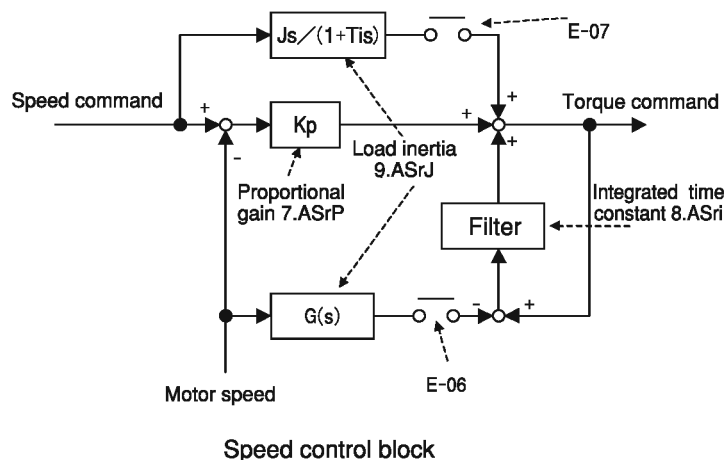
8.ASri

Set integrated gain equivalent of speed control by filter time constant.

9.ASrJ

Set inertia moment to be used for cancelation of speed control and feedforward by unit of gmm. Ordinary, input 20~100% of added value of "converted value of load inertia moment to motor shaft" and "inertia moment of motor itself".

In cases that gear creaks caused by large back rush of gear and belt vibrates by belt connection, make the setting smaller or make no use of cancellation, feedforward by setting of E-06, E-07.



(4) Selection of upper function setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
Func	Selection of extended function	(If [SET] key is pressed here, display turns to "Fund" and by ↑ ↓ keys, area items of A~P can be selected)	—	—	—

By pressing of [SET] key in the status of display of selection of this item (display turns to Fund), it becomes possible to set the upper function setting items (setting items A area~S area)

2—2. Setting Item A : Setting of max. speed, rated value, parameter of motor

This item is the area to set the parameter of motor, which becomes necessary in order for ED64sp Inverter to execute control. Surely set conforming to the motor and system to be used, before operation of ED64sp Inverter. A-11 ~A-33 are set automatically by execution of auto-tuning. Make auto-tuning combining with motor to be used before regular operation and set each data of A-11~A-33.

(1) Max., min. speed of motor

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-00	Max. speed	300 ~ 14700	1	1800	min ⁻¹
A-01	Min. drive speed	0~max. speed (A-00)	1	18(ED64S) 0(ED64P.V)	min ⁻¹

A-00

Set the max. speed (absolute value) of motor. Inverter controls the speed making this setting as 100% (standard). Make setting in the range of 1~1.5 times of the rated speed of motor to be used. In case of use of motor with speed of less than its rated speed only, set the rated speed of motor for setting of max. speed. (However, never set larger value than 240Hz equivalent of frequency conversion (14400 at 2 pole, 7200 at 4 pole, 4800 at 6 pole) times respectively.)

A-01

Set the min. speed of motor. Even if speed command is inputted at less than this speed in absolute value, speed is limited to this value in case of speed control. (However, this is invalid in case of driving in torque control mode by b-01 control mode selection.)

(2) Setting of values in motor name plate

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-02	Motor rated capacity	3 ranks down from INV rated capacity~INV rated capacity	Note	0.0	kW
A-03	Motor rated voltage	140~230 (200V class) 280~460 (400V class)	1	0	V
A-04	Motor rated current	40~150% of Inverter rating current	Note	0.0	A
A-05	Motor rated speed	67~100% of max. speed	1	0	min ⁻¹
A-06	No. of motor pole	2~12[Pole]	—	6	Pole

Note) Varies depending on the type of Inverter.

For the items of A-02~A-06, set each rating value described in motor name plate and data sheet. As these settings are used at the times of vector control and auto-tuning (auto-measuring of constant), surely set them before auto-tuning. If auto-tuning is done without setting, setting error (SEtO) is displayed.

Set each value described in motor name plate as per Fig. right and in data sheet, etc. of motor.

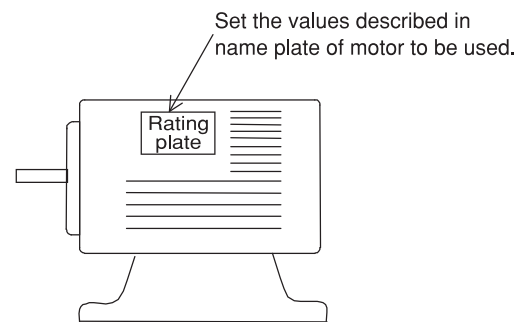
In case of use of motor up to the power constant range, basic speed is set at the rated speed of A-05.

Areas are:-

Torque constant control area at less than A-05 setting.

Power constant control area at more than rated speed.

In case of motor having 2 each of rated voltage and rated current, set larger values respectively within the speed range to be used, A-03 and A-04.



Name plate of motor

(3) Setting of number of PG pulse

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-07	No. of motor PG pulse	60~3600	1	600	P/R

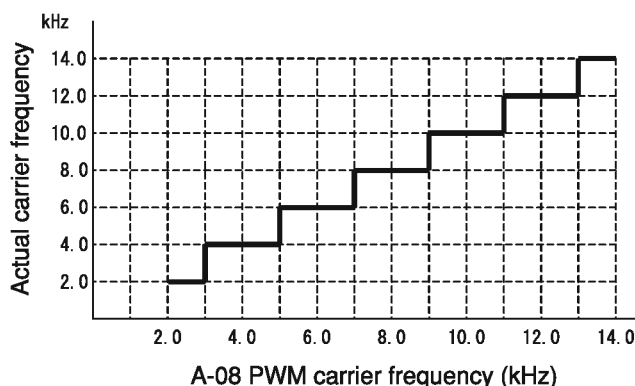
A-07 set the number of pulse of PG, which is connected directly with shaft of motor to be used. (This item cannot be set in ED64S mode)

(4) Setting of PWM carrier frequency

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-08	No. of PWM carrier frequency	2.0~ 14.0	0.1	6.0	kHz

This is modulated carrier frequency of voltage output PWM of Inverter.

Since torque control and PWM cycle is synchronized in case of ED64sp, PWM carrier frequency is designed to vary at 2.0kHz pitch. The relation between setting of A-8 and actual PWM carrier frequency is as per Fig. below, for which please pay attention.



A-08 PWM carrier frequency (kHz)

As to ED64sp, PWM carrier frequency is set at 6kHz ordinary. In case of setting at larger frequency than 8kHz in the type of Inverter capacity of 37kW and 6kHz in the type of more than 37kW, please consult us since it is necessary to use Inverter, lowering the load rate.

(4)q-axis pulse magnetic pole decision current

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-09	q-axis pulse magnetic pole decision current	50~200(% to motor rated current)	1	50	%

When A-31 magnetic pole decision method selection is [q-axis pulse magnetic pole decision method], direction of magnetic pole is decided flowing the current of this setting at the starting in ED64S and ED64V modes. When ED64P mode and A-31 are at the time of [d-axis magnetic pole decision method], keep initial values since this setting is not used. For details, see the item of [Relevance of magnetic pole discrimination].

(5)Selection of auto-tuning mode

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-10	Tuning selection	(at the time of full mode auto-tuning) 0:Ordinary, 1:With load (for.run), 2:With load (rev.run) (at the time of DC/d-axis mode auto-tuning) 0:DC, 1:d-axis measurement(for.run), 2:d-axis measurement(rev.run)		0	—

A-10 is mode selection at the time of auto-tuning. See [CHAPTER 2, Item 4, As to auto-tuning] This setting affects nothing at the time of ordinary operation.

(6)Setting item of auto-tuning

Setting item shown below (A-11~A-33) are the data to be set by execution of auto-tuning.

(Dead time compensation amount of IGBT element in the Inverter)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-11	Dead time compensation amount (U phase+side)	0~400	1	0	—
A-12	Dead time compensation amount (U phase-side)	0~400	1	0	—
A-13	Dead time compensation amount (V phase+side)	0~400	1	0	—
A-14	Dead time compensation amount (V phase-side)	0~400	1	0	—
A-15	Dead time compensation amount (W phase+side)	0~400	1	0	—
A-16	Dead time compensation amount (W phase-side)	0~400	1	0	—

In A11~A16, set the compensation amount of dead time of IGBT element at each phase in the Inverter in order to operate (arith.) Since +side and -side of U,V,W phases have element, dead time compensation amount also is prepared for 6 elements individually. By execution of auto-tuning, the most suitable compensation value is set individual element, This item is set by full mode auto-tuning or DC mode auto-tuning.

Electric constant of motor

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-17	Motor primary resistance	(Depending on Inverter capacity, setting range and resolution differ)		0	mΩ
A-18	Motor d-axis inductance			0	mH
A-19	Motor q-axis inductance			0	mH
A-20	Motor magnetic flux	0.001~9.999	0.001	0.000	wb
A-21	Iron loss conductance	0.0~30.0	0.1	0.0	mho
A-22	Lq rate-of change at the time of 30% q-axis current	-100.0~100.0	0.1	0.0	%
A-23	Lq rate-of change at the time of 60% q-axis current	-100.0~100.0	0.1	0.0	%
A-24	Lq rate-of change at the time of 90% q-axis current	-100.0~100.0	0.1	0.0	%
A-25	Lq rate-of change at the time of 120% q-axis current	-100.0~100.0	0.1	0.0	%
A-26	Ld rate-of change at the time of 30% d-axis current	-100.0~100.0	0.1	0.0	%
A-27	Ld rate-of change at the time of 60% d-axis current	-100.0~100.0	0.1	0.0	%
A-28	Ld rate-of change at the time of 90% d-axis current	-100.0~100.0	0.1	0.0	%
A-29	Ld rate-of change at the time of 120% d-axis current	-100.0~100.0	0.1	0.0	%

Setting of electric constant of ED motor inside to be used for control operation (arith.).

In A-17, set primary winding resistance value per 1 phase of motor. However, as resistance value of wiring between Inverter motor is included in the primary resistance, set the added value of motor inside resistance and wiring resistance. Therefore, if wiring length was changed substantially after tuning, execute tuning again. This item is set by full mode auto-tuning or DC mode auto-tuning.

In A-18, A-19, set inductance of d-axis and q-axis respectively. However, inductance varies by current owing to saturation and therefore, set inductance at near 0 current. This item is set by full mode tuning. In A-20, set interlinkage flux to the primary winding of permanent magnet embedded in the inside of rotor of ED motor. This item is set by full mode tuning.

In A-21, set corresponding value of conductance of iron loss in the ED motor. This item is set by full mode tuning.

In A-22 A-29, set the rate-of change (compensation rate) at the times of 30%, 60%, 90%, 120% current of d-axis, q-axis inductance respectively. From A-18, A-19 and these setting values, operate (arith.) actual inductance and execute control operation (arith.). This is set by full mode tuning.

(Setting of d-axis position (magnetic pole position))

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-30	d-axis position(magnetic pole position)	0~30000	1	-1	—

In A-30, angle from standard position angle of PG till position angle of incorporated magnetic pole in rotor is set by count number of PG pulse. As the value varies depending on the fitting angle of PG even in case of motor of same type, be sure to set the value after execution of auto-tuning for individual motors. In case also for reverse run of motor, changing the connection of U,V,W, it is necessary to execute auto-tuning again. Even by execution of auto-tuning in ED64S mode, this item cannot be set. When this setting is -1, it means that the values are still initial values and setting has not been set yet. Therefore, even Inverter is started under this status, changing to ED64P or ED64V modes, Inverter stops by protective operation. This item can be set by execution of full mode tuning or d-axis mode auto-tuning in ED64P, ED64V modes.

(Magnetic pole decision related setting)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-31	Selection of magnetic pole decision system	0:qaxis pulse magnet pole diccision system(1) 0:qaxis pulse magnet pole diccision system(2) 0:daxis pulse magnet pole diccision system	—	0	—

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
A-31	d-axis measuring pulse width	-12.7~12.7	0.1	0.0	ms
A-32	d-axis measurement pulse voltage amplitude	0:30% 1:50% 2:75% 3:100%	—	0	—

These are settings in regard to the discrimination of magnetic pole direction at d-axis mode auto-tuning and magnetic pole discrimination at sensorless starting of the first operation time after closing of power source in ED64S mode and ED64V mode. In ED64sp, 2 kinds of magnetic pole discrimination method such as [d-axis pulse magnetic pole decision method] and [q-axis pulse magnetic pole decision method] are available.

In A-31, suitable magnetic pole decision method for characteristic of motor to be used is set automatically by execution of full mode auto-tuning. q-axis pulse magnetic pole decision methods (1) and (2) show the difference of discrimination conditions at execution time of full mode auto-tuning. Operation of both of them is q-axis pulse magnetic pole decision.

<Setting of d-axis pulse magnetic pole decision>

Setting of A-32, A-33 is effective in case that A-31 became d-axis magnetic pole decision method by auto-tuning. In A-32, pulse time width in d-axis pulse magnetic pole discrimination method is set. If this value is minus, it means that the polarity to be decided is of minus characteristic. This item is set by execution of full mode auto-tuning. In A-33, pulse voltage amplitude in d-axis pulse magnetic pole discrimination is set. This item is set by execution of full mode auto-tuning.

<Setting of q-axis pulse magnetic pole decision>

Setting of A-09 is effective at the time of sensorless starting (starting in ED64S mode and first starting after closing of power source in ED64V mode) in case that A-31 became q-axis magnetic pole decision method (1) or (2) by auto-tuning. (This setting is not used in d-axis mode auto-tuning)

In A-09, command value of current of q-axis pulse is set by % to the motor rated current. It is 50% of the initial value ordinary but this value is adjusted substantially in case that [sensorless start error (SLSE)] protection operates at the time of start, depending on the load conditions. However, if that value is set too high, shock at the time of start may be large, for which please pay attention.



CAUTION [as to starting method in ED64S, ED64V modes]

- When A-31 setting is changed over manually, magnetic pole decision method also is changed over however, there is a possibility of output of n torque of the reverse of command direction, caused by error in magnetic pole decision as the case may be. Please do not change from the value set by auto-tuning in principle.
- In q-axis pulse magnetic pole decision method, there is a case of reverse run of rotor several times at starting. Pay attention since this cannot be used in the system where reverse run of several times may result in trouble.
- If the result of auto-tuning of A-31 becomes [q-axis pulse magnetic pole decision] in the system where reverse run of several times may result in trouble, please consult us.

2—3. Setting Item b area (Selection of operation mode, operation sequence)

(1) Selection of HC(super block) function

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-00	Selection of HC(super block) function	0 : OFF(unused) 1 : ON(use)	—	OFF	—

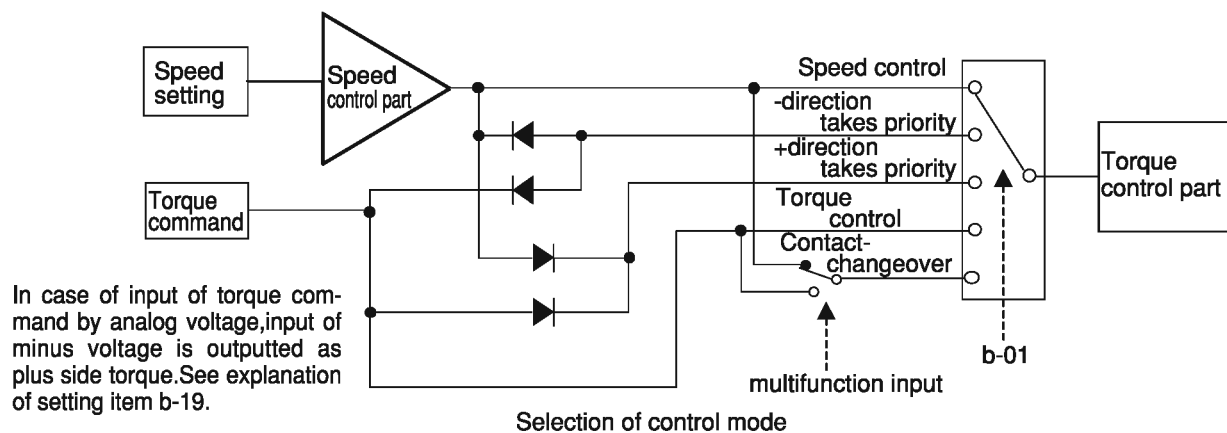
For using of super block function, setting should be ON. Usually, set at OFF.

For details of super block function, see individual Instruction of super block in [PC Tool Manual II] of separate issue. In [PC Tool Manual II], the case of use by VF64 is explained however, method of use of ED64sp is same with that of VF64. Please use this Manual, reading the VF64 as ED64sp instead.

(2) Selection of ontrl mode (speed control/ torque control)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-01	Selection of ontrl mode	0: Speed control mode (ASR) 1: -direction of torque command takes priority 2: +direction of torque command takes priority 3: Torque control mode (ATR) 4: Contact-changeover of speed/torque control	—	0	—

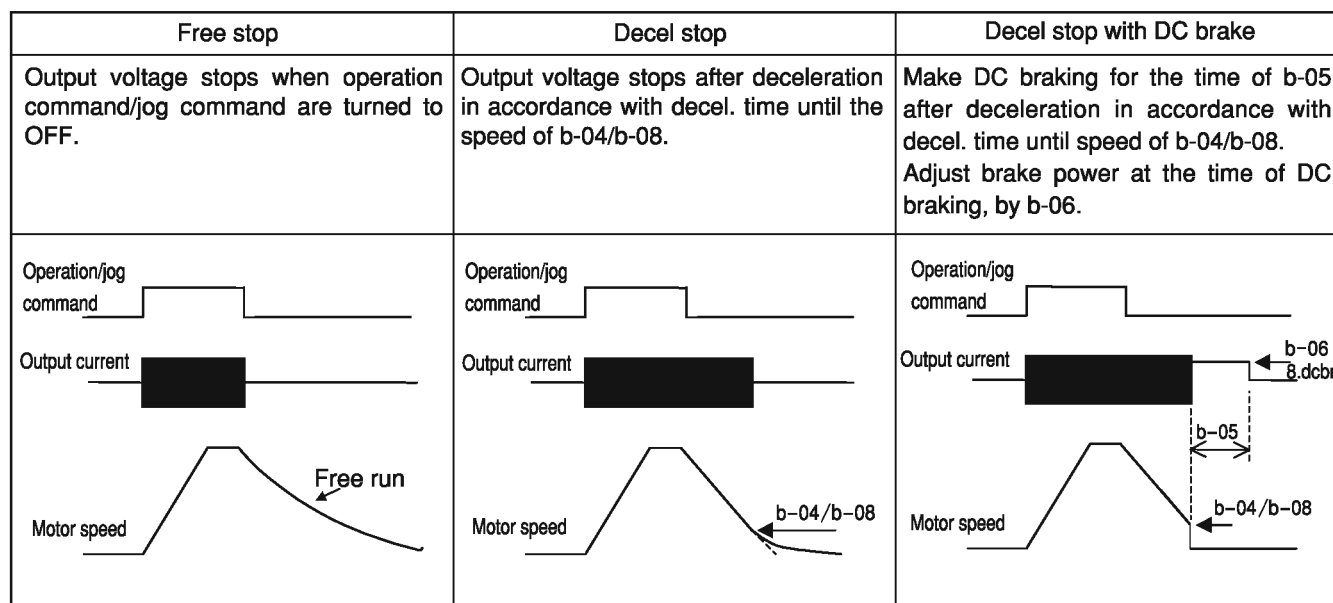
Select ontrl mode (speed control/ torque control/ priority). Combining with multifunction input, it is possible to changeover by external contact.



(3) Selection of stop mode

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-03	Stop mode selection	0: Free stop 1: Decel stop 2: Decel stop with DC brake	—	1	—
b-04	Stop speed	0~300	1	30	min ⁻¹
b-05	DC brake operating time	0.0~10.0	0.1	0.0	sec
b-06	DC brake gain	0.1~500.0	0.1	40.0(ED64S) 100.0(ED64P,V)	%
b-07	Jog stop mode selection	0: Free stop 1: Decel stop 2: Decel stop with DC brake	—	1	—
b-08	Jog time stop speed	0~300	1	30	min ⁻¹

Select activation in case of turning to OFF of operation command / jog command. (In case that b-01 is set at other point than 0(speed control), motor always becomes "Free Stop" regardless of these settings.



ED motor generates proportional voltage to the speed, even in the status of free run, by incorporated permanent magnet. In the area where generated voltage becomes larger than DC voltage of Inverter (during operation, etc. in the power constant area), control is continued and voltage is outputted continuously until the speed when generated voltage becomes smaller than DC voltage even though free stop was selected, for which pay attention. (In case of use of power constant area and when output voltage is required to break soon by turning off of operation, mount the output MC between motor - Inverter and arrange that MC to operate by 52MA relay of ED64sp.)

(4) Change of speed control gain at jog time

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-09	Speed control proportional gain (2)	3 ~ 100	1	15	—
b-10	Proportional gain selection at jog time	0: speed control proportional gain (1) 1: speed control proportional gain (2)	—	0	—

At jog time, it is possible to use different proportional gain (P gain) from that of ordinary operation. By selection by proportional gain selection (b-10) at jog time, speed control can be done by proportional gain of b-09 in lieu of proportional gain of basic setting item [7.ASrP] at jog time. (If b-10 is set at 2, Inverter turns to special mode for special application. Please do not set at 2 ordinary.)

(5) Setting of operation at re-starting after instantaneous power failure

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-11	Selection of re-starting after instantaneous power failure	0 : ON(USE) 1 : OFF(UNUSED)	—	OFF	—

If instantaneous power failure occurred, stop operation temporarily and after that, select transaction after re-supply of power. OFF: Even after re-supply of power, operation does not start (Inverter keeps stopping). For re-starting of operation, it is necessary to turn operation (jog) command to OFF once and to turn again to ON.

ON : After re-supply of power, operation re-starts automatically. However, operation command to Inverter is necessary to be held at ON in case that Inverter is operated by contact signal or command of digital option. (In case that operation command to Inverter is not recovered, being kept holding at ON even after passing of 10 sec. from operation stop and Inverter cannot be re-started, Start-stall (StrF) protection operates.)

(6) Setting of rev. run inhibition mode

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-12	Selection of reverse run inhibition mode	0: Ordinary 1: Inhibition of rotation to reverse direction against command 2: Inhibition of reverse rotation	—	0	—

Reverse run is inhibited.

1) Ordinary operation (b-12=0)

This is ordinary operation. There is no limit in both forward and reverse operation.

2) Inhibition of rotation to rev. direction against command (b-12=1)

Inhibit rotation to reverse direction against direction of operation command at the time of Inverter starting. (Once Inverter started, rotation to reverse direction against direction of command at the time of starting is inhibited until stop of Inverter. Even if forward run operation command and reverse run operation command are exchanged after starting, direction of rotation does not change unless Inverter is stopped)

	At the time of speed command		At the time of torque control
	In case that speed command input is +side	In case that speed command input is -side	
Starts by for. run operation	Operates to for. run	Limit to plus min. speed	Limit minus torque to 0 at rev. run side
Starts by rev. run operation	Limit to minus min. speed	Operates to rev. run	Limit plus torque to 0 at for. run side

3) Inhibition of reverse run (b-12=2)

Regardless of direction of operation command, inhibit operation to reverse run direction (when phase sequence of Inverter output voltage is U→V→W, direction of rotation is regarded as "forward run") of motor. Limit speed command of reverse run direction to plus min speed.

Note) When [Inhibition of operation to reverse direction against command] or [Inhibition of reverse run] is selected, there is a case of deterioration of speed control characteristics since torque of reverse direction is limited in the area of low speed. In such case, select [(ordinary)]

(7) Setting of regeneration stall prevention function

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-13	selection of regeneration stall prevention function	0 : OFF 1 : ON	—	OFF	—

In case that DC voltage increased exceeding [DB operation level (F-00) + 5V (10V in case of 400V)], trip by actuation of over-voltage protection (OV) is prevented by limiting the torque command of regeneration side (-direction at the time of forward run and +direction at the time of reverse run) to 0 (by stopping of deceleration once if during deceleration).

(8) Selection of sequence (PLC) function

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-14	Selection of sequence (PLC) function	0 : OFF 1 : ON	—	OFF	—

Select use of sequence (PLC) function incorporated in ED64sp Inverter.

As to details of sequence function, see Manual of [Sequence Editor].

(9) Selection of input positions of speed, operation, jog command

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-15	Selection of setting position at interlocking	0: terminal block 1: Console (SET64) 2: Digital communication option	—	1	—
b-16	Selection of speed command input position	0: Interlocking 1: Terminal block 2: Console (SET64) 3: Digital communication option 4: Isolated analog input option 5:BCD input option	—	0	—
b-17	Selection of operation command input position	0: Interlocking 1: Terminal block 2: Console (SET64) 3: Digital communication option	—	0	—
b-18	Selection of jog command input position		—	0	—

Select operating positions of speed , and jog command. These input positions can also be set en bloc by setting of b-15. Input operating position of each command by combination of settings of b-15~b-18 are as per Table of next.

		Selection of setting positions at interlocking (b-15)		
		0: Terminal block	1: Console	2: Digital communication option
Speed command (b-16 setting)	0: Interlocking	VFC64TB-P.C.Board [0~±10] or [4-20] terminal	Console [0.SrEF] setting [0.FrEF]setting	Speed command by communication
	1: Terminal block	VFC64TB-P.C.Board [0~±10] or [4-20] terminal	VFC64TB-P.C.Board [0~±10] or [4-20] terminal	VFC64TB-P.C.Board [0~±10] or [4-20] terminal
	2: Console(SET64)	Console [0.SrEF] setting	Console [0.SrEF] setting	Console [0.SrEF] setting
	3: Digital communication option	Command by communication	Command by communication	Command by communication
	4: Isolated analoginput	ISO64, IO64 option	ISO64, IO64 option	ISO64, IO64 option
Operation command (b-17 setting)	0: Interlocking	VFC64 P.C.Board [ST-F],[ST-R] terminal	Console [START], [FOR/REV] key	Operation command by communication
	1: Terminal block	VFC64 P.C.Board [ST-F],[ST-R] terminal	VFC64 P.C.Board [ST-F],[ST-R] terminal	VFC64 P.C.Board [ST-F],[ST-R] terminal
	2: Console(SET64)	Console [START],[FOR/REV]key	Console [START],[FOR/REV]key	Console [START],[FOR/REV]key
	3: Digital communication option	Operation command by communication	Operation command by communication	Operation command by communication
Jog command (b-18 setting)	0: Interlocking	VFC64 P.C.Board [JOG-F],[JOG-R] terminal	Console [JOG],[FOR/REV] key	Jog command by communication
	1: Terminal block	VFC64 P.C.Board [JOG-F],[JOG-R] terminal	VFC64 P.C.Board [JOG-F],[JOG-R] terminal	VFC64 P.C.Board [JOG-F],[JOG-R] terminal
	2: Console(SET64)	Console [JOG],[FOR/REV] key	Console [JOG],[FOR/REV] key	Console [JOG],[FOR/REV] key
	3: Digital communication option	Jog command by communication	Jog command by communication	Jog command by communication

• In case that speed command is inputted from terminal block, changeover of [0~±10] terminal block (0~±10V voltage input or 0~+10V voltage input) and [4-20] terminal block (4~20mA current input) is performed by G-02 setting. (By default, [0~±10](0~+10V voltage input) is selected)

• In case that super block function use selection (b-00) is set at ON, speed command is outputted from super block function, regardless of this selection.

• In case that sequence function use selection (b-14) is set at ON, operation/jog command is outputted from sequence function, regardless of this setting.

(10) Selection of torque command input position

	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-19	Selection of torque command input position	0: Terminal block 1: Analog option 2: Digital communication option	—	1	—

Select setting position of torque command at the time of torque control mode.

Terminal block : Input from VFC64TB-P.C.Board [0-±10] terminal.

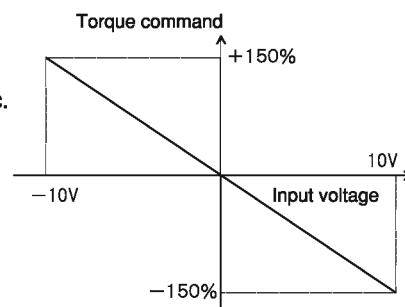
Analog option : Input from terminal of ISO64/IO64 option.

Digital communication option

: Torque command by communication of RSH64, DNET64, etc.

Torque command characteristic in case of input from terminal block and analog option is as per Fig. right.

Note) Since detection speed of VFC64TB-P.C.Board[0-±10] terminal input is a bit slow (1ms each), use analog option in case of use in application which requires high speed response.



Torque command input characteristic

(11) Free start max. speed (ED64P mode, ED64V mode only)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-20	Free start max. speed	100~150	1	100	%

Set the max. speed, by which the start from free run can be done, by % to the motor rated speed A-05. (This item cannot be set in the time of ED64S mode.)

Note) Since ED motor incorporates permanent magnet, it generates voltage even during free run. In case that motor is making free run at higher speed than motor rated speed A-05, generated electromotive voltage of motor may exceed sometimes DC voltage of Inverter, depending on the power source voltage and motor, and if motor is started from free run in this status, motor will be out of control and it could result in protective operation of Inverter. Therefore, this setting is to be 100% ordinary and Inverter is limited not to make free start at more than A-05 setting.

(12) Max. output voltage of Inverter

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
b-21	Inverter max: output voltage	80~200	1	100	%

Limit the output voltage of Inverter. Set % to motor rated voltage A-03. In case that output voltage exceeds the setting of b-21 by increase of motor speed and consequential electromotive force by permanent magnet in ED motor inside, execute weak flux and limit the output voltage.

2—4. Setting item c area (Relatives of multifunction input/output)

(1) Multifunction input

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
c-00	Multifunction input position selection	0: Terminal block 1: Digital communication option	—	0	—
c-01	Multifunction input terminal (1) function selection	0: Preset speed command selection 1 1: Preset speed command selection 2	—	0	—
c-02	Multifunction input terminal (2) function selection	2: Preset speed command selection 3 3: Accel/decel time selection 1	—	1	—
c-03	Multifunction input terminal (3) function selection	4: Accel/decel time selection 2 5: Speed UP command (MRH mode)	—	3	—
c-04	Multifunction input terminal (4) function selection	6: Speed DOWN command (MRH mode) 7: Speed hold	—	4	—
c-05	Multifunction input terminal (5) function selection	8: S pattern accel/decel inhibition 9: Max. speed reduction	—	7	—
c-06	Multifunction input terminal (6) function selection	10: Droop control inactive 11: Torque control selection	—	13	—
		12: For/Rev changeover command 13: DC brake command 14: — 15: External failure signal 1 (protective operation relay 86A active) 16: External failure signal 2 (protective operation relay 86A active) 17: External failure signal 3 (protective operation relay 86A active) 18: External failure signal 4 (protective operation relay 86A active) 19: External failure signal 1 (protective operation relay 86A inactive) 20: External failure signal 2 (protective operation relay 86A inactive) 21: External failure signal 3 (protective operation relay 86A inactive) 22: External failure signal 4 (protective relay 86A inactive) 23: Trace back external trigger 24: 2nd motor selection 25: Emergency stop (B contact) 26: Programed operation advance 27: Speed command terminal block selection			

Set input signal to multifunction input.

