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## REFERENCE SPECIFICATIONS

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### MODEL

Product Name AC Servo Driver  
Product No. MINAS A6BE,BF Series  
(standard type/multi-function type)

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Appended table : Default value of the parameters

## 1. Scope

The contents of this specification document are related to the AC servo driver MINAS A6B series manufactured by the Motor Business Unit, Electromechatronics Control Business Division, Automotive & Industrial Systems Company, Panasonic Corporation.

This product is intended for industrial equipment. It cannot be used for any other purposes (e.g. for household).

### <Related documents>

TECHNICAL REFERENCE - Function Specification - : SX-DSV03241

TECHNICAL REFERENCE - EtherCAT Communication Specification - : SX-DSV03242

\* See our Web site for the above documents.

### <About EtherCAT>

EtherCAT (Ethernet for Control Automation Technology) is open network communication using real-time-Ethernet between masters and slaves developed by Beckhoff Automation GmbH.

ETG (EtherCAT Technology Group) has control over it.

EtherCAT® is registered trademark and patented technology,  
licensed by Beckhoff Automation GmbH, Germany.

**EtherCAT®**  
Conformance tested

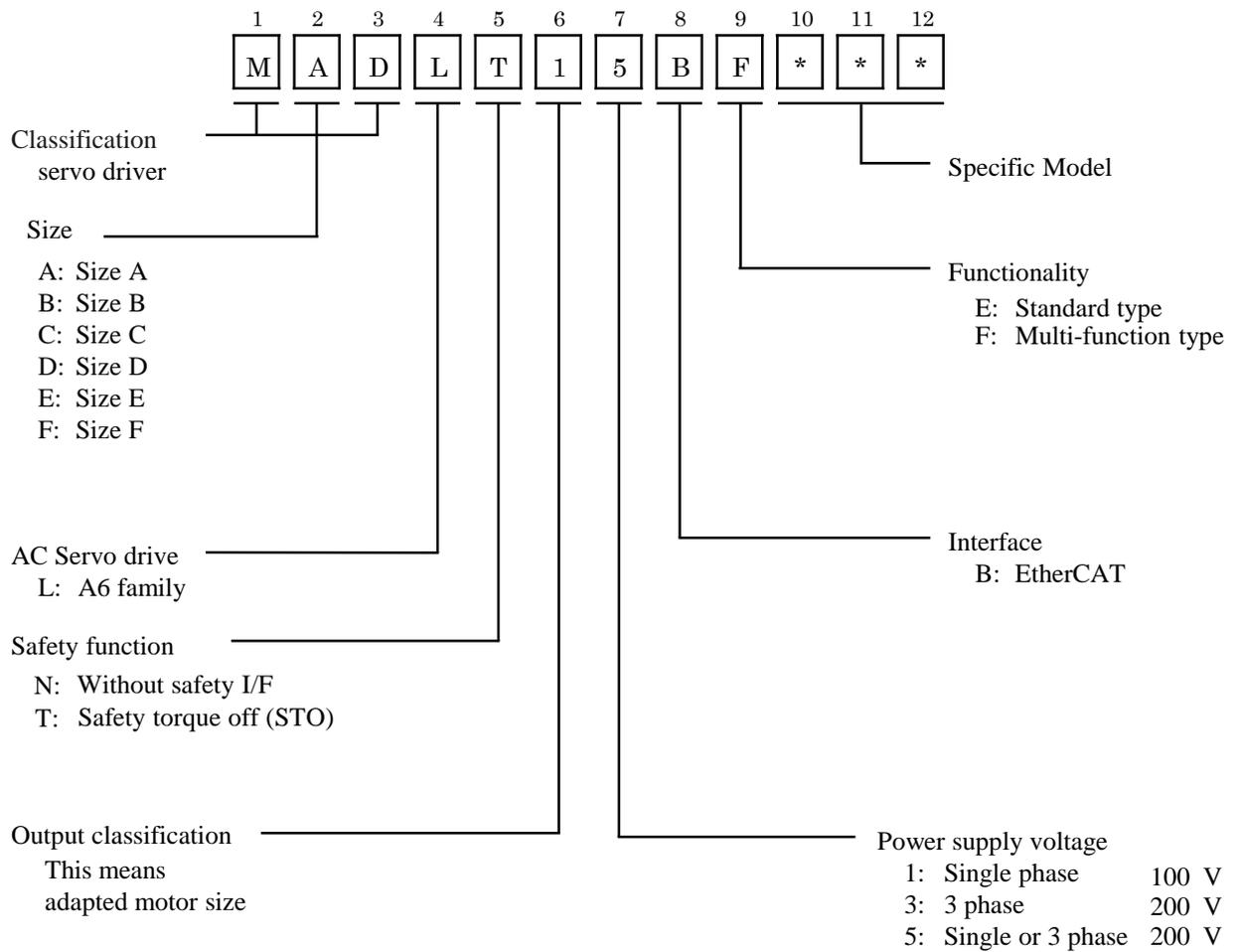


### <IMPORTANT>

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- Motor Business Unit, Panasonic Corporation reserves the right to make modifications and improvements to its products and/or documentation, including specifications and software, without prior notice.
- This product might require upgrade according to the specifications change requested by ETG. We do not have liability for expenses of such upgrades.

## 2. Way of looking at product numbers

Each segment of the product number has the following meaning.



## 3. Product Line-up

## 3-1 Standard type

Model No.	Product Code (*Note 1)	EtherCAT Conformance Test (*Note 2)	Size	Power supply input	Rated output of applicable motor (*Note 3)
MADLN01BE	60380000	○	A	Single-phase AC100-120 V	Max 50 W
MADLN11BE	60380001	○			Max 100 W
MADLN05BE	60380004	○		Single/3-phase AC200-240 V	Max 100 W
MADLN15BE	60380005	○			Max 200 W
MBDLN21BE	60380002	○	B	Single phase AC100-120 V	Max 200 W
MBDLN25BE	60380006	○		Single/3-phase AC200-240 V	Max 400 W
MCDLN31BE	60380003	○	C	Single phase AC100-120 V	Max 400 W
MCDLN35BE	60380007	○		Single/3-phase AC200-240 V	Max 750 W
MDDLN45BE	60380008	○	D	Single/3-phase AC200-240 V	Max 1000 W
MDDLN55BE	60380009	○			Max 1500 W
MEDLN83BE	6038000A	○	E	3-phase AC200-240 V	Max 2000 W
MEDLN93BE	6038000B	○			Max 2400 W
MFDLNA3BE	6038000C	○	F	3-phase AC200-240 V	Max 3000 W
MFDLNB3BE	6038000D	○			Max 5000 W

## 3-2 Multi-function type

Model No.	Product Code (*Note 1)	EtherCAT Conformance Test (*Note 2)	Size	Power supply input	Rated output of applicable motor (*Note 3)
MADLT01BF	613C0000	○	A	Single-phase AC100-120 V	Max 50 W
MADLT11BF	613C0001	○			Max 100 W
MADLT05BF	613C0004	○		Single/3-phase AC200-240 V	Max 100 W
MADLT15BF	613C0005	○			Max 200 W
MBDLT21BF	613C0002	○	B	Single phase AC100-120 V	Max 200 W
MBDLT25BF	613C0006	○		Single/3-phase AC200-240 V	Max 400 W
MCDLT31BF	613C0003	○	C	Single phase AC100-120 V	Max 400 W
MCDLT35BF	613C0007	○		Single/3-phase AC200-240 V	Max 750 W
MDDLT45BF	613C0008	○	D	Single/3-phase AC200-240 V	Max 1000 W
MDDLT55BF	613C0009	○			Max 1500 W
MEDLT83BF	613C000A	○	E	3-phase AC200-240 V	Max 2000 W
MEDLT93BF	613C000B	○			Max 2400 W
MFDLTA3BF	613C000C	○	F	3-phase AC200-240 V	Max 3000 W
MFDLTB3BF	613C000D	○			Max 5000 W

(Note 1) This is the Product code of our Servo Drive written in the ESI file (Hex numeral).

(Note 2) This shows that this product has passed the EtherCAT conformance Test conducted at EtherCAT test center.

(Note 3) Some of the combinations shown in this table cannot be used depending on motors. For the combination of a driver and a motor, refer to MINAS-A6 series catalog.

## 4. Specifications

## Basic specifications

Item		Description				
Input power supply	100 V	Main circuit power supply		Single-phase 100 - 120 V	+10 % -15 %	50/60 Hz
		Control circuit power supply		Single-phase 100 - 120 V	+10 % -15 %	50/60 Hz
	200 V	Main circuit power supply	A to D	Single-phase/3-phase 200 - 240 V	+10 % -15 %	50/60 Hz
			E and F	3-phase 200 - 240 V	+10 % -15 %	50/60 Hz
		Control circuit power supply	A to D	Single-phase 200 - 240 V	+10 % -15 %	50/60 Hz
			E and F	Single-phase 200 - 240 V	+10 % -15 %	50/60 Hz
Working ambient condition	Temperature		Operation temperature 0 - 55°C (without freezing) Storage temperature -20 to 65°C (maximum temperature guarantee: 80°C, 72 hours, without condensation*1)			
	Humidity		Working/storage humidity 20 - 85%RH or less (without condensation*1)			
	Altitude		1,000 m above sea level or less			
	Vibration		5.88 m/s <sup>2</sup> or less, 10 to 60 Hz			
	Pollution degree		Pollution degree 2 or 1			
Insulation voltage		Withstanding 1,500 VAC between the primary and grounding lines for one minute				
Control method		IGBT PWM method, sine wave drive				
Encoder feedback		23 bits (8388608 resolution), 7 cores-serial absolute encoders				
Control signal	Input		Each 8 input can be assigned by the parameter			
	Output		Each 8 output can be assigned by the parameter			
Analog signal	Output		2 outputs (analog monitor 1, analog monitor 2)			
Pulse signal	Output		Line driver output for encoder pulse (A/B phase signal) or external scale pulses.			
Communication function	EtherCAT		Interface for motion control.			
	USB		USB interface to connect to computers (setup software PANATERM) for parameter setting or status monitoring. USB cable and wireless LAN dongle connection is possible *2			
Safety terminal		Terminal to supports functional safety				
Front panel		1. 7-segment 2-digit LED (double digits) 2. Network status LED (RUN, ERR, L/A IN, L/A OUT) 3. Rotary switch for node address setting 4. Analog monitor output (Analog monitors 1 and 2)				
Regeneration		Sizes A and B: Without built-in regenerative resistor (use external mounting) Sizes C to F: With built-in regenerative resistor (External regenerative resistor is also available)				
Dynamic brake		Sizes A to F: Built in				
Control mode		Position control: Profile position mode (pp), Cyclic synchronous position mode (csp), Homing mode (hm) Velocity control: Profile velocity mode (pv), Cyclic synchronous velocity mode (csv) Torque control: Torque profile mode (tq), Cyclic synchronous torque mode (cst) These modes are switchable each other with commands through EtherCAT.				

\*1 Note that condensation occurs easily if temperature decreases.

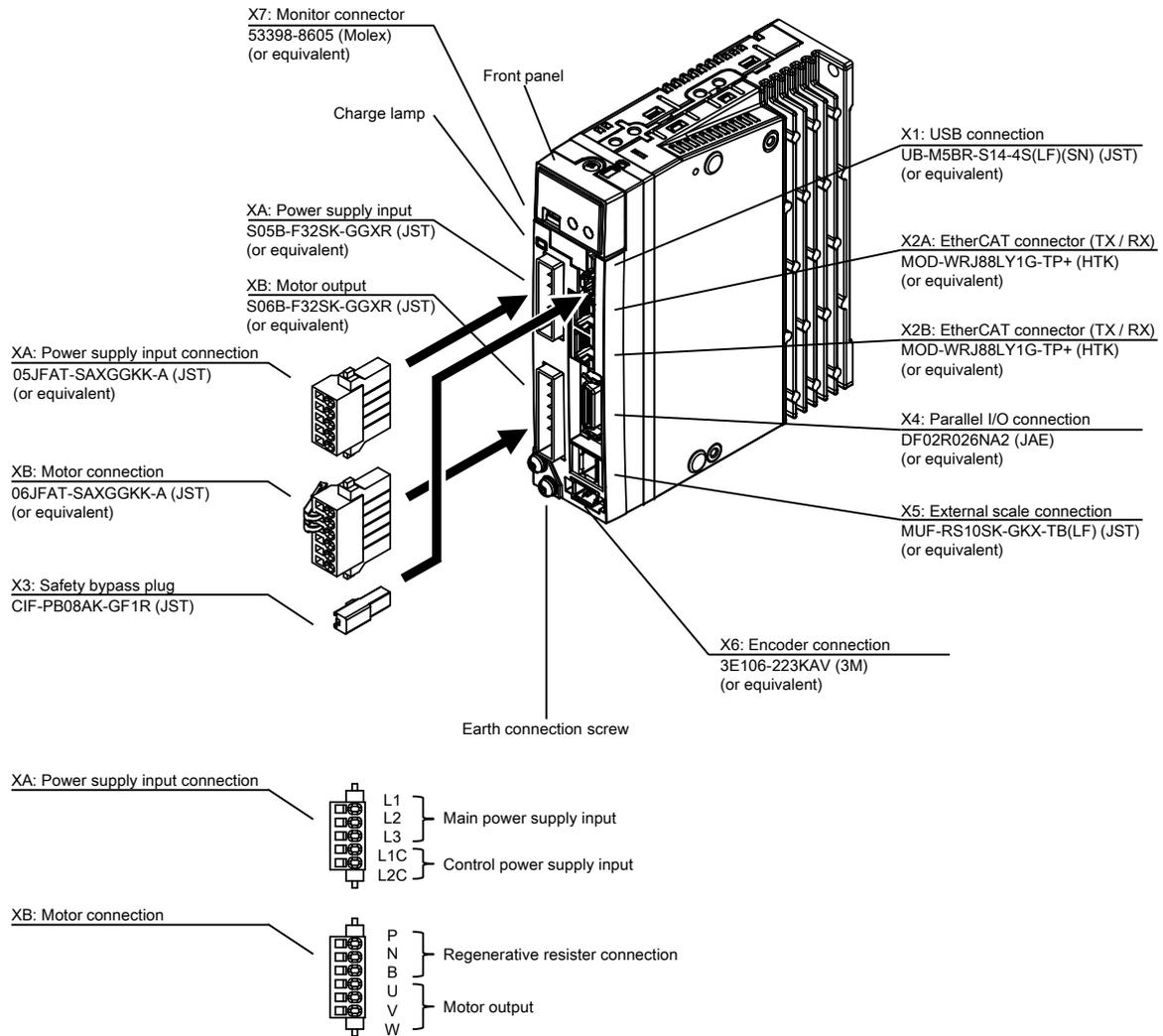
\*2 Do not use a wireless LAN dongle in a country that does not allow the use of it. Doing so will be a violation of the law.

For details, see the website of Panasonic. For the list of countries that allow the use of a dongle, see the website of Panasonic.

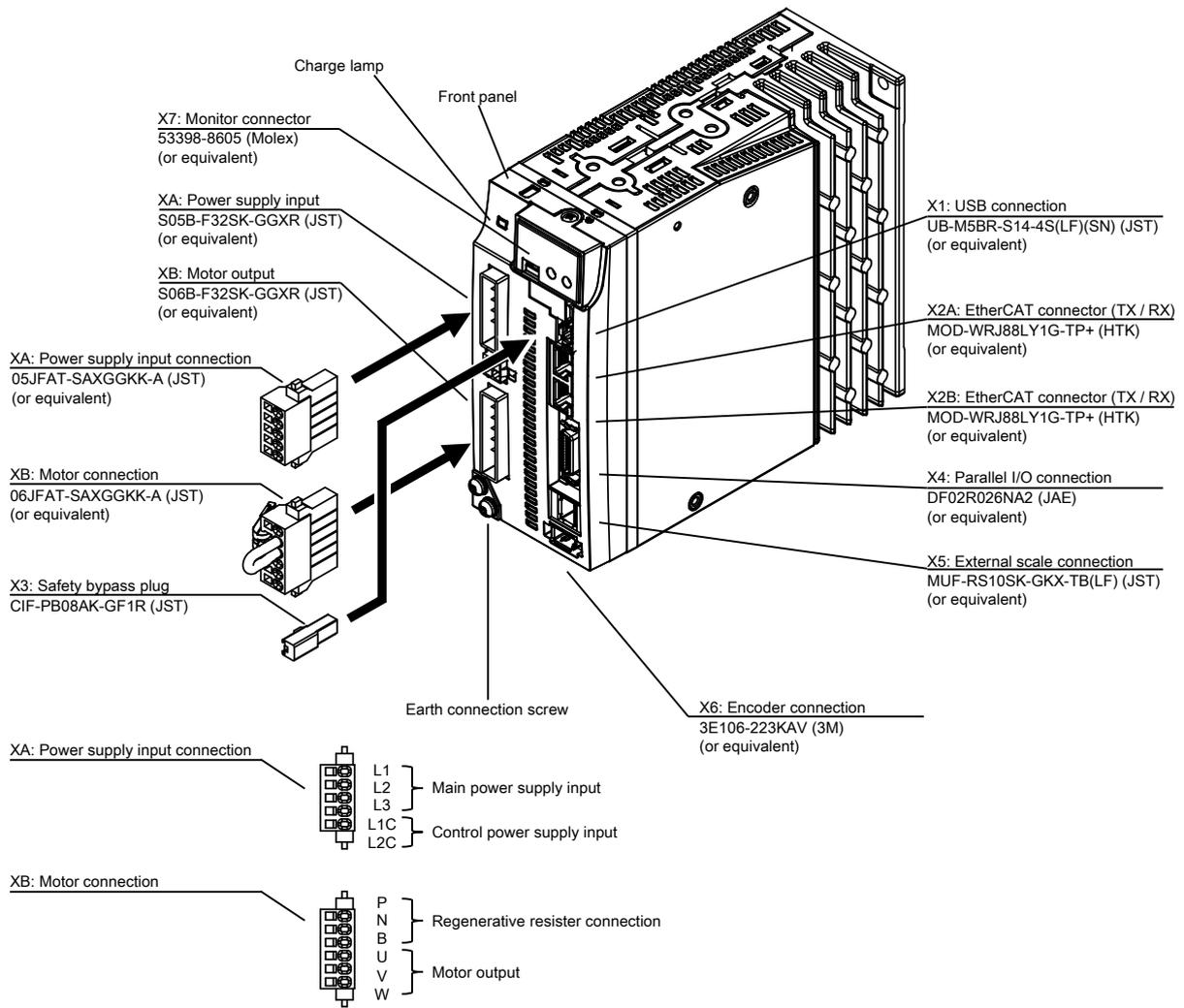
### 5. Appearance and name of each part

Each size in the figures shows a multi-function type. The standard type is not provided with X3 (safety function connector/safety bypass plug) and X5 (external scale connector).

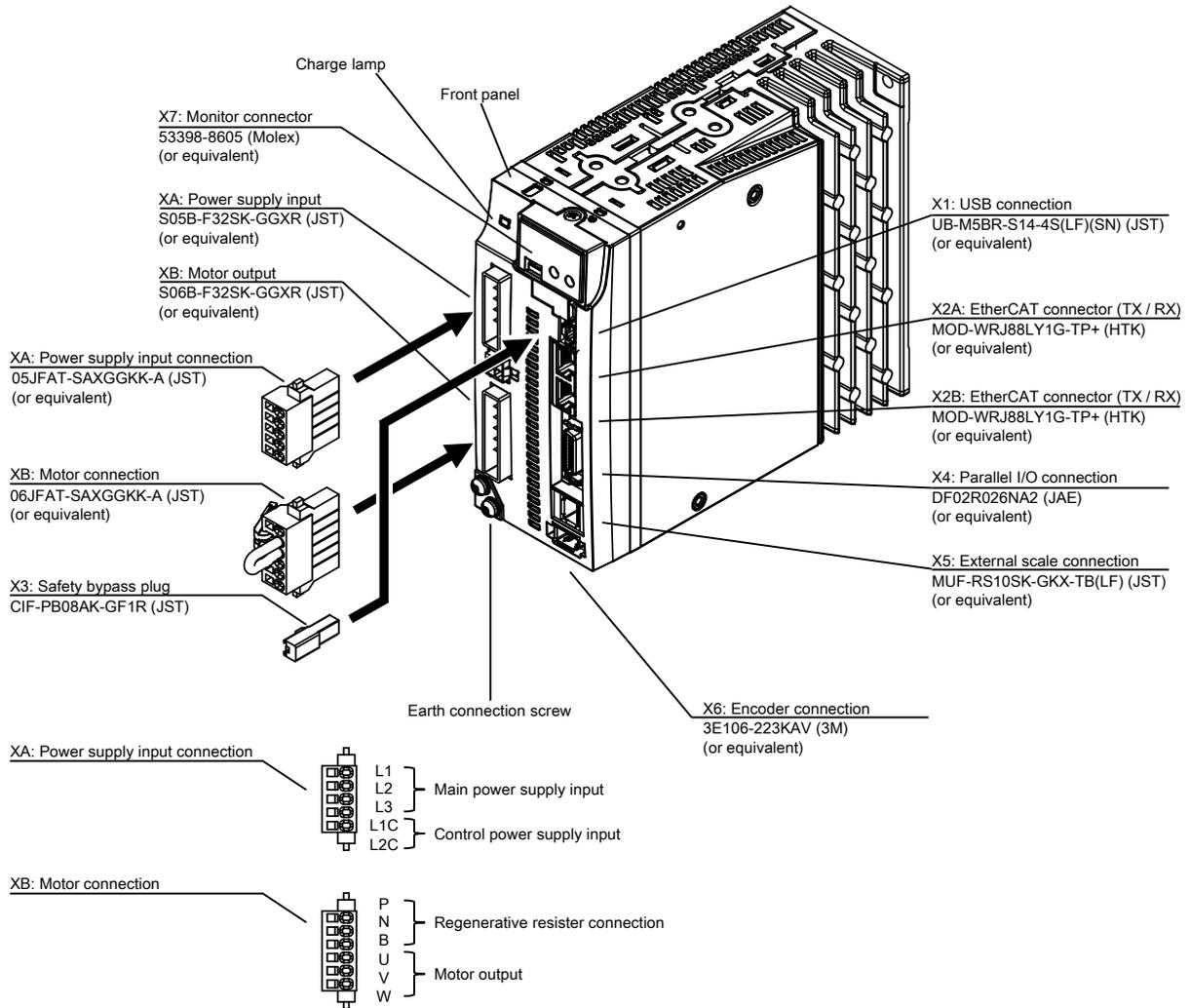
100 V / 200 V system sizes A and B



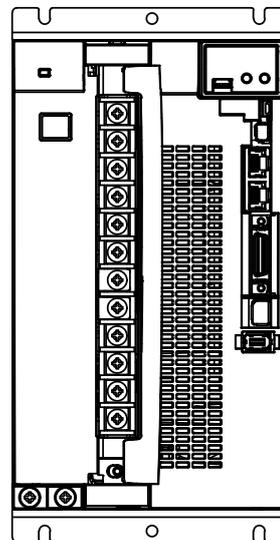
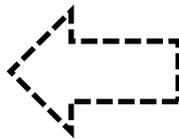
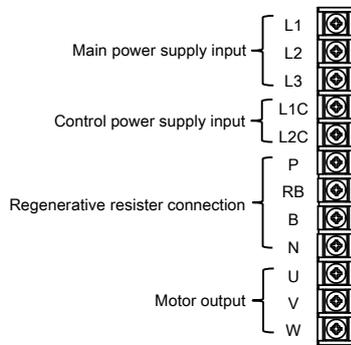
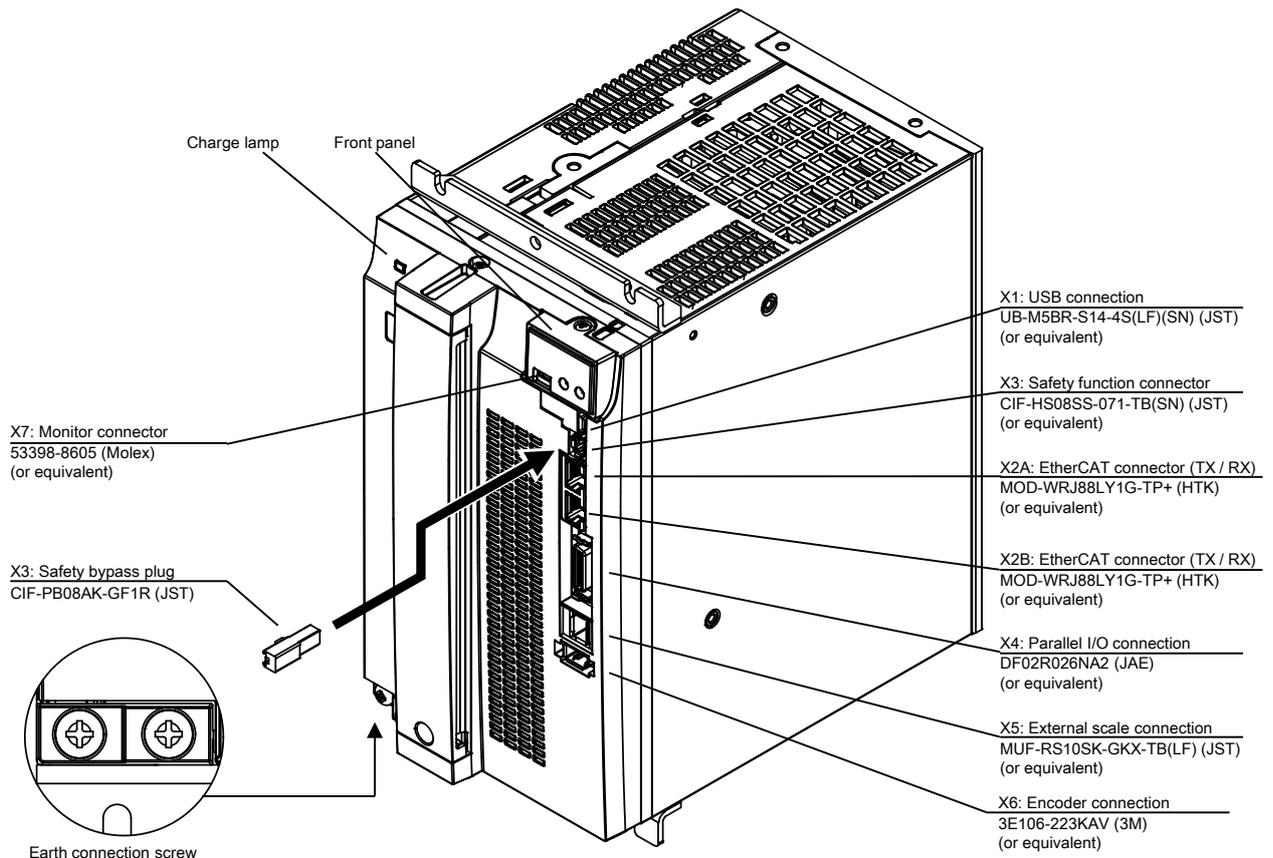
100 V / 200 V system sizes C and D



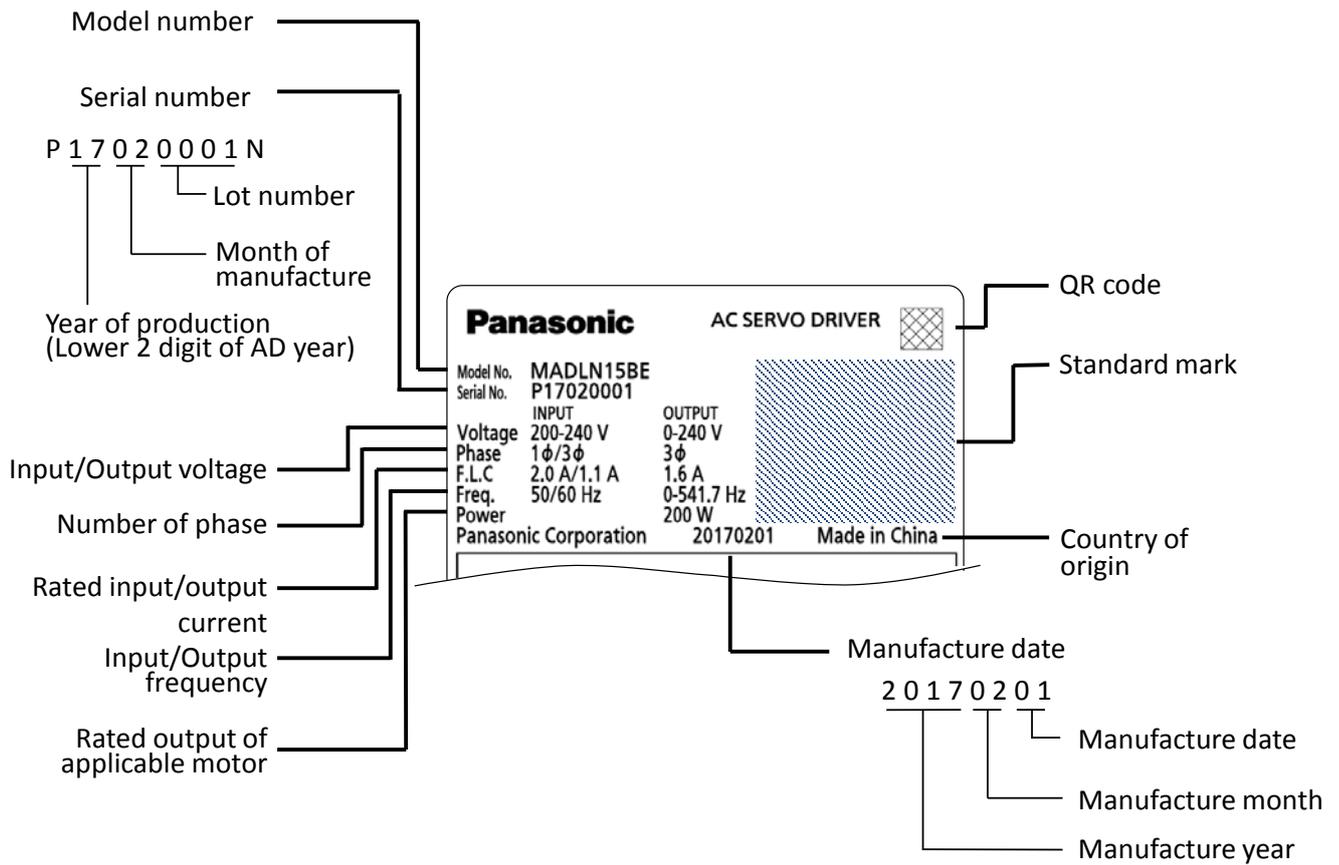
200 V system size E



200 V system size F



Example of a rating plate



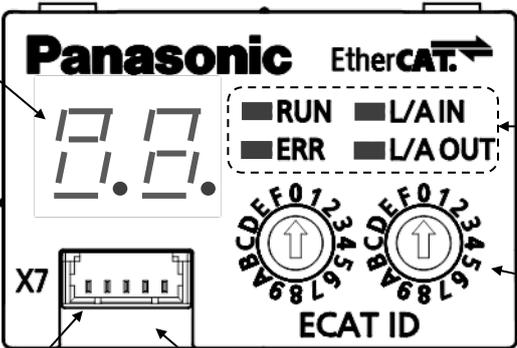
The values of the serial number part of the manufacturing number range from 1 to 33999. On the rating plate, it is indicated in four digits as in the format shown below.

