Panasonic

No. SX-DSV02201

REFERENCE SPECIFICATIONS

MODEL

Product Name : AC servo driver
Part Number : MINAS-A5N, A5N01 Series

Issued on
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Motor Business Unit, Appliances Company
Panasonic Corporation

7-1-1 Morofuku, Daito-City, Osaka 574-0044, Japan
Phone : (072) 871-1212
Fax : (072) 870-3151

REVISIONS

Date	Page	Rev.	Description	Signed
May. 31, 2011	-	1.0	NEWLY ISSUED	-
June 1, 2011	-	1.1	Added the model of size G, H and 400 V ac models	-
Mar. 6, 2012		2.0	Changed the company name	-
	1		Changed the software version from Ver1.00 to Ver1.01	
	1,2,4-20,25,53		Added the MINAS-A5N01 Series	
	4-11		Changed the outline dimensional drawing	
	52,58		Added the conformity standard	
	62		Added the notes about installation	

Contents

1. Scope ····· 1
2. Product number ····· 1
3. Product Line-up ····· 2
4. Specifications ····· 3
4-1 Basic Specifications ····· 3
4-2 Compatible Standard (Under Contemplation) ····· 3
5. Dimensions ····· 4
6. Appearance and Part Names ····· 12
7. Configuration of Connectors and Terminal Blocks ····· 21
7-1 Power Connector XA , XB , XC , XD and Terminal Block ····· 21
7-2 USB Connector X1 ····· 24
7-3 RTEX connectors X2A and X2B ····· 25
7-4 Safety function connector X3 (for MINAS-A5N01 Series) ····· 25
7-5 I/O Connector X4 ····· 26
7-6 External Scale Connector X5 ····· 28
7-7 Encoder Connector X6 ····· 28
7-8 Monitor Connector X7 ····· 29
8. Wiring ····· 31
8-1 Used Cables and Maximum Cable Lengths ····· 31
8-2 Cable Side Connector ····· 31
8-3 Precautions for Wiring ····· 32
9. Compliance with European EC Directive/UL Standard ····· 52
9-1 European EC Directive ····· 52
9-2 Peripheral Device Configuration ····· 53
9-3 List of Peripheral Devices Applicable to Servo Driver ····· 55
9-4 Compliance with UL Standard ····· 57
10. Compliance with SEMI F47 Instantaneous Stop Standard ····· 58
11. Compliance with KC mark ····· 58
12. Safety Precautions ····· 59
13. Life and Warranty ····· 63
13-1 Life Expectancy of the Driver ····· 63
13-2 Typical Life ····· 63
13-3 Warranty Period ····· 63
14. Others ····· 64
Specification for Each Model

1. Scope

The specifications are for AC servo driver MINAS-A5N Series standard models and MINAS-A5N01 Series made by Motor Business Unit, Appliances Company, Panasonic Corporation.

<Software version>

This technical reference applies to the servo drivers compatible with software of the following version:

Ver.1.01 or later

For the software version, confirm it by the setup support software PANATERM or other function.

<Related documents>

SX-DSV02202: Technical document - Functional specification -

SX-DSV02203: Technical document - Realtime Express (RTEX) communication specification –

<IMPORTANT>

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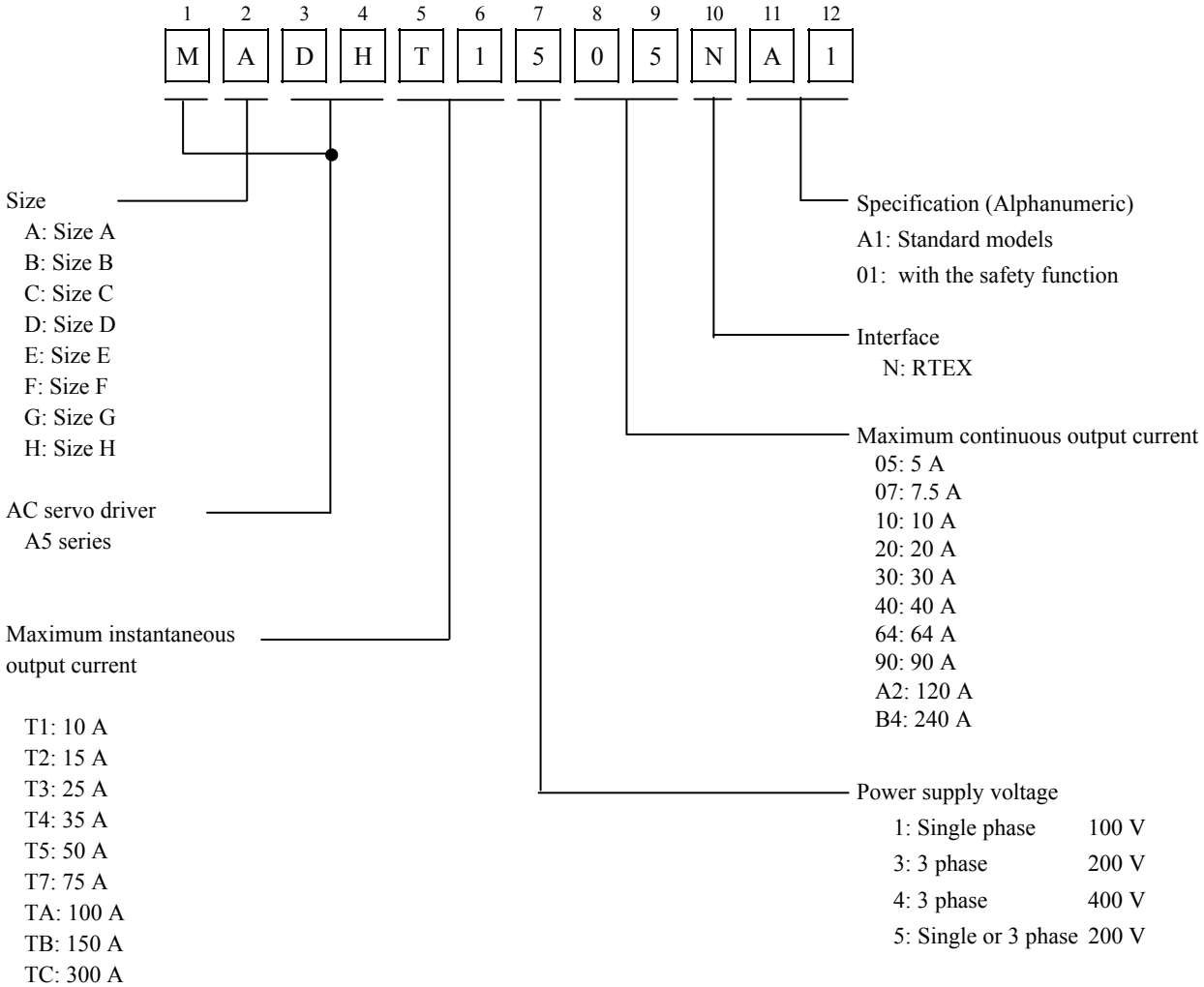
2. Product number

The following shows how to interpret a product number.



3. Product Line-up

Model No. (Note 1)		Frame mark	Power supply voltage	Rated output of applicable motor (Note 2)
MINAS-A5N Series (Standard models)	MINAS-A5N01 Series (With the safety function)			
MADHT1105NA1	MADHT1105N01	A	Single-phase AC100–120 V	Max 50 W
MADHT1107NA1	MADHT1107N01			Max 100 W
MADHT1505NA1	MADHT1505N01		Single/3-phase AC 200–240 V	Max 100 W
MADHT1507NA1	MADHT1507N01			Max 200 W
MBDHT2110NA1	MBDHT2110N01	B	Single-phase AC100–120 V	Max 200 W
MBDHT2510NA1	MBDHT2510N01		Single/3-phase AC 200–240 V	Max 400 W
MCDHT3120NA1	MCDHT3120N01	C	Single-phase AC100–120 V	Max 400 W
MCDHT3520NA1	MCDHT3520N01		Single/3-phase AC 200–240 V	Max 750 W
MDDHT3530NA1	MDDHT3530N01	D	Single/3-phase AC 200–240 V	Max 1,000 W
MDDHT5540NA1	MDDHT5540N01			Max 1,500 W
MDDHT2407NA1	MDDHT2407N01		3-phase AC 380–480 V	Max 600 W
MDDHT2412NA1	MDDHT2412N01			Max 1,000 W
MDDHT3420NA1	MDDHT3420N01			Max 1,500 W
MEDHT7364NA1	MEDHT7364N01	E	3-phase AC 200–230 V	Max 2,500 W
MEDHT4430NA1	MEDHT4430N01		3-phase AC 380–480 V	Max 2,500 W
MFDHTA390NA1	MFDHTA390N01	F	3-phase AC 200–230 V	Max 3,000 W
MFDHTB3A2NA1	MFDHTB3A2N01			Max 5,000 W
MFDHT5440NA1	MFDHT5440N01		3-phase AC 380–480 V	Max 3,000 W
MFDHTA464NA1	MFDHTA464N01			Max 5,000 W
MGDHTC3B4NA1	MGDHTC3B4N01	G	3-phase AC 200–230 V	Max 7,500 W
MGDHTB4A2NA1	MGDHTB4A2N01		3-phase AC 380–480 V	Max 7,500 W
MHDHTC3B4NA1	MHDHTC3B4N01	H	3-phase AC 200–230 V	Max 15,000 W
MHDHTB4A2NA1	MHDHTB4A2N01		3-phase AC 380–480 V	Max 15,000 W

(Note 1) MINAS-A5N01 Series are the models which are added the safety function to MINAS-A5N series standard models.
(Note 2) Some of the combinations shown in this table cannot be used depending on motors. For the combination of an driver and a motor, refer to MINAS-A5 series catalog.

4. Specifications

4-1 Basic Specifications

Item				Description
Input power supply	100 V	Main circuit power		Single phase 100–120 V ac + 10% - 15% 50/60 Hz
		Control circuit power		Single phase 100–120 V ac + 10% - 15% 50/60 Hz
	200 V	Main circuit power	A–D	Single/3 phase 200–240 V ac + 10% - 15% 50/60 Hz
			E–H	3 phase 200–230 V ac + 10% - 15% 50/60 Hz
		Control circuit power	A–D	Single phase 200–240 V ac + 10% - 15% 50/60 Hz
			E–H	Single phase 200–230 V ac + 10% - 15% 50/60 Hz
	400 V	Main circuit power	D-H	3 phase 380–480 V ac + 10% - 15% 50/60 Hz
		Control circuit power		24 V dc +/- 15%
Insulation voltage				Resistant to 1,500 V AC between primary power supply and ground for a minute (Sensed current: 20 mA) * Excluding control circuit power supply part (24 V dc) of 400 V models.
Operation conditions		Temperature		Operation temperature: 0–55 degrees C Storage temperature: -20–65 degrees C
		Humidity		Operation and storage humidity 90%RH or less (no condensation)
		Height above the sea		Height above the sea level: 1,000 meters or less
		Vibration		5. 88 m/s^2 or less, 10–60 Hz (Continuous operation at resonance point is not allowed)

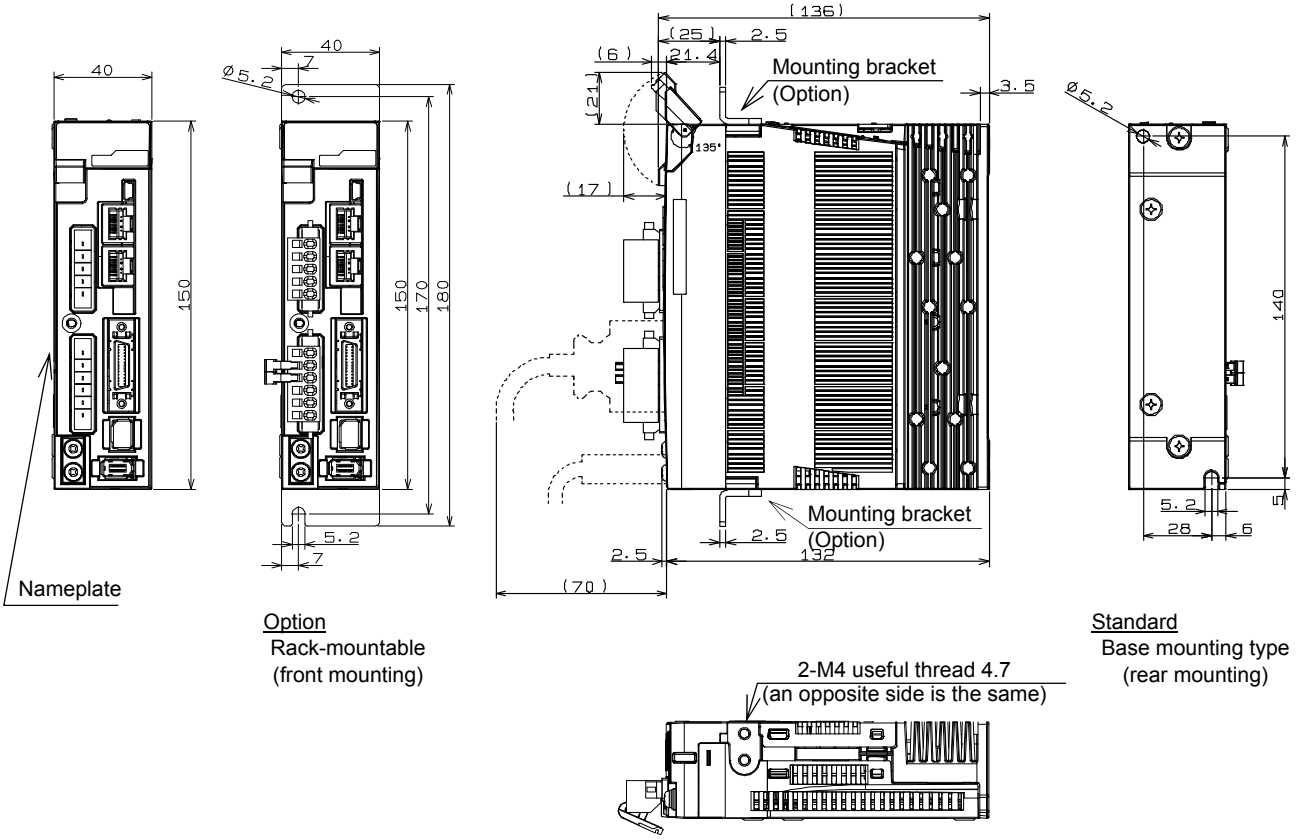
4-2 Compatible Standard (Under Contemplation)

Item		Description
EC Directive	EMC directive	EN55011 (CISPR11), EN61000-6-2, EN61800-3
	Low voltage directive	EN61800-5-1
UL		UL508C
CSA		CSA22. 2 No.14
KC		KN11 , KN61000-4-2,34,5,6,8,11

5. Dimensions

● MINAS-A5N and A5N01 Series

Size A 100 V/200 V



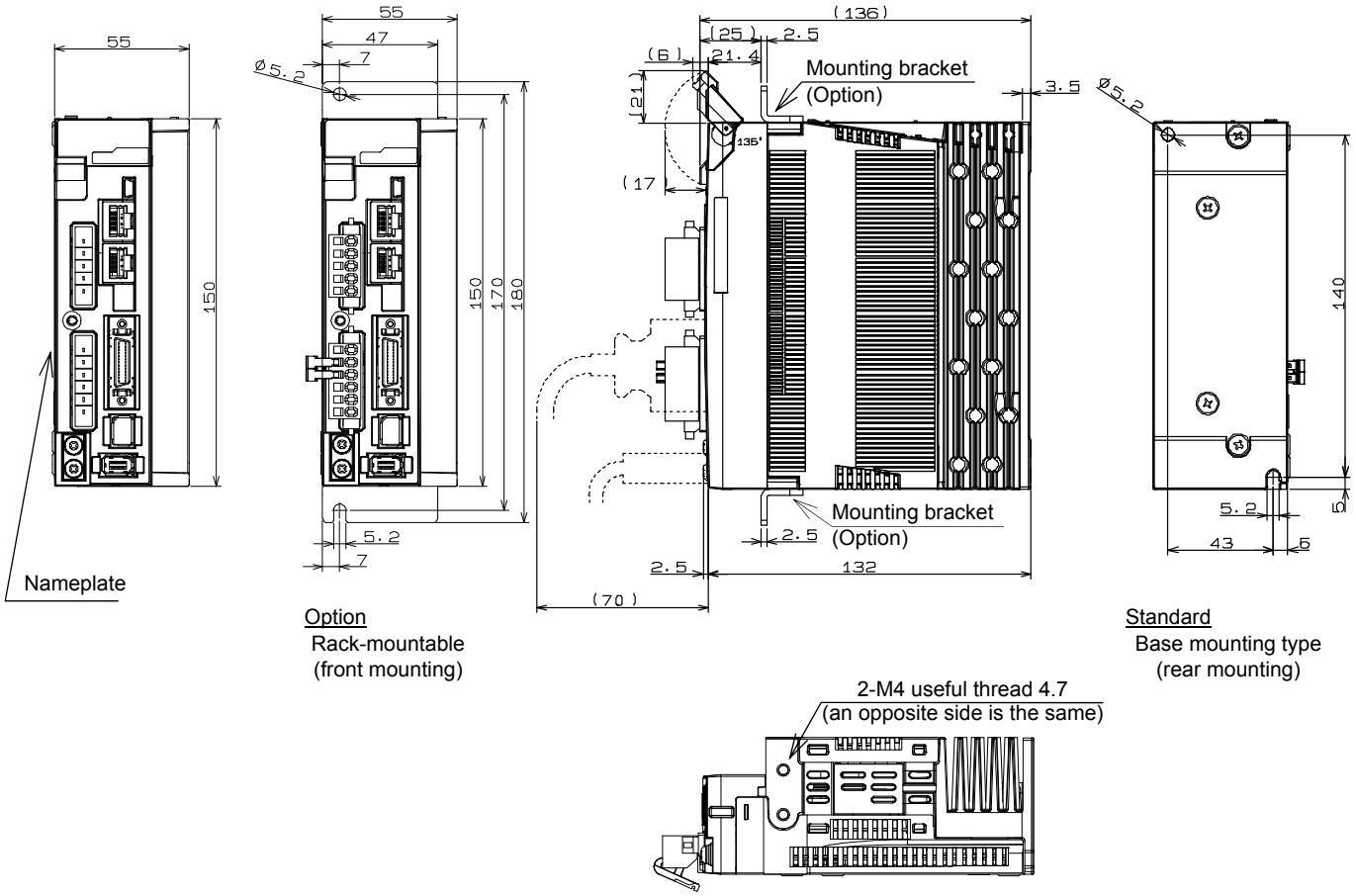
Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

