
REFERENCE SPECIFICATIONS

MODEL

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

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Revisions

[illegible]

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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.

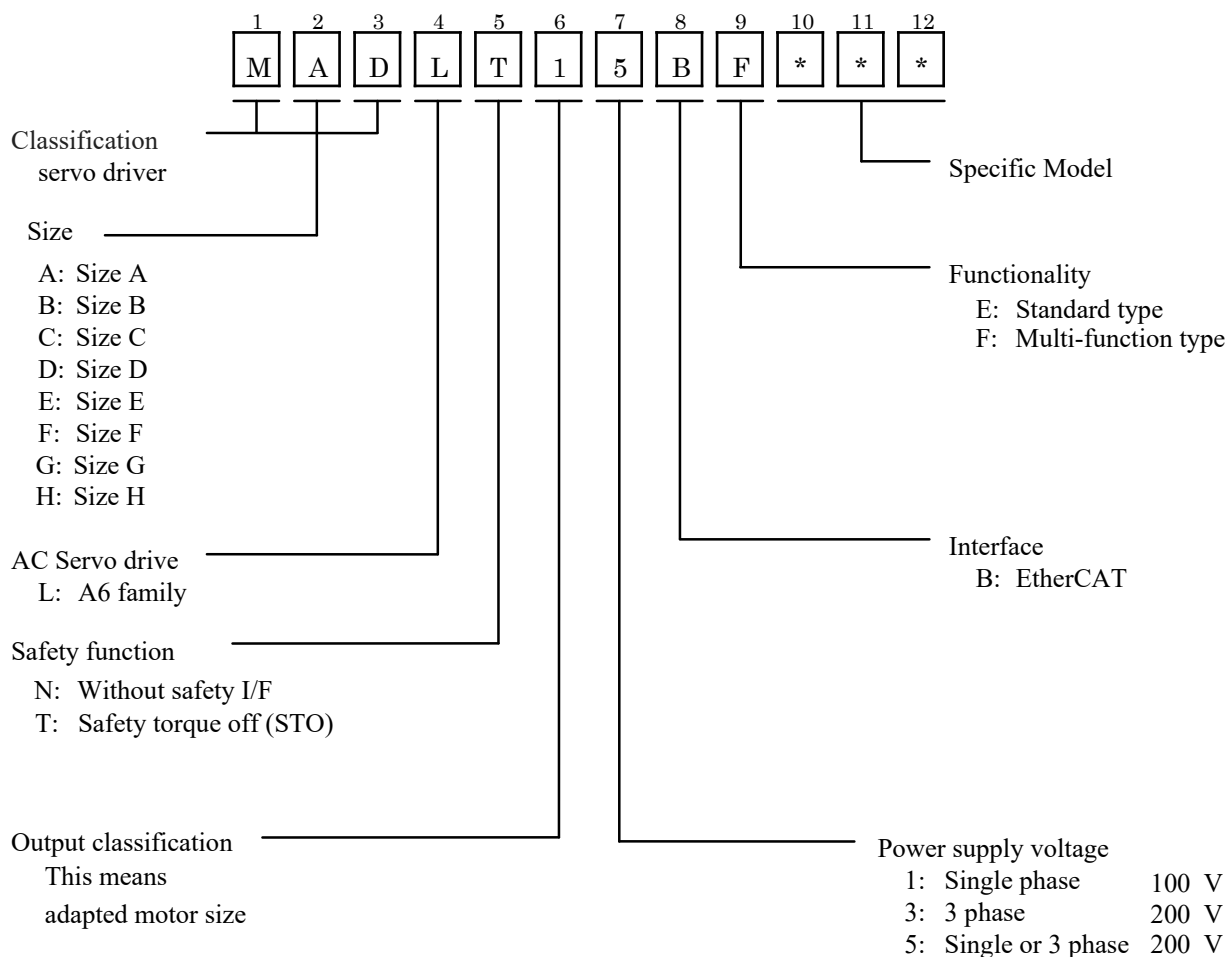


<IMPORTANT>

- All rights reserved. No part of this publication may be reproduced or transmitted in any form without prior permission.
- 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
MDDL45BE	60380008	○	D	Single/3-phase AC200-240 V	Max 1000 W
MDDL55BE	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

(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.

*There is no correspondence of Size G and Size H for standard type.

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
MGDLTC3BF	613C000E	○	G	3-phase AC200-240 V	Max 7500 W
MHDLTE3BF	613C000F	○	H	3-phase AC200-240 V	Max 15000 W
MHDLTF3BF	613C0010	○			Max 22000 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 to H	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 to H	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 ² 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					
External scale feedback *2				A/B phase, homing signal defferential input type Panasonic supported serial communication type *3					
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 *4					
Safety terminal *2				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,B,G,H: 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 G: Built in Size H : Extercal only					
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 Please note that condensation tend to occur when temperature fall.

*2 It can not be used for standard type.

*3 Please refer to the collaboration catalog for the corresponding scale maker and part number.

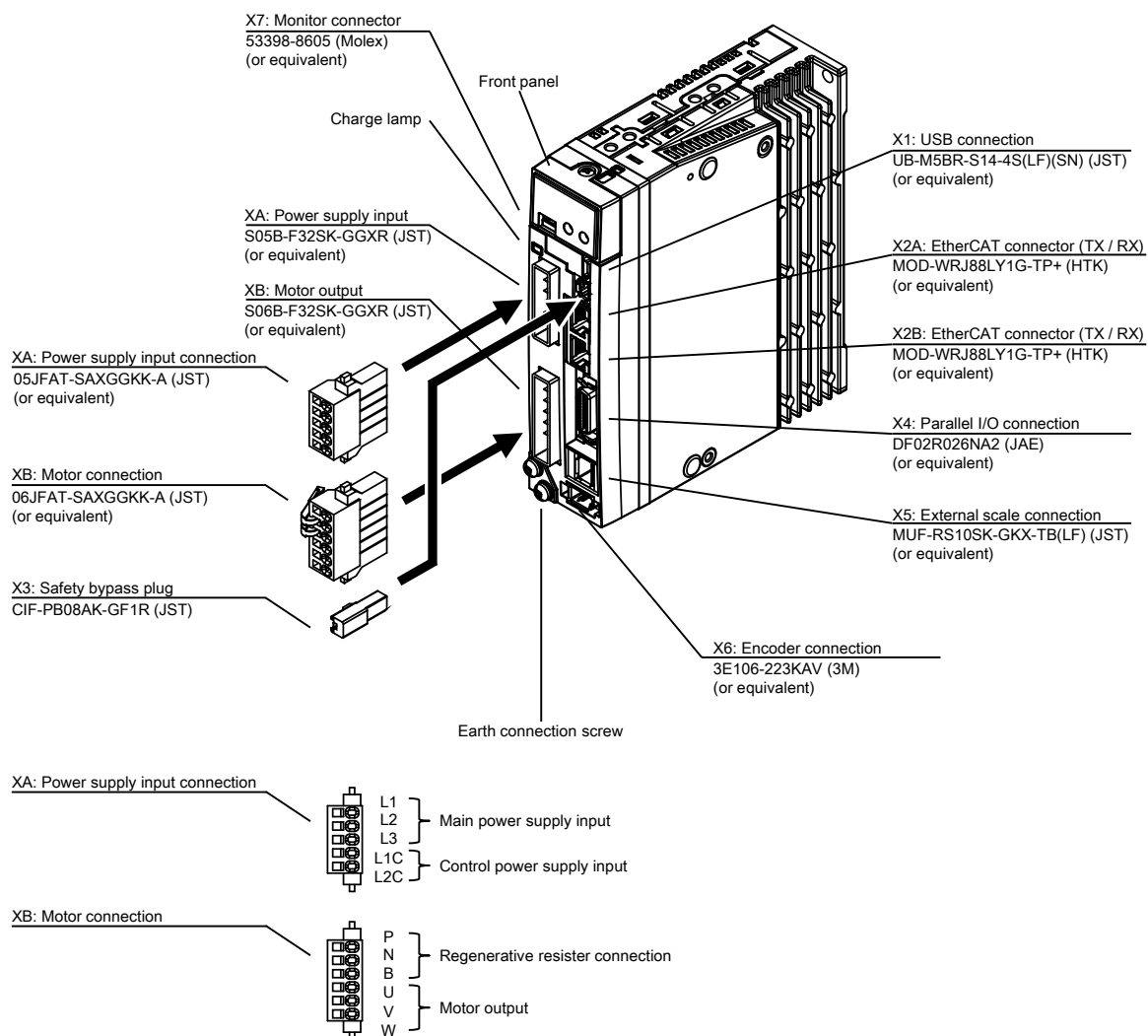
*4 Do not use wireless LAN dongle outside the usable country because it becomes a violation of laws and regulations.

For details of functions and available countries, please check our website

5. Appearance and name of each part

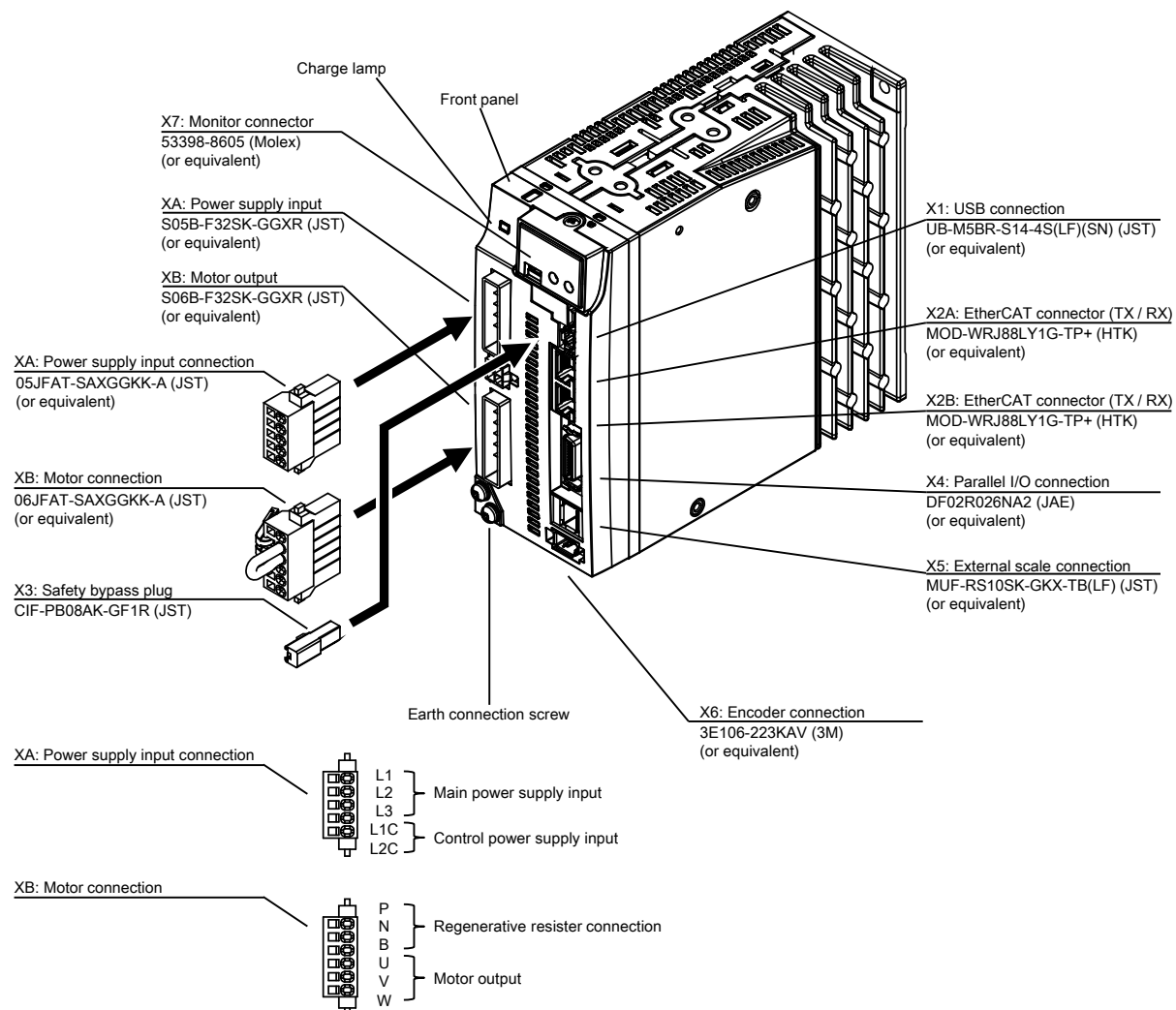
Each size in the figures shows a multi-function type. The standard type is not provided with X3 (safety function connector/safety bypass plug) and X5 (external scale connector).

100 V / 200 V system sizes A and B



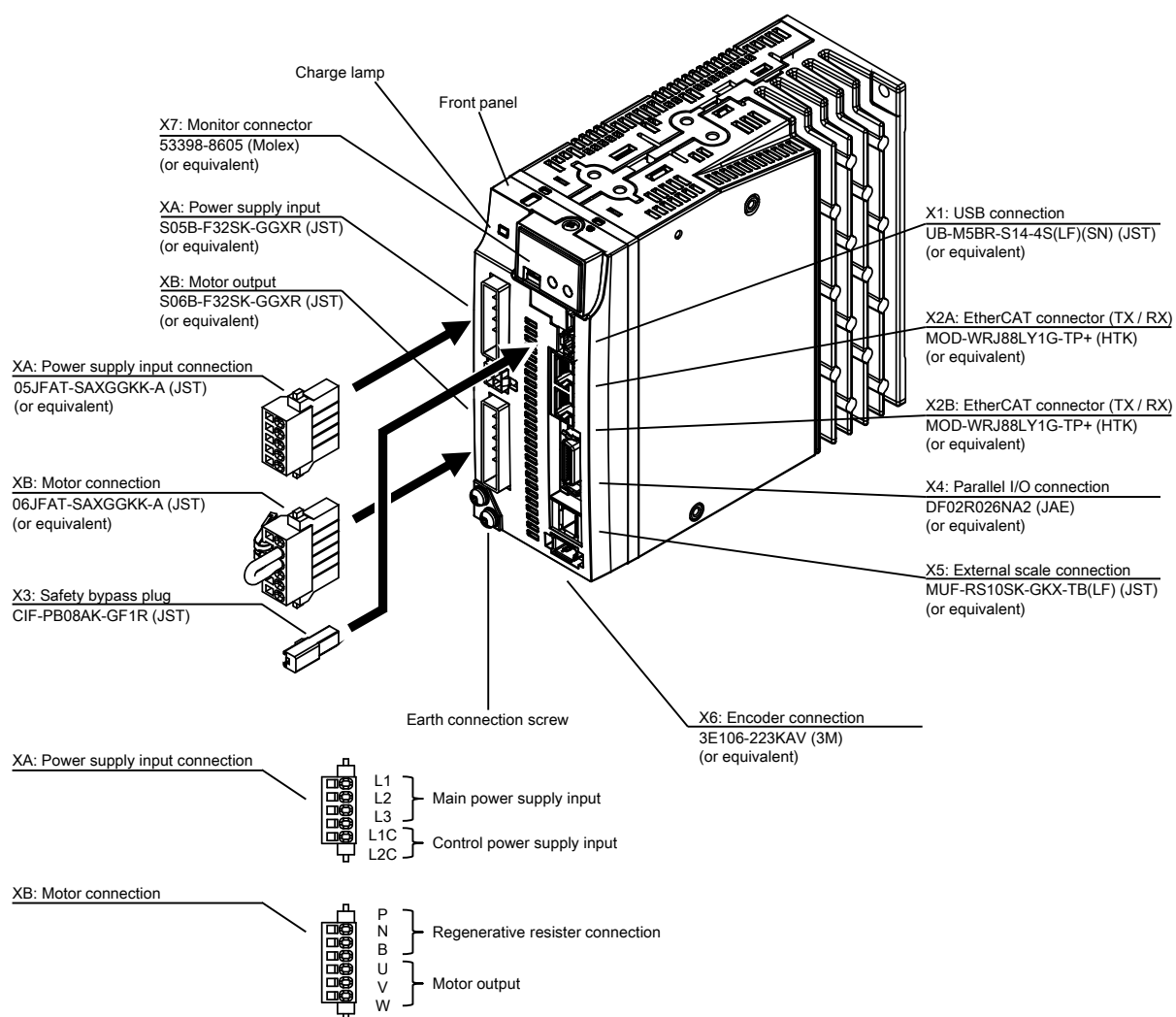
*Remove the safety bypass plug when wiring to X3.

100 V / 200 V system sizes C and D



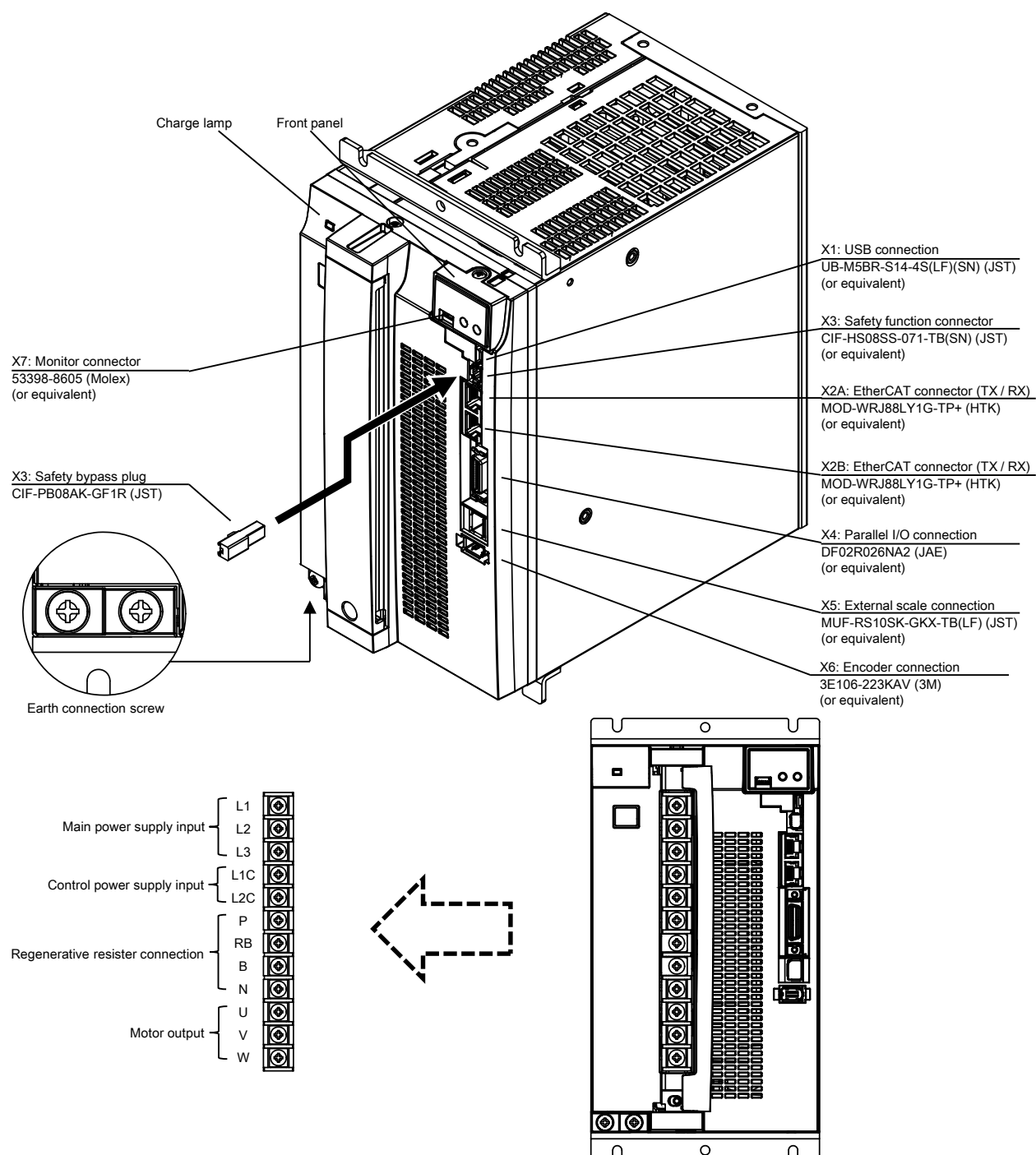
*Remove the safety bypass plug when wiring to X3.

200 V system size E



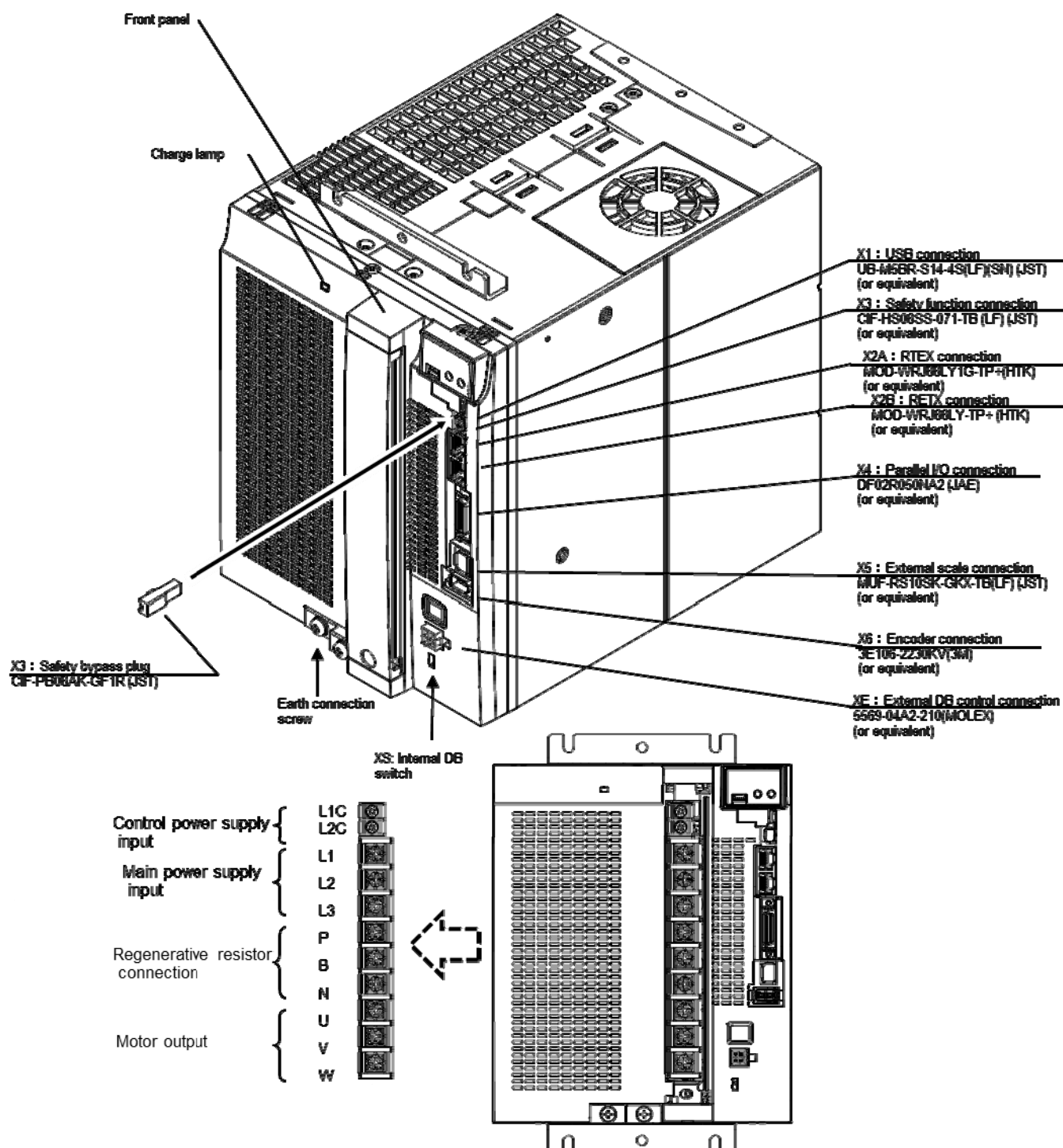
*Remove the safety bypass plug when wiring to X3.

200 V system size F



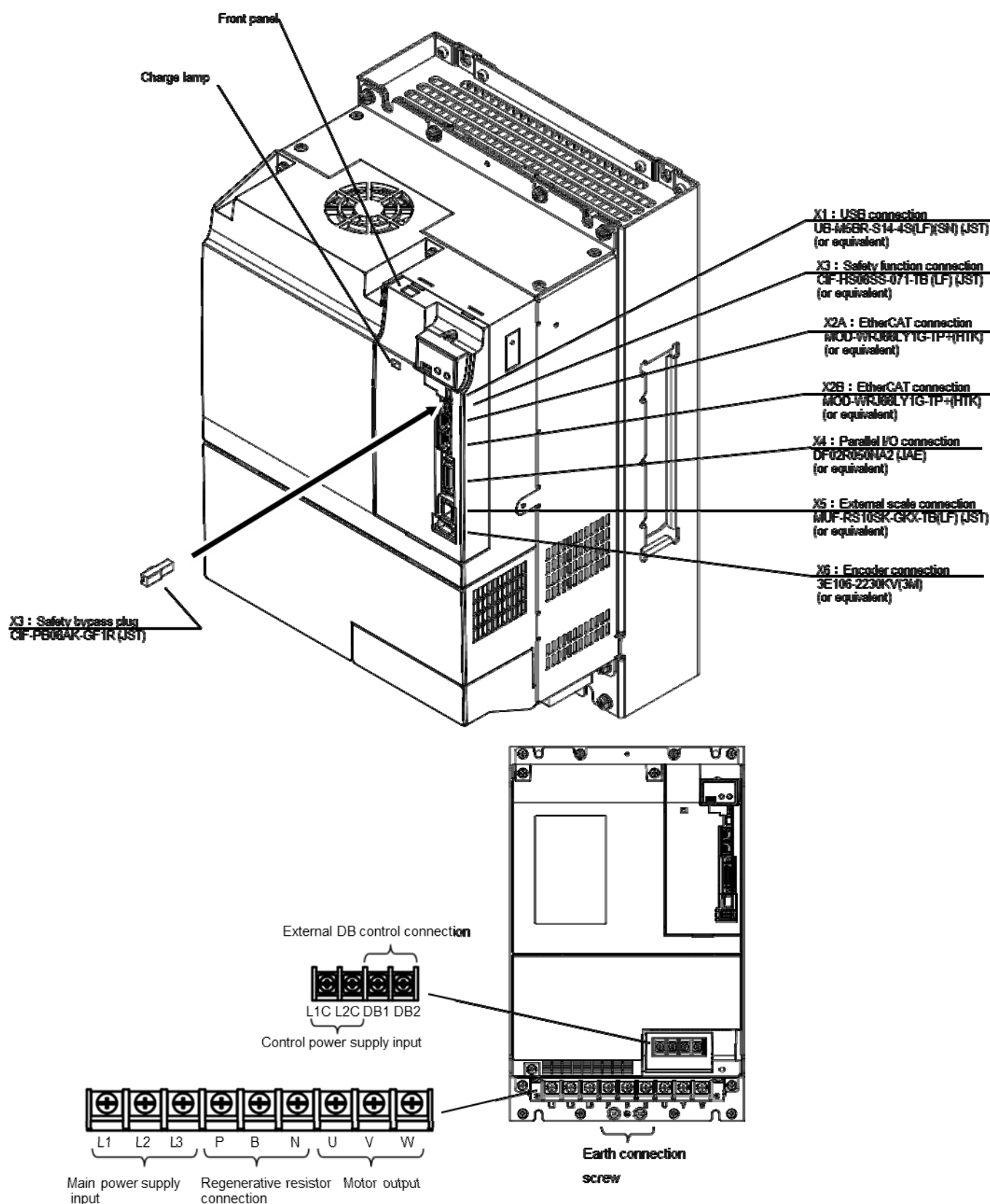
*Remove the safety bypass plug when wiring to X3.