If c-00 is set at 1, bit signal input from digital communication option is selected for input signal to each function of following multifunction input. If c-00 is set at 0, multifunction input terminals (1)~(6) ([MI1]~[MI6] terminal blocks) on VFC64TB-P.C.Board are set as input signal terminal blocks to each function of multifunction input to be set by c-01~c-06. (input of function which is not selected on any terminal block is regarded as OFF)

Note) However, in case that sequence function use selection (b-14) is set at ON, aforesaid setting is disregarded and terminal blocks (1)~(6) ([MI1]~[MI6] terminal blocks) on VFC64TB-P.C.Board become input terminals to sequence function. At this time, each function of following multifunction input is controlled by output of sequence function.

Multifunction input items

items	Explanation of function																																						
Preset speed command selection	By use of 3 inputs of preset speed command selections 1~3, it is possible to operate, selecting speed setting of preset speed command 1~7. (Preset speed and programed operation speed are common. However, preset speed command 8 is for programed operation only and cannot be used for preset) <table><tr><th>Preset speed selection 3</th><th>Preset speed selection 2</th><th>Preset speed selection 1</th><th>Speed command</th></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>as per standard selection(preset is not used)</td></tr><tr><td>OFF</td><td>OFF</td><td>ON</td><td>H-00 (preset speed command 1)</td></tr><tr><td>OFF</td><td>ON</td><td>OFF</td><td>H-01 (preset speed command 2)</td></tr><tr><td>OFF</td><td>ON</td><td>ON</td><td>H-02 (preset speed command 3)</td></tr><tr><td>ON</td><td>OFF</td><td>OFF</td><td>H-03 (preset speed command 4)</td></tr><tr><td>ON</td><td>OFF</td><td>ON</td><td>H-04 (preset speed command 5)</td></tr><tr><td>ON</td><td>ON</td><td>OFF</td><td>H-05 (preset speed command 6)</td></tr><tr><td>ON</td><td>ON</td><td>ON</td><td>H-06 (preset speed command 7)</td></tr></table>			Preset speed selection 3	Preset speed selection 2	Preset speed selection 1	Speed command	OFF	OFF	OFF	as per standard selection(preset is not used)	OFF	OFF	ON	H-00 (preset speed command 1)	OFF	ON	OFF	H-01 (preset speed command 2)	OFF	ON	ON	H-02 (preset speed command 3)	ON	OFF	OFF	H-03 (preset speed command 4)	ON	OFF	ON	H-04 (preset speed command 5)	ON	ON	OFF	H-05 (preset speed command 6)	ON	ON	ON	H-06 (preset speed command 7)
Preset speed selection 3	Preset speed selection 2	Preset speed selection 1	Speed command																																				
OFF	OFF	OFF	as per standard selection(preset is not used)																																				
OFF	OFF	ON	H-00 (preset speed command 1)																																				
OFF	ON	OFF	H-01 (preset speed command 2)																																				
OFF	ON	ON	H-02 (preset speed command 3)																																				
ON	OFF	OFF	H-03 (preset speed command 4)																																				
ON	OFF	ON	H-04 (preset speed command 5)																																				
ON	ON	OFF	H-05 (preset speed command 6)																																				
ON	ON	ON	H-06 (preset speed command 7)																																				
Accel/decel time selection	By use of input of accel/decel time selection 1~2, it is possible to changeover accel/decel time during operation. (In case of use of S pattern accel/decel, it is necessary to set d-06(S pattern accel/decel use selection) at ON) <table><tr><th>Accel/decel time selection 2</th><th>Accel/decel time selection 1</th><th>Accel/decel time to be selected (including S pattern accel/decel)</th></tr><tr><td>OFF</td><td>OFF</td><td>Standard (accel/decel time selected by d-00)</td></tr><tr><td>OFF</td><td>ON</td><td>Accel/decel time(2)(5.Acc2, 6.dEc2 and d-11~14)</td></tr><tr><td>ON</td><td>OFF</td><td>Accel/decel time(3)(d-02, d-03 (no S pattern accel/decel))</td></tr><tr><td>ON</td><td>ON</td><td>Accel/decel time(4)(d-04, d-05 (no S pattern accel/decel))</td></tr></table>			Accel/decel time selection 2	Accel/decel time selection 1	Accel/decel time to be selected (including S pattern accel/decel)	OFF	OFF	Standard (accel/decel time selected by d-00)	OFF	ON	Accel/decel time(2)(5.Acc2, 6.dEc2 and d-11~14)	ON	OFF	Accel/decel time(3)(d-02, d-03 (no S pattern accel/decel))	ON	ON	Accel/decel time(4)(d-04, d-05 (no S pattern accel/decel))																					
Accel/decel time selection 2	Accel/decel time selection 1	Accel/decel time to be selected (including S pattern accel/decel)																																					
OFF	OFF	Standard (accel/decel time selected by d-00)																																					
OFF	ON	Accel/decel time(2)(5.Acc2, 6.dEc2 and d-11~14)																																					
ON	OFF	Accel/decel time(3)(d-02, d-03 (no S pattern accel/decel))																																					
ON	ON	Accel/decel time(4)(d-04, d-05 (no S pattern accel/decel))																																					
Speed UP/DOWN command (MRH mode)	Turn d-23 (MRH function use selection) to ON and by selection of terminal block at speed command position by b-15 and b-16, it becomes possible to accel/decel the speed by Speed UP/DOWN Command. (However, speed is limited at d-24 and d-25 (MRH upper, lower limit speeds). In case that speed exceeded upper/lower limit, Inverter accelerates/decelerates to upper/lower limit automatically without UP/DOWN command. By setting the minus value at lower limit speed, it becomes possible to execute for/rev operation also)																																						
Speed hold	When this signal is turned to ON during accel/decel of Inverter, it suspends accel/decel once and holds the speed at that time. If that signal is turned to OFF, accel/decel is restarted. (However, "hold" is ineffective during decel stop by stop command)																																						
S pattern accel/decel inhibition	Even in case that S pattern accel/decel operation is performed turning d-06 (use selection of S pattern accel/decel) to ON, S pattern accel/decel can be inhibited forcibly and be changed to ordinary accel/decel by turning this signal to ON.																																						

items	Explanation of function	
Max. speed reduction	In case that terminal block is selected at speed command setting position, speed command is reduced based on setting of c-17 (max. speed reduction rate) by turning of this signal to ON as shown in Fig, right. This signal changes over ON/OFF during stop of Inverter. Even if Inverter is tried to change over during operation, it is not performed until operation stop once. (This function is effective for analog input only from terminal block)	The graph illustrates the relationship between speed setting and motor speed during maximum speed reduction. The y-axis is 'Motor speed' and the x-axis is 'Speed setting'. A solid line shows the speed reduction curve, which is limited by 'G-03 upper limit of analog setting'. A dashed line represents the 'C-17 reduction rate %'. A vertical dashed line at '10V' on the x-axis indicates the 'ON time of max. speed reduction'.
Droop control inactive	Even though i-00 (droop function use selection) was turned to ON, droop control is inactive if this signal is turned to ON. (as to droop control, see item of Setting Item i)	
Torque control selection	When b-01 (control mode selection) is set at 4 (contact changeover of speed/torque control), speed control and torque control can be changed over by this signal. Speed control by OFF and torque control by ON. (See item of Setting Item b)	
Rev. run operation command	If this signal is turned to ON, For/Rev run of operation/jog command is changed over. (For. run → Rev. run, Rev. run → For. run)	
DC brake command	If this signal is turned to ON, it becomes DC brake which flows DC current to motor. The brake at this time can be adjusted by b-06(DC brake gain) After passing of time set by b-05 (DC brake time) from turning to OFF of this signal, Inverter stops. In case of simultaneous input of operation/jog command, and DC brake command, operation/jog command takes priority.	
External failure signal (protective operation relay 86A active)	By inputting of failure signal of peripheral devices, Inverter can be stopped for protection. When signal of external failure signals 1~4 is turned to ON, Inverter breaks output and turns protection operation relay (86A) to ON. At the same time, [EF1]~[EF4] are displayed on console. Also, trace back is triggered by this signal. For releasing of trouble, reset protective operation relay. (See setting item F)	
External failure signal (protective operation relay 86A inactive)	Same as above but protective relay (86A) is inactive and trace back is not triggered by this signal. In this case, trouble is released automatically if all of each command of operation/jog/DC brake of Inverter are turned to OFF.	
Trace back external trigger	Ordinary, trace back triggers at the times of failure and protective operation. However, it can be triggered forcibly by input of this signal. (See setting item F)	
2nd motor selection	If this signal is turned to ON, keeping L-00 (2nd motor use selection) at ON, each parameter of 2nd motor of Setting Item L is used instead of parameter of motor set at Setting Item A. As to details of 2nd motor at the time of use, see item of Setting Item L.	
Emergency stop (B contact)	This is emergency stop signal of B contact input. It turns to emergency stop by contact-open. (Therefore, if this function is set at any terminal block, Inverter cannot be operated owing to emergency stop unless contact is closed)	
Programed operation advance	If this signal is turned to ON during programed operation, operation is proceeded to next step forcedly although programed time has not passed yet. As to programed operation, see Setting Item H.	
Selection of speed command terminal block	If this signal is turned to ON, speed command input position is designated to terminal block (VFC64TB[0~±10] or [4~20] terminal) forcedly, regardless of setting of b-15, b-16 (speed command input position selection). At the time of simultaneous input with preset speed command selection, this signal takes priority.	

(2) Multifunction output

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
c-07	Multifunction output terminal (1) function selection	0: Programed operation end	—	7	—
c-08	Multifunction output terminal (2) function selection	1: Speed detection (1) (speed = detection setting)	—	1	—
c-09	Multifunction output terminal (3) function selection	2: Speed detection (1)(speed >=detection setting)	—	0	—
c-10	Multifunction output terminal (4) function selection	3: Speed detection (1)(speed <=detection setting)	—	8	—
		4: Speed detection (2)(speed = detection setting)			
		5: Speed detection (2)(speed >=detection setting)			
		6: Speed detection (2)(speed <=detection setting)			
		7: Setting-reach			
		8: Torque detection			
		9: Absolute value torque detection			
		10: During power failure			
		11: Overload pre-alarm			
		12: During retry			
		13: During reverse run			
		14: Protective operation code			
		15: Sum check error			

Multifunction output terminals (1)~(4) ([M01]~[M04] terminal blocks) on VFC64TB-P.C.Board are set as output terminal blocks of each function of multifunction output to be set by c-07~c-10, respectively (each terminal block of [M01]~[M04] is open collector output).

Note) However, in case that sequence function use selection (b-14) is set at ON, above setting is disregarded and multifunction output terminals (1)~(4) blocks [M01]~[M04] on VFC64TB-P.C.Board become output terminal from sequence function. Also, output of each function of following multifunction output can be used as input to sequence function.

Multifunction output item

Item	Explanation of function ("Top" in Fig. shows A-00 max. speed)
Programed operation end	When final stage at the time of programed operation ends, this signal outputs. (One-Time mode) After end, outputs until disconnection of operation command. Programed operation (One-Time mode) (End-Less mode) Outputs 500ms when one round ends. Programed operation (End-Less mode)

Item	Account function("Top" in Fig. shows A-00 max. speed)
Speed detection (1)(2) (Speed =detection setting)	Turn output to ON when motor speed coincides with c-11, c-12 settings within width of $\pm C-13$. Output has hysteresis width of 0.2% of max. speed. Speed detection (1) output Speed detection (2) output c-11 detection speed (1) Hysteresis width 0.2%/Top c-12 detection speed (2) c-13 speed detection range Motor speed
Speed detection (1)(2) (Speed >=detection setting)	Turn output to ON when motor speed becomes higher than c-11, c-12 settings. (Speed is detected not by absolute value but by "with code".) Speed detection (1) output Speed detection (2) output c-11 detection speed (1) Hysteresis width 0.1%/Top c-12 detection speed (2) Motor speed
Speed detection (1)(2) (Speed <=detection setting)	Turn output to ON when motor speed becomes lower than c-11, c-12 settings. (Speed is detected not by absolute value but by "with code".) Speed detection (1) output Speed detection (2) output c-11 detection speed (1) Hysteresis width 0.1%/Top c-12 detection speed (2) Motor speed
Setting-reach	Turn output to ON when motor speed reaches $\pm 0.1\%$ of speed command value. Start command Setting-reach output Speed command 0.1%/Top 0.4%/Top Speed setting Motor speed
Torque detection	Turn output to ON when torque command becomes larger than setting of c-14. Torque detection output c-14 detection torque setting Output torque

Item	Explanation of function("Top" in Fig. shows A-00 max. speed)																																																																																																																																																																									
Absolute value torque detection	Turn output to ON when absolute value of torque command becomes larger than setting of c-15.																																																																																																																																																																									
During power failure	Turn output to ON when DC part voltage becomes smaller than 180V (360V in case of 400V class) and to OFF when it becomes larger than 200V (400V in case of 400V class). (However, turn output to OFF when power of control P.C.Board is lost)																																																																																																																																																																									
Overload pre-alarm	Turn output to ON when overload counter, which starts counting in the beginning of overload and actuates overload or overtorque protective operation at 100% load, exceeds the level set by c-16 (overload pre-alarm operation level). (For example, when c-16 is set at 50% in case that overcurrent protection actuates by 150% current 60 sec. and in case that output current is 150% as per Fig. right, output turns to ON at 30 sec., which is 50% of 60 sec., by which overload protection actuates)																																																																																																																																																																									
During retry	Turn output to ON for 10 sec. after retry from protective operation. As to "retry from protective operation", see item of Setting Item F.																																																																																																																																																																									
During rev. run	Turn to ON during reverse run of motor. (There is a hysteresis of 12r/min (ED64S mode) or 1.8 r/min (ED64P mode,ED64V mode) near 0 speed for prevention of chattering.																																																																																																																																																																									
Protective operation code	When trouble occurred and protection actuates, code of actuated protection is outputted using 4 multifunction output terminals. (For this function, it is necessary to set [protective operation code] to all terminals (MO1~MO4) of 4 multifunction outputs, different from other functions) Table of output code <table><tr><th>Content</th><th>MO1</th><th>MO2</th><th>MO3</th><th>MO4</th><th>Content</th><th>MO1</th><th>MO2</th><th>MO3</th><th>MO4</th></tr><tr><td>Overcurrent protection</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>Speed control error</td><td>ON</td><td>ON</td><td>ON</td><td>OFF</td></tr><tr><td>IGBT protective operation</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>Motor overheat</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td></tr><tr><td>IGBTU protective operation</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>Parallel slave unit abnormal</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td></tr><tr><td>IGBTV protective operation</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>FCL protective operation</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td></tr><tr><td>IGBTW protective operation</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>Setting error 0</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>Overvoltage of DC part</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>Setting error 1</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>Overload</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>Setting error 2</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>DC fuse blown</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>Setting error 3</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>Start stall</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>PG (phase) error</td><td>ON</td><td>ON</td><td>ON</td><td>OFF</td></tr><tr><td>Overspeed protection</td><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td>Sensorless start error</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td></tr><tr><td>(Power failure)</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>External failure 1</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr><tr><td>Overtorque protection</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>External failure 2</td><td>ON</td><td>OFF</td><td>ON</td><td>ON</td></tr><tr><td>Unit Overheat</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>External failure 3</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td></tr><tr><td>Option error</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>External failure 4</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr><tr><td>Communication timeout error</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td></td><td></td><td></td><td></td><td></td></tr></table>										Content	MO1	MO2	MO3	MO4	Content	MO1	MO2	MO3	MO4	Overcurrent protection	ON	OFF	OFF	OFF	Speed control error	ON	ON	ON	OFF	IGBT protective operation	OFF	ON	OFF	OFF	Motor overheat	OFF	OFF	ON	OFF	IGBTU protective operation	OFF	ON	OFF	OFF	Parallel slave unit abnormal	OFF	ON	OFF	OFF	IGBTV protective operation	OFF	ON	OFF	OFF	FCL protective operation	OFF	OFF	ON	OFF	IGBTW protective operation	OFF	ON	OFF	OFF	Setting error 0	ON	ON	OFF	ON	Overvoltage of DC part	ON	ON	OFF	OFF	Setting error 1	ON	ON	OFF	ON	Overload	OFF	OFF	ON	OFF	Setting error 2	ON	ON	OFF	ON	DC fuse blown	ON	OFF	ON	OFF	Setting error 3	ON	ON	OFF	ON	Start stall	OFF	ON	ON	OFF	PG (phase) error	ON	ON	ON	OFF	Overspeed protection	ON	ON	ON	OFF	Sensorless start error	OFF	ON	ON	OFF	(Power failure)	OFF	ON	OFF	ON	External failure 1	OFF	OFF	ON	ON	Overtorque 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					
Content	MO1	MO2	MO3	MO4	Content	MO1	MO2	MO3	MO4																																																																																																																																																																	
Overcurrent protection	ON	OFF	OFF	OFF	Speed control error	ON	ON	ON	OFF																																																																																																																																																																	
IGBT protective operation	OFF	ON	OFF	OFF	Motor overheat	OFF	OFF	ON	OFF																																																																																																																																																																	
IGBTU protective operation	OFF	ON	OFF	OFF	Parallel slave unit abnormal	OFF	ON	OFF	OFF																																																																																																																																																																	
IGBTV protective operation	OFF	ON	OFF	OFF	FCL protective operation	OFF	OFF	ON	OFF																																																																																																																																																																	
IGBTW protective operation	OFF	ON	OFF	OFF	Setting error 0	ON	ON	OFF	ON																																																																																																																																																																	
Overvoltage of DC part	ON	ON	OFF	OFF	Setting error 1	ON	ON	OFF	ON																																																																																																																																																																	
Overload	OFF	OFF	ON	OFF	Setting error 2	ON	ON	OFF	ON																																																																																																																																																																	
DC fuse blown	ON	OFF	ON	OFF	Setting error 3	ON	ON	OFF	ON																																																																																																																																																																	
Start stall	OFF	ON	ON	OFF	PG (phase) error	ON	ON	ON	OFF																																																																																																																																																																	
Overspeed protection	ON	ON	ON	OFF	Sensorless start error	OFF	ON	ON	OFF																																																																																																																																																																	
(Power failure)	OFF	ON	OFF	ON	External failure 1	OFF	OFF	ON	ON																																																																																																																																																																	
Overtorque 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																																																																																																																																																																						

(3) Each setting data of multifunction input/output

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
c-11	Detection speed (1)	–max. speed~+max. speed	1	0	min ⁻¹
c-12	Detection speed (2)	–max. speed~+max. speed	1	0	min ⁻¹
c-13	Speed detection range	0~600	1	0	min ⁻¹
c-14	Detection torque command (with polarity)	–205~205	1	0	%
c-15	Detection torque command (absolute value)	0~205	1	0	%
c-16	Overload pre-alarm operation level setting	0~100	1	50	%
c-17	Max. speed command reduction rate	50.0~100.0	0.1	90.0	%

The above are setting data to be used in each multifunction input/output. As to details of function, see items of multifunction input, multifunction output.

2–5. Setting Item d area (Accel/decel setting, Speed jump function, MRH function)

(1) Selection, setting of accel/decel times

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
d-00	Accel/decel time selection	0: accel/decel time 1 1: accel/decel time 2	—	0	—
d-01	Jog operation accel/decel time selection	2: accel/decel time 3 3: accel/decel time 4	—	1	—
d-02	Accel. time 3	0.1 ~ 3600.0	0.1	30.0	sec
d-03	Decel. time 3	0.1 ~ 3600.0	0.1	30.0	sec
d-04	Accel. time 4	0.1 ~ 3600.0	0.1	30.0	sec
d-05	Decel. time 4	0.1 ~ 3600.0	0.1	30.0	sec
d-06	S pattern accel/decel use selection	0 : OFF(unused) 1 : ON(use)	—	OFF	—
d-07	S pattern rise time-1	0.0~60.0	0.1	0.1	sec
d-08	S pattern accel. reach time-1	0.0~60.0	0.1	0.1	sec
d-09	S pattern fall time-1	0.0~60.0	0.1	0.1	sec
d-10	S pattern decel. reach time-1	0.0~60.0	0.1	0.1	sec
d-11	S pattern rise time-2	0.0~60.0	0.1	0.1	sec
d-12	S pattern accel. reach time-2	0.0~60.0	0.1	0.1	sec
d-13	S pattern fall time-2	0.0~60.0	0.1	0.1	sec
d-14	S pattern decel. reach time-2	0.0~60.0	0.1	0.1	sec

By d-00 and d-01, select accel/decel time settings which are used in ordinary operation and jog operation, respectively. Accel/decel time settings of ordinary operation can be changed by multifunction input also. This setting becomes ineffective at the time of programmed operation. See items of Setting Item c (multifunction input) and Setting Item H (programed operation).

Each time of accel/decel to be selected

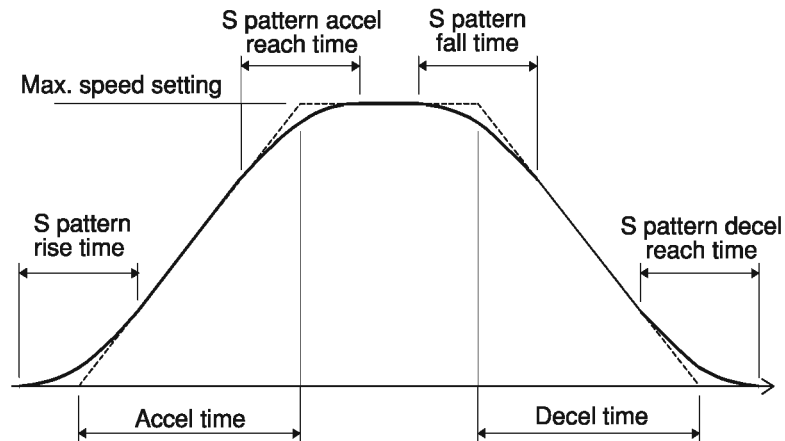
Selection by d-01, d-02 setting or by multifunction input	Accel time	Decel time	S pattern rise time	S pattern accel. reach time	S pattern fall time	S pattern decel. reach time
0: Accel/decel time 1	3.Acc1	4.dEc1	d-07	d-08	d-09	d-10
1: Accel/decel time 2	5.Acc2	6.dEc2	d-11	d-12	d-13	d-14
2: Accel/decel 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 basic setting items.

• When accel/decel times 3, 4 were selected, all of S pattern accel/decel times become 0.0.

As shown in accel/decel time chart (S pattern accel/decel) of Fig. below, each accel/decel time setting is accel/decel time and S pattern curving time between 0 ⇔ max. speed setting.

When S pattern accel/decel function is used, d-06 (S pattern accel/decel use selection) is necessary to be turned to ON. If OFF is kept, S pattern accel/decel is not realized in spite of each time setting of S pattern accel/decel is set, for which please pay attention.



Time chart of accel/decel (S pattern accel/decel)

(2) Speed deviation limit function at accel/decel times

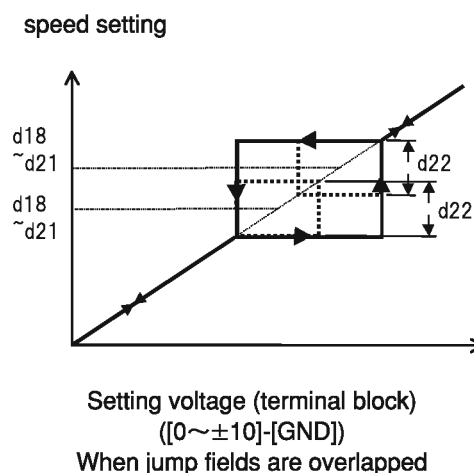
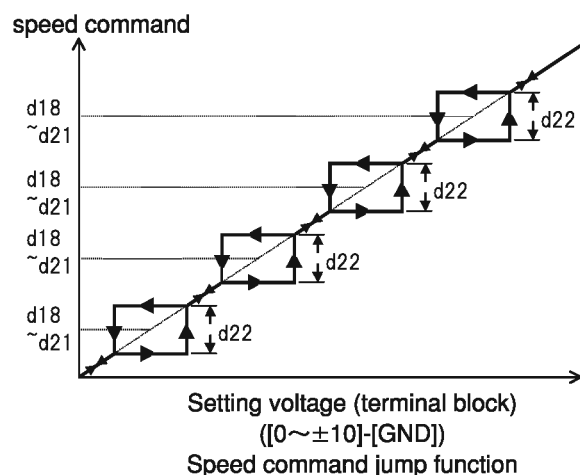
Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
d-15	Selection of speed deviation limit command	0 : OFF (unused) 1 : ON (use)	—	OFF	—
d-16	+direction deviation max. value	0.0~100.0	0.1	5.0	%
d-17	-direction deviation max. value	-100.0~0.0	0.1	-5.0	%

If d-15 is turned to ON, motor speed and output of accel/decel control is limited to deviation of d-16 (plus side) and d-17 (minus side). By this function, rapid acceleration caused by sudden change of load and supply voltage is prevented in cases that the load is lightened suddenly in the status of reduced speed owing to coming up to the torque limit during speed control operation, and speed can be reset by inclination to be set by accel/decel time. (If deviation is made too small, accel/decel is limited, for which please pay attention.)

(3) Speed command jump function

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
d-18	Jump (1) speed	0~max. speed	1	0	min ⁻¹
d-19	Jump (2) speed	0~max. speed	1	0	min ⁻¹
d-20	Jump (3) speed	0~max. speed	1	0	min ⁻¹
d-21	Jump (4) speed	0~max. speed	1	0	min ⁻¹
d-22	Jump speed range	0~300	1	0	min ⁻¹

Speed command can be jumped in order to avoid resonance point speed of load machine. At the jump point, make speed command jump like hysteresis shape as per Fig. below. As the object to be jumped is speed command to input to accel/decel control, it passes in jump width by inclination by accel/decel time setting during acceleration/deceleration.



(4) MRH (accel/decel by contact) mode

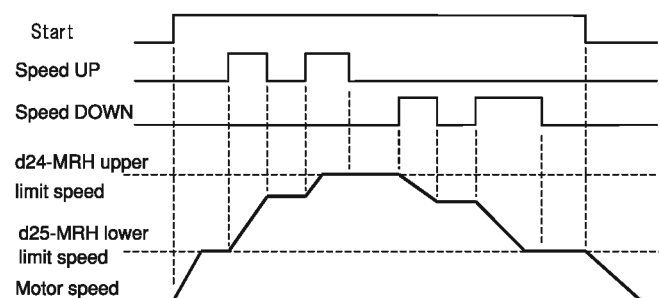
Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
d-23	MRH function selection	0 : OFF (unused) 1 : ON (use)	—	OFF	—
d-24	MRH upper limit speed	MRH lower limit speed (d-25) ~max. speed	1	300	min ⁻¹
d-25	MRH lower limit speed	— max. speed ~MRH upper limit speed (d-24)	1	0	min ⁻¹

If d-23 is turned to ON, accel/decel control by contact can be done (MRH mode). At this time and by settings of b-15 and b-16, Up/Down of speed can be carried out by multifunction input contact if operation command input selection position is terminal block, and by console keys ↑, ↓ if that position is console.

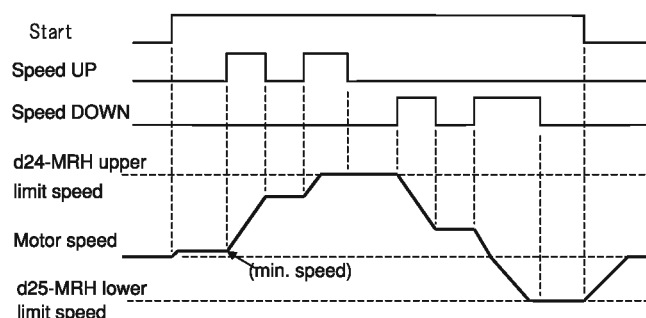
Speed is accelerated/decelerated to d-24 (MRH upper limit speed) by UP command input and to d-25 (MRH lower limit speed) by DOWN command input.

In case of no input command of both UP, DOWN and of input command of both UP, DOWN, speed at that time is maintained. However, if speed is not in the range between settings of d-24 and d-25, speed accelerates/decelerates up to d-24 or d-25 automatically.

By inputting of minus value to d-25 (MRH lower limit speed), for/rev operation by contact is possible.



When setting of MRH lower limit speed is plus



When setting of MRH lower limit speed is minus

Note) When signals of multifunction input preset speed command selection, speed command terminal block selection are inputted during selection of MRH mode, speed command of each multifunction input preset speed command, speed command terminal block takes priority.

2-6. Setting Item E (Relatives of torque limit, torque command characteristics, speed control, vector control)

(1) Torque limiter

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
E-00	For. run powering torque limit value	0~150 (Note)	1	150	%
E-01	For. run regeneration torque limit value	-150~0 (Note)	1	-150	%
E-02	Rev. run powering torque limit value	-150~0 (Note)	1	-150	%
E-03	Rev. run regeneration torque limit value	0~150 (Note)	1	150	%

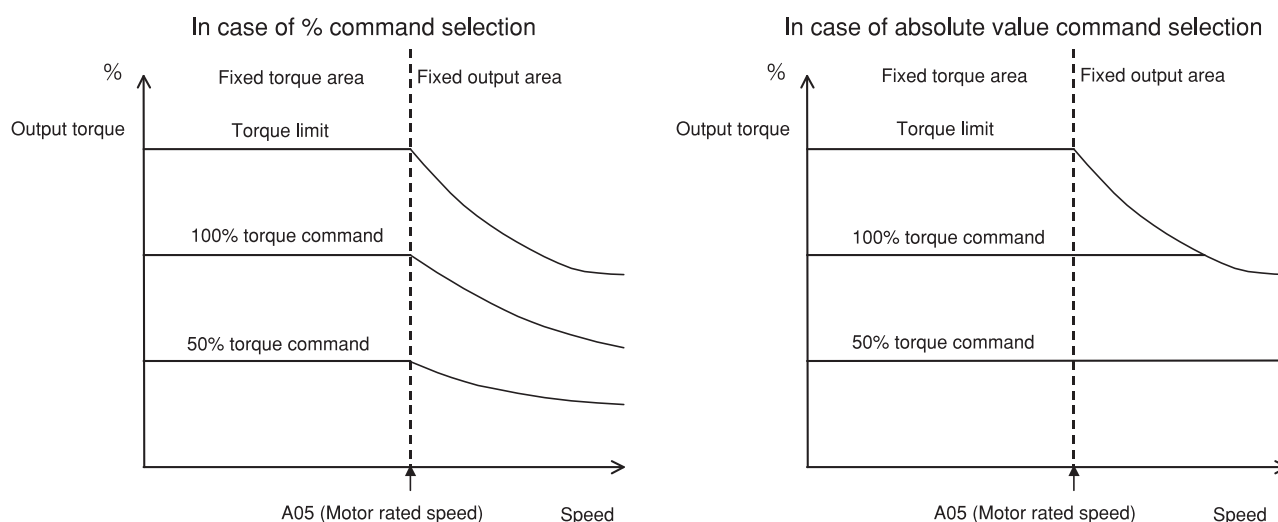
Torque limit can be set at powering and regeneration sides for both forward run and reverse run. When torque command exceeds these settings, torque is limited to these setting values.