[Front mounting bracket Optional part number]

	Part number
For frame A	DV0PM20027

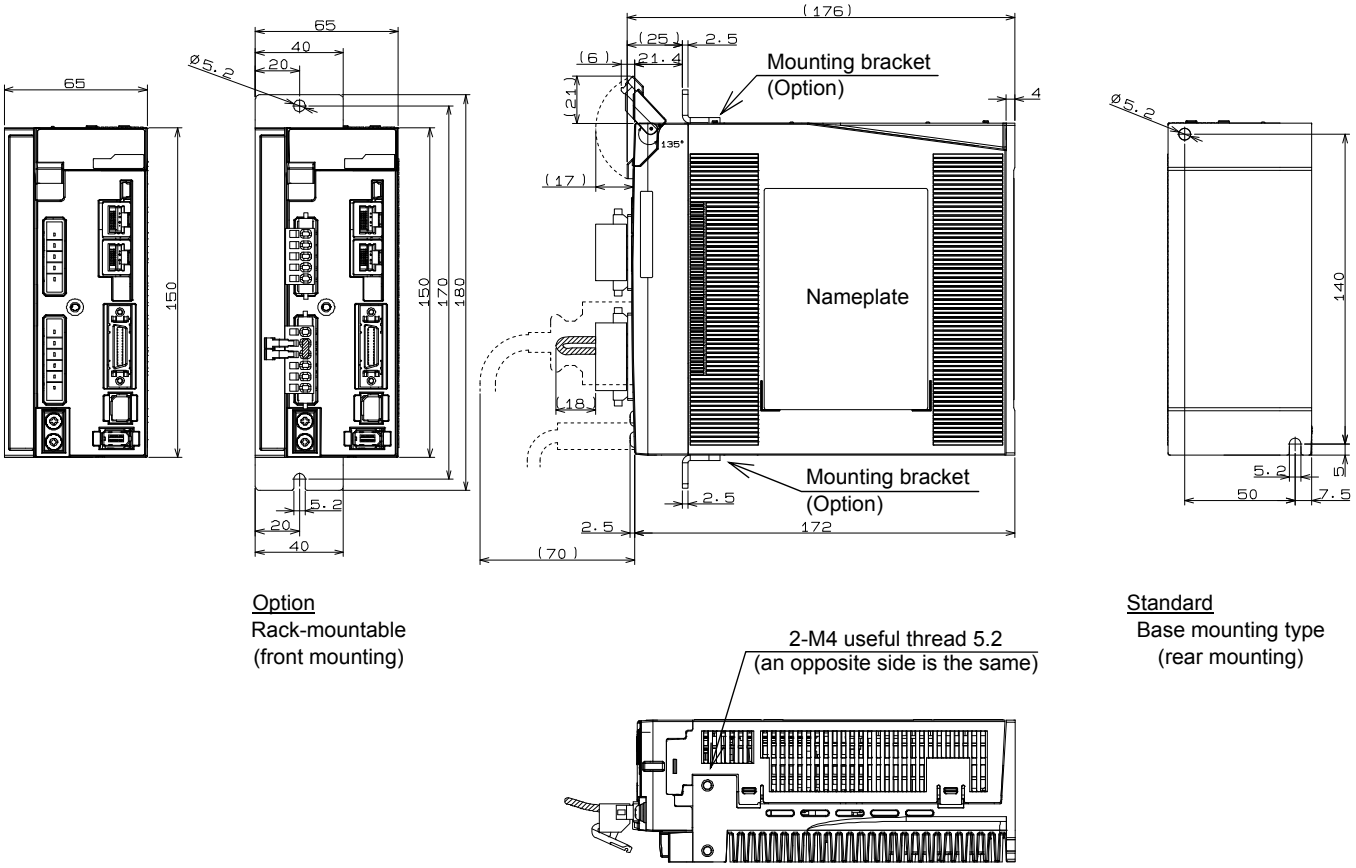
Size B 100 V/200 V



[Front mounting bracket Optional part number]

	Part number
For frame B	DV0PM20028

Size C 100 V/200 V



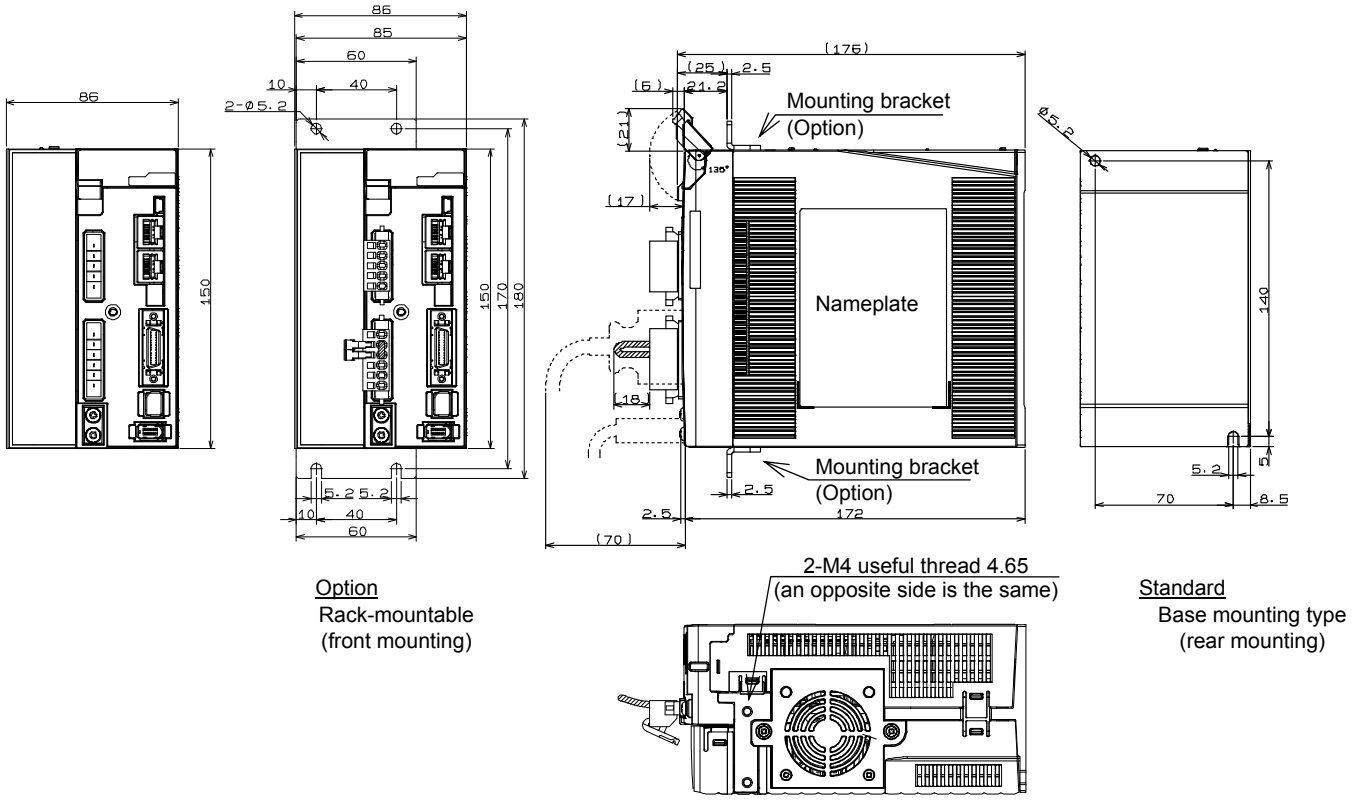
Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

[Front mounting bracket Optional part number]

	Part number
For frame C	DV0PM20029

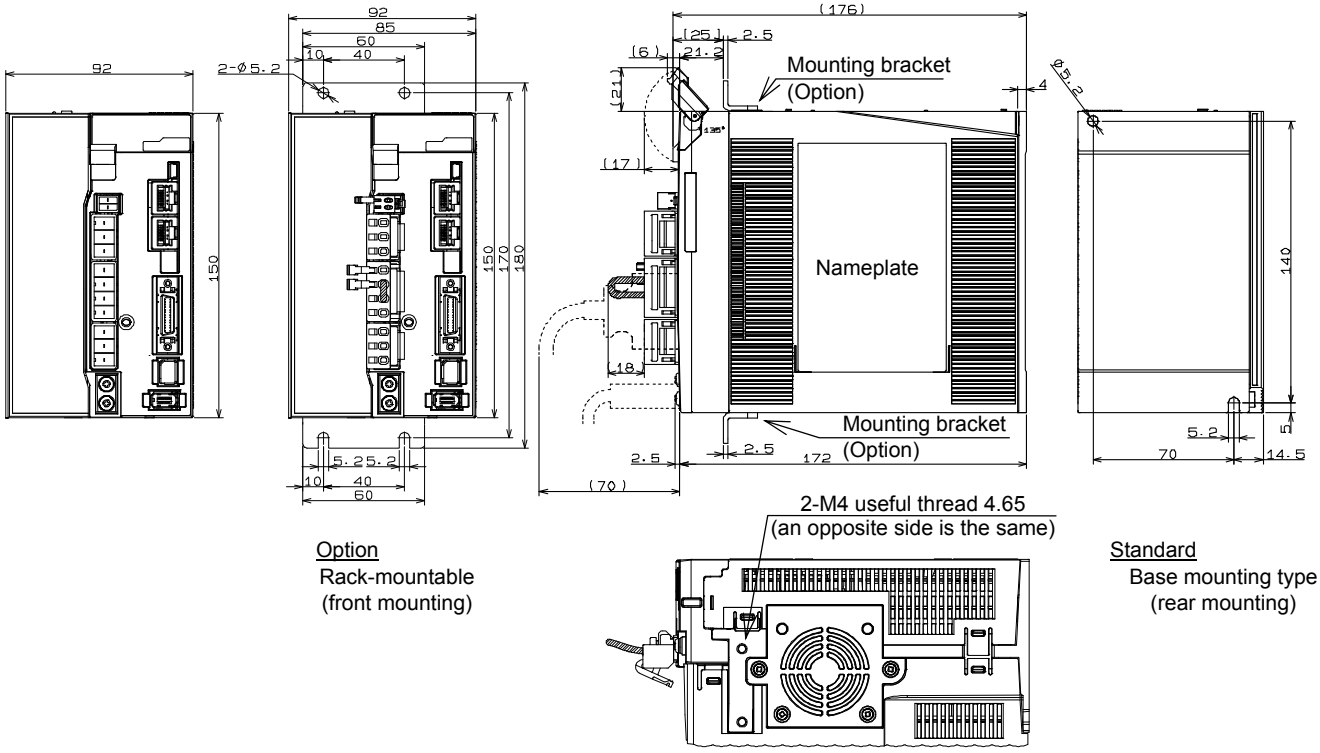
Size D 200 V



Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

Size D 400 V



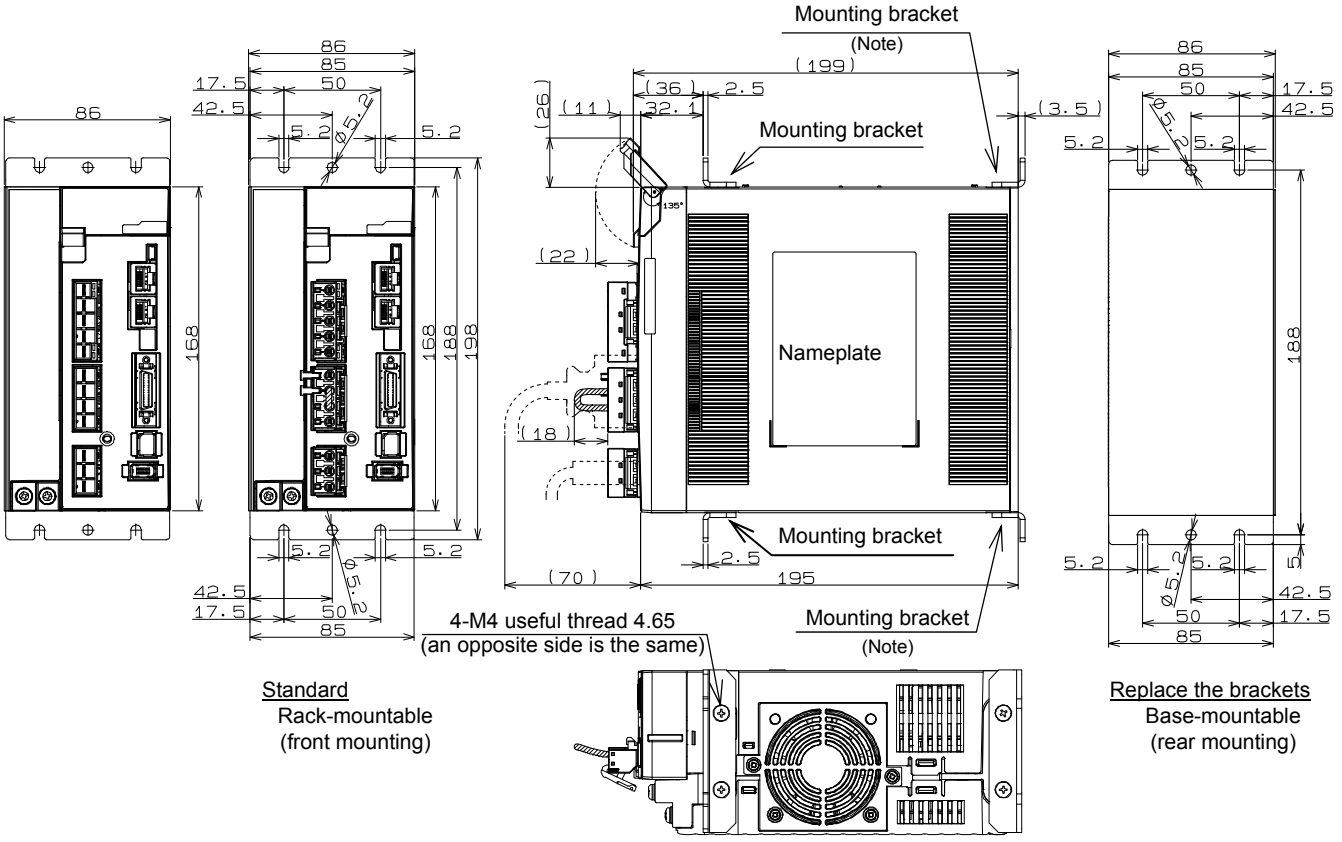
Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