“I” and “O” are not used for the fourth-digit alphabet.

Value of the serial number part	Indication on the rating plate
1 - 9999	0001 - 9999
10000 - 10999	A000 - A999
11000 - 11999	B000 - B999
⋮	⋮
17000 - 17999	H000 - H999
18000 - 18999	J000 - J999
⋮	⋮
22000 - 22999	N000 - N999
23000 - 23999	P000 - P999
⋮	⋮
33000 - 33999	Z000 - Z999

Front panel

2-digit 7-segment LED



RUN LED (green)    Link/Activity IN LED (green)  
 ERROR LED (red)    Link/Activity OUT LED (green)

2-digit rotary switch for  
 node Address setting  
 Setting range : 0 - FF

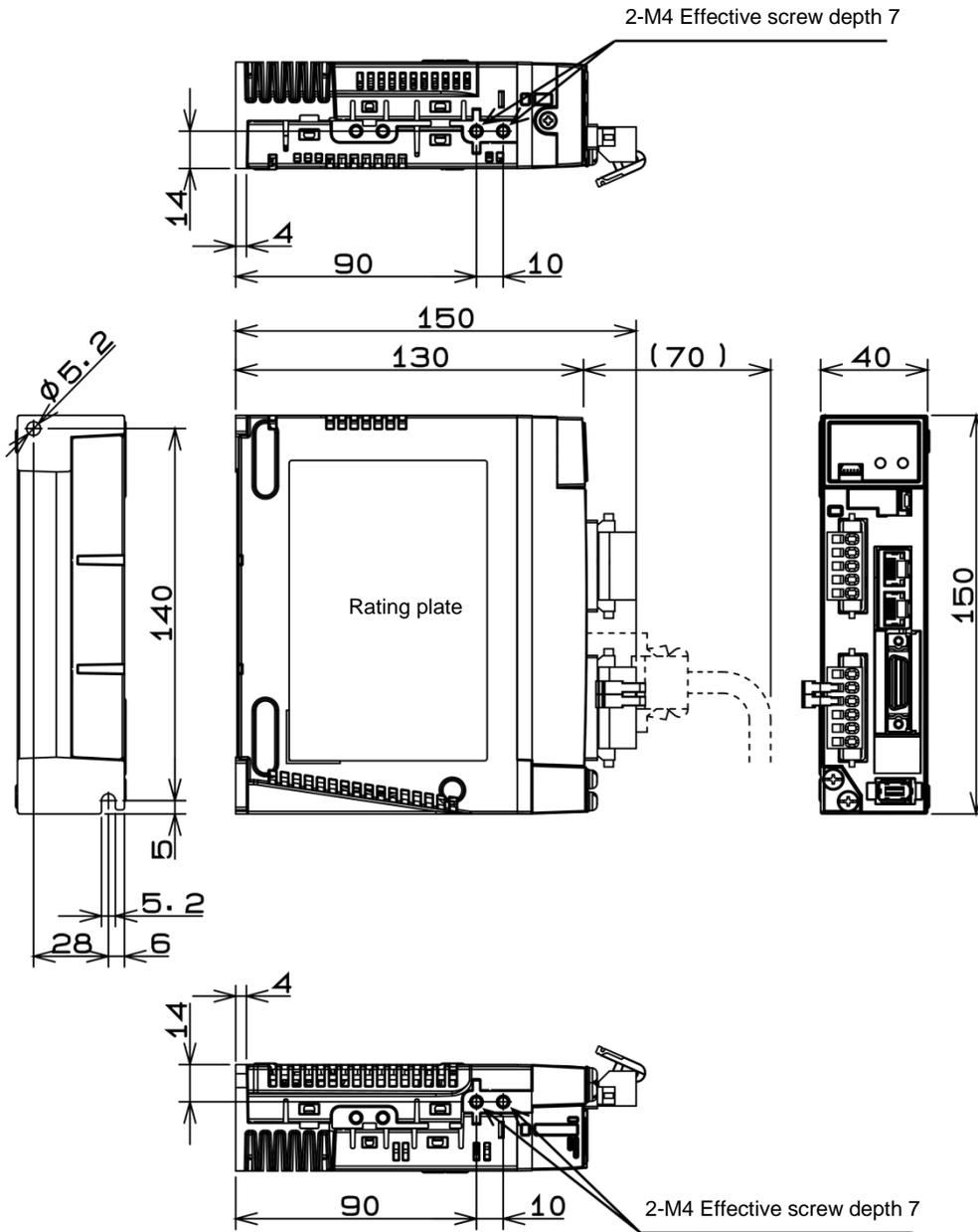
X7-1pin

Analog monitor connector(X7)

6. Dimensions

Both the standard type and the multi-function type have common outside dimensions of respective sizes (the figure shows the standard type).

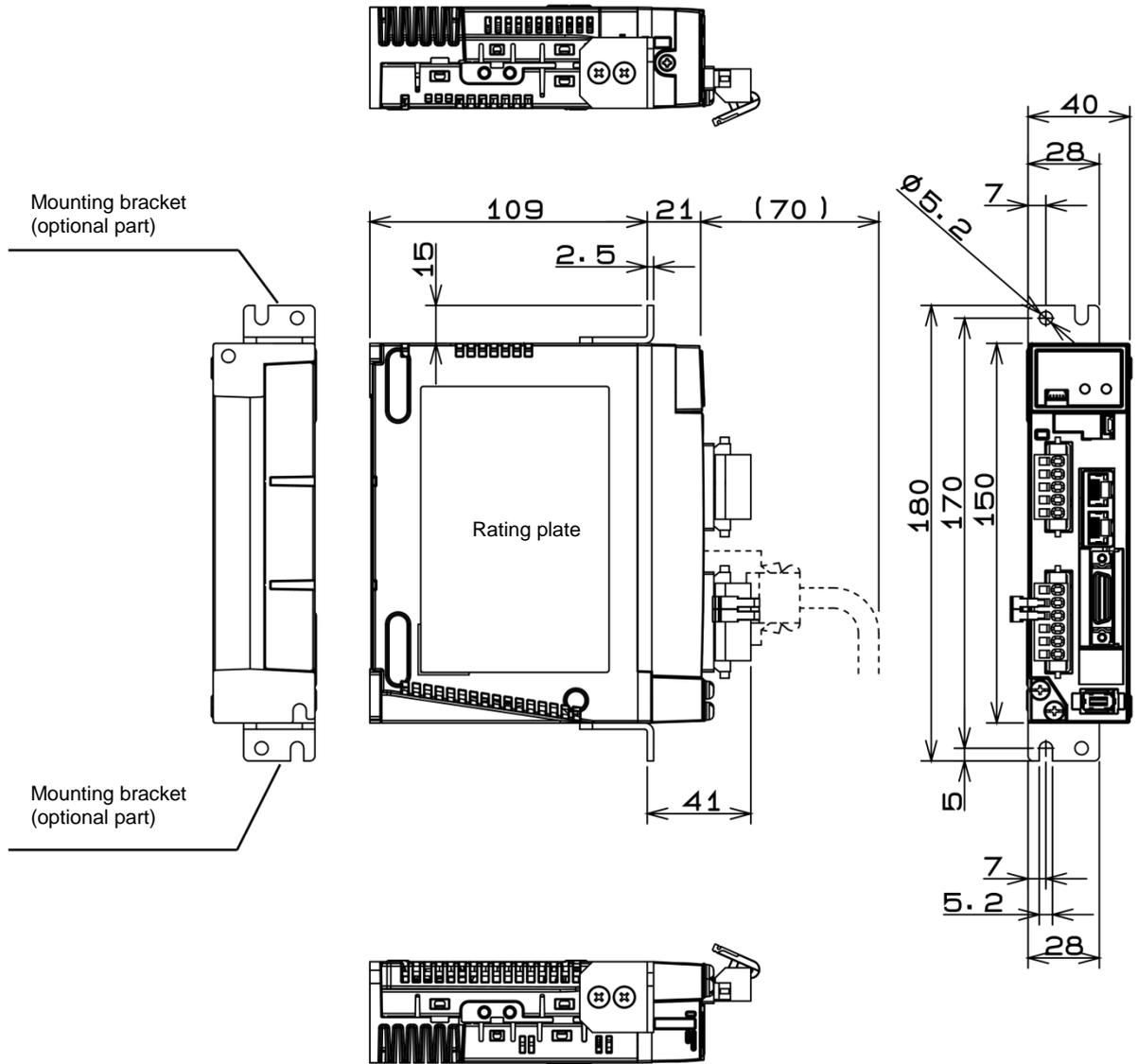
100 V / 200 V system size A



Unit: mm

\* Do not use threaded screw holes that do not have description of dimensions.

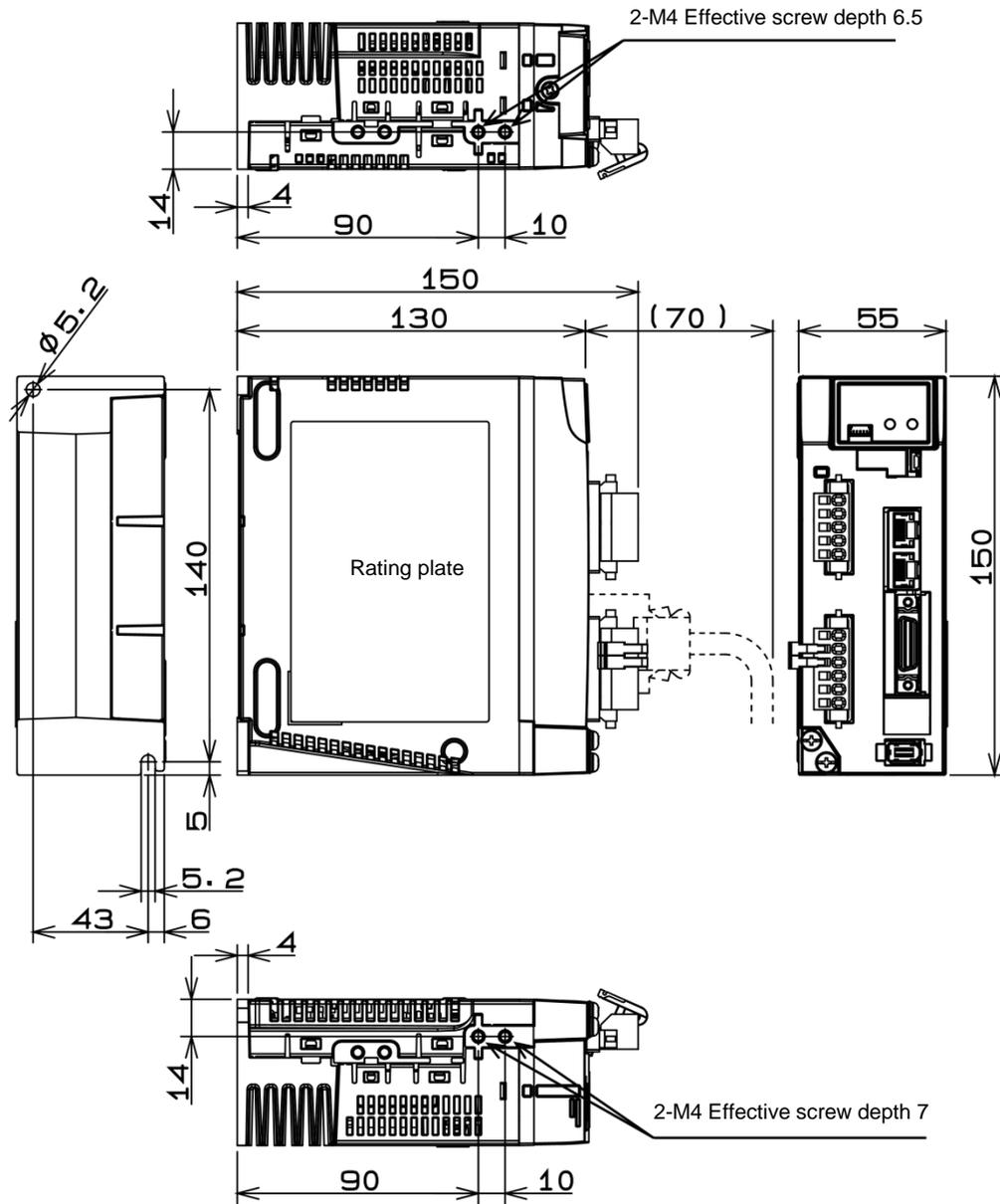
[Rack mount installation (by using optional parts: to be installed on the front)]



Unit: mm

- \* Do not use threaded screw holes that do not have description of dimensions.
- \* Mounting brackets are optional parts. They are not included with the product.

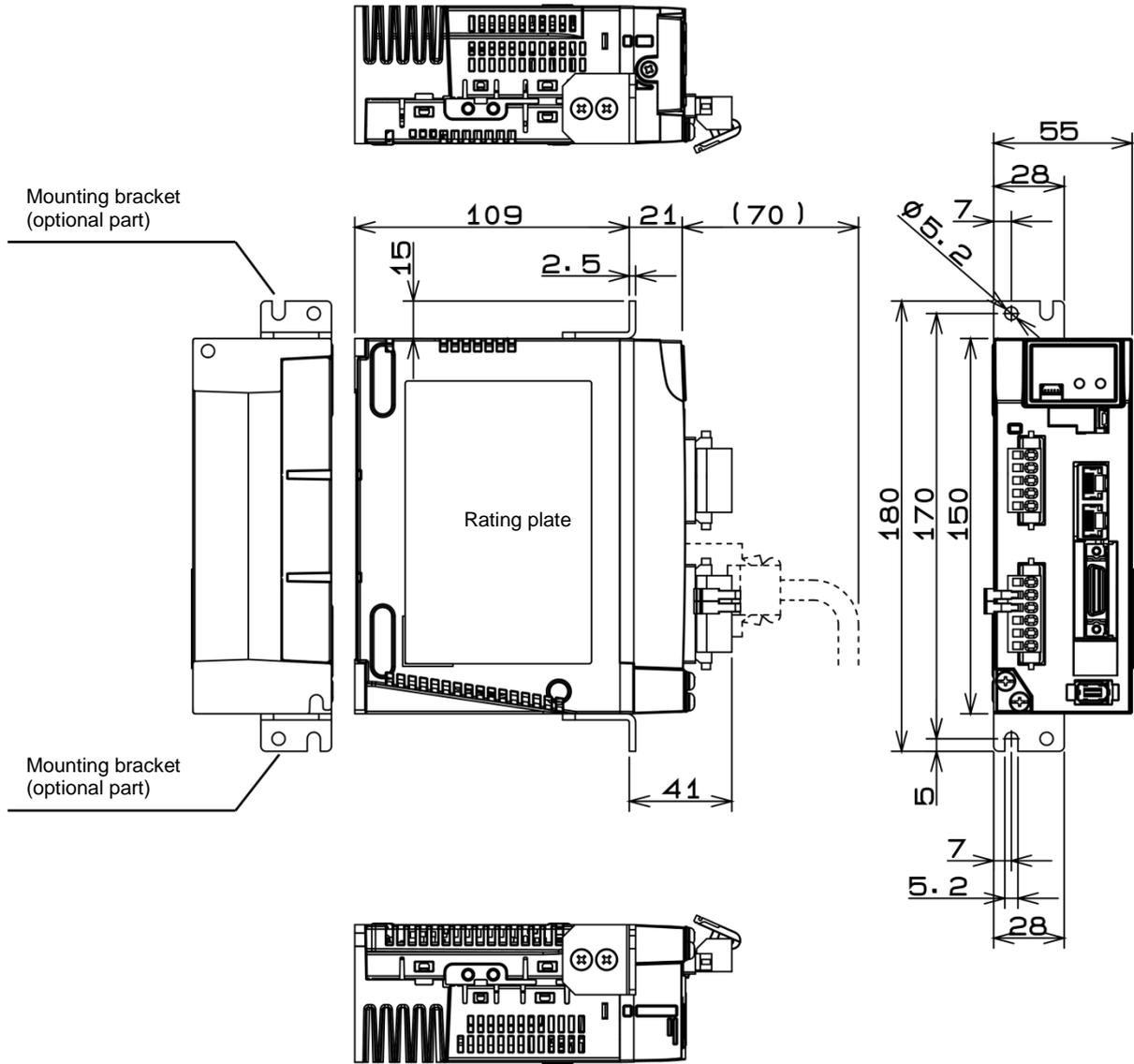
100 V / 200 V system size B



Unit: mm

\* Do not use threaded screw holes that do not have description of dimensions.

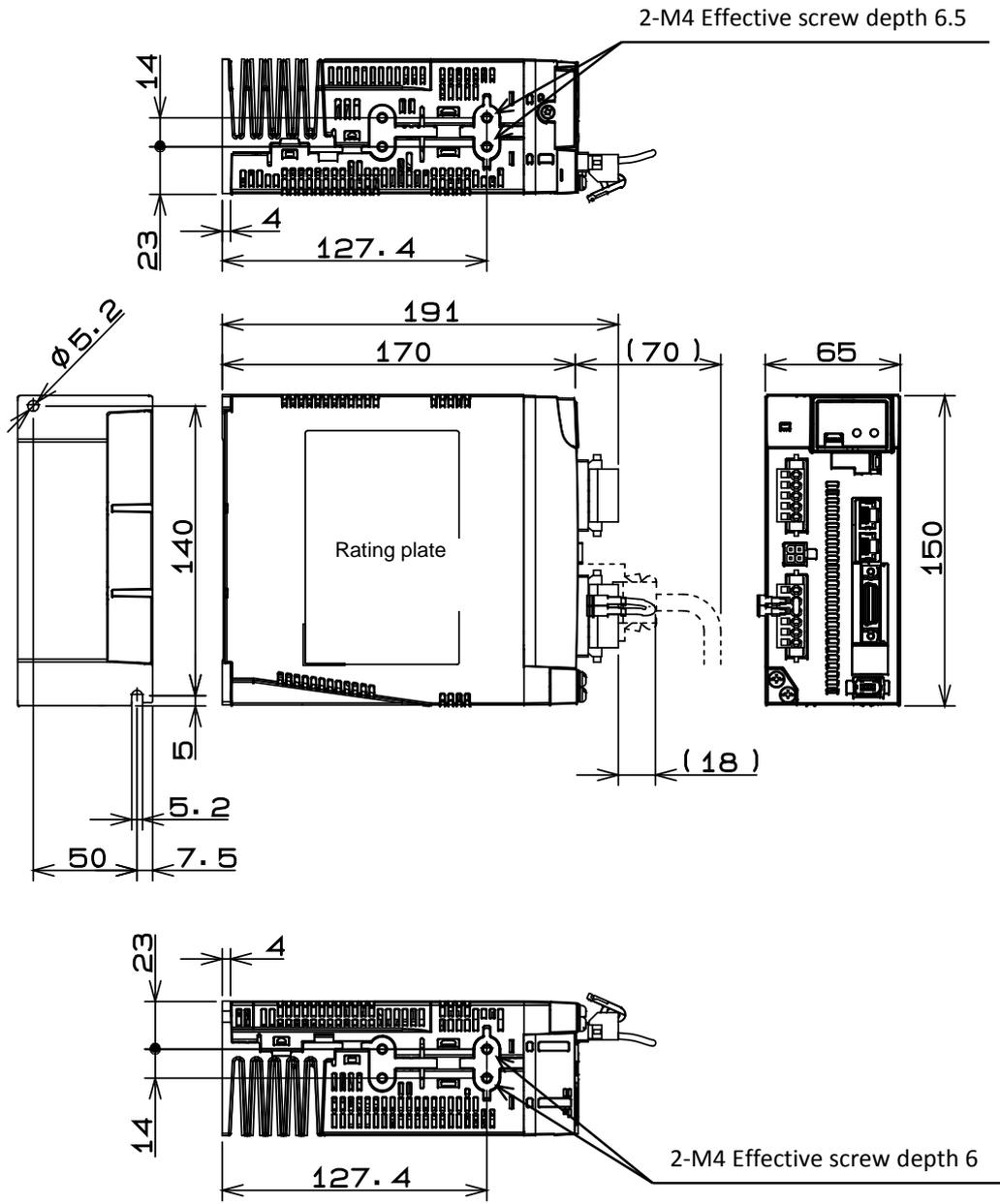
[Rack mount installation (by using optional parts: to be installed on the front)]



Unit: mm

- \* Do not use threaded screw holes that do not have description of dimensions.
- \* Mounting brackets are optional parts. They are not included with the product.

100 V / 200 V system size C

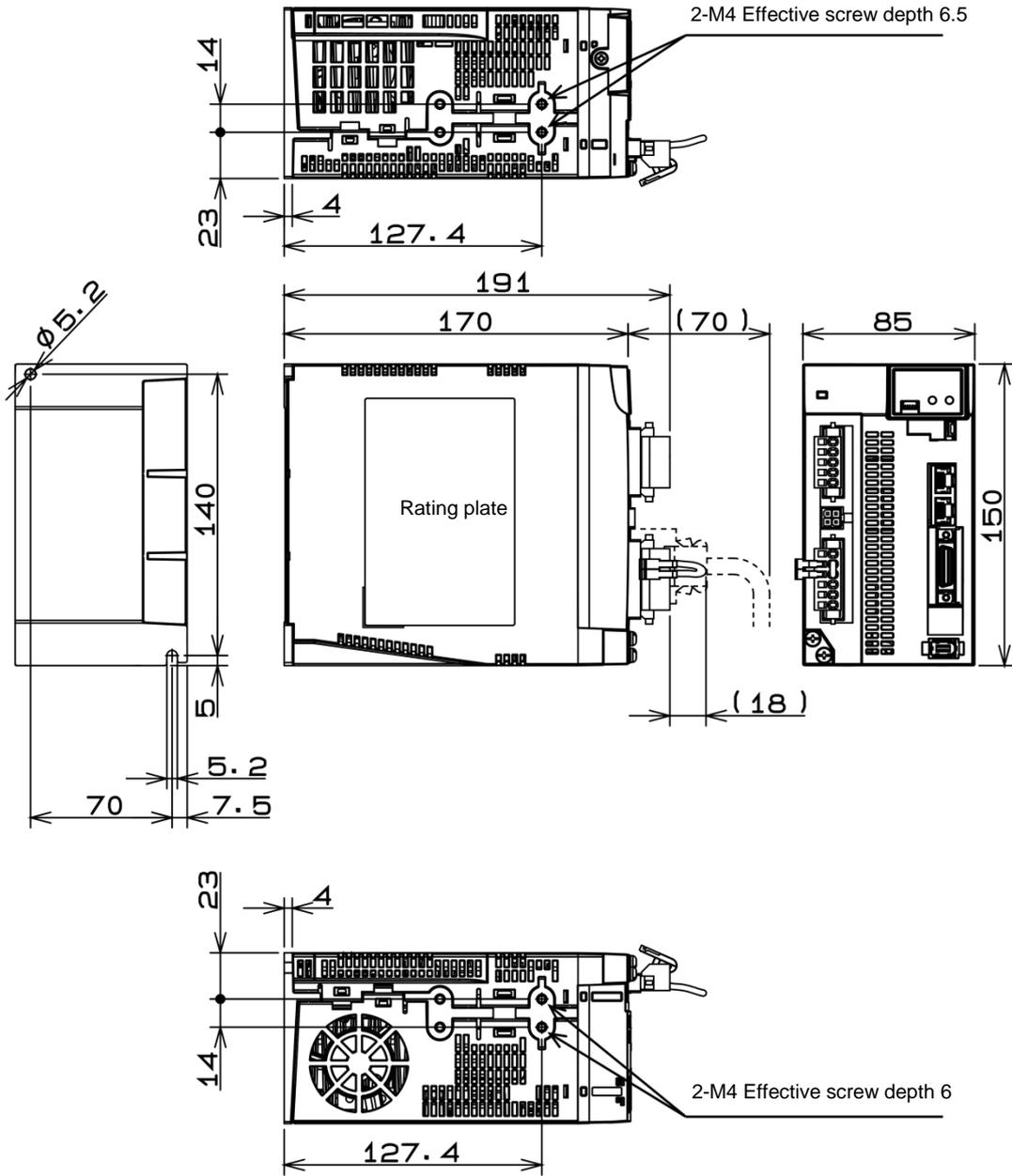


Unit: mm

\* Do not use threaded screw holes that do not have description of dimensions.



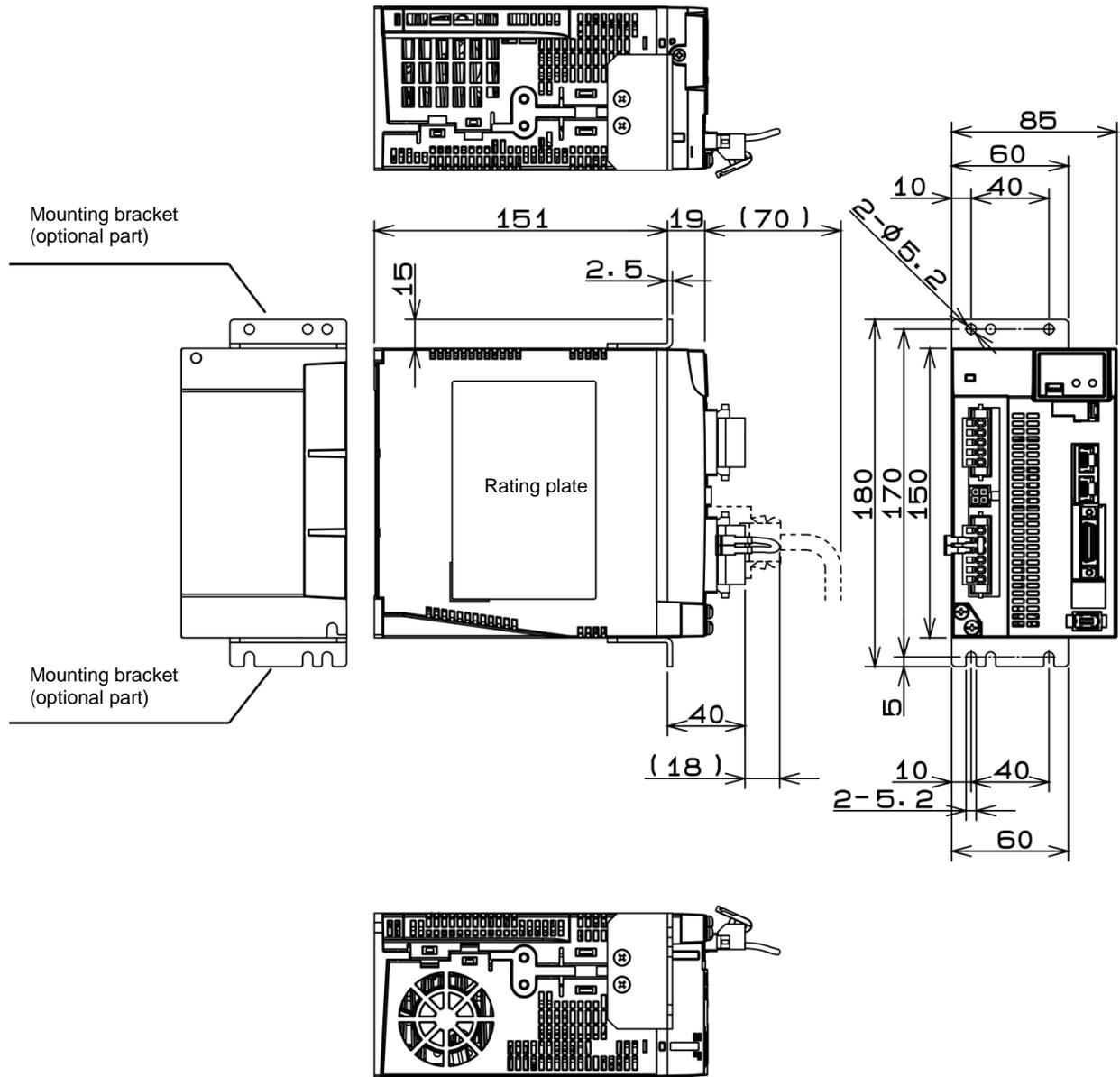
200 V system size D



Unit: mm

\* Do not use threaded screw holes that do not have description of dimensions.