Note) Max.(min.) value of setting range varies in range of until max.(min.) 200(-200), depending on the rated current of motor to be used. In case of use of motor, of which capacity coincides with Inverter capacity, setting range should be until 150%(-150%) ordinary.

(2) Torque command mode selection

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
E-05	Torque command mode selection	0: % command 1: absolute value command	—	0	—

Select characteristics of torque command in the area of fixed output area.



- Even if torque command is constant, output torque lowers, being inversely proportional to the speed, in order to make the output constant in the constant output area.
- Even in constant output area, output torque is constant if command is constant. (Torque limiter lowers for making the constant output.)

(3) Speed control (ASR) selection

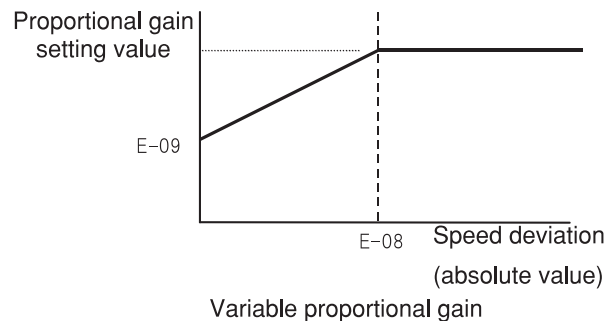
Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
E-06	ASR cancelation selection	0 : OFF (unused) 1 : ON (use)	—	ON	—
E-07	ASR feedforward selection	0 : OFF (unused) 1 : ON (use)	—	ON	—

In ED64sp Inverter, robust speed control (MFC control) is structured combining cancelation using disturbance observer and feedforward. These cancelation and feedforward can be turned to OFF individually. (If both of them are turned to OFF, that will be equal to conventional PI control) (See item of Basic Setting Item, Speed control gain)

(4) Adjustment of variable proportional gain

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
E-08	Variable proportional gain variation start speed	0.01~100.00	0.01	5.00(ED64S) 0.01(ED64P,V)	%
E-09	Variable proportional gain min. gain ratio	0~100	1	20(ED64S) 100(ED64P,V)	%

Adjust variable proportional gain, which varies proportional gain depending on the largeness of deviation between speed command and motor speed.



(5) Current control gain adjustment

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
E-10	d-axis current control P gain	0.0~3276.7	0.1	80.0	—
E-11	d-axis current control I gain	0.0~3276.7	0.1	15.0	—
E-12	q-axis current control P gain	0.0~3276.7	0.1	80.0	—
E-13	q-axis current control I gain	0.0~3276.7	0.1	15.0	—

The above is gain of current control. Keep initial value ordinary.

(6) Setting of re-start prohibition time

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
E-14	Re-start prohibition time	100~999	1	100	ms

Set the min. time from stop of Inverter till re-starting. Keep initial value ordinary.

(7) Motor temperature compensation (T/V61V is used)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
E-15	Function selection of motor temperature compensation option	0: OFF(unused) 1: ON (use)	—	OFF	—

Resistance value of primary resistance and flux of permanent magnet of ED motor vary, depending on the temperature. ED64sp has temperature identification function to compensate such variation by operation (arith.). However, there is a case that the specified torque cannot be outputted at the time of starting since this identification operation (arith.) is impossible at low speed and before starting. By this reason this setting is turned to ON in case that torque at starting is improved by execution of compensation by detected temperature, fitting the temperature sensor to motor.

Note) In this function, T/V61V option and temperature sensor of motor are needed. If they are not available, setting should be turned to OFF. As to T/V61V option, see [CHAPTE 5, Item 3 Motor temperature detection option : T/V61V].

2—7. Setting Item F area (Built-in DB operation setting, protective function, trace back setting)

(1) Built-in DB operation level

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-00	Built-in DB operation level	320~360(200V class)	1	340	V
		640~720(400V class)	2	680	V

Set operation level of built-in DB transistor. When DC voltage rises higher than this setting, DB transistor is turned to ON and when lower than this setting DB transistor is turned to OFF. Ordinary, keep the level at initial value but in case that DB transistor is turned to ON owing to high power source voltage even not in brake mode, make setting at higher level. Also, this setting interlocks operation level of regeneration stall preventive function. (See item of b-13)

In case of use of built-in DB combined with regeneration converter (VF61R, VF64R), this setting should be 360V (200V class) or 720V (400V class).

Note) In ED64sp-2R522~1122 (200V class), ED64sp-2R244~1544 (400V class), transistor for dynamic brake (DB) is incorporated and it can make dynamic braking by connection with DB resistor and thermal relay between main circuit terminal blocks [+2]–[B].

(2) Overspeed protection setting

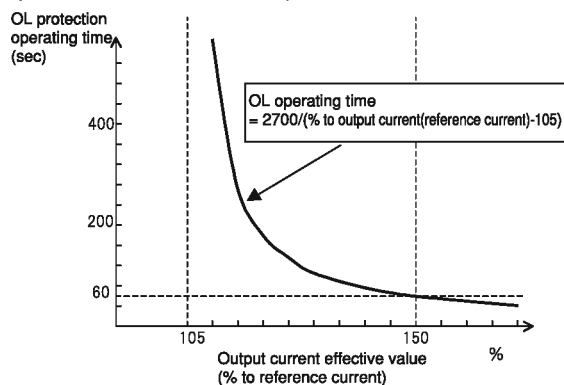
Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-01	For. run side overspeed setting	0~max. speed(A-00)x1.5	1	1900	min ⁻¹
F-02	Rev. run side overspeed setting	–max. speed(A-00)x1.5~0	1	–1900	min ⁻¹

When motor speed exceeds this setting value, overspeed protective function actuates and Inverter trips. Set forward and reverse sides individually. (In case of change of max. speed (A-00), revise this setting. If value of more than 1.5 times of max. speed is set, setting error is displayed.)

(3) Overload protection setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-03	Overload protection setting	20~110	1	100	%

Set reference current value of overload protection by ratio to motor rated current (A-04). If effective value of Inverter output current exceeds 105% of the reference current, overload protection counter starts sensing it as overload status and overload protection (OL) operates at the point of 60 sec. at 150% as per the curve of relation of OL actuation time and output current effective value of the Fig. below.



OVERLOAD PROTECTION (OL) OPERATING TIME

Note) Overload protection counter can be monitored by console. (comparing with counter of overtorque protection, larger one is displayed) Overload counter counts in the status of overload with the lapse of time and at 100%, overload protection operates and Inverter trips.

OL pre-alarm function, which outputs signal when overload counter exceeds discretionary point, can be used also. (See multifunction output of Setting Item c)

(4) FCL (high speed current limit) level setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-04	FCL level adjustment	80~125	1	100	%

Set the limit value of FCL (high speed current limit). Set it at 100% ordinary.

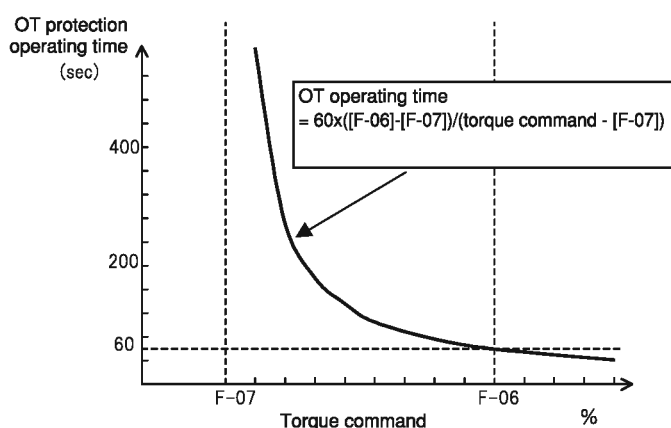
When instantaneous current of 2.86 times of the rated current of Inverter main body flows to any of phases at 100% setting, FCL function turns output of each phase of Inverter to OFF once in order to protect the Inverter (if current value falls, it turns Inverter output to ON automatically). When ON/OFF of output by this FCL function continues for more than 10 sec. successively (min. 2 sec. in case of output frequency of less than 10Hz), FCL continual protection operates and Inverter trips.

(5) Overtorque protection (vector control)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-05	Selection of overtorque protective function	0: OFF (unused) 1: ON (use)	—	ON	—
F-06	Level setting of overtorque protective operation	110~205	1	150	%
F-07	Reference torque of overtorque protective operation	50~105	1	105	%

Set overtorque protection. By F-05, active/inactive of protective operation can be selected.

In case that F-05 is set at ON, if torque command exceeds reference torque set by F-07, overtorque protection counter starts, sensing it as status of overtorque and overtorque protection (OT) operates at the point of 60 sec. in case of F-06 setting of torque command as per curve of relation of OT protection operating time and torque command of the Figure below. Torque command to be used for this protection can make compensation to deduct machine loss component from actual torque command. (See machine loss compensation of Setting Item i)



OVERTORQUE PROTECTION (OT) OPERATING TIME

Note) Similarly to overload protection, overtorque counter can be monitored by console. (compared with overload protection counter, larger one is displayed)

Overtorque counter counts with the lapse of time in the status of overtorque and at 100%, overtorque protection operates and Inverter trips.

OT pre-alarm function, which outputs signal when overtorque counter exceeds discretionary point, can also be used.

(See multifunction output of Setting Item c)

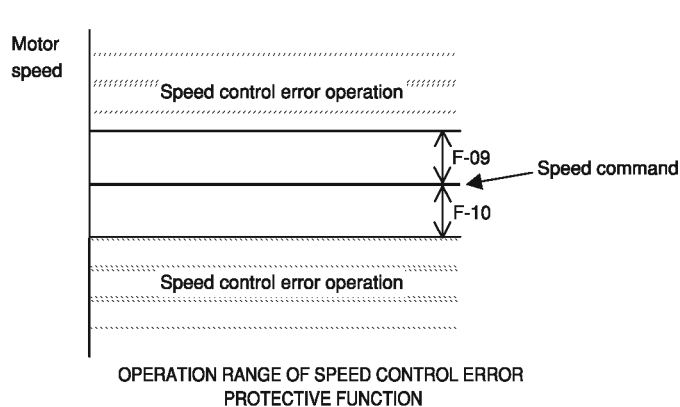
(6) Speed control error protection setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-08	Function use selection of speed control error	0: OFF (unused) 1: ON (use)	—	OFF	—
F-09	+side detection speed width of speed control error	50~500	1	100	min ⁻¹
F-10	-side detection speed width of speed control error	-500~-50	1	-100	min ⁻¹

By F-08, active/inactive of speed control error protection can be selected.

When speed control error operation is selected and if motor speed exceeds the range of $[SPD_REF + [F-10] \sim SPD_REF + [F-09]]$ ([F-10] is minus value) against speed command (SPD_REF), Inverter trips by speed control error.

Detective function actuates at the times of speed control part abnormal, PG abnormal and speed down caused by that load torque exceeds torque limit.



Reference speed command is selected speed command in case of speed control (b-01=0). In case of others, it is speed command of input from [0-±10] terminal block (or [4-20]) of VFC64TB terminal block.

(7) Motor overheat protection(option use of T/V61V)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-12	Selection of motor overheat protective operation	0: OFF (unused) 1: ON (use)	—	OFF	—

Select active/inactive of motor overheat protection. In case that this function is set at ON and motor temperature exceeds 150 C, Inverter trips.

Note) In this function, T/V61V option and temperature sensor of motor are needed. If they are not available, setting should be turned to OFF. As to T/V61V option, see [CHAPTER 5, Item 3 Motor temperature detection option : T/V61V].

(8) Operation of protective operation relay (86A) at the time of power failure

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-13	Selection of protective operation relay (86A) at the time of power failure	0: OFF (unused) 1: ON (use)	—	OFF	—

Select operation of protection relay (86A) at the time when Inverter detects power failure.

OFF: Even if Inverter detected power failure, protection relay does not operate and when running (or jogging, DC brake) command is turned to OFF after re-supply of power, Inverter is reset automatically. When [b-11] (re-start selection after instantaneous power failure) is at ON, Inverter is reset after re-supply of power automatically and re-starts.

ON: Detecting power failure, protection relay operates and Inverter trips. In this case and similarly to other protective operations, it is necessary to do protection reset operation by reset terminal or reset key. Even if [b-11] (re-start function selection after instantaneous power failure) is turned to ON, Inverter does not re-start automatically.

(9) Retry function after protective operation

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-14	Number of times of retry-after-protective operation	0~5	1	0	—

When trouble and protective operation occurred, [automatic protection reset]→[automatic re-start] is repeated until the number of times set at F-14. Automatic reset is done after 1 sec. from occurrence of protective operation and after that, automatic re-operation is done. If protective operation occurred again within 10 sec. after re-start, arrange counter of retry to add 1 and if counter value is less than setting value of F-14, reset again and re-start Inverter. If protective operation does not occur after passing of 10 sec. from re-start by automatic re-operation, clear the figure of counter of retry as retry was done satisfactorily.

Note) Protective operations, of which protection-retry is possible, are overvoltage, fuse blow-out, overspeed, phase (PG) error, power failure (when 86A is ON), option error, external failure only. The other protections are not retried owing to safety precautions.

(10) Trace back function setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
F-15	Trace back pitch	1~100	1	1	ms
F-16	Trace back trigger point	1~99	1	80	—
F-17	Trace back CH1 selection	0~64	1	0	—
F-18	Trace back CH2 selection	0~64	1	0	—
F-19	Trace back CH3 selection	0~64	1	0	—
F-20	Trace back CH4 selection	0~64	1	0	—
F-21	Trace back CH5 selection	0~64	1	0	—
F-22	Trace back CH6 selection	0~64	1	0	—
F-23	Trace back CH7 selection	0~64	1	0	—
F-24	Trace back CH8 selection	0~64	1	0	—
F-25	Trace back CH9 selection	0~64	1	0	—
F-26	Trace back CH10 selection	0~64	1	0	—
F-27	Trace back CH11 selection	0~64	1	0	—
F-28	Trace back CH12 selection	0~64	1	0	—

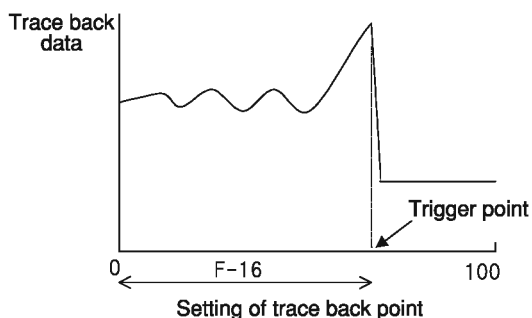
ED64sp incorporates trace back function which makes rapid restoring possible by memorizing, reading and analyzing of control data of current, voltage, etc. of the time of protective operation. The data, which is memorized by trace back function, can also designate output of each super block being used, when HC function is used, in addition to the current, voltage, etc. determined by initial values.

F-15: Set the interval of trace back.

F-16: Set trigger point of trace back.

F-17~F-28: Select whether each CH of trace back is to be internal data of Inverter or to be "variable" of super block function.

Note) Setting of trace back pitch and trace back point is necessary to be executed before collection of data of trace back by protective operation, etc.



F-17~28 setting	In case of 0		In case of 1~64	
	Record data	Dimension	Record data	Dimension
CH1	U phase current	(3536/Inverter rating)	Output RAM (1~64) of super block (setting of F-17~28 is selection of output RAM as it is)	20000/100%
CH2	V phase current			
CH3	W phase current			
CH4	DC voltage	10/1V (200V class)		
CH5	Output voltage	5/1V (400V class)		
CH6	Motor speed	20000/max. speed		
CH7	Speed command (after accel/decel control)			
CH8	Torque command	5000/100%		
CH9	(For our testing data)			
CH10	(For our testing data)			
CH11	(For our testing data)			
CH12	(For our testing data)			

Note) By using of PC Tool Software (separate sale), data of trace back can be read by personal computer. See [Instruction Manual of trace back monitor] in [PC Tool Manual I].

2—8. Setting Item G area (Analog input/output setting, Gain adjustment)

(1) Analog input (VFC64TB P.C.Board)[0~±10],[4~20] terminal input adjustment

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-00	Analog input +side adjustment gain	50.00~150.00	0.01	100.00	%
G-01	Analog input -side adjustment gain	50.00~150.00	0.01	100.00	%

This is adjustment gain to adjust finely the analog input of VFC64TB P.C.Board [0~±10], [4~20] terminal. When plus voltage is inputted, G-00 is effective and when minus voltage is inputted, gain of G-01 is effective. This is adjusted before delivery ordinary however, re-adjustment is needed in case that initializing (default) of P.C.Board is executed. (This item is effective in both cases that input is used as speed command and as torque command)

Adjustment method of gain

- 1) Select monitor [G-Adj] of console.
- 2) Input +10V to between [0~±10] - [GND].
- 3) Adjust G-00 to make monitor display 10.000.
- 4) Input -10V to between [0~±10] - [GND].
- 5) Adjust G-01 to make monitor display 10.000. (even if minus voltage is inputted, monitor displays absolute value)

Note 1) Adjust monitor to display 5.000 by 20mA input at the adjustment by 4~20mA input and to display 10.000 by 150kHz at the adjustment by pulse train input.

Note 2) Adjustment of 4), 5) is unnecessary in case that setting of minus side is not used.

(2) Analog speed command (VFC64TB P.C.Board [0~±10],[4~20] terminal input) characteristic setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-02	Analog speed command characteristic selection	0: 0~±10V (bipolarity) 1: 0~10V (unipolarity) 2: 4~20mA 3: Pulse train(0~150kHz)	—	1	—
G-03	Analog speed command upper limit speed	Absolute value of (G-04)~100.0	0.1	100.0	%
G-04	Analog speed command lower limit speed	-(G-03)~(G-03)	0.1	0.0	%

Note) G-03, G-04 are set by % to max. speed (A-00). Set characteristic in case that [0~±10],[4~20] terminal block of VFC64TB P.C.Board is used as speed command. (As to setting of speed command position selection, see items of b-15, b-16. In case of use as the torque command input, characteristic is to be 0~±10V(-10V:150%,+10V:-150%), regardless of this setting.)

At G-02, set any one of voltage input (bipolarity/unipolarity), current input, pulse train input is to be speed command input. Not G-02 only, it is necessary to changeover SW1, SW2 on VFC64TB. Table below shows "G-02 setting", "SW1, SW2 settings" and "terminal block to input setting signal" for respective setting input.

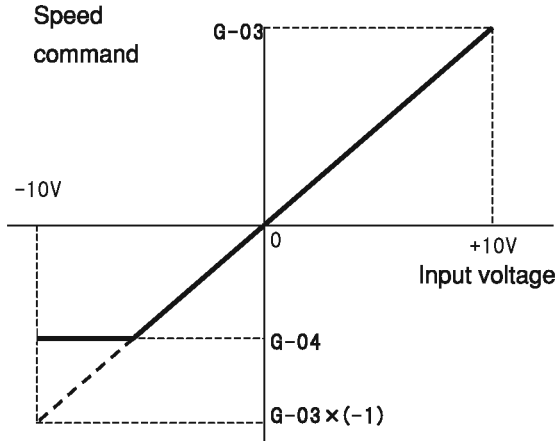
Setting input to be used	Voltage input (0~±10V)	Voltage input (0~+10V)	Current input (4~20mA)	Pulse train input (0~150kHz)
G-02 setting	0	1	2	3
VFC64TB-SW1	OFF	OFF	OFF	ON
VFC64TB-SW2	OFF	OFF	OFF	ON
Input terminal block	[0~±10] terminal block	[0~±10] terminal block	[4~20] terminal block	[0~±10] terminal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

Characteristic of speed command to the selected setting input is explained as follows.

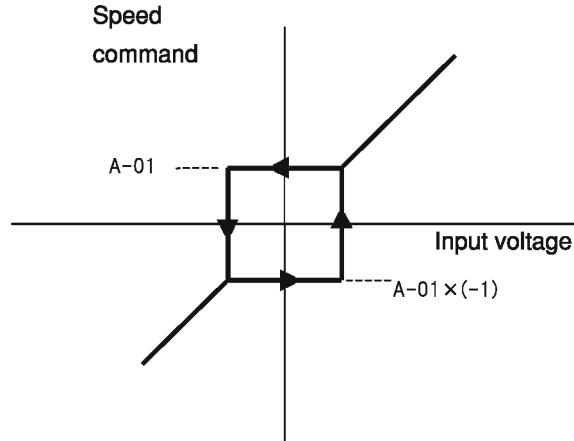
1) Voltage input (0~±10V)(G-02=0)

By making the command input voltage to minus voltage, motor can be run reversely (in case of drive by reverse run command, rotation is changed to reverse run by plus voltage and forward run by minus voltage). Characteristic is of G-03 setting at the time of +10V input and, minus value of G-03 setting at the time of -10V input however, minus side is limited than G-04 setting (therefore, G-04 is necessary to be set at -100% in case of use until max. of minus). Meanwhile, when A-01 (min. speed) is other than 0, absolute value is limited not to be less than this speed.

In this case, when characteristic line passes near 0V, it has hysteresis characteristic as per Figures below (At starting time, it is min. speed of forward run in case of forward run start and that of reverse run in case of reverse run start).



1-1) At the time of voltage input (0~±10V) selection

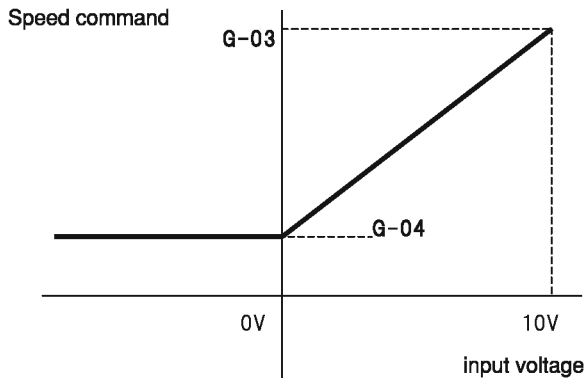


1-2) Hysteresis characteristic of minimum speed (A-01) near 0V

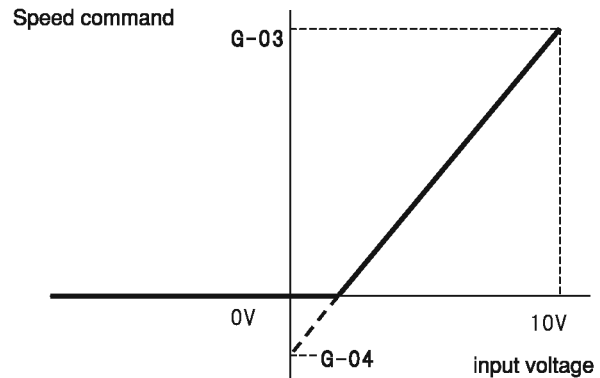
2) Voltage input (0~+10V)(G-02=1)

Characteristic is of G-04 at the time of 0V input and G-03 at the time of 10V input however, plus voltage only is effective and minus side is limited to G-04 (but 0 in case that minus value is set at G-04).

In case that A-01(min. speed) is other than 0, absolute value is limited not to be less than this speed. As speed command is forward run only, reverse run command is used in case of turning to reverse run.



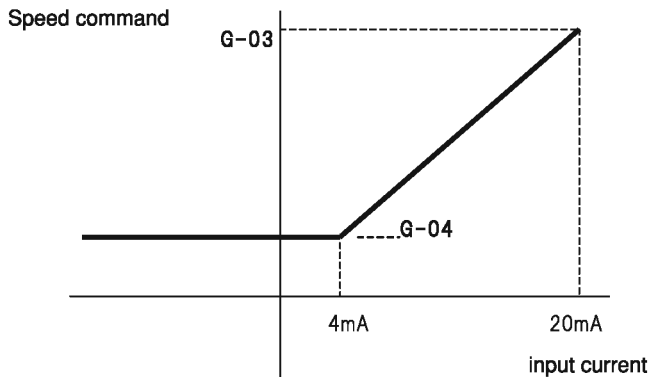
2-1) At the time of 0~+10V selection (at the time of G-04 ≥ 0)



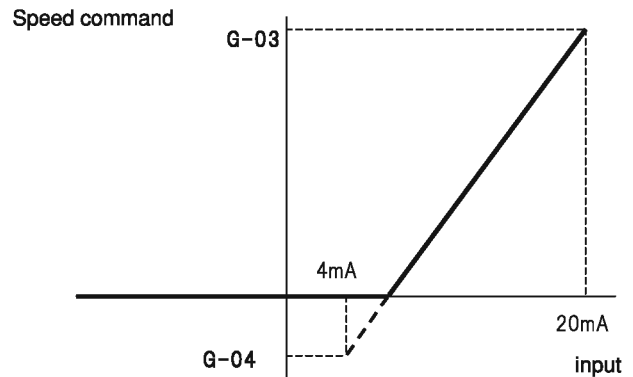
2-2) At the time of 0~+10V selection (at the time of G-04 < 0)

3) Current input (4~20mA)(G-02=2)

Characteristic is of G-04 at the time of 4mA input and G-03 at the time of 20mA input however, plus side current only is effective and characteristic at the time of minus current input is limited to G-04 (but 0 in case that minus value is set at G-04) . Meanwhile when A-01 (min. speed) is other than 0, absolute value is limited not to be less than this speed. As speed command is forward run only, reverse run command is used in case of turning to reverse run.



3-1) At the time of 4~20mA selection
(at the time of G04 ≥ 0)



3-2) At the time of 4~20mA selection
(at the time of G04 < 0)

4) Pulse train input (G-02 = 3)

In case of use by pulse train, turn SW1, SW2 on VFC64TB P.C.Board to ON and input pulse signal of duty 1:1 by 0-15V to between [0±10] - [GND] terminals.

As setting characteristic is same with that of voltage input (0~+10V), read item of (0~+10V) to 0-150kHz instead.

(3) Analog input 0 limit function

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-05	Analog input 0 limit voltage	0.000~1.000	0.001	0	V

In case that absolute value of command input voltage inputted to VFC64TB[0±10] is less than this setting, above function makes it to 0 forcedly.

This function is used when voltage does not become 0 perfectly caused by drift, etc. of analog circuit, in spite of setting at 0V. (It is effective in case of use of both speed command and torque command)

(4) Setting of relatives of analog output (VFC64TB-P.C.Board[A] terminal block)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-06	Analog output selection	0: Output voltage 1: Output current 2: Torque command 3: Motor speed 4: Speed command 5: Super block output 6: Calibration 7: Internal monitor (For our testing)	—	1	—
G-07	Analog output adjustment gain	50.0~150.0	0.1	100.0	%
G-08	Analog output adjustment offset	-50.0~50.0	0.1	0.0	%

The above is setting of selection of data, offset adjustment, gain adjustment of analog output which are outputted from between terminal blocks [A]-[GND] of VFC64TB P.C.Board.

Analog output selected by G-06

	Selection item	Output voltage		Selection item	Output voltage
0	Output voltage	7.5V/200V (200V class) 7.5V/400V (400V class)	4	Speed command (after accel/decel control)	10V/max. 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	outputs 5V
3	Motor speed	10V/max. speed (A-00)	7	(For our testing)	-----

Note) When super block output is selected, outputted value to Variable AnOutSb by HC (super block) function is outputted by rate of 5V/20000.

(5) Rotation speed meter (VFC64TB P.C.Board [f] terminal block) output selection

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-09	6F output selection	0: PG output (duty 1:1)(ED64P,V only) 1: — 2: Motor speed (6F output) 3: Calibration (6F output)	—	2	—

Signal, which is outputted to between [f]-[GND]terminal blocks on VFC64TB-P.C.Board, is selected.

0: PG output

Making frequency dividing of wave form of PG (B phase), outputs it as signal of (0-10V). It is possible to select 1/2 frequency dividing and 1/4 frequency dividing by SW3 on VFC64TB P.C.Board. (SW3: OFF:1/2 frequency dividing, ON: 1/4 frequency dividing) (Note: cannot be selected in ED64S mode)

2: Motor speed, 3: Calibration

When these are selected, frequency signal (6F signal) of 6 times of frequency conversion value is outputted from [f]-[GND] terminal blocks as shown in the Fig. below.

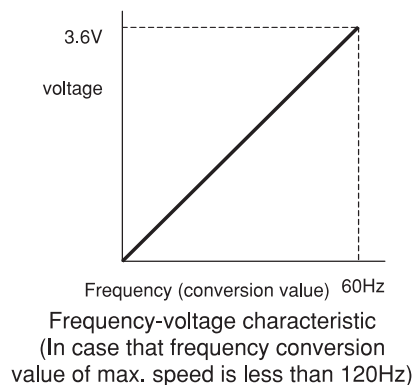
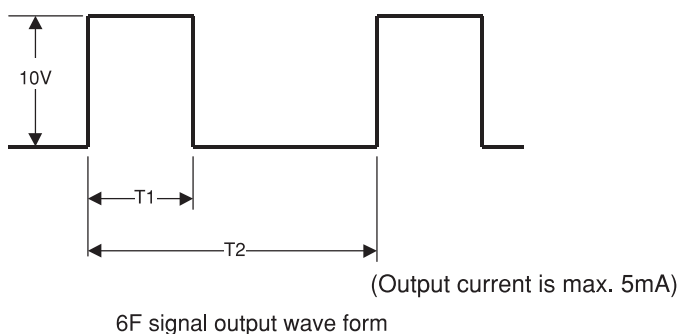
When motor speed is selected, frequency conversion value F is calculated as:-

$$F = (\text{motor speed}) / 60 \times (\text{number of motor pole}) / 2$$

When calibration is selected, frequency conversion value corresponding to max. speed (A-00) is outputted.

In case of use of digital counter type frequency/rotation meter, make 1/6 frequency dividing of pulse count.

In case of use of DC voltmeter, average of 6F signal output is as per Fig. of Frequency-voltage characteristic and therefore, adjust it conforming to the characteristic of this rate. (However, in case that frequency conversion value of max. speed exceeds 120Hz, the value will be 1/2 and when that exceeds 240Hz, the value will be 1/4 of the said rate)



T1, T2 of above Fig. are:-

T1 = 1ms (Frequency conversion value of max. speed is less than 120Hz)

= 0.5ms (Frequency conversion value of max. speed is less than 240Hz)

= 0.25ms (Frequency conversion value of max. speed exceeds 240Hz)

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

(6) Isolated speed command analog input (ISO64, IO64 option) adjustment

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-10	Isolated analog setting adjustment gain	50.00~150.00	0.01	100.00	%
G-11	Isolated analog input characteristic selection	0: 0~+10V 1: 4~20mA	—	0	—
G-12	Isolated analog setting upper limit speed	Absolute value of (G-13) ~100.0	0.01	100.0	%
G-13	Isolated analog setting lower limit speed	-(G-12)~(G-12)	0.01	0.0	%

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

Set the input in case that the part between terminal block [1]-[3] of ISO64 option P.C. Board or the part between terminal block [1]-[2] of IO64 option P.C.Board is used as speed command. Since characteristic of setting is same with that of analog input of VFC2001-P.C.Board, see the item of G-00~G-04 but minus voltage input and pulse train input cannot be used. This setting is for speed command input. SW1 on ISO64-P.C.Board, IO64-P.C.Board should be OFF in case that input is used by 0~+10V and ON in case that it is used by 4-20mA.

(display of console monitor [88888] just after setting of G-10 shows the voltage to be inputted to terminal block [1] of ISO64 option P.C.Board or terminal block [1] of IO64 option P.C.Board. In this connection, dispersion of about ± 0.01 occurs in the display of [88888] since input operation (arith.) resolution is low compared with VFC64TB-P.C.Board [0- ± 10] terminal input.