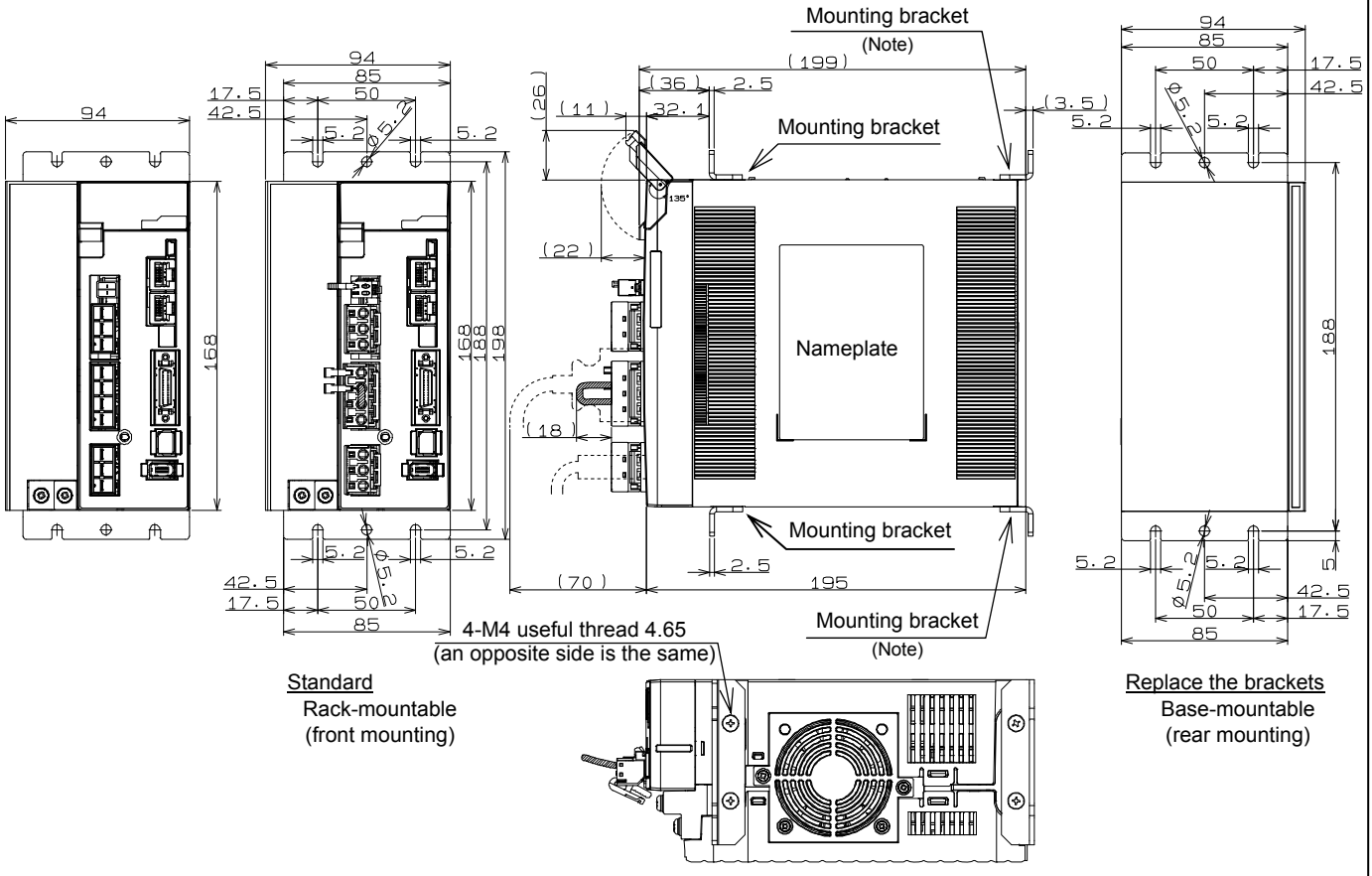
[Front mounting bracket Optional part number]

	Part number
For frame D	DV0PM20030

Size E 200 V

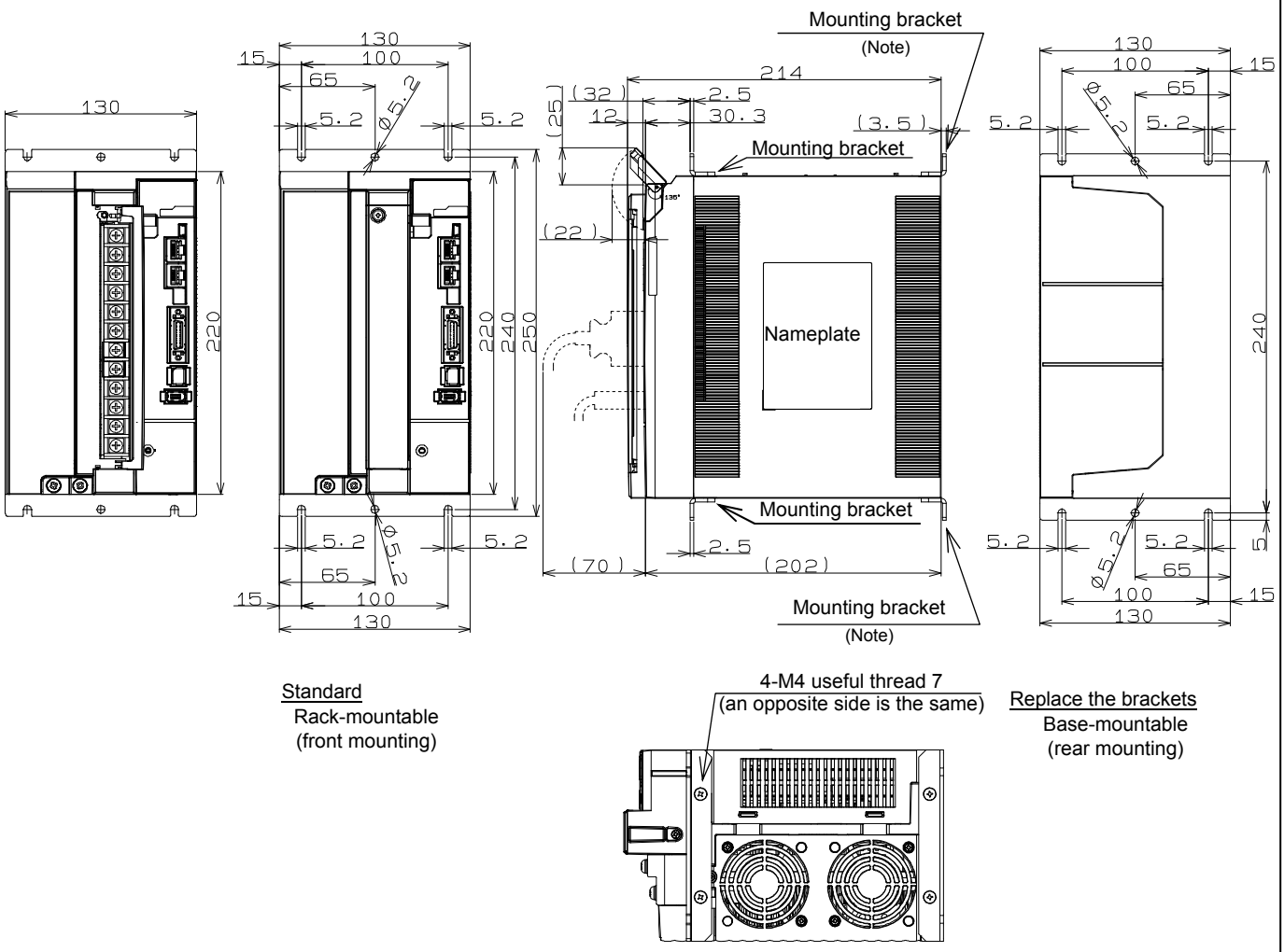


Size E 400 V



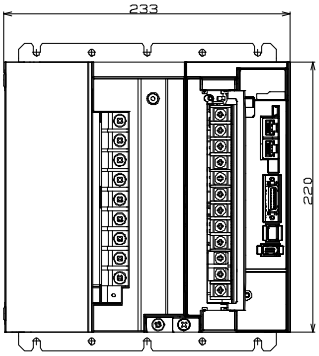
Note: For base mounting type (rear mounting type), attach the mounting bracket to the rear surface. Although the above figure shows brackets attached to both the front and rear surfaces, the unit is shipped out with the bracket attached to only the front.

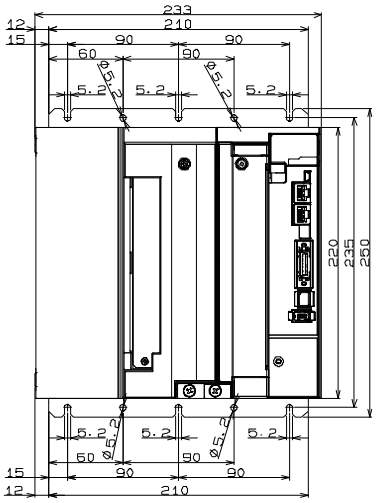
Size F 200 V/400 V

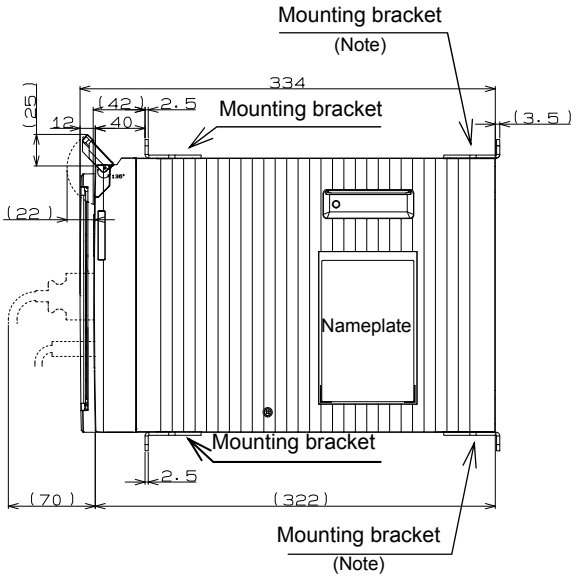


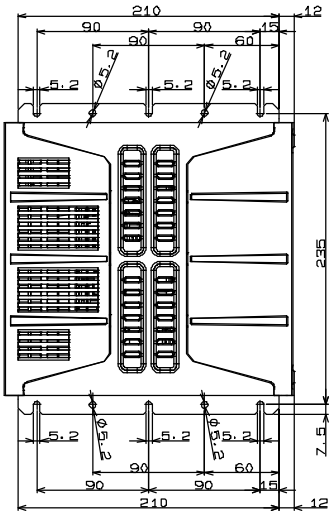
Note: For base mounting type (rear mounting type), attach the mounting bracket to the rear surface. Although the above figure shows brackets attached to both the front and rear surfaces, the unit is shipped out with the bracket attached to only the front.

Size G 200 V/400 V



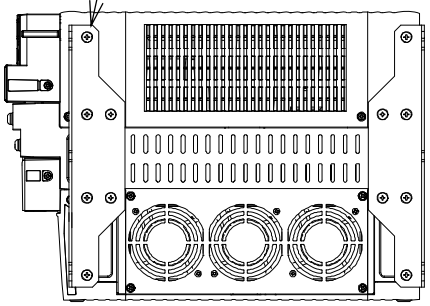






Standard
Rack-mountable
(front mounting)

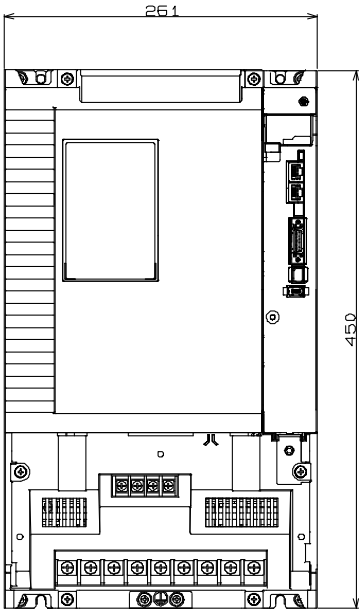
12-M4 useful thread 7.2
(an opposite side is the same)

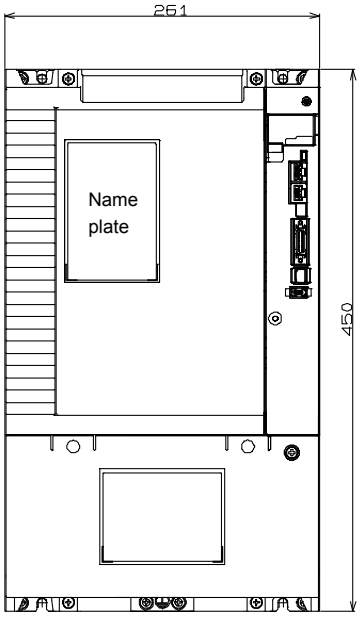


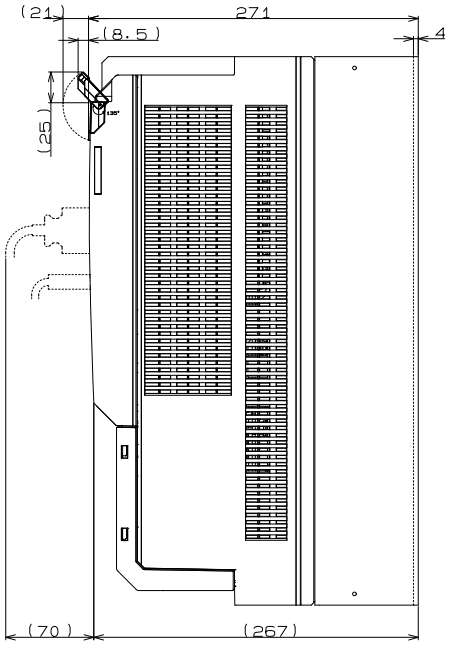
Replace the brackets
Base-mountable
(rear mounting)

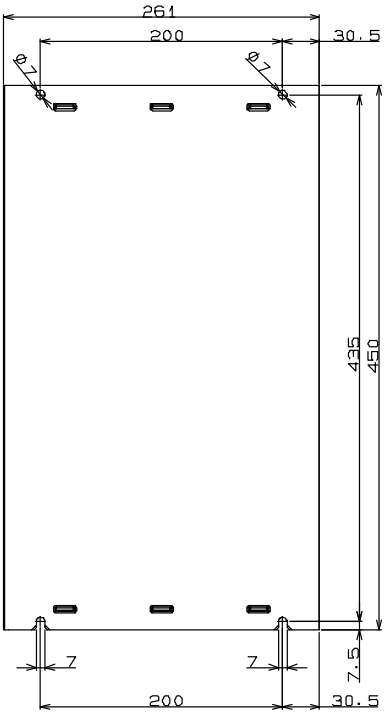
Note: For base mounting type (rear mounting type), attach the mounting bracket to the rear surface. Although the above figure shows brackets attached to both the front and rear surfaces, the unit is shipped out with the bracket attached to only the front.