Size G 200V



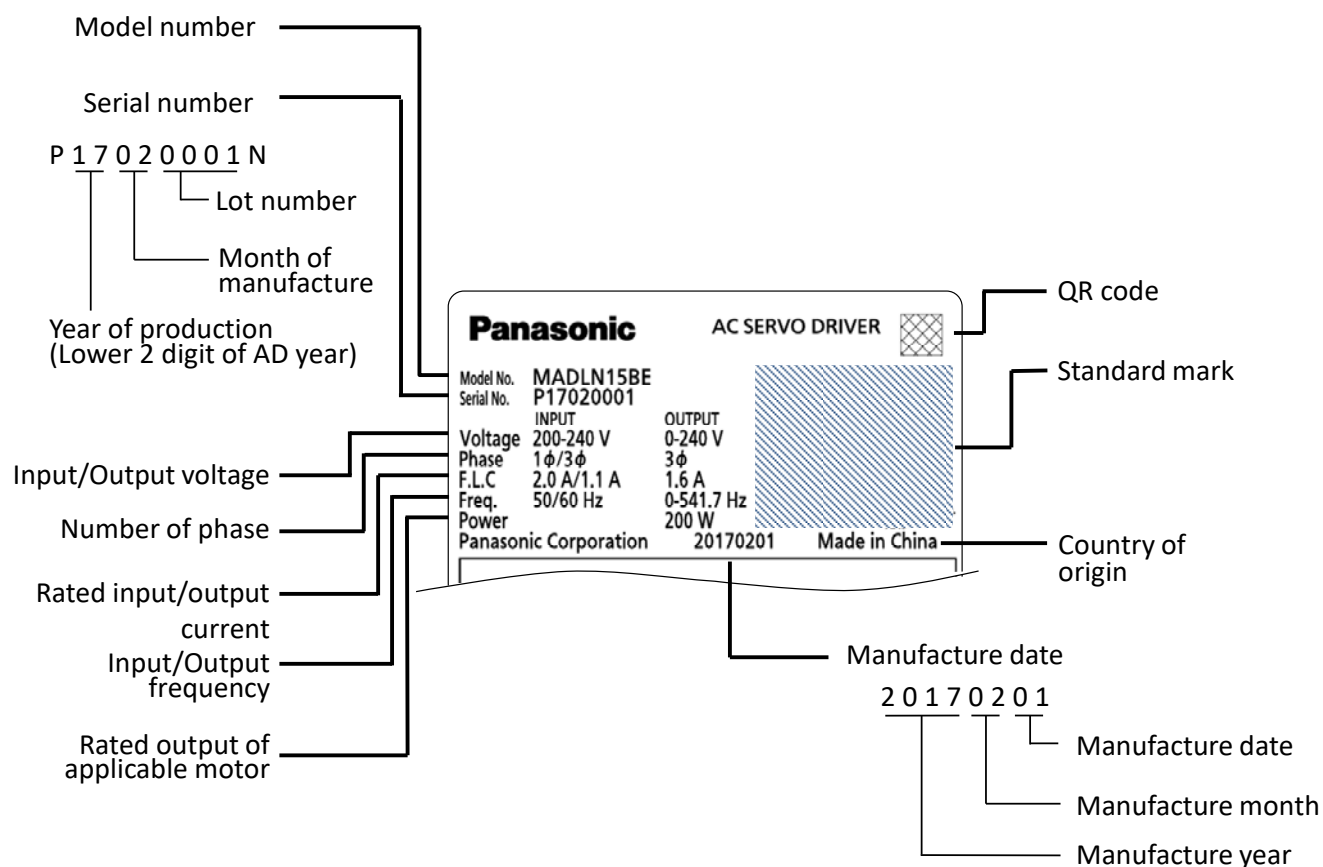
*Remove the safety bypass plug when wiring to X3.

Size H 200V



*Remove the safety bypass plug when wiring to X3.

Example of a rating plate



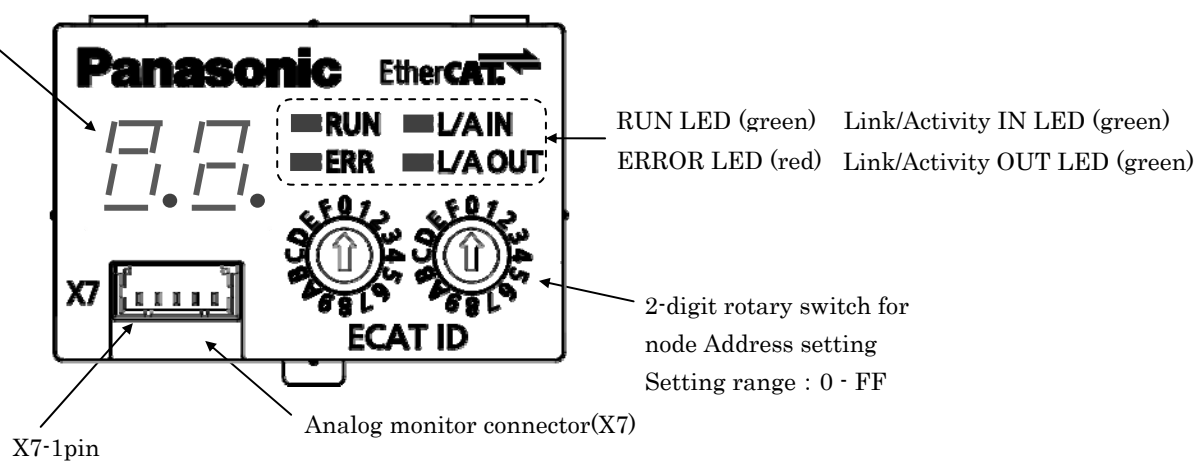
The values of the serial number part of the manufacturing number range from 1 to 33999. On the rating plate, it is indicated in four digits as in the format shown below.

“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

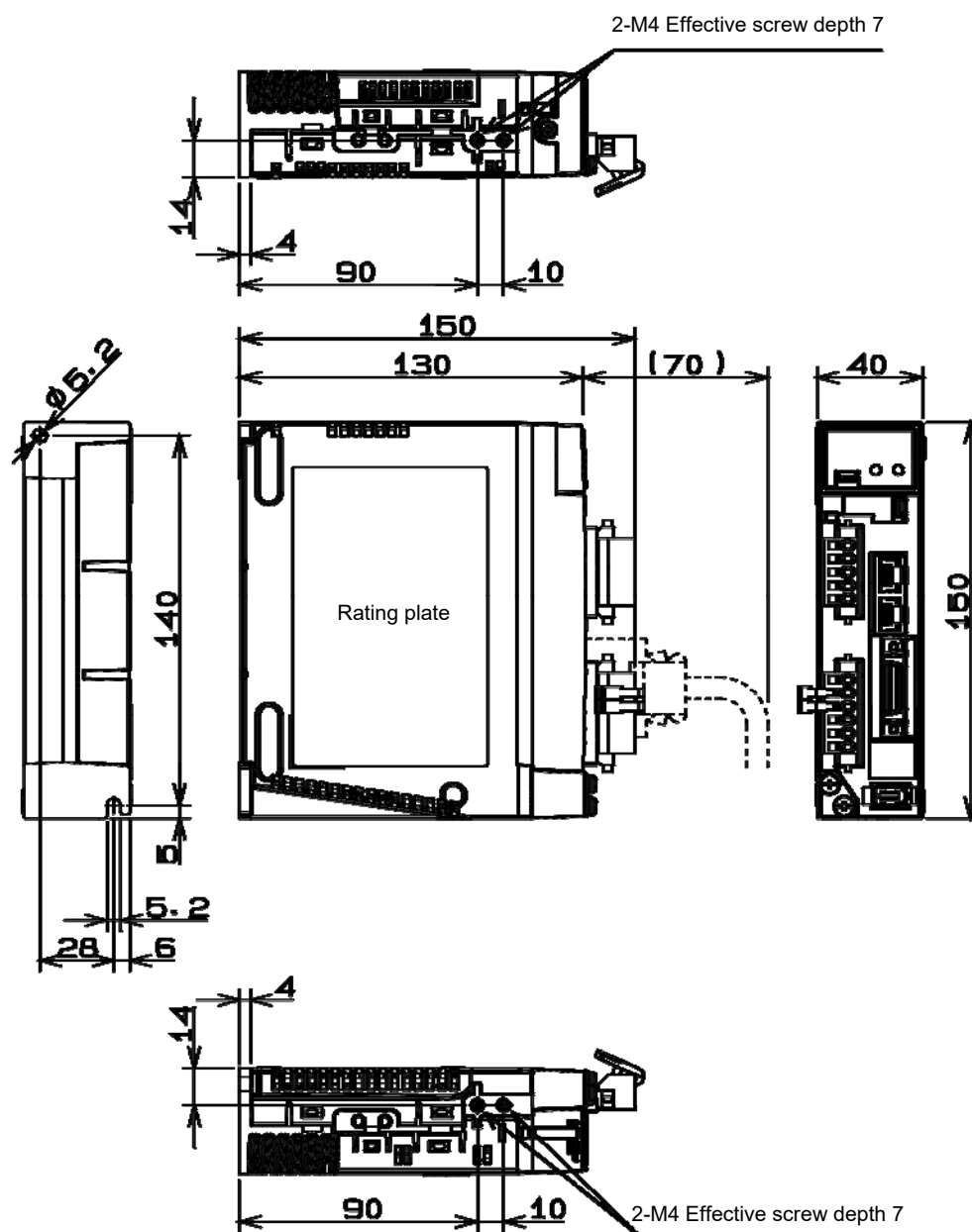
2-digit 7-segment LED



6. Dimensions

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

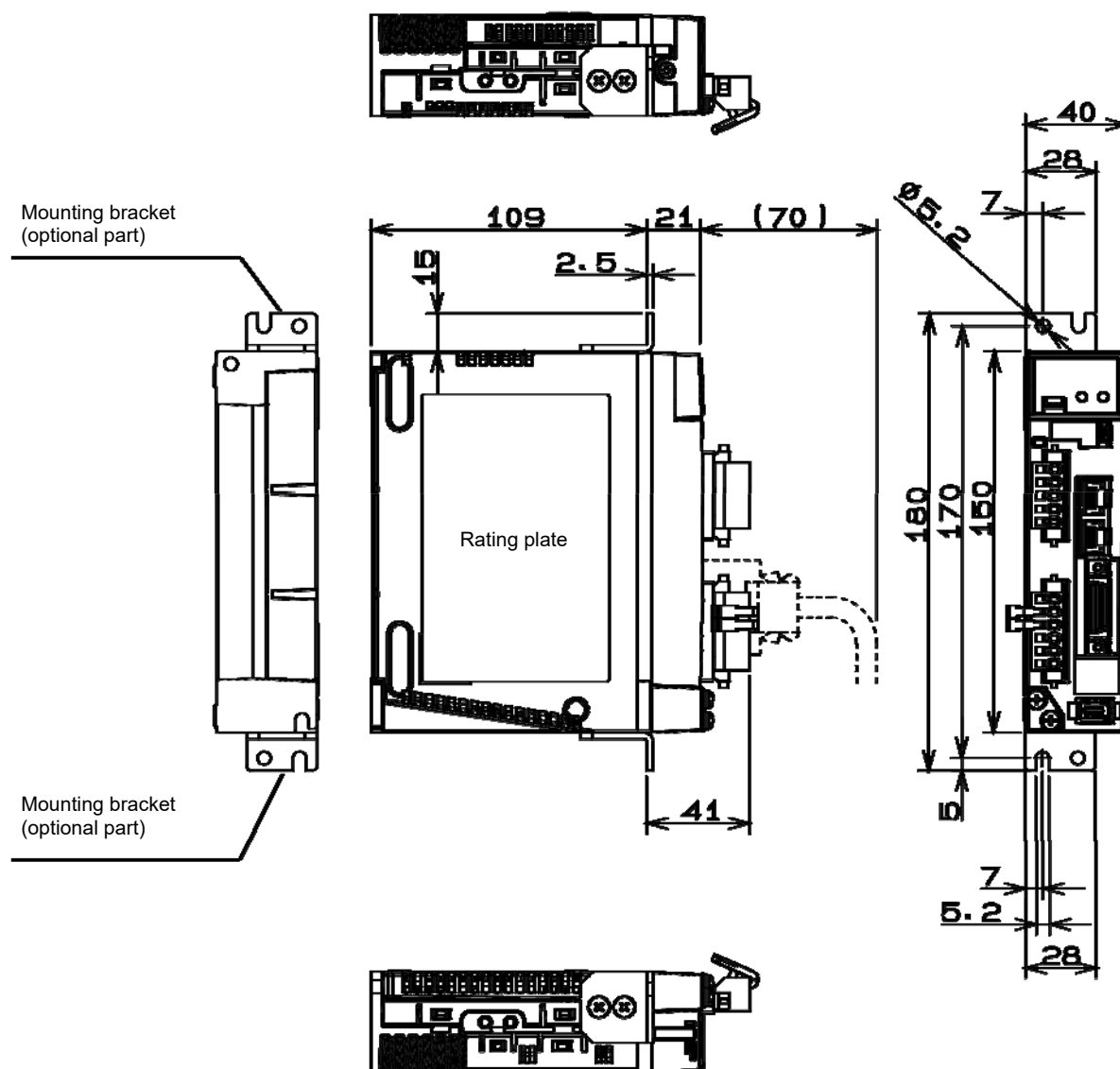
100 V /200 V system size A



Unit: mm

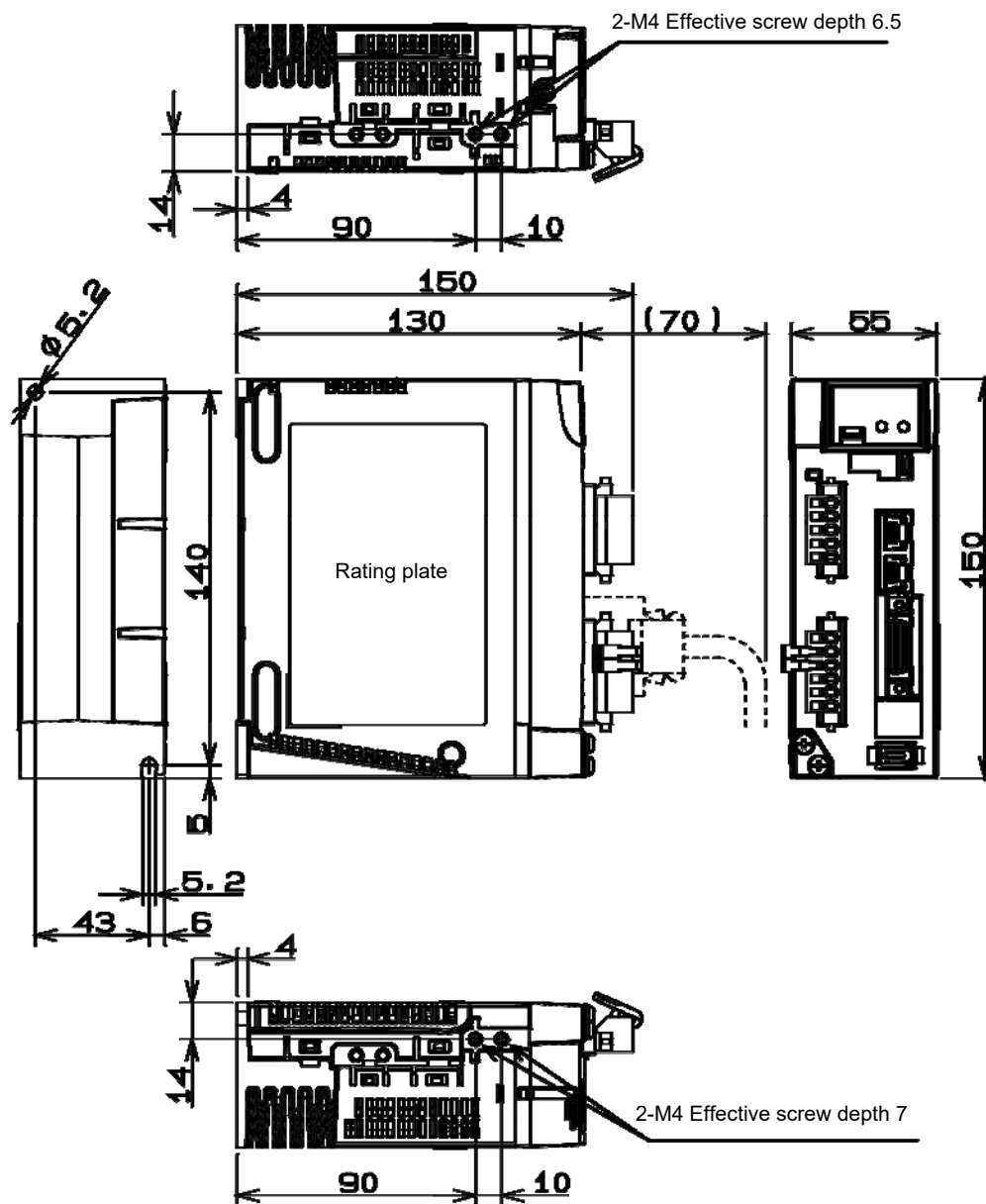
* Do not use threaded screw holes that do not have description of dimensions.

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



- * 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.

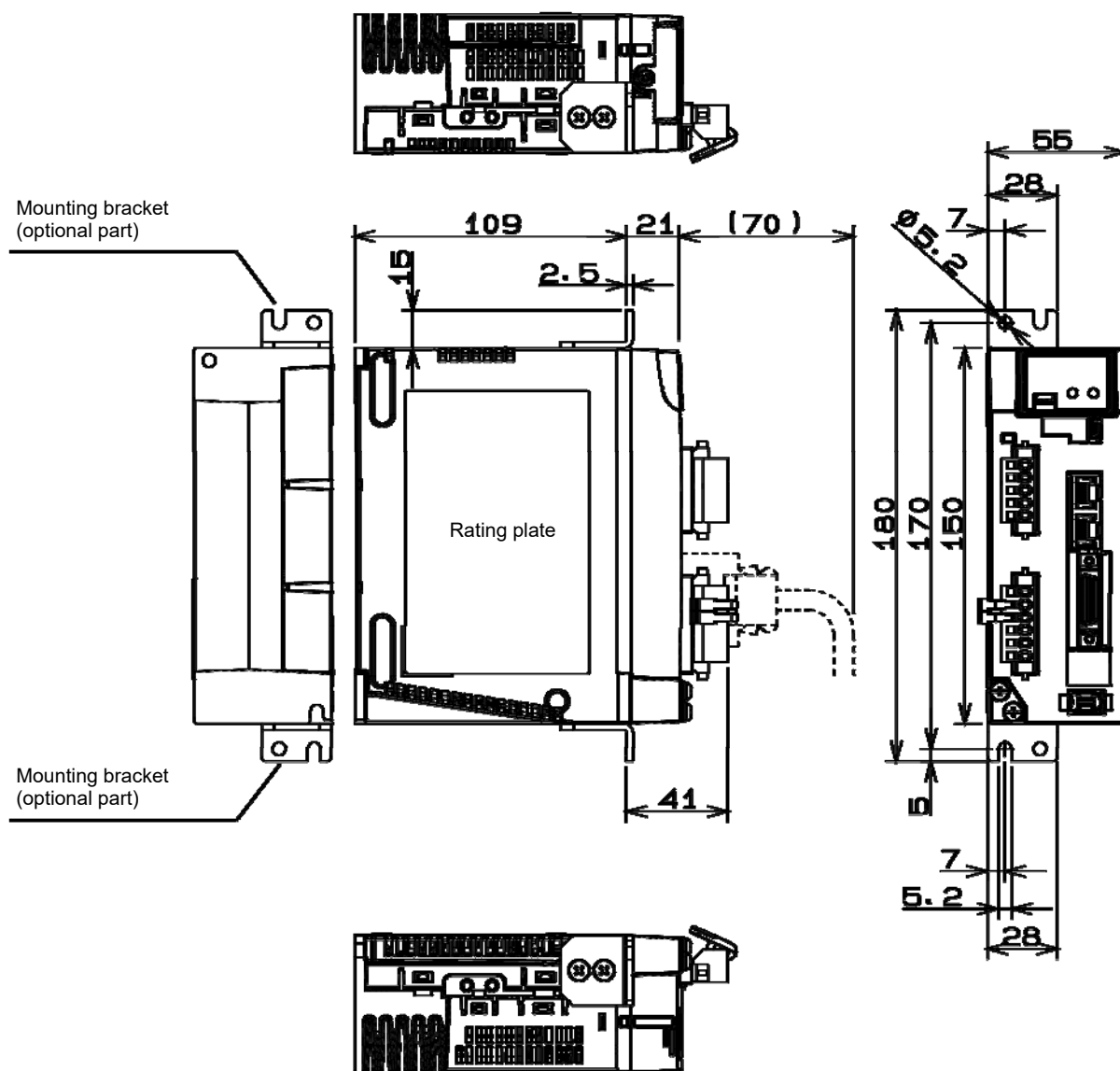
100 V / 200 V system size B



Unit: mm

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

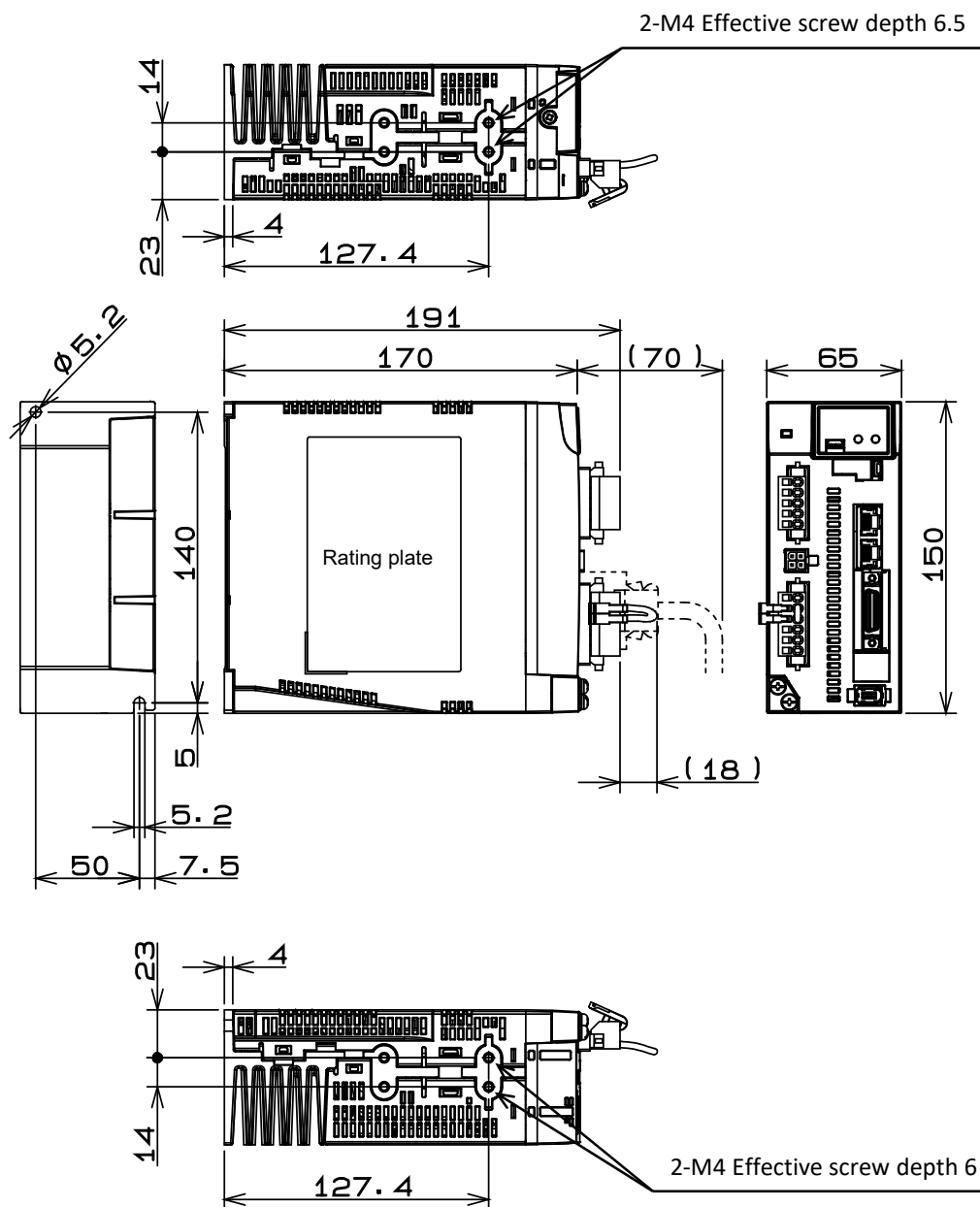
[Rack mount installation (by using optional parts: to be installed on the front)]



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.