Note) Terminals between [1]-[2] of IO64 option P.C.Board are connected with both input for speed command (0~+10V / 4~20mA) and input for torque command (-10~+10V). In case of use of terminals between [1]-[2] of IO64 option P.C.Board as the speed command input, adjust by this G-11~G-13 and in case of use of them as the torque command input, adjust by next G-14~G-15.

(7) Isolated torque command analog input (ISO64, IO64 Option) adjustment

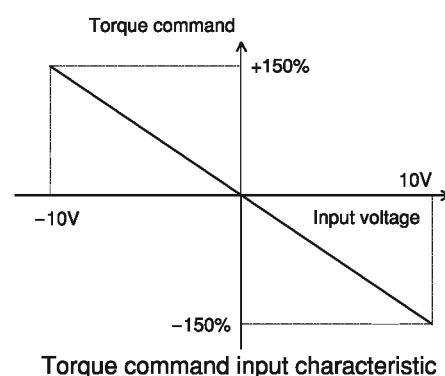
Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-14	Isolated torque command input adjustment gain	50.0~150.0	0.01	100.0	%
G-15	Isolated torque command input offset adjustment q'ty	-50.0~50.0	0.01	0.0	%

Adjust gain and offset in case of use of the part between terminal block [4]-[3] of ISO64 option P.C.Board or the part between terminal block [1]-[2] of IO64 option P.C.Board as the torque command. As this input can get the data faster than other analog input by 12 bit A/D Converter, it is used isolating the torque command, which needs high speed response.

G-14: This is adjustment gain to the input and effective for both plus and minus sides.

G-15: This is offset adjustment. It adjusts to make torque command 0 at the time of 0V input.

(Display of console monitor [G-AdJ] just after setting of G-14 indicates input voltage to the part between terminal blocks [4] - [3] of this ISO64 option P.C.Board.)



(8) Isolated analog output (IO64 Option) adjustment

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-16	Isolated analog output selection	0 : Output voltage 1 : Output current 2 : Torque command 3 : Motor speed 4 : 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 : Speed command (4~20mA) 13 : Super block output (4~20mA) 14 : Calibration (4~20mA)	—	1	—
G-17	Isolated analog output adjustment gain	50.0~150.0	0.1	100.0	%
G-18	Isolated analog output offset adjustment q'ty	-50.0~50.0	0.1	0.0	%

The above is setting of analog output, which outputs to between terminal blocks [3]-[4] of IO64, and adjustment of gain and offset. In case of selection of analog signal to output, select as shown in the Table below.

	±10V output		4-20mA output	
	IO64-SW2 = ON		IO64-SW2 = OFF	
	G-16 setting	Output voltage rate	G-16 setting	Output current rate
Output voltage	0	7.5V/200V(200V class) 7.5V/400V(400V class)	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. speed (A-00)	11	20mA/max. speed (A-00)
Speed command	4	10V/max. speed (A-00)	12	20mA/max. speed (A-00)
Super block output	5	5V/20000(100%)	13	12mA/20000(100%)
Calibration	6	outputs 5V	14	outputs 12mA

Note 1) In case that 4-20mA is selected, absolute value of data is outputted since output is turned to unipolarity output of plus side.

Note 2) In case that super block output is selected, outputted value to Variable IsoOutSb by HC (super block) function is outputted by the rate of 5V/20000 or 12mA/20000.

(9) Motor temperature detection option (T/V61V Option) adjustment

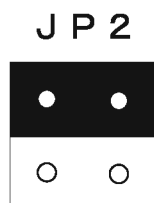
Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
G-19	Temperature correction option offset adjustment quantity	-20.0~20.0	0.01	0.00	%
G-20	Temperature correction option gain adjustment quantity	50.0~150.0	0.01	10.00	%

Adjust the offset and gain of motor temperature correction option (T/V61).

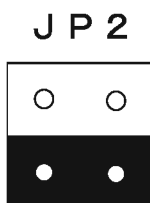
<Adjustment procedure of T/V61V>

When T/V61V is used, adjust it by the following procedure.

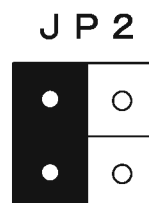
- 1) Set the setting item E-15 [Motor temperature compensation use selection] or F-12 [Motor overheat protective operation selection] at ON.
- 2) Select [motor temperature] of monitoring item in monitor mode.
- 3) Remove connection between terminal block of T/V61V and that of motor, and shortcircuit [2]-[3].
- 4) Insert jumper block on T/V61V P.C.Board to JP2 (as per Fig. A below).
- 5) Adjust setting item G-19 [Temperature compensation option offset adjustment amount] in order for [motor temperature] monitor display to become 0.
- 6) Remove jumper block on T/V61V P.C.Board from JP2 and insert it to JP1 (as per Fig. B below).
- 7) Adjust setting item G-20 [Temperature compensation option gain adjustment amount] in order for [motor temperature] monitor display to become [130.5].
- 8) Remove shortcircuit of terminal block [2]-[3] and restore connection with motor, and put back to the original position (as per Fig. C below).



J P 1

Fig. A
insert to JP2

J P 1

Fig. B
insert to JP1

J P 1

Fig. C
put back to
the original position

2—9. Setting Item H area (Setting of relatives of preset operation/ programed operation)

(1) Preset operation/ programed operation speed command

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
H-00	Preset speed command 1	-max. speed ~max. speed	1	0	min ⁻¹
H-01	Preset speed command 2		1	0	min ⁻¹
H-02	Preset speed command 3		1	0	min ⁻¹
H-03	Preset speed command 4		1	0	min ⁻¹
H-04	Preset speed command 5		1	0	min ⁻¹
H-05	Preset speed command 6		1	0	min ⁻¹
H-06	Preset speed command 7		1	0	min ⁻¹
H-07	Preset speed command 8		1	0	min ⁻¹

Item H is setting of speed command of preset operation function or undermentioned programed operation function selected by multifunction input signal. As to selection by multifunction input signal of preset operation, see item of Setting Item C area, Multifunction input/output.

Note) Since selective speed in preset operation function is up to 7 kinds, [(H-01) preset speed command 1]~[(H-06) preset speed command 6] cannot be used but by programed operation function only.

(2) Selection of programmed operation mode

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
H-08	Selection of programmed operation mode	0 : OFF 1 : One-Time 2 : End-less	—	0	—

0: OFF Programed operation is not executed (ordinary operation).
1: One-Time Executing one time only of [(H-01)preset speed command 1]~[(H-07)preset speed command 8] of
programed operation, Inverter stops automatically. (If operation command is kept inputting for more
than 10 secs., Start Stall trouble occurs and Inverter stops.
2: End-less Programed operation is repeated until operation command is turned to OFF.
(Until pressing the [STOP] key at the time of console operation)

(3) Setting of programmed operation time

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
H-09	Selection of programmed operation time unit	0: Sec. 1: Min. 2: Hour	—	0	—
H-10	Programed operation time 1	0.0~3600.0	0.1	0.0	—
H-11	Programed operation time 2		0.1	0.0	—
H-12	Programed operation time 3		0.1	0.0	—
H-13	Programed operation time 4		0.1	0.0	—
H-14	Programed operation time 5		0.1	0.0	—
H-15	Programed operation time 6		0.1	0.0	—
H-16	Programed operation time 7		0.1	0.0	—
H-17	Programed operation time 8		0.1	0.0	—

H-09: Set the time unit of setting of H-10~17.

H-10~17: Set the operation time of each step of programed operation. (Set 0.0 for the time of step of no use)

(4) Accel/decel time selection at the time of programmed operation

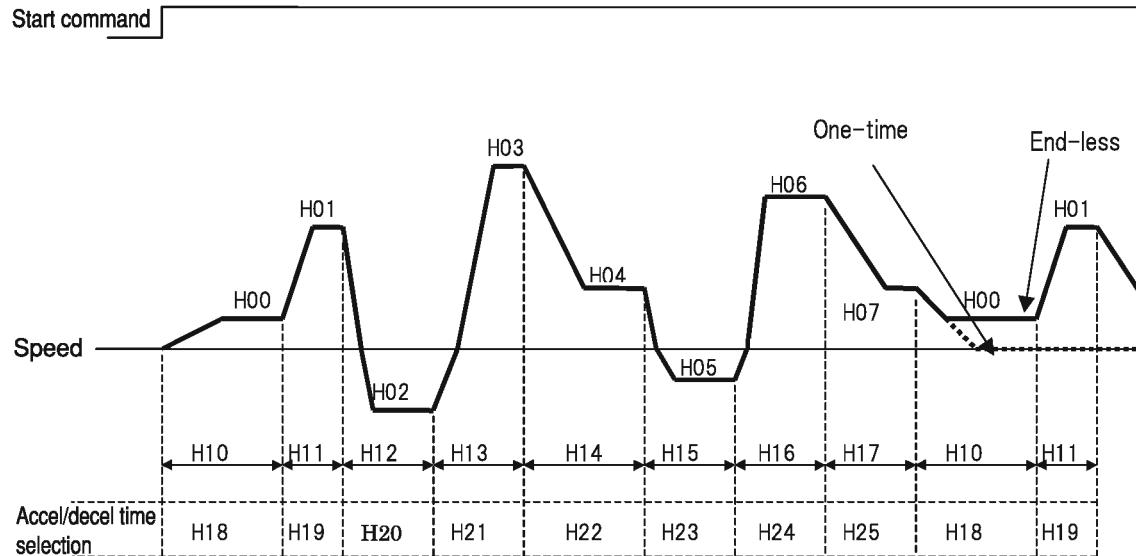
Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
H-18	Programed operation accel/decel time selection 1	0: Accel/decel time 1 1: Accel/decel time 2 2: Accel/decel time 3 3: Accel/decel time 4	—	0	—
H-19	Programed operation accel/decel time selection 2		—	0	—
H-20	Programed operation accel/decel time selection 3		—	0	—
H-21	Programed operation accel/decel time selection 4		—	0	—
H-22	Programed operation accel/decel time selection 5		—	0	—
H-23	Programed operation accel/decel time selection 6		—	0	—
H-24	Programed operation accel/decel time selection 7		—	0	—
H-25	Programed operation accel/decel time selection 8		—	0	—

At the time of programed operation, select accel/decel time setting of each step by H-18~H-25, regardless of setting of d-00, d-01 or multifunction input (accel/decel time selection).

Each time of accel/decel to be selected.

Selection of H-18~25	Accel time	Decel time	S pattern rise time	S pattern accel reach time	S pattern fall time	S pattern decel reach 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 basic setting items.
- When accel/decel times 3, 4 are selected, all of S pattern accel/decel times are 0.0.



Example of programed operation pattern

2—10. Setting Item i area (Droop control, machine loss compensation)

(1) Droop control setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
i-00	Droop control use selection	0 : OFF (unused) 1 : ON (use)	—	OFF	—
i-01	Droop start speed/frequency	0.0~100.0	0.1	0.0	%
i-02	Droop ratio changeover speed	0.0~100.0	0.1	0.0	%
i-03	Droop ratio	0.0~50.0	0.1	0.0	%
i-04	Droop start torque	0.0~90.0	0.1	0.0	%

Note) i-01 and i-02 are set by % to max. speed (A-00).

Execute each setting of droop control, which is used in order to balance the torque of 2 motors, etc.

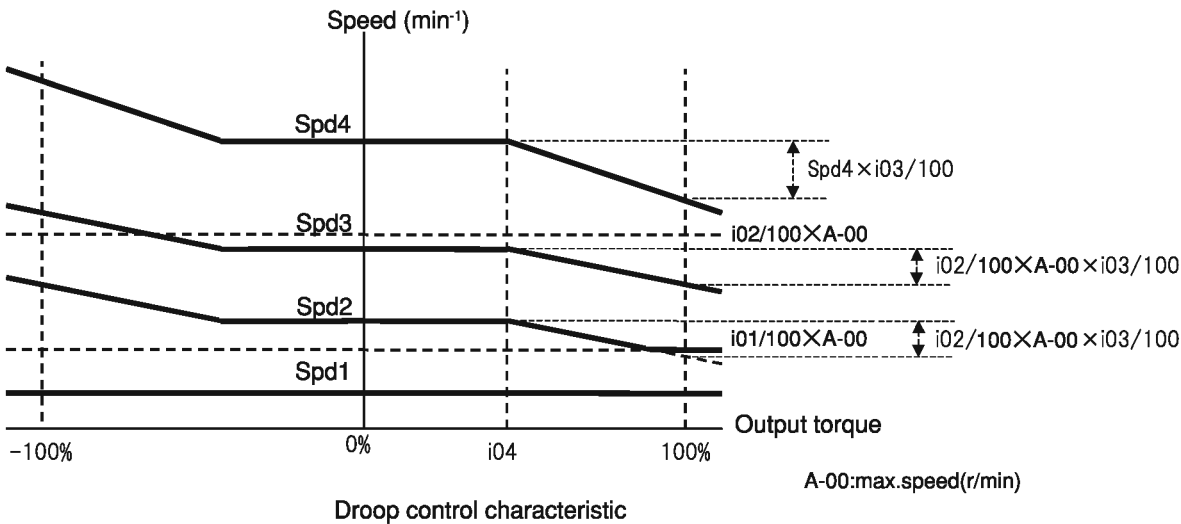
i-00: Select active/inactive of droop control.

i-01: Droop control starts at i-01 or over. (When speed become lower than this speed as a result of droop control, it is limited to this speed.)

i-02: When speed command is i-02 or more, droop amount makes speed command as criterion. In case of i-02 or less, i-02 is criterion. (In case of drooping all speed range by ratio to the speed command, set i-02 at 0. On the contrary in case of drooping all speed range by ratio of max. speed, set as i-02 = 100.0% (A-00).)

i-03: Set droop amount of the time when torque command becomes 100% by ratio (%) of droop amount to the basic speed (speed command when speed is i-02 or more, and setting of i-02 when speed is less than i-02).

i-04: Drooping is not done at less than this torque.



(2) Machine loss compensation setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
i-05	Selection of machine loss compensation	0 : OFF (unused) 1 : ON (use)	—	OFF	—
i-06	Offset quantity of machine loss	0~100	1	0	%
i-07	Machine loss inclination	0~100	1	0	

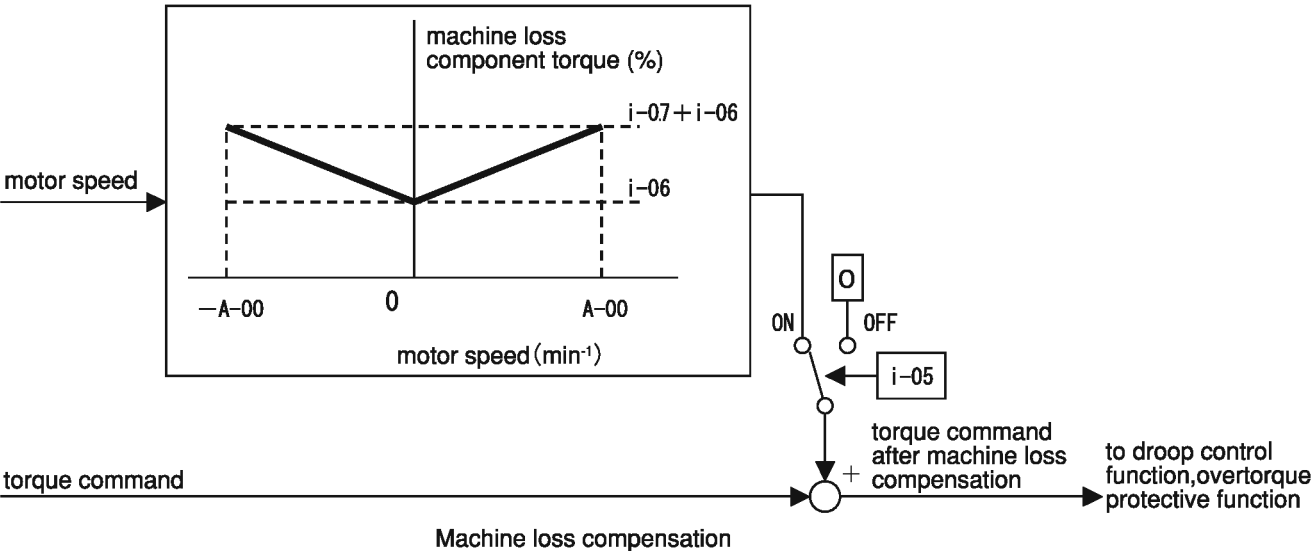
For torque command at the times of overtorque protection and droop control, torque command having machine loss compensation, from which machine loss component is deducted, can be used.

Note) Machine loss compensation for torque command input at the time of torque control is not done. Also, torque command monitor display is not compensated.

i-05: Select active/inactive of machine loss compensation. (In case of inaction, overtorque and droop control are done at the value of no machine loss compensation.)

i-06: Set offset quantity of machine loss component in case of 0 speed,making rated torque as 100%.

i-07: Set motor speed proportion component of machine loss, by torque at the time of max. speed.



2-11. Setting Item J area (Communication option setting)

Display	Content		Setting range (selection item)	Setting resolution	Initializing data	Unit
J-00	Use selection of communication option		0: OFF (unused) 1: ON (use)	—	OFF	—
J-01	ASYC64 communication speed		0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	—	4	—
J-02	RSH64 communication speed		0: 125kbps 1: 250kbps 2: 500kbps 3: 1Mbps	—	3	—
J-03	PBUS64(PROFIBUS)option		0~126	—	0	—
J-04	RSH64 option input (RSH64 → Master) frame No.		3~19	1	14	—
J-05	RSH64 option output (Master → RSH64) frame No.		2~12	1	6	—
J-06	BCDIN64 input readout selection		0: Automatic 1: Edge trigger operation 2: Level trigger operation	—	—	×
J-07	Use selection of BCDIN64 input polarity signal		0: Polarity bit (unused) 1: Polarity bit (use)	—	—	×
J-08	ASYC64/PBUS64 communication mode selection		0: Standard communication mode 1: Positioning mode 1 2: Positioning mode 2	—	—	×
J-09	Positioning speed setting 0	Effective at the time of positioning mode using ASYC64	16~200 (Unchangeable in ED64S)	1	min ⁻¹	○
J-10	Positioning speed setting 1		16~200 (Unchangeable in ED64S)	1	min ⁻¹	○
J-11	Positioning accel time		0.1~10.0 (Unchangeable in ED64S)	0.1	sec	○
J-12	Positioning decel time		0.1~10.0 (Unchangeable in ED64S)	0.1	sec	○
J-13	Creep speed		2~16 (Unchangeable in ED64S)	1	min ⁻¹	○
J-14	No. of pulse of creep time transfer		40~400 (Unchangeable in ED64S)	1	—	○
J-15	No. of stop pulse		0~50 (Unchangeable in ED64S)	1	—	○
J-16	Positioning emergency stop selection		0:OFF(unused) 1:ON(use) (Unchangeable in ED64S)	—	—	×
J-17	DNET64 Output Assembly Instance number setting		0:Instance No.20 1:Instance No.21 2~10(for our original communication mode)	—	—	×
J-18	DNET64 Input Assembly Instance number setting		0:Instance No.70 1:Instance No.71 2~15(for our original communication mode)	—	—	×
J-19	Setting of DNET64 speed scale		-126~127	—	—	×
J-20	Setting of DNET64 monitor ata No.		0~119	—	—	○

- J-00 :This is use selection of communication option. When this setting is OFF, Inverter does not work even if communication option is selected at speed command and operation command position (speed command is 0). Also, if this setting is turned to ON, option error is checked.
If this setting is turned to ON under situation of no connection of communication option, "option error" occurs and Inverter trips, for which please pay attention.(Since BCD64 is not communication option, turn this setting to OFF when BCD is used)
- J-01~08 :These are settings at the time of use of ASYC64 (asynchronous RS485, RS422-A, RS232C communication option), RSH64 (OPCN-1 communication option), PBUS64 (PROFIBUS communication option, BCDIN64 (BCD input option). see Instruction of individual options
- J-09~16 :These are settings when ASYC64 option is used in special mode. Keep initial values ordinary.
- J-17~20 :These are settings when DNET64 (DeviceNet communication option) is used. See Instruction of DNET64 option.

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

ED64sp Inverter has "2nd motor functin" to use 2 different motors alternately changing by contact, setting their rating, constant and speed control system gain in advance.

By turning to ON of [2nd motor selection] of multifunction input, data of following each item are used instead of each data of ordinary motor.

Note) Changeover of multifunction input should be done while Inverter is stopped. Changeover cannot be done during operation (including DC braking and initializing) of Inverter.

(1) Use selection of 2nd motor function

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-00	Use selection of 2nd motor function	0: OFF (unused) 1: ON (use)	—	OFF	—

By turning of this setting to ON, 2nd motor functions become effective. In the status of OFF setting, data are not changed over to each data of 2nd motor even if multifunction input [2nd motor selection] is turned to ON.

(2) Setting of values in name plate, cooling fan and PG pulse of 2nd motor

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-01	2nd motor rated capacity	3 ranks down from INV rated capacity~INV rated capacity	Note	0.0	kW
L-02	2nd motor rated voltage	140~230(200V class) 280~460(400V class)	1	0	V
L-03	2nd motor rated current	40~150% of Inverter rated current	Note	0.0	A
L-04	2nd motor rated speed	67~100% of max.speed	1	0	min ⁻¹
L-05	2nd motor pole	2~12 [Pole]	—	6	Pole

Note) Varies depending on type of Inverters.

Set values in name plate of 2nd motor. At the time of selection of 2nd motor, these values are replaced by each settings A-02~A-06 of ordinary motors. In case of auto-tuning work of 2nd motor, these values are necessary to be set in advance. (As to details of each item, see items of A-02~A-06)

(3) Setting of No. of 2nd motor PG pulse(ED64P,ED64V mode only)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-06	Number of 2nd motor PG pulse	60~3600	1	600	P/R

Set in PG pulse of 2nd motor. At the time of selection of 2nd motor, these values are replaced each setting A-07 of ordinary motors. (As to details of item, see items of A-07)

(4) q-axis pulse magnetic pole decision current of 2nd motor

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-07	q-axis pulse magnetic pole decision current of 2nd motor	50~200(% to motor rated current)	1	50	%

Set in q-axis pulse magnetic pole decision current of 2nd motor. At the time of selection of 2nd motor, these values are replaced each setting A-07 of ordinary motors. (As to details of item, see items of A-09)

(5) Setting item by auto-tuning of the 2nd motor.
(Electric constant of motor)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-08	2nd motor primary resistance	Setting range, resolution differ depending on Inverter capacity	—	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	0.001~9.999	0.001	0	mb
L-12	2nd motor iron loss conductance	0.0~300.0	0.1	0	mH
L-13	2nd motor Lq rate-of change at the time of 30% q-axis current	-100.0~100.0	0.1	0	%
L-14	2nd motor Lq rate-of change at the time of 60% q-axis current	-100.0~100.0	0.1	0.0	mmho
L-15	2nd motor Lq rate-of change at the time of 90% q-axis current	-100.0~100.0	0.1	0.0	%
L-16	2nd motor Lq rate-of change at the time of 120% q-axis current	-100.0~100.0	0.1	0.0	%
L-17	2nd motor Ld rate-of change at the time of 30% d-axis current	-100.0~100.0	0.1	0.0	%
L-18	2nd motor Ld rate-of change at the time of 60% d-axis current	-100.0~100.0	0.1	0.0	%
L-19	2nd motor Ld rate-of change at the time of 90% d-axis current	-100.0~100.0	0.1	0.0	%
L-20	2nd motor Ld rate-of change at the time of 120% d-axis current	-100.0~100.0	0.1	0.0	%

(Setting of d-axis location(magnet/magnetic pole location))

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-21	2nd motor d-axis location(magnet/ magnetic pole location)	0~30000	1	-1	—

(Setting-up related to the magnetic pole distinction)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-22	Magnetic pole decision system selection of 2nd motor	0:q-axis pulse magnetic pole decision system(1) 1:q-axis pulse magnetic pole decision system(2) 2:d-axis pulse magnetic pole decision system	—	0	—
L-23	d-axis measuring pulse width of 2nd motor	-12.7~12.7	0.1	0.0	ms
L-24	d-axis measurement pulse voltage amplitude selection of 2nd motor	0:30% 1:50% 2:75% 3:100%	—	0	—

L-08~L-24 are setting items by auto-tuning of the 2nd motor. When auto-tuning is executed under the status of selection of the 2nd motor, measured values are set in settings of L-08~L-24 instead of A-17~A-33. In the time of operation also, they are used transposed by A-17~A-33 when the 2nd motor is selected. (As to details of this item, see items of A-17~A-33 of each setting of ordinary motor.

(6) 2nd motor speed control adjustment gain

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
L-25	2nd speed control proportional gain	3~50	1	15	—
L-26	2nd speed control integration time constant	20~10000	1	40	ms
L-27	2nd motor control inertia moment	0~32767	1	10	gm ²

When the 2nd motor is selected, different speed control gain from that of ordinary motor is used. When the 2nd motor is selected, speed control gain is transposed by basic setting items 7.ASrP, 8.ASrI, 9.ASrJ and L-25 L-27 are used. (As to details of each gain, see items of 7.ASrP, 8.ASrI, 9.ASrJ respectively.

(7) Auto-tuning of 2nd motor

As to method of auto-tuning, see Chapter 2, item 4-7 Auto-tuning of 2nd motor(use only 2nd motor function)

Note) Even if auto-tuning only of 2nd motor is executed, Inverter cannot be operated since A-11~A-16 (dead time correction quantity) are not set. Therefore, execute [auto-tuning of ordinary motor] in advance.

2—13. Setting Item n area (Monitor setting)

(1) Line speed setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
n-00	Line speed monitor adjustment	0~2000.0	0.1	0.0	—

Adjust display gain of console [Line speed] monitor. Set line speed at the time of max. speed (A-00).

Display of line speed monitor is:-

Motor speed x (n-00)/(A-00)

(2) Monitor setting for our adjustment

Display	Content	Setting range (selection item)		Setting resolution	Initializing data	Unit
n-01	Gain of adjutment monitor outout(ch2)	0~32767	Monitor set- ting for our test .	1	1	—
n-02	Gain of adjutment monitor outout(ch1)	0~32767		1	1	—
n-03	address (H side) of adjutment monitor outout(ch2)	H0000~HFFFF	Keep initial values ordi- nary	1	H0000	—
n-04	address (L side) of adjutment monitor outout(ch2)	H0000~HFFFF		1	H0000	—
n-05	address (H side) of adjutment monitor outout(ch1)	H0000~HFFFF		1	H0000	—
n-06	address (L side) of adjutment monitor outout(ch1)	H0000~HFFFF		1	H0000	—
n-07	address (H side) of adjutment monitor display	H0000~HFFFF		1	HFFFF	—
n-08	address (L side) of adjutment monitor display	H0000~HFFFF		1	HF900	—
n-09	Selection of adjutment monitor display	0:HEC display 1:DEC display (without code) 2:DEC display (with code)		1	2	—

Function to confirm internal data of Inverter by analog or console display, by setting of internal address of CPU. (This function is for our test and for special application. Keep initial values ordinary).

2—14. Setting Item o area (Our adjustment)

(1) Line speed setting

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
o-00 ~65	Our adjustment	—	—	—	—

[setting item o area] is for our adjustment and for special application, and cannot be changed. Keep initial values (default data). (Even if writing is executed, error mark is displayed.)

2—15 Setting Item P area (Setting of super block constant)

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
P-000 ~259	Setting of super block constant	See each Instruction of super block in [PC Tool Manual II] of separate issue.	—	—	—

[Setting Item P area] is Constant setting area of super block function. As to details, see explanatory leaflet of super block function. (When super block function is not used, this setting is not necessary)

2— 16. Setting Item S area (Inverter capacity, DC detection gain)

(1) VDC detection gain

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
S-00	VDC detection gain	80.0~120.0	0.1	—	%

The above is detection adjustment gain of DC voltage which ED64sp detects. Adjust this gain in case that display of console monitor [Vdc] is different from voltage between main circuit terminal block $[\oplus 2] - [\ominus]$.

Note) At the time of initializing, by inputting of voltage between $[\oplus 2] - [\ominus]$ at that time, this Vdc detection gain is counted backward and set. Use this gain as it is usually.

If main circuit P.C.Boards (GAC61 or MAC61, etc.) are replaced, there may be a case that [Vdc] display of console is dislocated from the voltage between $[\oplus 2] - [\ominus]$. In such case, adjust VDC detection gain by this setting, without initializing the memory.

(2) Inverter control mode

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
S-01	Inverter control mode (read only)	ED64P	—	—	—

By reading of this setting, set mode of Inverter can be confirmed.

ED64P: Vector control mode with speed/magnetic pole location sensor (PG of A,B,U,V,W phase) (ED64P mode)

ED64V: Vector control mode with speed sensor (PG of A,B,Z phase) (ED64V mode)

ED64S: Vector control mode with speed/magnetic pole location sensorless (ED64S mode)

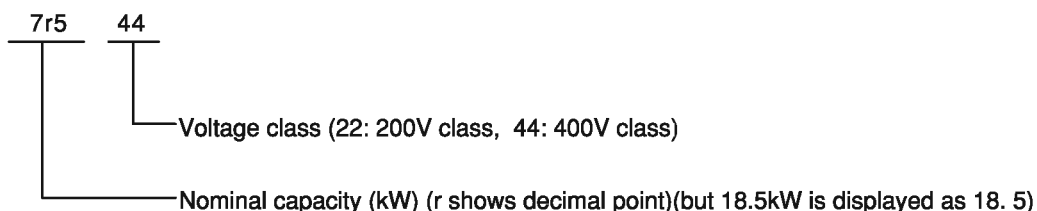
Note) This setting is read only and "write" is not available (always "write" is inhibited).

When control mode is alteration, see Chapter 2, item 6

(3) Inverter capacity, voltage series

Display	Content	Setting range (selection item)	Setting resolution	Initializing data	Unit
S-02	Inverter capacity, voltage class	2R222~18022 2R244~100044	—	—	—

By reading of this setting, set capacity and voltage class of Inverter can be confirmed.



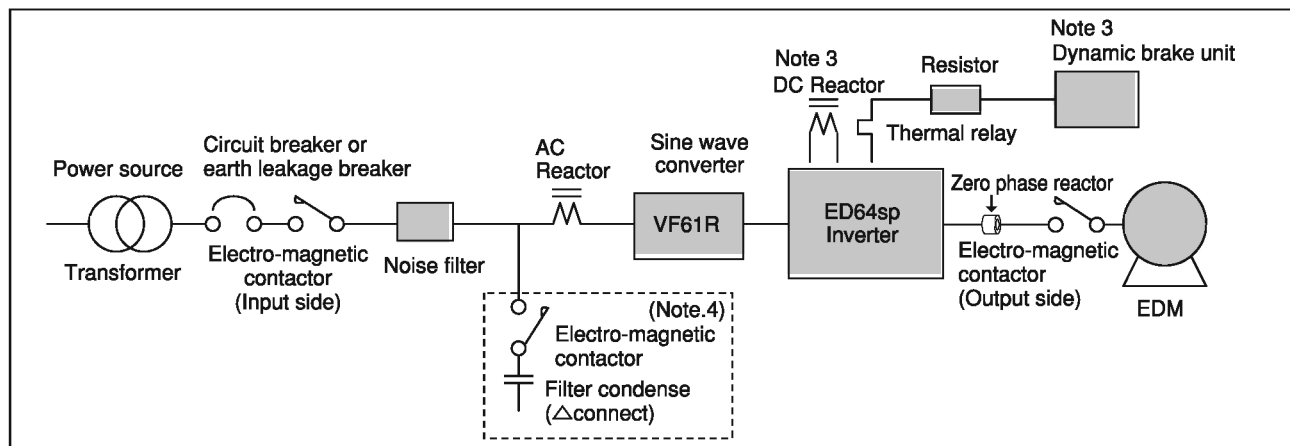
Note) This setting is read only and "write" is not available (always "write" is inhibited). In case of change (by replacement of spare parts, etc.) of Inverter capacity, voltage class set on P.C.Board, it is necessary to do from the initializing of memory.