Size H 200 V/400 V

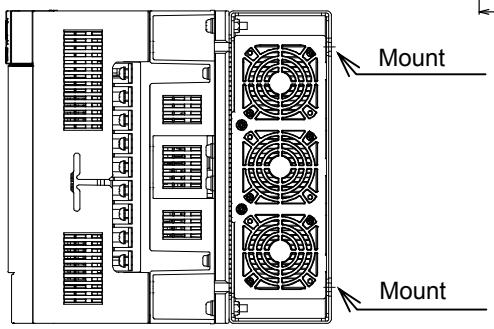






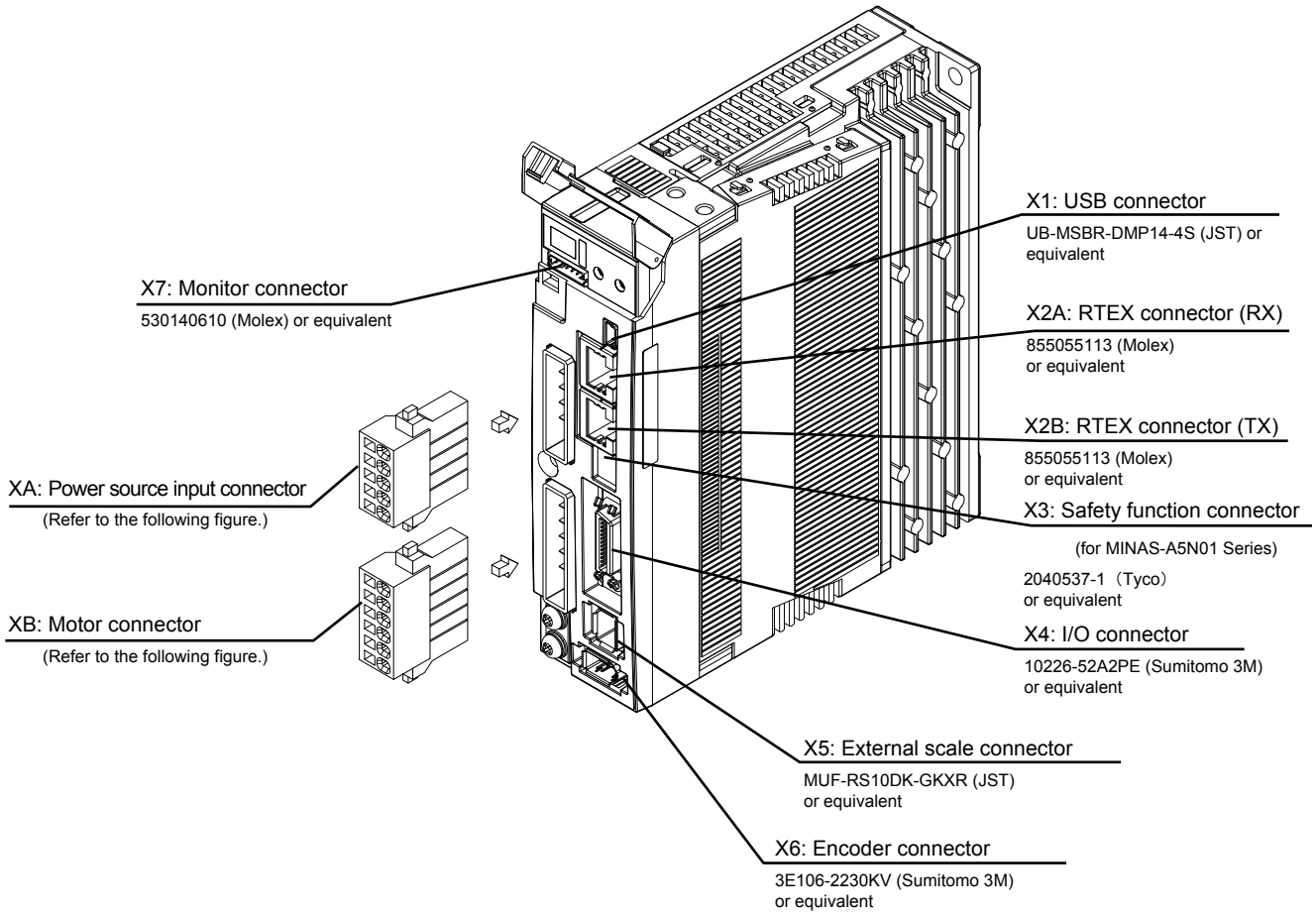


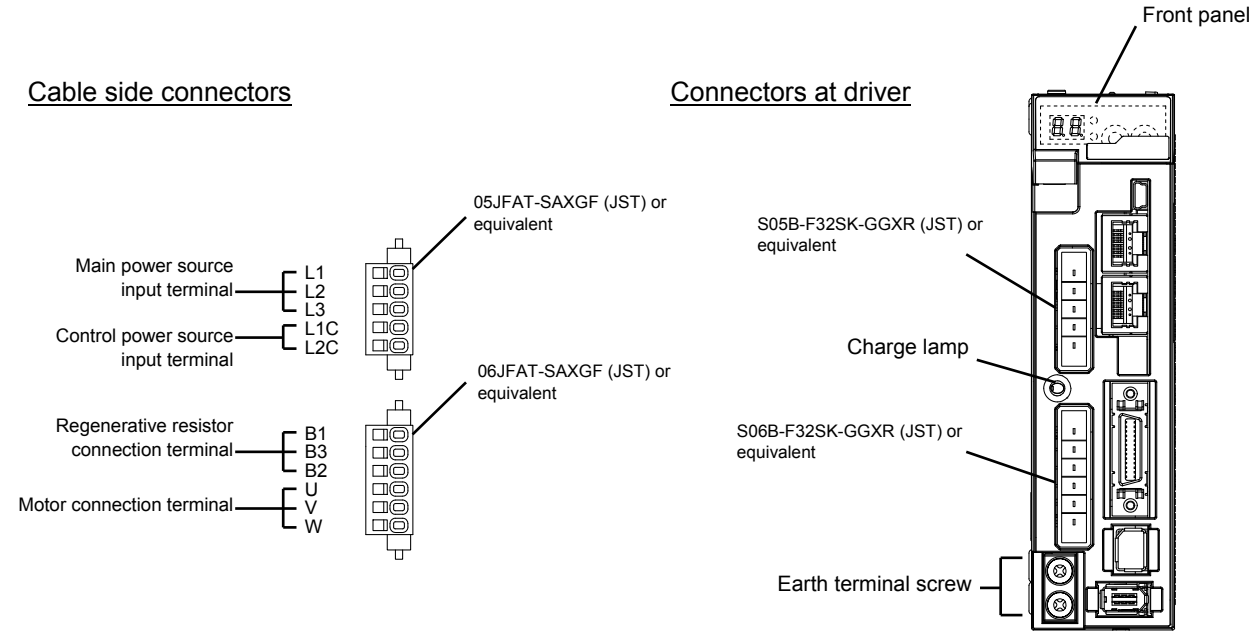
Base mounting type
(rear mounting)