[Rack mount installation (by using optional parts: to be installed on the front)]

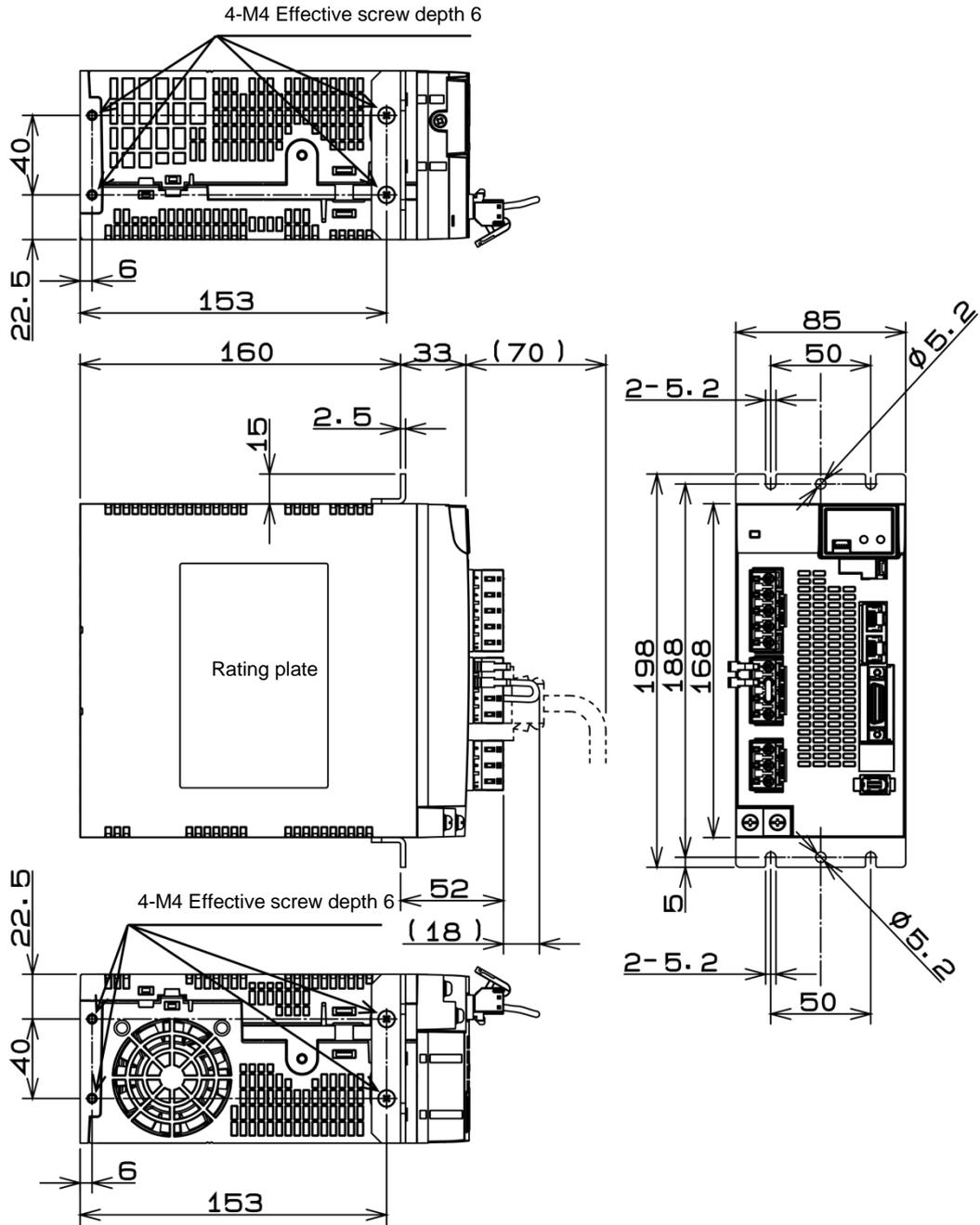


Unit: mm

- \* Do not use threaded screw holes that do not have description of dimensions.
- \* Mounting brackets are optional parts. They are not included with the product.

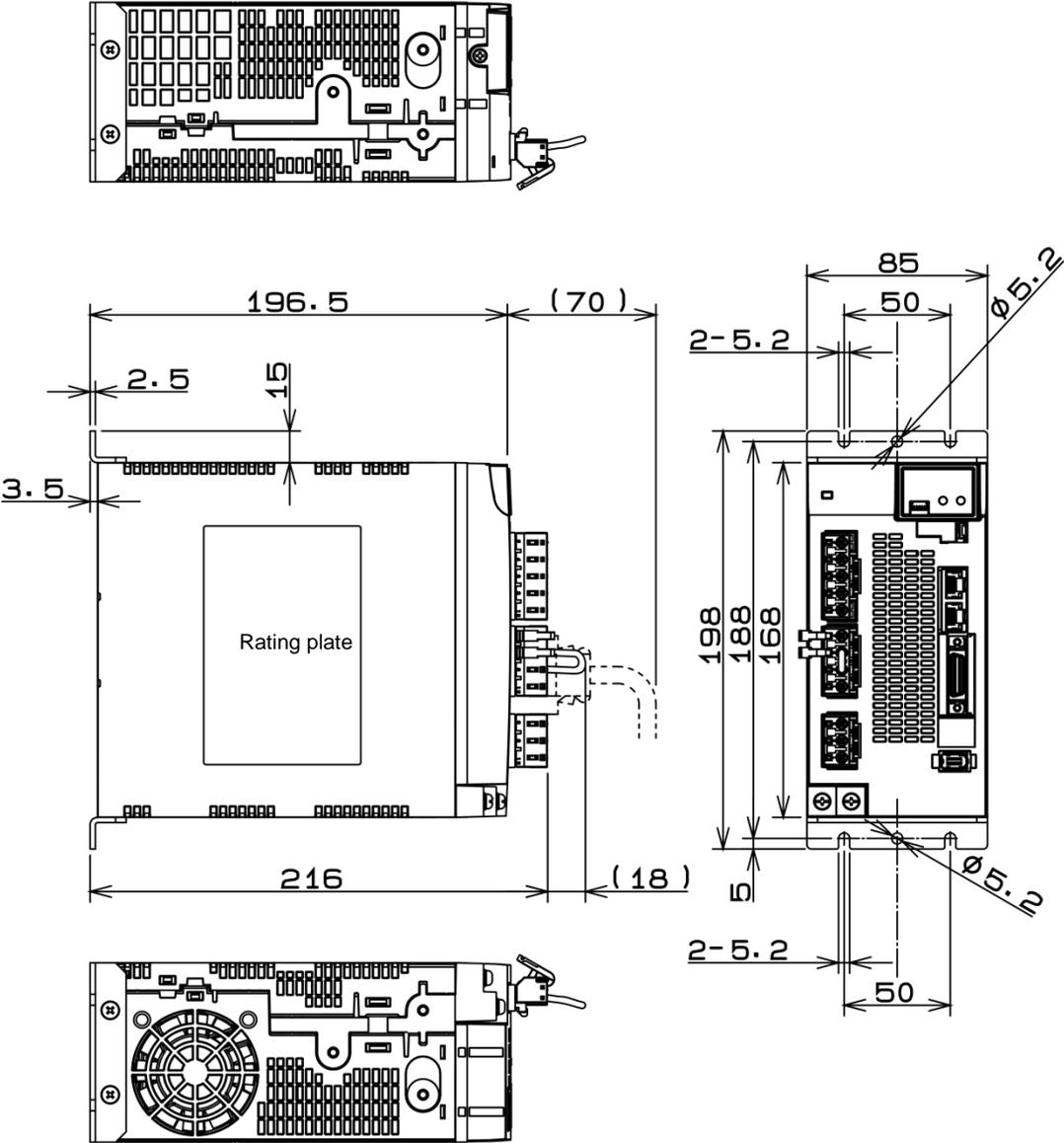
200 V system size E

[Rack mount installation (standard: to be installed on the front)]



Unit: mm

[Base mount installation (with brackets moved: to be installed on the rear)]

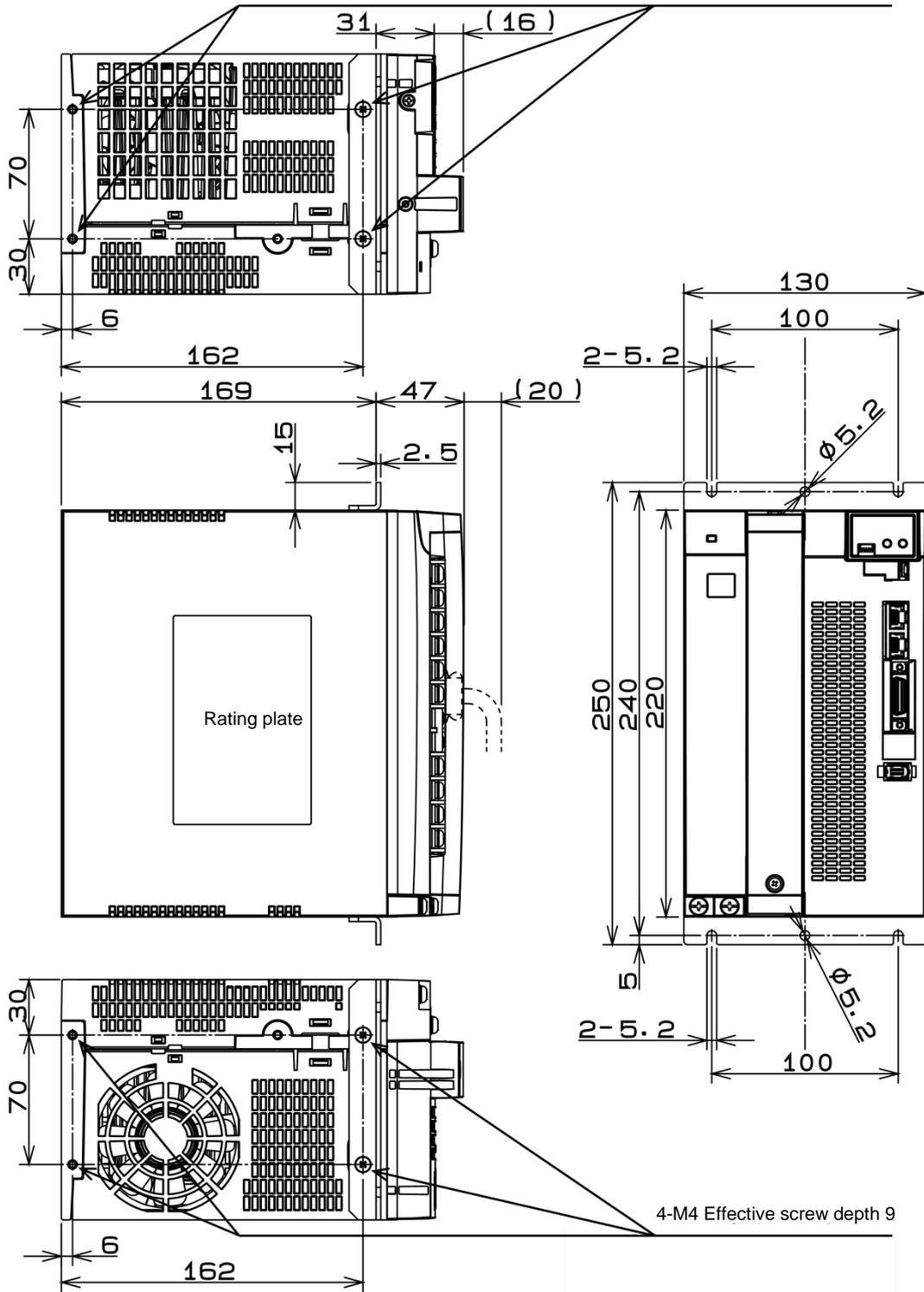


Unit: mm

200 V system size F

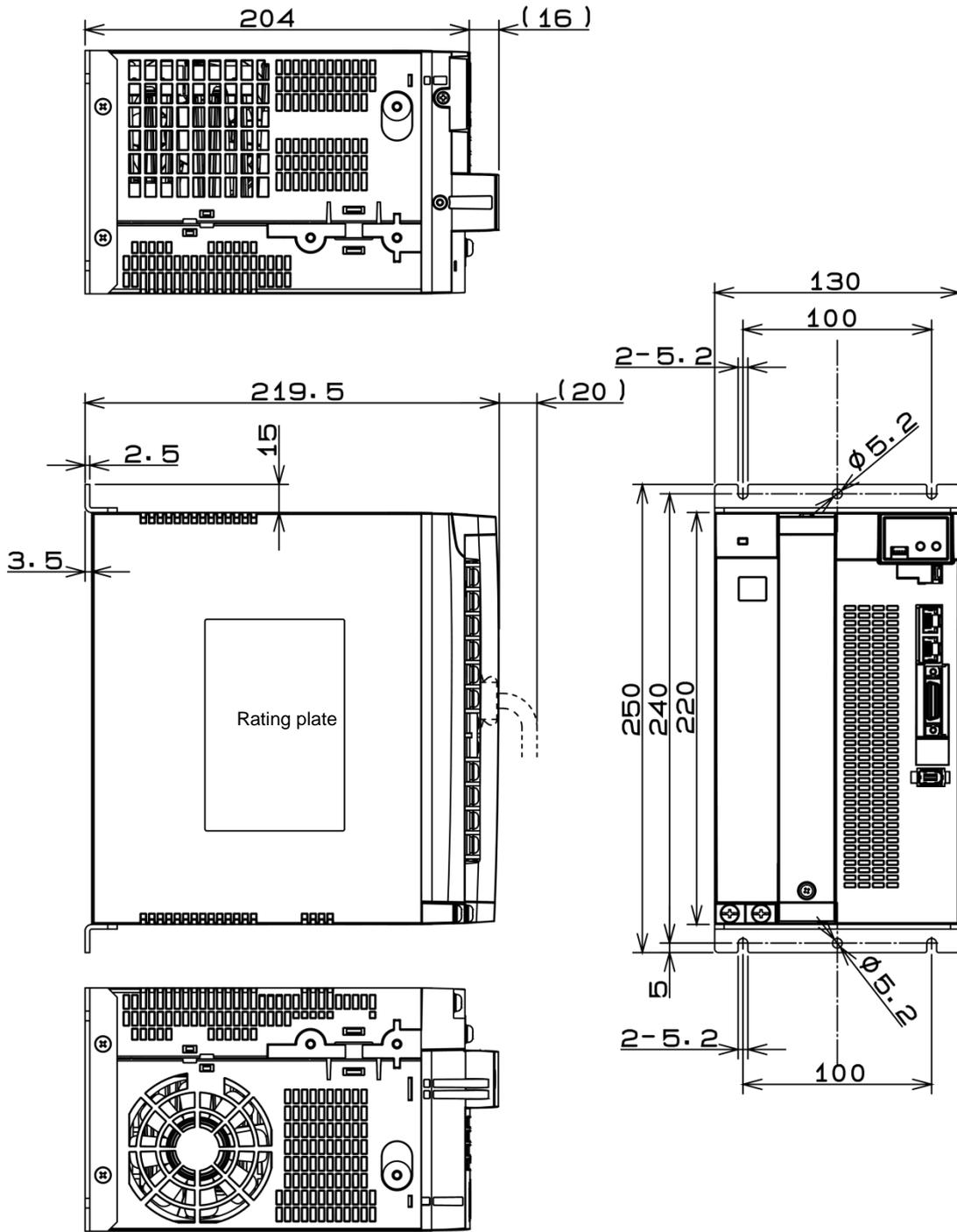
[Rack mount installation (standard: to be installed on the front)]

4-M4 Effective screw depth 9



Unit: mm

[Base mount installation (with brackets moved: to be installed on the rear)]



Unit: mm

## 7. Configuration of connectors and terminal blocks

7-1 Power connectors **XA**, **XB**, **XC** and terminal block

100 V / 200 V system sizes A and B

	Pin No.	Symbol	Name	Description
XA	5	L1	Main power input terminal	100 V system Single-phase 100 - 120 V + 10 % - 15 % , 50/60 Hz is input. For single-phase, the connector should be connected to the L1 and L3 terminals.
	4	L2		200 V system Single-phase/3 phase 200 - 240 V + 10 % - 15 % , 50/60 Hz is input. For single-phase, the connector should be connected to the L1 and L3 terminals.
	3	L3		
	2	L1C	Control power input terminal	100 V system Single-phase 100 - 120 V + 10 % - 15 % , 50/60 Hz is input.
	1	L2C		200 V system Single-phase 200 - 240 V + 10 % - 15 % , 50/60 Hz is input.
XB	6	P	Regenerative resistor connecting terminal	<ul style="list-style-type: none"> <li>When using an external regenerative resistor (to be prepared by the customer), connect the external regenerative resistor between the P terminal and the B terminal. In addition, parameter setting is required for the regenerative resistor. For details, refer to "Technical Document - Basic Functional Specifications -".</li> <li>Do not connect anything to the N terminal.</li> </ul>
	5	N		
	4	B		
	3	U	Motor output terminal	It is connected with each phase winding of the motor. U ... U phase, V ... V phase, W ... W phase
	2	V		
	1	W		
			Erath	It is connected with the E terminal of the motor to establish grounding.

\* The tightening torque of Earth screws should be 1.0 to 1.2 N·m for M4 screws.

## 100 V / 200 V system sizes C and D

	Pin No.	Symbol	Name	Description		
XA	5	L1	Main power input terminal	100 V system	Single-phase 100 - 120 V $\begin{matrix} + 10 \% \\ - 15 \% \end{matrix}$ , 50/60 Hz is input. For single-phase, the connector should be connected to the L1 and L3 terminals.	
	4	L2		200 V system	Single-phase/three-phase 200 - 240 V $\begin{matrix} + 10 \% \\ - 15 \% \end{matrix}$ , 50/60 Hz is input. For single-phase, the connector should be connected to the L1 and L3 terminals.	
	3	L3				
	2	L1C	Control power input terminal	100 V system	Single-phase 100 - 120 V $\begin{matrix} + 10 \% \\ - 15 \% \end{matrix}$ , 50/60 Hz is input.	
	1	L2C		200 V system	Single-phase 200 - 240 V $\begin{matrix} + 10 \% \\ - 15 \% \end{matrix}$ , 50/60 Hz is input.	
XC	4	N	-		• Do not connect anything to this connector.	
	3					
	2	P				
	1					
XB	6	P	Regenerative resistor connecting terminal		• Normally, short-circuit the RB terminal and the B terminal. • When using an external regenerative resistor (to be prepared by the customer), make the circuit between the RB terminal and the B terminal open and connect the external regenerative resistor between the P terminal and the B terminal. In addition, parameter setting is required for the regenerative resistor. For details, refer to "Technical Document - Basic Functional Specifications -".	
	5	RB				
	4	B				
	3	U	Motor output terminal			It is connected with each phase winding of the motor. U ... U phase, V ... V phase, W ... W phase
	2	V				
	1	W				
			Earth		It is connected with the E terminal of the motor to establish grounding.	

\* The tightening torque of Earth screws should be 1.0 to 1.2 N·m for M4 screws.

## 200 V system size E

	Pin No.	Symbol	Name	Description	
XA	5	L1	Main power input terminal	200 V system	Three-phase 200 - 240 V + 10 % - 15 % , 50/60 Hz is input.
	4	L2			
	3	L3			
	2	L1C	Control power input terminal	200 V system	Single-phase 200 - 240 V + 10 % - 15 % , 50/60 Hz is input.
	1	L2C			
XC	4	P	Regenerative resistor connecting terminal		<ul style="list-style-type: none"> <li>Normally, short-circuit the RB terminal and the B terminal.</li> <li>When using an external regenerative resistor (to be prepared by the customer), make the circuit between the RB terminal and the B terminal open and connect the external regenerative resistor between the P terminal and the B terminal. In addition, parameter setting is required for the regenerative resistor. For details, refer to "Technical Document - Basic Functional Specifications -".</li> <li>Do not connect anything to the N terminal.</li> </ul>
	3	RB			
	2	B			
	1	N			
XB	3	U	Motor output terminal		It is connected with each phase winding of the motor. U ... U phase, V ... V phase, W ... W phase
	2	V			
	1	W			
			Earth		It is connected with the E terminal of the motor to establish grounding.

\* The tightening torque of earth screws should be 1.0 to 1.2 N·m for M4 screws.

## 200 V system size F

Use terminal blocks.

Terminal block No. (From above)	Symbol	Name	Description
1	L1	Main power input terminal	Three-phase 200 - 240 V + 10 % - 15 % , 50/60 Hz is input.
2	L2		
3	L3		
4	L1C	Control power input terminal	Single-phase 200 - 240 V + 10 % - 15 % , 50/60 Hz is input.
5	L2C		
6	P	Regenerative resistor connecting terminal	<ul style="list-style-type: none"> <li>Normally, short-circuit the RB terminal and the B terminal.</li> <li>When using an external regenerative resistor (to be prepared by the customer), make the circuit between the RB terminal and the B terminal open and connect the external regenerative resistor between the P terminal and the B terminal.</li> </ul> In addition, parameter setting is required for the regenerative resistor. For details, refer to "Technical Document - Basic Functional Specifications -".
7	RB		
8	B		
9	N		
10	U	Motor output terminal	It is connected with each phase winding of the motor. U ... U phase, V ... V phase, W ... W phase
11	V		
12	W		
		Earth	It is connected with the E terminal of the motor to establish grounding.

- \* The tightening torque of earth screws should be 1.8 to 2.0 N·m for M5 screws.
- \* The tightening torque of terminal block screws should be 1.8 to 2.0 N·m for M5 screws.
- \* The tightening torque of fixing screws for the terminal block cover should be 0.19 to 0.21 N·m for M3.
- \* The screws may be damaged if the tightening torque has exceeded the maximum value.

7-2 USB connector X1

Operations such as parameter setting/change, control status monitoring, error status/history browsing, and parameter saving/loading can be performed by connecting to a PC or a high-order NC via a USB connector.

Name	Symbol	Pin No.	Description
USB signal terminal	VBUS	1	<ul style="list-style-type: none"> <li>Used for communication with a PC or a controller.</li> </ul>
	D-	2	
	D+	3	
For manufacturer	-	4	<ul style="list-style-type: none"> <li>Do not connect anything.</li> </ul>
Signal ground	GND	5	<ul style="list-style-type: none"> <li>Signal ground</li> </ul>

The connector shape on the driver side is USB mini-B.

7-3 EtherCATconnectors **X2A** **X2B**

They are RJ45 connectors used for EtherCAT.

[X2A] / [X2B]

Name	Symbol	Connector pin no.	Description
Network output / input +	TX/RX+	1	Connect to pin 1 on the RJ45 connector of communication node.
Network output / input -	TX/RX-	2	Connect to pin 1 on the RJ45 connector of communication node
Network input / output +	RX/TX+	3	Connect to pin 1 on the RJ45 connector of communication node
Unused	-	4	Connect to pin 1 on the RJ45 connector of communication node
Unused	-	5	Connect to pin 1 on the RJ45 connector of communication node
Network input / output -	RX/TX-	6	Connect to pin 1 on the RJ45 connector of communication node
Unused	-	7	Connect to pin 1 on the RJ45 connector of communication node
Unused	-	8	Connect to pin 1 on the RJ45 connector of communication node
Frame ground	-	Shell	Connect to shield of cable.

- \* Be sure to use shielded twisted pair (STP) compatible with 5e of TIA/EIA-568 or higher category
- \* Auto MDI/MDI-X assigns functions to pin no.1,2,3,6.

7-4 Safety function connector **X3**

It is a terminal for supporting functional safety.

This connector is supported only for the multi-function type.

Name	Symbol	Pin No.	Description	Input/output signal Interface
Reserved	-	1	• Do not connect anything.	-
	-	2		-
Safety input 1	SF1-	3	• It is an independent circuit consisting of two systems, which turns off the drive signal to the power module and shuts off the motor current.	i-1
	SF1+	4		
Safety input 2	SF2-	5		
	SF2+	6		
EDM output	EDM-	7	• It is monitor output for monitoring malfunctions of the safety function.	o-1
	EDM+	8		
Frame ground	FG	Shell	• It is connected with the earth terminal inside the servo driver.	-

7-5 Parallel I/O connector X4Input signal

Name	Symbol	Pin No.	Description	Input/output signal interface
General input common	SI-COM	6	<ul style="list-style-type: none"> <li>It is connected with the positive or negative electrode of the external DC power supply (12 - 24 V).</li> <li>Use 12 V<math>\pm</math>5% to 24 V<math>\pm</math>5% for power supply.</li> <li>It needs to be isolated from the primary side power supply. Do not connect with the same power supply.</li> </ul> Primary side power supply: Power supply for motor brake	-
Control input 1	SI1	5	<ul style="list-style-type: none"> <li>Functions are allocated according to parameters. For details, refer to "Technical Document - Basic Functional Specifications -".</li> <li>Note that there are limitations on function allocation. Regarding external latch input, for example, EXT1 can be allocated only to SI5, EXT2 to SI6, and EXT3 to SI7.</li> </ul>	i-1
Control input 2	SI2	7		
Control input 3	SI3	8		
Control input 4	SI4	9		
Control input 5	SI5	10		
Control input 6	SI6	11		
Control input 7	SI7	12		
Control input 8	SI8	13		

Output signal

Name	Symbol	Pin No.	Description	Input/output signal interface
Control output 1	SO1- SO1+	1 2	<ul style="list-style-type: none"> <li>Functions are allocated according to parameters. For details, refer to "Technical Document - Basic Functional Specifications -".</li> </ul>	o-1
Control output 2	SO2- SO2+	25 26		
Control output 3	SO3- SO3+	3 4		

Encoder output signal/Position comparison output signal

Name	Symbol	Pin No.	Description	Input/output signal interface
A-phase output Position comparison Output 1	OA+/ OCMP1+	17	<ul style="list-style-type: none"> <li>Encoder signals or external scale signals for which frequency division was performed (A-phase, B-phase) are output as differential signals. (Equivalent to RS422)</li> <li>The division ratio can be set for the corresponding parameter.</li> <li>The ground of the line driver for the output circuit is connected to the signal ground (GND), i.e. non-insulated.</li> <li>The maximum output frequency is 4 Mpps (after quad edge evaluation).</li> <li>This differential signal should be received by a line receiver (AM26C32 or equivalent). Connect a terminating resistor (approx. 330 <math>\Omega</math>) between the line receiver inputs.</li> <li>Use a twisted pair cable with shield for wiring, and connect the shield wire to the connector shell.</li> </ul>	Do-1
		OA-/ OCMP1-		
B-phase output/ Position comparison Output 2	OB+/ OCMP2+	20		
	OB-/ OCMP2-	19		
Position comparison Output 3	OCMP3+	21		
	OCMP3-	22		
Signal Ground	GND	16	<ul style="list-style-type: none"> <li>Signal ground</li> <li>Be sure to connect the line receiver ground to this terminal.</li> </ul>	-

## Battery input for encoder backup

Name	Symbol	Pin No.	Description	Input/output signal interface
Battery input for absolute encoder	BTP-I	14	<ul style="list-style-type: none"> <li>Connect a battery for the absolute encoder. For details, refer to 8-3-4. BTP-I: Positive electrode BTN-I: Negative electrode</li> <li>Power for retaining multi-rotation data is supplied to the absolute encoder via BTP-O (3pin) and BTN-O (4pin) of encoder connector <b>X6</b>.</li> <li>The battery for the absolute encoder should be connected using any of the following methods.               <ol style="list-style-type: none"> <li>Direct connection to the motor side</li> <li>Connection to the encoder cable</li> <li>Connection to this connector</li> </ol> </li> </ul>	-
	BTN-I	15		-

## Other

Name	Symbol	Pin No.	Description	Input/output signal interface
Reserved	-	23,24	Do not connect anything.	-
Frame Ground	FG	Shell	It is connected with the earth terminal inside the servo driver.	-

7-6 External scale connector **X5**

This connector is supported only for the multi-function type.