CAUTION

If Inverter capacity, voltage class set on VFC2001 P.C.Board do not match the capacity, voltage class of Inverter fitted that P.C.Board, normal control cannot be done and could result in trouble, for which please pay attention.
(see 「Chapter 2, item 7 operation at the time of replacement of P.C.Board」)

Chapter 4 Selection of peripheral devices and options

1. Selection guide



	Name	Type	Application	Remarks
Peripheral device	AC reactor	AL □□□□	Apply for the cases of input power factor improvement and suppression of distorted wave form.	For input side connection
	Noise filter	NF3 □□□□ MIF3 □□□□	Apply for reduction of electro-magnetic noise generated from Inverter. NF3 □□□□ is noise filter for attenuation of high band. MIF3 □□□□ is noise filter to comply with CE marking.	For input side connection
	DC reactor	DCL □□□□□□	Apply for the case of improvement of input power factor DC reactor is standard accessory for ED64sp-1522, ED64sp-2244 or over and is Option for Inverters of less than these capacities.	Connect between ⊕1~⊕2
	Sine wave converter	VF61R □□□□	Apply for the case that drastic remodeling, power factor improvement of power source regeneration braking, power source harmonic are necessary. In case of use of sine wave converter, it is necessary to fit ACL for converter. As there are kinds of capacity, please refer to catalog and instruction manual of VF61R(VF64R).	Apply for Inverter input side (VF64R is under development)
	Dynamic brake unit Resistor Thermal relay	VFDB5 □□□□ R □□□□ TH- □□□□	Apply for the case that braking of Inverter is necessary. At the time of application, use combining with dynamic brake unit, resistor and thermal relay. (As to types of ED64sp-1122 or less and ED64sp-1544 or less, dynamic brake unit is incorporated.	Connect between ⊕2~⊖ Types incorporating dynamic brake unit should connect resistor and thermal relay between B~⊕2

Note 1) For selection of circuit breaker, input/output side electro-magnetic contactor and size of wiring, see next page.

Note 2) As to earth leakage circuit breaker, use the product which complied with high harmonic.

Note 3) DCL is standard accessory for Inverters of 200V class 15kW (ED64sp-1522) or over and 400V class 22kW (ED64sp-2244) or over. DCL is option for Inverters of less than these capacities. However, DCL and dynamic brake unit (including resistor, thermal relay) are unnecessary in case that sine wave converter is used.

Note 4) Filter condenser and magnetic contactor for closing of filter condenser are needed when sine wave converter (VF61R or VF64R) is used. Electromagnetic contactor for closing is used to turn to ON when sine wave converter is operated and to OFF when that converter is stopped.

Note 5) Use electromagnetic contactor at input and output sides, in accordance with applications. Since ED motor incorporates permanent magnet, motor generates voltage when it rotates even while Inverter is stopped. In cases that power constant area is used and that the motor is rotated by other power, etc., we recommend to use electromagnetic contactor at output side also for safety. In this case, arrange that contactor to trip by operation contact (52MA) of Inverter.

2. Input/output devices and wiring

● 200V Class

* 1

Motor output * 2	Type of inverter	Input circuit breaker (MCCB) * 5	Electro-magnetic contactor (MC) * 6 (upper tier: current, lower tier: devices)		Wiring size (mm ²) * 7 (upper tier: inside panel, lower tier: outside panel)			
			Input side	Output side	Input side	Output side	DC input /DCL	earth wire
1.5kW	ED64sp-2R222	20A	14A over S-N20	9A over S-N10	2.0 2.0	2.0 3.5	2.0 2.0	2.0
2.2kW * 3	ED64sp-2R222	20A	14A over S-N20	9A over S-N10	2.0 2.0	2.0 3.5	2.0 2.0	2.0
3.7kW * 3	ED64sp-3R722	30A	23A over S-N25	15A over S-N18	2.0 2.0	2.0 5.5	2.0 2.0	2.0
5.5kW	ED64sp-5R522	40A	33A over S-N35	23A over S-N25	3.5 3.5	3.5 8.0	3.5 3.5	3.5
7.5kW	ED64sp-7R522	50A	46A over S-N50	29A over S-N35	5.5 5.5	3.5 8.0	5.5 5.5	3.5
11.0kW	ED64sp-1122	75A	64A over S-N65	41A over S-N50	8.0 14	5.5 14	8.0 8.0	5.5
15.0kW	ED64sp-1522	75A	61A over S-N65	56A over S-N65	8.0 14	8.0 14	14 14	5.5
18.5kW 22.0kW	ED64sp-2222	100A	89A over S-N95	81A over S-N95	14 22	14 22	22 38	5.5
30.0kW	ED64sp-3022	150A	120A over S-N125	114A over S-N125	22 38	22 38	38 38	14
37.0kW	ED64sp-3722	175A	147A over S-N150	137A over S-N150	38 38	38 38	60 60	14
45.0kW	ED64sp-4522	200A	180A over S-N180	162A over S-N180	38 60	38 60	60 80	22
55.0kW	ED64sp-5522	250A	219A over S-N220	217A over S-N220	60 80	60 80	80 100	22
65.0kW 75.0kW	ED64sp-7522	350A	296A over S-N300	289A over S-N300	80 150	80 100	100 150	22
90.0kW	ED64sp-9022	400A	355A over S-N400	330A over S-N400	150 150	100 150	150 200	38

● 400V Class

* 1

Motor output * 2	Type of inverter	Input circuit breaker (MCCB) * 5	Electro-magnetic contactor (MC) * 6 (uppertier:current,lowertier:devices)		Wiring size(mm ²) * 7 (uppertier:inside panel,lowertier:outside panel)			
			Input side	Output side	Input side	Output side	DC input /DCL	earth wire
1.5kW	ED64sp-2R244	20A	8A over S-N11	5A over S-N10	2.0 2.0	2.0 2.0	2.0 2.0	2.0
2.2kW * 3	ED64sp-2R244	20A	8A over S-N11	5A over S-N10	2.0 2.0	2.0 2.0	2.0 2.0	2.0
3.7kW * 3	ED64sp-3R744	30A	12A over S-N18	8A over S-N11	2.0 2.0	2.0 2.0	2.0 2.0	2.0
5.5kW	ED64sp-5R544	40A	16A over S-N20	11A over S-N18	2.0 2.0	2.0 2.0	2.0 2.0	2.0
7.5kW	ED64sp-7R544	50A	22A over S-N25	15A over S-N20	3.5 2.0	2.0 2.0	2.0 2.0	2.0
11.0kW	ED64sp-1144	75A	32A over S-N35	21A over S-N25	3.5 3.5	3.5 3.5	3.5 3.5	3.5
15.0kW	ED64sp-1544	75A	44A over S-N50	28A over S-N35	5.5 3.5	5.5 3.5	5.5 5.5	3.5
18.5kW 22.0kW	ED64sp-2244	100A	44A over S-N50	41A over S-N50	5.5 3.5	5.5 5.5	8.0 8.0	5.5
30.0kW	ED64sp-3044	150A	60A over S-N65	57A over S-N65	8.0 8.0	8.0 8.0	14 14	5.5
37.0kW	ED64sp-3744	175A	75A over S-N80	69A over S-N80	14 14	14 14	14 22	5.5
45.0kW	ED64sp-4544	200A	89A over S-N95	81A over S-N95	14 22	14 14	22 38	14
55.0kW	ED64sp-5544	250A	109A over S-N125	108A over S-N125	22 22	22 22	38 38	14
65.0kW 75.0kW	ED64sp-7544	350A	147A over S-N150	143A over S-N150	38 38	38 38	38 60	14
90.0kW 110.0kW	ED64sp-11044	400A	216A over S-N220	203A over S-N220	60 80	60 60	80 100	22
132.0kW 160.0kW	ED64sp-16044	400A	311A over S-N400	284A over S-N300	80 100	80 100	150 150	22
200.0kW	ED64sp-20044	400A	388A over S-N400	361A over S-N400	150 200	150 200	150 250	38
250.0kW	ED64sp-25044	400A	480A over S-N600	455A over S-N600	150 200	150 250	250 150×2P	38
315.0kW	ED64sp-31544	400A	604A over S-N600	596A over S-N600	250 150×2P	250 150×2P	150 150×2P	50
375.0kW * 4	ED64sp-31544	400A	720A over S-N800	600A over S-N600	250×2P 150×2P	250×2P 150×2P	150×2P 150×2P	50

* 1 200V class set the device at input AC200V and 400V class set the device at input voltage AC400V.

* 2 Among standard, semi-standard EDM (basic speed 1200min⁻¹, 1500min⁻¹, 1800min⁻¹) of 375kW or less, motor output is calculated under combination of motor (max. one at the applicable capacity of Inverter) and Inverter. In case of non-standard motor and of use of capacity of out of above table, please consult us.

* 3 2.2kW, 3.7kW motors are dedicated for ED64S (sensorless) mode only.

* 4 375kW motor shows the case of motor of torque constant area of basic speed 1200min⁻¹, 1500min⁻¹, 1800min⁻¹. In case of use of other speed and constant output area, applicable Inverter is ED64sp-40044 (parallel unit specification).

* 5 input MCCB shows the rated current value. Determine the breaking capacity of MCCB by power source capacity, etc.

* 6 As to input/output MC (electromagnetic contactor), upper tier shows necessary current capacity and lower tier shows selection example of the products of Mitsu-bishi Electric Co.

* 7 Please arrange wiring between ED64sp and motor to make voltage drop to 2% or less. Wire size shows that for panel inside (KIV for 5.5mm or less, MLFC for 8mm or over, wiring length 3m) and that for panel outside (CV(3 strands, single core), wiring length 30m).

As to crimp style terminal, please use R type standardized by Jpan Industrial standard (JIS C2805).

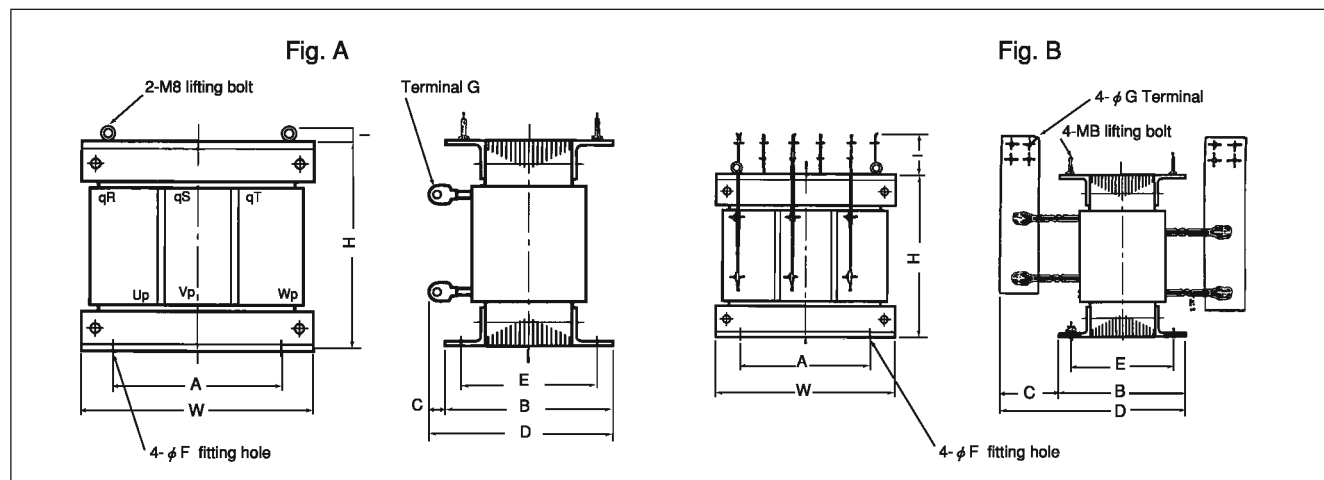
3. AC Reactor (option)

As to AC Reactor of Inverter input side, use types of the table below.

200V class	
Inverter type	AC Reactor type
ED64sp-2R222	AL15A1000L
ED64sp-3R722	AL20A333L
ED64sp-5R522	AL37A180L
ED64sp-7R522	AL55A122L
ED64sp-1122	AL70A97L
ED64sp-1522	AL70A97L
ED64sp-2222	AL105A64L
ED64sp-3022	AL140A49L
ED64sp-3722	AL173A39L
ED64sp-4522	AL209A32L
ED64sp-5522	AL253A27L
ED64sp-7522	AL341A20L
ED64sp-9022	AL416A17L

400V class	
Inverter type	AC Reactor type
ED64sp-2R244	AL15A1000L
ED64sp-3R744	AL15A1000L
ED64sp-5R544	AL20A333L
ED64sp-7R544	AL20A333L
ED64sp-1144	AL37A180L
ED64sp-1544	AL55A122L
ED64sp-2244	AL55A122L
ED64sp-3044	AL7097L
ED64sp-3744	AL84A80L
ED64sp-4544	AL105A64L
ED64sp-5544	AL140A49L
ED64sp-7544	AL173A39L
ED64sp-11044	AL253A27L
ED64sp-16044	AL341A20L
ED64sp-20044	AL503A14L
ED64sp-25044	AL585A11L
ED64sp-31544	AL850A8L

● External form and dimension



AL Type	W	H	D	A	B	C	E	F	G	I	Fig	Mass
AL15A1000L	150	117	118	90	78	40	58	7	M4	—	A	5.0
AL20A333L	160	100	120	100	80	40	60	7	M8	—	A	3.4
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
AL341A27L	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

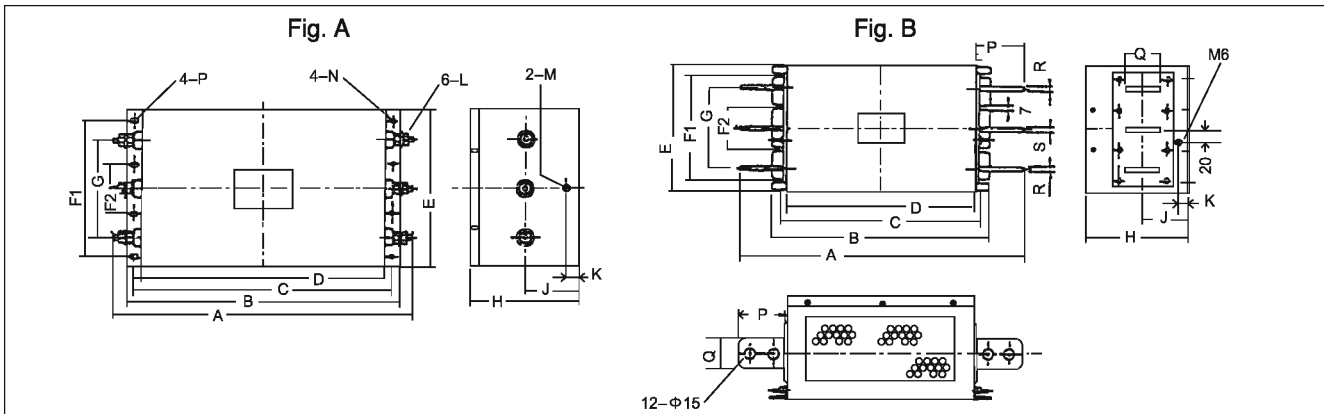
4. Noise filter

4-1. Noise filter (Option)

As to noise filter of Inverter input side, use types of the table below, (Regarding noise filter complying with CE marking, use types shown in next page.)

200V class		400V class	
Type of Inverter	Type of noise filter	Type of Inverter	Type of noise filter
ED64sp-2R222	NF3015A-CD	ED64sp-2R244	NF3010C-CD
ED64sp-3R722	NF3020A-CD	ED64sp-3R744	NF3010C-CD
ED64sp-5R522	NF3030A-CD	ED64sp-5R544	NF3015C-CD
ED64sp-7R522	NF3040A-CD	ED64sp-7R544	NF3020C-CD
ED64sp-1122	NF3060A-CD	ED64sp-1144	NF3030C-CD
ED64sp-1522	NF3060A-CD	ED64sp-1544	NF3040C-CD
ED64sp-2222	NF3100A-CD	ED64sp-2244	NF3050C-CD
ED64sp-3022	NF3150A-CD	ED64sp-3044	NF3080C-CD
ED64sp-3722	NF3150A-CD	ED64sp-3744	NF3080C-CD
ED64sp-4522	NF3200A-CD	ED64sp-4544	NF3100C-CD
ED64sp-5522	NF3250A-CD	ED64sp-5544	NF3150C-CD
ED64sp-7522	NF3400A-CD	ED64sp-7544	NF3200C-CD
ED64sp-9022	NF3400A-CD	ED64sp-11044	NF3250C-CD
		ED64sp-16044	NF3400C-CD
		ED64sp-20044	NF3500C-CD
		ED64sp-25044	NF3600C-CD
		ED64sp-31544	NF31000C-CD

●External form and dimension



Type		Dimension (unit: mm)																		Fig.
200V class	400V class	A	B	C	D	E	F1	F2	G	H	J	K	L	M	N	P	Q	R	S	
NF3010A-CD	NF3005C-CD	167	160	145	130	110	80	—	60	70	35	15	—	—	φ5.5	R2.75X7	—	—	—	A
NF3015A-CD	NF3010C-CD	167	160	145	130	110	80	—	60	70	35	15	—	—	φ5.5	R2.75X7	—	—	—	
NF3020A-CD	NF3015C-CD	167	160	145	130	110	80	—	60	70	35	15	—	—	φ5.5	R2.75X7	—	—	—	
—	NF3020C-CD	167	160	145	130	110	80	—	60	70	35	15	—	—	φ5.5	R2.75X7	—	—	—	
NF3030A-CD	—	175	160	145	130	110	80	—	60	70	35	15	M4	M5	φ5.5	R2.75X7	—	—	—	
NF3040A-CD	NF3030C-CD	215	200	185	170	120	90	—	70	70	35	15	M4	M5	φ5.5	R2.75X7	—	—	—	
—	NF3040C-CD	215	200	185	170	120	90	—	70	70	35	15	M4	M5	φ5.5	R2.75X7	—	—	—	
NF3050A-CD	NF3050C-CD	255	230	215	200	140	110	—	80	80	40	15	M4	M5	φ6.5	R2.75X8	—	—	—	
NF3060A-CD	NF3060C-CD	255	230	215	200	140	110	—	80	80	40	15	M4	M5	φ6.5	R2.75X8	—	—	—	
NF3080A-CD	NF3080C-CD	310	280	260	240	200	150	—	120	100	55	20	M6	M8	φ6.5	R2.75X8	—	—	—	
NF3100A-CD	NF3100C-CD	420	370	350	330	210	170	60	120	155	95	20	M10	M6	φ6.5	R3.25X8	—	—	—	
NF3150A-CD	NF3150C-CD	435	370	350	330	210	170	60	120	155	95	20	—	M6	φ6.5	R3.25X8	—	—	—	
NF3200A-CD	NF3200C-CD	475	410	390	370	230	190	70	140	180	100	25	M12	M6	φ6.5	R3.25X8	—	—	—	B
NF3250A-CD	NF3250C-CD	475	410	390	370	230	190	70	140	180	100	25	—	M6	φ6.5	R3.25X8	—	—	—	
NF3400A-CD	—	450	340	310	280	220	180	80	146	170	85	18	—	—	—	80	45	4.5	4	
—	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	

4-2. Noise filter complying with CE marking (Option)

Please use the inverter and Noise filter by the following combination to suit the EMC(Electromagnetic Compatibility) instruction of Europe. Noise filter is connected with the input of the inverter, and please store on the control board and use the inverter and Noise filter. Application is possible the performance (attenuation characteristic) more than the equal application Noise filter a even if it is not the following, recommended goods. EMC agreement standard suits following PDS(Power Drive Systems).

EMI (Emission) : Normative Standard EN61800-3

EMS (Immunity) : Normative Standard EN61800-3

Please add common-mode reactor (core) besides above-mentioned Noise filter to the inverter unit output line in the form of a common mode (three aspect batch penetration) when you clear standard EN55011 with EMS(Emission).

Note: Please arrange in the vicinity of the inverter output terminal, and roll number (T) of turns of tables below in common-mode reactor.

Note: Please refer to the manual for details for EMC.

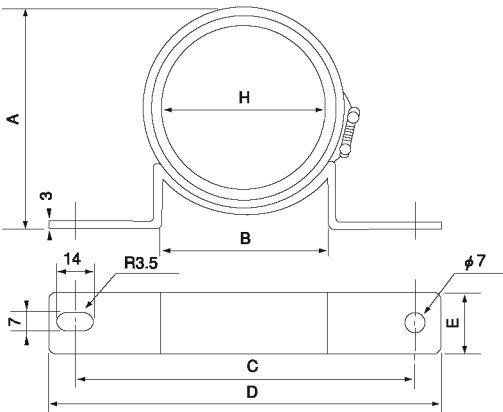
200V class noise filter complying with CE marking (option)

Type of Inverter	EN55011	
	EN61800-3	
	Noise filter	Common mode reactor
ED64sp-2R222	FN3258-16-45	RC5060x3T
ED64sp-3R722	FN3258-30-47	RC5060x3T
ED64sp-5R522	FN3258-30-47	RC5060x3T
ED64sp-7R522	FN3258-55-52	RC5060x3T
ED64sp-1122	FN3258-75-52	RC5060x2Pcsx3T
ED64sp-1522	FN3258-75-52	RC5060x2Pcsx3T
ED64sp-2222	FN3258-100-35	RC5060x2Pcsx3T
ED64sp-3022	FN3258-130-35	F6045GBx1T
ED64sp-3722	FN3258-180-40	F6045GBx1T
ED64sp-4522	FN3259-250-28	F6045GBx1T
ED64sp-5522	FN3259-250-28	F6045GBx1T
ED64sp-7522	FN3259-400-99	F140100PBx1T
ED64sp-9022	FN3259-400-99	F140100PBx1T

400V class noise filter complying with CE marking (option)

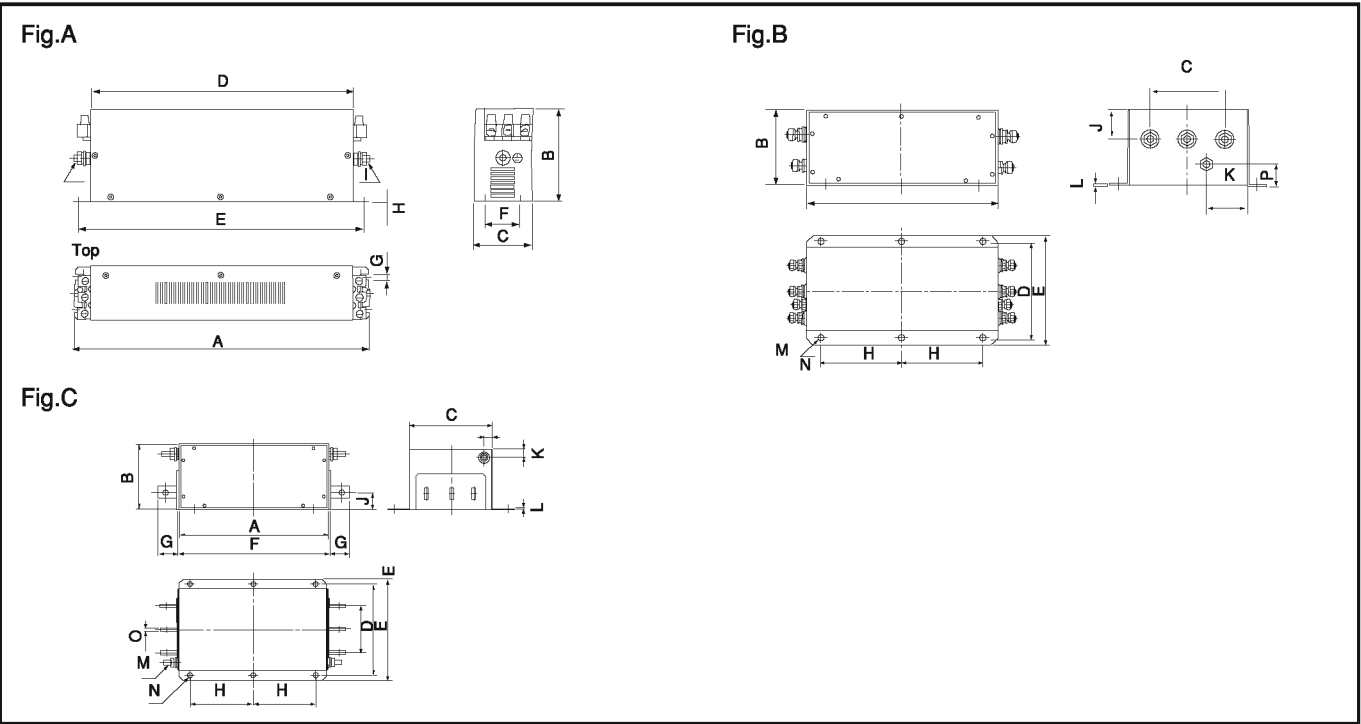
Type of Inverter	EN55011	
	EN61800-3	
	Noise filter	Common mode reactor
ED64sp-2R244	FN3258-7-45	RC5060x3T
ED64sp-3R744	FN3258-16-45	RC5060x3T
ED64sp-5R544	FN3258-30-47	RC5060x3T60
ED64sp-7R544	FN3258-30-47	RC5060x3T
ED64sp-1144	FN3258-42-47	RC5060x3T
ED64sp-1544	FN3258-42-47	RC5060x3T
ED64sp-2244	FN3258-55-52	RC5060x2Pcsx3T
ED64sp-3044	FN3258-75-52	RC5060x2Pcsx3T
ED64sp-3744	FN3258-100-35	RC5060x2Pcsx3T
ED64sp-4544	FN3258-130-35	F6045GBx1T
ED64sp-5544	FN3258-130-35	F6045GBx1T
ED64sp-7544	FN3258-180-40	F140100PBx2T
ED64sp-11044	FN3259-320-45	F140100PBx2T
ED64sp-16044	FN3259-400-45	F140100PBx2Pcsx1T
ED64sp-20044	FN3259-600-45	F140100PBx3Pcsx1T
ED64sp-25044	FN3259-600-45	F140100PBx3Pcsx1T
ED64sp-31544	FN3259-1000-99	F140100PBx5Pcsx1T
ED64sp-40044	FN3259-600-99x2Pcs	F140100PBx6Pcsx1T
ED64sp-50044	FN3259-600-99x2Pcs	F140100PBx6Pcsx1T
ED64sp-60044	FN3259-600-99x3Pcs	F140100PBx9Pcsx1T
ED64sp-75044	FN3259-600-99x3Pcs	F140100PBx9Pcsx1T

4—3. Common mode reactor



type	Dimension	A	B	C	D	E	F	G	H	Weight(g)
RC5060		67	45	95	115	19	φ 7	7×14	38	200
F6045GB		78	—	80	95	26	M5	M5	39	200
F140100PB		162	—	160	181	42	M6	M6	95	1610

4—4. Filter external form



type	Dimension	A	B	C	D	E	F	G	I	Fig	Weight(g)
FN3258-7-45		190	70±0.6	40	160	180	20	4.5	M5	A	0.5
FN3258-16-45		250	70±0.6	45	220	235	25	5.4	M5	A	0.8
FN3258-30-47		270	85	50	240	255	30	5.4	M5	A	1.2
FN3258-42-47		310	85	50	280	295	30	5.4	M6	A	1.4
FN3258-55-52		250	90	85	220	235	60	5.4	M6	A	1.8
FN3258-75-52		270	135±1	80	240	255	60	6.5	M6	A	3.2
FN3258-100-35		270	150±1	90±0.8	240	255	65	6.5	M10	A	4.3
FN3258-130-35		270	150±1	90±0.8	240	255	65	6.5	M10	A	4.5
FN3258-180-40		380	170±1	120±0.8	350	365	102	6.5	M10	A	6.0

type	Dimension	A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	Fig	Weight(g)
FN3359-250-28		365	125	180	205	230	—	—	120	110	40	62.5	M10	—	—	35	B	7.0
FN3359-320-99		300	115	210	235	260	306	40	120	60	35	20	M12	12	6	—	C	10.5
FN3359-400-99		300	115	210	235	260	306	40	120	60	35	20	M12	12	6	—	C	10.5
FN3359-600-99		300	135	210	235	260	306	40	120	60	35	20	M12	12	8	—	C	11.0
FN3359-100-99		350	170	230	255	280	356	50	145	60	64	25	M12	12	8	—	C	18.0

5. DC Reactor

DC Reactor is separately supplied as option for ED64sp-1122 or less of 200V class and ED64sp-1544 or less of 400V class. DC Reactor of separate installation type is equipped as standard for ED64sp-1522 or over of 200V class and ED64sp-2244 or over of 400V class. See [chapter8 item4] of external form dimension.

6. VF61R Sine wave converter

In cases of regeneration of energy at the time of brake torque and improvement of input power factor and of distortion rate is required, power regenerative sine wave converter can be used. We prepare VF61R series as sine wave converter unit. For details, please contact our sales division or see [Instruction Manual of VF61R Sine Wave Converter] of separate issue.

7. Dynamic brake unit (DB unit)

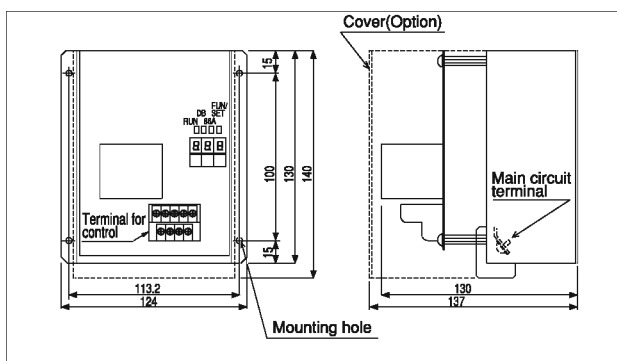
If sine wave converter is not used in case of need of brake torque, dynamic brake unit (DB unit) is used for disposing of generated energy. In case of ED64sp, units of 200V class 11kW (ED64sp-1122) capacity or less and 400V class 15kW (ED64sp-1544) capacity or less incorporate the transistor for dynamic braking and by adding the resistor and protection relay at external, dynamic braking can be performed. In case of higher types of aforesaid ones, dynamic brake unit (DB unit) should be used. For details, please contact our sales division or see [Instruction Manual of Dynamic brake (DB unit)] of separate issue.