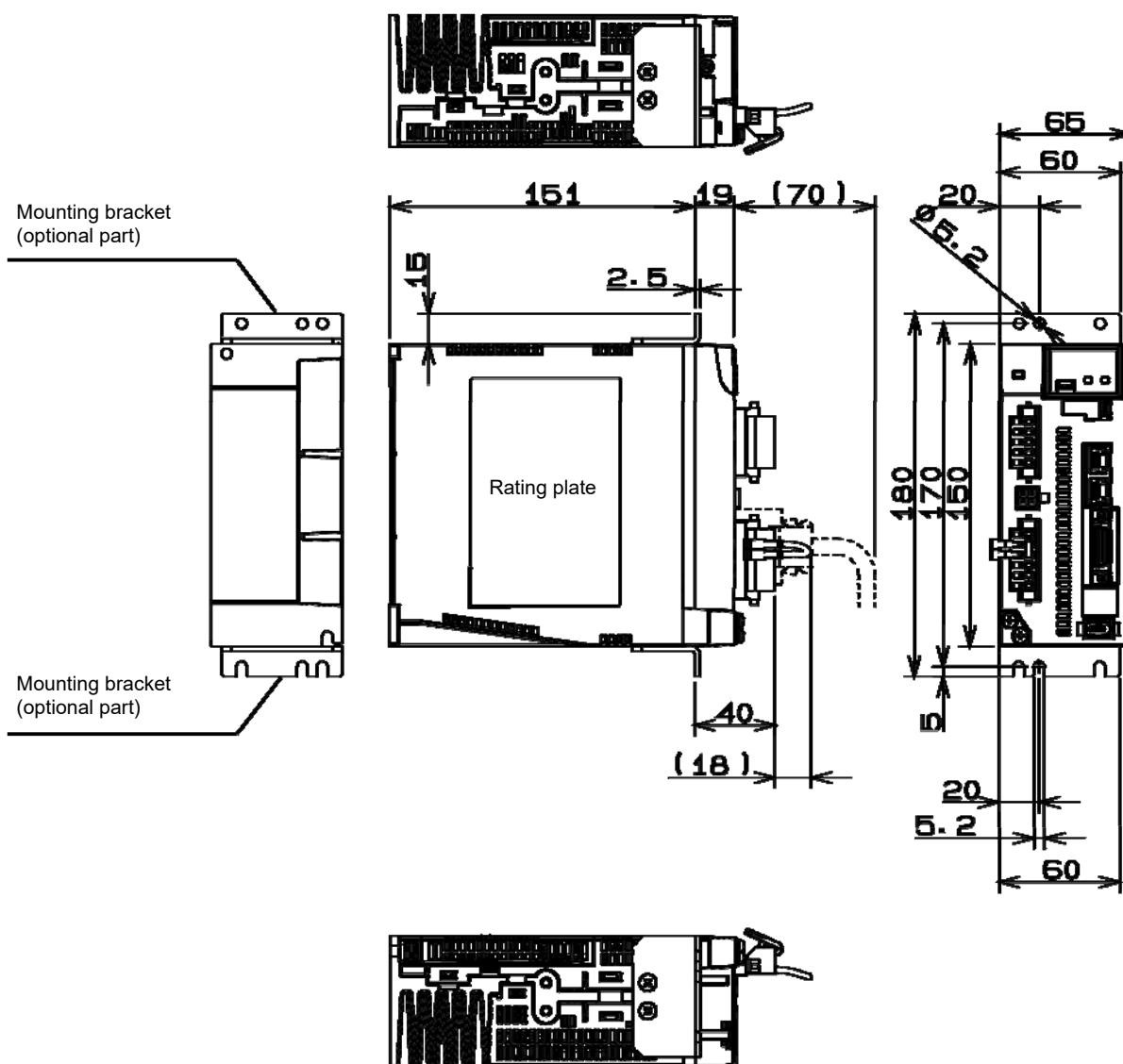
100 V / 200 V system size C



Unit: mm

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

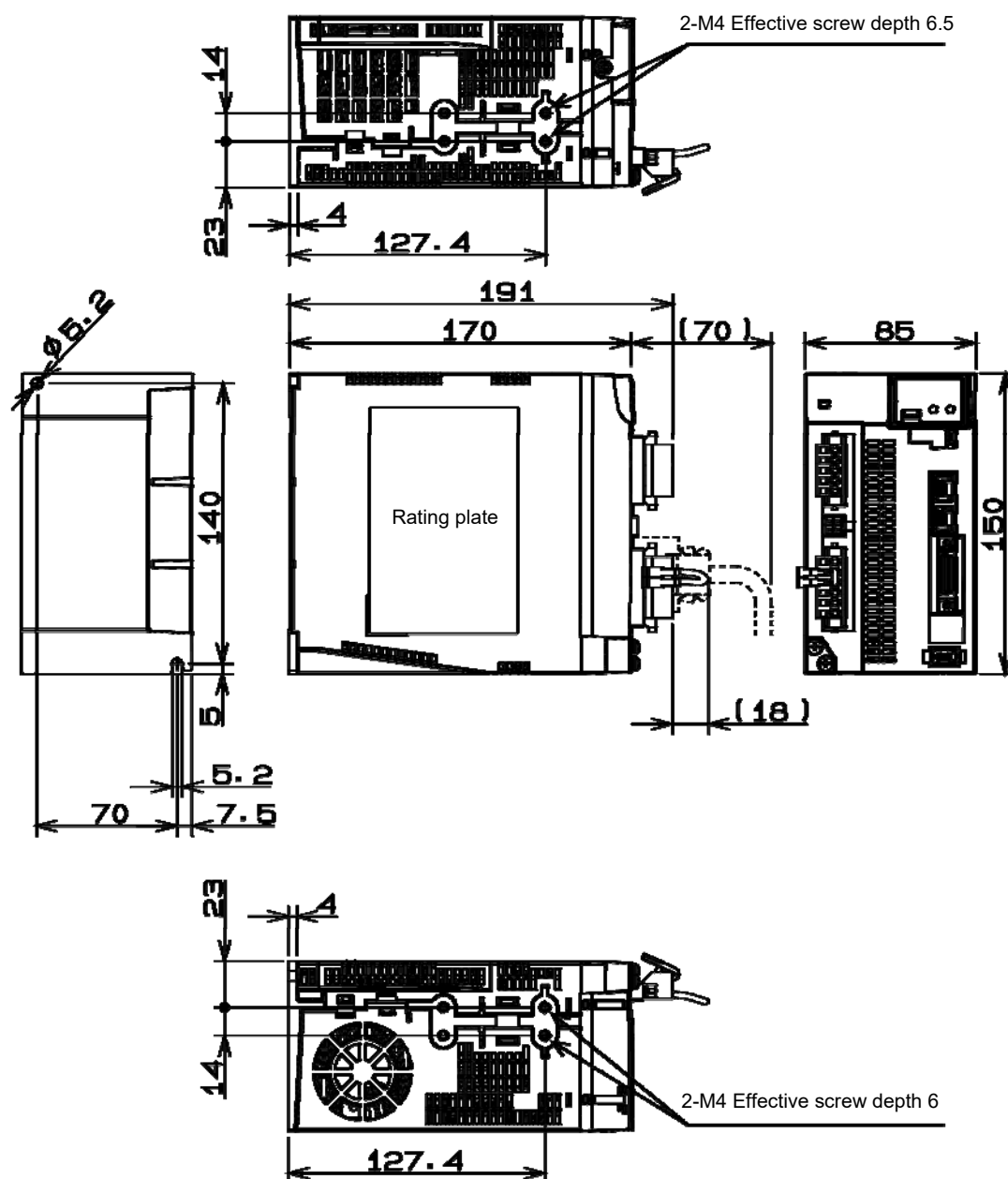
[Rack mount installation (by using optional parts: to be installed on the front)]



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.

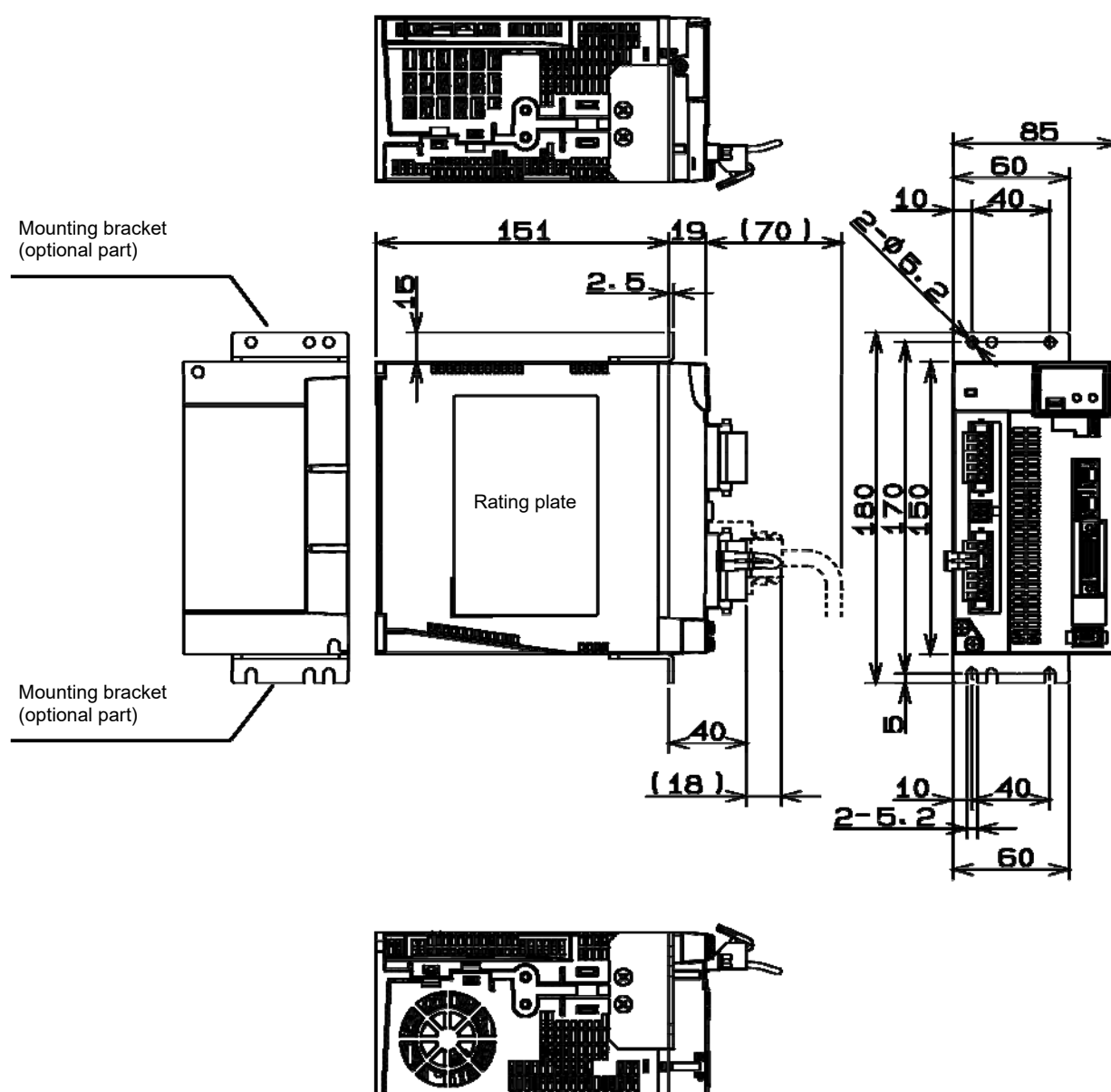
200 V system size D



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)]

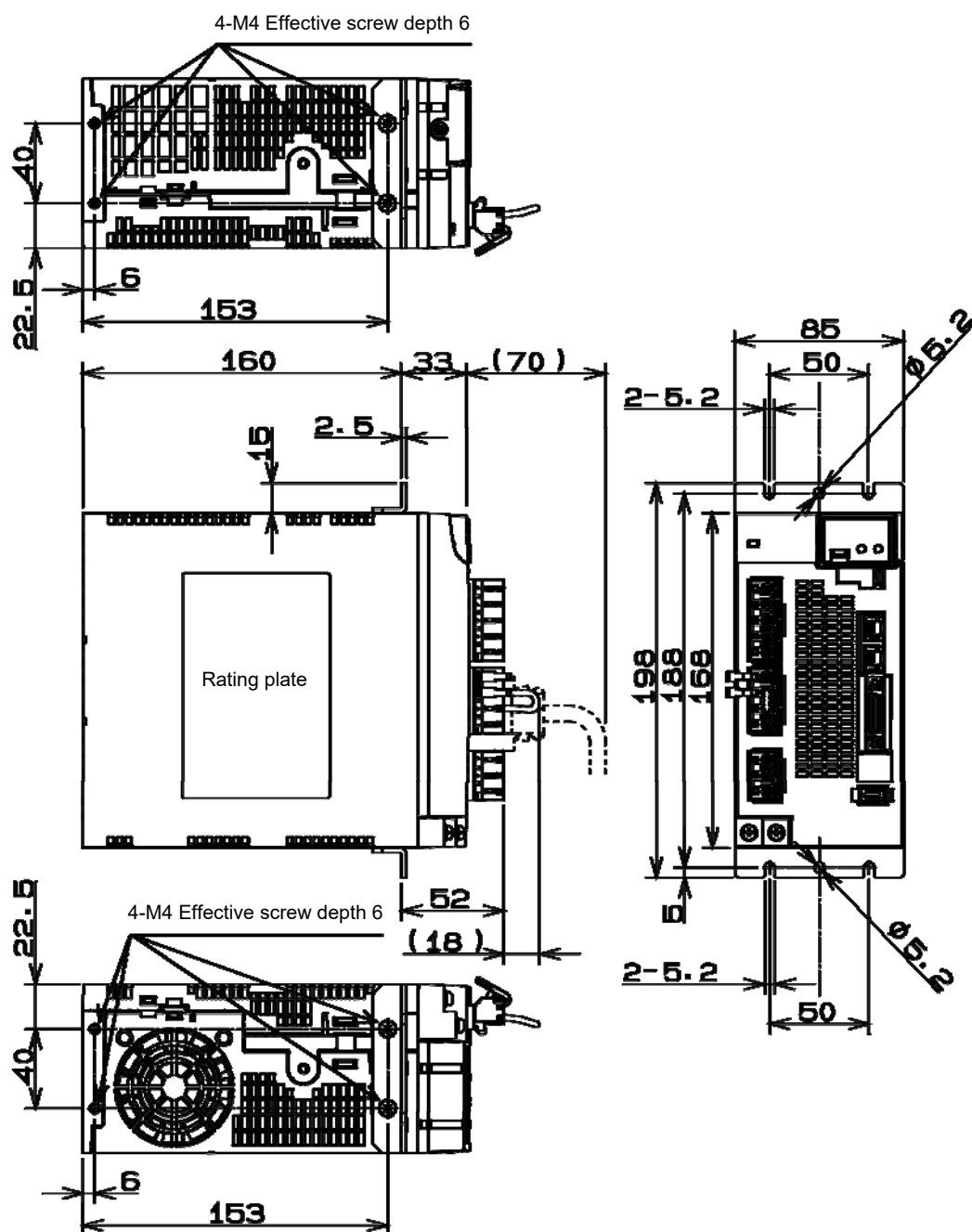


Unit: mm

- * 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

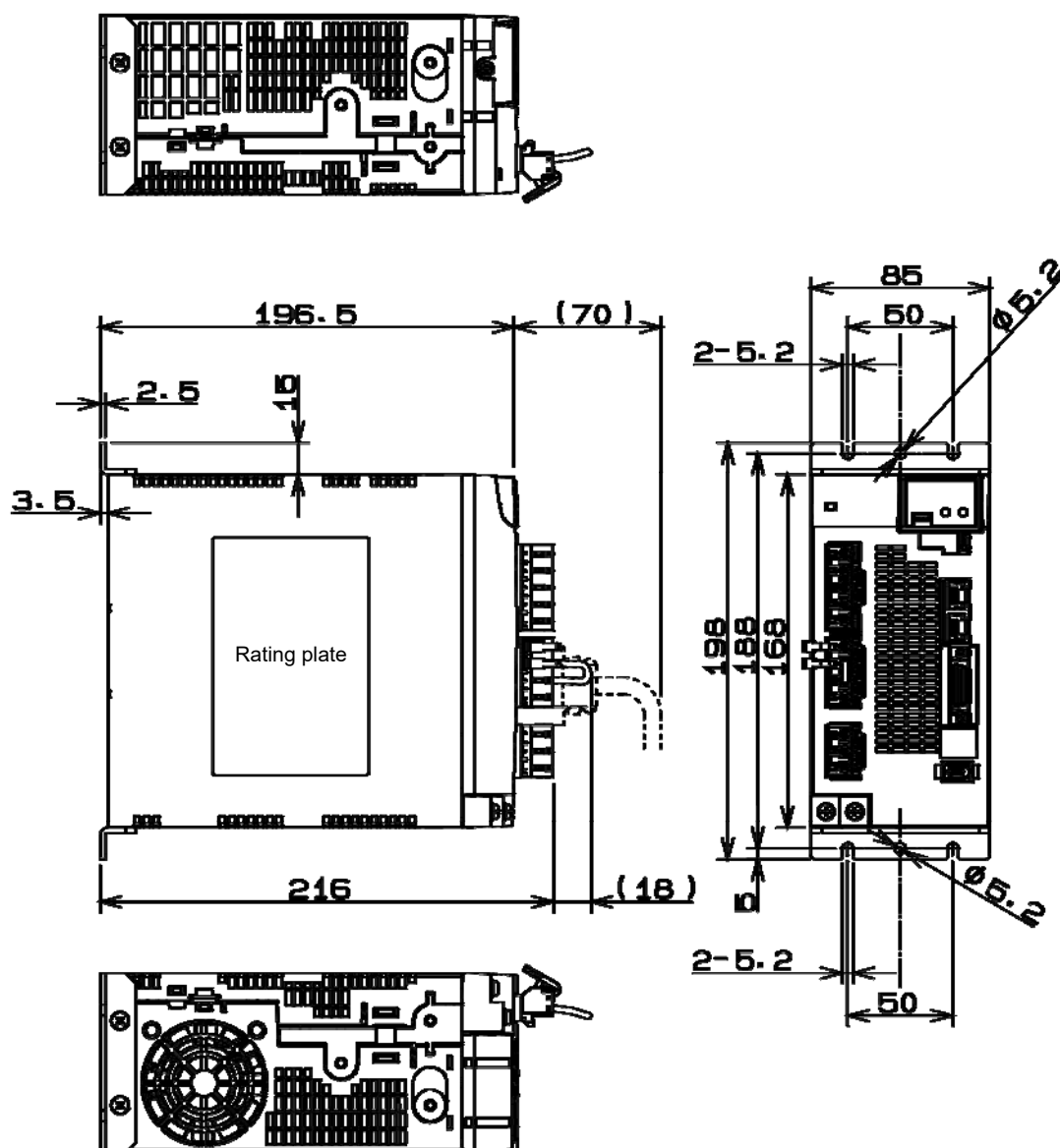
[Rack mount installation (standard: to be installed on the front)]



Unit: mm

- * Do not use threaded screw holes that do not have description of dimensions.
- * When installing the driver, please fix it with 4 U-shaped cutouts of the mounting bracket.

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



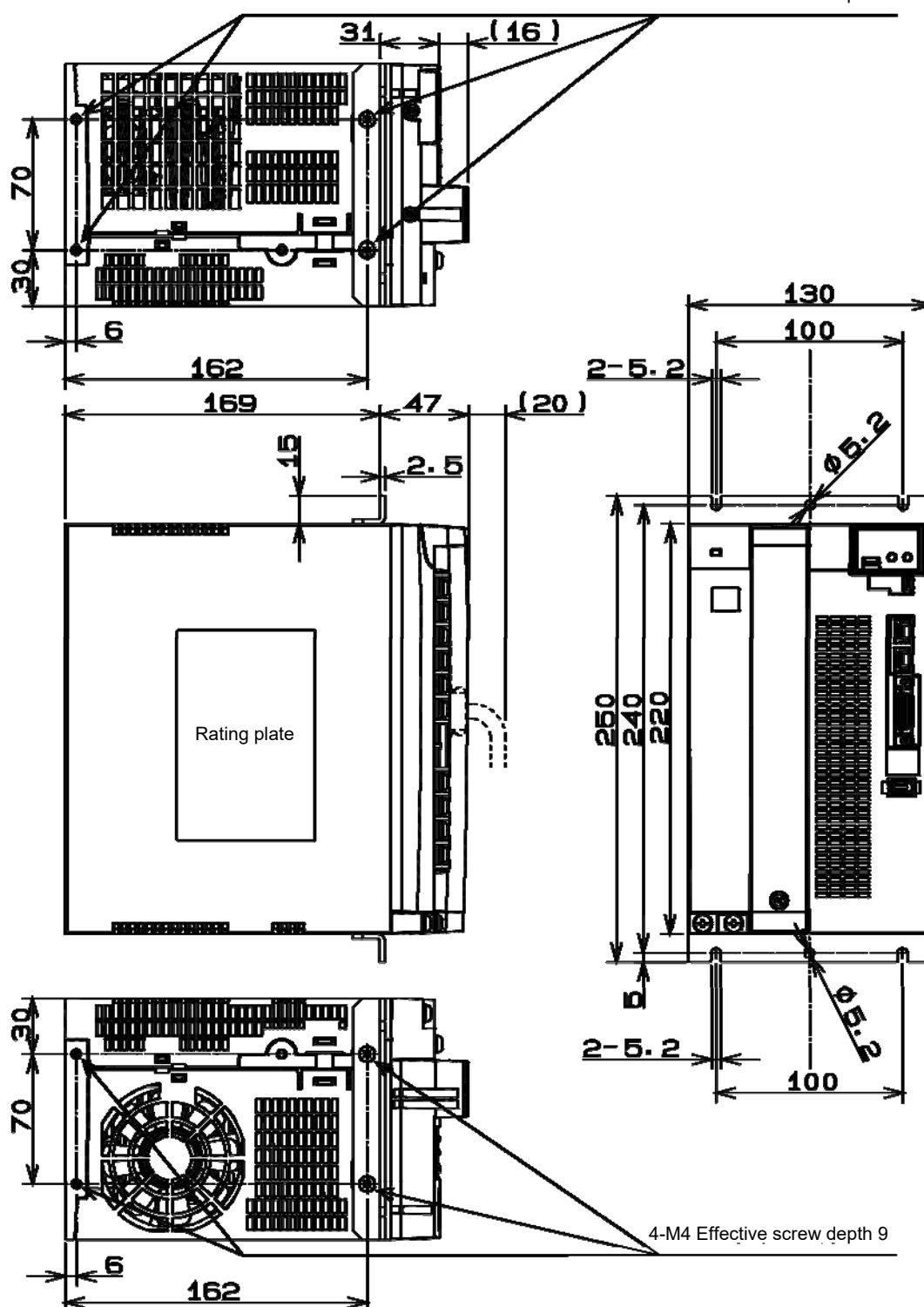
Unit: mm

- * Do not use threaded screw holes that do not have description of dimensions.
- * When installing the driver, please fix it with 4 U-shaped cutouts of the mounting bracket.

200 V system size F

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

4-M4 Effective screw depth 9



Unit: mm

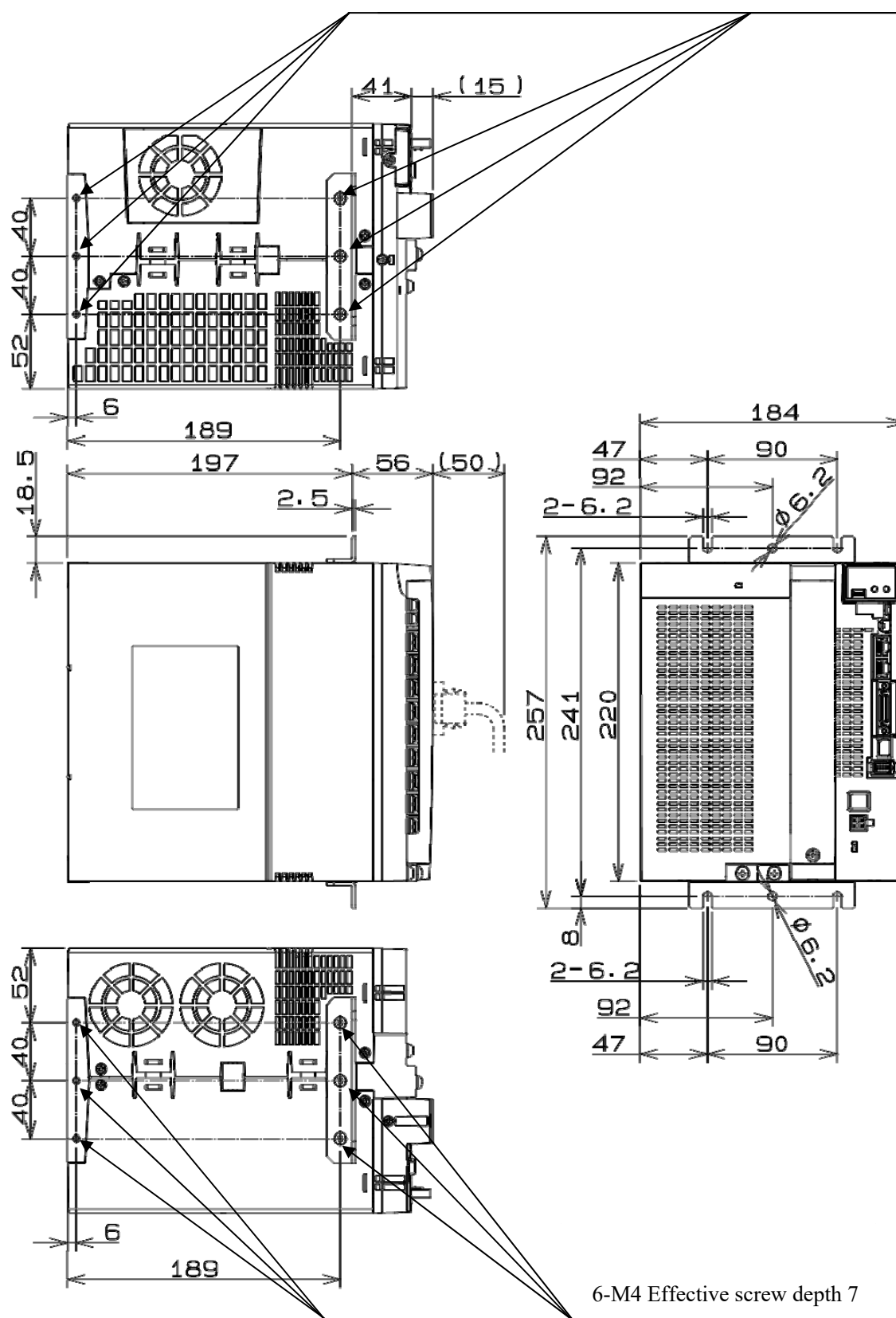
* Do not use threaded screw holes that do not have description of dimensions.