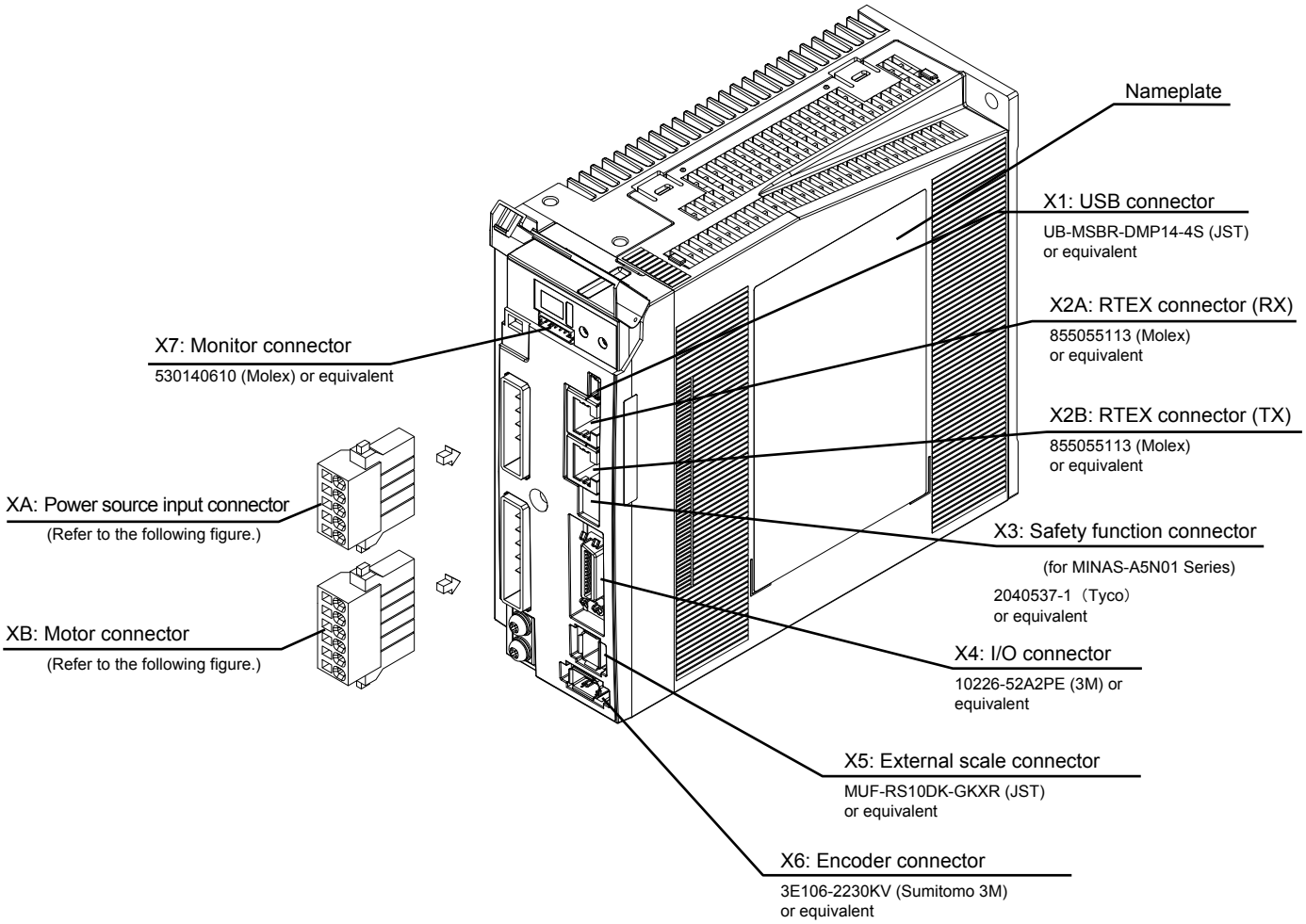
6. Appearance and Part Names

Size A, B 100 V/200 V

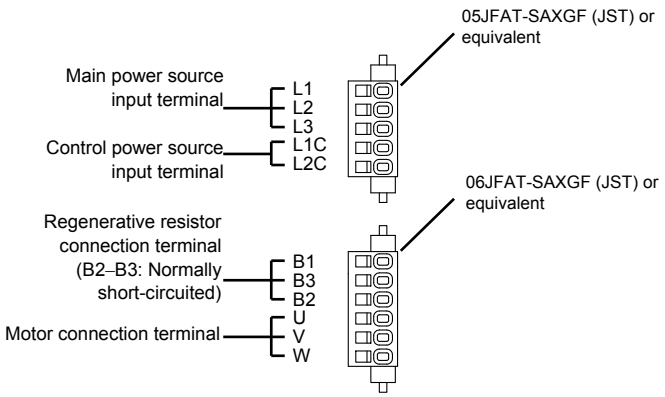




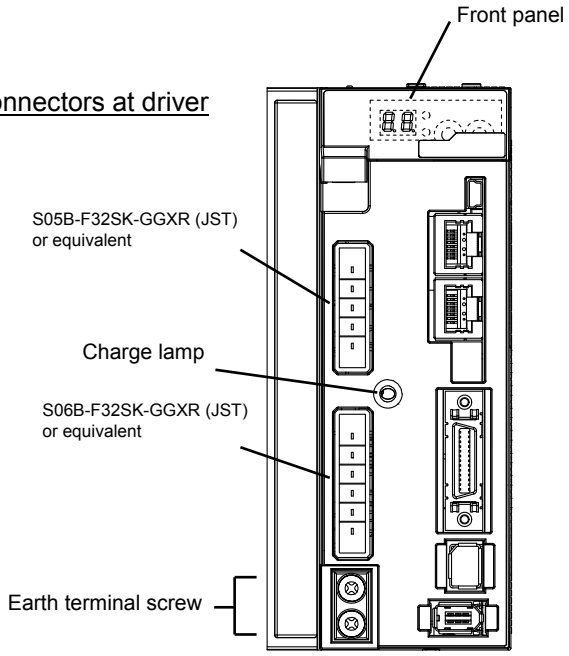
Size C, D 100 V/200 V



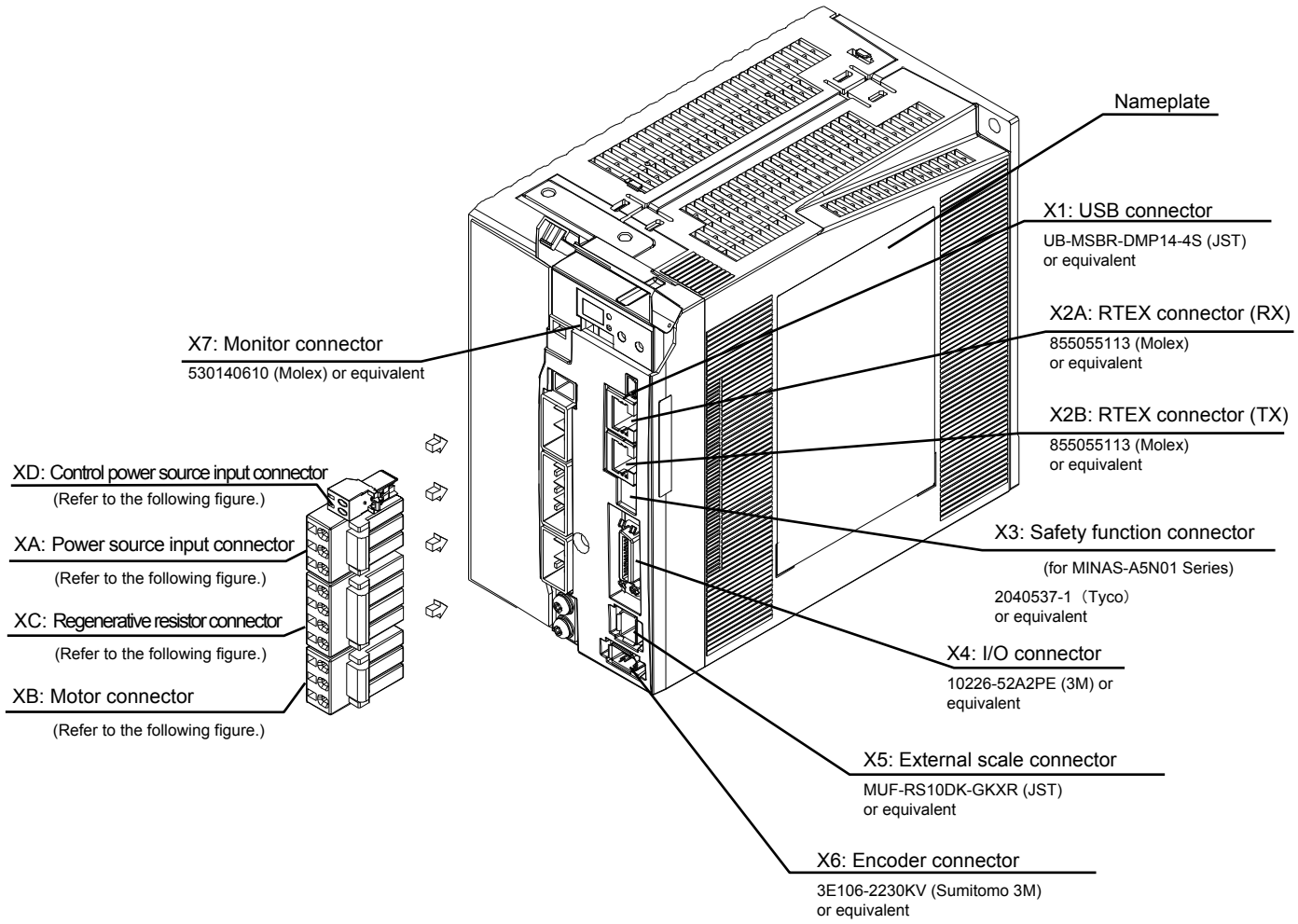
Cable side connectors

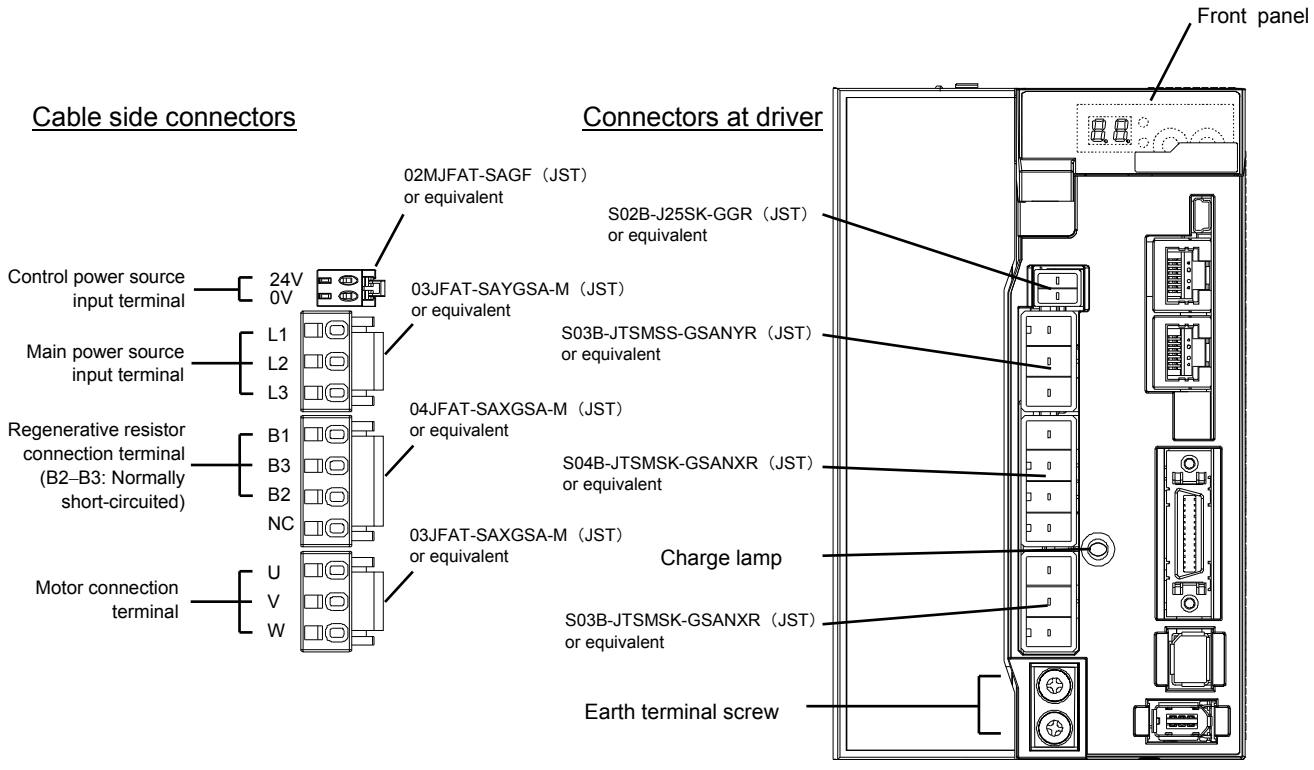


Connectors at driver

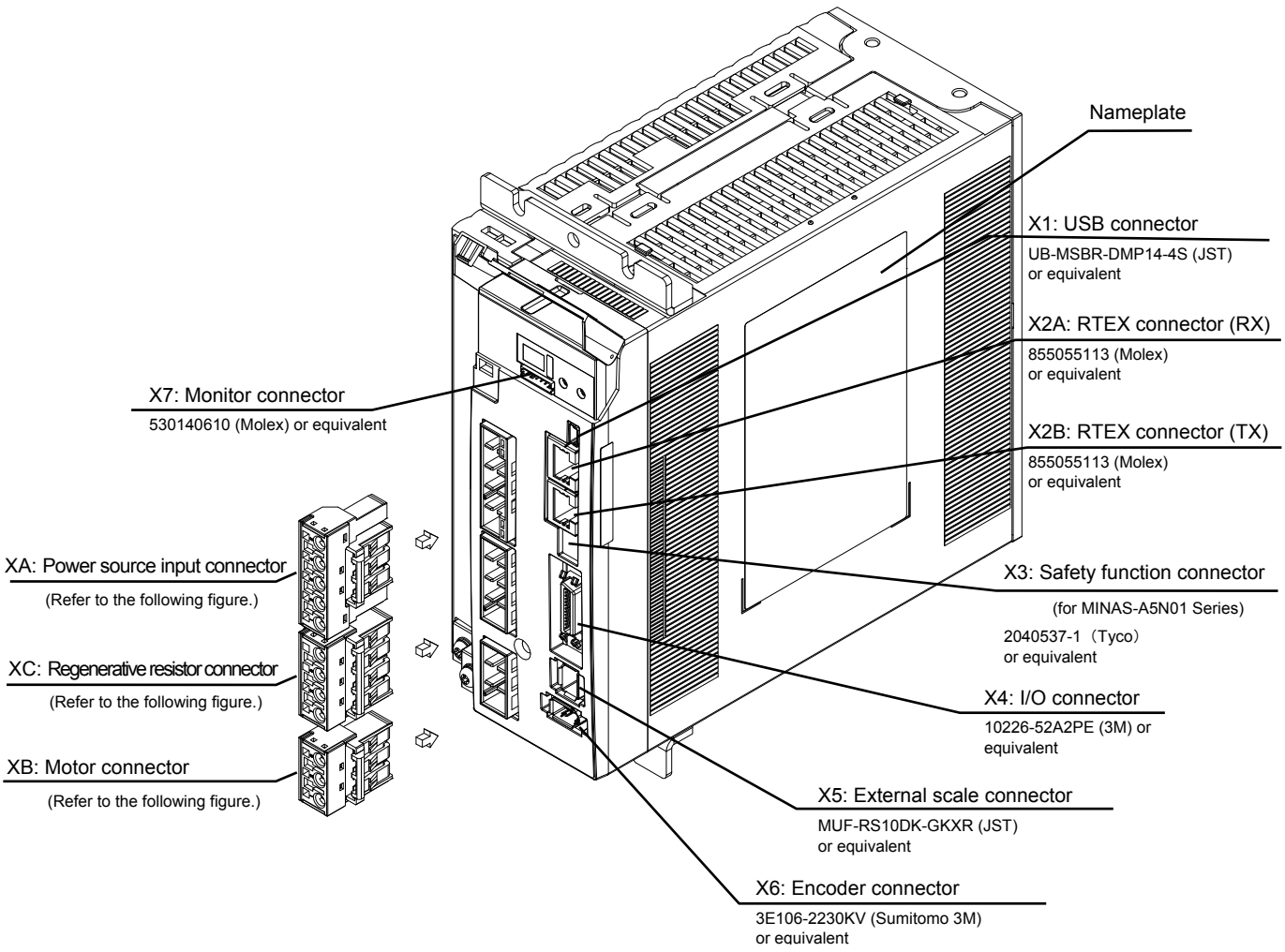


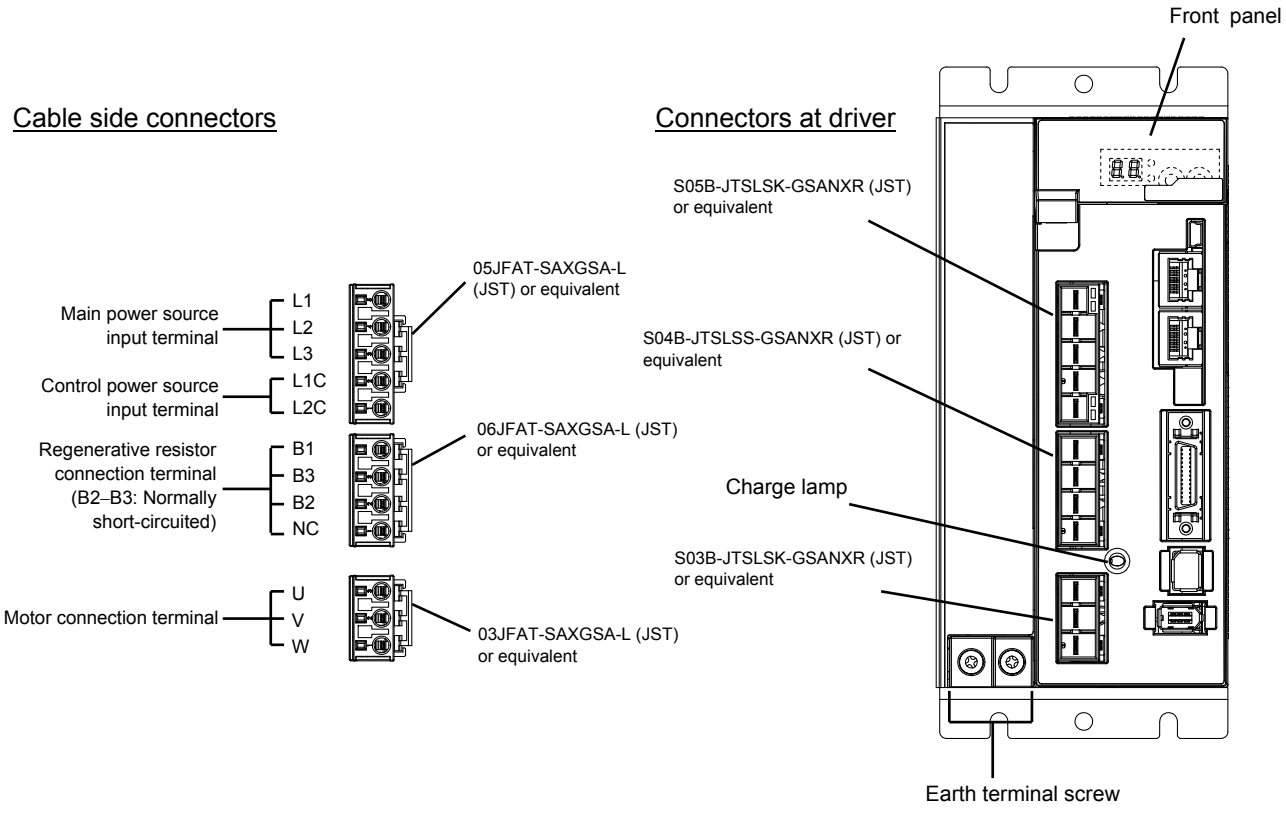
Size D 400 V


Nameplate
X1: USB connector
UB-MSBR-DMP14-4S (JST)
or equivalent
X2A: RTEX connector (RX)
855055113 (Molex)
or equivalent
X2B: RTEX connector (TX)
855055113 (Molex)
or equivalent
X7: Monitor connector
530140610 (Molex) or equivalent
XD: Control power source input connector
(Refer to the following figure.)
XA: Power source input connector
(Refer to the following figure.)
XC: Regenerative resistor connector
(Refer to the following figure.)
XB: Motor connector
(Refer to the following figure.)
X3: Safety function connector
(for MINAS-A5N01 Series)
2040537-1（Tyco）
or equivalent
X4: I/O connector
10226-52A2PE (3M) or
equivalent
X5: External scale connector
MUF-RS10DK-GKXR (JST)
or equivalent
X6: Encoder connector
3E106-2230KV (Sumitomo 3M)
or equivalent

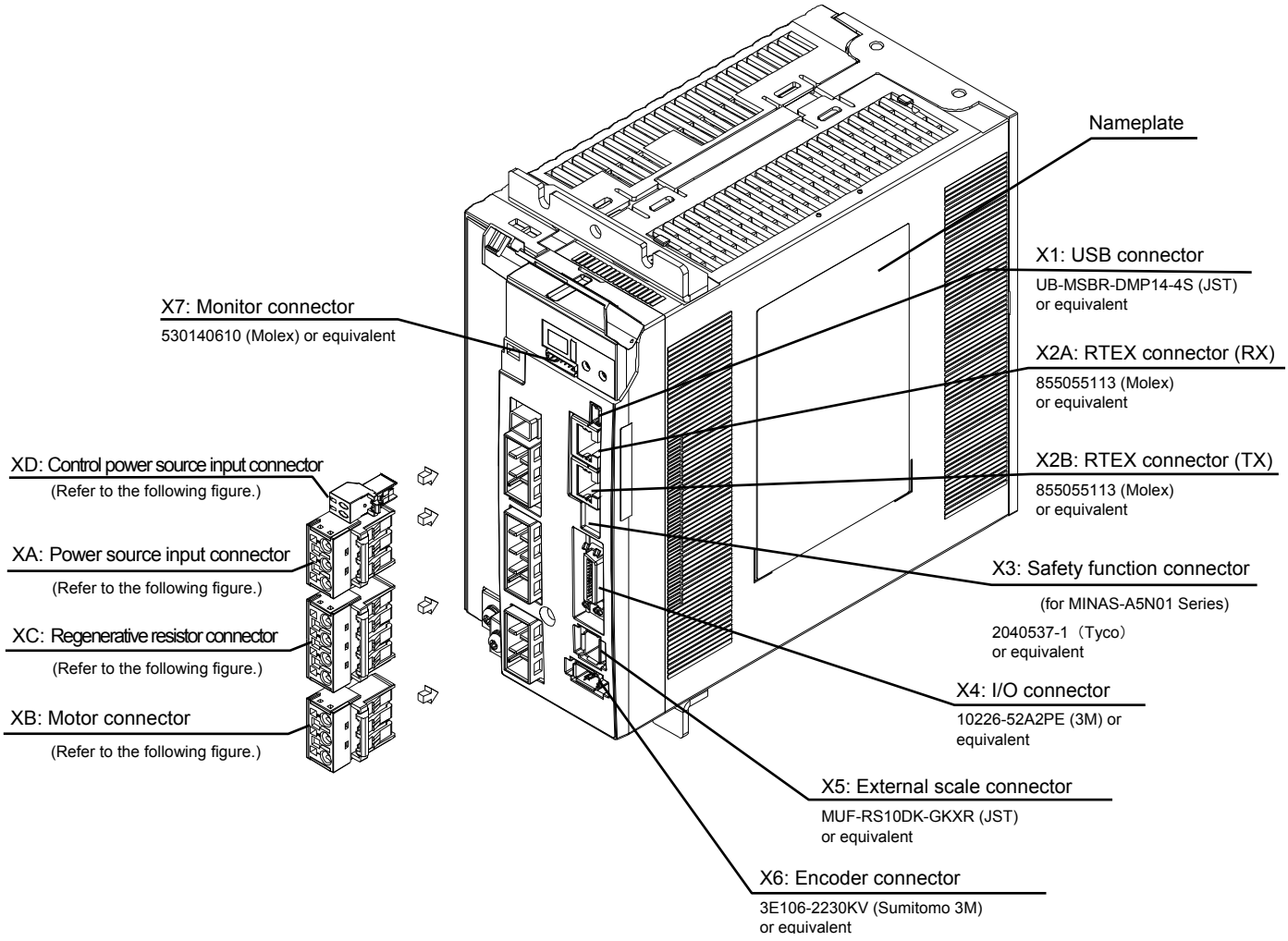

Front panel
Cable side connectors
Connectors at driver
02MJFAT-SAGF（JST）
or equivalent
S02B-J25SK-GGR（JST）
or equivalent
Control power source input terminal
24V
0V
03JFAT-SAYGSA-M（JST）
or equivalent
Main power source input terminal
L1
L2
L3
S03B-JTSMSS-GSANYR（JST）
or equivalent
Regenerative resistor connection terminal (B2–B3: Normally short-circuited)
B1
B3
B2
NC
04JFAT-SAXGSA-M（JST）
or equivalent
S04B-JTSMSK-GSANXR（JST）
or equivalent
Motor connection terminal
U
V
W
03JFAT-SAXGSA-M（JST）
or equivalent
Charge lamp
S03B-JTSMSK-GSANXR（JST）
or equivalent
Earth terminal screw

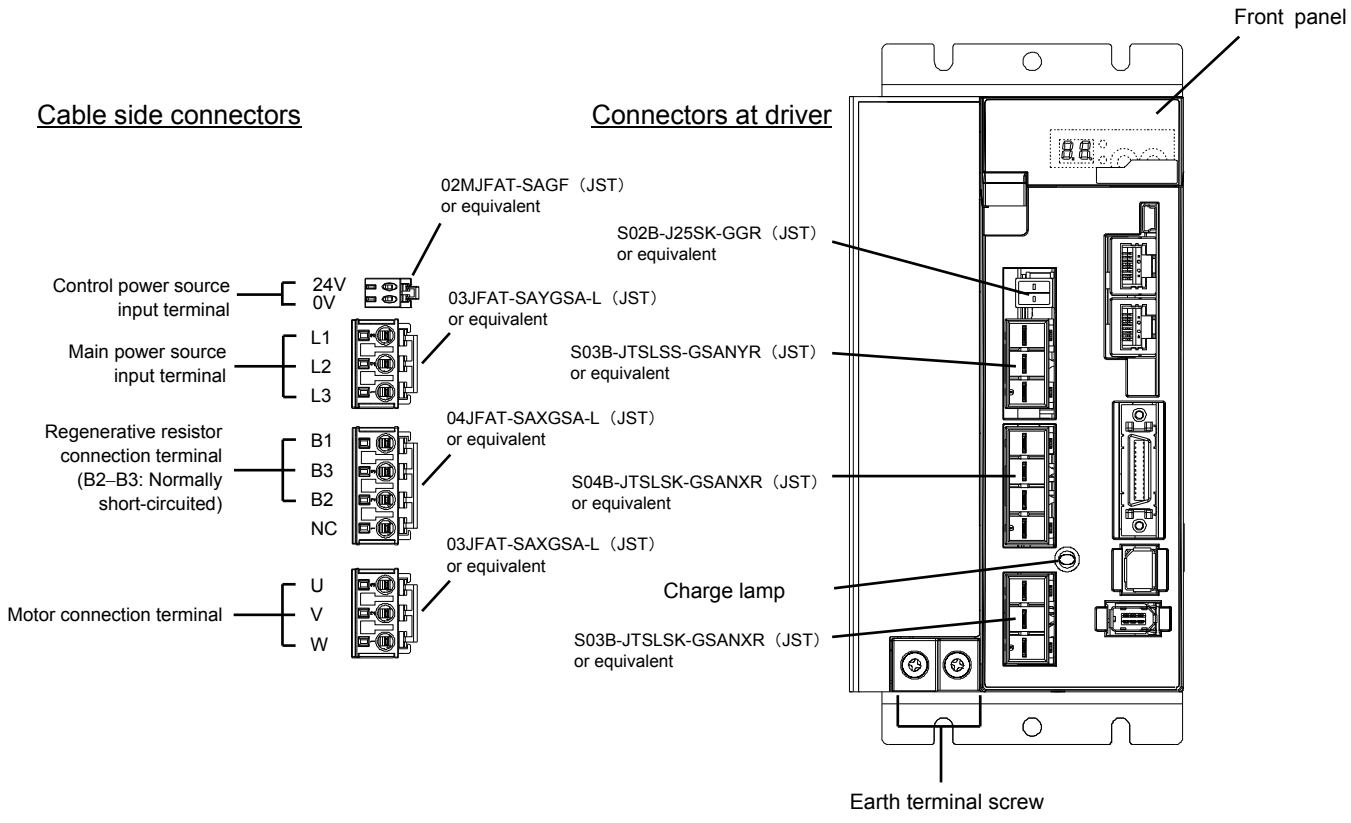
Size E 200 V


Nameplate
X1: USB connector
UB-MSBR-DMP14-4S (JST)
or equivalent
X2A: RTEX connector (RX)
855055113 (Molex)
or equivalent
X2B: RTEX connector (TX)
855055113 (Molex)
or equivalent
X7: Monitor connector
530140610 (Molex) or equivalent
XA: Power source input connector
(Refer to the following figure.)
XC: Regenerative resistor connector
(Refer to the following figure.)
XB: Motor connector
(Refer to the following figure.)
X3: Safety function connector
(for MINAS-A5N01 Series)
2040537-1 (Tyco)
or equivalent
X4: I/O connector
10226-52A2PE (3M) or
equivalent
X5: External scale connector
MUF-RS10DK-GKXR (JST)
or equivalent
X6: Encoder connector
3E106-2230KV (Sumitomo 3M)
or equivalent