Type of Inverter	200V class												
	2R222	3R722	5R522	7R522	1122	1522	2222	3022	3722	4522	5522	7522	9022
Motor capacity	2.2	3.7	5.5	7.5	11	15	22	30	37	45	55	75	90
DB unit	Built-in type					Use separate type(Type VFDB2002-50)					Use separate TypeX2parallelly		
Max. braking power	2.9	3.2	9.8		13.1	17.3					34.6		
Ave. braking power	0.08	0.16	0.2		0.24	0.4					0.8		
Type, q ¹ /s(*2) of brake resistor	200W 22Ω ×2S	200W 10Ω ×4S	250W 3.3Ω×4S		400W 3.3Ω ×3S	400W 1.5Ω×5S					400W 1.5Ω×5S×2sets		
Thermal setting	2.4	3.5	7.5		8.5	13.0					13.0		

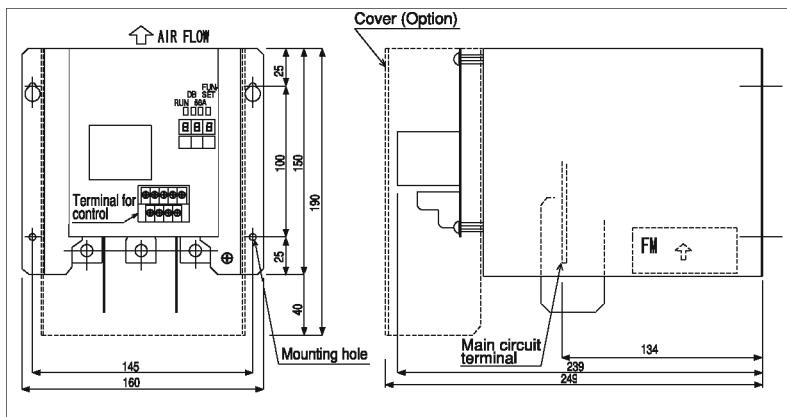
Type of Inverter	400V class																	
	2R244	3R744	5R544	7R544	1144	1544	2244	3044	3744	4544	5544	7544	11044	16044	20044	25044	31544	
Motor capacity	2.2	3.7	5.5	7.5	11	15	22	30	37	45	55	75	110	160	200	250	315	
DB unit	Built-in type						Use separate type(Type VFDB2002-50)					Use separate Type X2parallelly						
Max. braking power	2.6	5.9	8.6		15.2		22.4					44.8						
Ave. braking power	0.08	0.16	0.24		0.4		0.56					1.1						
Type, q'ty(*2) of brake resistor	200W 100Ω ×2S	200W 22Ω ×4S	200W 10Ω ×6S		400W 6.8Ω ×5S		400W 3.3Ω×7S					400W 3.3Ω×7S×2sets						
Thermal setting	1.2	2.4	3.5		6.0		8.5					8.5						

Large capacity dynamic brake unit	VFDB2002-200									
Voltage class	200V class				400V class					
Max. braking power	17.3	34.6	51.9	69.2	22.4	44.8	67.2	89.6	112	134.4
Ave. braking power	0.4	0.8	1.2	1.6	0.56	1.1	1.68	2.24	2.8	3.36
Type, q'ty(*2) of brake resistor	400W 1.5Ω ×5S	(400W 1.5Ω ×5S) ×2P	(400W 1.5Ω ×5S) ×3P	(400W 1.5Ω ×5S) ×4P	400W 3.3Ω ×7S	(400W 3.3Ω ×7S) ×2P	(400W 3.3Ω ×7S) ×3P	(400W 3.3Ω ×7S) ×4P	(400W 3.3Ω ×7S) ×5P	(400W 3.3Ω ×7S) ×6P
Thermal setting	13.0	N60A type 26.0	N60A type 39.0	N60A type 50.0	8.5	N60A type 17.0	N60A type 25.0	N60A type 34.0	N60A type 42.0	N60A type 50.0

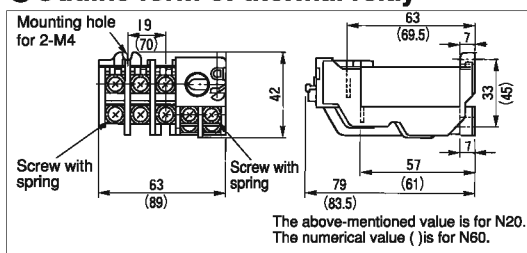
●Outline of DB unit, Type:VFDB2002-50



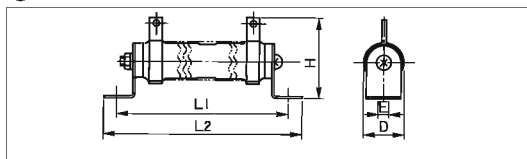
●Outline form of DB unit, Type:VFDB2002-200



●Outline form of thermal relay



●Outline of brake resistor



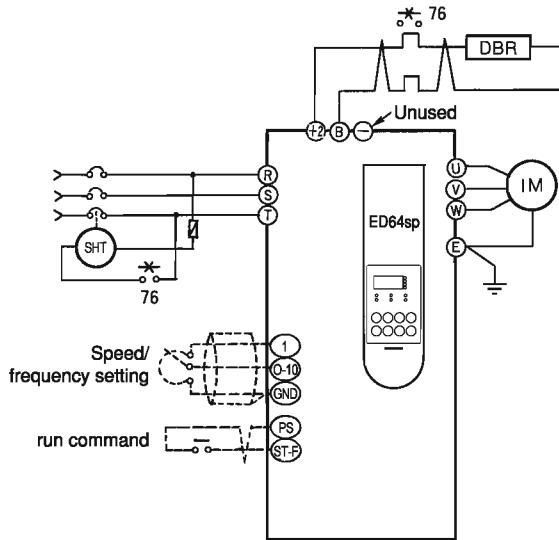
●Dimension table of brake resistor

capacity	Dimension (mm)				
	L1	L2	H	D	E
200W	306	331	49.5	28	8.2
250W	343	358	59.0	40	4.5
400W	380	408	82.0	50	9.5

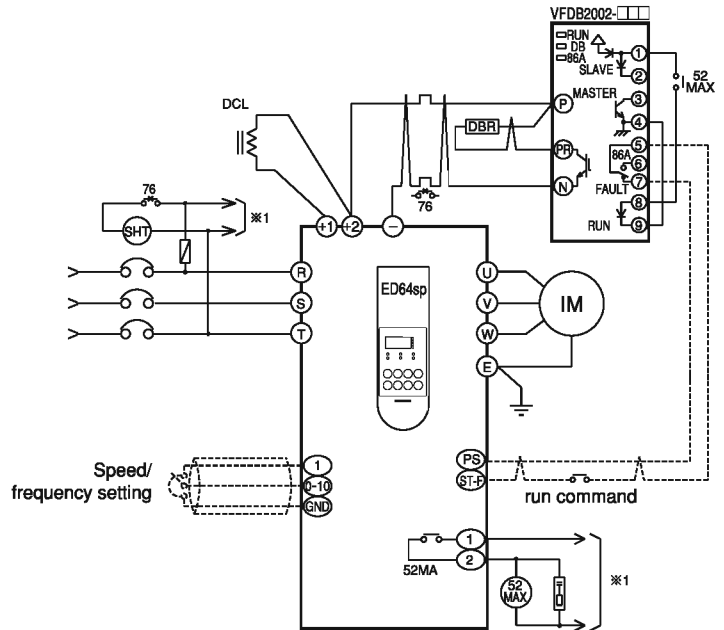
(Note 3) Installation of resistors, in case of series connection of brake resistors, should be done securing a space of 100mm or more between center of resistors in both lateral placement and stacking arrangement.

7-2. Connection example of dynamic brake circuit

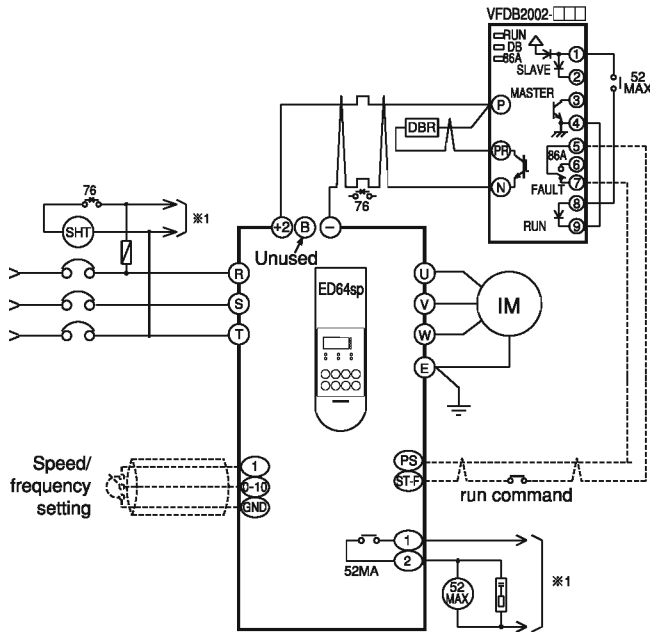
● Connection example of DB unit built-in type



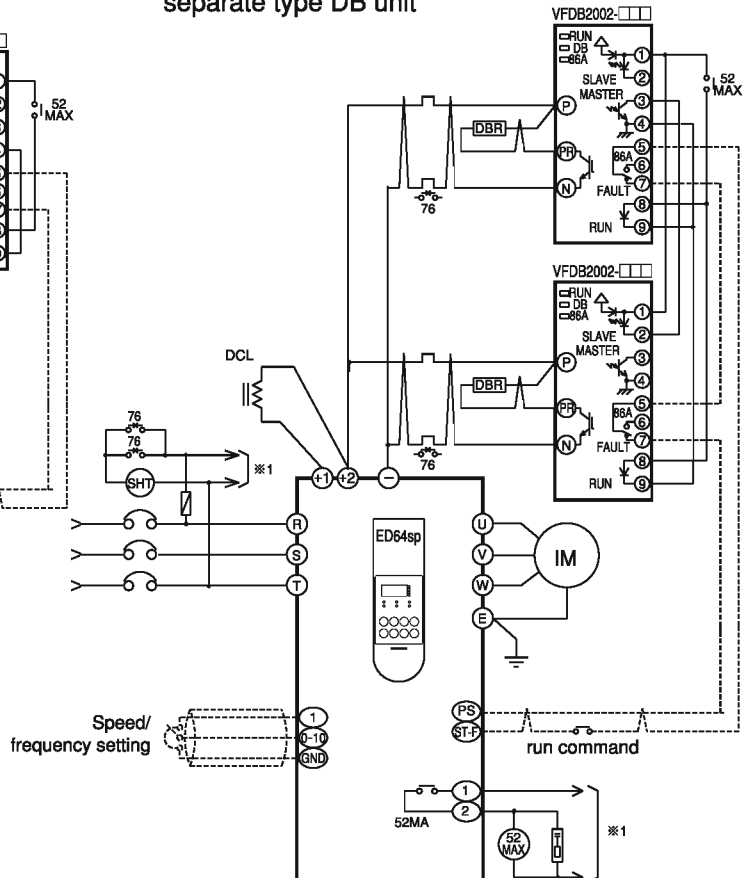
● Connection example of separate type DB unit



● Connection example of DB unit built-in type with separate type DB unit



● Connection example use of plural number of separate type DB unit



Note.1) Please run/stop the contact point of 52MAX at the same time as the drive contact point of ED64sp (Terminal ①-②). The lowpower relay must be used as the one for this contact point.

Note.2) VFDB2002-□□□ can be applied to both 200V class and 400V class. Please change the connection with the jumper (CN4,5, CN7,8) and switch voltage with the indicator.

Note.3) It is necessary to set the slave machine with the indicator when using in parallel. Please refer its detail to the instruction manual.

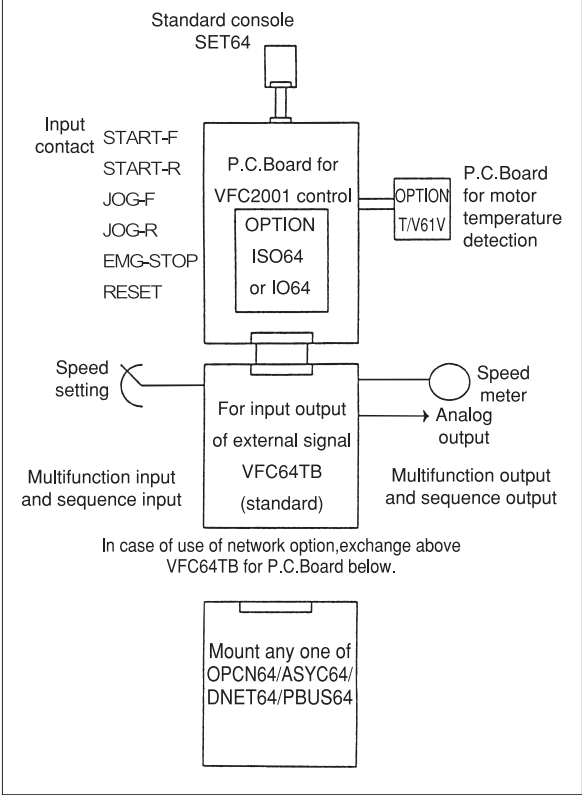
Chapter 5 Function-up option

●Table of Options

	Name	Type	Application	Remarks
Function up	Extension cable	CBL64-L□	3 kinds of 1m/3m/5m are available	
	Metal fitting of console		Metal fitting to be used for mounting of SET64OP or SET64 on panel, etc.	
	Isolation input card	ISO64	Analog isolation 2 inputs are equipped.	Mount one of them on VFC2001.
	Isolation input output card	IO64	Analog isolation 1 input/ 1 output are equipped.	
	Motor temperature detection	T/V61V *1	Apply for motor start torque compensaion and motor protection.	Mount in ED64sp.
Network	JEMA-Net	OPCN64	Comply with OPCN-1 compliance class TYPE-S521.	Select one Kind of them and mount exchanging P.C.Board VFC64TB.
	RS422/485 RS232C	ASYC64	Communication of start/stop synchronous serial system can be executed.	
	Device-Net	DNET64		
	PROFIBUS	PBUS64		

(* 1) Owing to the limited space, T/V61V cannot be added to the following models as option, ED64sp-2R222 ,3R722 ,2R244 ,3R744

●Fitting position of P.C.Board for Option



1. Extension cable and metal fitting

○ Extension cable

Type

CBL64-L1	1m
CBL64-L3	3m
CBL64-L5	5m

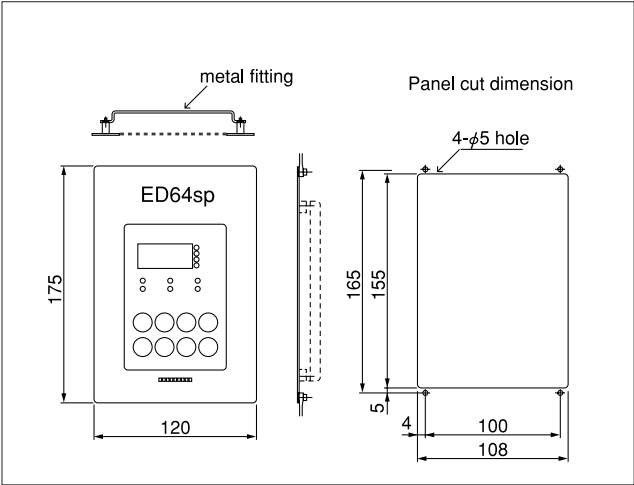
(SET64)



○ Metal fitting

To be used when standard console (SET64) is fitted to the external(Control panel door, etc.)

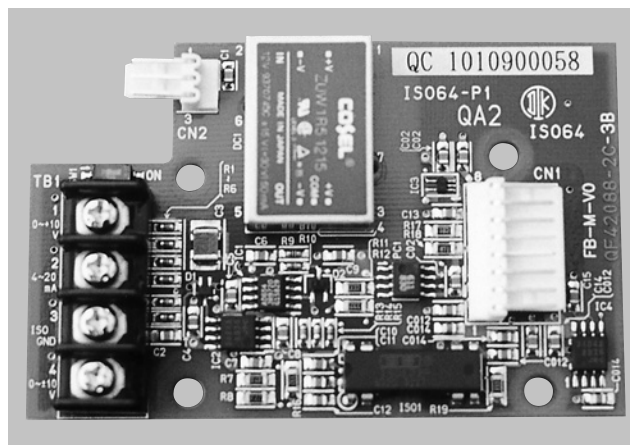
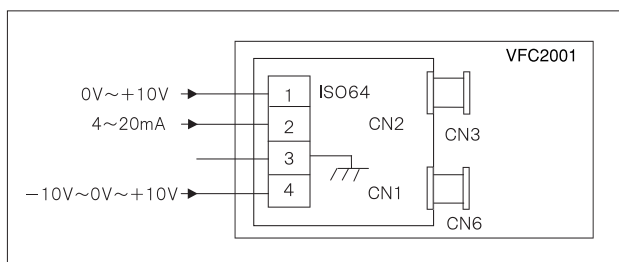
Outline dimension



2. Isolated input card : ISO64

- ISO64 can be used as input of HC function and sequence function and, as input of feedback signal of pressure control and air volume control.

(Note1) As to ISO64 and IO64, please select and use any one of them.



●Specification

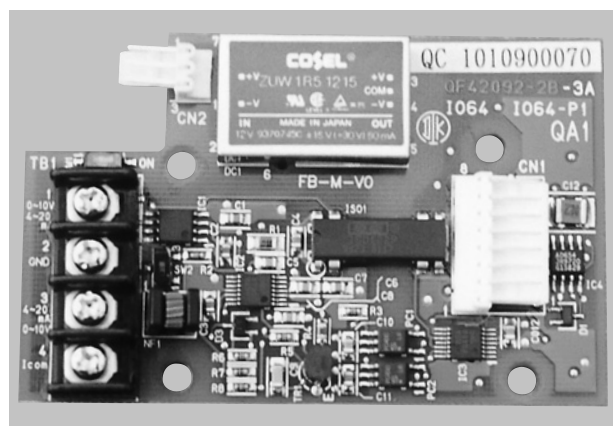
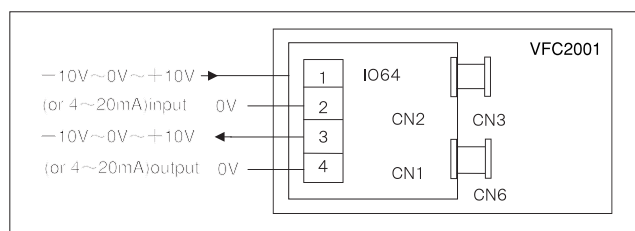
Function	Kind of input	Input resistance	Input terminal	Remarks
Isolated analog input (1)	-10V~0V~+10V	69KΩ	4-3 (0V)	—
Isolated analog input (2)	0V~+10V	150KΩ	1-3 (0V)	SW1-OFF
	4~20mA	250Ω	2-3 (0V)	SW1-ON

3. Isolated input output card : IO64

- IO64 can be used as input output of HC function and sequence function, and as input output of feedback signal of pressure control and air volume control.

(Note1) As to ISO64 and IO64, please select and use any one of them.

(Note2) Insulation analog input is 0V~+10V when it is used as speed command input and is -10V~0V~+10V when it is used as torque command input.



●Specification

Function	Kind of input output	Input resistance	Load resistance	Input Output terminal	Remarks
Isolated analog input	-10V~0V~+10V	150KΩ	—	1-2 (0V)	SW1-OFF
	4~20mA	250Ω	—	1-2 (0V)	SW1-ON
Isolated analog output	4~20mA	—	500Ω or less	3-4 (0V)	SW2-OFF
	-10V~0V~+10V	—	10kΩ or over	3-4 (0V)	SW2-ON

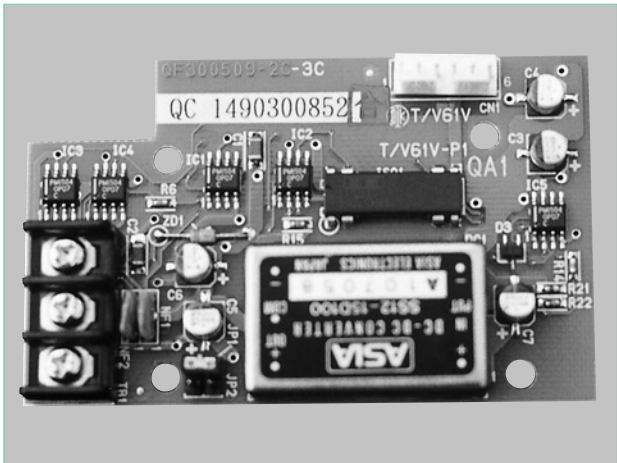
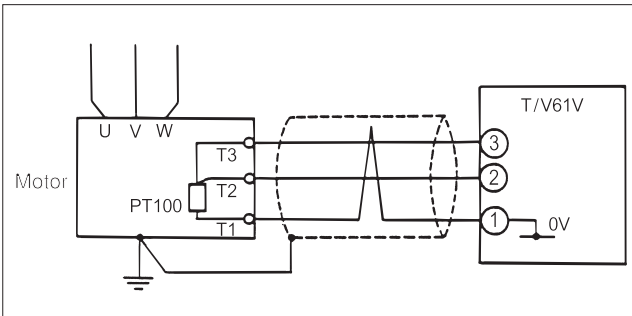
(Note) Minus voltage input is in the time only when it is used as torque command

4. Motor temperature compensation : T/V61V

By incorporating of our own motor temperature compensation system (Patent Pending) and function to measure and set variance of motor electric constant automatically, which was problem point of conventional vector Inverter control, Linearity and Reproducibility are improved drastically.

Other functions:—

- When motor temperature exceeds 150℃,Inverter is stopped.
- Displays motor temperature on console panel.



- (Note 1) In case of fitting of temperature compensation option, it is necessary to mount temperature detector (PT100 equivalent 3 wires type resistance thermometer). Please designate motor with thermometry resistor.
- (Note 2) Use twisted shielded cable for connection of temperature detector and temperature compensation option.
- (Note 3) Temperature compensation option(T/V61V) can not be used for ED64sp-2R222,3R722,2R244,and 3R744.

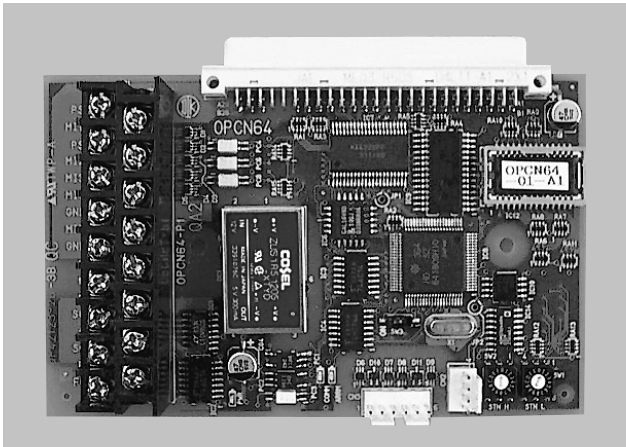
Chapter 6 Communication system up option

1. OPCN64 : OPCN-1(JPCN-1) compliance

By use of OPCN64, ED64sp Inverter can perform drive command, speed command, setting/ drive monitoring, etc. of kinds of parameter with upper CPU system and personal computer • PLC via communication circuit highly speedy.

Item	Specification
Power source	Supply from isolated control power source of VF64 Inverter
Data link layer	Network specification OPCN-1
Electric characteristic of physical layer	Based on RS485
Connection form	Bus type (multi drop system)
Object device of communication	Devices having specification of master office of OPCN-1
Transmission speed and transmission distance	Speed is set by console of ED64sp main body 125kbps:within 1000m 250kbps:within 800m 500kbps:within 480m 1Mbps :within 240m
Class of adaptability	TYPE-S52I
Synchronous method	Frame synchronous method
Coding method	NRZI
Setting of Local Number	Among 01-7F, 31 offices (selectable by rotary switch)which are not overlapped with other office
Number of connection office	Max. 31 offices for master office of 1 unit
Connection/wiring method	Terminal block (5 poles), 2 wires type or 3 wires type
Data form	Bit data by frame composition
Error detection	FCS system (frame inspection sequence)
Recommendable cable	CO—SPEV (SB) —0.5mm ² ×2P

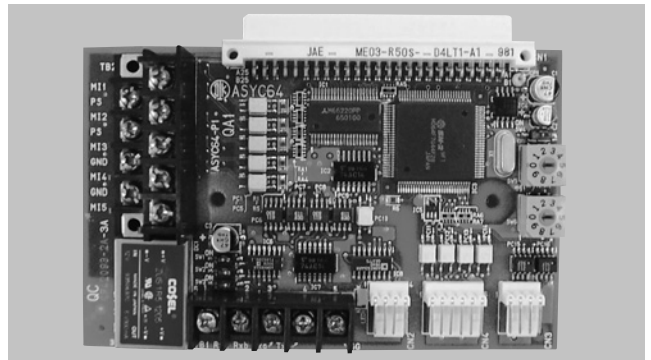
OPCN64 adopted Standard Specification OPC N-1 which was recommended by The Japan Electrical Manufacturers' Association and communication protocol is based on the specification of the slave office. ED64sp can perform connection • control with other maker s • different types that have master office function of OPC N-1, in addition to our PLC (μ GPCsx), needless to say. OPCN64 obtained [Authentication No.J990908JPCNS031]. Control program canbe made at customer side.As Instruction Manual is prepared, please contact us.



2. ASYC64 : Complied with RS232C/RS485 start-stop synchronous serial communication

ASYC64 is an option for communication network by start/stop synchronous communication(max. 19200bps).It can control and monitor ED64sp Inverter by upper CPU system, PLC and personal computer communication line.See [Instruction Manual of ASYC64] of another volume.

Item	Specification	
Power source	Supply from isolated control power source of ED64sp Inverter	
Elec. characteristic of physical layer	RS422/RS485 compliant	RS232 compliant
Transmission distance	1000m	3m
No. of office	1 : max. 31 units	1 : 1
Communication control system	Polling/selecting system	Polling system
Communication speed	1200/2400/4800/9600/19200/38400bps	1200/2400/4800/9600/19200bps
Transmission procedure	Semi-double (no procedure)	Semi-double (no procedure)
Connection form	Terminal block (M3)	Connector (5051-04 of MOLEX)
Data type	Data length ASCII (7 bits)	
	Start bit (1 bit)	
	Parity check (1 bit even number)	
	Stop bit (1 bit)	
Error detection	Sum check	



3. DNET64 : Complied with DeviceNet

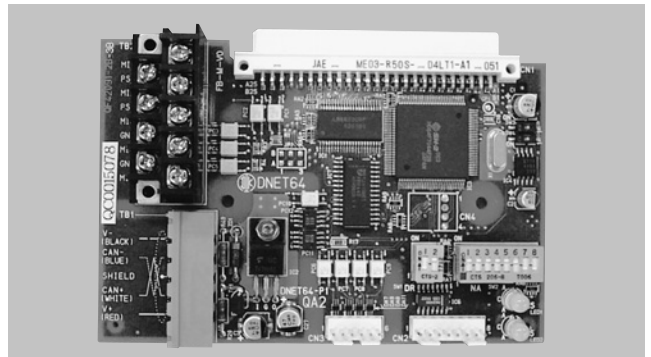
DNET64, being network option board of ED64sp, can beconnected with DeviceNet of open network standard and offers communication function as a DeviceNet slave device.

DeviceNet is lower network to connect simple device (sensor, actuator) for industrial use and upper device (controller).

Also, DeviceNet is open network standard and its specification and protocol are opened by Open DeviceNet Vendor Association, Inc.(ODVA) and offers mutual compatible connection between devices of same kind by plural vendors.

This product was tested at test laboratory of the third party, which was authorized by by ODVA, and recognized adaptation to conformance test software Ver.A-14 of ODVA.

Item	Specification
Communication function of DeviceNet	Slave function
Vendor ID	178
Device profile	AC Drive
Setting range of MAC ID	00~63
Connection form	T branch, DG chain connection
Communication function	1/0 message Polling Explicit message Group2 Only server, Overlap MAC ID
Transmission speed and transmission	125kbps : within 500m 250kbps : within 250m 500kbps : within 100m



4. PBUS64 : Complied with PROFIBUS

PBUS64, being an option of ED64sp series, is communication option to connect ED64sp Inverter with network of PROFIBUS, the world standard of field bus.

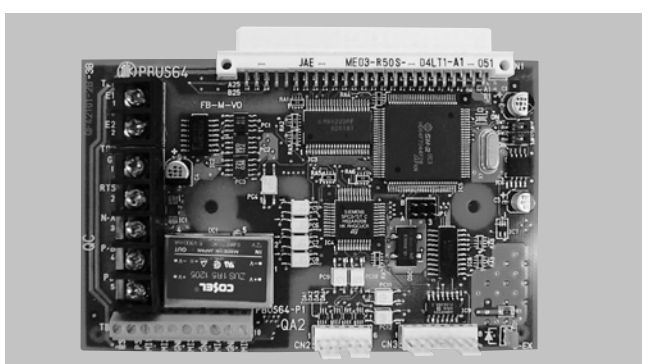
PROFIBUS is the standard of open type field bus, without dependence on vendor, which is used in wide range of actuator/sensor-le is regulated by International Standard IEC61158.

PBUS64 has function of PROFIBUS-DP slave and can control, monitor ED64sp Inverter from other master station.

PBUS64 is PROFIDRIVE-Profile compliant and can use PRO-Type 1 5.

PBUS64 passed Authentification Test of TEST-LAB., recognized officially by PROFIBUS Association and was approved by PROFIBUS Association.

Item	Specification
Power source	supply from isolated control power source of ED64sp Inverter
Communication protocol	PROFIBUS-DP slave
Physical layer	RS485 compliant
Connection form	Bus type
Object device of P communication	Devices having specification of PROFIBUS-DP master
Transmission speed and transmission distance	9.6kbps : within 1200m 19.2kbps : within 1200m 93.75kbps : within 1200m 187.5kbps : within 1000m 500kbps : within 400m 1.5Mbps : within 200m 3Mbps : within 100m 6Mbps : within 100m 12Mbps : within 100m
Station number setting	Setting by console of ED64sp



Chapter 7 System-up option

Making the most of our experience of developed ED64sp Inverter as the product which can perform to meet the demand of market. We also prepared following system-up options as the function to pursue the easiness in use of Inverter. In order to use these function, special technology to structure the system is required. In case of use of these functions, PC Tool (separate sale) such as dedicated Editor, etc., which are operated on personal computer, is needed. In case of handling of PC Tool, please consult our sales division.

1. HC function

This function consists of:-

- 1) Numerical value operation part, called [Super block].
- 2) Function to link mutual input/output between plural super blocks.
- 3) Processing part to link the discretionary data of input/output of super blocks.

By super block editor (separate sale) to be operated by personal computer, the most suitable motor drive system to the applications of customer can be structured prepared in ED64sp in advance. For details, see [Instruction of super block editor] in [PC Tool Manual II] of separate issue.

2. Sequence (PLC) function

Sequence function is the function to edit the sequence of ED64sp inside by sequence editor (separate sale), which operates by personal computer, using ladder circuit, and to control transposing with standard sequence incorporated in ED64sp. By this function, the most suitable sequence to customers' application can be structured in ED64sp inside, and it is possible to omit PLC and a part of relay circuit, which were necessary so far. For details, see [Instruction of sequence editor] in [PC Tool Manual II] of separate issue.