* When installing the driver, please fix it with 4 U-shaped cutouts of the mounting bracket.

200 V system Size G

[Rack-mounting TYPE (Standard)]

6-M4 Effective screw depth 7



6-M4 Effective screw depth 7

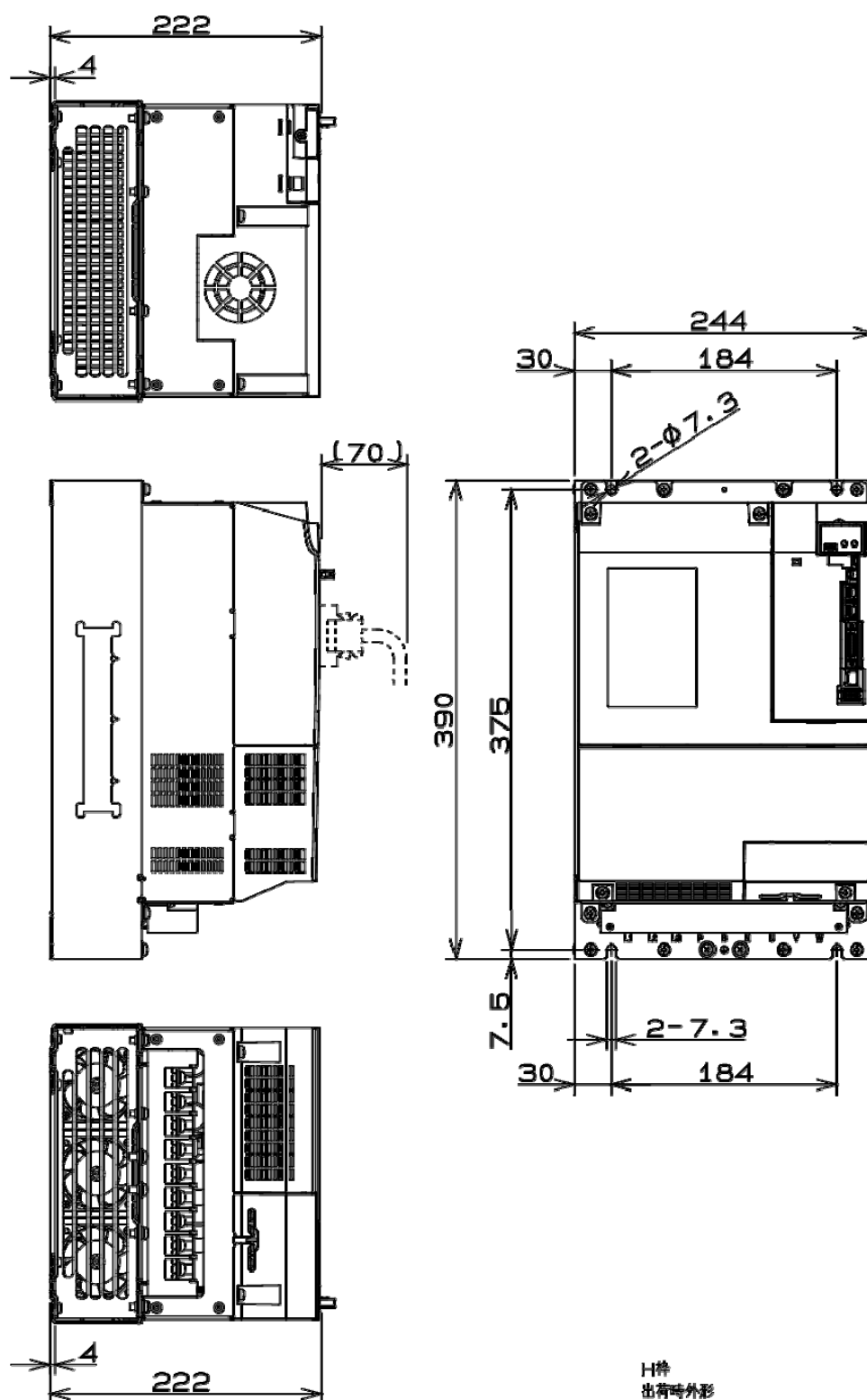
Unit[mm]

*Please do not use the screw holes of no description of the size value.

*When installing the driver, please fix it with 4 U-shaped cutouts of the mounting bracket.

200 V system Size H

[Base-mounting TYPE (Standard)]



Unit[mm]

*Please do not use the screw holes of no description of the size value.

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.
	3	L3			For single-phase, the connector should be connected to the L1 and L3 terminals.
	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	- 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 -". - Do not connect anything to the N terminal.	
	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			
			Earth	It is connected with the E terminal of the motor to establish grounding.	

*Tighten the Earth screw with a torque of M4: 1.0 to 1.2 N · m, M5: 1.8 to 2.0 N · m.

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.	

*Tighten the Earth screw with a torque of M4: 1.0 to 1.2 N · m, M5: 1.8 to 2.0 N · m.

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	• 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 -”. • Do not connect anything to the N terminal.	
	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.	

*Tighten the Earth screw with a torque of M4: 1.0 to 1.2 N · m, M5: 1.8 to 2.0 N · m.

200 V system size F

Use terminal blocks.

	Terminal block No. (From above)	Symbol	Name	Description
Terminal block	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	- 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 -".
	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 1.0 to 1.2 N · m for M4 screws, 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.

Size G 200 V

Terminal

	Terminal No. (Upper to bottom)	Symbol	Name	Description
Upper	1	L1C	Control power supply input	Single phase 200 - 240 V + 10 % - 15 % 50/60 Hz input
	2	L2C		
Lower	1	L1	Main power supply input	3 phase 200 - 240 V + 10 % - 15 % 50/60 Hz input
	2	L2		
	3	L3		
	4	P	Regen resistor connection	•To use an external regenerative resistor (customer prepared), connect an external regenerative resistor between P terminal and B terminal. Then, specify the external regenerative resistor for the parameter. For details, refer to "Technical Data -Functional Specification-" • Do not connect N terminal.
	5	B		
	6	N		
	7	U	Motor connection	Connect each phase of the motor winding. U: U phase V: V phase W: W phase
	8	V		
	9	W		
			Earth	Earth terminal for grounding

Connector

	Pin No.	Symbol	Name	Description
XE	1	DB1	External Dynamic brake Control connection	· This is a terminal for controlling the electromagnetic contactor (MC) for external dynamic brake resistor (customer preparation). Please connect if necessary. · The applied voltage between DB1 and DB2 must be AC 300 V or less, DC 100 V or less
	2	DB2		

*Tighten the grounding screw with a torque of M5: 1.4 to 1.6 N · m

*Tighten the terminal block (control power) screw with a torque of M4: 0.7 to 1.0 N · m.

If the tightening torque exceeds the maximum value, the terminal block may be damaged.

*Tighten the screw base (main power supply, regenerative resistance, motor) screw with torque of M5: 2.0 to 2.4 N · m.

If the tightening torque exceeds the maximum value, the terminal block may be damaged

*Tighten the terminal screw cover fixing screw with torque of M3: 0.19 to 0.21 N · m.

If it exceeds the maximum value of tightening torque, it may be damaged.

Size H 200 V

	Terminal No. (Upper to bottom)	Symbol	Name	Description
Upper	1	L1C	Control power supply input	Single phase 200 - 240 V $+10\%$ -15% 50/60 Hz input
	2	L2C		
	3	DB1	External Dynamic brake Control connection	- This is a terminal for controlling the electromagnetic contactor (MC) for external dynamic brake resistor (customer preparation). Please connect if necessary. - The applied voltage between DB1 and DB2 must be AC 300 V or less, DC 100 V or less
	4	DB2		
Lower	1	L1	Main power supply input	3phase 200 - 240 V $+10\%$ -15% 50/60 Hz input
	2	L2		
	3	L3		
	4	P	Regen resistor connection	- To use an external regenerative resistor (customer prepared), connect an external regenerative resistor between P terminal and B terminal. Then, specify the external regenerative resistor for the parameter. For details, refer to "Technical Data -Functional Specification-" - Do not connect N terminal.
	5	B		
	6	N		
	7	U	Motor connection	Connect each phase of the motor winding. U: U phase V: V phase W: W phase
	8	V		
	9	W		
			Earth	Earth terminal for grounding

*Tighten the grounding screw with a torque of M6: 2.4 to 2.6 N · m.

*Tighten the terminal block (upper side: control power supply, dynamic brake) screws with M4: torque of 0.7 to 1.0 N · m.

If the tightening torque exceeds the maximum value, the terminal block may be damaged.

*Tighten the terminal block (lower side: main power supply, regenerative resistance, motor) screw with torque of M2: 2.2 to 2.5 N · m. If the tightening torque exceeds the maximum value, the terminal block may be damaged.

*Tighten the fixing screw of terminal block cover 1 (transparent) with torque of M3: 0.19 to 0.21 N · m.

*Tighten the fixing screw of the terminal block cover 2 (black) with a torque of M5: 2.0 to 2.5 N · m.

7-2 USB connector

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	• Used for communication with a PC or a controller.
	D-	2	
	D+	3	
For manufacturer	-	4	• Do not connect anything.
Signal ground	GND	5	• Signal ground

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.	-

In order to set the safety level to SIL 3, PL e, DCavg Medium, diagnosis by EDM output is required (diagnosis interval is up to 3 months).

Safety levels are SIL 2, PL d, DCavg Low when diagnosis by EDM output is not performed.

7-5 Parallel I/O connector **X4****Input signal**

Name	Symbol	Pin No.	Description	Input/output signal interface
General input common	SI-COM	6	- It is connected with the positive or negative electrode of the external DC power supply (12 - 24 V). - Use 12 V$\pm$5% to 24 V$\pm$5% for power supply. - It needs to be isolated from the primary side power supply. Do not connect with the same power supply. Primary side power supply: Power supply for motor brake	-
Control input 1	SI1	5	- Functions are allocated according to parameters. For details, refer to "Technical Document - Basic Functional Specifications -". - 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.	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	Functions are allocated according to parameters. For details, refer to "Technical Document - Basic Functional Specifications -".	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	- Encoder signals or external scale signals for which frequency division was performed (A-phase, B-phase) are output as differential signals. (Equivalent to RS422) - The division ratio can be set for the corresponding parameter. - The ground of the line driver for the output circuit is connected to the signal ground (GND), i.e. non-insulated. - The maximum output frequency is 4 Mpps (after quad edge evaluation). - It can be used as position compare output by parameter setting. For details, refer to "Technical Document - Basic Functional Specifications -" - This differential signal should be received by a line receiver (AM26C32 or equivalent). Connect a terminating resistor (approx. 330 Ω) between the line receiver inputs. - Use a twisted pair cable with shield for wiring, and connect the shield wire to the connector shell.	Do-1
	OA-/ OCMP1-	18		
B-phase output/ Position comparison Output 2	OB+/ OCMP2+	20		
	OB-/ OCMP2-	19		
Position comparison Output 3	OCMP3+ OCMP3-	21 22		
Signal Ground	GND	16	- Signal ground - Be sure to connect the line receiver ground to this terminal.	-

Battery input for encoder backup

Name	Symbol	Pin No.	Description	Input/output signal interface
Battery input for absolute encoder	BTP-I	14	- Connect to the absolute encoder backup battery. (Recommended item:ER6V 3.6 V manufactured by Toshiba Lifestyle) BTP-I: positive, BTN-I: negative - The power necessary to store multi-turn data is supplied to the absolute encoder via BTP-0 (pin 3) and BTN-0 (pin 4) of encoder connector X6	-
	BTN-I	15	- The battery for the absolute encoder should be connected using any of the following methods. - Direct connection to the motor side - Connection to the encoder cable - Connection to this connector	-

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) (Note4)	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 5 V $\pm$ 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**.

Note 4) Up to 8 Mpps can be received with A / B phase multiplied by 4. However, please note that if the duty ratio of the scale input signal waveform is not 50%, it may not be able to be read normally.

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.

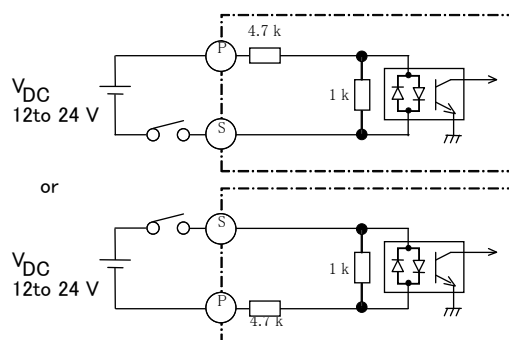
Note 1) The encoder power output E0V is connected with the control circuit ground that is connected to connector **X4** inside the servo driver.

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**

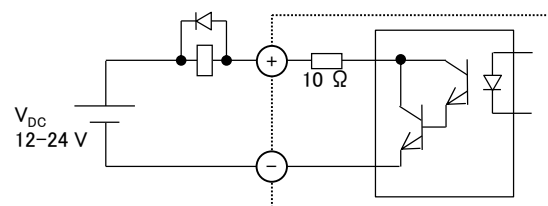
Name	Symbol	Pin No.	Description	Input/output signal interface
Analog monitor output 1	AM1	1	• Analog signals for the monitor are output. • The meaning of the output signal varies depending on the parameter setting.	Ao-1
Analog monitor output 2	AM2	2		
Signal ground	GND	3	• Signal ground	-
Reserved	-	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

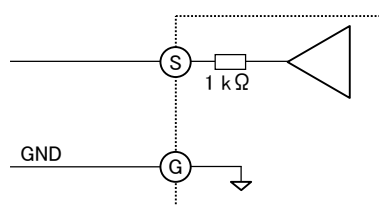
P: (X3) 4,6pin / (X4) 6pin

o-1

+: (X3) 8pin / (X4) 1,3,25pin

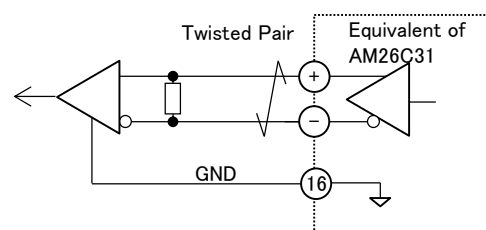
-: (X3) 7pin / (X4) 2,4,26pin

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 ± 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	-	Refer to chapter 14 “specification for each models”
Control power input	L1C,L2C	-	Refer to chapter 14 “specification for each models”
Motor output	U,V,W, 	20 m	Refer to chapter 14 “specification for each models”
Earth wire		-	Refer to chapter 14 “specification for each models”
Encoder connection	X6	20 m	Common shielded twisted pair wire Core wire 0.18 mm ² 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 ² 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 Company
	Shell kit	3E306-3200-008	
X7	Connector	51021-0500	Molex Incorporated
	Terminal	50058-8500	
XE (Note1)	Connector	5557-04R-210	Molex Incorporated
	Terminal	5556PBTL	

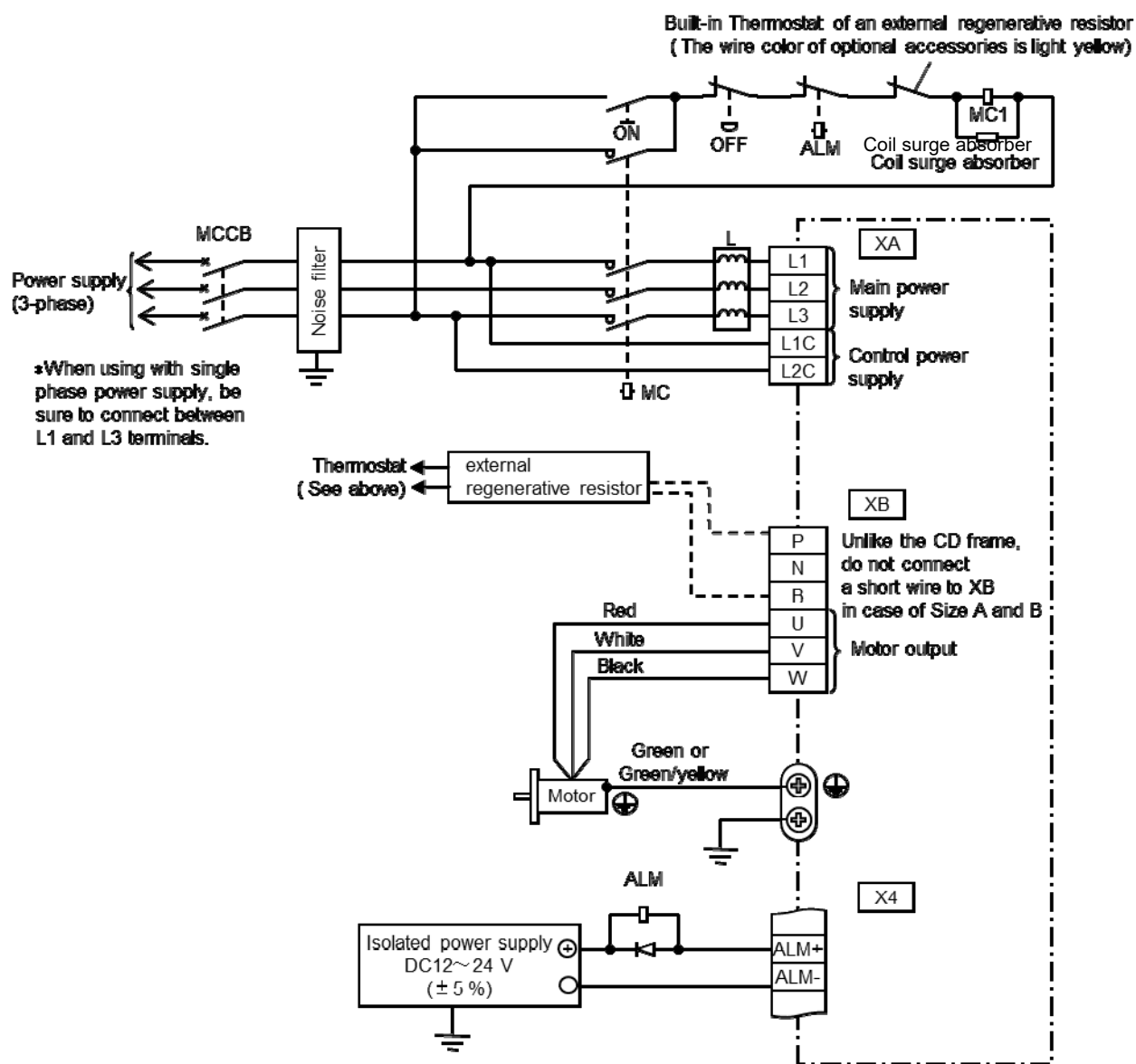
Use the above connector or equivalent.

Note 1) Correspond to Size G only.

8-3 Precautions for wiring

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

100 V / 200 V system sizes A and B



■ 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

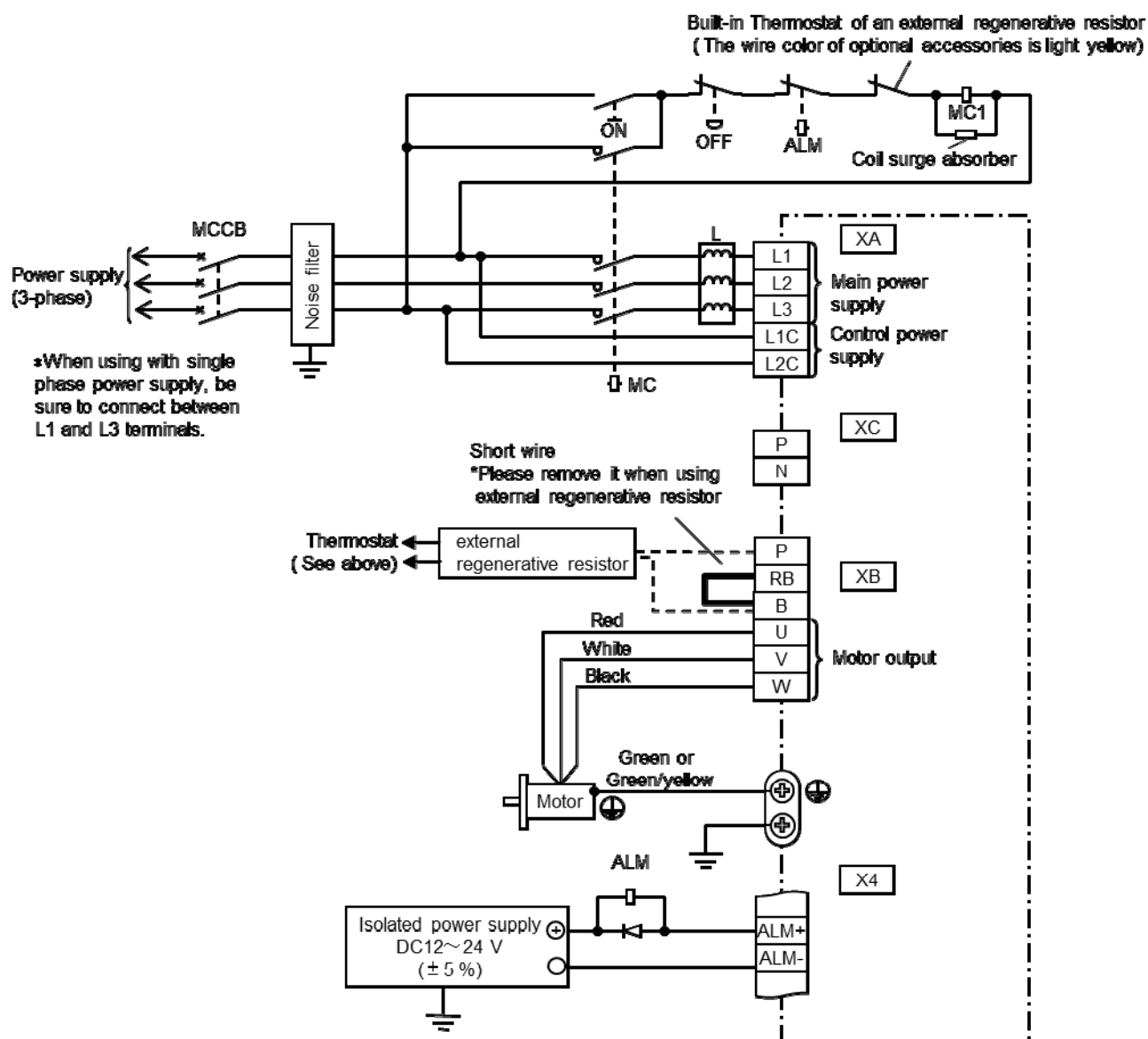
* The circuit connected to terminal X1 – X7 are secondary circuits. (See Page 6)

Insulation is needed against the primary side power supply (power supply of the motor brake).

Please do not connect them with the same power supply.

* For details, refer to 7-1 Power connector XA, XB, XC, and terminal block.

100 V / 200 V system sizes C and D



■ 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.

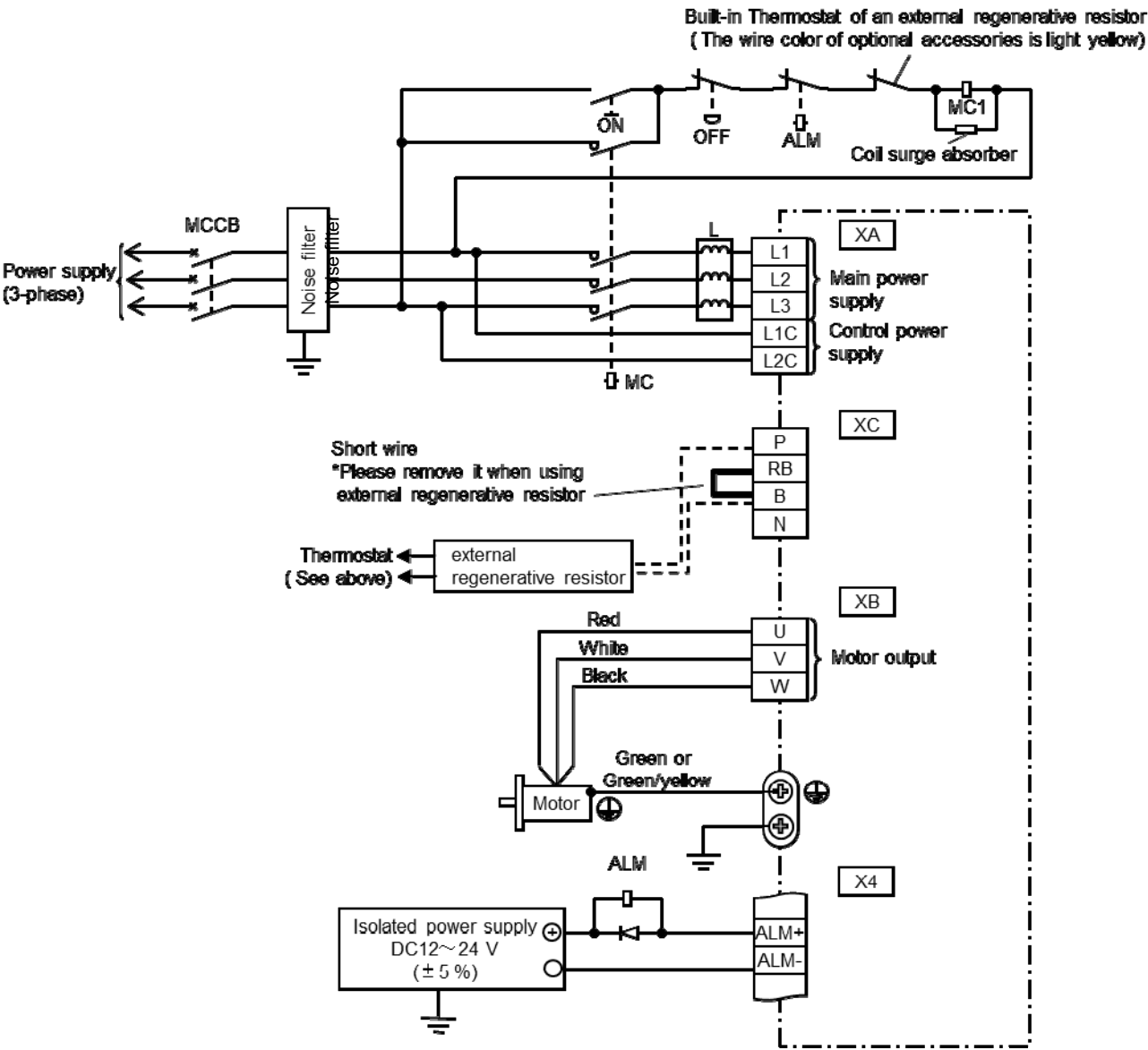
* The circuit connected to terminal X1 – X7 are secondary circuits. (See Page 7)

Insulation is needed against the primary side power supply (power supply of the motor brake).