Name	Symbol	Pin No.	Description
External scale power output	EX5V	1	External scale power output (Note 1) (Note 2)
	EX0V	2	Ground of external scale power output (Note 3)
External scale signal input/output (Serial signal)	EXPS	3	Serial signal non-inverting input/output
	/EXPS	4	Serial signal inverting input/output
External scale signal input (A/B/Z-phase signal)	EXA	5	A-phase signal non-inverting input
	/EXA	6	A-phase signal inverting input
	EXB	7	B-phase signal non-inverting input
	/EXB	8	B-phase signal inverting input
	EXZ	9	Z-phase signal non-inverting input
	/EXZ	10	Z-phase signal inverting input
Frame ground	FG	Shell	It is connected with the earth terminal inside the servo driver.

Note 1) The external scale power output EX5V should be  $5V \pm 5\%$  and 250 mA at the maximum.

When using an external scale whose consumption current exceeds this value, external power supply should be prepared by the customer.

It may take time to perform initialization after power-on, depending on external scales.

Note 2) When driving an external scale using external power supply, make the EX5V pin open so that voltage is not supplied to this pin from outside.

Note 3) The external scale power output EX0V is connected with the control circuit ground that is connected to connector **X5**.

7-7 Encoder connector **X6**

Name	Symbol	Pin No.	Description
Encoder power output	E5V	1	• Encoder power output
	E0V	2	• Ground of encoder power output (Note 1)
Battery output for absolute encoder (Note 2)	BTP-O	3	• Battery output (positive electrode)
	BTN-O	4	• Battery output (negative electrode)
Encoder signal input/output (Differential serial signal)	PS	5	• Encoder signal non-inverting input/output
	/PS	6	• Encoder signal inverting input/output
Frame ground	FG	Shell	• It is connected with the earth terminal inside the servo driver.

Note 1) The encoder power output E0V is connected with the control circuit ground that is connected to connector **X4** inside the servo driver.

Note 2) It is connected with absolute encoder battery inputs BTP-I and BTN-I for connector **X4** inside the driver.

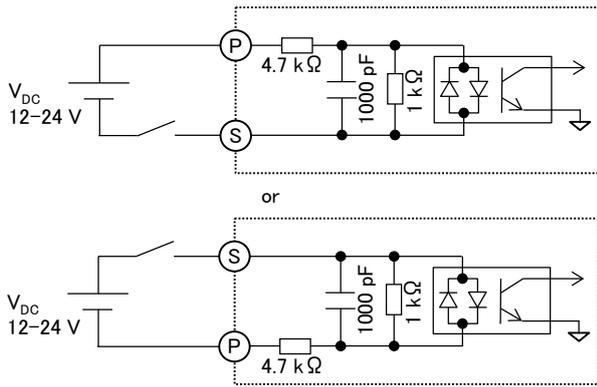
When connecting the battery directly to the encoder connecting cable, do not connect anything to this terminal.

7-8 Monitor connector **X7**

Name	Symbol	Pin No.	Description	Input/output signal interface
Analog monitor output 1	AM1	1	• Analog signals for the monitor are output. • The meaning of the output signal varies depending on the parameter setting.	Ao-1
Analog monitor output 2	AM2	2		
Signal ground	GND	3	• Signal ground	-
Reserved	-	4,5	• Do not connect anything.	-

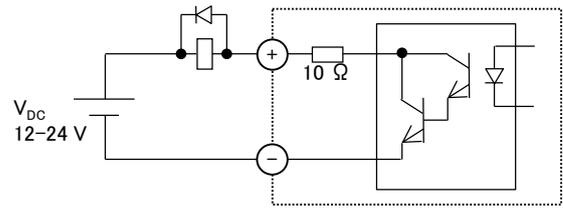
7-9 Input/output signal interface

i-1



S: (X3) 3,5pin / (X4) 5,7,8,9,10,11,12,13pin  
 P: (X3) 4,6pin / (X4) 6pin

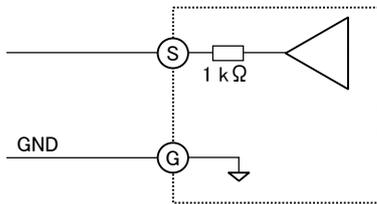
o-1



+: (X3) 8pin / (X4) 1,3,25pin  
 -: (X3) 7pin / (X4) 2,4,26pin

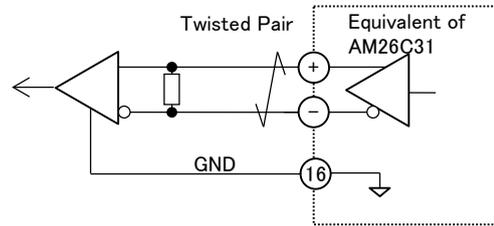
Note) When driving the relay directly, mount a diode in parallel with the relay in the direction shown in the above figure.

Ao-1



S: (X7) 1,2pin  
 G: (X7) 3pin  
 The output signal amplitude is  $\pm 10$  V.

Do-1



+: (X4) 17,20,21pin  
 -: (X4) 18,19,22pin  
 G: (X4) 16pin

Connect a terminating resistor (approx. 330 Ω) between the line receiver inputs.

## 8. Wiring and system configuration

## 8-1 Wire rods used and maximum wiring length

Name	Symbol	Maximum wiring length (Note 1)	Electric wire used
Main power input	L1,L2,L3	-	In accordance with Appendix "Specifications for Each Model"
Control power input	L1C,L2C	-	In accordance with Appendix "Specifications for Each Model"
Motor output	U,V,W, 	20 m	In accordance with Appendix "Specifications for Each Model"
Earth wire		-	In accordance with Appendix "Specifications for Each Model"
Encoder connection	X6	20 m	Common shielded twisted pair wire Core wire 0.18 mm <sup>2</sup> or more
External scale connection (Note 3)	X5	20 m	
I/O connection	X4	3 m	
Safety connection (Note 3)	X3	3 m	Core wire 0.18 mm <sup>2</sup> or more
EtherCAT connection	X2A, X2B	100 m (Note 2)	TIA/EIA-568 CAT5e STP

Note 1) The above wiring length is the maximum value under the evaluation environment of Panasonic. It does not guarantee the operation under the working environment of the customer.

Note 2) For details, refer to "8-3-5 Connection to connectors **X2A** and **X2B**".

Note 3) It is supported for the multi-function type only.

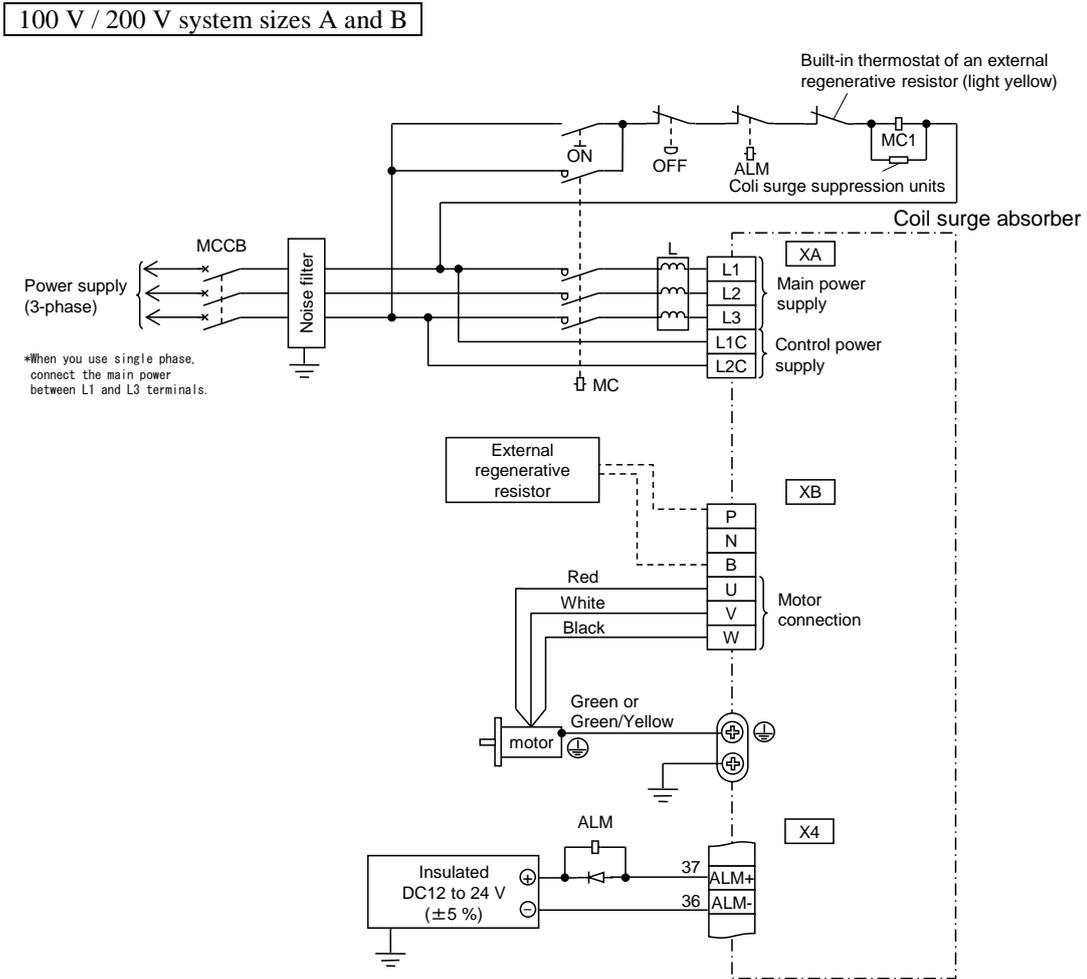
## 8-2 Cable-side connector

Connector symbol	Product Name	Product No.	Manufacturer
X3	Connector	2013595-1	TE Connectivity
X4	Solder plug (soldered type)	DF02P026F22A1	Japan Aviation Electronics Industry
	Plug hood	DF02D026B22A	
X5	Connector	MUF-PK10K-X	J.S.T. Mfg.
X6	Receptacle	3E206-0100 KV	3M Japan
	Shell kit	3E306-3200-008	
X7	Connector	51021-0500	Molex Japan
	Terminal	50058-8500	

Use the above connector or equivalent.

### 8-3 Precautions for wiring

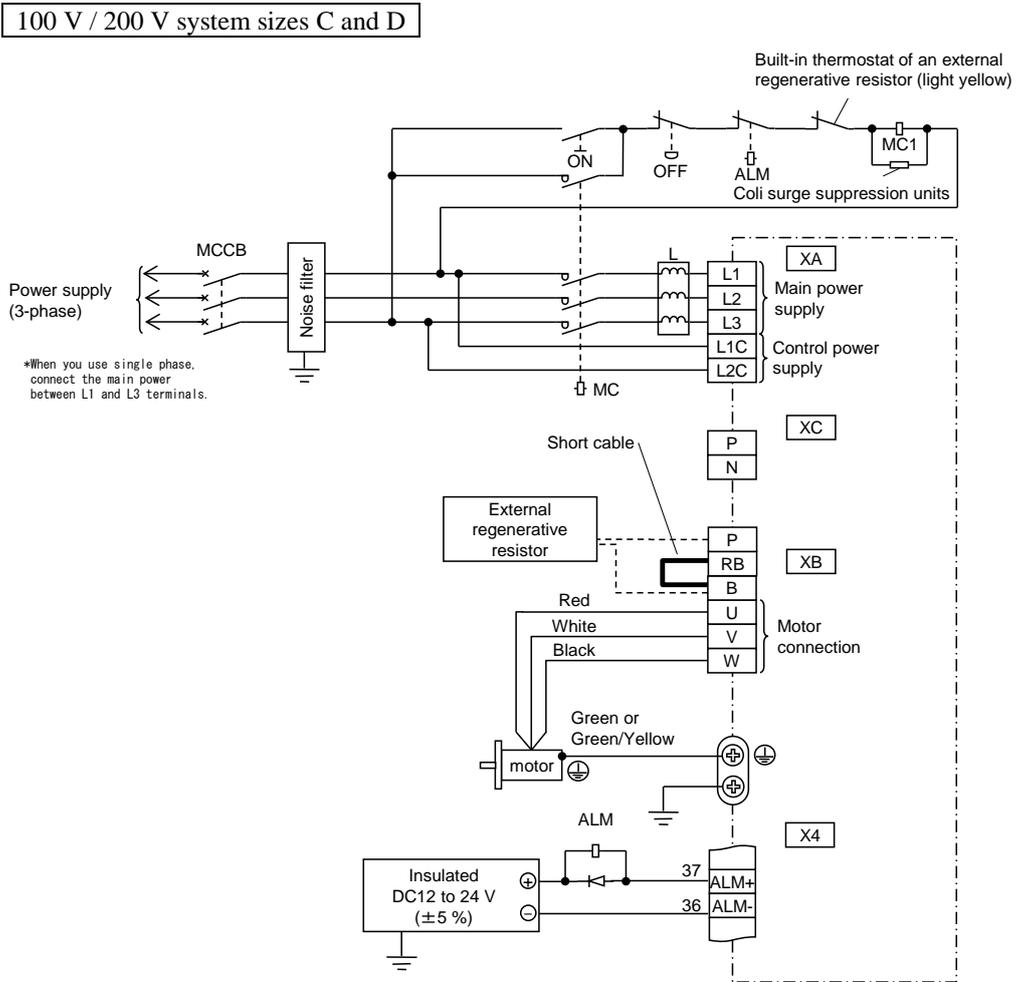
#### 8-3-1 Wiring to the power connector and the terminal block



#### ■ Connection of a regenerative resistor

Size	Short wire (accessory)	Built-in regenerative resistor	Connection of connector XB	
			When an external regenerative resistor is used	When an external regenerative resistor is not used
A B	None	None	Connect an external regenerative resistor between P and B.	Normally open between P and B

- \* Connectors X1 to X6 are used for the secondary side circuit. They need to be isolated from the primary side power supply (motor brake power supply). Do not connect to the same power supply.

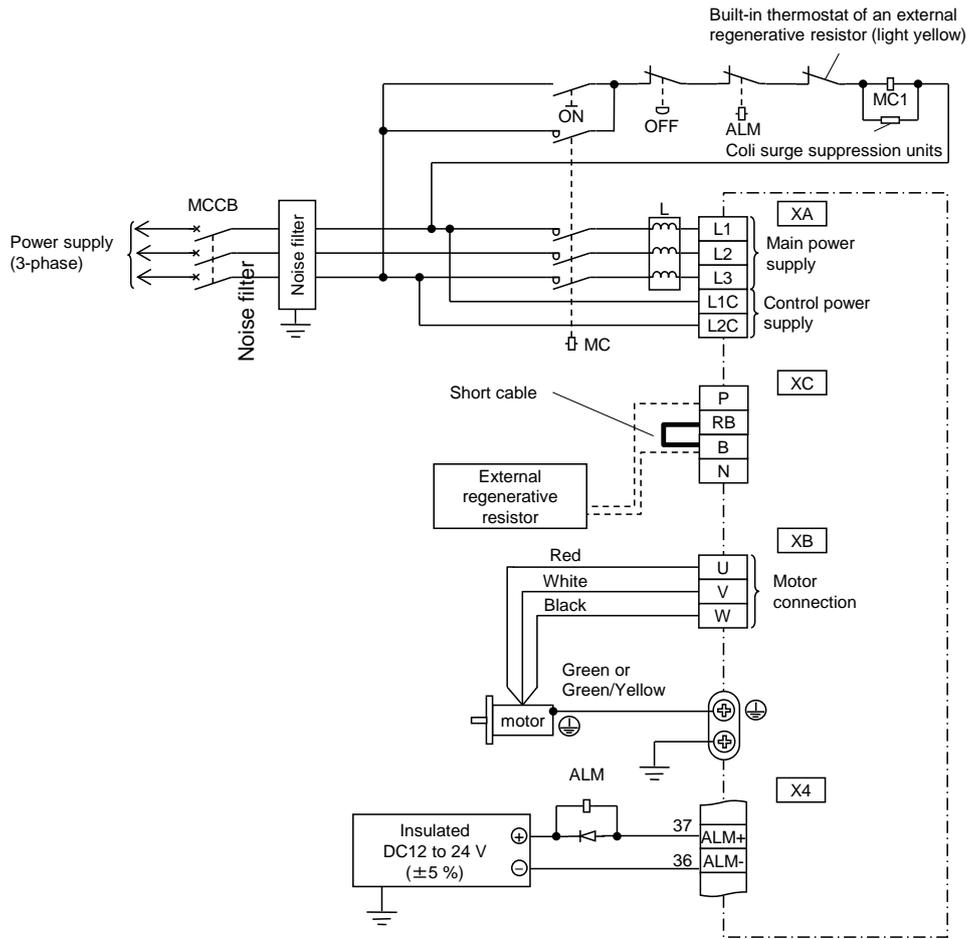


■ Connection of a regenerative resistor

Size	Short wire (accessory)	Built-in regenerative resistor	Connection of connector XB	
			When an external regenerative resistor is used	When an external regenerative resistor is not used
C D	Provided	Provided	Disconnect the accessory short wire between RB and B. Connect an external regenerative resistor between P and B.	Short-circuit between RB and B using the accessory short wire.

- \* Connectors X1 to X6 are used for the secondary side circuit. They need to be isolated from the primary side power supply (motor brake power supply). Do not connect to the same power supply.

200 V system size E

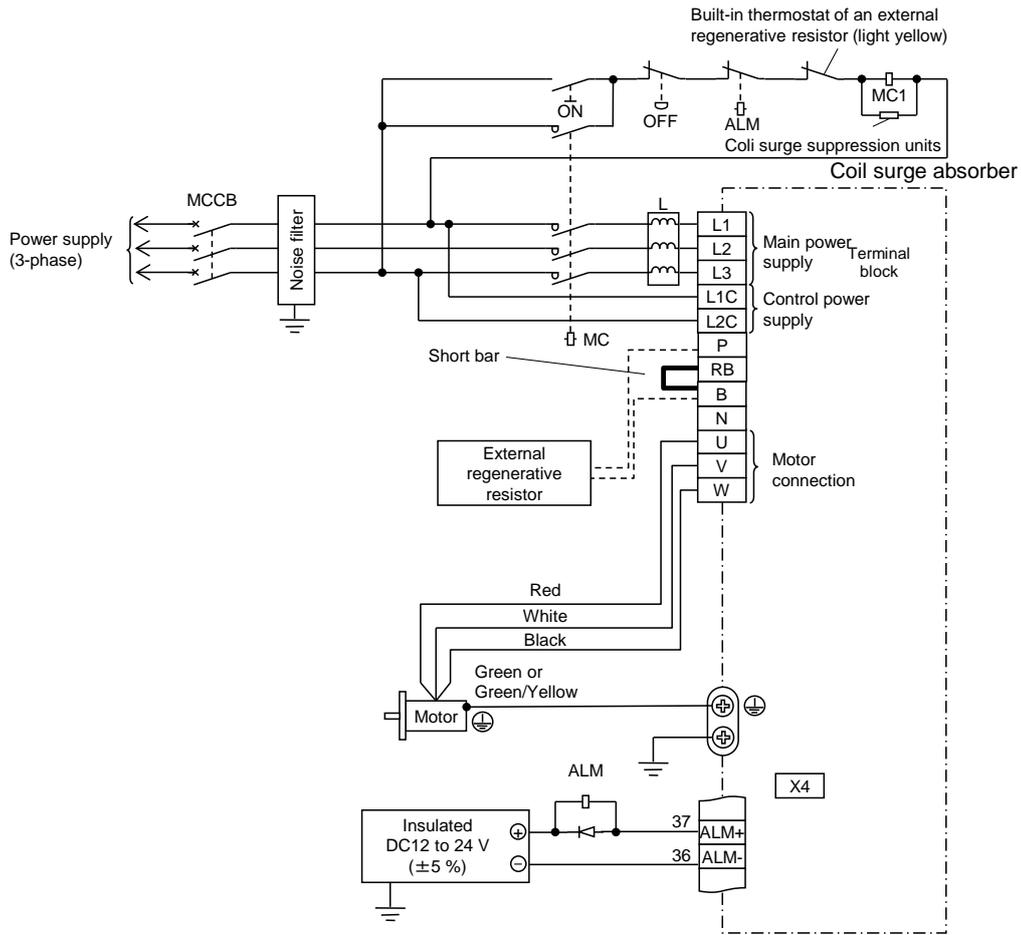


■ Connection of a regenerative resistor

Size	Short wire (accessory)	Built-in regenerative resistor	Connection of connector XC	
			When an external regenerative resistor is used	When an external regenerative resistor is not used
E	Provided	Provided	Disconnect the accessory short wire between RB and B. Connect an external regenerative resistor between P and B.	Short-circuit between RB and B using the accessory short wire.

- \* Connectors X1 to X6 are used for the secondary side circuit. They need to be isolated from the primary side power supply (motor brake power supply). Do not connect to the same power supply.

200 V system size F



■ Connection of a regenerative resistor

Size	Short bar (accessory)	Built-in regenerative resistor	Connection of a terminal block	
			When an external regenerative resistor is used	When an external regenerative resistor is not used
F	Provided	Provided	Remove the accessory short bar between RB and B. Connect an external regenerative resistor between P and B.	Short-circuit between RB and B using the accessory short bar.

- \* Connectors X1 to X6 are used for the secondary side circuit.  
They need to be isolated from the primary side power supply (motor brake power supply).  
Do not connect to the same power supply.
- \* The standard capacity of the built-in dynamic brake is max. three consecutive times in the case of stopping at the maximum allowable inertia and the rated rotating speed.  
If the dynamic brake is used exceeding the above conditions, the resistor may be disconnected, resulting in malfunctioning.

- [1] If the servo drivers for sizes A to D are used by single-phase power input, connect them to main power input terminals L1 and L3. Do not connect anything to the L2 terminal.
- [2] Insert the connector securely until it is locked.
- [3] Be sure to use a crimped terminal with insulating coating for connection with each terminal of the terminal block. (Size F only)
- [4] For the model whose terminal block is provided with a cover, the cover of the terminal block is fixed with screws. (Size F only)  
At the time of wiring for the terminal block, remove these screws to open the cover.  
Tighten the cover fixing screws with tightening torque of 0.19 to 0.21 N·m.
- [5] Apply power supply voltage as specified in the rating plate.
- [6] Do not connect the power input terminals (L1, L2, and L3) and the motor output terminals (U, V, and W) reversely.
- [7] Do not ground or short-circuit the motor output terminals (U, V, and W) each other.
- [8] High voltage is applied to power connectors XA XB XC and the terminal block. Make sure not to touch them.  
There is a risk to get an electric shock.
- [9] The short circuit current for the power supply to be used should be equal to or less than the maximum input voltage of the product, and the symmetrical current should be 5,000 Arms or less. If the short circuit current for the power supply exceeds this value, install a track current limiting device (such as a current-limiting fuse, current-limiting breaker, or transformer) to limit the short circuit current.
- [10] The rotating direction of the AC servo motor cannot be changed by exchanging the three phases as in the case of the induction motor. Make sure that the motor output terminals (U, V, and W) of the servo driver match the colors of the lead wires of the motor (or pin numbers for the cannon plug).
- [11] Make sure to connect the earth terminal of the motor with the earth terminal of the servo driver and ground them with the earth terminal of the noise filter at a single point. The machine body should also be grounded. Employ class D grounding (grounding resistance of 100 Ω or less). Tighten the earth screws of the servo driver with an appropriate torque designated for each size. Use the earth wire with the diameter described in the specifications for each model or more. To avoid influence by electrolytic corrosion, make sure that aluminum is not in direct contact with copper.
- [12] To prevent noise, insert a surge absorber in the electromagnetic contactor installed around the servo driver, the coil between relay contacts, and the brake winding of the motor with brake.
- [13] Install a molded-case circuit-breaker (MCCB), and in an emergency, be sure to shut off power supply outside the servo driver.  
  
When using an earth leakage breaker, take measures against high frequency.
- [14] To reduce noise voltage of the terminal, install a noise filter.
- [15] Brake power supply for the motor with brake should be prepared by the customer.
- [16] Apply power supply voltage after completing wiring.

## [17] External regenerative resistor

- A regenerative resistor is not built in size A and size B.
- A regenerative resistor is built in sizes C, D, E, and F. The built-in regenerative resistor becomes effective by making the RB terminal and the B terminal short-circuited.
- When tripping occurs due to an error in regenerative load protection, it is necessary to install an external regenerative resistor. An external regenerative resistor should be connected between the P terminal and the B terminal after removing the short wire or short bar between the P terminal and the B terminal. In addition, parameter setting is required for the regenerative resistor.  
For details, refer to “Technical Document - Basic Functional Specifications -”.
- The following resistance is recommended for the external regenerative resistor.

Size	Input power supply voltage	
	Single-phase 100 V	Single-phase 200 V / Three-phase 200 V
A	DV0P4280	DV0P4281 (100 W or less) DV0P4283(200 W)
B	DV0P4283	DV0P4283
C	DV0P4282	DV0P4283
D		DV0P4284
E		Two pieces of DV0P4284 in parallel or a single piece of DV0P4285
F		Two pieces of DV0P4285 in parallel

Manufacturer: IWAKI MUSEN KENKYUSHO

Panasonic's product No.	Manufacturer's product No.	Specifications			Built-in thermal protector (Note 2) Operating temperature
		Resistance value [Ω]	Rated power (reference) (Note 1)		
			Free air [W]	Use of a fan [W]	
DV0P4280	RF70M	50	10	25	140±5°C Normal close contact Switching capacity (resistance load) 1 A, 125 VAC, 6,000 times 0.5 A, 250 VAC, 10,000 times
DV0P4281	RF70M	100	10	25	
DV0P4282	RF180B	25	17	50	
DV0P4283	RF180B	50	17	50	
DV0P4284	RF240	30	40	100	
DV0P4285	RH450F	20	52	130	

Note 1) Electric power that can be used without operation of the built-in thermal protector

Note 2) Each regenerative resistor has a thermal fuse and a thermal protector built in for safety.

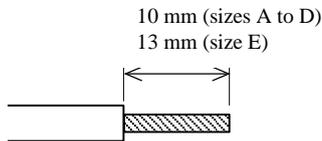
- The circuit should be configured so that power supply is turned off when the thermal protector is operated. (Refer to “Wiring and System Configuration”.)
- The built-in thermal fuse may be disconnected depending on heat release conditions, operating temperature ranges, power supply voltage, and load fluctuations.  
Incorporate the fuse into the machine and perform operation check to make sure that the surface temperature of the regenerative resistor is 100°C or less under conditions where the resistor generates heat easily (e.g. when power supply voltage is high, when the load inertia is large, when deceleration time is short).
- Mount the regenerative resistor to the noncombustible material such as metal.
- Cover the regenerative resistor with a noncombustible material so that persons do not touch it directly.
- The place that may be directly touched by persons must be kept at less than 70°C.

### Procedure of connection to the power connector

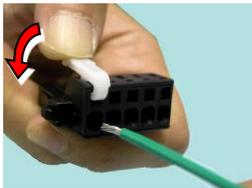
Perform connection to connectors **XA**, **XB**, and **XC** according to the following procedure.

#### <Connection procedure>

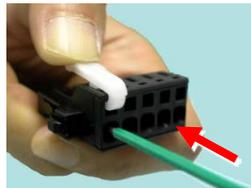
1. Perform strip processing for the wire to be used. Determine the strip length according to the following figure.



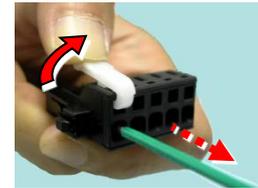
2. Insert the wires into the connector.



[1] Press the operation lever attached to the operation slot with a finger to push down the spring.



[2] Insert the wires while pressing the operation lever.  
\*Make sure that all of the wires are inserted into the opening part of the spring.