3. Trace back monitor function

Trace back function is to memorize the status of running at the time of protective operation of ED64sp and information of 16ch of component of current, voltage, etc. of each phase at the time of protective operation, in the Inverter inside. By this function, it is possible to analyze the cause of trouble of Inverter and system, and carry out restoration in short time. Trace back monitor function is to display the memory data of this trace back on the screen of personal computer, using [trace back monitor tool software] (separate sale). For details, see [Instruction manual of trace back monitor] in [PC Tool Manual I] of separate issue.

4. Trend monitor function

Trend monitor function is the function to display the internal sequence signal such as operation command and protective operation signal, etc. of ED64sp inside as well as internal data such as effective value current, voltage, etc., on the screen of personal computer on real time. Since it is possible to display each output data of super block, which were put in using aforesaid HC function, in addition to the standard internal data, this function can be used for checking, etc. of operation status of the system and also for debugging of circuit put in by HC function. For using of this function, [Trend monitor tool software] (separate sale), which is operated on personal computer, is needed. For details, see [Instruction manual of trend back monitor] in [PC Tool Manual I] of separate issue.

5. Console data set function

This is function to perform read/write of console setting of ED64sp at the same time by personal computer. Also, it is possible to copy the setting data between Inverters. For using of this function, [Trend monitor tool software] (separate sale), which is operated on personal computer, is needed. For details, see [Instruction manual of console data set] in [PC Tool Manual I] of separate issue.

Chapter 8 Maintenance inspection

1. ED64sp protection display and trouble shooting

When abnormalities arise during operation and an inverter carries out protective operation, please check LED of a standard console, and protection display LED of each P.C. Board as well as study the cause by trouble shooting of the following, and take suitable measures.

SET64 LED Display	Model	Protection display LED on P.C .board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
		In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001			
Fu	2R222~ 9022 2R244~ 31544		—			Main circuit DC part fuse melting in a unit	* The power supply wasconnected to theinverter output. * IGBT (IPM) was damaged by a certain cause. * Ground-fault or short-circuit of the output wiring cable. * The dynamic brake circuit was damaged.	* The check of input-and-output wiring. * The conduction check of IGBT (IPM). * Exchange of damage parts and a fuse. * Exchange of a unit.
	40044~ 75044	Fu	—	—	—	Main circuit DC part fuse melting in a master unit		
		—	—	Fu	—	Main circuit DC part fuse melting in a slave unit		
oL	All models	—	—	—	—	Protection operates when the current of 150% or equivalent of motor rated current flows to an inverter output for 1 minute.	* Load capacity is unusually large. * Selection of an inverter and motor capacities is not correct. * The setting value of load rate of over load protection is unsuitable. * Combination of Inverter and motor is incorrect. * Rated current setting value (A- 04) is incorrect.	* Prectical use of over load pre- alarm function (C-16). * Mitigation of load. Revision of an inverter and motor capacities. * Revision of the setting value of the overload protection setting (F-03). * Make correct combination of Inverter and motor. * Set correct value of rated current setting of motor.
FcL	All models	—	—	—	—	Protection operates when about 290% current of inverter rating flows to an inverter output for several seconds.	* Output wiring cable was earthed or shortcircuited. * Load capacity is large abnormally. * Current control gain is unsuitable. * Operation level setting value is unsuitable. * Combination of inverter and motor is incorrect.	* Check output wiring. * Reduction of load, Revision of capacity of Inverter and motor. * Adjust current control gain (E10-13). * Revise setting value of FCL level (F-04). * Make correct combination of inverter and motor.
oc	All models	—	—	—	—	When about 350% or more of the current of inverter rating flows to an inverter output, protection operates immediately.	* Output wiring cable was earthed or shortcircuited. * Auto-tuning was not done after replacement of moter. Setting value of auto-tuning is unsuitable. * Combination of Inverter and motor is incorrect. * Erroneous detection of speed detection (ED64P.V mode)	* Check output wiring. * Execute full mode auto-tuning. * Make correct combination of Inverter and motor. * Check PG wiring route. Separetion from main circuit wiring.

SET64 LED Display	Model	Protection display LED on P.C .board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
		In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001			
oH	7522~ 9022 7544~ 75044	—	OH	—	—	Overheating of heat sink for IGBT module in a unit and input rectification diode modules.	* Trouble of the fan motor for cooling. * Ambient temperature is high. * The cooling space of a unit is not enough. * The direction of installation of a unit is unsuitable. * DCL was not connected. * Carrier frequency was set beyond initial value. * Operation of the temperature detection sensor for cooling fins is poor.	* Exchange of the fan motor for cooling. * A check of installation environment, a check of the temperature rise in a control board. * Secure sufficient cooling space. * Make correct installation. * Connect DCL. * Set carrier frequency (A-08) below the initial value, or reduce load capacity. * The conduction check of a cooling fin temperature sensor (Non-conduction is normal when fin temperature is low).
oV	All models	—	—	—	—	Intermediate DC part of a unit (master unit in case of parallel units) over voltage protection (Operates by DC voltage of about 400(200V series)/ 800V(400V series)).	* Ground-fault or short-circuit of the output wiring cable. * Deceleration time is too short. * Erroneous setting of built-in DB operation voltage * The erroneous operation of a dynamic brake option. * An unusual rise of input power supply voltage. * The inertia of load is large.	* The check of output wiring. * Elongate decel. time or use regeneration stall prevention function (b-13). Or connect DB option. * Adjustment of built-in DB operation voltage (F-00). * Exchange a dynamic brake option. * Confirm input power supply voltage. * Use a regeneration converter or dynamic brake option.
iGbt	2R222~ 2222 2R244~ 2244	—	—			IPM module protective operation in a unit (IGBT element over-current, IGBT gate power supply voltage down. overheating of fin for IPM module, input rectification diode module)	* IGBT(IPM) was damaged by a certain cause. * Ground-fault or short-circuit of the output wiring cable. * Trouble of the fan motor for cooling. * Ambient temperature is high. * The cooling space of a unit is not enough. * The direction of installation of a unit is unsuitable. * DCL was not attached even in model, to which DCL is attached as the standard accessory. * Set carrier frequency at higher value than initial one. * Continued the operation at lower frequency than10Hz. * Operation of the P.C. Board GAC64 or MAC64 is poor.	* Check the conduction of IGBT (IPM). * The check of output wiring. * Exchange of the fan motor for cooling. * A check of installation environment, a check of the temperature rise in a control board. * Secure sufficient cooling space. * Make correct installation. * Connect DCL. * Set carrier frequency (A-08) at lower value than initial one, or reduce load capacity. * Reduce capacity according to the capacity reduction curve at the time of low frequency operation. * Exchange of GAC64 or MAC64 P.C.board.

SET64 LED Display	Model	Protection display LED on P.C .board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
		In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001			
iGbt	7522~ 9022 7544~ 75044	—	OGU	—	—	Over-current protection of U phase IGBT module in a unit, or output over- current protection.	* IGBT (IPM) was damaged by a ceratin cause. * Ground-faukt or short-circuit of the output wiring cable. * Setting value of auto-tuning is unsuitable. * Load capacity is large abnormally. * Operated continuously by low frequency of less than 10Hz. * Malfunction of GAC2001 P.C Board.	* Check the conducyion of IGBT (IPM). * The check of output wiring. * Carry-out the full mode auto-tuning. * Reduction of load. Revision of capacity of Inverter and motor. * Reduce capacity in accordance with capacity reduction curve at the time of operation by low frequency. * Replacement of GAC2001 P.C Board.
		—	OCV	—	—	Over-current protection of V phase IGBT module in a unit, or output over- current protection.		
		—	OCW	—	—	Over-current protection of W phase IGBT module in a unit, or output over- current protection.		
		—	UV-G	—	—	IGBT gate power supply voltage in a unit is abnormal (Liphase N side is detected)		
	40044~ 75044	FCL- OC	—	—	—	Protection operates, when about 290% current of inverter rating flows continuously for about 2 seconds or more to a master unit or a slave unit output.	* Ground-fault or short-circuit of the output wiring cable. * Load capacity is large abnormally. * Current contorol gain is unsuitable. * Setting value of FCL operation level is unsuitable. * Erroneous detection of speed detection (ED64P.V modes)	* The check of output wiring. * Reduction of load. Revision of capacity of Inverter and motor. * Adjust current control gain (E10-13). * Revision of setting value of FCL level (F-04). * Check PG wiring route. Separation from main circuit wiring.
iGt1	3022~ 5522 3044~ 5544					Protective operation of U phase IPM module in a unit.	* U,V,W phases of IGBT (IPM) were damaged by a certain cause. * Ground-fault or short-circuit of the output wiring cable. * Trouble of the fan motor for cooling. * Ambient temperature is high. * The cooling space of a unit is not enough. * The direction of installation of a unit is unsuitable. * DCL was not connected. * Carrier frequency was set at higher value than initial one. * Continued operation at lower frequency than 10Hz. * Operation of the P.C. boards GAC64 is poor.	* The conduction check of IGBT (IPM). * The check of output wiring. * Exchange of Fan Motor for Cooling. * A chek of installation environment, a check of the temperature rise in a control board. * Secure sufficient cooling space. * Make correct installation. * Connect DCL. * Set carrier frequency (A-08) at lower value than initial one , or reduce load capacity. * Reduce capacity according to the capacity reduction curve at the time of low frequency operation. * Exchange of GAC64 P.C. board.
iGt2						Protective operation of V phase IPM module in a unit.		
iGt3						Protective operation of W phase IPM module in a unit.		

SET64 LED Display	Model	Protection display LED on P.C. board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
		In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001			
StrF	All models	—	—	—	—	Protection operates when Inverter does not work even though 10 seconds passed after inputting or operation and jog commands.	* Inputted the operation and jog commands for more than 10 seconds after detection of under-voltage (power failure). * Inputted the operation and jog commands for more than 10 seconds during input of emergency stop signal.	* Turu the instantaneous power failure re-starting selection (B- 11) to on. * Sequence should be that operation and jpg commands are turned to off at the time of an emergency stop signal input.
oPEr	All models	—	—	—	—	The abnormal operation or poor connection of a digital option P.C. board.	* In spite of no use of digital option P.C. Board,selected the use of digital option (J-00). * Operation of a digital option P.C. board is poor. * The digital option P.C.board is not surely connected.	* Turn digital option use selection (J-00) to OFF. * Exchange of a digital option P.C. board. * Check the connection with a digital option P.C. boarf and the state of the insertion of a connector.
cS2	All models	—	—	—	—	EEPROM data sum check error of VFC2001 P.C. board.	* VFC2001 P.C. board of no initialozing was mounted. * Erroneous writing to EEPROM by the excessive noise. * The defect of EEPROM parts.	* Initialize the VFC2001 P.C. board. * Take countermeasure against noise to wring from VFC2001. * Exchange of VFC2001 P.C. board. (Once console indication is turned to cS2. it cannot be released unless VFC2001 is initiallzed.)
ccEr1	All models	—	—	—	—	The communication timeout error between VFC2001 P.C. board~ console panel (SET64).	* Disconnection of a console panel connection cable and poor insertion of a connector. * VFC2001 P.C. board is in the program rewriting mode. * Mal-operation of VFC2001 P.C. board.	* An insertion check of a connector. Exchange of a connection cable. * Confirm that SW 3 and SW4 of VFC2001 P.C. board are OFF. * Exchange of VFC2001 P.C. board.
ccEr2	All models	—	—	—	—	The communication sum check error between VFC2001 P.C. board~ console panel.	* The excessive noise invaded into the extension cable, connected with console panel (SET64). * Mal-operation of VFC2001 P.C. board.	* Take countermeasure against noise to the extension cable, connected with console panel (SET64). * Exchange of VFC2001 P.C.board.
ccEr3	All models	—	—	—	—	There was an error in the communication data which VFC2001 P.C. board received.	* Disconnection of a console panel (SET64) connection cable and poor insertion of a connector. * Two console panels (SET64) were connected to the connector for SET64 simultaneously.	* An insertion check of a connector.Exchange of a connection cable. * To the connector for SET64,only one cosole panel SET64 should be connected.
tS	All models	—	—	—	—	The communication timeout error between digital option P.C. board~ communication master office.	* Operation of a communication master office is poor. * Disconnection of connection cable between digital option P.C. board~ communication master office. Poor insertion of a connector.	* The check of operation of a communication master office. * The check of insertion of a connector.Exchange of connection cable.
SLF	40044~ 75044	—	—	—	OH	Overheat of heat sink for IGBT module in slave unit. Overheat of heat sink for input converter at slave side.	* Trouble of fan motor for cooling of slave unit. * Ambient temperature is high. * Cooling space of unit is insufficient. * Direction of installation of unit is unsuitable. * Set carrier frequency at higher than initial value. * DCL is not connected. * Mal-function of temperature detection sensor of cooling fin.	* Replace fan motor for cooling. * Confirm installation environment and temperature increase of inside of control panel. * Secure sufficient cooling space. * Install correctly. * Set carrier frequency (A-08) at lower than initial value or reduce load capacity. * Connect DCL. * Conduction check of temperature sensor of cooling fin (When fin temperature is low, non-condrction is normal).

SET64 LED Display	Model	Protection display LED on P.C .board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
		In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001			
SLF	40044~ 75044	—	—	—	OV-S	Over voltage protection at inter- mediate DC part of slave unit (operates when DC voltage is about 400V(200V series) /800V (400V series)	* Earthing or shortcircuit of output wiring cable. * Deceleration time is too short. * Malfunction of DB option. * Extra-ordinary increase of input power source voltage. * Load inertia is large.	* Check output wiring. * Elongate deceleration time or use preventive function (b-13) of regeneration stall. Or,connect DB option. * Replace DB option. * Confirm input power source voltage. * Use regeneration converter or DB option.
		—	—	—	OCU	Overcurrent protection of U- phase IGBT module in slave unit or output overcurrent protection.	* IGBT (IPM) broke. * Earthing or shortcircuit of output wiring cable. * Setting value of auto-tuning is unsuitable. * Load capacity is extra-ordinarily large.	* Conduction check of IGBT (IPM). * Creck output wiring. * Execute full mode auto-tuning. * Reduce the load and revise capacity of Inverter motor. * Reduce capacity in accordance with capacity reduction curve at the time of operation by low frequency.
		—	—	—	OCV	Overcurrent protection of V- phase IGBT module in slave unit or output overcurrent protection.	* Executed continuous operation by low frequency of less than 10Hz. * Malfunction of GA2001 P.C Board.	* Replacement of GAC2001 P.C. Board.
		—	—	—	OCW	Overcurrent protection of W- phase IGBT module in slave unit or output overcurrent protection.		
		—	—	—	UV-G	Abnomal voltage of IGBT gate power source in slave unit (Detect N-side of U-phase).	* Malfunction of GAC2001 P.C.board.	* Replace GAC2001 P.C.board.
		—	—	—	OV-S	Abnomal voltage of GAC2001 control power source in slave unit	* Mal-function of GAC2001 P.C.board.	* Replace GAC2001 P.C.board.
		PSCF	—	—	—	Voltage lowering of PRIM61. PRIS61 control power source or dis-connection of power source supply line.	* Disconnection of connection cable between master unit and slave unit. Erroneous insertion of connector. * Mal-function of PRIM61 P.C.board.	* Confirm insertion of connector,Replace connection cable. * Replace PRIM61 P.C.board.
SPdE	All models	—	—	—	—	Protection operates, when the deviation of speed command value from motor speed comes off the speed range of speed control error detection.	* The setting value of detection speed rabge is unsuitable. * Since load was large,torque restriction function startde. * Since accel/decel times were short,torgue restriction function started. * Operation of an external speed setter is poor. * Disconnection of PG line,operation of PG is poor. * Erroneous connection of PG. * Erroneous connection between Inverter output terminal and motor.	* Set the suitable value for detection speed range (F-09~ 10). * Reduce the load. * Elongate acceleration /deceleration times. * Operation check of an external speed setter. * A check of PG line, exchange of PG. * Confirm connection line between PG and VFC2001 P.C. board. * Confirm connection line between inverter and motor.

SET64 LED Display	Model	Protection display LED on P.C .board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
		In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001			
EF1	All models	—	—	—	—	The external failure 1 of a multifunction input was inputted.	* The external failure signal was inputted. * Setting of multifunction input is unsuitable.	* Check the input conditions of an * external failure signal. Check the conditions of the setting of a multifunction input (C00~06).
EF2	All models	—	—	—	—	The external failure 2 of a multifunction input was inputted.		
EF3	All models	—	—	—	—	The external failure 3 of a multifunction input was inputted.		
EF4	All models	—	—	—	—	The external failure 4 of a multifunction input was inputted.		
oS	All models	—	—	—	—	Protection operates, when motor speed exceeds the over speed setting (F- 01, F-02).	* Operation of an external speed setter is poor. * The overshoots by poor adjustment of a speed control system gain. * Load is smaller than torque command value at the time of the torque control mode. * The setting value of overspeed setting is unsuitable. * An erroneous operation caused by noise of speed detection . * The setting value of the number of PG pulse is unsuitable * Setting of d-axis position of PG is unsuitable, or auto-tuning of d-axis measurement mode after replacement of PG was not done. * Auto-tuning after replacement of motor was not done, or setting value of auto-tuning is unsuitable. * Combination of Inverter and motor is incorrect.	* Check the operation of an external speed setter. * Re-adjustment of a speed control system gain(7. ASRP, 8. ASrI, 9. ASrJ). * Revision of torque command value. * Revision of the setting value of overspeed setting(F-01~02). * The check of PG wiring route, separation from the main circuit wiring. * Revise the setting value of the number (A-07) of PG pulse. * Execute auto-tuning of d-axis measurement mode. * Execute full mode auto-tuning. * Make correct combination of Inverter and motor.

SET64 LED Display	Model	Protection display LED on P.C .board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
		In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001			
ot	All models	—	—	—	—	When torque command exceeds 105%, counting starts and when it reaches 150% for 1 minute or equivalent, protection operates.	* Mal-function of external torque command setter. * Setting values of relatives of over torque protection function are unsuitable. * Load capacity is unusually large. * Setting of d-axis position of PG is unsuitable, or auto-tuning of d-axis measurement mode after replacement of PG was not done. * Auto-tuning after replacement of motor was not done, or setting value of auto-tuning is unsuitable. * Combination of inverter and motor is incorrect.	* Operation check of an external torque command setter. * Revision of setting of relatives of over torque protection function (F-05~07). * Mitigation of load. Revision of inverter and motor capacities. * Execute auto-tuning of d-axis measurement mode. * Execute full mode auto-tuning. * Make correct combination of inverter and motor.
inoH	All models	—	—	—	—	When the motor temperature detection option is equipped if motor temperature exceeds 150℃, protection operates.	* Trouble of cooling fan motor of a motor. * The ambient temperature of a motor is high. * Disconnection of wiring of motor temperature detection invasion of a noise. * Unsuitable adjustment of motor temperature detection gain, etc.	* The check of cooling fan motor of amotor. * The check of installation environment of a motor. * The check of motor temperature detection wiring countermeasure for noise. * Re-adjustment of motor temperature detection gain (G- 19, 20).
SEt0	All models	—	—	—	—	In the status that settings of values of motor rating plate and of carrier frequency are unsuitable, operation / jog command or auto- tuning start command was inputted.	* Setting value of inverter capacity of the plate is different from that of actual inverter unit. * The setting of values of motor rating plate and of carrier frequency are unsuitable. * Although use of the 2nd motor was selected, values of the 2nd motor rating plate have not been set. * Auto-tuning was not carried out after changing of carrier frequency.	* Reset from memory initializing and coincide setting value of inverter capacity with that of inverter unit. * Set the values of motor rating plate (A-02~06) and carrier frequency (A-08) corre-city,and carry out auto-tuning. * Set the values of plate (L-01~ 05) of the 2nd motor correctly and carryout auto-tuning. * After chanfe of carrier frequency (A-08), surely carry out suto- tuning.
SEt1	All models	—	—	—	—	In the status that settings of PG pulse vector control and of relatives of current control are unsuitable, operation / jog command was inputted.	* The setting value of the number of PG pulse is unsuitable * Setting of relatives of current control gain is unsuitable. * Auto-tuning has not been carted out or auto-tuning was not performed correctly.	* Revision of setting value of the number of PG pulus (A-07). * Revision of setting of current control gain (E-10~13). * Carry out auto-tuning (When use of the 2nd motor is chosen,carry out suto-tuning also of the 2nd motor).
SEt2	All models	—	—	—	—	Operation / jog command was inputted in the state that setting of relatives of speed exceeded setting possible range.	* Absolute value of settings of overspeed/overfrequency (F- 01,F-02) exceeded 1.5 times of the maximum speed/frequency (A-00). * Setting values related to speed and frequency exceeded the max. frequency (A-00).	* Revision of setting values related to overspeed and over- frequency (F-01,F-02). * Revise setting values related to speed/frequency. (If setting values are correct,reset Inverter from initia- lizing of VFC2001 P.C. board).

SET64 LED Display		Model		Protection display LED on P.C .board				The contents of protective operation	The main factors which carried out protective operation	The main check points and countermeasure
				In single unit and master unit of parallel connection		In slave unit of parallel connection				
		PRIM61	GAC2001	PRIS61	GAC2001					
SEt3	All models	—	—	—	—		Operation / jog command was inputted when analog input / output gain setting is incorrect.	* Setting of relatives of analog input / output gain is unsuitable.	* Revisrion of setting values related to analog input / output gain (G-00~20) (If setting values are correct,reset inverter from initialiging of VFC2001 P.C/ board).	
PER1~ PER6	All models						Operates when connection between PG - VFC2001 P.C Board is incorrect (only when ED64P. ED64V modes)	* Disconnection of PG wire. * Trouble of PG. * Erroneous connection between Inverter output and motor. * Misoperation of speed detection. * Setting value of number of PG pulse is unsuitable. * Setting of d-axis position of PG is unsuitable, or auto-tuning of d-axis measurement mode was not done after replacement of PG. * Auto-tuning after replacement of motor,or setting value of auto- tuning is unsuitable. * Combination of Inverter and motor is incorrect.	* Check PG wire. * Replacement of PG. * Check connection between inverter output and motor. * Check PG wire route. Separation from main circuit wire. * Revision of setting value of number of PG pulse (A-07). * Execute auto-tuning of d-axis measuerment mode. * Execute full mode auto-tuning. * Make correct combination of Inverter and motor.	
PER7	All models						Operates when operation error occurred in sensorless pole position operation (at the time of ED64S mode)	* Auto-tuning was not done after replacement of motor and change of wiring to motor, or setting value of auto-tuning is unsuitable. * Combination of Inverter and motor is incorrect.	* Execute full mode auto-tuning. * Make correct combination of Inverter and motor.	
SLSE	All models						In starting by position sensorless. operates when start failed since pole could not be discriminated (at the time of ED64S,ED64V modes only)	* Setting value of q-axis pulse pole current (A-09) is small [when pole discrimination system sclection (A-31) is 0 or 1] . * Setting of d-axis measurement pulse width (A-32), d-axis measurement pulse voltage amplitude is unsuitable [when pole discrimination system selection (A-31) is 2].	* Adjust setting value of q-axis pulse pole current (A-09). * Execute full mode auto-tunnng.	
uV	class200V all models	—	—	—	—		Intermediate DC part voltage of the unit dropped to about 180V or less during operation.	* The input power supply interrupted during operation (instant electric power failure). * Open phase of an input power supply.	* Confirm an input power supply. * Turn to “ON” the selection of re-start function at instaneous power failure (b-11).	
	class400V all models	—	—	—	—		Intermediate DC part voltage of the unit dropped to about 360V or less during operation.			
EnGon	All models	—	—	—	—		Display only when the input contact of an emergency stop is “ON” .	(EnGon is not a protection display)	—	

(Note 1) All other LEDs for protection display on each other P.C. boards are red and they go on at the time of protective operation. However, they go off in case that the input power supply of an inverter is cut once and is revived.

2. Periodical inspection

In order to keep always the Inverter in best condition and to make it deliver excellent performance fully, execute periodical inspection once a half year at least and at that time, inspect enough the points which are not inspected in daily visual operation check.

Maintenance inspection is to be executed by persons having safety knowledge on electricity.

CAUTION [as to inspection work]

- Don't open the cover during input power is supplied.
There is a fear of electric shock
- Make inspection after turning the power source of Inverter to OFF and going off of LED for confirmation of [CHG] on main circuit P.C.Board.
When cover of Inverter is opened, LED can be confirmed on P.C.Board.
There is a fear of electric shock
There is a fear of injury
- There may be a case that temperature of heat sink rises higher than that of use conditions, for which please pay attention.
There is a fear of burn

DANGER [as to maintenance, inspection, replacement of parts]

- Make inspection after passing of 10 minutes or more from turning off of input power source. Also, check DC voltage between [⊕2 and ⊖] and confirm that it is less than 30V.
There is a fear of electric shock
- Maintenance, inspection and exchange of parts should be done by designated persons only.
[Remove worn metallic materials (watch, bracelet) before these works.]
(Surely use insulated tools at the time of these works.)
There is a fear of electric shock and injury

Table of items of periodical inspection

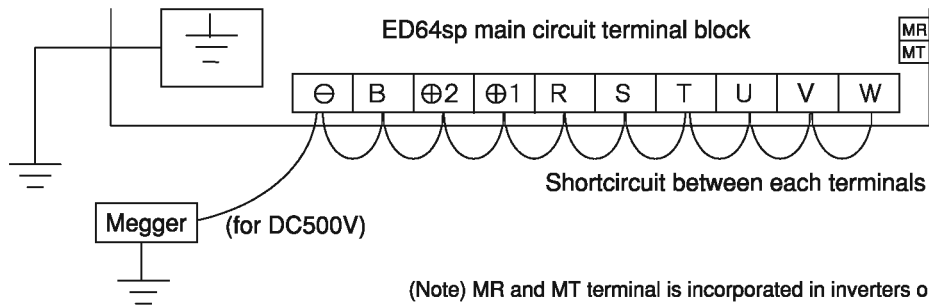
Inspection item, object	Content of inspection
External appearance of the unit	Check whether vent and heatsink are choked with dust.If they are choked, clean them.
Cooling fan	If dust adhered to cooling fan, clean it. Replace the fan making its life (about 30,000 hours) as a criterion.
Inside of the unit	Check whether dust adhered to P.C.Board and other electronic parts. If adhered, clean them.
Terminal block, terminal screw	Check whether terminal block and fitting screws became loose.If looseness is found, make increased tightening.
Connector	Check whether connectors and terminals of control P.C.Board became loose.
Wiring	Check whether defects such as crack and deformation, etc. are found on insulation coating of wiring.
Electrolytic condenser	Replace if defects such as leak and discoloration of eletrolyte are found. Criterion of replacing time of condenser is 5 years under condition of 12 hours use per day, with ambient average temperature of less than 35°C.

CAUTION [as to condenser]

- In case of use of spare Inverter, of which storing period is more than 3 years, impress rated AC input voltage to Inverter for about 8 hours in the status of disconnecting the output wire of Inverter since electrolytic condenser is mounted in the Inverter. After this aging work of condenser, use Inverter.
If such condenser is used without aging, it could result in breakage of condenser and dangerous situation.

3. Insulation resistance test

- (1) Clean each part and make insulation resistance test by DC 500V Megger. For Megger test, remove all wirings once and shortcircuit between terminal blocks of main circuit as per Fig. below.
(Don't make Megger Test of control circuit)



- (2) After completion of preparation, measure insulation resistance between terminal of main circuit terminal block TB1 and earth terminal ($\equiv$).
(3) Remove all shortcircuit wires after testing.

Chapter 9 Standard specifications

1.Common specifications

Specifications of ED64 are as per table below.

Performance/Function		ED64P Mode with (speed/position sensor (UVWAB-PG))	ED64V Mode with (speed sensor (ABZ-PG))	ED64S Mode with (sensorless)
Power source rating		200V class: 200~230V, 50/60Hz 400V class: 400V~460V, 50/60Hz		
Power source fluctuation		Voltage: $\pm 10\%$ Frequency: $\pm 5\%$		
Control system		High efficiency space vector control system.		Speed/position sensorless High efficiency space vector control method
Max. speed		Until 245Hz or equivalent		
Carrier frequency		Selective from 2, 4, 6, 8, 10, 12, 14Hz(standard value 6.0kHz) Types of 3722, 4544 or less: Reduction of capacity is required at 10kHz or over Types of 5522, 5544 or over: Reduction of capacity is required at 8kHz or over		
Inverter efficiency		95% or more (at the time of rated output)		
Overload capacity		150% current 1 min.		
Speed control range		1:1000		1:100 (but, output frequency 0.9Hz or over)
Speed accuracy	Digital input	$\pm 0.01\%$		$\pm 0.01\%$ (speed range 1:10) $\pm 0.1\%$ (speed range 1:100)
	Analog input	$\pm 0.2\%$		$\pm 0.2\%$
Speed control system		MFC control (P control + feedforward control + cancellation control) (Feedforward, cancellation individual ON/OFF is possible. By turning both of them to OFF, MFC control is equal to PI control)		
Speed control response		400rad/s (-3dB)		200rad/s (-3dB)
Torque control accuracy		$\pm 5\%$ or less (torque command: 0~100%) $\pm 10\%$ or less (torque command exceeds 100%) (Output frequency 10Hz or over)		
Torque control response		2krad/s (-3dB)		2krad/s (-3dB)
Power constant range		1:1.33 *1		1:1.33 *1 but, free run start from voltage saturation area is not compensated.
Zero speed control		Available		Unavailable
Starting torque		150% or more		
Torque limit		For. run powering, For. run regeneration, Rev. run powering, Rev. run regeneration Setting range: 0~150% each (Possible to set until max. 200% by increasing of Inverter capacity to motor)		
C O N T R O L F U N C T I O N	Accel/decel time	0.1~3600sec.(Possible to changeover 4 kinds of setting from terminal block and 2 kinds of them are S pattern accel/decel time)		
	S pattern accel/decel time	0~60sec. (Possible to changeover 2 kinds of setting from terminal block)		
	Programed operation	Possible to set max. 8 points (Time unit: possible to changeover hour, minute, second. Range: 0.0~3600.0)		
	Rotation direction	For. run and rev. run are possible (Possible to select inhibition of counter direction against command)		
	Dynamic braking(DB)	Types of 1122 (200V class), 1544 (400V class) or less incorporate dynamic brake circuit.(DB of other capacity is option of separate type) (Brake resistor, thermal relay are Option and of external mounting)		
	Droop control	Possible (Setting function of droop ratio, droop starting torque, etc. is available)		
	Drive of 2nd motor	Possible to drive two motors alternately.		
	Stop mode	Possible to select decel. stop/ DC brake after decel. stop/ Free stop.		
	DC braking	At decel. stop : 0~10sec.		
	Jog drive	Min. rotation speed~300min ⁻¹		
	Jump function	Possible to make 4 kinds of speed jump setting.		