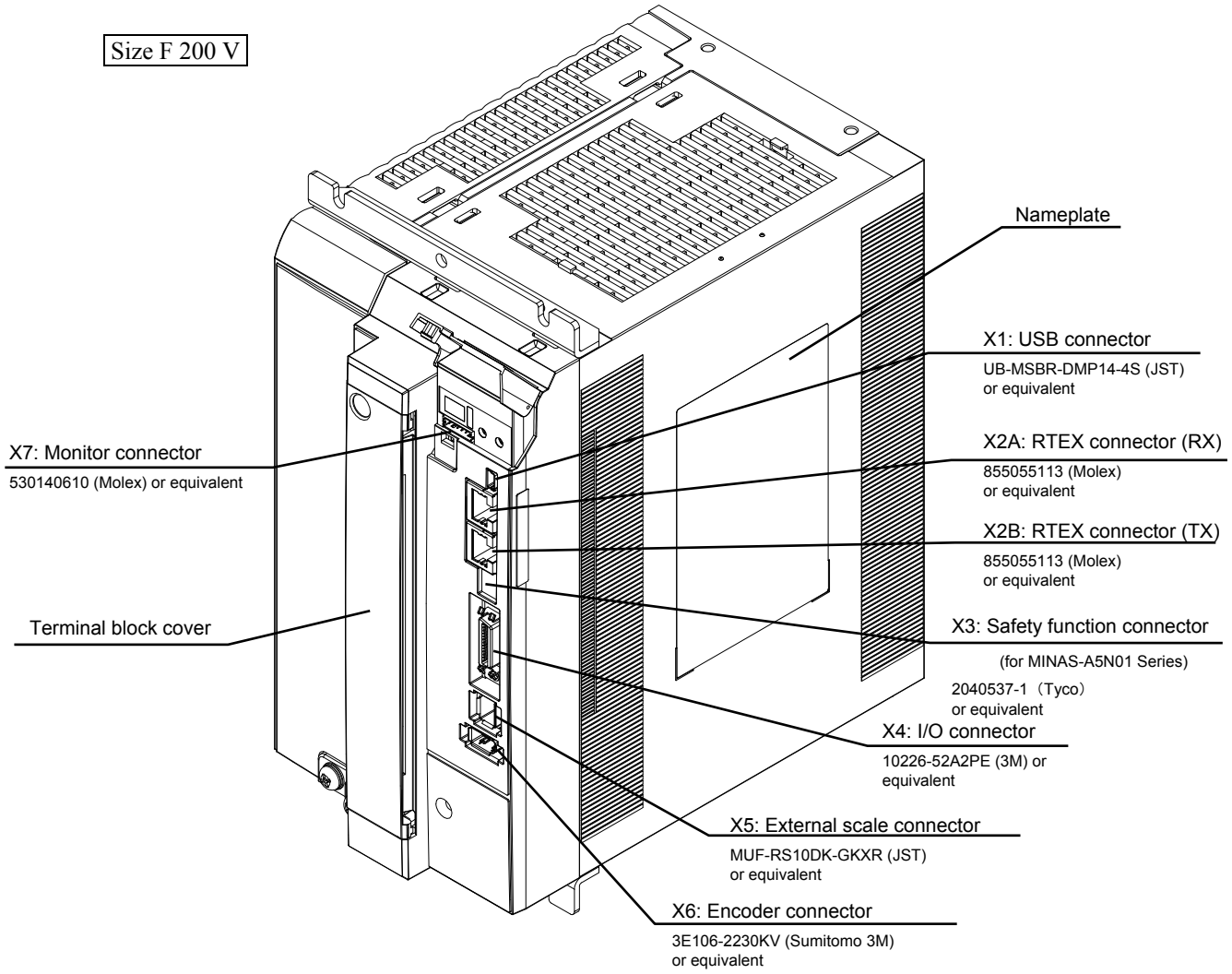

Front panel
Cable side connectors
Connectors at driver
S05B-JTSLSK-GSANXR (JST)
or equivalent
05JFAT-SAXGSA-L
(JST) or equivalent
Main power source
input terminal
L1
L2
L3
S04B-JTSLSS-GSANXR (JST) or
equivalent
Control power source
input terminal
L1C
L2C
Regenerative resistor
connection terminal
(B2–B3: Normally
short-circuited)
B1
B3
B2
NC
06JFAT-SAXGSA-L (JST)
or equivalent
Charge lamp
S03B-JTSLSK-GSANXR (JST)
or equivalent
Motor connection terminal
U
V
W
03JFAT-SAXGSA-L (JST)
or equivalent
Earth terminal screw

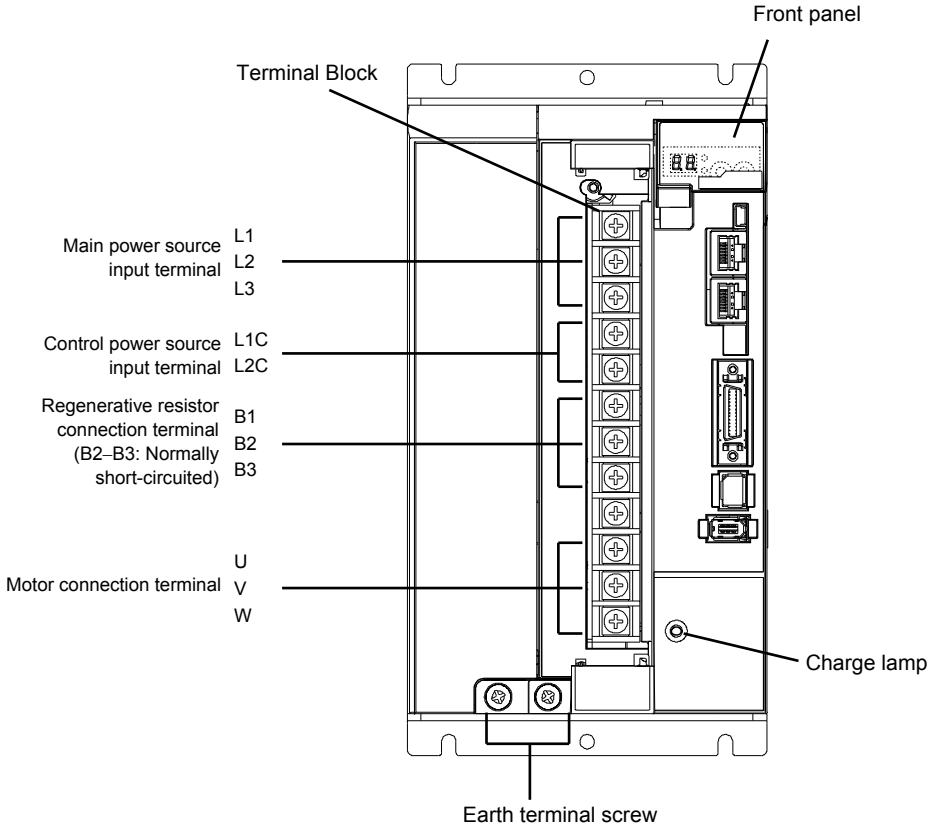
Size E 400 V


Nameplate
X1: USB connector
UB-MSBR-DMP14-4S (JST)
or equivalent
X7: Monitor connector
530140610 (Molex) or equivalent
X2A: RTEX connector (RX)
855055113 (Molex)
or equivalent
XD: Control power source input connector
(Refer to the following figure.)
X2B: RTEX connector (TX)
855055113 (Molex)
or equivalent
XA: Power source input connector
(Refer to the following figure.)
X3: Safety function connector
(for MINAS-A5N01 Series)
2040537-1 (Tyco)
or equivalent
XC: Regenerative resistor connector
(Refer to the following figure.)
X4: I/O connector
10226-52A2PE (3M) or
equivalent
XB: Motor connector
(Refer to the following figure.)
X5: External scale connector
MUF-RS10DK-GKXR (JST)
or equivalent
X6: Encoder connector
3E106-2230KV (Sumitomo 3M)
or equivalent


Front panel
Cable side connectors
Connectors at driver
02MJFAT-SAGF (JST)
or equivalent
S02B-J25SK-GGR (JST)
or equivalent
Control power source input terminal
24V
0V
03JFAT-SAYGSA-L (JST)
or equivalent
Main power source input terminal
L1
L2
L3
S03B-JTSLSS-GSANYR (JST)
or equivalent
Regenerative resistor connection terminal (B2–B3: Normally short-circuited)
B1
B3
B2
NC
04JFAT-SAXGSA-L (JST)
or equivalent
S04B-JTSLSK-GSANXR (JST)
or equivalent
03JFAT-SAXGSA-L (JST)
or equivalent
Charge lamp
Motor connection terminal
U
V
W
S03B-JTSLSK-GSANXR (JST)
or equivalent
Earth terminal screw