[3] The wires can be connected by releasing the operation lever. Pull the wires lightly to check that they have been connected securely.

#### <Precautions>

- The strip length of the wire depends on wire types. Determine the optimum strip length according to the processing state.
- Remove the connector from the servo driver body before performing connection.
- Insert one wire into each of the wire insertion ports of the connector.
- Wires can be removed by pressing down the operation lever.

8-3-2 Wiring to connector **X4**

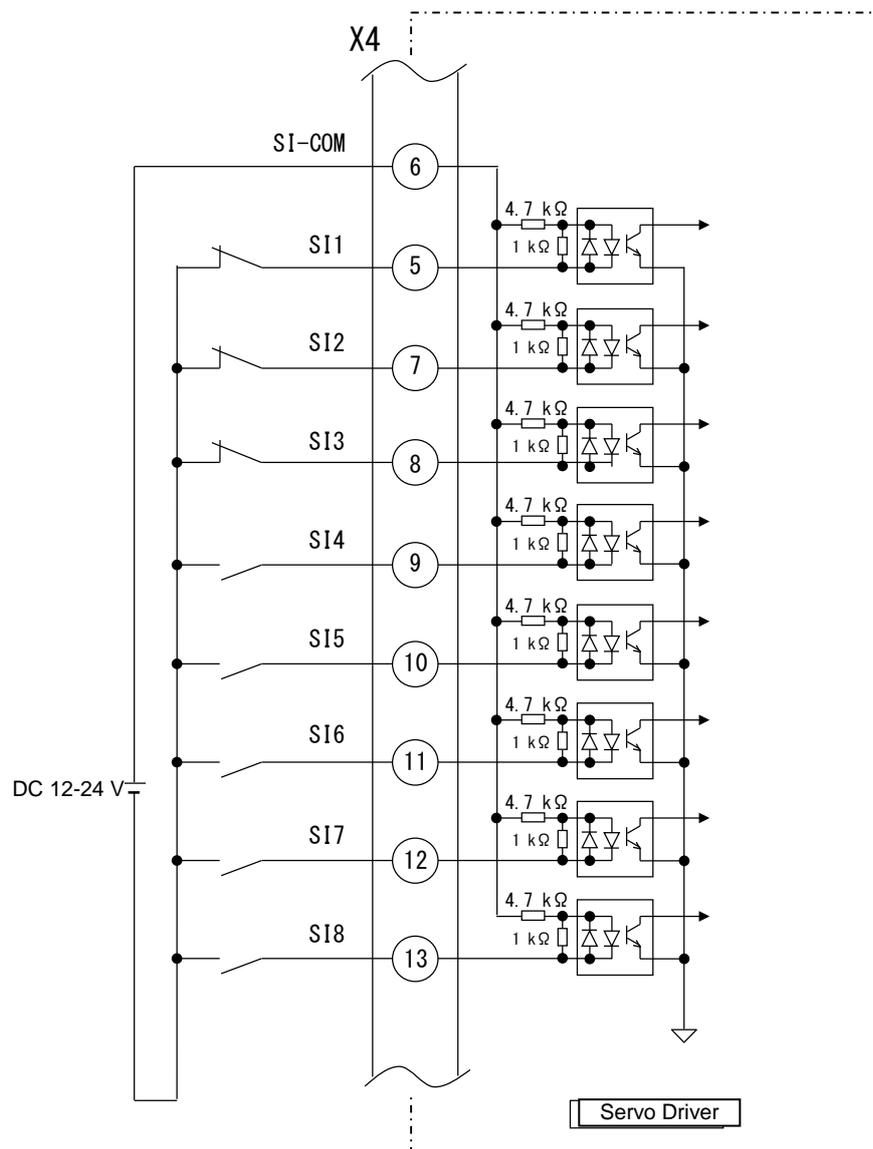
[1] The customer is required to prepare the 12 to 24 VDC control signal power supply for external control to be connected to SI-COM.

The connector needs to be isolated from the primary side power supply (DC power supply for the external regenerative resistor, power supply for the motor brake).

Do not connect to the same power supply.

[2] Install peripheral devices close to the servo driver as much as possible so that wiring length is minimized (within 3 m).

[3] Keep the wires away from the wiring of the power lines (L1, L2, L3, L1C, L2C, U, V, W,  $\oplus$ ) as much as possible (at least 30 cm). Do not route the wires through the same duct and do not tie them together.

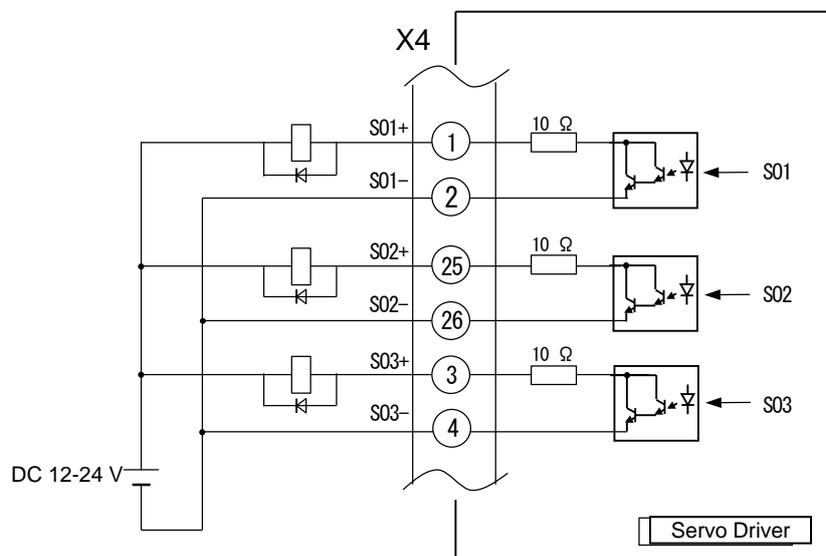
**Control input**

Functions SI1 to SI8 should be allocated by parameters. For details, refer to “Technical Document - Basic Functional Specifications -”.

### Control output

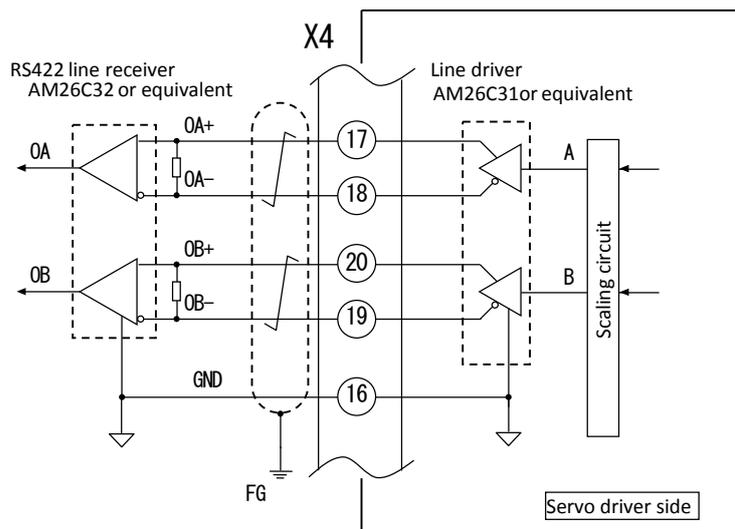
- [1] Pay attention to the polarity of the control signal power supply. Connection to the polarity opposite to that in the figure can cause damage to the servo driver.
- [2] When driving the relay directly using each output signal, be sure to mount a diode in parallel with the relay in the direction shown in the figure below. If a diode is not mounted or it is mounted in the reverse direction, the servo driver may be damaged.
- [3] When receiving each output signal by a logical circuit such as a gate, be careful not to be affected by noise.
- [4] The rated current, maximum current, and rush current applied to each output should be 40 mA, 50 mA, and 90 mA or less respectively.
- [5] A limiting resistor (10 Ω) is connected to the output circuit.

For the purpose of Darlington connection of the output transistor, voltage between the collector and the emitter  $V_{CE}$  (SAT) is approx. 1 V when the transistor is turned ON. Note that direct connection is impossible because the normal TTL IC cannot satisfy the  $V_{IL}$ .



Functions SO1 to SO3 should be allocated by parameters. For details, refer to “Technical Document - Basic Functional Specifications -”.

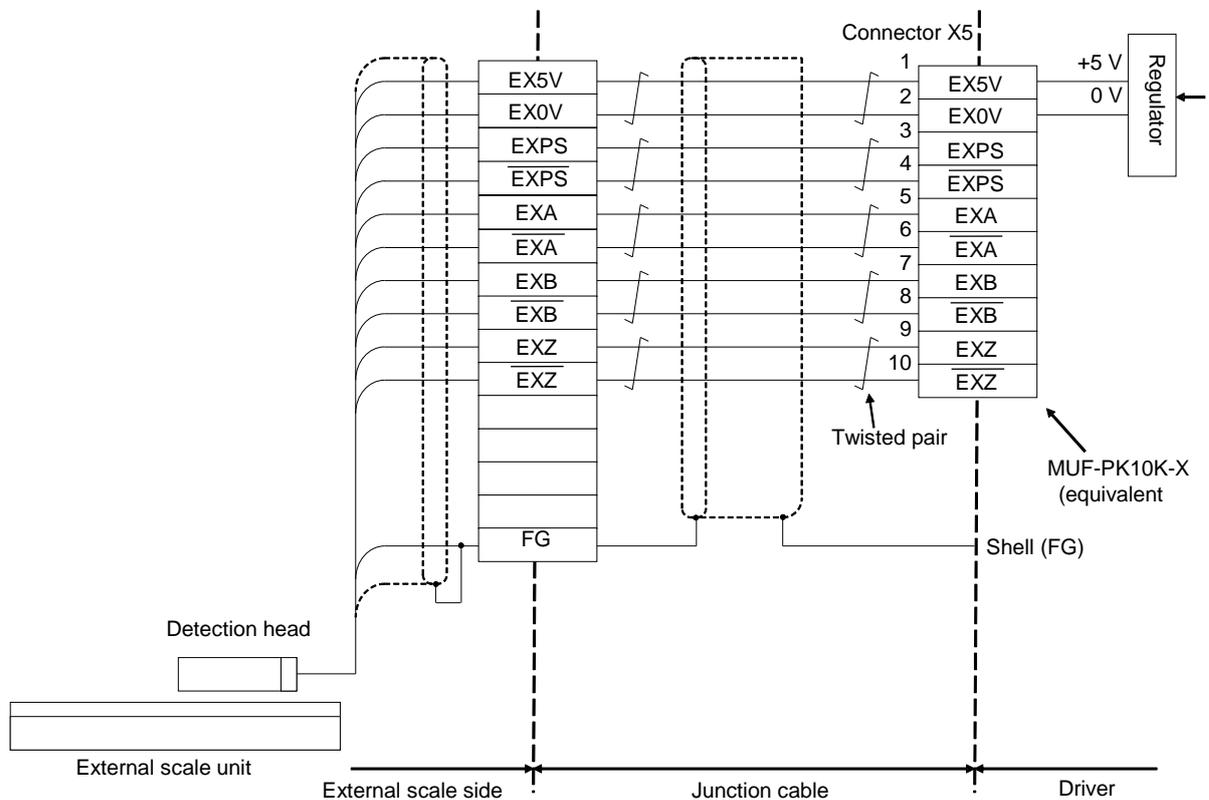
## Feedback pulse of the rotary encoder



- [1] Use an RS422 line receiver (AM26C32 or equivalent) to receive output pulse.  
At that time, mount an appropriate terminating resistor (approx. 330  $\Omega$ ) between the line receiver inputs.
- [2] The maximum output frequency should be 4 Mpps (after quad edge evaluation) or less.

## 8-3-3 Wiring to connector X5

- [1] It is supported for the multi-function type only.
- [2] The core wire of the external scale cable should be a strand wire of  $0.18 \text{ mm}^2$  or more. Use a common shielded twisted pair wire.
- [3] The maximum cable length should be 20 m or less. If the wiring length is long, double wiring is recommended for the 5 V power supply to reduce influence of voltage drop.
- [4] Connect the exterior covering of the shield wire on the motor side to the shield of the shield wire from the external scale.  
Be sure to connect the exterior covering of the shield wire on the servo driver side to the shell of X5 (FG).
- [5] Keep the wires away from the wiring of the power lines (L1, L2, L3, L1C, L2C, U, V, W,  $\oplus$ ) as much as possible (at least 30 cm). Do not route the wires through the same duct and do not tie them together.
- [6] Do not connect anything to the idle pin of X5.
- [7] Power that can be supplied from X5 is max.  $5 \text{ V} \pm 5\%$  and 250 mA. When using an external scale whose consumption current exceeds this value, the corresponding power supply should be prepared by the customer. It may take time to perform initialization after power-on, depending on external scales. Make a design so as to satisfy the operation timing after supplying power.
- [8] When driving an external scale using external power supply, make the EX5V pin open so that voltage is not supplied to this pin from outside. In addition, connect 0 V (GND) of the external power supply with EX0V (X5 2pin) of the driver to obtain the same electric potential.



8-3-4 Wiring to connector X6

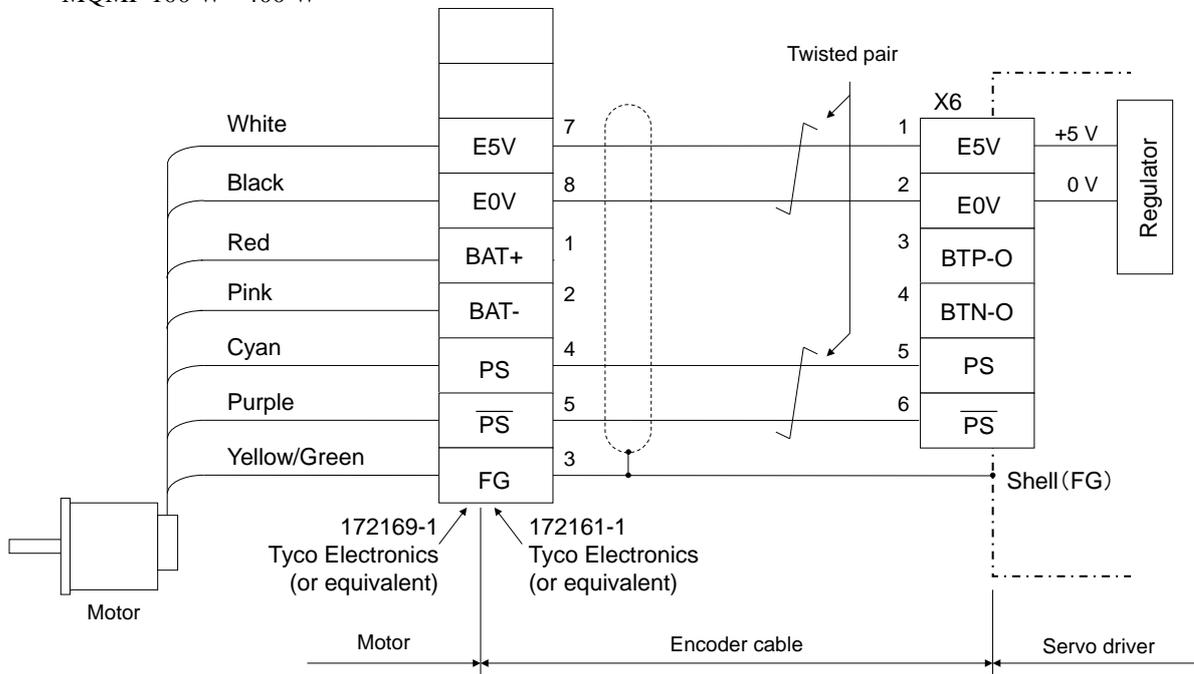
- [1] The core wire of the encoder cable should be a strand wire of 0.18 mm<sup>2</sup> or more. Use a common shielded twisted pair wire.
- [2] The maximum cable length should be 20 m or less. If the wiring length is long, double wiring is recommended for the 5 V power supply to reduce influence of voltage drop.
- [3] Be sure to connect the shield wires of the encoder cable to the Earh terminal on the motor side and the shell of X6 (FG) on the servo driver side.
- [4] Keep the wires away from the wiring of the power lines (L1, L2, L3, L1C, L2C, U, V, W, ⊕) as much as possible (at least 30 cm). Do not route the wires through the same duct and do not tie them together.

When multi-rotation data is not used

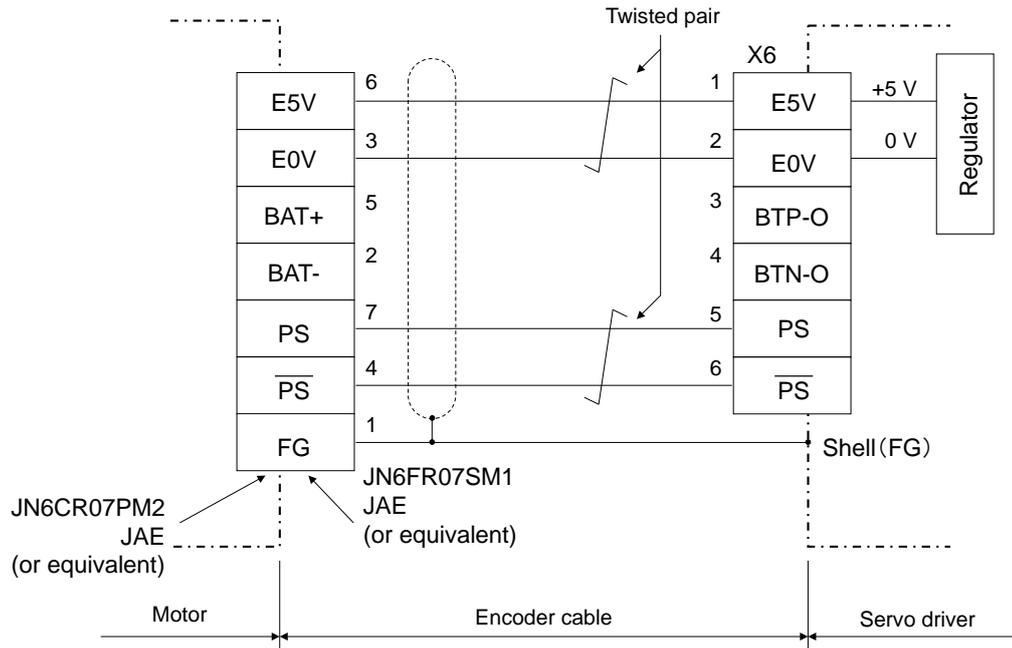
- \*When used as an incremental encoder
- \*When used as a single-rotation absolute encoder

■Lead wire type

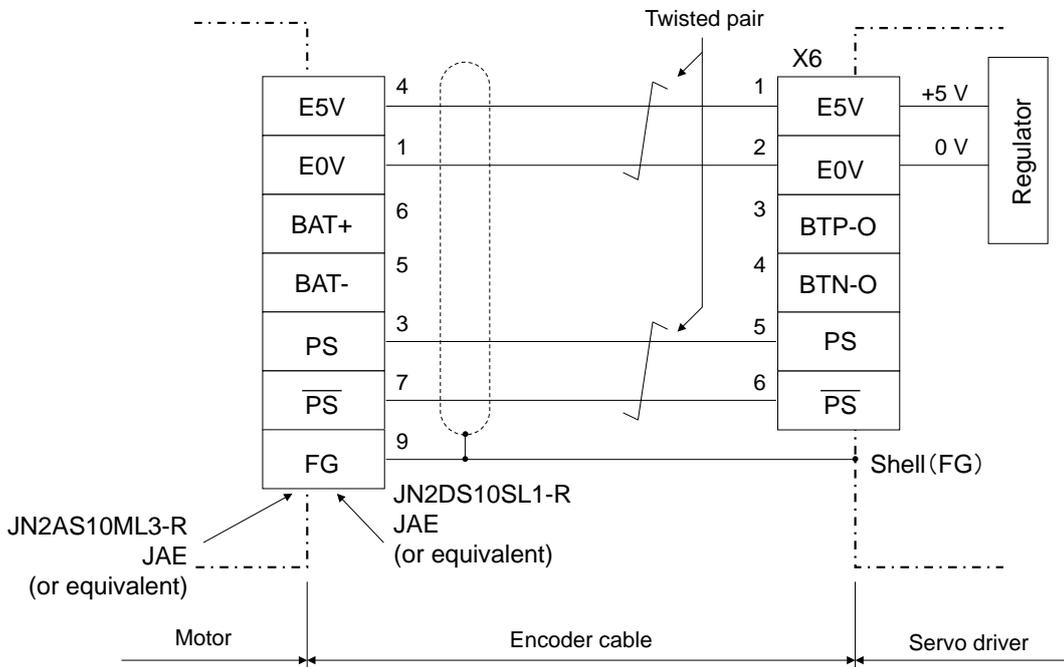
- MSMF 50 W - 1000 W
- MHMF 50 W - 1000 W
- MQMF 100 W - 400 W



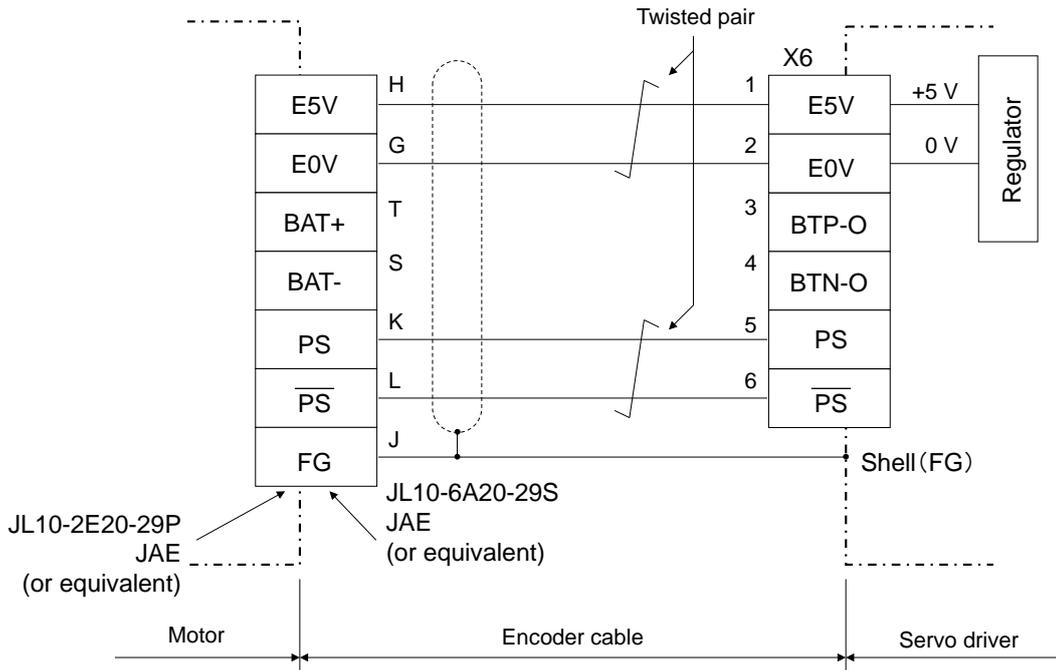
- Connector type
- MSMF 50 W - 1000 W
- MHMF 50 W - 1000 W
- MQMF 100 W - 400 W



- MSMF 1.0 kW - 5.0 kW
- MHMF 1.0 kW - 5.0 kW
- MDMF 1.0 kW - 5.0 kW
- MGMF 0.85 kW - 4.4 kW



- Cannon plug type
- MSMF 1.0 kW - 5.0 kW
- MHMF 1.0 kW - 5.0 kW
- MDMF 1.0 kW - 5.0 kW
- MGMF 0.85 kW - 4.4 kW

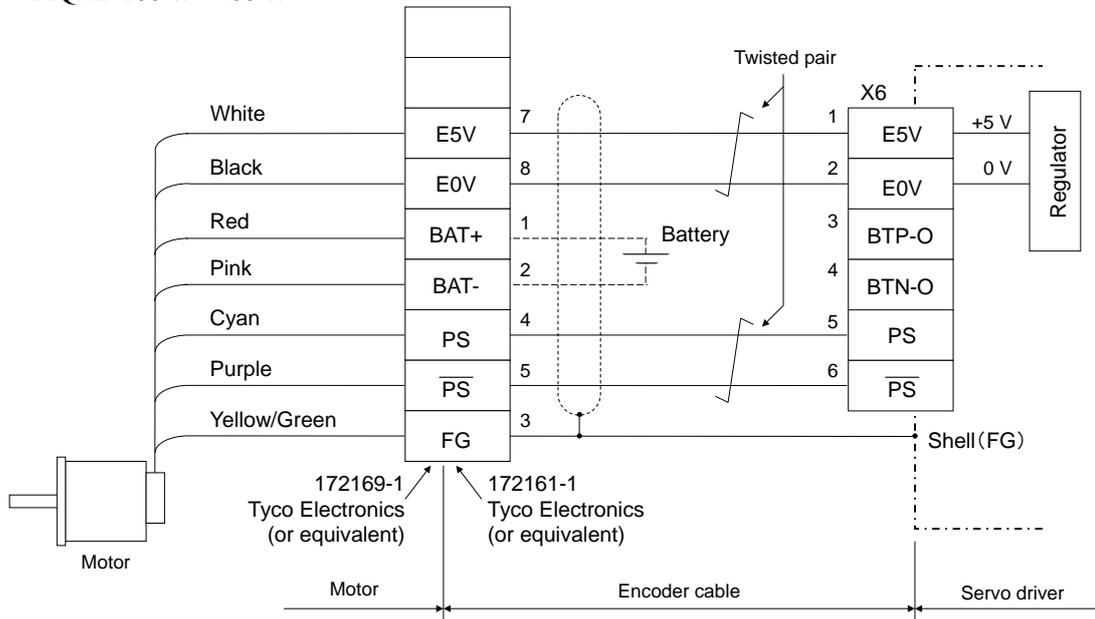


**When multi-rotation data is used**

\*When an absolute system is constructed

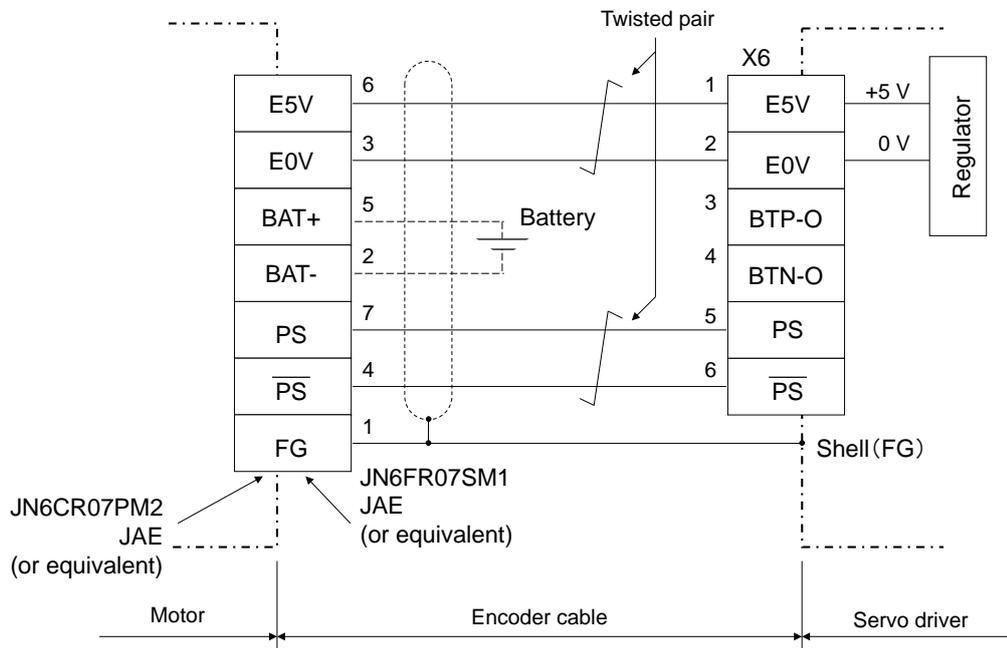
■ Lead wire type

- MSMF 50 W - 1000 W
- MHMF 50 W - 1000 W
- MQMF 100 W - 400 W

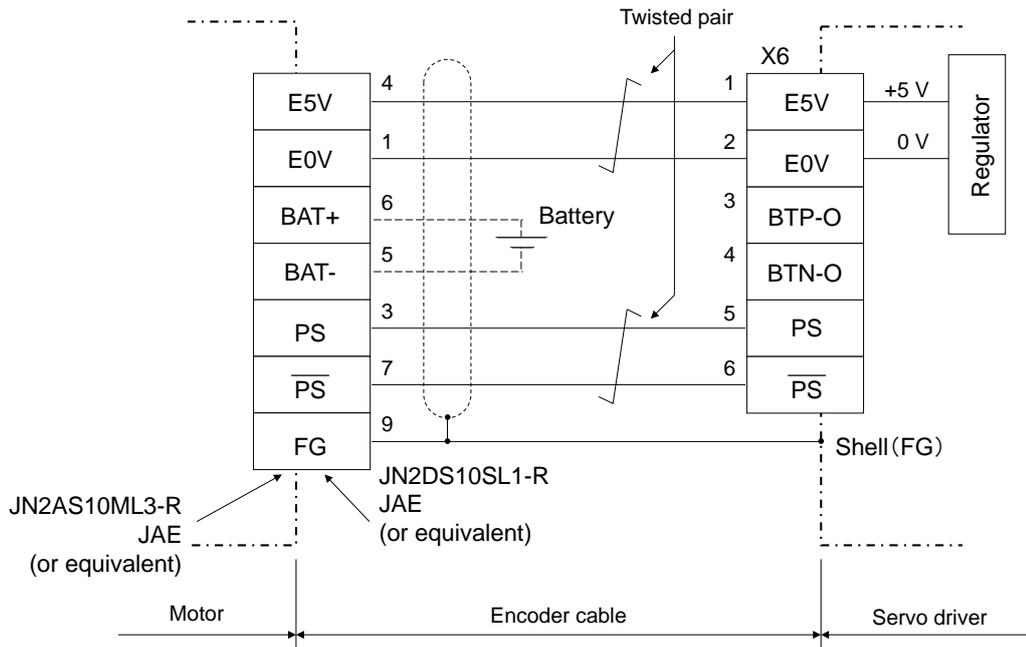


■ Connector type

- MSMF 50 W - 1000 W
- MHMF 50 W - 1000 W
- MQMF 100 W - 400 W

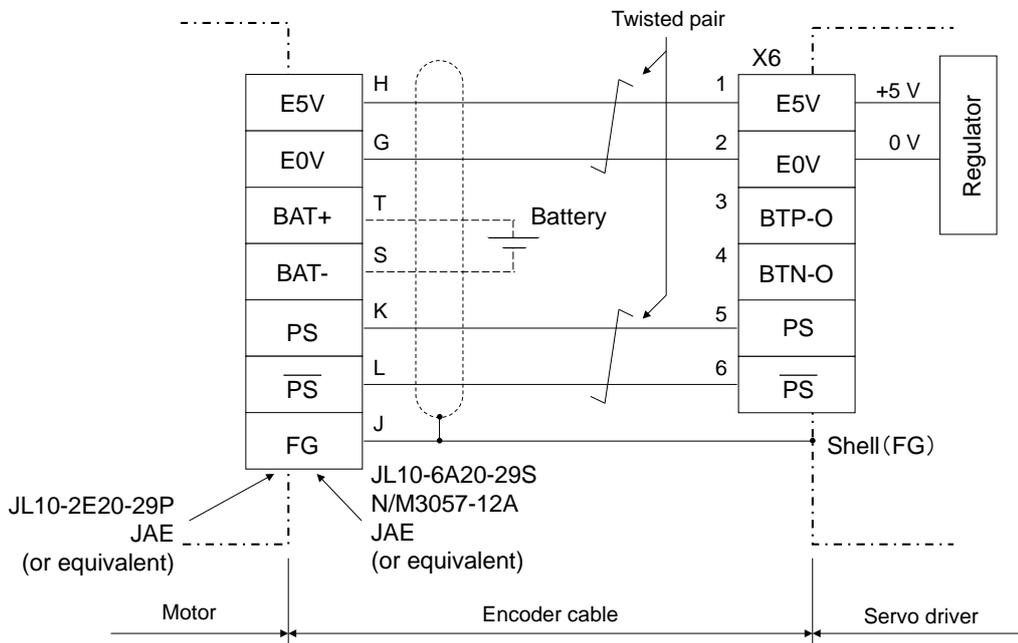


MSMF 1.0 kW - 5.0 kW  
 MHMF 1.0 kW - 5.0 kW  
 MDMF 1.0 kW - 5.0 kW  
 MGMF 0.85 kW - 4.4 kW