Please do not connect them with the same power supply.

* For details, refer to 7-1 Power connector XA, XB, XC, and terminal block.

200 V system size E

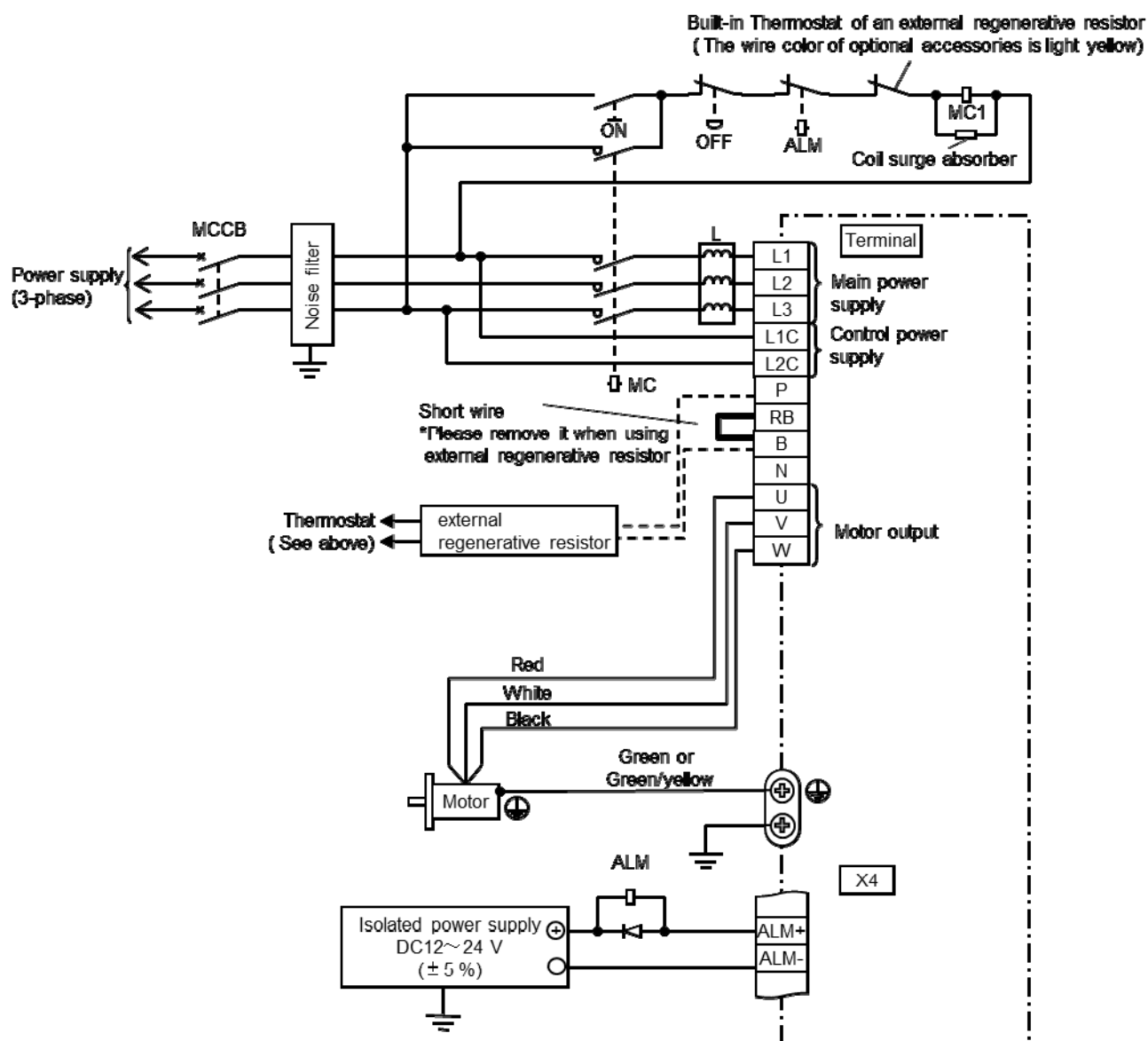


■ Connection of a regenerative resistor

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.

- * The circuit connected to terminal X1 – X7 are secondary circuits. (See Page 8)
Insulation is needed against the primary side power supply (power supply of the motor brake).
Please do not connect them with the same power supply.
- * For details, refer to 7-1 Power connector XA, XB, XC, and terminal block.

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.

* The circuit connected to terminal X1 – X7 are secondary circuits. (See Page 9)

Insulation is needed against the primary side power supply (power supply of the motor brake).

Please do not connect them with the same power supply.

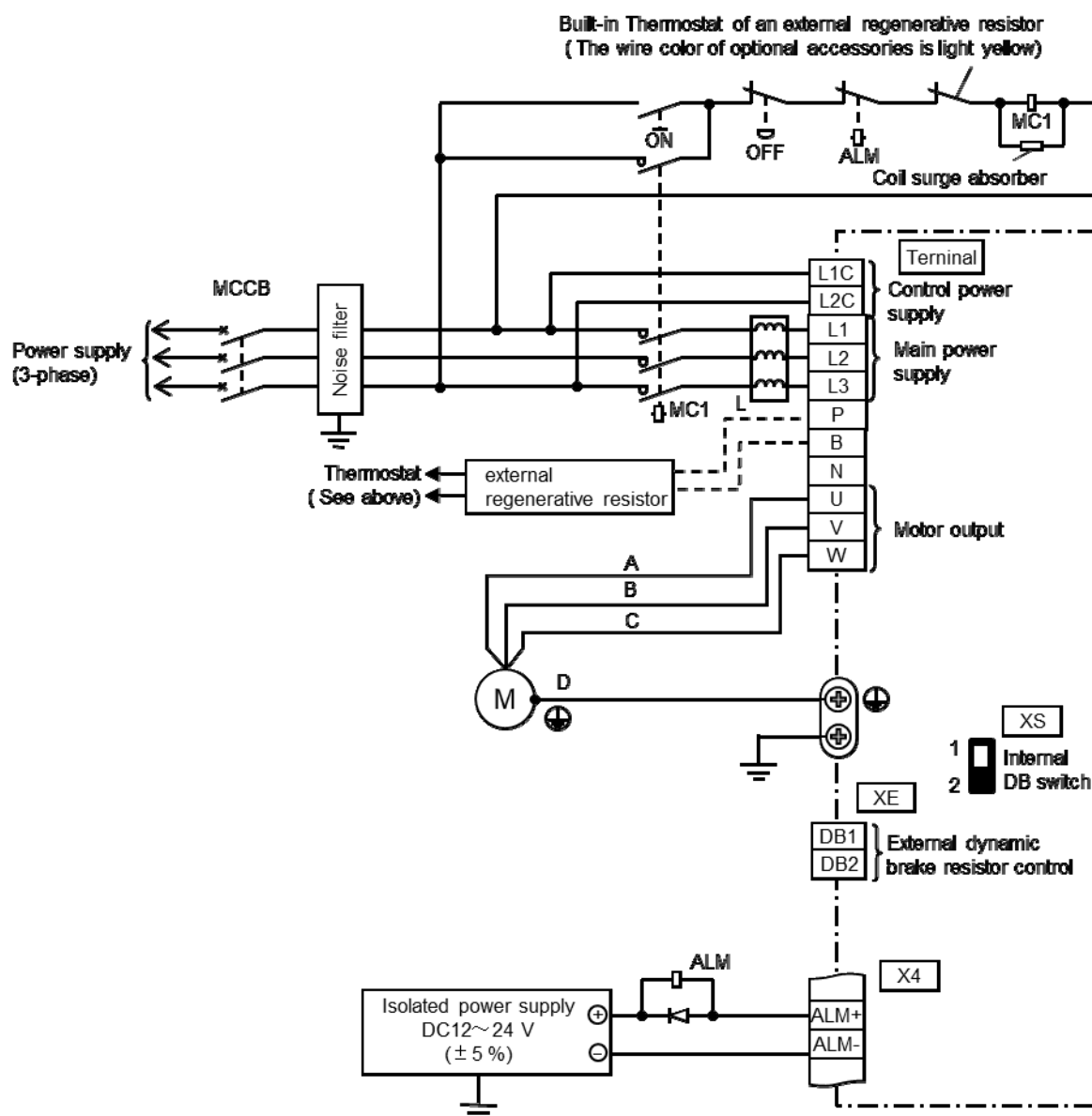
* The standard of the ability of the built-in dynamic brake resistor is up

to continuousness three times in the stop from the allowance and maximum inertia and the rated speed.

Resistor is damaged and the dynamic brake might not work when using it under more critical operating condition.

* For details, refer to 7-1 Power connector XA, XB, XC, and terminal block.

200 V system size G



■ Connection of regenerative resistor

Size	Internal regenerative resistor	Connection of the Terminal	
		In case of using the external regenerative resistor	In case of not using the external regenerative resistor
G	Not installed	Between P and B: Connect the external regenerative resistor	Between RB and B is open

* Connectors X1 to X7 are secondary side circuits. (See Page 10)

Insulation is required from the primary side power supply (power supply for motor brake).

Do not connect to the same power supply.

* Size G has a built-in dynamic brake. When using built-in dynamic brake, set switch XS to "1" side.

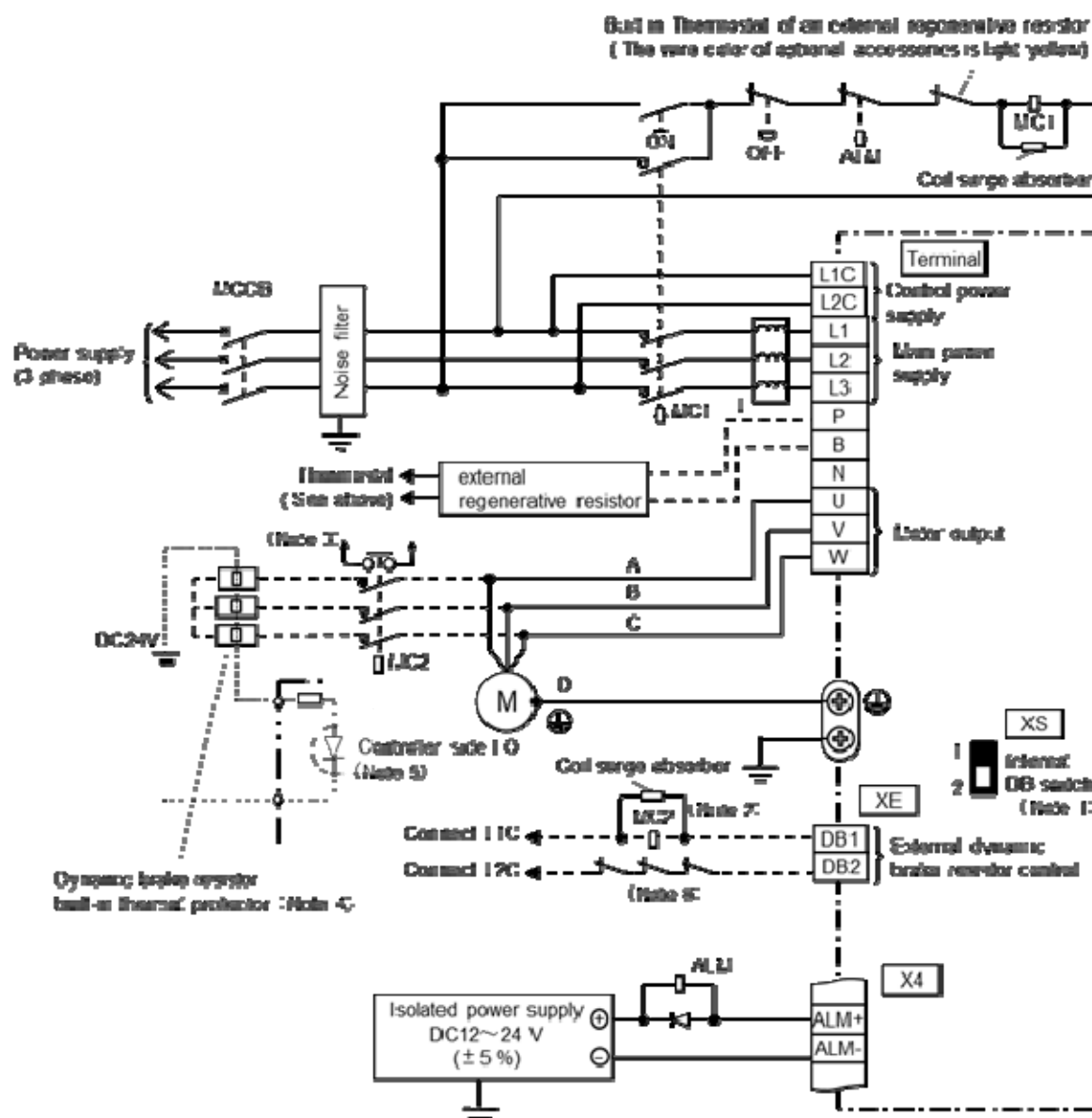
(Shipping setting is set to "1" side.)

* The indication of built-in dynamic brake resistance is up to 3 times in succession due to maximum allowable inertia, stop from rated speed. If it is used under more conditions, the resistance may be broken and the dynamic brake may not operate.

* When exceeding the capacity of the built-in dynamic brake resistor, set the switch XS to "2" side and use the external dynamic brake resistor. For connection, refer to the example of external dynamic brake connection.

* For details, refer to 7-1 Power connector XA, XB, XC, and terminal block.

200 V Size G External Dynamic Brake Connection Example



Note1) To attach a dynamic brake resistor externally, set switch XS to "2" side.

Note2) Make the electromagnetic contactor (MC2) the same as the electromagnetic contactor (MC1) of the main circuit.

Note 3) When auxiliary contact is provided and main contact is welded Configure protection so that servo on will not be turned on by external sequence

Note 4) Please use three 1.2 Ω 400 W dynamic brake resistors.

Please attach dynamic brake resistance to incombustible material such as metal.

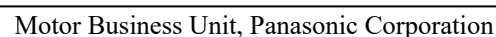
Note 5) Install the thermal protector on the dynamic brake resistor and monitor with the upper side I / O and configure the protection so that the servo will not be turned on in the sequence during thermal protector operation.

Note 6) If the thermal protector can not be monitored by the upper I / O, input the thermal protector output between L2C and DB2 so that the dynamic brake does not operate when temperature protection works.

* External dynamic brake resistance should be used when exceeding the dynamic brake resistance capability.

* Do not use the built-in dynamic brake and the external dynamic brake together.

* For details, refer to 7-1 Power connector XA, XB, XC, and terminal block.



■ Connection of regenerative resistor

Size	Internal regenerative resistor	Connection of the Terminal	
		In case of using the external regenerative resistor	In case of not using the external regenerative resistor
H	Not installed	Between P and B: Connect the external regenerative resistor	Between RB and B is open

* Connectors X1 to X7 are secondary side circuits. (See Page 11)

Insulation is required from the primary side power supply (power supply for motor brake).

Do not connect to the same power supply.

* Since the dynamic brake is not built in, it is in the free-run state when the motor emergency stops.

If it can cause a machine collision accident, please use the external dynamic brake resistor.

*The indication of built-in dynamic brake resistance is up to 3 times in succession due to maximum allowable inertia, stop from rated speed.

If it is used under more conditions, the resistance may be broken and the dynamic brake may not operate.

- [1] When the servo driver uses single phase power supply for sizes A - D, connect the servo driver to the terminals L1, L3 of main power supply input. Do not connect anything to the terminal L2.
- [2] Insert the connector securely until it is locked.
- [3] Make sure to use an insulation coated crimp terminal when connecting to each terminal on the terminal block. (size F,G,H)
- [4] For models with terminal block covers, the terminal block cover is screwed. When wiring to the terminal block, unscrew these screws to uncover the cover. Please tighten the cover fixing screw to $0.19 - 0.21 \text{ N} \cdot \text{m}$ or less, and only tighten the terminal block cover 2 (black) of size H to less than $2.0 - 2.5 \text{ N} \cdot \text{m}$ torque.
- [5] Apply the power supply of the voltage indicated on the nameplate.
- [6] Do not reverse-connect the power input terminals (L1, L2, and L3) and the motor output terminals (U, V, and W).
- [7] Do not connect the motor output terminals (U, V, and W) to ground or short out them.
- [8] Power connector XA, XB, XC, and the terminal block, are supplied with high voltage, so do not touch them. There is a danger of electric shock.
- [9] Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, below the maximum input voltage of the product.
- [10] An AC servomotor, unlike an induction motor, cannot change the rotation direction by exchanging three phases.
Make sure to coincide the motor output terminals (U, V, and W) of the servo driver with the colors (pin number for cannon plugs) of the motor output cables.
- [11] Be sure to connect the earth ground terminal of the motor to the grounding terminal of the servo driver and ground it together with the ground terminal of the noise filter. Please also ground the machine body. Grounding resistance should be less than 100Ω . Tighten the servo driver's ground screw with the appropriate torque specified for each size. Please use the wire diameter of the ground wire be equal to or larger than the wire diameter specified in the each model specification. Also, please avoid direct contact between aluminum and copper to avoid the effect of electrolytic corrosion.
- [12] Attach the surge absorbing circuits for preventing noises to an electromagnetic contactor placed around the servo driver, a coil between relay contact points, and a brake winding of motor with a brake.
- [13] Attach the no fuse breaker (MCCB). In case of emergency, make sure to power off outside the servo driver. To use an earth leakage circuit breaker, use that in which a high frequency wave countermeasure is taken.
- [14] In order to reduce the terminal noise voltage, install a noise filter.
- [15] Customer is responsible for the power supply of the brake attached to a motor.
- [16] Turn ON the power after the wiring was finished.

[17]About external regenerative resistance

- Size A, B, G, and H do not have built-in regenerative resistors.
- Size C, D, E, and F have built-in regenerative resistors, and the built-in regenerative resistor is effective by short-circuiting between RB terminal and B terminal.
- When tripping with regenerative load protection error (Err 18.0), it is necessary to install external regenerative resistor. Remove the short or short bar between the RB terminal and the B terminal, and connect the external regenerative resistor between the P terminal and the B terminal.
In addition, it is necessary to set regenerative resistance with parameters.
- For details, refer to "Technical Data -Functional Specification-".

* As for external regenerative resistor, we recommend the resistors below:

Size	Input Power Voltage	
	Single phase 100 V	Single/3 phase 200 V
A	DV0P4280	DV0P4281 (100 W or less), DV0P4283 (200 W)
B	DV0P4283	DV0P4283
C	DV0P4282	DV0P4283
D	-	DV0P4284
E		DV0P4284 x 2 in parallel or DV0P4285 x 1
F		DV0P4285 x 2 in parallel
G		DV0P4285 x 3 in parallel
H	—	DV0P4285 x 6 parallel

Manufacturer by Iwaki Musen Kenkyusho

Part number	Manu -facturer's model	Specification			Built-in thermal protector operational temperature (Note2)
		Resis -tance value	Rated power (for reference) (Note1)		
			Free air	Fan used (1 m/s)	
DV0P4280	RF70M	50	10	25	140 ± 5 deg. Celsius Contact point B Open/close capacity (resistance load) 1 A 125 VAC, 6000 times 0.5 A 250 VAC, 10000 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	

Note1) Electric power available without running the built-in thermal protector.

Note2) Each regenerative resistor has built-in thermal fuse and thermal protector for safety.

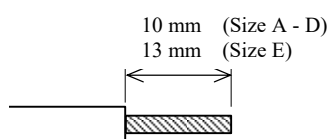
- When using the thermal protector, please configure the circuit to turn off the power supply.
(See "Wiring and system configuration")
- Built-in thermal fuse may break due to heat dissipation condition, operating temperature range, power supply voltage, load fluctuation.
Please perform operation confirmation by incorporating it in the machine so that the surface temperature of regenerative resistance becomes 100 °C or less in conditions where regenerative resistance is easy to generate heat (when the power supply voltage is high, when load inertia is large, deceleration time is short, etc.) .
- Please install the regenerative resistance so that people do not touch directly,
such as covering with incombustible material.
- Please make sure that the place where the person touches directly is less than 70 °C.

Procedure of connection to the power connector

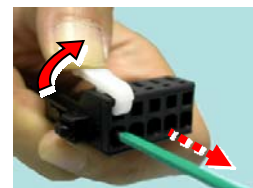
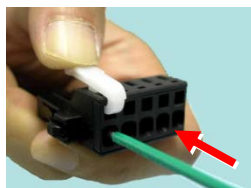
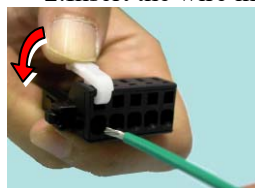
To connect to Connector **XA** **XB** **XC**, follow the procedure below.

< Wiring method >

1. Stripping electric wires to be used. Please refer to the figure below for the strip length



2. Insert the wire into the connector.



① Push down the spring by pushing the control lever attached to the upper operating slot with your fingers.

② Insert the wire while pressing the control lever. Please be careful that all strands are inserted into the spring opening

③ You can wire it by releasing the control lever. Please pull the wire lightly and make sure that the wire is securely connected.

< Notes >

- Be careful not to damage the core wire or cut it when stripping the wire.
- Because the strip length of the electric wire depends on the size and type of electric wire, please decide the optimum strip length according to the processing condition.
- For wiring, please disconnect the connector from the servo driver main body.
- Insert one wire into one wire insertion slot of the connector.
- When the control lever is pushed down, the wire can be removed.

8-3-2 Wiring to connector X4

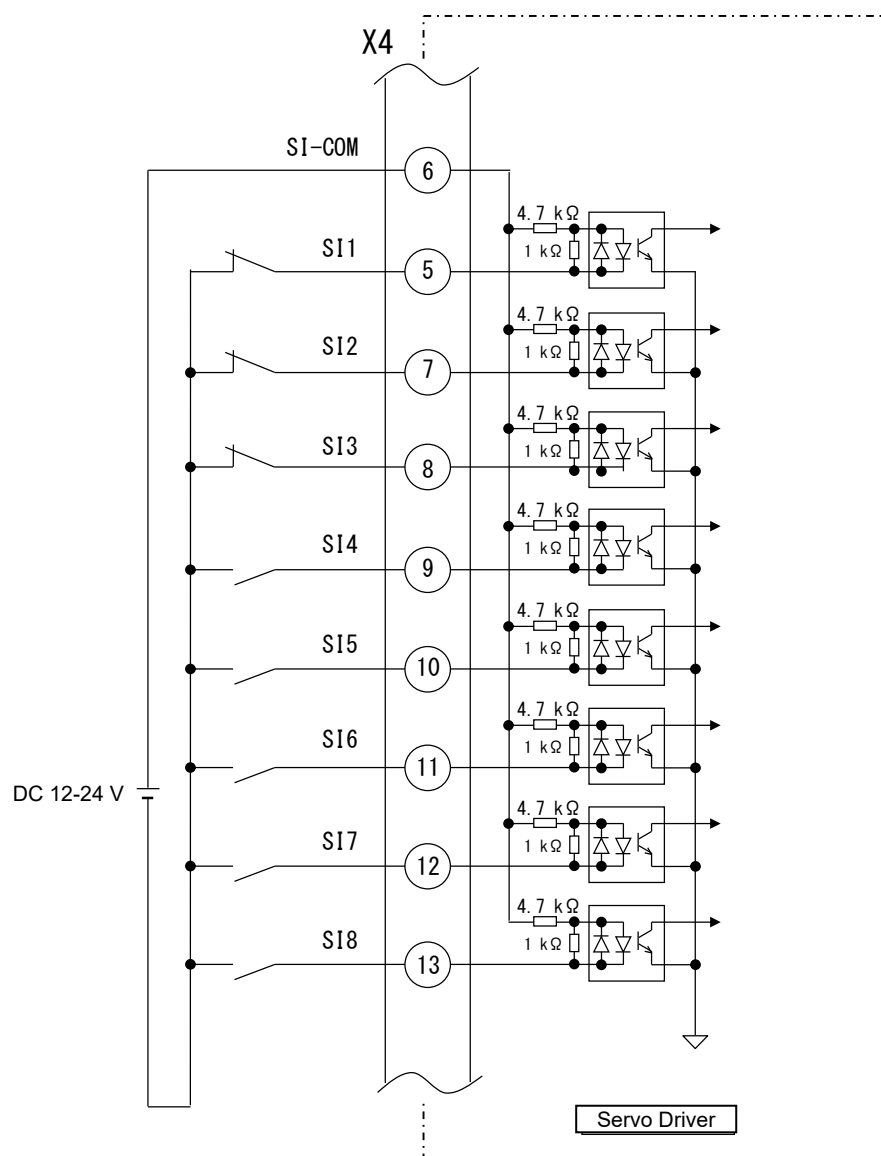
- [1] The customer is required to prepare the 12 to 24 VDC control signal power supply for external control to be connected to SI-COM.