		ED64P Mode with (speed/position sensor (UVWAB-PG))	ED64V Mode with (speed sensor (ABZ-PG))	ED64S Mode with (sensorless)
I N P U T O U T P U T S I G N A L	Control terminal block input	Possible to changeover sink mode / source mode.		
	Speed	Terminal block: DC 0~10V or $\pm 10V$ or 4~20mA input non-isolated.		
	Drive signal	For. run, Rev. run, Jog for. run, Jog rev. run, Emergency stop, Reset.		
	Speed detection signal	Speed detector(PG) (Standard 600P/R DC12 V A-phase B-phase and U-phase V-phase W-phase)		
	Output for speed meter	PWM pulse of 6 times of synchronous frequency of rotation speed (Possible to connect analog meter).		
	Analog voltage output	DC 10V output voltage: Output current/ Motor speed / Speed command , etc.		
	Contact output (2 points)	Operate by drive: Operate by protective functions en bloc.		
	Multifunction input (contact input:6 points)	Preset speed command (7 kinds), Accel/decel time selection (4 kinds),Accel/decel drive by contact,Hold of speed.Inhibition of S pattern accel/decel, Droop control inactive, Reverse run command, DC brake command, External failure signal (4 kinds), Trace back external trigger, Second motor selection, Emergency stop B contact, Programed drive advance, Speed command terminal block selection, Speed/torque control changeover , etc.		
	Multifunction output (Open collector output:4 points)	Speed detection (2 points), Setting-reach, Torque detection (2 points of "with polarity" and "absolute value"), During power failure, Load pre-alarm, During retry, During rev. run, Protective operation code, Sum check abnormal.		
HC function (Super block function)		Possible to make out the control, combining Super Block such as ... Addition/subtraction, Multiplication, Comparator, First order lag, Dead band, PI Amplifier, Feedforward, Cancelation (Modern control), Diode preference, Simple accel/decel, S pattern accel/decel, Data selector, Hysteresis non-linear, Pattern generator, 1 bit selection of data.		
Sequence function (PLC function)		Make sequence of drive• stop and multifunction input/output conforming to the application.		
		Input: Terminal block 10 contacts (By communication, input from upper CPU is also possible).		
		Output: Open collector 4, Contact output 2 (1a•1c) (By communication, output to upper CPU is also possible)		
		Kind of internal relays: Master control relay 1, Control relay IN 1, Control relay OUT 128, Internal relay 30, Latch relay 10, ON differentiation relay 10, OFF differentiation relay 10, ON delay timer 10, OFF delay timer 10.		
Trace back function		Possible to memorize digital 12ch + [status of drive•protection] X 100 points for past 2 times. Memory content: Memorize Output current, Output voltage, Torque command, Output of each super block, etc.		
1 point trace back function		Records the history of past 5 protective operation and 6 points data of output current, output voltage, torque command, etc. at the time of protective operation.		
Console panel		Indicator : 7 segments, 5 digits LED display. Display: Status of drive / Data monitor / Function Setting data / Protective operation / Protection history. Unit indication: LED 4 Indication of status: LED 6 Operation: Touch key 8		
Protective function		Output overcurrent, Output overload (electronic thermal), DC part low voltage, Fin overheat, IGBT power source abnormal, Memory abnormal, Earth fault, Overspeed , Option abnormal, Start stall, External failure, Under voltage, Communication abnormal, Over torque , Speed control error , Motor overheat, Position, Speed detector abnormal.		
Safety indication		LED goes on while charging.		
Protective structure (JEM1030)		IP00 (open type)		
Ambient environment		Operation temperature : 0~50℃ Humidity : 20~90%RH (No condensation) Altitude : 1000m or less Storage temperature : 20~60℃ Atmosphere : To be no harmful gas, metal powder, oil, etc. Vibration : 5.9m/S ² (0.6G or less 10~55Hz), conforming to JIS 00040		

*1.Constant output range can be controlled up to max. 1 : 1.5 by use, reducing the capacity of motor.

2. Table of types

Capacity range of ED64sp Inverters.

- 200V class : 2.2~90kW
- 400V class : 2.2~ 750kW

Corresponding types of ED motor~ED64sp.

200V class (Motor rated voltage 190V)		400V class (Motor rated voltage 380V)	
ED Motor capacity	Inverter type	ED Motor capacity	Inverter type
1.5kW	ED64sp-2R222	1.5kW	ED64sp-2R244
2.2kW	ED64sp-2R222	2.2kW	ED64sp-2R244
3.7kW	ED64sp-3R722	3.7kW	ED64sp-3R744
5.5kW	ED64sp-5R522	5.5kW	ED64sp-5R544
7.5kW	ED64sp-7R522	7.5kW	ED64sp-7R544
11.0kW	ED64sp-1122	11.0kW	ED64sp-1144
15.0kW	ED64sp-1522	15.0kW	ED64sp-1544
18.5kW	ED64sp-2222	18.5kW	ED64sp-2244
22.0kW	ED64sp-2222	22.0kW	ED64sp-2244
30.0kW	ED64sp-3022	30.0kW	ED64sp-3044
37.0kW	ED64sp-3722	37.0kW	ED64sp-3744
45.0kW	ED64sp-4522	45.0kW	ED64sp-4544
55.0kW	ED64sp-5522	55.0kW	ED64sp-5544
65.0kW	ED64sp-7522	65.0kW	ED64sp-7544
75.0kW	ED64sp-7522	75.0kW	ED64sp-7544
90.0kW	ED64sp-9022	90.0kW	ED64sp-11044
		110.0kW	ED64sp-11044
		132.0kW	ED64sp-16044
		160.0kW	ED64sp-16044
		200.0kW	ED64sp-20044
		250.0kW	ED64sp-25044
		315.0kW	ED64sp-31544
		375.0kW (torque constant area only)	ED64sp-31544
		375.0kW	★ED64sp-40044
		400.0kW	★ED64sp-40044
		500.0kW	★ED64sp-50044
		750.0kW	★ED64sp-75044

(Note 1) Types with★mark use Inverter units parallely.

(Note 2) This table shows standard combination. However, as there is a case of difference from above table, depending on motor, please confirm with us.

3. Table of capacities

3—1. 200V Class

Type ED64sp-□□□□□	200V class												
	2R222	3R722	5R522	7R522	1122	1522	2222	3022	3722	4522	5522	7522	9022
Applicable motor capacity(kW)*1	2.2	3.7	5.5	7.5	11	15	22	30	37	45	55	75	90
Rated output current (A)	10.0	17.0	24.0	32.5	46.0	62.5	87.0	121	146	185	222	280	340
Max. output voltage (V)	200~230V (complies with input voltage) *2												
Input voltage	3 phase 3 wires 200~230V±10% 50/60Hz±5%												
Input power factor *3	[Delay] about 0.7(0.9 *4)					[Delay] about 0.9							
Input capacity (kVA)*5	4.7	8.0	11.5	15.8	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 system	Forced air cooling												

3—2. 400V Class

Type ED64sp-□□□□□	400V class									
	2R244	3R744	5R544	7R544	1144	1544	2244	3044	3744	4544
Applicable motor capacity(kW)*1	2.2	3.7	5.5	7.5	11	185	22	30	37	45
Rated output current (A)	5.5	9.2	13.0	17.0	24.0	32.5	46.0	62.5	75.5	92.5
Max. output voltage (V)	380~460V (complies with input voltage) *2									
Input voltage	3 phase 3 wires 380~460V±10% 50/60Hz±5%									
Input power factor *3	[Delay] about 0.7(0.9 *4)						[Delay] about 0.9			
Input capacity (kVA)*5	4.7	7.9	11.3	15.5	22.4	30.2	30.3	41.9	51.7	61.8
DC Reactor (DCL□□)	Option						2244	3044	3744	4544
Cooling system	Forced air cooling									

Type ED64sp-□□□□□	400V class									
	5544	7544	11044	16044	20044	25022	31544	40044 *6	50044*6	75044*7
Applicable motor capacity(kW)*1	55	75	110	160	200	250	375	400.0	500.0	750.0
Rated output current (A)	111	146	210	300	370	460	600	740	920	1380
Max. output voltage (V)	380~460V (complies with input voltage) *2									
Input voltage	3 phase 3 wires 380~460V±10% 50/60Hz±5%									
Input power factor *3	[Delay] about 0.9									
Input capacity (kVA)*5	75.5	103	149	215	269	333	499	532	661	999
DC Reactor (DCL□□)	5544	7544	11044	16044	20044	25044	31544	20044 ×2	25044 ×2	25044 ×3
Cooling system	Forced air cooling									

(*1) Shows in capacity of ED motor. (but 375.0kW motor, which can be driven by 1544, is torque constant area only.)

(*2) Voltage of more than AC input voltage cannot be outputted.

(*3) Values at the time of rated output but they vary depending on power source impedance.

(*4) Figure in () shows the value in case that DC Reactor of option is connected.

(*5) Shows the values at the time of rated output of applied motor. (varies, depending on power source impedance.)

(*6) ED64sp-40044, ED64sp-50044, are parallel units of 2 each of ED64sp-20044, ED64sp-25044, respectively.

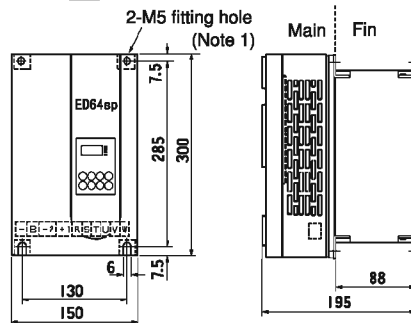
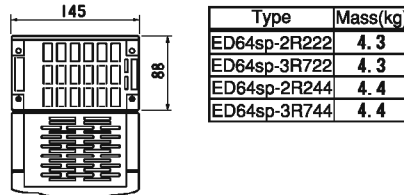
(*7) ED64sp-75044, are parallel units of 3 each of ED64sp-25044, respectively.

4. Outline dimensions

Main body

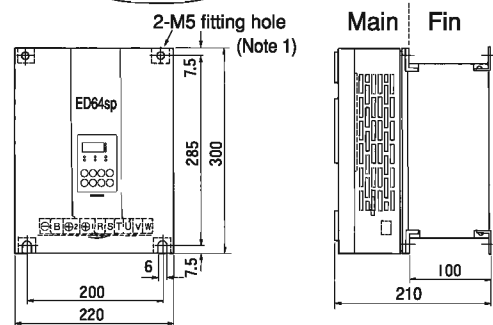
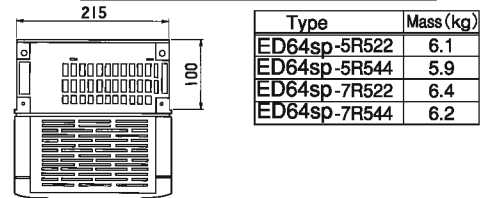
ED64sp-2R222 ED64sp-2R244
ED64sp-3R722 ED64sp-3R744

Terminal block	Terminal screw
⊖, B, ⊕2, ⊕1, R, S, T, U, V, W	M4
Terminal for control	M3



ED64sp-5R522 ED64sp-5R544
ED64sp-7R522 ED64sp-7R544

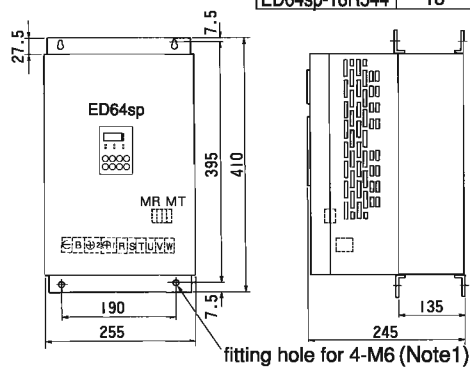
Terminal block	Terminal screw
⊖, B, ⊕2, ⊕1, R, S, T, U, V, W	M5 (200V) M4 (400V)
Terminal for control	M3



ED64sp-1122 ED64sp-1144
ED64sp-1522 ED64sp-1544

Terminal block	Terminal screw	Remark
⊖, B, ⊕2, ⊕1, R, S, T, U, V, W	M6	1122, 1144, 1544
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M6	1522
MR, MT	M4	
Terminal for control	M3	

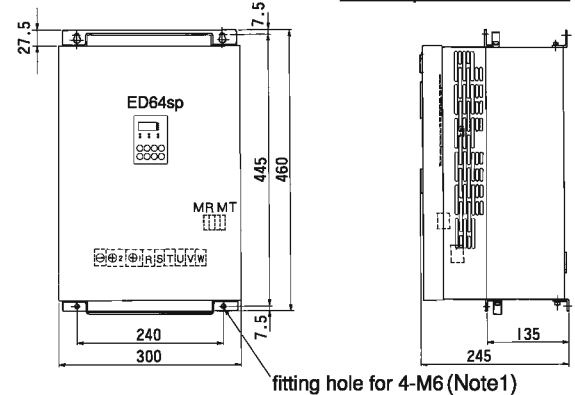
Type	Mass(kg)
ED64sp-1122	18
ED64sp-1144	18
ED64sp-18R522	18
ED64sp-18R544	18



ED64sp-2222 ED64sp-2244

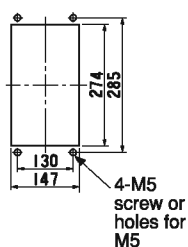
Terminal block	Terminal screw	Remark
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M8	2222
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M6	2244
MR, MT	M4	
Terminal for control	M3	

Type	Mass(kg)
ED64sp-2222	23
ED64sp-2244	22

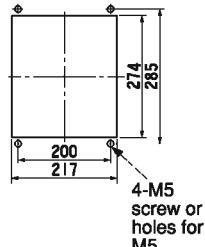


◎ Panel cut dimensions of cooling of outside installation

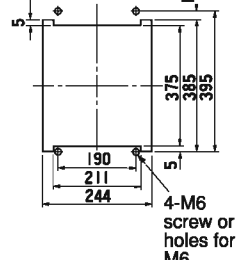
ED64sp-2R222
ED64sp-2R244
ED64sp-3R722
ED64sp-3R744



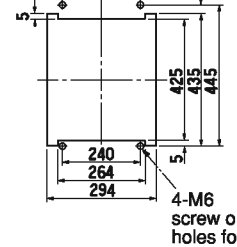
ED64sp-5R522
ED64sp-5R544
ED64sp-7R522
ED64sp-7R544



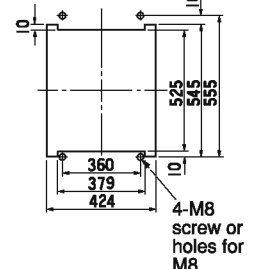
ED64sp-1122
ED64sp-1144
ED64sp-1522
ED64sp-1544



ED64sp-2222
ED64sp-2244



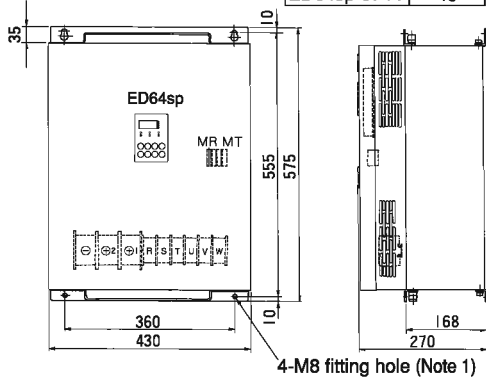
ED64sp-3022
ED64sp-3044
ED64sp-3722
ED64sp-3744



ED64sp-3022 ED64sp-3044
ED64sp-3722 ED64sp-3744

Terminal block	Terminal screw	Remark
⊖, ⊕2, ⊕1	M10	200V Class
	M8	400V Class
R, S, T, U, V, W	M8	
MR, MT	M4	
Terminal for control	M3	

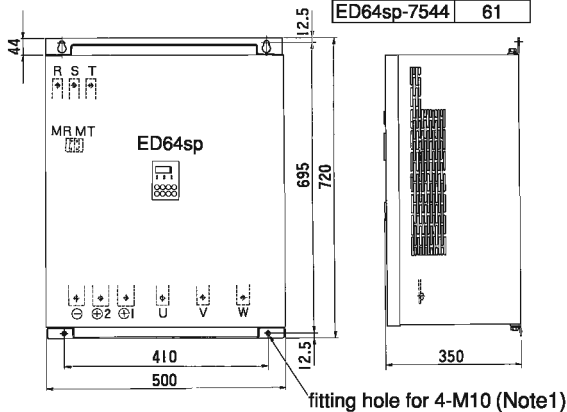
Type	Mass (kg)
ED64sp-3022	43
ED64sp-3044	40
ED64sp-3722	43
ED64sp-3744	40



ED64sp-7522 ED64sp-7544

Terminal block	Terminal screw	Remark
⊖, ⊕2, ⊕1, R, S, T	M10	7522
U, V, W	M10	
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M8	7544
MR, MT	M4	
Terminal for control	M3	

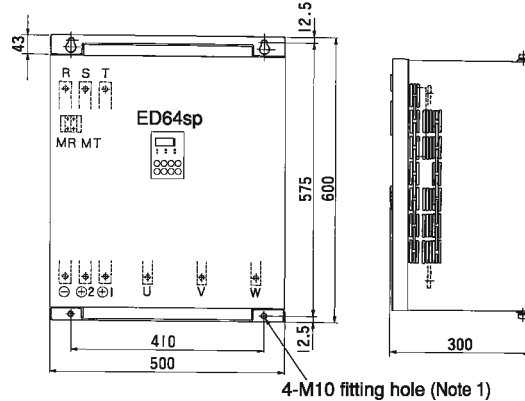
Type	Mass (kg)
ED64sp-7522	75
ED64sp-7544	61



ED64sp-4522 ED64sp-4544
ED64sp-5522 ED64sp-5544

Terminal block	Terminal screw
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M8
MR, MT	M4
Terminal for control	M3

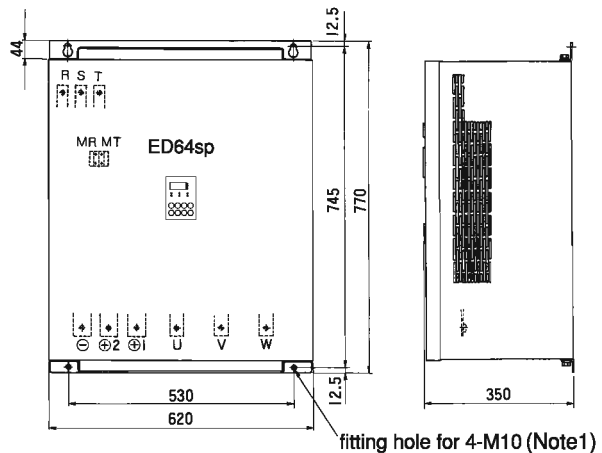
Type	Mass (kg)
ED64sp-4522	48
ED64sp-4544	43
ED64sp-5522	48
ED64sp-5544	43



ED64sp-9022

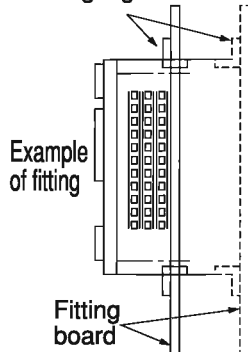
Terminal block	Terminal screw
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M10
MR, MT	M4
Terminal for control	M3

Type	Mass (kg)
ED64sp-9022	91



◎Fitting method for outside installation of cooling fin

Fitting leg



Move fitting leg (upper · lower) to the intermediate position
(Available for 1.1~160kW)

(NOTE 1)

In case that cooling fin is used installing outside, see ◎Panel cut dimensions of cooling fin outside installation (for 45~160kW, please inquire us)

◎Fitting method for outside installation of cooling fin of the figures shown below.

●Painting color

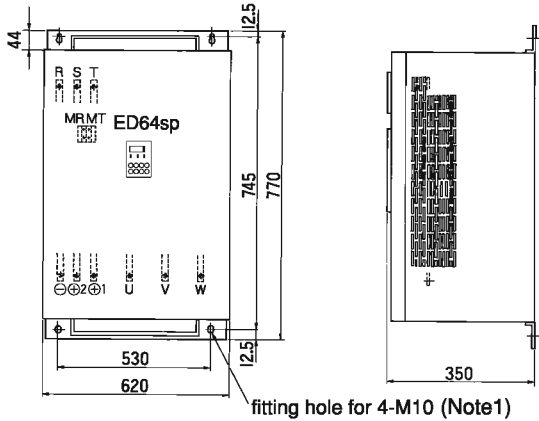
Inverter main body : Munsell notation 5B2/6 (Dark blue)

Console : DIC727 (Wine red)

ED64sp-11044

Terminal block	Terminal screw
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M8
MR, MT	M4
Terminal for control	M3

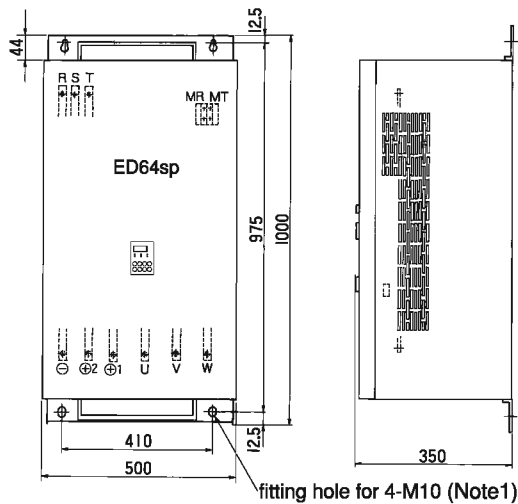
Type	Mass (kg)
ED64sp-11044	79



ED64sp-16044

Terminal block	Terminal screw
⊖, ⊕2, ⊕1, R, S, T	M10
U, V, W	M8
MR, MT	M4
Terminal for control	M3

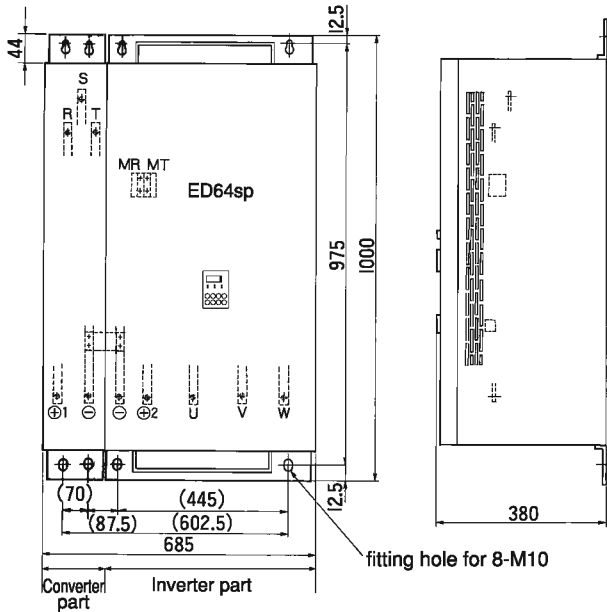
Type	Mass (kg)
ED64sp-16044	99



ED64sp-20044
ED64sp-25044

Terminal block	Terminal screw
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M12
MR, MT	M4
Terminal for control	M3

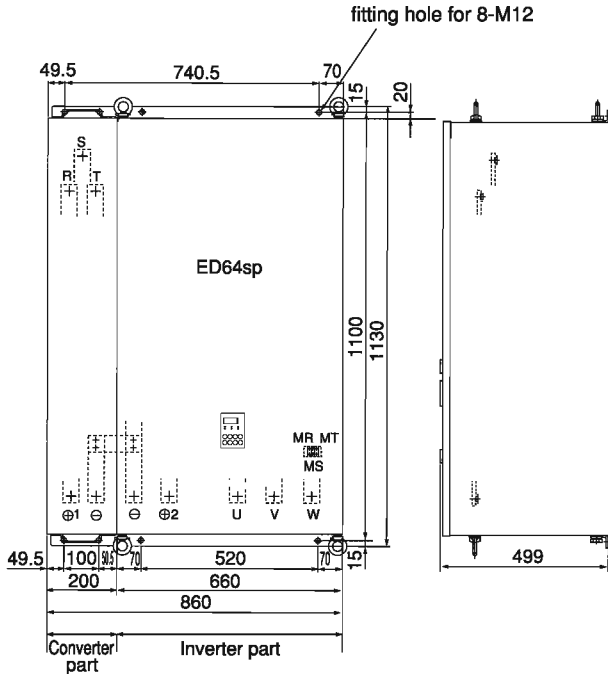
Type	Mass (kg)
ED64sp-20044	187
ED64sp-25044	194



ED64sp-31544

Terminal block	Terminal screw
⊖, ⊕2, ⊕1, R, S, T, U, V, W	M12
MR, MT	M4
Terminal for control	M3

Type	Mass (kg)
ED64sp-31544	275

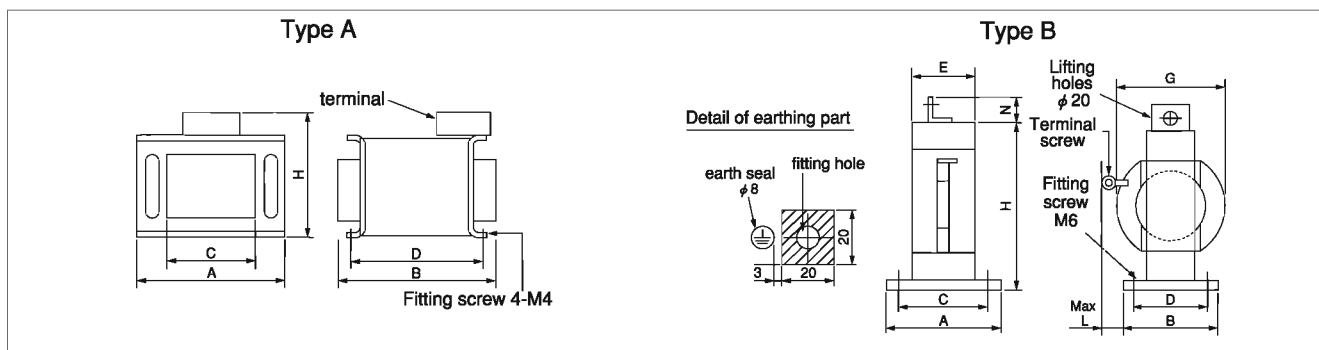


In case of Inverters of 200kW or over, inverter part and converter part can be installed separately.

5.DC Reactor (Standard • Option)

For the types of ED64sp-1522 or over in 200V class and ED64sp-2244 or over in 400V class, DC Reactor of separate installation is equipped as standard. As to the types of less than these capacities, DC Reactor is optional.

●External form and dimensions



200V class (hatching part is optional type)

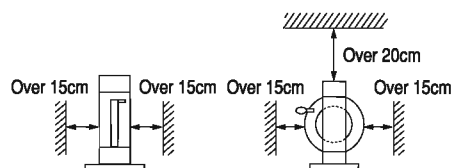
Inverter capacity	DC Reactor type	Dimension (mm)										Type	Weight (kg)
		A	B	C	D	E	G	H	N	L	terminal		
ED64sp-2R222	DCL3R722	97	90	70	55	—	—	120	—	—	M4	A	2.1
ED64sp-3R722	DCL3R722	97	90	70	55	—	—	120	—	—	M4	A	2.1
ED64sp-5R522	DCL7R522	97	100	70	75	—	—	130	—	—	M6	A	3.3
ED64sp-7R522	DCL7R522	97	100	70	75	—	—	130	—	—	M6	A	3.3
ED64sp-1122	DCL1122	60	110	40	90	48	162	205	—	90	M6	B	4.0
ED64sp-1522	DCL1522	60	110	40	90	48	169	212	—	90	M8	B	5.0
ED64sp-2222	DCL2222	60	110	40	90	50	182	226	—	90	M10	B	6.0
ED64sp-3022	DCL3022	90	120	70	100	75	181	224	—	90	M10	B	10
ED64sp-3722	DCL3722	90	120	70	100	77	182	226	—	90	M10	B	10
ED64sp-4522	DCL4522	110	125	90	105	81	170	214	—	90	M12	B	11
ED64sp-5522	DCL5522	120	145	100	125	107	182	236	—	90	M12	B	15
ED64sp-7522	DCL7522	110	125	90	105	92	205	259	—	100	M12	B	16
ED64sp-9022	DCL9022	135	135	115	115	111	215	279	40	100	M12	B	20

400V class (hatching part is optional type)

Inverter capacity	DC Reactor type	Dimension (mm)										terminal	Type	Weight (kg)
		A	B	C	D	E	G	H	N	L				
ED64sp-2R244	DCL3R744	78	80	55	62	—	—	100	—	—	M3	A	1.6	
ED64sp-3R744	DCL3R744	78	80	55	62	—	—	100	—	—	M3	A	1.6	
ED64sp-5R544	DCL7R544	97	100	70	70	—	—	120	—	—	M4	A	3.1	
ED64sp-7R544	DCL7R544	97	100	70	70	—	—	120	—	—	M4	A	3.1	
ED64sp-1144	DCL1544	106	100	80	75	—	—	150	—	—	M6	A	4.0	
ED64sp-1544	DCL1544	106	100	80	75	—	—	150	—	—	M6	A	4.0	
ED64sp-2244	DCL2244	60	120	40	100	48	192	235	—	90	M6	B	6.0	
ED64sp-3044	DCL3044	60	120	40	100	48	192	235	—	90	M8	B	6.5	
ED64sp-3744	DCL3744	90	120	70	100	75	195	238	—	90	M8	B	10	
ED64sp-4544	DCL4544	90	120	70	100	75	186	230	—	90	M10	B	10	
ED64sp-5544	DCL5544	110	125	90	105	90	194	248	—	90	M10	B	14	
ED64sp-7544	DCL7544	110	125	90	105	92	209	263	—	100	M10	B	16	
ED64sp-11044	DCL11044	135	135	115	115	117	219	283	40	100	M12	B	24	
ED64sp-16044	DCL16044	145	145	125	125	124	251	325	40	110	M12	B	28	
ED64sp-20044	DCL20044	145	145	125	125	130	256	330	40	110	M12	B	35	
ED64sp-25044	DCL25044	155	155	135	135	141	283	367	40	120	M16	B	40	
ED64sp-31544	DCL31544	155	155	135	135	142	310	389	40	210	M16	B	45	

Cautions on installation

Since DCL becomes hot, do not install near DCL the device which is influenced by heat. Also, arrange not to circulate the heat of DCL in the panel.



Chapter 10 Necessary information to us in the inquiry from customers

In case of order for replacements of the unit and parts in trouble as well as technical question, please be requested to inform us or our distributor of the following items.

- 1) Type, capacity (kW), input voltage (V) of Inverter.
- 2) Type, Capacity (kW), rated speed (min^{-1}), rated voltage (V), and pole of motor.
- 3) Serial number, Software version Number (See the label stuck on IC18 of VFC2001 P.C.Board).
- 4) Details of trouble. Situation when trouble occurred.
- 5) Conditions of use. status of load, ambient conditions, date of purchase, how the Inverter was operated.
- 6) Name of our distributor.

Request to the distributor

When our Inverter is delivered to customer combining with your equipment, etc., please arrange to deliver this Instruction Manual also to the end user. If you changed setting values of Inverter from our default values, please arrange to deliver its content to the end user surely.

Memo

DATE
PLACE

Handwriting practice area with horizontal dashed lines.

TOYODENKI SEIZO K.K.

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

HEAD OFFICE: Tokyo Tatemono Yaesu Bldg, 1-4-16 Yaesu, Chuo-ku,
Tokyo, Japan ZIP CODE 103-0028
TEL : +81-3-5202-8132 - 6
FAX : +81-3-5202-8150

Contents of this manual are subject to change without notice.

2012-09

ITE050B