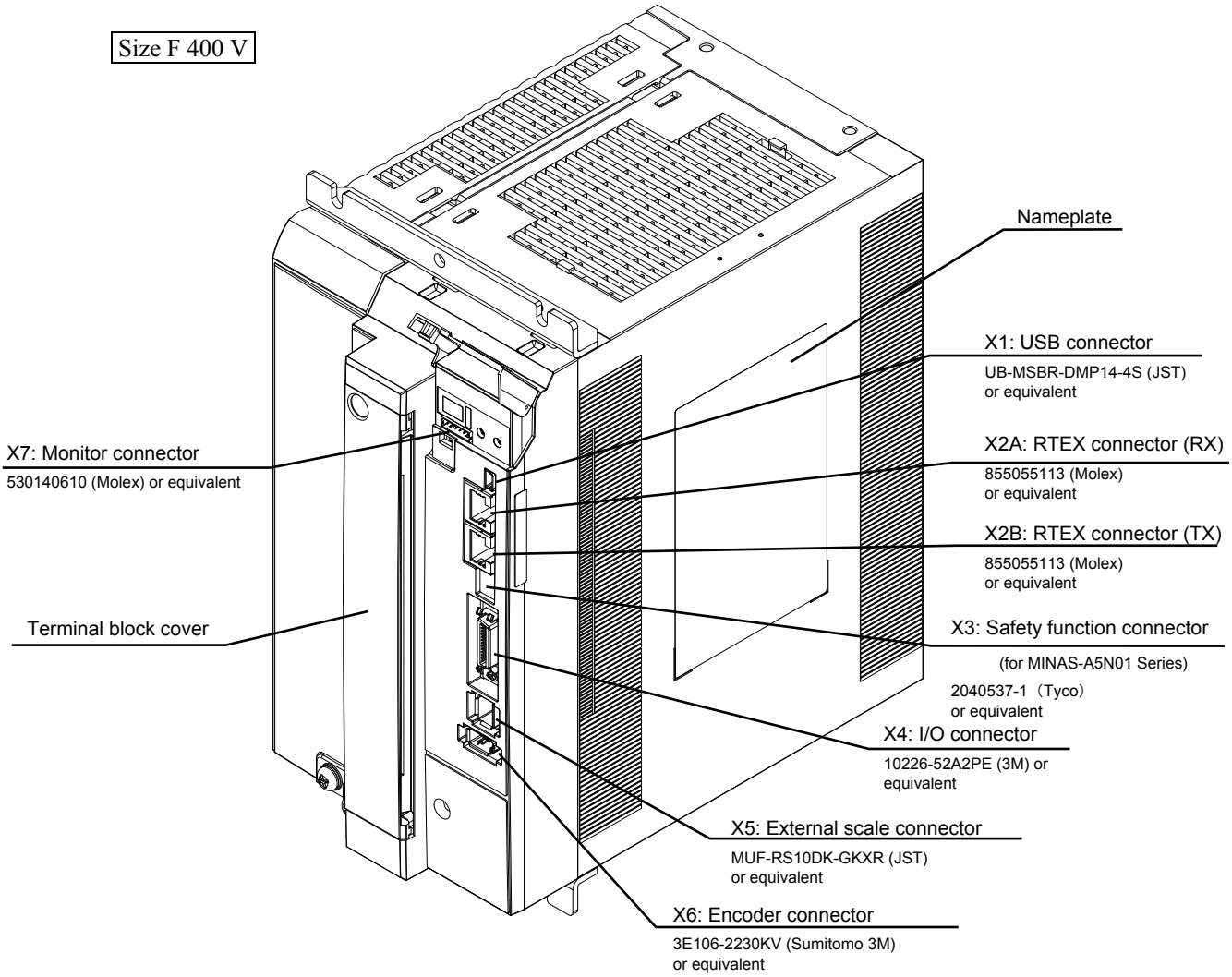
Size F 200 V

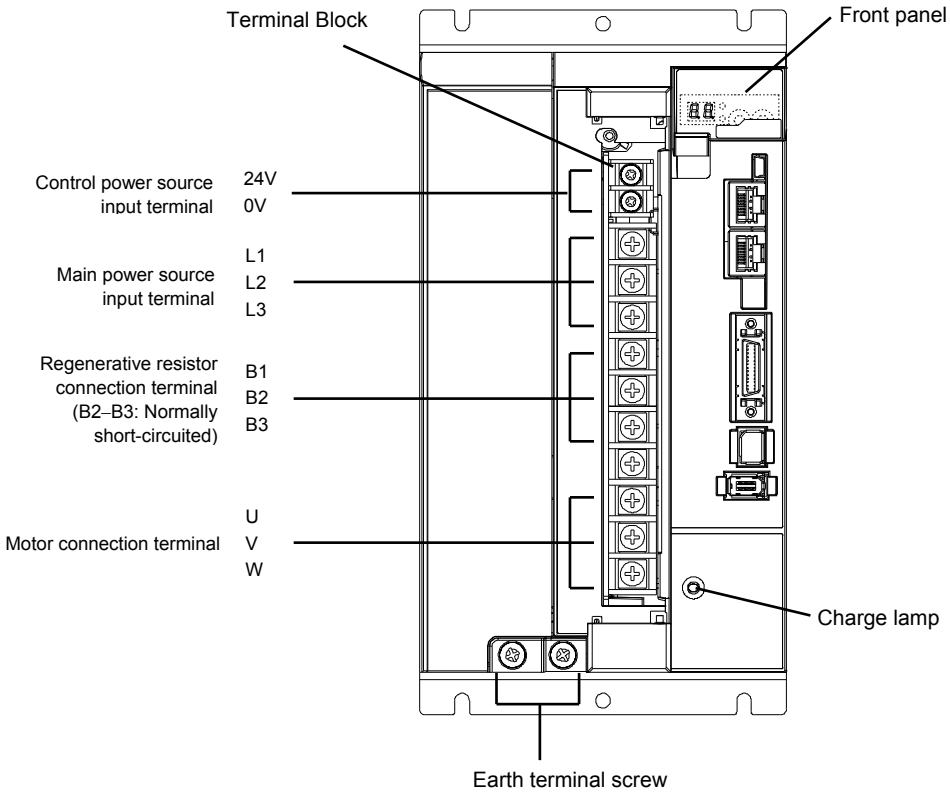




Note: Terminal block with the cover removed

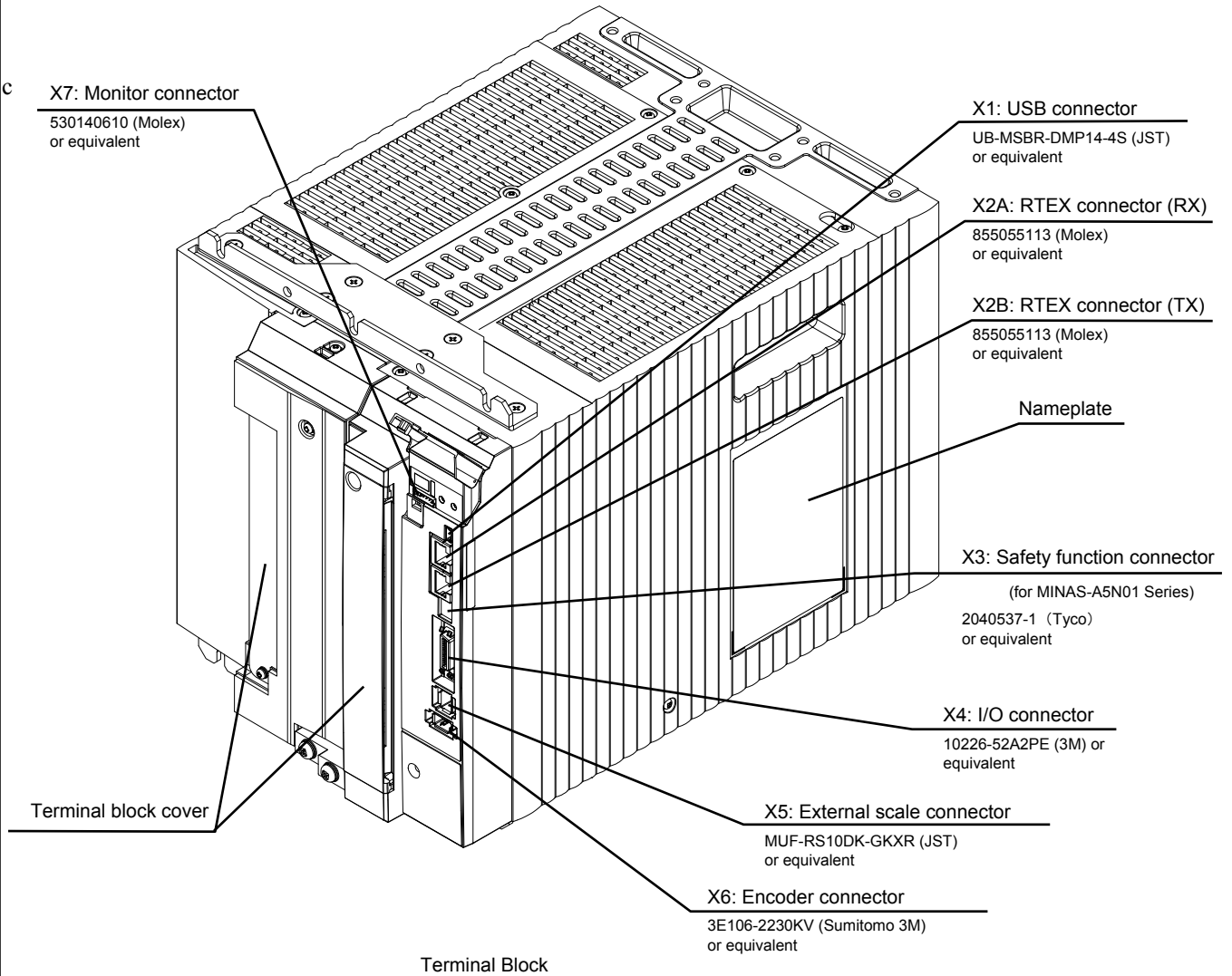
Size F 400 V

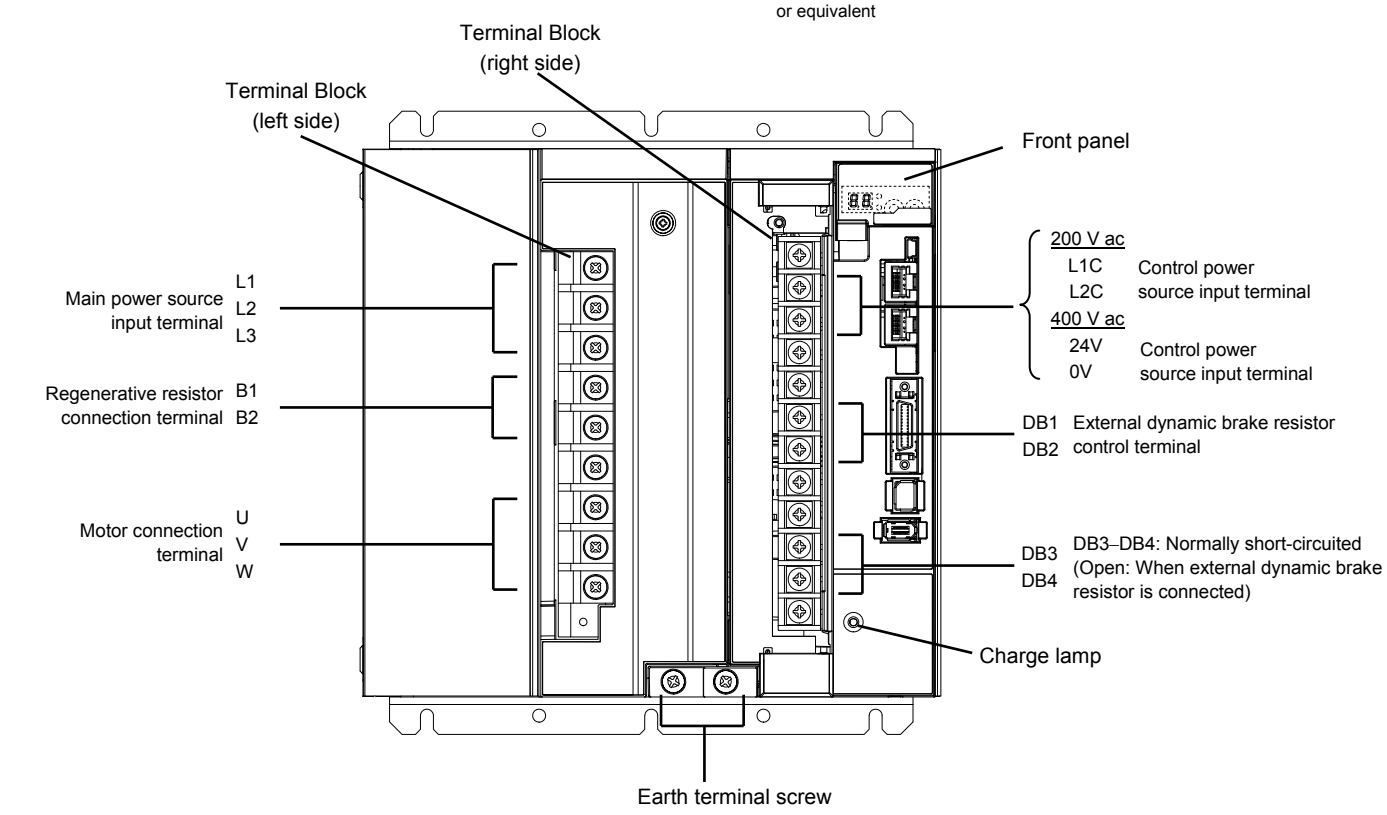




Note: Terminal block with the cover removed

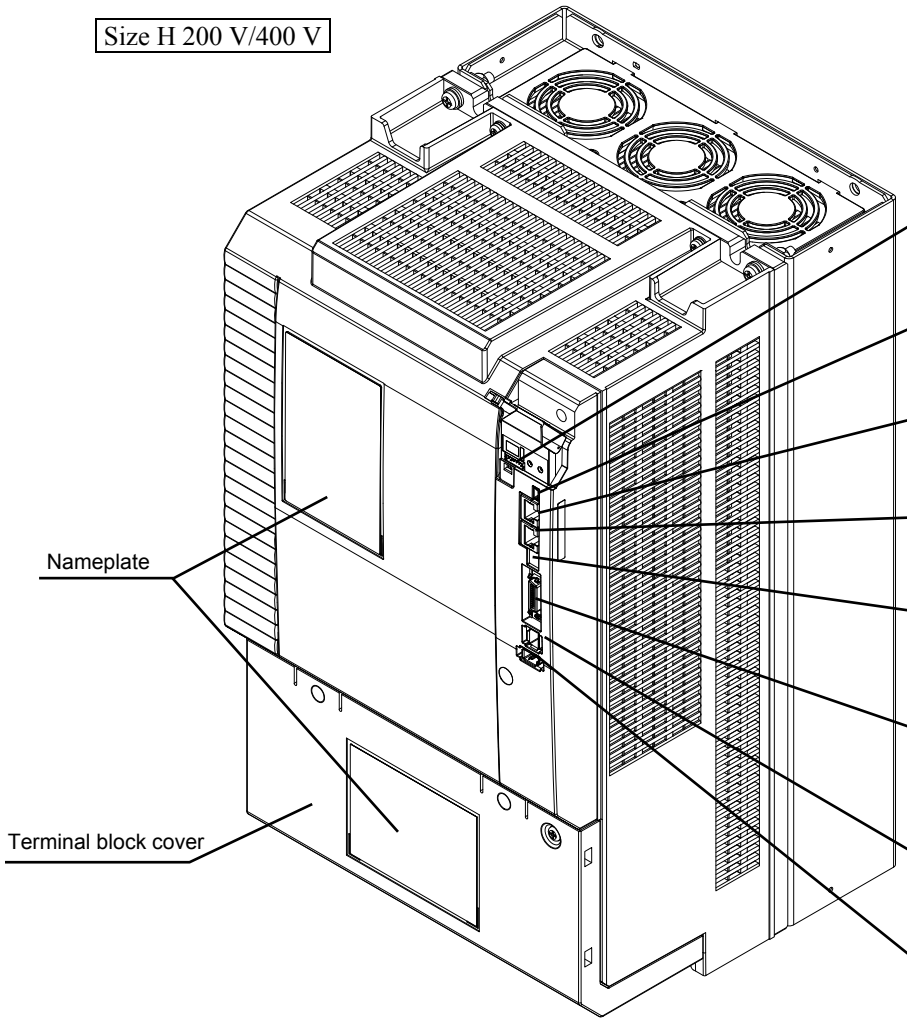
Size G 200 V/400 V





Note: Terminal block with the cover removed

Size H 200 V/400 V



X7: Monitor connector
530140610 (Molex)
or equivalent

X1: USB connector
UB-MSBR-DMP14-4S (JST)
or equivalent

X2A: RTEX connector (RX)
855055113 (Molex)
or equivalent

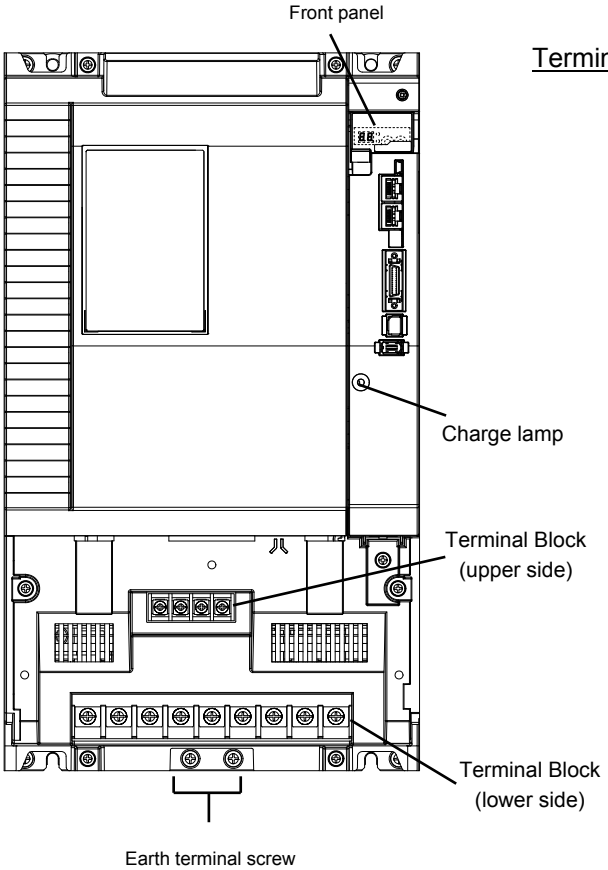
X2B: RTEX connector (TX)
855055113 (Molex)
or equivalent

X3: Safety function connector
(for MINAS-A5N01 Series)
2040537-1（Tyco）
or equivalent

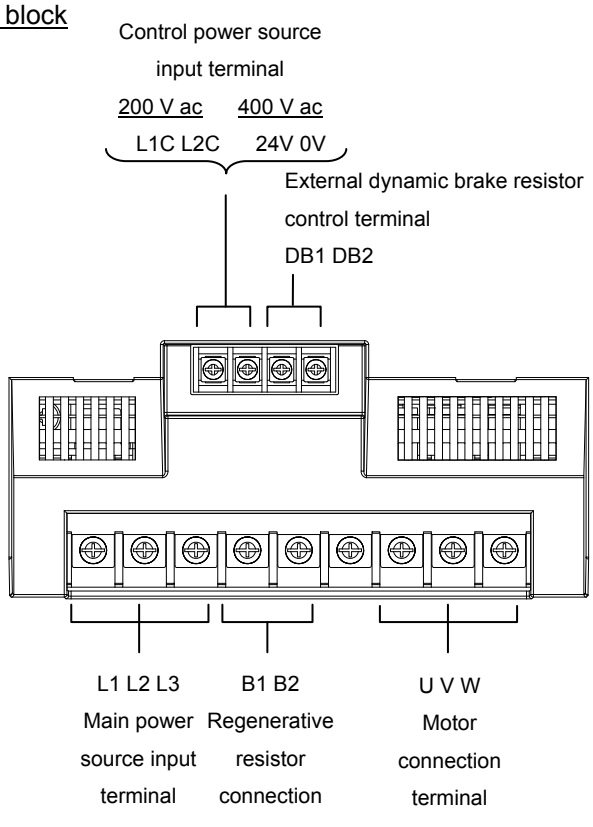
X4: I/O connector
10226-52A2PE (3M) or
equivalent

X5: External scale connector
MUF-RS10DK-GKXR (JST) or
equivalent

X6: Encoder connector
3E106-2230KV (Sumitomo 3M)
or equivalent



Terminal block



Note: Terminal block with the cover removed

7. Configuration of Connectors and Terminal Blocks

7-1 Power Connector XA , XB , XC , XD and Terminal Block

[1] Sizes A, B, C, D of 100 V and 200 V System

	Name	Terminal symbol	Connector pin no.	Description	
XA	Main power supply input	L1	5	100 V	Single phase 100–120 V +10% -15% 50/60 Hz input Use L1 and L3 terminal.
		L2	4	200 V	Single or 3 phase 200–240 V +10% -15% 50/60 Hz input Use L1 and L3 terminal for single phase input
		L3	3		
	Control power supply input	L1C	2	100 V	Single phase 100–120 V +10% -15% 50/60 Hz input
		L2C	1	200 V	Single phase 200–240 V +10% -15% 50/60 Hz input
XB	Regen resistor connection	B1	6	• Normally, open the circuit between B2 and B3. (Sizes A, B) • Normally, short out the circuit between B2 and B3. (Sizes C, D) • When a trip happens due to a regenerative load protection error, connect an external regenerative resistor (prepared by customer) between B1 and B2.	
		B3	5		
		B2	4		
	Motor connection	U	3	Connect each phase of the motor winding. U: U phase V: V phase W: W phase	
		V	2		
		W	1		
	Earth	⏚	–	There are 2 grounding terminals. Connect the one terminal to ground, and the other to the E terminal of a motor. Do not connect more than one wire to a grounding terminal.	

• Refer to section 9-3 for the tightening torque of the screw.

[2] Size E of 200 V System

	Name	Terminal symbol	Connector pin no.	Description	
XA	Main power supply input	L1	5	200 V	3 phase 200–230 V +10% -15% 50/60 Hz input
		L2	4		
		L3	3		
	Control power supply input	L1C	2	200 V	Single phase 200–230 V +10% -15% 50/60 Hz input
		L2C	1		
XC	Regen resistor connection	B1	4	Normally, short out the circuit between B2 and B3. When a trip happens due to a regenerative load protection error, connect an external regenerative resistor (prepared by customer) between B1 and B2. Note: Keep NC terminal unconnected.	
		B3	3		
		B2	2		
		NC	1		
XB	Motor connection	U	3	Connect each phase of the motor winding. U: U phase V: V phase W: W phase	
		V	2		
		W	1		
	Earth	⏚	–	There are 2 grounding terminals. Connect the one terminal to ground, and the other to the E terminal of a motor. Do not connect more than one wire to a grounding terminal.	

• Refer to section 9-3 for the tightening torque of the screw.

[3] Size D and E of 400 V System

	Name	Terminal symbol	Connector pin no.	Description
XA	Main power supply input	L1	3	3 phase 380–480 V +10% -15% 50/60 Hz input
		L2	2	
		L3	1	
XD	Control power supply input	24V	2	24 V dc +/- 15%
		0V	1	
XC	Regen resistor connection	B1	4	Normally, short out the circuit between B2 and B3. When a trip happens due to a regenerative load protection error, connect an external regenerative resistor (prepared by customer) between B1 and B2. Note: Keep NC terminal unconnected.
		B3	3	
		B2	2	
		NC	1	
XB	Motor connection	U	3	Connect each phase of the motor winding. U: U phase V: V phase W: W phase
		V	2	
		W	1	
	Earth	⏚	–	There are 2 grounding terminals. Connect the one terminal to ground, and the other to the E terminal of a motor. Do not connect more than one wire to a grounding terminal.

- Refer to section 9-3 for the tightening torque of the screw.

[4] Size F of 200 V System

	Name	Terminal symbol	Terminal no. (upper to bottom)	Description
Terminal block	Main power supply input	L1	1	3 phase 200–230 V +10% -15% 50/60 Hz input
		L2	2	
		L3	3	
	Control power supply input	L1C	4	Single phase 200–230 V +10% -15% 50/60 Hz input
		L2C	5	
	Regen resistor connection	B1	6	Normally, short out the circuit between B2 and B3. When a trip happens due to a regenerative load protection error, open the circuit between B2 and B3 and connect an external regenerative resistor (prepared by customer) between B1 and B2. Note: Keep NC terminal unconnected.
		B3	7	
		B2	8	
		NC	9	
	Motor connection	U	10	Connect each phase of the motor winding. U: U phase V: V phase W: W phase
		V	11	
		W	12	
	Earth	⏚	–	There are 2 grounding terminals. Connect the one terminal to ground, and the other to the E terminal of a motor. Do not connect more than one wire to a grounding terminal.

- Refer to section 9-3 for the tightening torque of the screw.
- Tighten the fixing screw of the terminal block cover with a torque 0.2 N•m or lower.