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

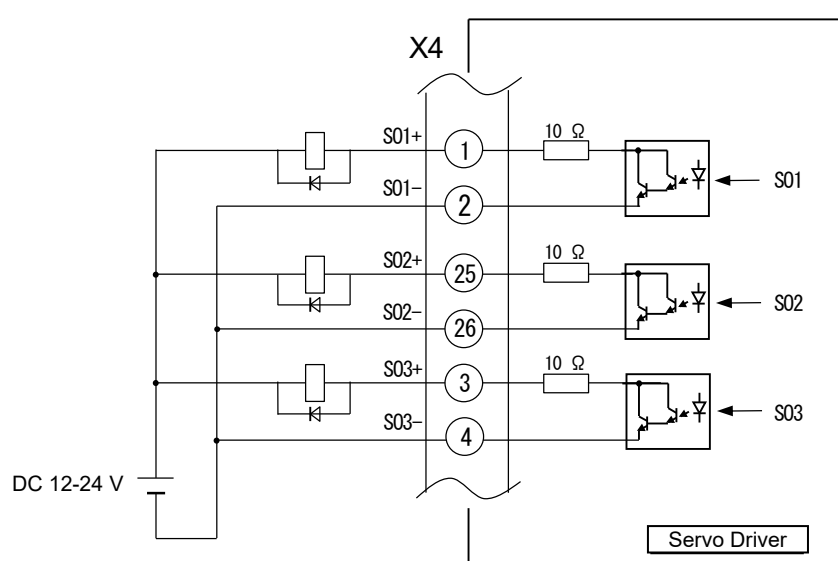


Functions SI1 to SI8 should be allocated by parameters. For details, refer to “Technical Document - Basic Functional Specifications -”.

Control output

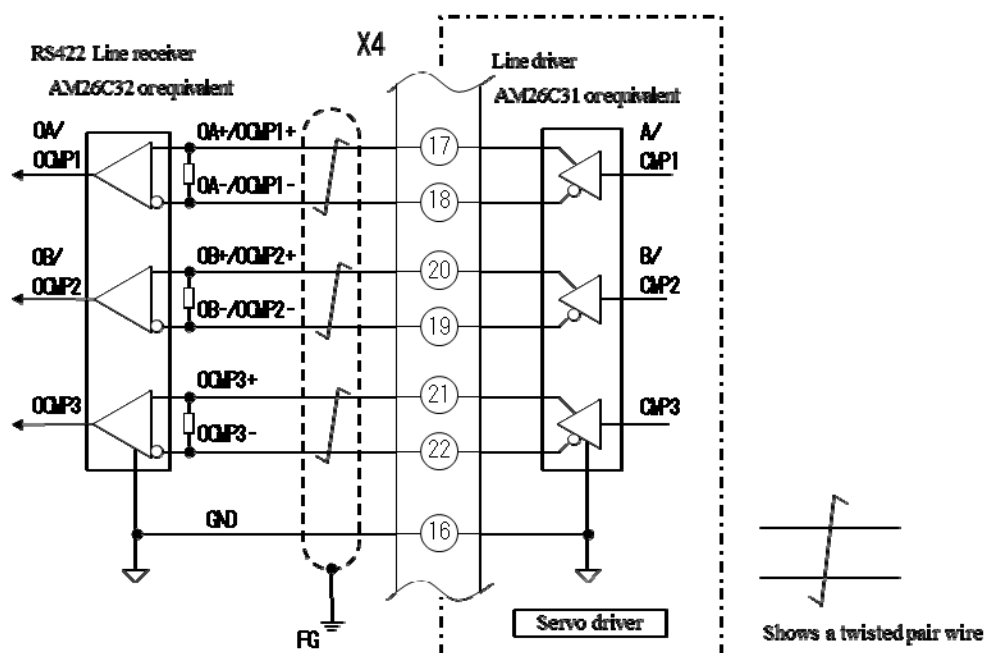
- [1] Pay attention to the polarity of the control signal power supply. Connection to the polarity opposite to that in the figure can cause damage to the servo driver.
- [2] When driving the relay directly using each output signal, be sure to mount a diode in parallel with the relay in the direction 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 S01 to S03 should be allocated by parameters. For details, refer to “Technical Document - Basic Functional Specifications -”.

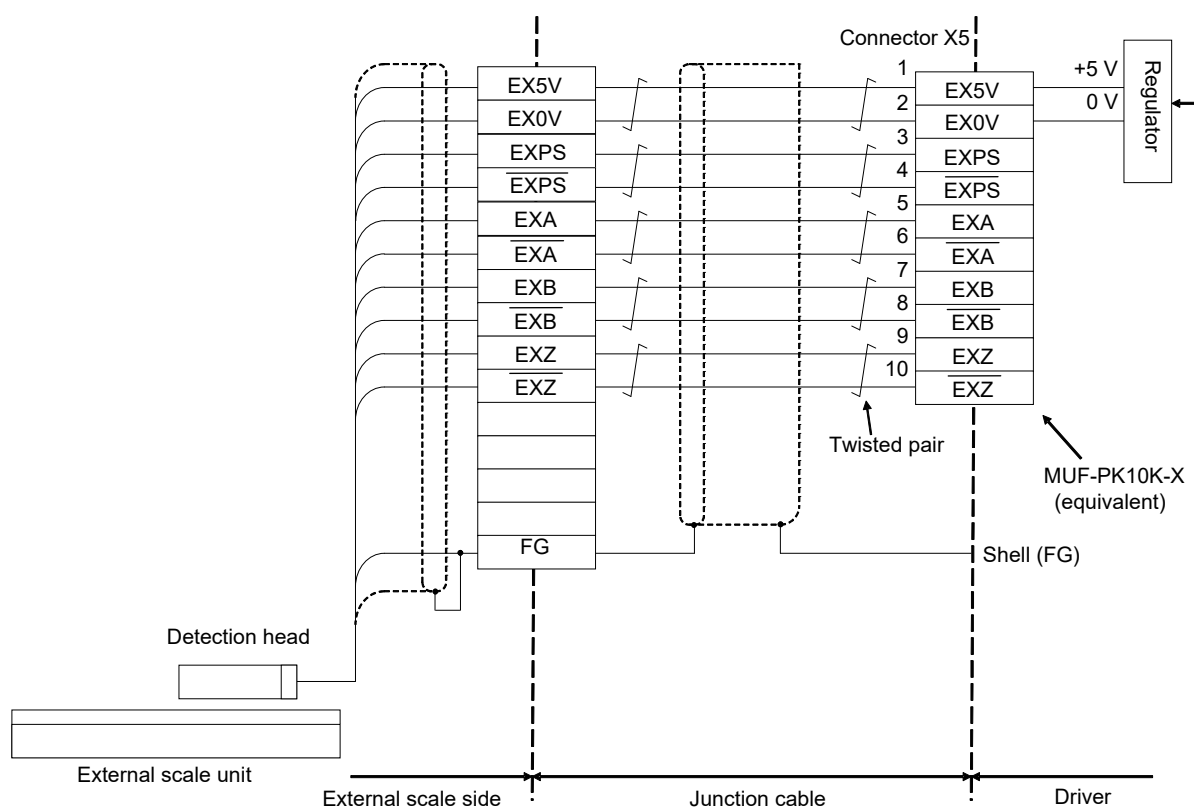
Feedback pulse of the rotary encoder



- [1] Use an RS422 line receiver (AM26C32 or equivalent) to receive output pulse.
At that time, mount an appropriate terminating resistor (approx. 330 Ω) 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 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 mm² 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 Earth 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, $\oplus$) as much as possible (at least 30 cm). Do not route the wires through the same duct and do not tie them together.
- [5] Do not connect anything to the empty pins of X6.

When multi-rotation data is not used

*When used as an incremental encoder

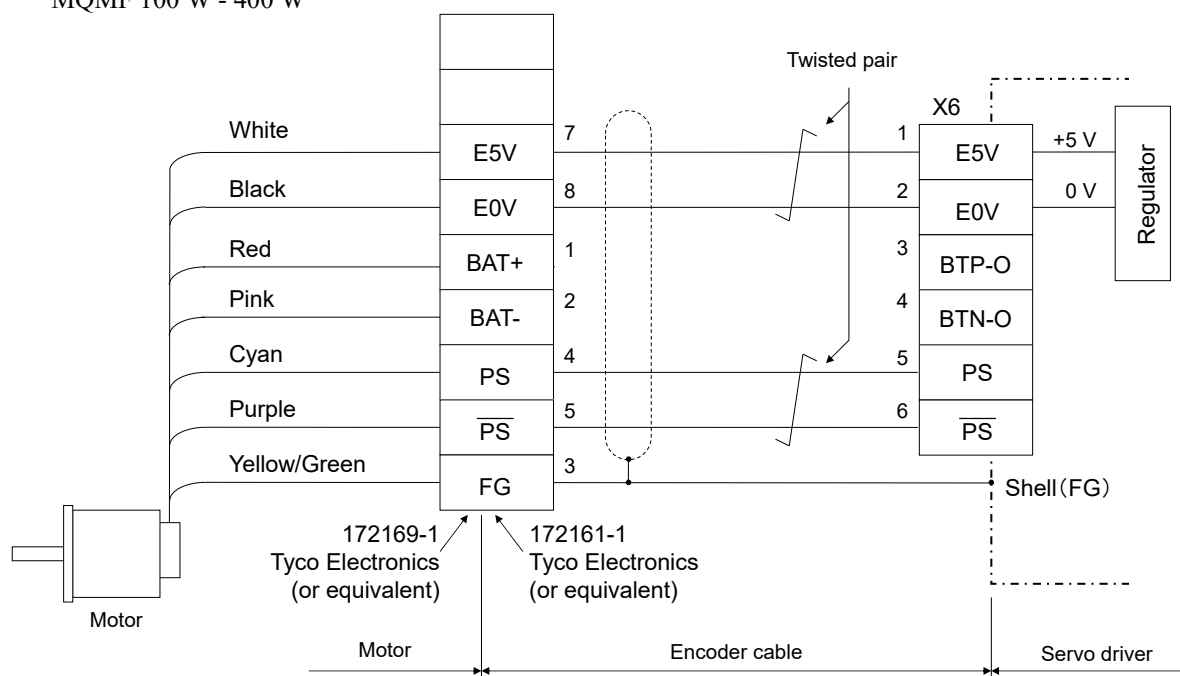
*When used as a single-rotation absolute encoder

■ Lead wire type

MSMF 50 W - 1000 W

MHMF 50 W - 1000 W

MQMF 100 W - 400 W

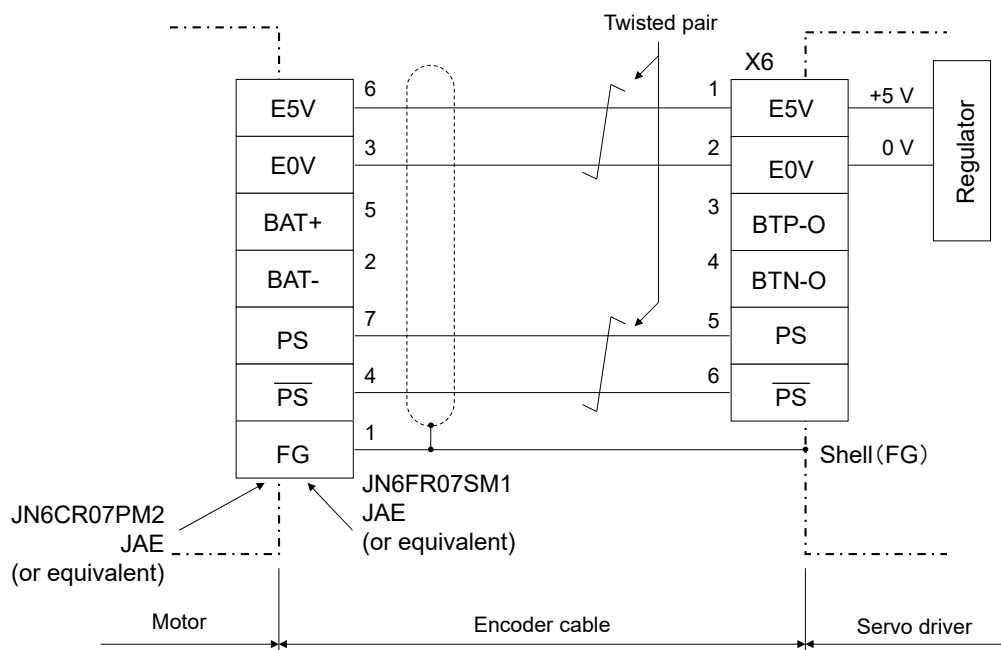


■ Connector type

MSMF 50 W - 1000 W

MHMF 50 W - 1000 W

MQMF 100 W - 400 W

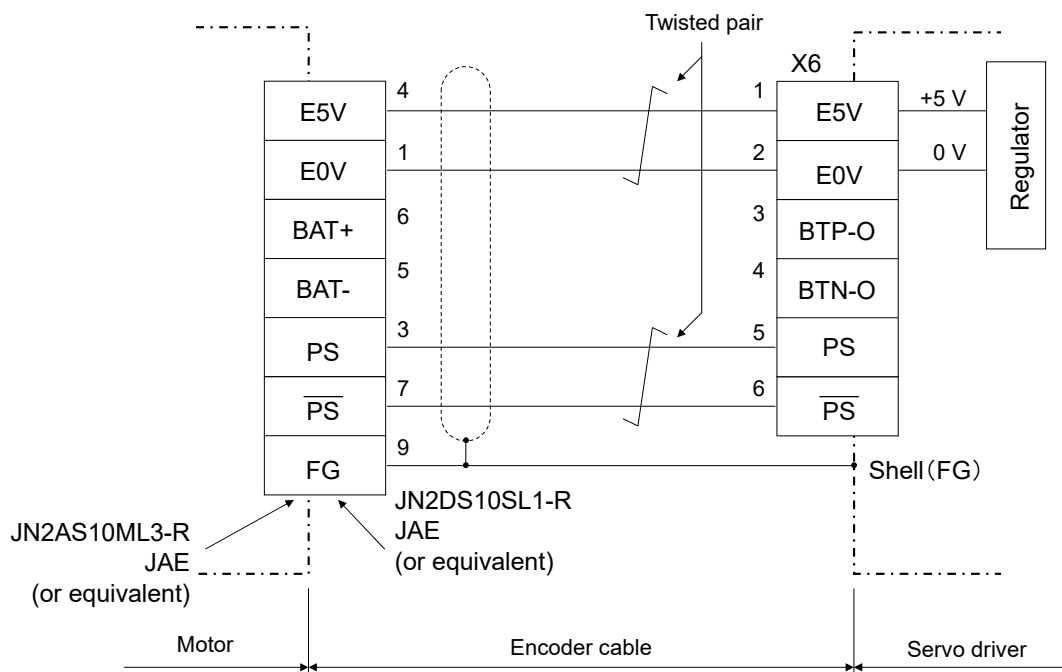


MSMF 1.0 kW - 5.0 kW

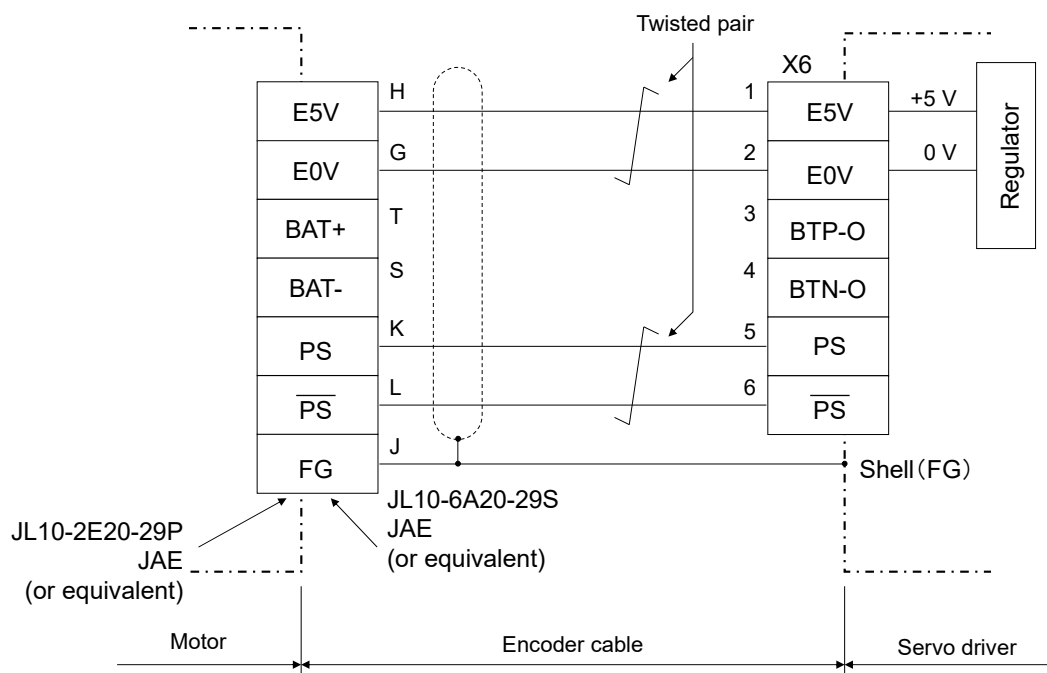
MHMF 1.0 kW - 5.0 kW

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 - 7.5 kW
 MDMF 1.0 kW - 22.0 kW
 MGMF 0.85 kW - 5.5 kW



When multi-rotation data is used

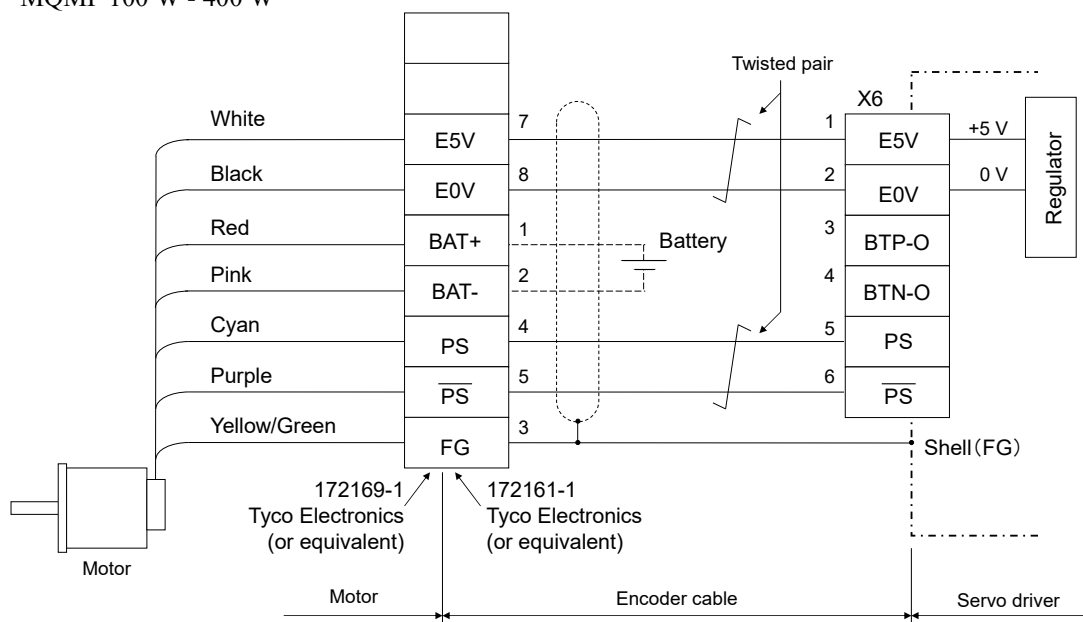
*When an absolute system is constructed

■ Lead wire type

MSMF 50 W - 1000 W

MHMF 50 W - 1000 W

MQMF 100 W - 400 W

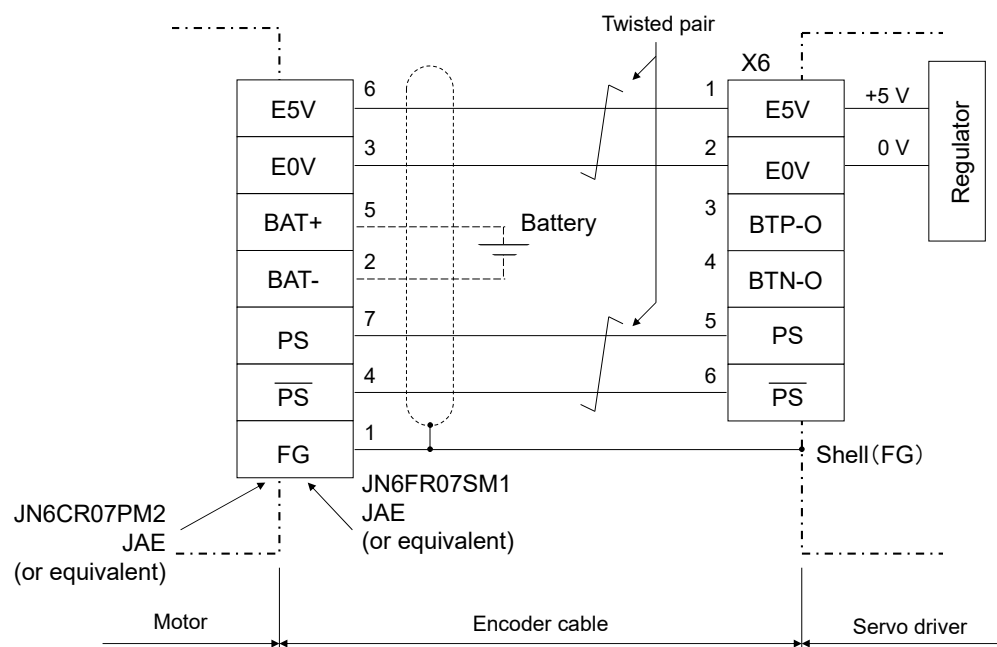


■ Connector type

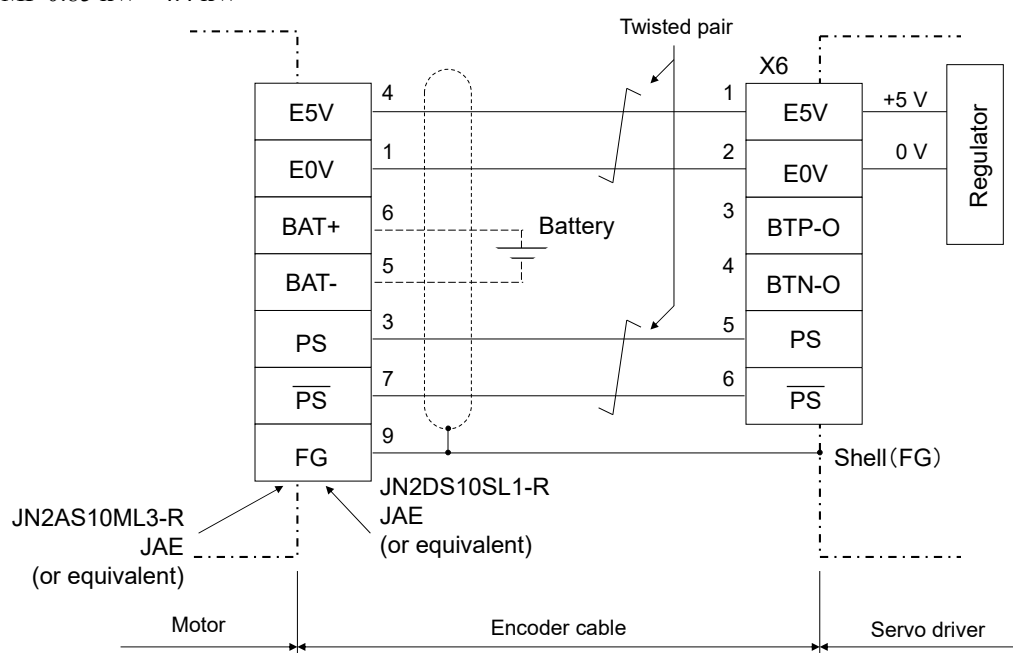
MSMF 50 W - 1000 W

MHMF 50 W - 1000 W

MQMF 100 W - 400 W

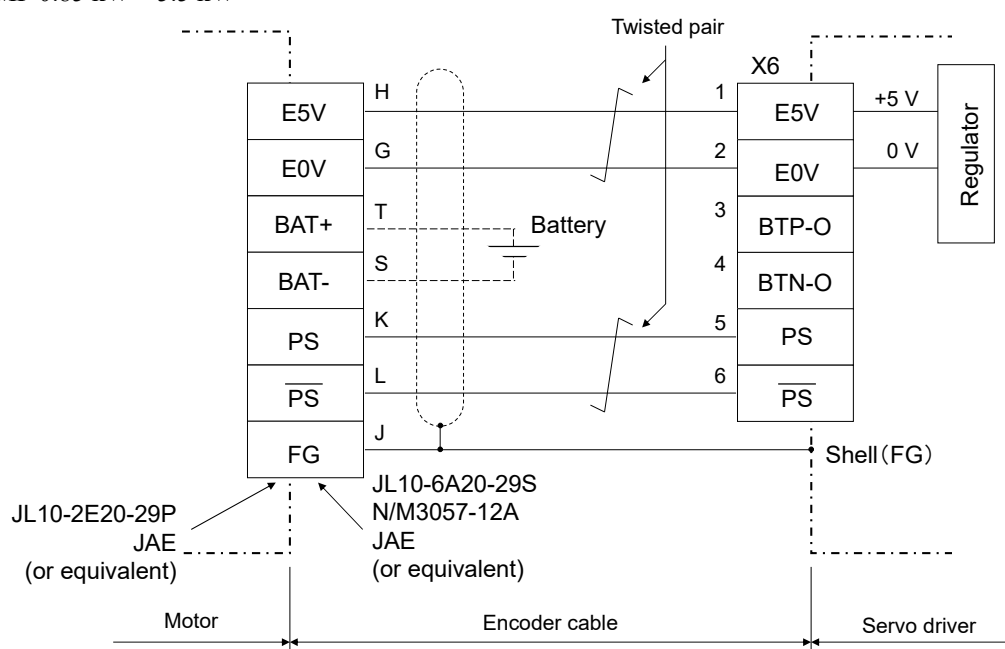


MSMF 1.0 kW - 5.0 kW
 MHMF 1.0 kW - 5.0 kW
 MDMF 1.0 kW - 5.0 kW
 MGMF 0.85 kW - 4.4 kW