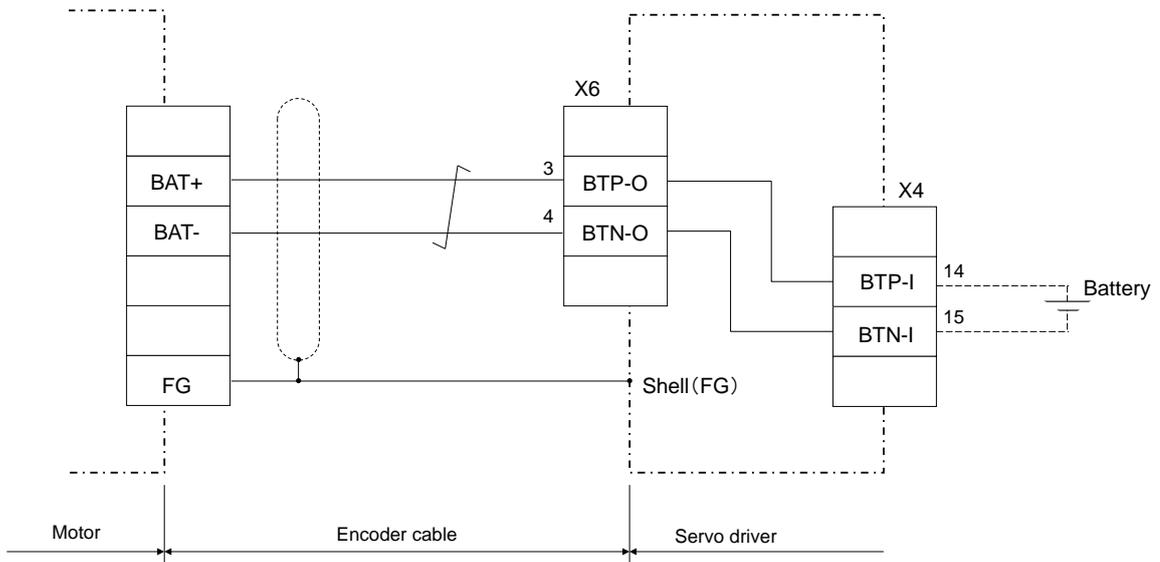
■ Cannon plug type

MSMF 1.0 kW - 5.0 kW  
 MHMF 1.0 kW - 5.0 kW  
 MDMF 1.0 kW - 5.0 kW  
 MGMF 0.85 kW - 4.4 kW



### Connection of a battery for the absolute encoder

Connect a battery for the absolute encoder directly between BAT+ and BAT- of the encoder connector on the motor side. It is also acceptable to connect it between the 14pin and 15pin of the X4 connector via the 3pin and 4pin of the X6 connector shown in the following figure.



Note: When connecting the battery directly to the encoder connector on the motor side, do not connect anything to the 3pin and 4pin of the X6 connector.

**Precautions when using the battery for the absolute encoder**

- If the battery voltage drops, an error occurs in the absolute encoder.  
Voltage drop is caused by either the end of the battery life or a voltage delay.
  - [1] Note that the battery life is shortened depending on surrounding environmental conditions.
  - [2] A lithium battery has the minimum transient voltage (voltage delay phenomenon). Voltage may drop temporarily when the battery starts discharging current. Therefore, it is necessary to refresh the battery before using it.
    - <When using the battery for the first time>
 

If you use battery unit DV0P2990 (built-in battery: ER6V 3.6V made by TOSHIBA LIFESTYLE PRODUCTS & SERVICES), which is an optional item of Panasonic, connect the connector with lead wire to CN601 as shown in the right figure and set it aside for five minutes.

Then, disconnect the connector from CN601 and attach it to the servo driver.

Even when a battery is prepared by the customer, it is recommended to perform refreshing before using it. For the refreshing procedure, consult with the corresponding battery manufacturer.
    - <After mounting the battery unit>
 

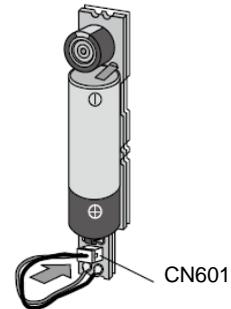
It is recommended to perform turning ON/OFF of the control power supply approx. once in a day.
- Incorrect use of the battery can cause troubles such as corrosion of the product due to leakage from the battery or risks such as breakage of the battery. Therefore, be sure to observe the following.
  - [1] Make sure that the directions of the positive and negative electrodes are correct.
  - [2] If the battery that has been used for a long period or the battery that cannot be used any more is kept set in the device, troubles such as leakage may occur. Replace it with a new one promptly. (As a guide, it is recommended to replace the battery every two years.)
    - The electrolytic solution of the battery is not only highly corrosive, which corrodes peripheral parts, but also conductive, which can cause short circuiting. Periodical replacement is needed.
  - [3] Do not dismantle the battery and do not put it into a fire.
    - Never dismantle it because it is very dangerous if the scattered content enters the eye. Putting it into a fire or heating it may cause a bursting, which is dangerous.
  - [4] Do not short circuit the battery and do not peel the battery tube.
    - If a metal or the like touches the positive or negative electrode terminal of the battery, large current is applied at a time, which weakens the battery.

Further, heavy heat generation may occur, resulting in bursting, which is dangerous.
  - [5] This battery cannot be charged. Do not charge the battery.
- Disposal of the used battery after replacement is regulated by some municipalities. Dispose of the battery according to the regulations of each municipality.
- Air transportation
 

At the time of transportation by aircraft (both passenger airplane and cargo airplane), it is necessary to make an application with regard to hazardous materials. (UN packaging is required.)

When requesting air transportation, it is required to submit necessary documents (such as a parameter sheet and SDS) to the transport company. Please make the request for it via the distributor.
- UN packaging
 

For details, contact each transport company.



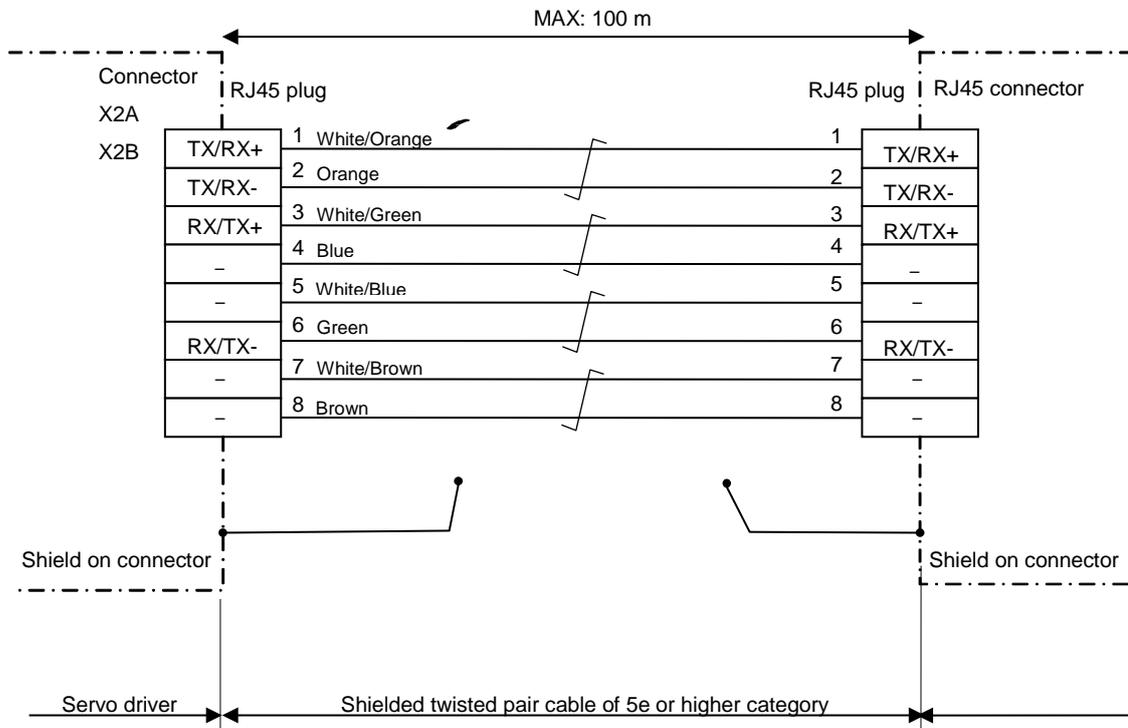
8-3-5 Wiring to connectors X2A and X2B

- [1] Use a shielded twisted pair (STP) cable in conformance with category 5e of SIA/EIA-568 or higher.
- [2] If both ends of the shield are not grounded, the EMC characteristic will deteriorate.  
When attaching a connector plug to both ends of the cable, make sure to connect the shield wire of the cable to the metal shell of the plug.
- [3] Correspondence between the lead wire colors and the connector terminals should be in accordance with TIA/EIA-568B (see the figure below).  
The 3-6pin pair is a signal line. Three pairs of 1-2, 4-5, and 7-8pins that are not used must also be connected to the connector.
- [4] When using a 2-pair line instead of a 4-pair line, connect the wires to the 1-2 and 3-6 pins of the connector and do not connect anything to the 4-5 and 7-8 pins.
- [5] The wiring length of the communication cable should be within the range that satisfies the following conditions.

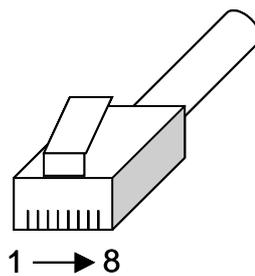
Length between respective nodes: within 100 m

- [6] Cable specifications including flexural property, temperature range, and materials used for covering are different according to manufacturers.  
Select the cable according to the working conditions of the customer.  
A movable cable should also be selected according to the working conditions of the customer.

Connection of X2A / X2B



Pin layout of the RJ45 plug



## 8-4 Dynamic brake

Servo driver (sizes A to F) has a dynamic brake built in for emergency stop. The dynamic brake can be operated in the following cases.

- [1] When power supply is turned off
- [2] When the servo is turned off
- [3] When the protective function is operated
- [4] When drive prohibiting input (POT, NOT) of connector X4 is operated

During deceleration in the above cases [1] to [4] or after the stop of the servo driver, whether the dynamic brake is operated or free run is applied can be selected by setting the parameter.

However, when the control power input is turned off, the dynamic brake of the servo driver for sizes A to F is kept operated.

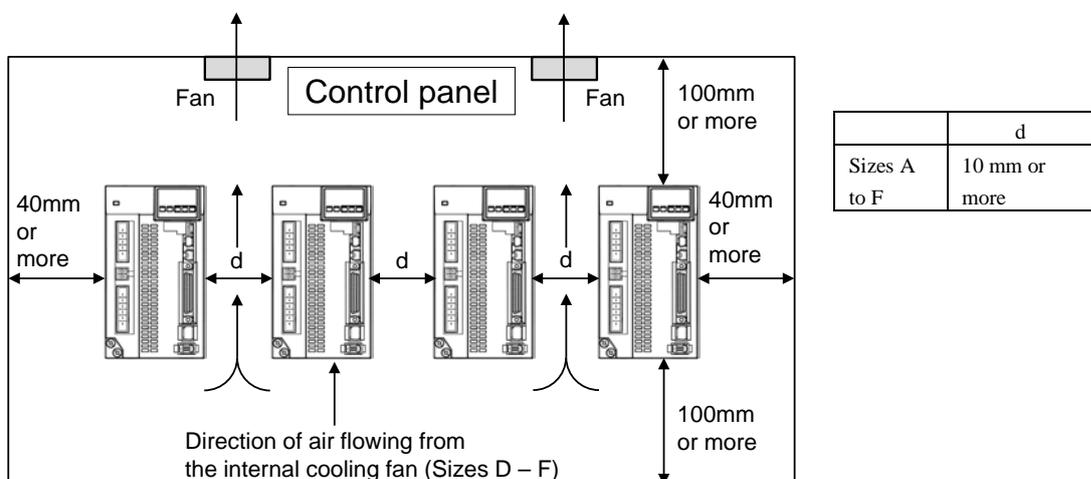
The dynamic brake is provided only for the short-time usage in case of emergency stop. Therefore, note the following points.

- [1] Do not start or stop operation by turning on/off the servo ON signal. Otherwise, the dynamic brake circuit built in the servo driver may get damaged.
- [2] Do not drive the motor with external power.  
If the motor is driven from outside, it will work as a generator. Therefore, short circuit current is applied during operation of the dynamic brake, which can cause smoking or ignition. In addition, the dynamic brake may be disconnected, which can cause disabling the operation.
- [3] If the dynamic brake is operated during high-speed operation, provide stop time for approx. 10 minutes. If the dynamic brake is used beyond that condition, the brake may be disconnected, which can cause disabling the operation.

## 8-5 Mounting direction and interval

- Secure the surrounding space for effective cooling.
- Install a fan to equalize the temperature in the control panel.
- Sizes D to F have a cooling fan on the lower side.
- Satisfy the environmental conditions for the inside of the control panel.
- Fix the servo driver to the grounded conductive size.
- If the servo driver is mounted to a painted portion, anti-noise measures can be taken by installing it after peeling off the paint.
- If you make a mounting bracket by yourself, apply conductive plating to the surface of the bracket.
- The temperature around the servo driver should be measured at a position 50 mm away from the side or bottom surface of the driver.

If it is impossible to measure the temperature at a position 50 mm away from it, perform measurement at the mid point in the clearance between the obstacle and the driver.



## 9. Compliance with the international standards

### 9-1 List of compatible standards for the servo driver

		Standard No.
European Communities Directive	EMC Directive	EN55011 EN61000-6-2 EN61000-6-4 EN61800-3
	Low Voltage Directive	EN61800-5-1 EN50178
	Machinery Directive Functional safety	ISO13849-1 (PL e, Cat.3) EN61508 (SIL 3) EN62061 (SILCL 3) EN61800-5-2 (SIL 3, STO) IEC61326-3-1 IEC60204-1
UL standard		UL508C (file No. E164620)
CSA standard		C22.2 No.14
Radio Waves Act of South Korea (KC)		KN11 KN61000-4-2,3,4,5,6,8,11

IEC: International Electrotechnical Commission

EN: Europaischen Norman

EMC: Electromagnetic Compatibility

UL: Under writers Laboratories

CSA: Canadian Standards Association

### 9-2 European Communities (EC) Directive

We achieve compliance with the standards related to the Low Voltage Directive, so that the embedded machines and devices can easily comply with the EC Directive.

#### 9-2-1 Compliance with the EMC Directive

The servo driver and the servo motor are not intended to be used on a low-voltage public network which supplies residential premises; Radio frequency interference is expected if used on such a network.

To comply with the EMC Directive, use a noise filter, surge absorber, and ferrite core. To make the machines and devices comply with the EMC Directive, it is necessary to perform checking using the final machines/devices in which the servo driver and the servo motor have been embedded.

### 9-3 Configuration of peripheral devices

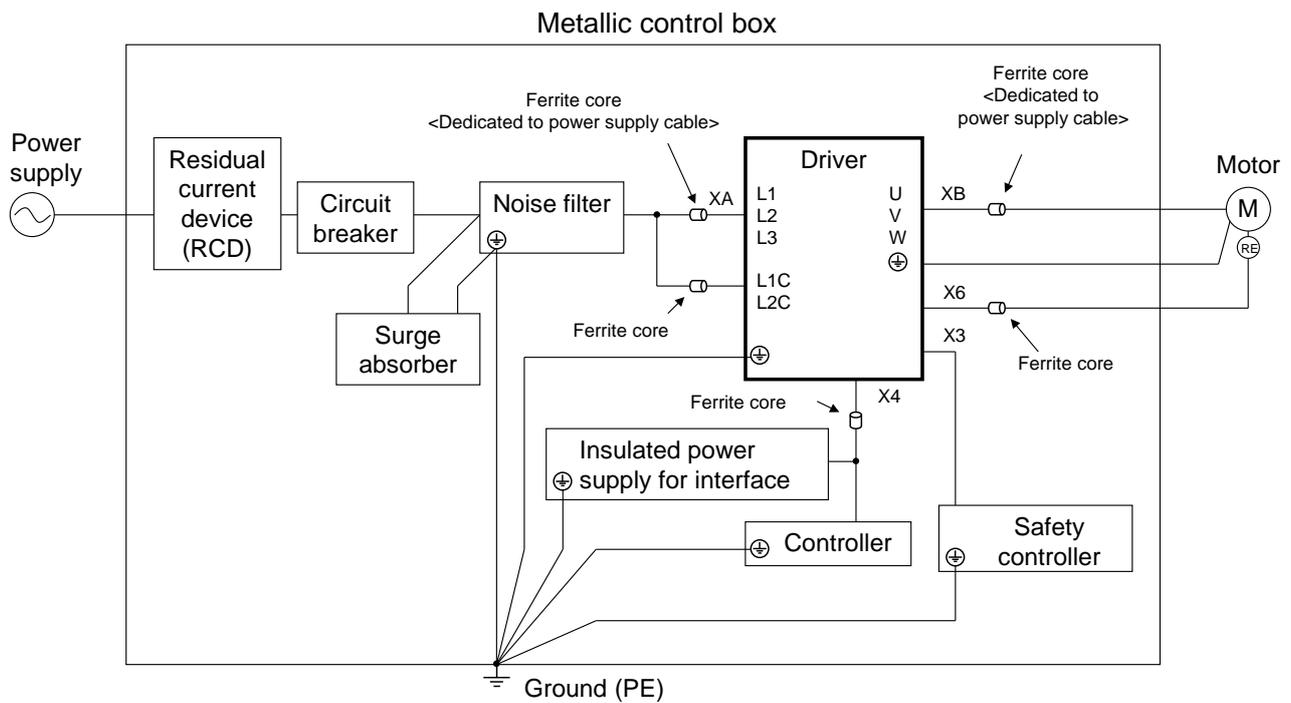
#### 9-3-1 Installation environment

Use the devices under the environment at pollution level 1 or 2 stipulated in IEC60664-1.

Be sure to connect a UL-certified molded-case circuit-breaker (MCCB) in compliance with the IEC standard to the main power supply.

Use 24 VDC power supply with a double-insulation structure or reinforced insulation structure for parallel I/O.

#### Specifications for the 100 V / 200 V system



Number of ferrite cores

Symbol	Place of use	Applicable size	Optional product No.	Manufacturer's product No.	Quantity		
NF1	Power supply line	(100 V) C	DV0P1460	ZCAT3035-1330	0		
		(200 V) C,D			1		
NF2	Motor line	(100 V) A,B			DV0P1460	ZCAT3035-1330	1
		(200 V) A,B,E					1
		(100 V) A,B,C					1
		(200 V) A,B,C,D,E					2
		(200 V) F			2		

\* The number of turns toward the ferrite core is once for each size.

### 9-3-2 Power supply

100 V system:	Single-phase 100 V - 120 V	+10 % -15 %	50/60 Hz
200 V system (sizes A to D):	Single-phase/three-phase 200 V - 240 V	+10 % -15 %	50/60 Hz
200 V system (sizes E and F):	Three-phase 200 V - 240 V	+10 % -15 %	50/60 Hz

- (1) Use them under the environment of overvoltage category III stipulated in IEC60664-1.
- (2) Use insulated-type 12 to 24 VDC power supply for parallel I/O in compliance with the CE marking or the EN standard (EN60950).

### 9-3-3 Molded-case circuit-breaker (MCCB)

Be sure to connect a UL-certified molded-case circuit-breaker (MCCB) in compliance with the IEC standard (LISTED,  with mark) between the power supply and the noise filter.

The short circuit protective circuit of the product is not intended to protect the branch circuit.

Select the protection for the branch circuit in accordance with the NEC standard and the local standard.

### 9-3-4 Noise filter

When using multiple units of servo drivers and installing one noise filter collectively in the power supply section, consult with the noise filter manufacturer.

### 9-3-5 Surge absorber

Install a surge absorber on the primary side of the noise filter.

<Request>

When performing a withstand test for the machines and devices, be sure to remove the surge absorber.

Otherwise, the surge absorber may get damaged.

### 9-3-6 Ferrite core

Install ferrite cores in the power input line and the motor output line.

### 9-3-7 Grounding

- (1) To avoid electric shocks, be sure to connect the protective earth terminal () of the servo driver and the protective earth (PE) of the control panel.
- (2) Avoid co-fastening for the connection to the protective earth terminal (). The servo driver is equipped with two protective earth terminals.

## 9-4 List of servo drivers and applicable peripheral devices

Servo driver	Voltage specification	Power supply capacity	Electromagnetic contactor (Rated flowing current/lth)	Molded-case circuit-breaker (MCCB) Rated current	Noise filter	Surge absorber	Ferrite core				
							Power supply line	Motor line			
MADL□01□□	Single-phase 100 V	Approx. 0.4 kVA	20 A	10 A	DV0P4170 (exclusive for single-phase)/ DV0PM20042	DV0P4190 (for single-phase) /DV0P1450 (for three-phase)	DV0P1460	DV0P1460			
MADL□11□□											
MADL□05□□	Single-phase/ three-phase 200 V	Approx. 0.5 kVA									
MADL□15□□											
MBDL□21□□	Single-phase 100 V	Approx. 0.5 kVA									
MBDL□25□□	Single-phase/ three-phase 200 V	Approx. 0.9 kVA									
MCDL□31□□	Single-phase 100 V	Approx. 0.9 kVA							15 A	DV0PM20042	
MCDL□35□□	Single-phase/ three-phase 200 V	Approx. 1.8 kVA									
MDDL□45□□	Single-phase/ three-phase 200 V	Approx. 2.4 kVA							30 A	20 A	DV0P4220
MDDL□55□□		Approx. 2.9 kVA									
MEDL□83□□	Three-phase 200 V	Approx. 3.8 kVA	60 A	30 A	DV0PM20043						
MEDL□93□□		Approx. 4.5 kVA									
MFDL□A3□□		Approx. 5.2 kVA	100 A	50 A	DV0P3410						
MFDL□B3□□		Approx. 7.8 kVA									

\* For the common specifications of the single-phase/three-phase 200 V, select the peripheral devices according to the power supply to be used.

## &lt;Request&gt;

- Select a molded-case circuit-breaker (MCCB) and a noise filter with a capacity suitable for the power supply capacity (in consideration of load conditions).
- Terminal block and ground terminal  
Use copper conductor wires whose temperature rating is 75°C or higher.  
The protective ground terminal is M4 for sizes A to E, and M5 for size F.  
If the screw tightening torque exceeds the maximum value (refer to the page that provides description of terminal blocks), the terminal block may be damaged.
- The diameter of the ground wire should be 2.0 mm<sup>2</sup> (AWG 14) or more for the output of 50 W to 2.5 kW, and 3.5 mm<sup>2</sup> (AWG 12) or more for output of 3.0 kW to 5.0 kW.
- For sizes A to E, use the exclusive connectors included with the product.  
In such cases, make sure that the length of the stripped wire is 8 to 9 mm.
- Tighten the high-order controller with the connector (X4) with the screw tightening torque of 0.3 to 0.35 N·m.  
If 0.35 N·m is exceeded, the connector on the servo driver may be damaged.

	Optional product No.	Manufacturer's product No.	Manufacturer
Surge absorber	DV0P1450	R•A•V-781BXXZ-4	OKAYA ELECTRIC INDUSTRIES CO., LTD.
	DV0P4190	R•A•V-781BWZ-4	
Ferrite core	DV0P1460	ZCAT3035-1330	TDK Corporation
Noise filter	DV0P4170	SUP-EK5-ER-6	OKAYA ELECTRIC INDUSTRIES CO., LTD.
	DV0P4220	3SUP-HU30-ER-6	
	DV0P3410	3SUP-HL50-ER-6B	
	DV0PM20042	3SUP-HU10-ER-6	
	DV0PM20043	3SUP-HU50-ER-6	

### 9-5 Compliance with the UL standard

[1] Installation environment

Install the servo driver under the environment at pollution level 2 stipulated in IEC60664-1.

Be sure to connect a UL-certified molded-case circuit-breaker (MCCB) or fuse to the main power supply.

Use copper conductor wires whose temperature rating is 75°C or higher.

[2] Short circuit current rating (SCCR)

This servo driver is compatible with power supply whose voltage is less than the maximum input voltage and symmetrical current is 5,000 A or less.

[3] Branch circuit protection

Protect the branch circuit in accordance with the NEC (National Electrical Code) and the local standard.

[4] Load protection and overheating protection

The servo driver has a built-in function to protect against servo motor overload.

The overload protection function is operated based on the specified time limit characteristics when current has reached 115% or more of the rating.

The servo motor is not provided with an overheating protection function. When it is necessary to satisfy the NEC, implement overheating protection measures for the servo motor.

### 9-6 Radio Waves Act of South Korea

The servo driver is a Class A device (broadcast communication device for business use) based on the Radio Waves Act of South Korea.

Use the product after understanding the following precautions.

**A 급 기기 (업무용 방송통신기자재)**

이 기기는 업무용(A 급) 전자파적합기기로서 판매자

또는 사용자는 이 점을 주의하시기 바라며, 가정외의

지역에서 사용하는 것을 목적으로 합니다.