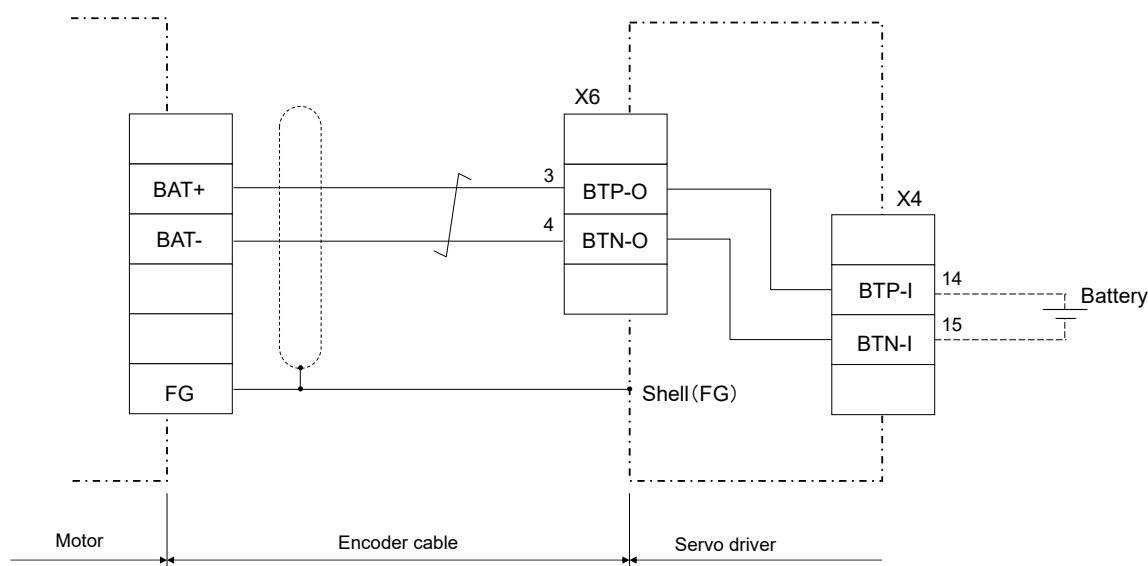
■ Cannon plug type

MSMF 1.0 kW - 5.0 kW
 MHMF 1.0 kW - 7.5 kW
 MDMF 1.0 kW - 22.0 kW
 MGMF 0.85 kW - 5.5 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>

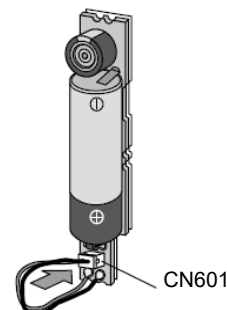
It is recommended to perform turning ON/OFF of the control power supply approx. once in a day.
- Incorrect use of the battery can cause troubles such as corrosion of the product due to leakage from the battery or risks such as breakage of the battery. Therefore, be sure to observe the following.
 - [1] 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

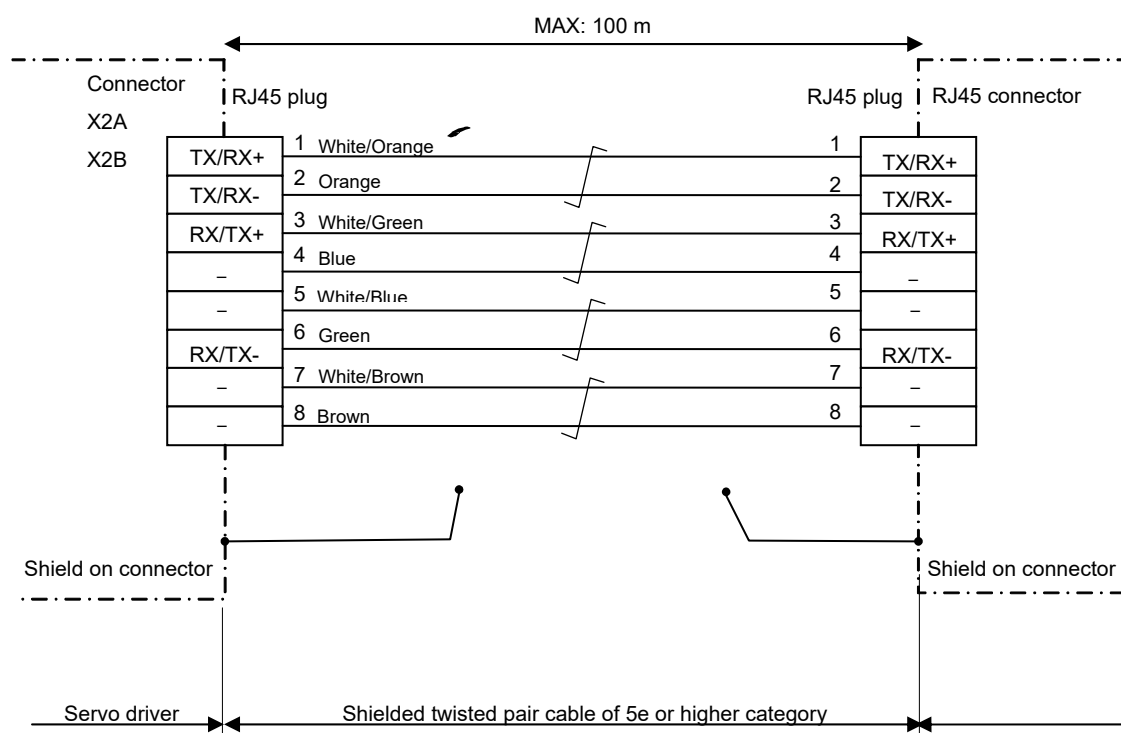
For details, contact each transport company.



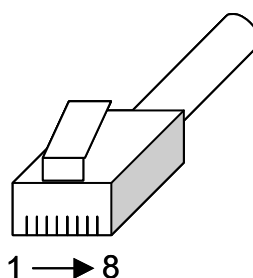
8-3-5 Wiring to connectors X2A and X2B

- [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 7-8 pins 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 G) has a dynamic brake built in for emergency stop.

Size H driver does not have built-in dynamic brake.

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.

Size G and H driver can attach a dynamic brake circuit (electromagnetic contactor for driving and resistor) externally.

Size G driver should be externally attached when the built-in dynamic brake resistance capacity is insufficient.

Wiring according to the above notes "Wiring to power connector and terminal block", and wiring diagram of 200 V size G, 200 V size H.

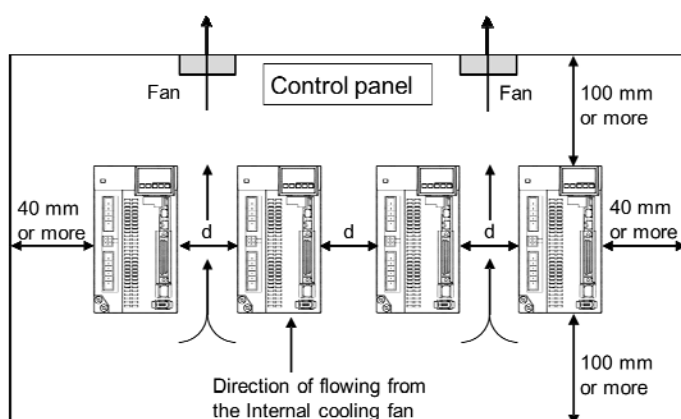
8-5 Mounting direction and interval

- The servo driver is a vertical placement type. Mounting should be vertical.
- The base mount type (rear mounted) is the standard for drivers Size A to D and Size H.
- When changing mounting surface with amp of Size A to D, please use the optional mounting bracket.
- Please select the tightening torque of the product fixing screws considering the strength of the screws and the material of the installation destination.

Example) When mounting with steel screws to steel

Size A to G : M5 2.7 to 3.3 N · m, Size H : M6 4.7 to 5.7 N · m

- To ensure effective cooling, ensure the surrounding space.
 - Install a fan to make the temperature inside the control panel uniform.
 - The cooling fans are attached to the lower side of the size D - F, the lower side and the upper side of the size G and H.
 - Please observe the environmental conditions in the control panel environment.
 - Secure the servo driver to the grounded conductive frame.
 - If there is paint on the part where the servo driver or fan is to be installed, if you remove the paint and install it, there is a possibility of it being effective for noise control.
 - In case you install the mounting bracket yourself, there is a possibility that noise countermeasure may be effective if using conductive plating process.
 - The ambient temperature should be measured 50 mm away from the side or bottom of the servo driver.
- If it can not be measured at a distance of 50 mm, measure at the midpoint of the gap between the obstacle and the driver.



	d
Sizes A to H	10 mm or more

9. Compliance with the international standards

9-1 List of compatible standards for the servo driver

European EU 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 EN61508 EN62061 EN61800-5-2 IEC61326-3-1 IEC60204-1
UL standard		UL508C (File No. E164620)
CSA standard		C22. 2 No. 274
KC		KN11 KN61000-4-2,3,4,5,6,8,11

IEC : International Electrotechnical Commission

EN : Europaischen Norman

EMC : Electromagnetic Compatibility

UL : Under writers Laboratoris

CSA : Canadian Standards Association

KC : Radio Waves Act(South Korea)

The parameter of functional safety

	With diagnosis of “EDM output”	Without diagnosis of “EDM output”
Safety Integrity Level	EN61508(SIL3) EN62061(SILCL3)	EN61508(SIL2) EN62061(SILCL2)
Performance Level	ISO13849-1 PL e (Cat.3)	ISO13849-1 PL d (Cat.3)
Safety Function	EN61800-5-2 (SIL 3, STO)	EN61800-5-2 (SIL 2, STO)
Probability of dangerous failure	<For size A,B,C,D,E,F> PFH = 1.34×10^{-8} (%SIL3=13.4%) <For size G and H> PFH = 1.78×10^{-8} (%SIL3=17.8%)	<For size A,B,C,D,E,F> PFH = 1.40×10^{-8} (%SIL2=1.40%) <For size G and H> PFH = 1.85×10^{-8} (%SIL2=1.85%)
Mean time to dangerous failure	MTTFd : High (100 years)	MTTFd : High (100 years)
Average diagnostic coverage	DC : Medium	DC : Low
Mission time	15 years	15 years

9-2 European EU directive

Our products, in order to make it easy for the embedded equipments and devices to be compliant with EU directive, provide the compliance with the standards associated with low voltage directive.

9-2-1 Compliance with EMC directive

This product is not intended to be used in low-voltage networks supplied to home facilities.

When used in such a network, high frequency interference is assumed.

To conform to EMC directive, please use noise filter , surge absorber and ferrite core. Regarding compliance with

For compliance with EMC directives in machinery or equipment, confirmation with the final machine or equipment incorporating the servo driver and servomotor is necessary.

9-3 Configuration of peripheral devices

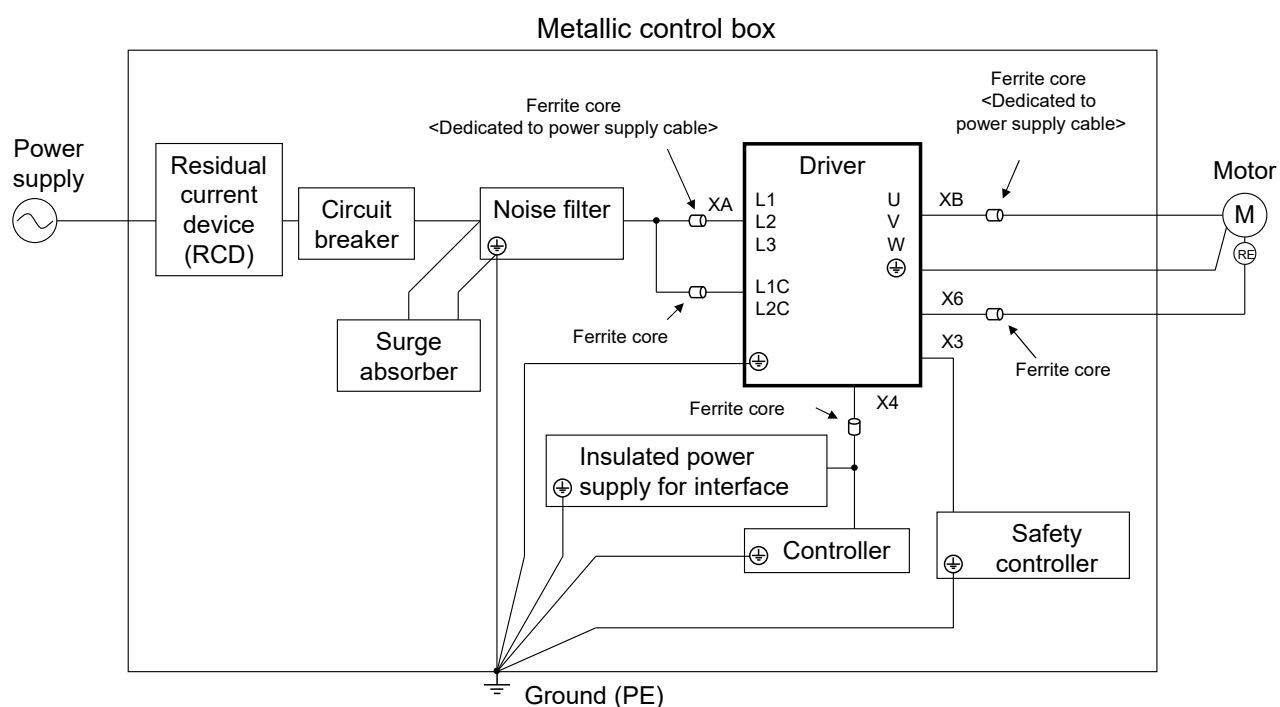
9-3-1 Installation environment

Use the servo driver under the environment of pollution degree 2 or 1 defined in IEC60664-1.
(Example: Installed in the IP54 control panel.)

Be sure to connect the circuit breaker (MCCB) or fuse of IEC standard and UL approved type to the main power supply.

For power supply for parallel I / O, use double insulated or reinforced insulated DC 24 V power supply.

Specifications for the 100 V / 200 V system



Number of ferrite cores

Symbol	Location	Applicable Size of servo driver	Option part number	Manufacturer's part number	Number
NF1	Power supply cable	(100 V) C	DV0P1460	ZCAT3035-1330	No need
		(200 V) C,D			1
		(100 V) A,B	DV0P1460	ZCAT3035-1330	3
		(200 V) A,B,E			1
NF2	Motor cable	(200 V) G,H	-	RJ8095	1
		(100 V) A,B,C	DV0P1460	ZCAT3035-1330	1
		(200 V) A,B,C,D,E			2
		(200 V) F	DV0P1460	ZCAT3035-1330	3
		(200V) G,H	-	T400-61D	1

*The number of turns to the ferrite core is one in each size of servo driver

9-3-2 Power supply

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

- (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 spec	Power capacity (Rated current)	Electromagnetic contactor (Rated current/ Released heat current)	Circuit breaker (MCCB) Rated current	Noise filter	Surge absorber	Ferrite core				
							Power supply cable	Motor cable			
MADL*01**	Single phase 100 V	Approx. 0.4 kVA	20 A	10 A	DV0P4170 (for single phase) / DV0PM20042	DV0P4190 (for single phase) / DV0P1450 (for 3 phase)	DV0P 1460	DV0P 1460			
MADL*11**											
MADL*05**	Single/ 3 phase 200 V	Approx. 0.5 kVA									
MADL*15**											
MBDL*21**	Single phase 100 V	Approx. 0.5 kVA		15 A	DV0PM20042						
MBDL*25**	Single/ 3 phase 200 V	Approx. 0.9 kVA									
MCDL*31**	Single phase 100 V	Approx. 0.9 kVA									
MCDL*35**	Single/ 3 phase 200 V	Approx. 1.8 kVA	30 A	20 A	DV0P4220	DV0P1450	DV0P1460 RJ8095	DV0P1460 T400-61D			
MDDL*45**	Single/ 3 phase 200 V	Approx. 2.4 kVA									
MDDL*55**		Approx. 2.9 kVA									
MEDL*83**	3 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									
MGDL*C3**		Approx. 11 kVA							100A	60 A	HF3080C-SZA
MHDL*E3**		Approx. 20 kVA	150A	125 A	HF3100C-SZA						
MHDL*F3**		Approx. 28 kVA		175 A							

● Select the specification common to single/ 3 phase 200 V according to the power supply.

- Notes

- Select a circuit breaker (MCCB) and a noise filter with capacity appropriate for power supply capacity (considering load conditions).
- Terminal block and ground terminal, Use copper conductor wires with a temperature rating of 75 ° C or higher for wiring. The protective earth terminal is from size A to size E is M4, size F to size G is M5, size H is M6. If the tightening torque of the screw exceeds the maximum value (refer to the terminal block explanation page), the terminal block may be damaged.
- The wire diameter of the ground wire is at least 2.0 mm² (AWG 14) at 50 W to 2.5 kW output, 3.5 mm² (AWG 12) or more at 3.0 kW to 5.0 kW output, 7.0 kW at 8.0 mm² (AWG 8) Or more, please use 22 mm² (AWG 4) or more for output 15.0 kW and 38 mm² (AWG 2) or more for 22.0 kW output.
- Use the supplied dedicated connector from size A to E.
- Tighten the screw of the connecting connector (X4) to the host controller at a tightening torque of 0.3 to 0.35 N · m. If it exceeds 0.35 N · m, the driver side connector may be damaged.

	Optional part number	Part number of manufacturer	Manufacturer
Absorber	DV0P1450	R•A•V-781BXZ-4	Okaya Electric Industries
	DV0P4190	R•A•V-781BWZ-4	
	DV0PM20050	R•A•V-801BXZ-4	
Ferrite core	DV0P1460	ZCAT3035-1330	TDK
	—	RJ8095	Konno Kogyousho
	—	T400-61D	MICROMETALS
Noise filter	DV0P4170	SUP-EK5-ER-6	Okaya Electric Industries
	DV0P4220	3SUP-HU30-ER-6	
	DV0P3410	3SUP-HL50-ER-6B	
	DV0PM20042	3SUP-HU10-ER-6	
	DV0PM20043	3SUP-HU50-ER-6	
	—	RTHN-5010	TDK Lambda
	—	RTHN-5010	
	—	RTHN-5010	
	—	HF3080C-SZA	Soshin Electric
	—	HF3100C-SZA	

9-5 Compliance with the UL standard

[1] Installation environment

Install the servo driver under the environment at pollution degree 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 degree of the injury or damage caused when using the product improperly is categorized and an explanation is provided.

DANGER	Indicates “actions carrying a significant risk of death or serious injury.”
ATTENTION	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) Please use it in the environment of pollution degree 2 or 1 (where there is no foreign matter such as dust, metal powder, oil mist, etc., where it does not come in contact with liquids such as water, oil and grinding liquid). Avoid storing or using it near combustibles or in an atmosphere of corrosive gas (H₂S, SO₂, NO₂, Cl₂ etc.) or flammable gas.
- (2) Do not place combustible objects near the motor, servo driver, or regenerative resistor.
- (3) Do not drive the motor with external power. As the motor is driven from the outside, it becomes a generator, so a short circuit current will flow during the dynamic brake operation built into the servo driver, possibly causing smoke and dust. Also, the dynamic brake may break and the brake may not operate.
- (4) Do not damage the cable, apply excessive stress, place heavy objects on it, or pinch it.
- (5) Please do not use cable with oil and water soaked.
- (6) Do not install near heating elements such as heaters or large winding resistors. (Provide a heat shield plate, etc. so that it is not affected by the heating element.)
- (7) Do not connect commercial power directly to the motor.
- (8) Please do not use in places subject to vibration / shock. When installing the servo driver near the vibration source, attach the vibration isolator to the servo driver mounting surface.
- (9) Do not touch the rotating parts of the motor during operation.
- (10) Do not touch the key groove of the motor output shaft with bare hands.
- (11) Do not touch the inside of the servo driver.
- (12) Temperature of the heat sink and peripheral devices of the motor / servo driver will increase, so please do not touch it.
- (13) Do not wire or operate with wet hands.



SAFETY PRECAUTIONS



- (14) Wiring work should be done by an electrician's expert.
- (15) Protective devices are not attached to motors other than those specified. Please protect with overcurrent protection device · earth leakage circuit breaker · temperature overheat prevention device · emergency stop device etc.
- (16) When operating the servo driver after the earthquake, please check the installation condition of the servo driver / motor and the safety of the machine beforehand and check that there is no abnormality before driving.
- (17) After turning off the power supply, the internal circuit is charged with high voltage for a while. When carrying out movement, wiring and inspection, completely shut off the power supply input outside the servo driver, leave it for 15 minutes or more, then perform the operation.
- (18) When earthquakes occur, please ensure installation so that fire and personal injury will not occur due to installation.
- (19) Install an emergency stop circuit externally so that operation can be immediately stopped and the power can be shut off in case of emergency. There is a possibility of smoking and dust generation due to malfunction of the motor and servo driver to be combined. As an example, if the regenerative control power transistor with built-in servo driver is energized with a short-circuit fault, smoke generation and dust generation due to overheating of the regenerative resistor installed outside the servo driver can occur. If a regenerative resistor is connected to the outside of the servo driver, install overheat detecting means such as a thermal protector to detect abnormal overheating and shut off the power supply.
- (20) Mount the motor, servo driver and peripheral devices on incombustible materials such as metal.
- (21) Wiring should be done correctly and reliably. Uncertain wiring and incorrect wiring may cause motor malfunction or thermal damage. Also, during installation / wiring work, please make sure that conductors such as wire scraps do not get inside the servo driver.
- (22) Be sure to connect the cables, and insulate the current-carrying parts securely with insulation.
- (23) When binding the wires and inserting them in a metal duct or the like for use, the permissible current of the wire will decrease due to the temperature rise, causing thermal damage. Please consider the current reduction coefficient and select the electric wire.
- (24) Be sure to install the wiring breaker (MCCB) on the power supply. Be sure to ground the earth terminal or the ground wire. To prevent electric shock and malfunction, we recommend ground resistance 100 Ω or less.
- (25) Tighten the screws of the terminal block for connection and the grounding screw securely and securely with the torque indicated in the specification sheet.
- (26) When constructing a system using the safety function, please design so as to understand and comply with related safety standards and the description items of our manual or technical document.



ATTENTION



- (27) Do not hold the cable or motor shaft during transportation.
- (28) In parameter adjustment of the servo driver, do not do extreme gain setting and action of changing the setting value greatly at once, as it may lead to unexpected unstable operation.
- (29) Do not approach the machine because there is a possibility of a sudden restart after recovery at the time of a power failure. Please set up the machine to ensure safety to people even after restarting.
- (30) Do not approach the motor and the machine driven by it during power-on in preparation for a malfunction.
- (31) Do not apply strong impact to the motor shaft.
- (32) Do not operate or stop the motor with the magnetic contactor installed on the main power supply side.
- (33) Do not turn on / off the main power supply of the servo driver frequently.
- (34) When the brake is built in the motor, the built-in brake is for holding, so do not use it for a stop device (braking) to ensure machine safety.



SAFETY PRECAUTIONS



- (35) Do not drop or fall over during transportation or installation work.
- (36) Do not climb onto the motor or place heavy objects on it.
- (37) Please block the heat release hole of the servo driver, please do not put foreign matter.
- (38) Please do not use in direct sunlight. When saving, please save at direct sunlight and temperature and humidity within the use range.
- (39) Do not disassemble, repair, or modify. Please disassemble repair at our company or our designated store.
- (40) Do not start or stop by ON / OFF of Servo ON command (SRV - ON). Dynamic brake circuit built into the servo driver may be damaged.



- (41) Please use a combination of motor and servo driver in combination specified by us. Please check your company's performance and safety when combined with other servo driver s.
- (42) Failure of the motor and the servo driver to be combined may cause thermal damage to the motor, smoke or dust. Please note that when used in a clean room etc.
- (43) Make an appropriate fitting to match the output or body mass.
- (44) Ambient temperature and ambient humidity of servo driver / motor should be within allowable ambient temperature and allowable ambient humidity range.
- (45) Please observe the specified mounting method and direction.
- (46) Set the distance between the servo driver and control panel inner surface or other equipment with a specified distance.
- (47) When eye bolts are attached to the motor, use eye bolts only for motor transport and do not use for transporting equipment. Do not use it even when a speed reducer, a face plate, etc. are installed.
- (48) Connect a relay that shuts off with an emergency stop in series with the relay for brake control.
- (49) When performing trial operation, secure the motor firmly and confirm it in a state separated from the mechanical system.
- (50) Make sure that the input power supply voltage is in accordance with the specifications of the servo driver, turn on the power supply and operate. Inputting a voltage higher than the rating may cause smoke or dust inside the servo driver, which may cause motor malfunction or thermal damage in some cases.
- (51) When an alarm occurs, remove the cause and restart it. If you restart it unnecessarily without removing the cause, it may cause motor malfunction and thermal damage.
- (52) When the brake is built in the motor, the built-in brake may not be able to be held due to the life and machine structure. Please install a stop device to ensure safety on the machine side.
- (53) The motor and servo driver generate heat as the motor operates. If it is used in a sealed place, the ambient temperature may rise abnormally. Be careful that the ambient temperature of the motor / servo driver meets the usage range.
- (54) Maintenance and inspection should be done by experts.
- (55) When not using for a long time, be sure to turn off the power.
- (56) When the dynamic brake built into the servo driver operates from high-speed operation, set a stop time of about 10 minutes. If it is used under more conditions, the internal circuit may be disconnected and the brake may not operate.
- (57) Secure the cable so that stress is not applied to the connection part of the connector, terminal block, etc.

- Capacitance of the capacitors of power supply rectifier circuit drops over time. To avoid a secondary problem due to a failure, replacement of capacitors is recommended at an interval of approximately 5 years. Commission the manufacturer or sales agency authorized by the manufacturer to replace the parts.
- Be sure to read operating manual (safety guide) that shipped with product before use.

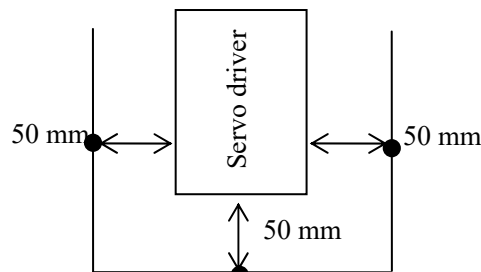


SAFETY PRECAUTIONS

Servo driver's ambient temperature

The driver's service life significantly depends on the ambient temperature.
Make sure that the driver's ambient temperature (at 50 mm distant from the driver) does not exceed the operating temperature range.

If the temperature can not be measured at a distance of 50 mm, measure it at the midpoint between the obstacle and the air gap of the driver.



Operating temperature range: 0 to 55 °C

11.Product life

(This item is not guaranteed)

11-1 Life expectancy of the driver

The driver has 28000 hours of life expectancy when used continuously under the following conditions,

Definition of the life: Life end shall be defined as the capacitance of the electrolytic capacitor is reduced by 20 % from the ex-factory status.

Condition	{	Input power	:	Single phase 100 VAC 50/60 Hz
			:	Single phase or 3 phase 200 VAC 50/60 Hz
		Working temperature.	:	55 degrees C
		Above sea level	:	Below 100m
		Output thrust	:	Constant thrust at rating
		Speed	:	Constant speed at rating

Note that the life varies due to the working conditions.

11-2 Typical life

11-2-1 In-rush current prevention relay

Replace the in-rush current prevention relay when it is activated typically 20000 times. Note that the criteria may vary depending on the environmental and working condition.

11-2-2 Cooling fan

Replace the cooling fan in 10000 to 30000 hours. Note that the criteria may vary depending on the environmental and working condition.

12. Warranty

12-1 Warranty period

Warranty period shall be 12 months from the ex-factory date or 18 months from the date of manufacturing.

This Warranty shall be exempted in the following cases,

- [1] defects resulting from misuse and/or repair or modification by the customer.
- [2] defects resulting from drop of the Product or damage during transportation.
- [3] defects resulting from improper usage of the Product beyond the Specifications.
- [4] defects resulting from fire, earthquake, lightening, flood, damage from salt, abnormal voltage or other natural disasters.
- [5] defects resulting from the intrusion of foreign material to the Product, such as water, oil or metallic particles.
- [6] when the typical life of components that is described exceeds.

12-2 Warranty scope

When failure occurs due to our responsibility during the warranty period, we will respond only to the replacement or repair of the failed part of the single unit delivered by our company. In addition, the responsibility of our company is limited to the replacement and repair of the single unit delivered by our company, we shall not bear any responsibility for damages of your company and third parties caused by equipment malfunction delivered by our company. We are not responsible for any of the exclusion items stated in 12-1 above or any malfunction of the equipment which occurred in any of the cases and damages of your company and third party.

- ① If the equipment is incorporated or used contrary to the instructions or notices stipulated in this specification.
- ② When there is a cause for the combination of the equipment and the product incorporating the equipment.
- ③ If you can not respond to the items you are asking for in this specification.
- ④ In case of malfunction of equipment other than our responsibility.

12-3 Guarantee service

If you need to receive warranty service (troubleshooting cause repair / repair etc), please contact us.

If you send us directly to our company after consent of the purchaser, please receive "repair / survey request form" from the supplier, after filling in the necessary items, attach it to the product and send it to our motor service reception. As a rule shipping fee will be paid by the customer.

13. Others

- (1) Precautions for exporting this product and equipment incorporating this product.
When the end user of this product and the end use relates to military or weapons etc., it may become subject to export restrictions prescribed by the "Foreign Exchange and Foreign Trade Control Law", so when it is exported, the examination and necessary export Please take a procedure.
- (2) This product is designed for general industrial products etc. Do not use it in nuclear power control, aerospace equipment, transportation equipment, medical equipment, various safety devices, devices requiring cleanliness such as devices related to human life, special environment.
- (3) Please confirm the conformity of the standards, laws, etc. in the finished equipment, and the matching of the structure, dimensions, life span, characteristics, etc. with your equipment and parts installed at your company.
- (4) Since it is possible that your completed equipment will malfunction due to malfunction of our products (signal breakage, signal phase loss, etc.) and external noise / static electricity applied operation, so your company to ensure safe operation within the operable range at the operation location.
- (5) Since overloading of products causes load collapse, please follow the display.
- (6) If the machine is operated in a state where the motor shaft is not electrically grounded, there is a risk of electric corrosion of the motor bearing occurring depending on the actual machine and the installation environment and the bearing sound may become large, so at your company please confirm.
- (7) Tighten properly the tightening torque of the mounting screw of the product so as not to loosen or break, considering the strength of the screw to be used and the material of the installation destination.
- (8) Since there is a possibility that noise resistance performance may be influenced by the wiring situation (earth grounding method, cable length, signal line shielding situation) etc, please check noise immunity even if placed in your completed equipment.
- (9) When discarding the servo driver / motor, please handle it as industrial waste.
- (10) When disposing of the battery, please insulate the battery with tape etc and dispose according to the ordinance of the municipality.
- (11) For performance improvement or other reasons, some components of this product may be modified in a range that satisfies the specifications given in this document.
- (12) Specification change shall be made by our specifications or documents specified by your company, and if there is an influence on function / characteristics, we will change specification after reviewing on prototype.
- (13) If there is a change in the specification, the product price may change.
- (14) Please contact us beforehand with items that are not described in this specification and in particular need to be arranged.
- (15) When a problem occurs, we will respond after consultation on both sides based on the items described in this specification.
- (16) There is a possibility of smoking of about 1 cigarette depending on the content of breakdown of this product.
Please note that when used in a clean room etc.
- (17) Do not use benzene, thinner, alcohol, acidic or alkaline detergents as they may discolor or break the exterior.

14. Specification 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	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 ²	HVSF 0.75 mm ²	HVSF 0.75 mm ²	HVSF 0.75 mm ²
	AWG18	AWG18	AWG18	AWG18
Wire material for main power supply	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²
	AWG14-18	AWG14-18	AWG14-18	AWG14-18
Wire material for earth wire	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²
	AWG14	AWG14	AWG14	AWG14
Wire material for motor	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²
	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	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 ²	HVSF 0.75 mm ²	HVSF 0.75 mm ²	HVSF 0.75 mm ²
	AWG18	AWG18	AWG18	AWG18
Wire material for main power supply	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²
	AWG14-18	AWG14-18	AWG14-18	AWG14-18
Wire material for earth wire	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²
	AWG14	AWG14	AWG14	AWG14
Wire material for motor	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²	HVSF 0.75-2.0 mm ²
	AWG14-18	AWG14-18	AWG14-18	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.	MDDL45BE MDDL45BF	MDDL55BE 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	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 ²	HVSF 0.75 mm ²	HVSF 0.75 mm ²	HVSF 0.75 mm ²
	AWG18	AWG18	AWG18	AWG18
Wire material for main power supply	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²
	AWG14	AWG14	AWG14	AWG14
Wire material for earth wire	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²
	AWG14	AWG14	AWG14	AWG14
Wire material for motor	HVSF 2.0mm ²	HVSF 2.0 mm ²	HVSF 2.0 mm ²	HVSF 3.5 mm ²
	AWG14	AWG14	AWG14	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	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 ²	HVSF 0.75 mm ²
	AWG18	AWG18
Wire material for main power supply	HVSF 3.5 mm ²	HVSF 3.5 mm ²
	AWG12	AWG12
Wire material for earth wire	HVSF 3.5 mm ²	HVSF 3.5 mm ²
	AWG12	AWG12
Wire material for motor	HVSF 3.5 mm ²	HVSF 3.5 mm ²
	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.

Model	MGDLTC3BF	MHDLTE3BF	MHDLTF3BF
Power supply input	3 phase 200 V	3 phase 200 V	3 phase 200 V
Maximum output current	160 A	240 A	360 A
Rotary encoder	Resolution: 8388608 P/r	Resolution: 8388608 P/r	Resolution: 8388608 P/r
Regenerative discharge resistor	Externally connected	Externally connected	Externally connected
Auto gain tuning function	Provided	Provided	Provided
Dynamic brake function	Provided	None	None
Absolute system	Available ^{NOTE)}	Available ^{NOTE)}	Available ^{NOTE)}
Ambient temperature main power supply cable	0-55 °C	0-55 °C	0-55 °C
Control power cable	HVSF0.75mm ²	HVSF0.75mm ²	HVSF0.75mm ²
	AWG18	AWG18	AWG18
Main power supply cable	HVSF8.0mm ²	HVSF22mm ²	HVSF38mm ²
	AWG8	AWG4	AWG2
Ground cable	HVSF8.0mm ²	HVSF22mm ²	HVSF38mm ²
	AWG8	AWG4	AWG2
Motor cable	HVSF14mm ²	HVSF22mm ²	HVSF38mm ²
	AWG6	AWG4	AWG2
Inrush current (Main power supply) (*1)	Max. 66 A	Max. 66 A	Max. 66 A
Inrush current (Control power supply) (*1)	Max. 15 A	Max. 15 A	Max. 15 A
Weight	Approx.8.2 kg	Approx14.2 kg	Approx15.2 kg
Dimensions	Size G	Size H	Size H

(*1) The current is the value calculated with the voltage as 100 V when the product power input voltage is 100 V specification and 200 V when the product is 200 V specification.

MINAS-A6B(BE/BF) series

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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-H 32.0	1	31	For Manufacturer use	0	1	62	For Manufacturer use	0				
	*1				32	For Manufacturer use	0		63	For Manufacturer use	0				
	1	1st gain of velocity loop	Size A-C 27.0 Size D-H 18.0		33	For Manufacturer use	0		64	For Manufacturer use	0				
	2	1st time constant of velocity loop integration	Size A-C 21.0 Size D-H 31.0		34	For Manufacturer use	0		65	For Manufacturer use	0				
	*1				35	For Manufacturer use	0		66	For Manufacturer use	0				
	3	1st filter of velocity detection	0		36	For Manufacturer use	0		67	For Manufacturer use	0				
	4	1st time constant of torque filter	Size A-C 0.84 Size D-H 1.26		37	For Manufacturer use	0		68	For Manufacturer use	0				
	*1				38	For Manufacturer use	0		69	For Manufacturer use	0				
	5	2nd gain of position loop	Size A-C 48.0 Size D-H 32.0		39	For Manufacturer use	0		70	For Manufacturer use	0				
	*1				40	For Manufacturer use	0		71	For Manufacturer use	0				
	6	2nd gain of velocity loop	Size A-C 27.0 Size D-H 18.0		41	For Manufacturer use	0		72	For Manufacturer use	0				
	*1				42	For Manufacturer use	0		73	For Manufacturer use	0				
	7	2nd time constant of velocity loop integration	Size A-C 21.0 Size D-H 31.0		43	For Manufacturer use	0		74	For Manufacturer use	0				
	*1				44	For Manufacturer use	0		75	For Manufacturer use	0				
	8	2nd filter of velocity detection	0		45	For Manufacturer use	0		76	For Manufacturer use	0				
	9	2nd time constant of torque filter	Size A-C 0.84 Size D-H 1.26		46	For Manufacturer use	0		77	For Manufacturer use	0				
	*1				47	For Manufacturer use	0		78	For Manufacturer use	0				
	10	Velocity feed forward gain	100.0		48	For Manufacturer use	0								
	*1				49	For Manufacturer use	0								
	11	Velocity feed forward filter	0		50	For Manufacturer use	0								
	*1				51	For Manufacturer use	0								
	12	Torque feed forward gain	100.0		52	For Manufacturer use	0								
	*1				53	For Manufacturer use	0								
	13	Torque feed forward filter	0		54	For Manufacturer use	0								
	*1				55	For Manufacturer use	0								
	14	2nd gain setup	1		56	For Manufacturer use	0								
	15	Mode of position control switching	0		57	For Manufacturer use	0								
	16	Delay time of position control switching	1.0		58	For Manufacturer use	0								
	*1				59	For Manufacturer use	0								
	17	Level of position control switching	0		60	For Manufacturer use	0								
	18	Hysteresis at position control switching	0		61	For Manufacturer use	0								
	19	Position gain switching time	1.0												
	*1														
	20	Mode of velocity control switching	0												
	21	Delay time of velocity control switching	0												
	*1														
	22	Level of velocity control switching	0												
	23	Hysteresis at velocity control switching	0												
	24	Mode of torque control switching	0												
	25	Delay time of torque control switching	0												
	*1														
	26	Level of torque control switching	0												
	27	Hysteresis at torque control switching	0												
	28	For Manufacturer use	0												
	29	For Manufacturer use	0												
	30	For 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 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) series

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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	For Manufacturer use	0								
	1	1st notch frequency	5000		32	For Manufacturer use	0								
	2	1st notchwidth selection	2		33	For Manufacturer use	0								
	3	1st notch depth selection	0		34	For Manufacturer use	0								
	4	2nd notch frequency	5000		35	For Manufacturer use	0								
	5	2nd notch width selection	2		36	For Manufacturer use	0								
	6	2nd notch depth selection	0		37	For 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												
	15	1st damping filter setup	0.0												
	16	2nd damping frequency	0.0												
	17	2nd damping filter setup	0.0												
	18	3rd damping frequency	0.0												
	19	3rd damping filter setup	0.0												
	20	4th damping frequency	0.0												
	21	4th damping filter setup	0.0												
	22	Command smoothing filter	Size A-C 9.2 Size D-H 13.9												
	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 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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 use	-												
	1	No use	-												
	2	No use	-												
	3	No use	-												
	4	For Manufacturer use	0												
	5	For Manufacturer use	0												
	6	No use	-												
	7	No use	-												
	8	No use	-												
	9	No use	-												
	10	No use	-												
	11	No use	-												
	12	Acceleration time setup	0												
	13	Deceleration time setup	0												
	14	Sigmoid acceleration/ deceleration time setup	0												
	15	No use	-												
	16	No use	-												
	17	Selection of speed limit	2												
	18	No use	-												
	19	No use	-												
	20	No use	-												
	21	For Manufacturer use	0												
	22	For Manufacturer use	0												
	23	External scale selection *3	0												
	24	Numerator of external scaledivision *3	0												
	25	Denominator of external scaledivision *3	10000												
	26	Reversal of direction ofexternal scale *3	0												
	27	External scale Z phase disconnection detection disable *3	0												
	28	Hybrid deviation excess setup *3	16000												
	29	Hybrid deviation clear setup *3	0												

*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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 use	-		39	Brake release speed setup	30								
	9	No use	-		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 use	-								
	13	No use	-		44	Position comparison output pulse width setting	0								
	14	No use	-		45	Position comparison output polarity selection	0								
	15	No use	-		46	No use	-								
	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 use	-		51	Position comparison value 4	0								
	21	Analog monitor output setup	0		52	Position comparison value 5	0								
	22	For Manufacturer use	0		53	Position comparison value 6	0								
	23	For Manufacturer use	0		54	Position comparison value 7	0								
	24	For Manufacturer use	0		55	Position comparison value 8	0								
	25	No use	-		56	Position comparison output delay compensation amount	0								
	26	No use	-		57	Position comparison output assignment setting	0								
	27	No use	-												
	28	No use	-												
	29	No use	-												
	30	No use	-												

*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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 use	-	5	31	USB axis address	1	5	62	No use	-				
	1	No use	-		32	No use	-		63	No use	-				
	2	No use	-		33	Pulse regenerative output limitsetup	0		64	No use	-				
	3	Denominator of pulse outputdivision	0		34	For Manufacturer use	4		65	No use	-				
	4	Over-travel inhibit input setup	1		35	No use	-		66	Deterioration diagnosis convergence judgment time	0				
	5	Sequence at over-travel inhibit	0		36	For Manufacturer use	0		67	Deterioration diagnosis inertia ratio upper limit	0				
	6	Sequence at Servo-off	0		37	No use	-		68	Deterioration diagnosis inertia ratio lower limit	0				
	7	Sequence at main power off	0		38	No use	-		69	Deterioration diagnosis unbalanced load upper limit	0				
	8	LV trip selection at main power off	0		39	No use	-		70	Deterioration diagnosis unbalanced load lower limit	0				
	9	Detection time of main power off	2000		40	No use	-		71	Deterioration diagnosis dynamic friction upper limit	0				
	10	Sequence at alarm	0		41	No use	-		72	Deterioration diagnosis dynamic friction lower limit	0				
	11	Torque setup for emergency stop	0		42	No use	-		73	Deterioration diagnosis viscous friction upper limit	0				
	12	Over-load level setup	0		43	No use	-		74	Deterioration diagnosis viscous friction lower limit	0				
	13	Over-speed level setup	0		44	No use	-		75	Deterioration diagnosis velocity setting	0				
	14	*1 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				
	16	Alarm clear input(A-CLR) setup	1		47	Quadrant glitch compensation delay time	0		78	Deterioration diagnosis torque lower limit	0				
	17	No use	-		48	Quadrant glitch compensation filter setting L	0								
	18	No use	-		49	Quadrant glitch compensation filter setting H	0								
	19	No use	-		50	For Manufacturer use	0								
	20	Position setup unit select	0		51	For Manufacturer use	0								
	21	Selection of torque limit	1		52	For Manufacturer use	0								
	22	*2 2nd torque limit	500		53	For Manufacturer use	0								
	23	No use	-		54	For Manufacturer use	0								
	24	No use	-		55	For Manufacturer use	0								
	25	*2 For Manufacturer use	0		56	Slow stop deceleration time setting	0								
	26	*2 For Manufacturer use	0		57	Slow stop S-shape acceleration and deceleration setting	0								
	27	No use	-		58	No use	-								
	28	No use	-		59	No use	-								
	29	For Manufacturer use	2		60	No use	-								
	30	No use	-		61	No use	-								

*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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 use	-	6	31	Real time auto tuning estimation speed	1	6	62	1st resonance attenuation ratio	0	6	93	No use	-
	1	No use	-		32	Real time auto tuning custom setup	0		63	1st anti-resonance frequency	0		94	No use	-
	2	Velocity deviation excess setup	0		33	No use	-		64	1st anti-resonance attenuation ratio	0		95	Overload warning detection level	0
	3	No use	-		34	Hybrid vibration suppression gain *3	0		65	1st response frequency	0		96	Overload warning release level	0
	4	No use	-		35	Hybrid vibration suppression filter*3	0.10		66	2nd resonance frequency	0		97	Function expansion setup 3	0
	5	Position 3rd gain valid time	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	Oscillation detecting level	0		68	2nd anti-resonance frequency	0		99	No use	-
	7	Torque command additional value	0		38	Warning mask setup	4		69	2nd anti-resonance attenuation ratio	0		100	For Manufacturer use	40.00
	8	Positive direction torque compensation value	0		39	Warning mask setup2	0		70	2nd response frequency	0		101	For Manufacturer use	0
	9	Negative direction torque compensation value	0		40	No use	-		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	Two-stage torque filter time constant	0		73	Load estimation filter	0				
	12	No use	-		43	Two-stage torque filter attenuation term	1000		74	Torque compensation frequency 1	0				
	13	No use	-		44	No use	-		75	Torque compensation frequency 2	0				
	14	Emergency stop time at alarm	200		45	No use	-		76	Load estimation count	0				
	15	2nd over-speed level setup	0		46	No use	-		77	No use	-				
	16	No use	-		47	Function expansion settings 2	1		78	No use	-				
	17	No use	-		48	Adjust filter	Size A 1.1 Size B-C 1.2 Size D-H 1.7		79	No use	-				
	18	Power-up wait time	0.0		49	Command / tuning filter damping	15		80	No use	-				
	19	For Manufacturer use	0		50	Viscous friction compensation gain	0.0		81	No use	-				
	20	For Manufacturer use	0		51	Immediate cessation completion wait time	0		82	No use	-				
	21	For Manufacturer use	0		52	For Manufacturer use	0		83	No use	-				
	22	A,B phase external scale pulse output selection *3	0		53	For Manufacturer use	0		84	No use	-				
	23	Load change compensation gain	0		54	For Manufacturer use	0		85	Retracting operation condition setting	0				
	24	Load change compensation filter	0.53		55	No use	-		86	Retracting operation alarm setting	0				
	25	No use	-		56	No use	-		87	For Manufacturer use	0				
	26	No use	-		57	Torque saturation anomaly detection time	0		88	Absolute encoder multi-turn data upper-limit value	0				
	27	Warning latch state setup	3		58	For Manufacturer use	0		89	No use	-				
	28	No use	-		59	For Manufacturer use	0		90	No use	-				
	29	No use	-		60	2nd damping depth	0		91	No use	-				
	30	For Manufacturer use	0		61	1st resonance frequency	0		92	No use	-				

*1 When checking directly value of parameter-file with a text data etc., it does not show the decimal point. Ex) Pr6.24 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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 use	-	7	62	No use	-	7	93	Home position return limit speed	0
	1	Display time setup upon power-up	0		32	No use	-		63	No use	-		94	No use	-
	2	No use	-		33	No use	-		64	No use	-		95	No use	-
	3	Output setup during torque limit	0		34	No use	-		65	No use	-		96	No use	-
	4	Backlash correction selection	0		35	No use	-		66	No use	-		97	No use	-
	5	Amount of backlash correction	0		36	No use	-		67	No use	-		98	No use	-
	6	Backlash correction time constant	0		37	No use	-		68	No use	-		99	Communication function expansion settings 6	0
	7	For Manufacturer use	0		38	No use	-		69	No use	-		100	For Manufacturer use	0
	8	For Manufacturer use	0		39	For Manufacturer use	0		70	No use	-		101	For Manufacturer use	0
	9	Correction time of latch delay 1	360		40	Station alias setup (for controller)	0		71	No use	-		102	For Manufacturer use	0
	10	For Manufacturer use	3		41	Station alias selection	1		72	No use	-		103	For Manufacturer use	0
	11	For Manufacturer use	0		42	Maximum continuation communication error	-30584		73	No use	-		104	For Manufacturer use	0
	12	For Manufacturer use	0		43	Detection time of lost link	0		74	No use	-		105	No use	-
	13	For Manufacturer use	0		44	Software Ver.	-		75	No use	-		106	No use	-
	14	Main power off warning detection time	0		45	No use	-		76	No use	-		107	No use	-
	15	For Manufacturer use	0		46	No use	-		77	No use	-		108	For Manufacturer use	7
	16	Torque saturation error protection frequency	0		47	No use	-		78	No use	-		109	For Manufacturer use	0
	17	No use	-		48	No use	-		79	For Manufacturer use	0		110	For Manufacturer use	0
	18	No use	-		49	No use	-		80	No use	-		111	No use	-
	19	No use	-		50	No use	-		81	No use	-		112	No use	-
	20	No use	-		51	No use	-		82	No use	-		113	Torque offset filter	0.00
	21	No use	-		52	No use	-		83	No use	-				
	22	Communication function expansion settings 1	0		53	No use	-		84	No use	-				
	23	Communication function expansion settings 2	16384		54	No use	-		85	No use	-				
	24	Communication function expansion settings 3	14352		55	No use	-		86	No use	-				
	25	No use	-		56	No use	-		87	Communication function expansion settings 5	3072				
	26	No use	-		57	No use	-		88	No use	-				
	27	No use	-		58	No use	-		89	No use	-				
	28	No use	-		59	No use	-		90	No use	-				
	29	No use	-		60	No use	-		91	No use	-				
	30	No use	-		61	No use	-		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 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

[illegible]

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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
9	0	For Manufacturer use	1		31	For Manufacturer use	0								
	1	External scale resolution	0		32	For Manufacturer use	0								
	2	For Manufacturer use	0		33	For Manufacturer use	100								
	3	For Manufacturer use	0		34	For Manufacturer use	0								
	4	For Manufacturer use	0		35	No use	-								
	5	For Manufacturer use	0		36	No use	-								
	6	For Manufacturer use	0		37	No use	-								
	7	For Manufacturer use	0		38	No use	-								
	8	For Manufacturer use	0		39	No use	-								
	9	For Manufacturer use	0		40	No use	-								
	10	For Manufacturer use	0		41	No use	-								
	11	For Manufacturer use	Size A 1 Size B-H 0		42	No use	-								
	12	For Manufacturer use	Size A 80 Size B-H 40		43	No use	-								
	13	For Manufacturer use	50		44	No use	-								
	14	For Manufacturer use	10		45	No use	-								
	15	No use	-		46	No use	-								
	16	No use	-		47	No use	-								
	17	For Manufacturer use	0		48	For Manufacturer use	0								
	18	For Manufacturer use	0		49	For Manufacturer use	0								
	19	For Manufacturer use	0		50	For Manufacturer use	0								
	20	For Manufacturer use	0												
	21	For Manufacturer use	0												
	22	For Manufacturer use	200												
	23	For Manufacturer use	50												
	24	For Manufacturer use	100												
	25	For Manufacturer use	40												
	26	For Manufacturer use	40												
	27	For Manufacturer use	1000												
	28	For Manufacturer use	100												
	29	For Manufacturer use	0												
	30	For 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 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]

PARAMETER

MODEL

MINAS-A6B(BE/BF) 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	For Manufacturer use	0	15	31	For Manufacturer use	5								
	1	No use	-		32	No use	-								
	2	For Manufacturer use	0		33	For Manufacturer use	0								
	3	No use	-		34	For Manufacturer use	0								
	4	No use	-		35	For Manufacturer use	1								
	5	No use	-												
	6	No use	-												
	7	No use	-												
	8	No use	-												
	9	No use	-												
	10	No use	-												
	11	No use	-												
	12	No use	-												
	13	No use	-												
	14	No use	-												
	15	No use	-												
	16	For Manufacturer use	2												
	17	For Manufacturer use	4												
	18	No use	-												
	19	No use	-												
	20	No use	-												
	21	No use	-												
	22	No use	-												
	23	No use	-												
	24	No use	-												
	25	No use	-												
	26	No use	-												
	27	No use	-												
	28	No use	-												
	29	No use	-												
	30	For 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 Load change compensation filter ... Value of Panaterm : 0.53 / Value of parameter-file : 53

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

*3 Can not be used with [A6BE]