( 대상기종 : Servo Driver )

[Reference translation]

Class A device (broadcast communication device for business use)

This product is an electromagnetic wave generating device for business use (Class A), which is intended for the use in places other than household.

The distributor and the user should be attentive to this point.

(Applicable model: Servo Driver)

### 9-7 Compliance with the SEMI F47 standard

- The SEMI F47 standard includes requirements for voltage drop in semiconductor manufacturing equipment.
- The control power supply for the servo driver is applicable to the SEMI F47 standard.  
The main circuit power supply is applicable to the SEMI F47 standard in the case of no load or light load.

(Cautions)

[1] This shall not apply to the single-phase 100 V servo driver whose control power input is 24 VDC.

[2] Make sure to verify the evaluation for the SEMI F47 standard using the actual equipment.

### 9-8 Harmonic suppression measures

- Harmonic suppression measures are different depending on countries. Perform installation in accordance with regulations in each country.
- The servo driver for Japan whose input current exceeds 20 A is applicable to the “Guidelines for harmonic suppression measures for users who receive high-voltage or extra-high voltage power”.

Calculate the equivalent capacity and harmonic outflow current based on the guidelines. If the harmonic current exceeds the limit value predetermined for the contract demand, appropriate measures must be taken.

When calculating the equivalent capacity, assume that the conversion factor of the servo driver is  $K_{31}=3.4$ .

(Refer to JEM-TR210 and JEM-TR225\*.)

\* They are technical documents issued by JEMA (Japan Electrical Manufacture’s Association).



# Safety Precautions

## 10. Safety Precautions

The following explanations are for things that must be observed in order to prevent harm to people and damage to property.

■ The degree of the injury or damage caused when using the product improperly is categorized and an explanation is provided.

 <b>DANGER</b>	Indicates “actions carrying a significant risk of death or serious injury.”
 <b>CAUTION</b>	Indicates “actions carrying the risk of the occurrence of minor injury or property damage.”

■ The actions to be observed are explained with the following symbols.

	Indicates actions that must not be performed.
	Indicates actions that must be performed without fail.

## DANGER



- (1) Use the product in an environment of pollution degree 2 or 1 (a place where the product will not come in contact with foreign matter such as dust, metal particles and oil mist, or liquids such as water, oil and polishing liquid). Avoid using the product near flammable objects, in an atmosphere of corrosive gas (such as H<sub>2</sub>S, SO<sub>2</sub>, NO<sub>2</sub>, Cl<sub>2</sub>) or storing or using the product in an atmosphere of flammable gas.
- (2) Do not place inflammable material near a motor, a driver, or a regenerative resistance.
- (3) Do not drive the motor with external torque. Motor generates electricity by external torque. Dynamic brake circuit will be damaged and it is possible that short-circuit current cause smoke or combustion.
- (4) Do not damage the cable nor place too much stress or heavy object on the cable. Do not pinch the cable.
- (5) Do not operate the product while the cable is dipped in oil or water.
- (6) Do not install the equipment near a heating object such as a heater or a large wire-wound resistor. (Install a thermal shield, etc. to avoid the influences of heating object.)
- (7) Do not connect the motor to the commercial power source directly.
- (8) Do not use the equipment under conditions subject to strong vibrations or an impact shock. Please attach the anti-vibration equipment to servo driver mounting surface if you install the servo driver in the vicinity of the vibration source.
- (9) Be sure not to touch the rotating part of the motor during operation.
- (10) Do not touch the keyway of the output shaft of the motor with bare hands.
- (11) Be sure not to insert your hand into the driver.
- (12) Do not touch the motor, the heat sink of the driver nor the surrounding equipment since they will be hot.
- (13) Do not perform wiring nor operate the product with wet hand.
- (14) Be sure that the wiring task is performed by electrical engineer.
- (15) There is no protective device attached to the motor other than the specified ones. Please protect them with an overcurrent protective device, a ground-fault circuit interrupter, an over temperature preventing device, an emergency stop device, and the like.



# Safety Precautions



## DANGER



- (16) When starting operation of the driver after an earthquake, please make sure that there is no abnormality as to the installation condition of the driver and the motor and the safety of the machine before starting operation.
- (17) After turning off the power, the inside circuit remains charged at a high voltage for a while. When moving, wiring or inspection the equipment, completely shut off the power supply input outside the driver and leave for 15 minutes or longer before working.
- (18) To prevent causing fire or accident resulting in injury or death due to improper installation or mounting at the occurrence of earthquake, please install or mount the device securely.
- (19) Install an external emergency shutoff circuit to stop operation and interrupt power immediately upon emergency. Emission of smoke or dust may occur due to a fault of a motor or a driver used in combination. For example, if the system is energized with the regenerative control power transistor shorted by failure, overheating of a regenerative resistor installed outside the driver may occur and it may emit smoke and dust. If a regenerative resistor is connected outside a driver, provide a means of detecting overheating such as a thermal protector to shut off power upon detecting abnormal heating.
- (20) Install the motor, the driver, and the surrounding devices on nonflammables such as metal.
- (21) Perform wiring correctly and securely. Insecure and incorrect wiring may be the cause of abnormal motor operation and its damage by fire.  
Also, please make sure that no electrical conducting material such as a scrap of electric wire get inside the driver at the time of performing installation and wiring task.
- (22) Connect the cables securely, and firmly insulate the current-carrying part with insulating material.
- (23) When using a bundling wire is inserted into the metal ducts, because burning for wire allowable current is decreased by the temperature rise.
- (24) Be sure to install a fuseless breaker in a power supply. Be sure to connect grounding terminals and grounding wires. To prevent an electric shock and malfunction, grounding resistance at 100 Ω or lower is recommended.
- (25) Tighten the screws on the terminal block for connection securely at appropriate torque shown in the specifications of the driver.
- (26) When building a system by using the safety feature, design it by fully understanding and being compliant with the related safety standards and items described in our operation manual or technical reference.



## CAUTION



- (27) When transferring the product, do not hold the cable or the shaft of the motor.
- (28) Do not adjust or modify the gain of the driver extremely, nor let the operation or movement of the machine be unstable.
- (29) After recovering from power failure, do not get close to the machine because there is a possibility that the machine restarts suddenly.  
Setting must be made to the machine so that safety for the worker is ensured when the machine restarted suddenly.
- (30) When the equipment is energized, keep away from the motor and mechanism driven by the motor in case of malfunction.
- (31) Do not apply strong shock to the shaft of the motor.
- (32) Be sure not to start or stop the motor with the electromagnetic contactor installed on the main power source side.
- (33) Do not switch on or off the main power supply of the driver frequently.
- (34) Since the brake built in the motor is used for maintenance, do not use it as a stopping device (braking) to ensure the safety of the machine.
- (35) Be careful not to drop or to topple over the product when transferring or performing installation task.



# Safety Precautions



## CAUTION



- (36) Do not climb on the motor or place heavy object on the motor.
- (37) Do not cover the louver on the driver nor insert foreign matter.
- (38) Do not use the product in an area exposed to direct sunlight. And when storing the product, avoid direct sunlight and keep the temperature and the humidity within the range specified for when the product is in use.
- (39) Never overhaul or modify the motor.  
Overhauling will be performed at our company or at the retailers approved by our company
- (40) Do not start/stop the a product by the turning on/off the servo ON command (SRV-ON).  
Otherwise the dynamic brake circuit built in the servo driver may get damaged.



- (41) Use the motor and the driver in the combination specified by our company. Please confirm the performance and the safety at customer when the motor is used in combination with another driver.
- (42) Due to the trouble with the motor or the driver combined, the motor may be damaged by fire, or smoking or dusting might occur. Please consider these possibilities when they are to be used in a clean room or the like.
- (43) Perform proper installation which is in proportion to the output and the weight of the main body.
- (44) Keep the ambient temperature and humidity of the installed motor within the range of allowable temperature and humidity.
- (45) Observe the specified installation method and the orientation of the product.
- (46) Keep a space as specified between the driver and the inner surface of the control panel, or between the driver and the other devices when installing the product.
- (47) Use the eyebolt attached to motor only for transferring the motor, but not for transferring the equipment. And do not use them with the speed reducer or heat sink attached to the motor.
- (48) Install a relay used to break the circuit at the time of emergency stop in series with the relay used to control the brake.
- (49) Fix the motor at the time of test run, and confirm its movement after isolating it from the mechanical system, and then mount it on the machine.
- (50) Verify that an input power supply voltage satisfies the driver specifications before turning on the power and start operation.  
An input voltage higher than rated may cause ignition and smoking in the driver, which may cause malfunction or burning of a motor in some cases.
- (51) When an alarm status occurs, remove a cause of the problem before restarting.  
Careless restarting without removing a cause of problem may cause malfunction or burning of a motor.
- (52) The brake built in the motor may not be maintained due to its life span, the mechanical structure, and so on. Please install a stopping device to ensure the safety on the machine side.
- (53) The driver generates heat by operating a motor. A driver used in a sealed box may cause an extreme rise of temperature.  
Consider cooling so that an ambient temperature around the driver satisfies an operating range.
- (54) Maintenance should be performed by the specialist.
- (55) If the product is not to be used for a long period of time, be sure to turn off the power.
- (56) Allow approx. 10 minutes pause when the dynamic brake is activated during high-speed running.  
Resistor is damaged and the dynamic brake might not work when using it under more critical operating condition.
- (57) Fix the cable so that stress is not applied to the connection parts such as the connector and terminal block.

- The capacity of the capacitor for the power rectifying circuit decreases over time. It is recommended to replace it every five years or so, in order to prevent secondary accidents due to malfunction. Replacement should be performed in our factory or our designated factory.
- Before using the product, be sure to read the "Safety Instructions" included with the product.



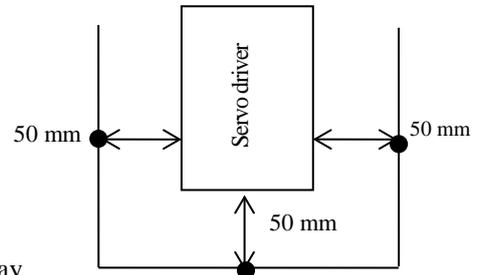
# Safety Precautions

## Temperature around the servo driver

The life span of the servo driver significantly depends on ambient temperature.

Make sure that temperature within 50 mm from the servo driver does not exceed the working temperature range.

If it is impossible to measure temperature in a place 50 mm away from the servo driver, perform measurement at the mid point in the clearance between the obstacle and the servo driver.



**Working temperature range: 0 - 55°C**

## 11. Life span

(This is not a guaranteed item.)

### 11-1 Expected life span of the servo driver

When the servo driver is used continuously under the following conditions, the expected life span is 28,000 hours.  
 Definition of life ... The time from when the product is shipped until the capacity of the electrolytic capacitor is reduced by 20%

Conditions	Input power supply	:	Single-phase 100 VAC, 50/60 Hz, Three-phase 200 VAC, 50/60 Hz,
	Ambient temperature	:	55 °C
	Above sea level	:	100 m or less
	Output torque	:	Constant rated torque
	Rotation speed	:	Constant rated rotation speed

Life span changes significantly depending on working conditions.

### 11-2 Standard life span

#### 11-2-1 Rush current protection circuit

The expected life span of the rush current protection circuit is approx. 20,000 times. However, it varies depending on environmental conditions and usage.

#### 11-2-2 Cooling fan

The standard replacement period of the cooling fan is approx. 20,000 hours. However, it varies depending on environmental conditions and usage.

## 12. Warranty

### 12-1 Warranty period

The manufacturer warrants the quality of its product for one year after purchasing by customer or one and a half year after the month of production at our factory. The warranty, however, is not applicable to the following, even within the period of warranty:

- (1) Failures due to wrong use, inappropriate repair or modifications.
- (2) Failures due to falling after purchase and damages during transportation.
- (3) Failures due to the use out of product specifications.
- (4) Failures due to fire, earthquake, lightning strike, wind and flood damage, salt pollution, abnormal voltage, and other natural disasters and accidents.
- (5) Failures due to penetration of water, oil, metal, or any other foreign materials.
- (6) Failures of internal components, which exceeded their described standard life.

### 12-2 Warranty scope

During the warranty period, we will only replace or repair the defective single product we delivered, if the failure is caused due to our fault. In the above, our responsibility is limited to the replacement or repair of the above single product we delivered. We are not liable for any damage to you or a third party, caused in association with the failure of the product we delivered. Further, we are not liable for any failure and damage to you or a third party, caused by the above 12-1 exemptions and any one of the following.

- (1) Failures due to the mounting or use of our product against the instructions and warnings described in this specification.
- (2) Failures due to the combination of our product and the equipment that mounted our product.
- (3) Failures due to your negligence of our instructions described in this specification.
- (4) Other equipment failures not attributable to our responsibility.

### 12-3 Warranty service

Please contact your dealers when you need to apply for warranty, including investigation of failure cause and request for repair. If you return our product directly to Panasonic Motor, after obtaining an approval from your dealer, please obtain the application form for repair and investigation from your dealer, enter the necessary information on it, and attach it to our product. In principle, you need to pay the transportation cost.

### 13. Other

- (1) Precautions for export of this product and the equipment incorporating this product.  
If the end user or end purpose of this product relates to military affairs, armament and so on, this product may be subject to the export regulations prescribed in "Foreign Exchange and Foreign Trade Control Law." To export this product, take thorough examination, and follow the required export procedure.
- (2) This product was designed to be used with general industrial products or the like. It is not designed to be used with a device dealing with human life or as a device to be used in unusual circumstances such as nuclear power management, use with aerospace instruments, use in transportation, use with medical equipment, use with various types of safety devices, or use with a device for which high level of cleanliness is required.
- (3) Please make the final decision at customer as to the specification of the completed product, compliance with laws and regulations, and its compatibility with the equipment and parts attached by customer in respects such as the structure, dimensions, service life, and characteristics.
- (4) There is a possibility that the completed device of customer may malfunction due to troubles (such as signal disconnection and signal phase interruption) or operation out of the setting by applying external noise/static electricity. Therefore, customer is required to make a fail-safe design and secure safety within the operable range in the place of operation.
- (5) Since excessive loading of the product may be the cause of load collapsing, follow the instructions indicated.
- (6) When the motor is to be operated without electrically connecting the shaft of the motor to the ground, depending on the actual equipment and the installing environment, problems such as the bearing sound will be louder may occur due to the occurrence of electrical corrosion at the motor bearing. So please confirm and verify the matter at customer.
- (7) Apply adequate tightening torque to the product mounting screw by taking into consideration strength of the screw and the characteristics of material to which the product is installed.
- (8) There is a possibility that the noise resistance performance may be affected depending on the wiring conditions (such as a grounding method, cable length, and shielding state of signal wires). Therefore, customer's completed devices should also be checked for the noise resistance performance.
- (9) When discarding the product, dispose it as an industrial waste.
- (10) When discarding the battery, isolate the battery with a tape or the like, and discard it according to the regulations of the local government.
- (11) Some of the parts or the like may be modified to improve the performance, but the improvement will be implemented within the range of satisfying the items in this specification.
- (12) The specification change of the product shall be implemented with the specification delivered by our company or a document specified by customer. And when the functions or characteristics are affected, the specification will be changed after being verified and confirmed with a prototype.
- (13) When the specification is changed, the price may also be changed in some cases.
- (14) If there is an item other than the items described in this specification and needs to be specified, please notify us beforehand.
- (15) If malfunctioning has occurred, the matter shall be addressed by discussing the matter with both parties according to the items indicated in this specification.
- (16) Failure of this product depending on its content, may generate smoke of about one cigarette.  
Take this into consideration when the application of the machine is clean room related.
- (17) Do not use benzene, thinner, alcohol, and acid or alkaline detergent, because they can discolor and damage the product.

## 14. Specifications for Each Model

Product No.	MADLN01BE MADLT01BF	MADLN11BE MADLT11BF	MADLN05BE MADLT05BF	MADLN15BE MADLT15BF
Power input	Single-phase 100 V	Single-phase 100 V	Single-phase/three-phase 200 V	Single-phase/three-phase 200 V
Maximum output current rating	6 A	8 A	6 A	8 A
Rotary encoder	Resolution: 8388608 P/r	Resolution: 8388608 P/r	Resolution: 8388608 P/r	Resolution: 8388608 P/r
Regenerative resistor	External	External	External	External
Auto gain tuning function	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided
Absolute system	Available	Available	Available	Available
Working ambient temperature	0-55 °C	0-55 °C	0-55 °C	0-55 °C
Wire material for control power supply	HVSF 0.75 mm <sup>2</sup>	HVSF 0.75 mm <sup>2</sup>	HVSF 0.75 mm <sup>2</sup>	HVSF 0.75 mm <sup>2</sup>
	AWG18	AWG18	AWG18	AWG18
Wire material for main power supply	HVSF 0.75-2.0 mm <sup>2</sup>	HVSF 0.75-2.0 mm <sup>2</sup>	HVSF 0.75-2.0 mm <sup>2</sup>	HVSF 0.75-2.0 mm <sup>2</sup>
	AWG14-18	AWG14-18	AWG14-18	AWG14-18
Wire material for earth wire	HVSF 2.0 mm <sup>2</sup>	HVSF 2.0 mm <sup>2</sup>	HVSF 2.0 mm <sup>2</sup>	HVSF 2.0 mm <sup>2</sup>
	AWG14	AWG14	AWG14	AWG14
Wire material for motor	HVSF 0.75-2.0 mm <sup>2</sup>	HVSF 0.75-2.0 mm <sup>2</sup>	HVSF 0.75-2.0 mm <sup>2</sup>	HVSF 0.75-2.0 mm <sup>2</sup>
	AWG14-18	AWG14-18	AWG14-18	AWG14-18
inrush current (main power supply) (*1)	Max.7 A	Max.7 A	Max.14 A	Max.14 A
inrush current (control power supply) (*1)	Max.7 A	Max.7 A	Max.14 A	Max.14 A
Product weight	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg
Dimension	Size A	Size A	Size A	Size A

(\*1) The current value has been calculated assuming that power input voltage is 100 V for the 100 V specification or 200 V for the 200 V specification.

Product No.	MBDLN21BE MBDLT21BF	MBDLN25BE MBDLT25BF	MCDLN31BE MCDLT31BF	MCDLN35BE MCDLT35BF
Power input	Single-phase 100 V	Single-phase/three-phase 200 V	Single-phase 100 V	Single-phase/three-phase 200 V
Maximum output current rating	12 A	12 A	22 A	22 A
Rotary encoder	Resolution: 8388608 P/r	Resolution: 8388608 P/r	Resolution: 8388608 P/r	Resolution: 8388608 P/r
Regenerative resistor	External	External	Built in	Built in
Auto gain tuning function	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided
Absolute system	Available	Available	Available	Available
Working ambient temperature	0-55 °C	0-55 °C	0-55 °C	0-55 °C
Wire material for control power supply	HVSF 0.75 mm <sup>2</sup> AWG18			
Wire material for main power supply	HVSF 0.75-2.0 mm <sup>2</sup> AWG14-18			
Wire material for earth wire	HVSF 2.0 mm <sup>2</sup> AWG14			
Wire material for motor	HVSF 0.75-2.0 mm <sup>2</sup> AWG14-18			
inrush current (main power supply) (*1)	Max.7 A	Max.14 A	Max.15 A	Max.29 A
inrush current (control power supply) (*1)	Max.7 A	Max.14 A	Max.7 A	Max.14 A
Product weight	Approx. 1.0 kg	Approx. 1.0 kg	Approx. 1.6 kg	Approx. 1.6 kg
Dimension	Size B	Size B	Size C	Size C

(\*1) The current value has been calculated assuming that power input voltage is 100 V for the 100 V specification or 200 V for the 200 V specification.

Product No.	MDDLN45BE MDDL45BF	MDDLN55BE MDDL55BF	MEDLN83BE MEDLT83BF	MEDLN93BE MEDLT93BF
Power input	Single-phase/three-phase 200 V	Single-phase/three-phase 200 V	Three-phase 200 V	Three-phase 200 V
Maximum output current rating	24 A	40 A	60 A	80 A
Rotary encoder	Resolution: 8388608 P/r	Resolution: 8388608 P/r	Resolution: 8388608 P/r	Resolution: 8388608 P/r
Regenerative resistor	Built in	Built in	Built in	Built in
Auto gain tuning function	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided
Absolute system	Available	Available	Available	Available
Working ambient temperature	0-55 °C	0-55 °C	0-55 °C	0-55 °C
Wire material for control power supply	HVSF 0.75 mm <sup>2</sup> AWG18			
Wire material for main power supply	HVSF 2.0 mm <sup>2</sup> AWG14			
Wire material for earth wire	HVSF 2.0 mm <sup>2</sup> AWG14			
Wire material for motor	HVSF 2.0mm <sup>2</sup> AWG14	HVSF 2.0 mm <sup>2</sup> AWG14	HVSF 2.0 mm <sup>2</sup> AWG14	HVSF 3.5 mm <sup>2</sup> AWG12
inrush current (main power supply) (*1)	Max.29 A	Max.29 A	Max.29 A	Max.29 A
inrush current (control power supply) (*1)	Max.14 A	Max.14 A	Max.14 A	Max.14 A
Product weight	Approx. 2.1 kg	Approx. 2.1 kg	Approx. 2.7 kg	Approx. 2.7 kg
Dimension	Size D	Size D	Size E	Size E

(\*1) The current value has been calculated assuming that power input voltage is 100 V for the 100 V specification or 200 V for the 200 V specification.

Product No.	MFDLNA3BE MFDLTA3BF	MFDLNB3BE MFDLTB3BF
Power input	Three-phase 200 V	Three-phase 200 V
Maximum output current rating	100 A	120 A
Rotary encoder	Resolution: 8388608 P/r	Resolution: 8388608 P/r
Regenerative resistor	Built in	Built in
Auto gain tuning function	Provided	Provided
Dynamic brake function	Provided	Provided
Absolute system	Available	Available
Working ambient temperature	0-55 °C	0-55 °C
Wire material for control power supply	HVSF 0.75 mm <sup>2</sup>	HVSF 0.75 mm <sup>2</sup>
	AWG18	AWG18
Wire material for main power supply	HVSF 3.5 mm <sup>2</sup>	HVSF 3.5 mm <sup>2</sup>
	AWG12	AWG12
Wire material for earth wire	HVSF 3.5 mm <sup>2</sup>	HVSF 3.5 mm <sup>2</sup>
	AWG12	AWG12
Wire material for motor	HVSF 3.5 mm <sup>2</sup>	HVSF 3.5 mm <sup>2</sup>
	AWG12	AWG12
inrush current (main power supply) (*1)	Max.22 A	Max.22 A
inrush current (control power supply) (*1)	Max.14 A	Max.14 A
Product weight	Approx. 5.2 kg	Approx. 5.2 kg
Dimension	Size F	Size F

(\*1) The current value has been calculated assuming that power input voltage is 100 V for the 100 V specification or 200 V for the 200 V specification.



PARAMETER

MODEL

MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
1	0	1st gain of position loop	Size A-C 48.0 Size D-F 32.0	1	31	Manufacturer use	0	1	62	Manufacturer use	0				
	*1														
	1	1st gain of velocity loop	Size A-C 27.0 Size D-F 18.0		32	Manufacturer use	0		63	Manufacturer use	0				
	*1														
	2	1st time constant of velocity loop integration	Size A-C 21.0 Size D-F 31.0		33	Manufacturer use	0		64	Manufacturer use	0				
	*1														
	3	1st filter of velocity detection	0		34	Manufacturer use	0		65	Manufacturer use	0				
	4	1st time constant of torque filter	Size A-C 0.84 Size D-F 1.26		35	Manufacturer use	0		66	Manufacturer use	0				
	*1														
	5	2nd gain of position loop	Size A-C 48.0 Size D-F 32.0		36	Manufacturer use	0		67	Manufacturer use	0				
	*1														
	6	2nd gain of velocity loop	Size A-C 27.0 Size D-F 18.0		37	Manufacturer use	0		68	Manufacturer use	0				
	*1														
	7	2nd time constant of velocity loop integration	Size A-C 21.0 Size D-F 31.0		38	Manufacturer use	0		69	Manufacturer use	0				
	*1														
	8	2nd filter of velocity detection	0		39	Manufacturer use	0		70	Manufacturer use	0				
	9	2nd time constant of torque filter	Size A-C 0.84 Size D-F 1.26		40	Manufacturer use	0		71	Manufacturer use	0				
	*1														
	10	Velocity feed forward gain	100.0		41	Manufacturer use	0		72	Manufacturer use	0				
	*1														
	11	Velocity feed forward filter	0.0		42	Manufacturer use	0		73	Manufacturer use	0				
	*1														
	12	Torque feed forward gain	100.0		43	Manufacturer use	0		74	Manufacturer use	0				
	*1														
	13	Torque feed forward filter	0.0		44	Manufacturer use	0		75	Manufacturer use	0				
	*1														
	14	2nd gain setup	1		45	Manufacturer use	0		76	Manufacturer use	0				
	15	Mode of position control switching	0		46	Manufacturer use	0		77	Manufacturer use	0				
	16	Delay time of position control switching	1.0		47	Manufacturer use	0		78	Manufacturer use	0				
	*1														
	17	Level of position control switching	0		48	Manufacturer use	0								
	18	Hysteresis at position control switching	0		49	Manufacturer use	0								
	19	Position gain switching time	1.0		50	Manufacturer use	0								
	*1														
	20	Mode of velocity control switching	0		51	Manufacturer use	0								
	21	Delay time of velocity control switching	0.0		52	Manufacturer use	0								
	*1														
	22	Level of velocity control switching	0		53	Manufacturer use	0								
	23	Hysteresis at velocity control switching	0		54	Manufacturer use	0								
	24	Mode of torque control switching	0		55	Manufacturer use	0								
	25	Delay time of torque control switching	0.0		56	Manufacturer use	0								
	*1														
	26	Level of torque control switching	0		57	Manufacturer use	0								
	27	Hysteresis at torque control switching	0		58	Manufacturer use	0								
	28	Manufacturer use	0		59	Manufacturer use	0								
	29	Manufacturer use	0		60	Manufacturer use	0								
	30	Manufacturer use	0		61	Manufacturer use	0								

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
2	0	Adaptive filter mode setup	0	2	31	Manufacturer use	0								
	1	1st notch frequency	5000		32	Manufacturer use	0								
	2	1st notchwidth selection	2		33	Manufacturer use	0								
	3	1st notch depth selection	0		34	Manufacturer use	0								
	4	2nd notch frequency	5000		35	Manufacturer use	0								
	5	2nd notch width selection	2		36	Manufacturer use	0								
	6	2nd notch depth selection	0		37	Manufacturer use	0								
	7	3rd notch frequency	5000												
	8	3rd notch width selection	2												
	9	3rd notch depth selection	0												
	10	4th notch frequency	5000												
	11	4th notch width selection	2												
	12	4th notch depth selection	0												
	13	Selection of damping filter switching	0												
	14	1st damping frequency	0.0												
	*1 15	1st damping filter setup	0.0												
	*1 16	2nd damping frequency	0.0												
	*1 17	2nd damping filter setup	0.0												
	*1 18	3rd damping frequency	0.0												
	*1 19	3rd damping filter setup	0.0												
	*1 20	4th damping frequency	0.0												
	*1 21	4th damping filter setup	0.0												
	*1 22	Command smoothing filter	Size A-C 9.2 Size D-F 13.9												
	*1 23	Command FIR filter	1.0												
	24	5th notch frequency	5000												
	25	5th notch width selection	2												
	26	5th notch depth selection	0												
	27	1st damping width setting	0												
	28	2nd damping width setting	0												
	29	3rd damping width setting	0												
	30	4th damping width setting	0												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
3	0	No available	-												
	1	No available	-												
	2	No available	-												
	3	No available	-												
	4	Manufacturer use	0												
	5	Manufacturer use	0												
	6	No available	-												
	7	No available	-												
	8	No available	-												
	9	No available	-												
	10	No available	-												
	11	No available	-												
	12	Acceleration time setup	0												
	13	Deceleration time setup	0												
	14	Sigmoid acceleration/ deceleration time setup	0												
	15	No available	-												
	16	No available	-												
	17	Selection of speed limit	2												
	18	No available	-												
	19	No available	-												
	20	No available	-												
	21	Manufacturer use	0												
	22	Manufacturer use	0												
	23	External scale selection	0												
	24	Numerator of external scaledivision	0												
	25	Denominator of external scaledivision	10000												
	26	Reversal of direction ofexternal scale	0												
	27	External scale Z phase disconnection detection disable	0												
	28	Hybrid deviation excess setup	16000												
	29	Hybrid deviation clear setup	0												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
4	0	SI1 input selection	3289650	4	31	Positioning complete (In-position) range	8400								
	1	SI2 input selection	8487297		32	Positioning complete (In-position) output setup	0								
	2	SI3 input selection	8553090		33	INP hold time	0								
	3	SI4 input selection	2236962		34	Zero-speed	50								
	4	SI5 input selection	2105376		35	Speed coincidence range	50								
	5	SI6 input selection	2171169		36	At-speed (Speed arrival)	1000								
	6	SI7 input selection	3158064		37	Mechanical brake action at stalling setup	0								
	7	SI8 input selection	3223857		38	Mechanical brake action at running setup	0								
	8	No available	-		39	Brake release speed setup	30								
	9	No available	-		40	Selection of alarm output 1	0								
	10	SO1 output selection	197379		41	Selection of alarm output 2	0								
	11	SO2 output selection	1052688		42	2nd Positioning complete (In-position) range	8400								
	12	SO3 output selection	65793		43	No available	-								
	13	No available	-		44	Position comparison output pulse width setting	0								
	14	No available	-		45	Position comparison output polarity selection	0								
	15	No available	-		46	No available	-								
	16	Type of analog monitor 1	0		47	Pulse output selection	0								
	17	Analog monitor 1 output gain	0		48	Position comparison value 1	0								
	18	Type of analog monitor 2	4		49	Position comparison value 2	0								
	19	Analog monitor 2 output gain	0		50	Position comparison value 3	0								
	20	No available	-		51	Position comparison value 4	0								
	21	Analog monitor output setup	0		52	Position comparison value 5	0								
	22	Manufacturer use	0		53	Position comparison value 6	0								
	23	Manufacturer use	0		54	Position comparison value 7	0								
	24	Manufacturer use	0		55	Position comparison value 8	0								
	25	No available	-		56	Position comparison output delay compensation amount	0								
	26	No available	-		57	Position comparison output assignment setting	0								
	27	No available	-												
	28	No available	-												
	29	No available	-												
	30	No available	-												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
5	0	No available	-	5	31	USB axis address	1	5	62	No available	-				
	1	No available	-		32	No available	-		63	No available	-				
	2	No available	-		33	Pulse regenerative output limitsetup	0		64	No available	-				
	3	Denominator of pulse outputdivision	0		34	Manufacturer use	4		65	No available	-				
	4	Over-travel inhibit input setup	1		35	No available	-		66	Deterioration diagnosis convergence judgment time	0.0				
	5	Sequence at over-travel inhibit	0		36	Manufacturer use	0		67	Deterioration diagnosis inertia ratio upper limit	0				
	6	Sequence at Servo-off	0		37	No available	-		68	Deterioration diagnosis inertia ratio lower limit	0				
	7	Sequence at main power off	0		38	No available	-		69	Deterioration diagnosis unbalanced load upper limit	0.0				
	8	LV trip selection at main power off	0		39	No available	-		70	Deterioration diagnosis unbalanced load lower limit	0.0				
	9	Detection time of main power off	2000		40	No available	-		71	Deterioration diagnosis dynamic friction upper limit	0.0				
	10	Sequence at alarm	0		41	No available	-		72	Deterioration diagnosis dynamic friction lower limit	0.0				
	11	Torque setup for emergency stop	0		42	No available	-		73	Deterioration diagnosis viscous friction upper limit	0.0				
	12	Over-load level setup	0		43	No available	-		74	Deterioration diagnosis viscous friction lower limit	0.0				
	13	Over-speed level setup	0		44	No available	-		75	Deterioration diagnosis velocity setting	0				
	14	Motor working range setup	1.0		45	Quadrant glitch positive-direction compensation value	0		76	Deterioration diagnosis torque average time	0				
	15	Control input signal reading setup	0		46	Quadrant glitch negative-direction compensation value	0		77	Deterioration diagnosis torque upper limit	0.0				
	16	Alarm clear input(A-CLR) setup	1		47	Quadrant glitch compensation delay time	0		78	Deterioration diagnosis torque lower limit	0.0				
	17	No available	-		48	Quadrant glitch compensation filter setting L	0								
	18	No available	-		49	Quadrant glitch compensation filter setting H	0								
	19	No available	-		50	Manufacturer use	0								
	20	Position setup unit select	0		51	Manufacturer use	0								
	21	Selection of torque limit	1		52	Manufacturer use	0								
	22	2nd torque limit	500		53	Manufacturer use	0								
	23	No available	-		54	Manufacturer use	0								
	24	No available	-		55	Manufacturer use	0								
	25	Manufacturer use	0		56	Slow stop deceleration time setting	0								
	26	Manufacturer use	0		57	Slow stop S-shape acceleration and deceleration setting	0								
	27	No available	-		58	No available	-								
	28	No available	-		59	No available	-								
	29	Manufacturer use	2		60	No available	-								
	30	No available	-		61	No available	-								

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
6	0	No available	-	6	31	Real time auto tuning estimation speed	1	6	62	1st resonance attenuation ratio	0	6	93	No available	-
	1	No available	-		32	Real time auto tuning custom setup	0		63 *1	1st anti-resonance frequency	0.0		94	No available	-
	2	Velocity deviation excess setup	0		33	No available	-		64	1st anti-resonance attenuation ratio	0		95	Overload warning detection level	0
	3	No available	-		34 *1	Hybrid vibration suppression gain	0.0		65 *1	1st response frequency	0.0		96	Overload warning release level	0
	4	No available	-		35 *1	Hybrid vibration suppression filter	0.10		66 *1	2nd resonance frequency	0.0		97	Function expansion setup 3	0
	5 *1	Position 3rd gain valid time	0.0		36	Dynamic brake operation input setup	0		67	2nd resonance attenuation ratio	0		98	Function expansion setup 4	0
	6	Position 3rd gain scale factor	100		37 *1	Oscillation detecting level	0.0		68 *1	2nd anti-resonance frequency	0.0				
	7	Torque command additional value	0		38	Warning mask setup	4		69	2nd anti-resonance attenuation ratio	0				
	8	Positive direction torque compensation value	0		39	Warning mask setup2	0		70 *1	2nd response frequency	0.0				
	9	Negative direction torque compensation value	0		40	No available	-		71	3rd damping depth	0				
	10	Function expansion setup	528		41	1st damping depth	0		72	4th damping depth	0				
	11	Current response setup	100		42 *1	Two-stage torque filter time constant	0.0		73 *1	Load estimation filter	0.0				
	12	No available	-		43	Two-stage torque filter attenuation term	1000		74 *1	Torque compensation frequency 1	0.0				
	13	No available	-		44	No available	-		75 *1	Torque compensation frequency 2	0.0				
	14	Emergency stop time at alarm	200		45	No available	-		76	Load estimation count	0				
	15	2nd over-speed level setup	0		46	No available	-		77	No available	-				
	16	No available	-		47	Function expansion settings 2	1		78	No available	-				
	17	No available	-		48 *1	Adjust filter	Size A 1.1 Size B-C 1.2 Size D-E 1.7		79	No available	-				
	18 *1	Power-up wait time	0.0		49	Adjust/Torque command attenuation term	15		80	No available	-				
	19	Manufacturer use	0		50 *1	Viscous friction compensation gain	0.0		81	No available	-				
	20	Manufacturer use	0		51	Immediate cessation completion wait time	0		82	No available	-				
	21	Manufacturer use	0		52	Manufacturer use	0		83	No available	-				
	22	A,B phase external scale pulse output selection	0		53	Manufacturer use	0		84	No available	-				
	23	Load change compensation gain	0		54	Manufacturer use	0		85	Retracting operation condition setting	0				
	24 *1	Load change compensation filter	0.53		55	No available	-		86	Retracting operation alarm setting	0				
	25	No available	-		56	No available	-		87	Manufacturer use	0				
	26	No available	-		57	Torque saturation anomaly detection time	0		88	Absolute encoder multi-turn data upper-limit value	0				
	27	Warning latch state setup	3		58	Manufacturer use	0		89	No available	-				
	28	No available	-		59	Manufacturer use	0		90	No available	-				
	29	No available	-		60	2nd damping depth	0		91	No available	-				
	30	Manufacturer use	0		61 *1	1st resonance frequency	0.0		92	No available	-				

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
7	0	Display on LED	0	7	31	No available	-	7	62	No available	-	7	93	Home position return limit speed	0
	1	Display time setup upon power-up	0		32	No available	-		63	No available	-		94	No available	-
	2	No available	-		33	No available	-		64	No available	-		95	No available	-
	3	Output setup during torque limit	0		34	No available	-		65	No available	-		96	No available	-
	4	Manufacturer use	0		35	No available	-		66	No available	-		97	No available	-
	5	Manufacturer use	0		36	No available	-		67	No available	-		98	No available	-
	6	Manufacturer use	0		37	No available	-		68	No available	-		99	Communication function expansion settings 6	0
	7	Manufacturer use	0		38	No available	-		69	No available	-		100	Manufacturer use	0
	8	Manufacturer use	0		39	Manufacturer use	0		70	No available	-		101	Manufacturer use	0
	9	Correction time of latch delay 1	360		40	Station alias setup (for controller)	0		71	No available	-		102	Manufacturer use	0
	10	Manufacturer use	3		41	Station alias selection	1		72	No available	-		103	Manufacturer use	0
	11	Manufacturer use	0		42	consecutive communication abnormality number of times upper	-30584		73	No available	-		104	Manufacturer use	0
	12	Manufacturer use	0		43	Detection time of lost link	0		74	No available	-		105	No available	-
	13	Manufacturer use	0		44	Software Ver.	16908546		75	No available	-		106	No available	-
	14	Main power off warning detection time	0		45	No available	-		76	No available	-		107	No available	-
	15	Manufacturer use	0		46	No available	-		77	No available	-		108	Manufacturer use	7
	16	Torque saturation error protection frequency	0		47	No available	-		78	No available	-		109	Manufacturer use	0
	17	No available	-		48	No available	-		79	No available	-		110	Manufacturer use	0
	18	No available	-		49	No available	-		80	No available	-				
	19	No available	-		50	No available	-		81	No available	-				
	20	No available	-		51	No available	-		82	No available	-				
	21	No available	-		52	No available	-		83	No available	-				
	22	Communication function expansion settings 1	0		53	No available	-		84	No available	-				
	23	Communication function expansion settings 2	16384		54	No available	-		85	No available	-				
	24	Communication function expansion settings 3	14352		55	No available	-		86	No available	-				
	25	No available	-		56	No available	-		87	Communication function expansion settings 5	3072				
	26	No available	-		57	No available	-		88	No available	-				
	27	No available	-		58	No available	-		89	No available	-				
	28	No available	-		59	No available	-		90	No available	-				
	29	No available	-		60	No available	-		91	No available	-				
	30	No available	-		61	No available	-		92	Correction time of latch delay 2	0				

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.



PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
15	0	Manufacturer use	0	15	31	Manufacturer use	5								
	1	No available	-		32	No available	-								
	2	Manufacturer use	0		33	Manufacturer use	0								
	3	No available	-		34	Manufacturer use	0								
	4	No available	-		35	Manufacturer use	1								
	5	No available	-												
	6	No available	-												
	7	No available	-												
	8	No available	-												
	9	No available	-												
	10	No available	-												
	11	No available	-												
	12	No available	-												
	13	No available	-												
	14	No available	-												
	15	No available	-												
	16	Manufacturer use	2												
	17	Manufacturer use	4												
	18	No available	-												
	19	No available	-												
	20	No available	-												
	21	No available	-												
	22	No available	-												
	23	No available	-												
	24	No available	-												
	25	No available	-												
	26	No available	-												
	27	No available	-												
	28	No available	-												
	29	No available	-												
	30	Manufacturer use	0												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.



PARAMETER

MODEL MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
1	0	1st gain of position loop	Size A-C 48.0 Size D-F 32.0	1	31	Manufacturer use	0	1	62	Manufacturer use	0				
	*1														
	1	1st gain of velocity loop	Size A-C 27.0 Size D-F 18.0		32	Manufacturer use	0		63	Manufacturer use	0				
	*1														
	2	1st time constant of velocity loop integration	Size A-C 21.0 Size D-F 31.0		33	Manufacturer use	0		64	Manufacturer use	0				
	*1														
	3	1st filter of velocity detection	0		34	Manufacturer use	0		65	Manufacturer use	0				
	4	1st time constant of torque filter	Size A-C 0.84 Size D-F 1.26		35	Manufacturer use	0		66	Manufacturer use	0				
	*1														
	5	2nd gain of position loop	Size A-C 48.0 Size D-F 32.0		36	Manufacturer use	0		67	Manufacturer use	0				
	*1														
	6	2nd gain of velocity loop	Size A-C 27.0 Size D-F 18.0		37	Manufacturer use	0		68	Manufacturer use	0				
	*1														
	7	2nd time constant of velocity loop integration	Size A-C 21.0 Size D-F 31.0		38	Manufacturer use	0		69	Manufacturer use	0				
	*1														
	8	2nd filter of velocity detection	0		39	Manufacturer use	0		70	Manufacturer use	0				
	9	2nd time constant of torque filter	Size A-C 0.84 Size D-F 1.26		40	Manufacturer use	0		71	Manufacturer use	0				
	*1														
	10	Velocity feed forward gain	100.0		41	Manufacturer use	0		72	Manufacturer use	0				
	*1														
	11	Velocity feed forward filter	0.0		42	Manufacturer use	0		73	Manufacturer use	0				
	*1														
	12	Torque feed forward gain	100.0		43	Manufacturer use	0		74	Manufacturer use	0				
	*1														
	13	Torque feed forward filter	0.0		44	Manufacturer use	0		75	Manufacturer use	0				
	*1														
	14	2nd gain setup	1		45	Manufacturer use	0		76	Manufacturer use	0				
	15	Mode of position control switching	0		46	Manufacturer use	0		77	Manufacturer use	0				
	16	Delay time of position control switching	1.0		47	Manufacturer use	0		78	Manufacturer use	0				
	*1														
	17	Level of position control switching	0		48	Manufacturer use	0								
	18	Hysteresis at position control switching	0		49	Manufacturer use	0								
	19	Position gain switching time	1.0		50	Manufacturer use	0								
	*1														
	20	Mode of velocity control switching	0		51	Manufacturer use	0								
	21	Delay time of velocity control switching	0.0		52	Manufacturer use	0								
	*1														
	22	Level of velocity control switching	0		53	Manufacturer use	0								
	23	Hysteresis at velocity control switching	0		54	Manufacturer use	0								
	24	Mode of torque control switching	0		55	Manufacturer use	0								
	25	Delay time of torque control switching	0.0		56	Manufacturer use	0								
	*1														
	26	Level of torque control switching	0		57	Manufacturer use	0								
	27	Hysteresis at torque control switching	0		58	Manufacturer use	0								
	28	Manufacturer use	0		59	Manufacturer use	0								
	29	Manufacturer use	0		60	Manufacturer use	0								
	30	Manufacturer use	0		61	Manufacturer use	0								

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
2	0	Adaptive filter mode setup	0	2	31	Manufacturer use	0								
	1	1st notch frequency	5000		32	Manufacturer use	0								
	2	1st notchwidth selection	2		33	Manufacturer use	0								
	3	1st notch depth selection	0		34	Manufacturer use	0								
	4	2nd notch frequency	5000		35	Manufacturer use	0								
	5	2nd notch width selection	2		36	Manufacturer use	0								
	6	2nd notch depth selection	0		37	Manufacturer use	0								
	7	3rd notch frequency	5000												
	8	3rd notch width selection	2												
	9	3rd notch depth selection	0												
	10	4th notch frequency	5000												
	11	4th notch width selection	2												
	12	4th notch depth selection	0												
	13	Selection of damping filter switching	0												
	14	1st damping frequency	0.0												
	*1 15	1st damping filter setup	0.0												
	*1 16	2nd damping frequency	0.0												
	*1 17	2nd damping filter setup	0.0												
	*1 18	3rd damping frequency	0.0												
	*1 19	3rd damping filter setup	0.0												
	*1 20	4th damping frequency	0.0												
	*1 21	4th damping filter setup	0.0												
	*1 22	Command smoothing filter	Size A-C 9.2 Size D-F 13.9												
	*1 23	Command FIR filter	1.0												
	24	5th notch frequency	5000												
	25	5th notch width selection	2												
	26	5th notch depth selection	0												
	27	1st damping width setting	0												
	28	2nd damping width setting	0												
	29	3rd damping width setting	0												
	30	4th damping width setting	0												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
3	0	No available	-												
	1	No available	-												
	2	No available	-												
	3	No available	-												
	4	Manufacturer use	0												
	5	Manufacturer use	0												
	6	No available	-												
	7	No available	-												
	8	No available	-												
	9	No available	-												
	10	No available	-												
	11	No available	-												
	12	Acceleration time setup	0												
	13	Deceleration time setup	0												
	14	Sigmoid acceleration/ deceleration time setup	0												
	15	No available	-												
	16	No available	-												
	17	Selection of speed limit	2												
	18	No available	-												
	19	No available	-												
	20	No available	-												
	21	Manufacturer use	0												
	22	Manufacturer use	0												
	23	Manufacturer use	0												
	24	Manufacturer use	0												
	25	Manufacturer use	10000												
	26	Manufacturer use	0												
	27	Manufacturer use	0												
	28	Manufacturer use	16000												
	29	Manufacturer use	0												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
4	0	SI1 input selection	3289650	4	31	Positioning complete (In-position) range	8400								
	1	SI2 input selection	8487297		32	Positioning complete (In-position) output setup	0								
	2	SI3 input selection	8553090		33	INP hold time	0								
	3	SI4 input selection	2236962		34	Zero-speed	50								
	4	SI5 input selection	2105376		35	Speed coincidence range	50								
	5	SI6 input selection	2171169		36	At-speed (Speed arrival)	1000								
	6	SI7 input selection	3158064		37	Mechanical brake action at stalling setup	0								
	7	SI8 input selection	3223857		38	Mechanical brake action at running setup	0								
	8	No available	-		39	Brake release speed setup	30								
	9	No available	-		40	Selection of alarm output 1	0								
	10	SO1 output selection	197379		41	Selection of alarm output 2	0								
	11	SO2 output selection	1052688		42	2nd Positioning complete (In-position) range	8400								
	12	SO3 output selection	65793		43	No available	-								
	13	No available	-		44	Position comparison output pulse width setting	0								
	14	No available	-		45	Position comparison output polarity selection	0								
	15	No available	-		46	No available	-								
	16	Type of analog monitor 1	0		47	Pulse output selection	0								
	17	Analog monitor 1 output gain	0		48	Position comparison value 1	0								
	18	Type of analog monitor 2	4		49	Position comparison value 2	0								
	19	Analog monitor 2 output gain	0		50	Position comparison value 3	0								
	20	No available	-		51	Position comparison value 4	0								
	21	Analog monitor output setup	0		52	Position comparison value 5	0								
	22	Manufacturer use	0		53	Position comparison value 6	0								
	23	Manufacturer use	0		54	Position comparison value 7	0								
	24	Manufacturer use	0		55	Position comparison value 8	0								
	25	No available	-		56	Position comparison output delay compensation amount	0								
	26	No available	-		57	Position comparison output assignment setting	0								
	27	No available	-												
	28	No available	-												
	29	No available	-												
	30	No available	-												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
5	0	No available	-	5	31	USB axis address	1	5	62	No available	-				
	1	No available	-		32	No available	-		63	No available	-				
	2	No available	-		33	Pulse regenerative output limitsetup	0		64	No available	-				
	3	Denominator of pulse outputdivision	0		34	Manufacturer use	4		65	No available	-				
	4	Over-travel inhibit input setup	1		35	No available	-		66	Deterioration diagnosis convergence judgment time	0.0				
	5	Sequence at over-travel inhibit	0		36	Manufacturer use	0		67	Deterioration diagnosis inertia ratio upper limit	0				
	6	Sequence at Servo-off	0		37	No available	-		68	Deterioration diagnosis inertia ratio lower limit	0				
	7	Sequence at main power off	0		38	No available	-		69	Deterioration diagnosis unbalanced load upper limit	0.0				
	8	LV trip selection at main power off	0		39	No available	-		70	Deterioration diagnosis unbalanced load lower limit	0.0				
	9	Detection time of main power off	2000		40	No available	-		71	Deterioration diagnosis dynamic friction upper limit	0.0				
	10	Sequence at alarm	0		41	No available	-		72	Deterioration diagnosis dynamic friction lower limit	0.0				
	11	Torque setup for emergency stop	0		42	No available	-		73	Deterioration diagnosis viscous friction upper limit	0.0				
	12	Over-load level setup	0		43	No available	-		74	Deterioration diagnosis viscous friction lower limit	0.0				
	13	Over-speed level setup	0		44	No available	-		75	Deterioration diagnosis velocity setting	0				
	14	Motor working range setup	1.0		45	Quadrant glitch positive-direction compensation value	0		76	Deterioration diagnosis torque average time	0				
	15	Control input signal reading setup	0		46	Quadrant glitch negative-direction compensation value	0		77	Deterioration diagnosis torque upper limit	0.0				
	16	Alarm clear input(A-CLR) setup	1		47	Quadrant glitch compensation delay time	0		78	Deterioration diagnosis torque lower limit	0.0				
	17	No available	-		48	Quadrant glitch compensation filter setting L	0								
	18	No available	-		49	Quadrant glitch compensation filter setting H	0								
	19	No available	-		50	Manufacturer use	0								
	20	Position setup unit select	0		51	Manufacturer use	0								
	21	Selection of torque limit	1		52	Manufacturer use	0								
	22	2nd torque limit	500		53	Manufacturer use	0								
	23	No available	-		54	Manufacturer use	0								
	24	No available	-		55	Manufacturer use	0								
	25	Manufacturer use	0		56	Slow stop deceleration time setting	0								
	26	Manufacturer use	0		57	Slow stop S-shape acceleration and deceleration setting	0								
	27	No available	-		58	No available	-								
	28	No available	-		59	No available	-								
	29	Manufacturer use	2		60	No available	-								
	30	No available	-		61	No available	-								

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL  
MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
6	0	No available	-	6	31	Real time auto tuning estimation speed	1	6	62	1st resonance attenuation ratio	0	6	93	No available	-
	1	No available	-		32	Real time auto tuning custom setup	0		63 *1	1st anti-resonance frequency	0.0		94	No available	-
	2	Velocity deviation excess setup	0		33	No available	-		64	1st anti-resonance attenuation ratio	0		95	Overload warning detection level	0
	3	No available	-		34 *1	Manufacturer use	0.0		65 *1	1st response frequency	0.0		96	Overload warning release level	0
	4	No available	-		35 *1	Manufacturer use	0.10		66 *1	2nd resonance frequency	0.0		97	Function expansion setup 3	0
	5 *1	Position 3rd gain valid time	0.0		36	Dynamic brake operation input setup	0		67	2nd resonance attenuation ratio	0		98	Function expansion setup 4	0
	6	Position 3rd gain scale factor	100		37 *1	Oscillation detecting level	0.0		68 *1	2nd anti-resonance frequency	0.0				
	7	Torque command additional value	0		38	Warning mask setup	4		69	2nd anti-resonance attenuation ratio	0				
	8	Positive direction torque compensation value	0		39	Warning mask setup2	0		70 *1	2nd response frequency	0.0				
	9	Negative direction torque compensation value	0		40	No available	-		71	3rd damping depth	0				
	10	Function expansion setup	528		41	1st damping depth	0		72	4th damping depth	0				
	11	Current response setup	100		42 *1	Two-stage torque filter time constant	0.0		73 *1	Load estimation filter	0.0				
	12	No available	-		43	Two-stage torque filter attenuation term	1000		74 *1	Torque compensation frequency 1	0.0				
	13	No available	-		44	No available	-		75 *1	Torque compensation frequency 2	0.0				
	14	Emergency stop time at alarm	200		45	No available	-		76	Load estimation count	0				
	15	2nd over-speed level setup	0		46	No available	-		77	No available	-				
	16	No available	-		47	Function expansion settings 2	1		78	No available	-				
	17	No available	-		48 *1	Adjust filter	Size A 1.1 Size B-C 1.2 Size D-E 1.7		79	No available	-				
	18 *1	Power-up wait time	0.0		49	Adjust/Torque command attenuation term	15		80	No available	-				
	19	Manufacturer use	0		50 *1	Viscous friction compensation gain	0.0		81	No available	-				
	20	Manufacturer use	0		51	Immediate cessation completion wait time	0		82	No available	-				
	21	Manufacturer use	0		52	Manufacturer use	0		83	No available	-				
	22	Manufacturer use	0		53	Manufacturer use	0		84	No available	-				
	23	Load change compensation gain	0		54	Manufacturer use	0		85	Retracting operation condition setting	0				
	24 *1	Load change compensation filter	0.53		55	No available	-		86	Retracting operation alarm setting	0				
	25	No available	-		56	No available	-		87	Manufacturer use	0				
	26	No available	-		57	Torque saturation anomaly detection time	0		88	Absolute encoder multi-turn data upper-limit value	0				
	27	Warning latch state setup	3		58	Manufacturer use	0		89	No available	-				
	28	No available	-		59	Manufacturer use	0		90	No available	-				
	29	No available	-		60	2nd damping depth	0		91	No available	-				
	30	Manufacturer use	0		61 *1	1st resonance frequency	0.0		92	No available	-				

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 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.

PARAMETER

MODEL MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
7	0	Display on LED	0	7	31	No available	-	7	62	No available	-	7	93	Home position return limit speed	0
	1	Display time setup upon power-up	0		32	No available	-		63	No available	-		94	No available	-
	2	No available	-		33	No available	-		64	No available	-		95	No available	-
	3	Output setup during torque limit	0		34	No available	-		65	No available	-		96	No available	-
	4	Manufacturer use	0		35	No available	-		66	No available	-		97	No available	-
	5	Manufacturer use	0		36	No available	-		67	No available	-		98	No available	-
	6	Manufacturer use	0		37	No available	-		68	No available	-		99	Communication function expansion settings 6	0
	7	Manufacturer use	0		38	No available	-		69	No available	-		100	Manufacturer use	0
	8	Manufacturer use	0		39	Manufacturer use	0		70	No available	-		101	Manufacturer use	0
	9	Correction time of latch delay 1	360		40	Station alias setup (for controller)	0		71	No available	-		102	Manufacturer use	0
	10	Manufacturer use	3		41	Station alias selection	1		72	No available	-		103	Manufacturer use	0
	11	Manufacturer use	0		42	consecutive communication abnormality number of times upper	-30584		73	No available	-		104	Manufacturer use	0
	12	Manufacturer use	0		43	Detection time of lost link	0		74	No available	-		105	No available	-
	13	Manufacturer use	0		44	Software Ver.	16908546		75	No available	-		106	No available	-
	14	Main power off warning detection time	0		45	No available	-		76	No available	-		107	No available	-
	15	Manufacturer use	0		46	No available	-		77	No available	-		108	Manufacturer use	7
	16	Torque saturation error protection frequency	0		47	No available	-		78	No available	-		109	Manufacturer use	0
	17	No available	-		48	No available	-		79	No available	-		110	Manufacturer use	0
	18	No available	-		49	No available	-		80	No available	-				
	19	No available	-		50	No available	-		81	No available	-				
	20	No available	-		51	No available	-		82	No available	-				
	21	No available	-		52	No available	-		83	No available	-				
	22	Communication function expansion settings 1	0		53	No available	-		84	No available	-				
	23	Communication function expansion settings 2	16384		54	No available	-		85	No available	-				
	24	Communication function expansion settings 3	14352		55	No available	-		86	No available	-				
	25	No available	-		56	No available	-		87	Communication function expansion settings 5	3072				
	26	No available	-		57	No available	-		88	No available	-				
	27	No available	-		58	No available	-		89	No available	-				
	28	No available	-		59	No available	-		90	No available	-				
	29	No available	-		60	No available	-		91	No available	-				
	30	No available	-		61	No available	-		92	Correction time of latch delay 2	0				

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PARAMETER

MODEL MINAS-A6BF series

Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value	Cat e	Pr.	Parameter	Default value
15	0	Manufacturer use	0	15	31	Manufacturer use	5								
	1	No available	-		32	No available	-								
	2	Manufacturer use	0		33	Manufacturer use	0								
	3	No available	-		34	Manufacturer use	0								
	4	No available	-		35	Manufacturer use	1								
	5	No available	-												
	6	No available	-												
	7	No available	-												
	8	No available	-												
	9	No available	-												
	10	No available	-												
	11	No available	-												
	12	No available	-												
	13	No available	-												
	14	No available	-												
	15	No available	-												
	16	Manufacturer use	2												
	17	Manufacturer use	4												
	18	No available	-												
	19	No available	-												
	20	No available	-												
	21	No available	-												
	22	No available	-												
	23	No available	-												
	24	No available	-												
	25	No available	-												
	26	No available	-												
	27	No available	-												
	28	No available	-												
	29	No available	-												
	30	Manufacturer use	0												

\*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Disturbance observer filter ... Value of Panatern : 0.53 / Value of parameter-file : 53  
 \*2 The maximum torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.