[5] Size F of 400 V System

	Name	Terminal symbol	Terminal no. (upper to bottom)	Description
Terminal block	Control power supply input	24V	1	24 V dc +/- 15%
		0V	2	
Terminal block	Main power supply input	L1	1	3 phase 380–480 V + 10% - 15% 50/60 Hz input
		L2	2	
		L3	3	
	Regen resistor connection	B1	4	Normally, short out the circuit between B2 and B3. When a trip happens due to a regenerative load protection error, open the circuit between B2 and B3 and connect an external regenerative resistor (prepared by customer) between B1 and B2. Note: Keep NC terminal unconnected.
		B3	5	
		B2	6	
		NC	7	
	Motor connection	U	8	Connect each phase of the motor winding. U: U phase V: V phase W: W phase
		V	9	
		W	10	
	Earth	⏚	–	There are 2 grounding terminals. Connect the one terminal to ground, and the other to the E terminal of a motor. Do not connect more than one wire to a grounding terminal.

- Refer to section 9-3 for the tightening torque of the screw.
- Tighten the fixing screw of the terminal block cover with a torque 0.2 N•m or lower.

[6] Size G of 200 V and 400 V System

	Name	Terminal symbol		Terminal no. (upper to bottom)	Description
		200 V	400 V		
Terminal block (left side)	Main power supply input	L1	L1	1	200 V : 3 phase 200–230 V + 10% - 15% 50/60 Hz input 400 V : 3 phase 380–480 V + 10% - 15% 50/60 Hz input
		L2	L2	2	
		L3	L3	3	
	Regen resistor connection	B1	B1	4	• When tripped by a regenerative load protect error, connect an external regenerative resistor (the value set by parameter Pr0.16 and prepared by the user) across B1 and B2. Note: Keep NC terminal unconnected.
		B2	B2	5	
		NC	NC	6	
	Motor connection	U	U	7	• Connect each phase of the motor winding. U: U phase V: V phase W: W phase
		V	V	8	
		W	W	9	
Terminal block (right side)		NC	NC	1	• Leave this terminal unconnected.
	Control power supply input	L1C	24V	2	200 V : Single phase 200–230 V + 10% - 15% 50/60 Hz input 400 V : 24 V dc +/- 15%
		L2C	0V	3	
		NC	NC	4	• Leave this terminal unconnected.
		NC	NC	5	
	Dynamic brake resistor control terminal	DB1	DB1	6	• Connect when it is necessary to control the MC for external dynamic brake resistor (prepared by the user). • Impress the voltage AC300V or less or DC100V or less between DB1 and DB2.
		DB2	DB2	7	
		NC	NC	8	• Leave this terminal unconnected.
		NC	NC	9	
	Dynamic brake resistor control terminal	DB3	DB3	10	• Be short-circuited usually between DB3 and DB4. Remove the short bar when you use the external dynamic brake resistor.
		DB4	DB4	11	
		NC	NC	12	
	Earth	⏚		–	There are 2 grounding terminals. Connect the one terminal to ground, and the other to the E terminal of a motor. Do not connect more than one wire to a grounding terminal.

- Refer to section 9-3 for the tightening torque of the screw.
- Tighten M3 terminal block cover fixing screw with the 0.2 N•m torque.

[7] Size H of 200 V and 400 V System

	Name	Terminal symbol 200 V	Terminal symbol 400 V	Terminal no. (left to right)	Description
Terminal block (upper side)	Control power supply input	L1C	24V	1	200 V : Single phase 200–230 V + 10% - 15% 50/60 Hz input
		L2C	0V	2	400 V : 24 V dc +/- 15%
	Dynamic brake resistor control terminal	DB1	DB1	3	• Connect when it is necessary to control the MC for external dynamic brake resistor (prepared by the user). • Impress the voltage AC300V or less or DC100V or less between DB1 and DB2.
		DB2	DB2	4	
Terminal block (lower side)	Main power supply input	L1	L1	1	200 V : 3 phase 200–230 V + 10% - 15% 50/60 Hz input
		L2	L2	2	
		L3	L3	3	400 V : 3 phase 380–480 V + 10% - 15% 50/60 Hz input
	Regen resistor connection	B1	B1	4	• When tripped by a regenerative load protect error, connect an external regenerative resistor (the value set by parameter Pr0.16 and prepared by the user) across B1 and B2. Note) Do not connect any wire to the NC terminal.
		B2	B2	5	
		NC	NC	6	
	Motor connection	U	U	7	Connect each phase of the motor winding. U: U phase V: V phase W: W phase
		V	V	8	
		W	W	9	
	Earth	⏚		–	There are 2 grounding terminals. Connect the one terminal to ground, and the other to the E terminal of a motor. Do not connect more than one wire to a grounding terminal.

- Refer to section 9-3 for the tightening torque of the screw.
- Tighten M5 terminal block cover fixing screw with the 0.4 N•m torque.

7-2 USB Connector X1

By connecting to the PC through USB interface, various operations such as setting/changing of parameters, monitoring of control state, referencing of error/history, and saving/loading of parameters can be performed.

Name	Symbol	Connector pin no.	Description
USB signal	VBUS	1	• Communicate with a computer
	D-	2	
	D+	3	
For manufacturer use	–	4	• Do not connect
Signal ground	GND	5	• Signal ground

7-3 RTEX connectors X2A and X2B

For connection, use RJ45 connector.

[X2A] RX connector

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

[X2B] TX connector

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

• Be sure to use shielded twisted pair (STP) compatible with 5e of TIA/EIA-568 or higher category.

7-4 Safety function connector X3 (for MINAS-A5N01 Series)

For the safety function connector.

Name	Symbol	Connector pin no.	Description	I/O type
Reserved	—	1	Do not connect.	——
	—	2		——
Safety input 1	SF1-	3	These are two independent circuits that turn off the operation signal to the power module to shut off the motor current.	i-1
	SF1+	4		
Safety input 2	SF2-	5		
	SF2+	6		
EDM output	EDM-	7	This is an output for monitoring the failure of the safety function.	o-1
	EDM+	8		
Frame ground	FG	Shell	Connected with protective earth terminal in the servo driver.	——

Refer to the technical document SX-DSV02199 for the safety function.

7-5 I/O Connector X4

Input signal

Name	Symbol	Connector pin no.	Description	I/O type
Control signal power source	I-COM	6	• Connect to positive/negative polarity of the external power supply. • Use power supply: 12 V +/-5% to 24 V +/-5%	—
Input 1	SI1	5	• Assign functions using parameters. For details, refer to the technical data – Basic function specification – SX-DSV02202. • Range of available functions is limited. For example, external latch input EXT1 can be allocated only to SI5, EXT2 to SI6 and EXT3 to SI7. • For factory default function assignment, refer to appendix “Specification for Each Model”.	i-1
Input 2	SI2	7		i-1
Input 3	SI3	8		i-1
Input 4	SI4	9		i-1
Input 5	SI5	10		i-1
Input 6	SI6	11		i-1
Input 7	SI7	12		i-1
Input 8	SI8	13		i-1

Output signal

Name	Symbol	Connector pin no.	Description	I/O type
Output 1	SO1+ SO1-	1 2	• Assign functions using parameters. For details, refer to the technical data—Basic function specification—SX-DSV02202. • For factory default function assignment, refer to appendix “Specification for Each Model”.	o-1
Output 2	SO2+ SO2-	25 26		
Output 3	SO3+ SO3-	3 4		

Encoder output signal

Name	Symbol	Connector pin no.	Description	I/O type
Phase A output	OA+	17	• Differential output of divided encoder signal or external scale signal (A – B phase). (RS422 compatible) • The ground of line driver of output circuit is connected to the signal ground (GND) and kept non-insulated. • Maximum output frequency is 4 Mpps (multiplied by 4). • Use a line receiver to receive the differential signals, and connect a termination resistor (Approx. 330 Ω) between the input terminals of the line receiver. • Use a shielded twisted-pair cable for wiring, and connect the shield wire to the connector shell.	Do-1
	OA-	18		
Phase B output	OB+	20		
	OB-	19		
Reserved	-	21		
	-	22		
Signal ground	GND	16	• Signal ground • Be sure to connect the ground of the line receiver to this terminal.	—

Encoder backup power input

Name	Symbol	Connector pin no.	Description	I/O type
Battery input to absolute encoder	BTP-I	14	• Connect to the absolute encoder backup battery (recommended battery: Toshiba ER6V 3.6 V) 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 (CN2). • Use any of the following methods to connect the battery for absolute encoder. (1) Directly connected to the motor. (2) Connected to the encoder cable. (3) Connected to this connector.	—
	BTN-I	15		

Other

Name	Symbol	Connector pin no.	Description	I/O type
Reserved	—	23 24	• Do not connect	—
Frame ground	FG	Shell	• Connected to the earth terminal in the servo driver.	—

7-6 External Scale Connector X5

Name	Connector pin no.	Description
Power supply output for external scale	1	EX5V (Note 2) (Note 3)
	2	EX0V (Note 1)
External scale signal input / output (serial signal)	3	EXPS
	4	/EXPS
External scale signal input (A / B / Z phase signal)	5	EXA
	6	/EXA
	7	EXB
	8	/EXB
	9	EXZ
	10	/EXZ
Frame ground	Shell	FG

Note 1: EX0V power supply output for external scale is connected with the signal ground of the X4 connector.

Note 2: EX5V power supply output for external scale is rated at 5.2 V ± 5% and 300 mA at maximum. To use an external scale with a current consumption higher than that, a preparation of an external power supply is required. Some external scales may take longer time in initialization after turning on the power.

Note 3: In case an external power supply is used for the external scale, make sure that the EX5V pin is open and no external power is supplied to the EX5V pin.

7-7 Encoder Connector X6

Name	Connector pin no.	Description
Encoder power supply output	1	E5V
	2	E0V (Note 1)
Absolute encoder battery backup output (Note 2)	3	BTP-O
	4	BTN-O
Encoder signal I/O (serial signal)	5	PS
	6	/PS
Frame ground	Shell	FG

Note 1: E0V power supply output for external scale is connected with the signal ground of the X4 connector.

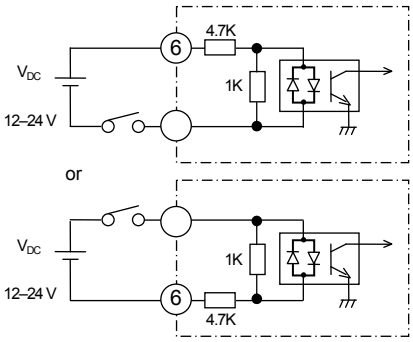
Note 2: Connected to the absolute encoder battery input terminals BTP-I and BTN-I of X4 connector in the servo driver. When connecting the battery directly to the encoder connection cable, leave these pins unconnected.

7-8 Monitor Connector X7

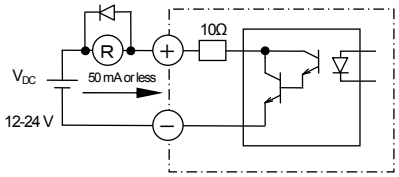
Name	Symbol	Connector pin no.	Description	I/O signal interface
Analog monitor output 1	AM1	1	• Analog signal output for monitoring • Monitoring object changes according to the parameter setting. • For details, refer to the technical data—Basic function specification —SX-DSV02202.	Ao-1
Analog monitor output 2	AM2	2		
Signal ground	GND	3	• Signal ground	——
Reserved	——	4	• Do not connect	——
Reserved	——	5	• Do not connect	——
Reserved	——	6	• Do not connect	——

I/O signal interface

i-1

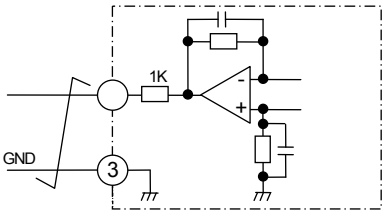


o-1



Note: To directly run the relay, attach a diode in parallel with the relay and in the direction shown in the figure above.
VCE sat = 1.2 V

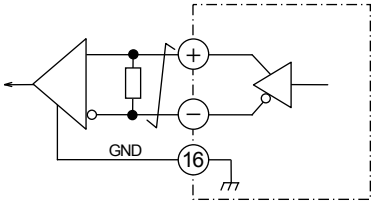
Ao-1



Output signal amplitude is ±10V

Do-1

Equivalent of AM26C31



+: Pins 17, 20, 21, -: Pins 18, 19, 22

Connect a terminating resistor (approx. 330 Ω) between the input terminals of the line receiver.

8. Wiring

8-1 Used Cables and Maximum Cable Lengths

Name	Symbol	Maximum cable length	Used cable
Main power supply	L1, L2, L3	——	Refer to the associated specification available separately.
Control power supply	L1C, L2C	——	HVSF 0.75 mm^2
Motor connection	U, V, W, ⏚	20 m	Refer to the associated specification available separately. (Note 1)
Earth cable	⏚	1 m	Refer to the associated specification available separately.
Encoder connection	X6	20 m	Overall twisted shielded pair Core wire: 0.18 mm^2 or larger
I/O connection	X4	3 m	
RTEX connection	X2A/X2B	100 m (Note 2)	Twisted shielded pair (STP) cable of category 5e or better

Note 1: When using Tyco Electronics AMP connectors (172167-1, 172189-1) as motor junction connector, maximum applicable conductor size is 1.3 mm^2.

Note 2: Refer to 8.3 (5) Connection to connectors X2A and X2B.

8-2 Cable Side Connector

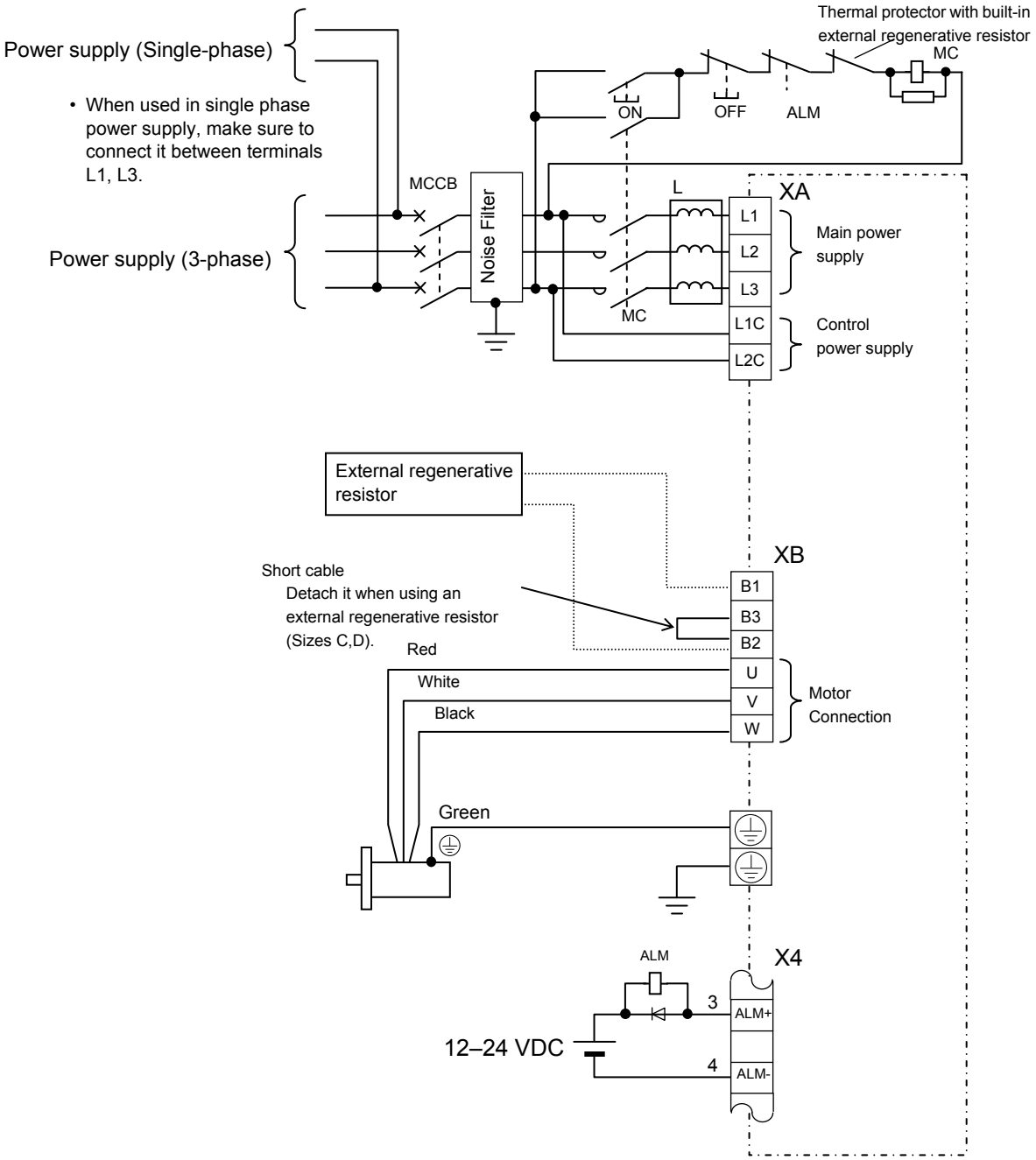
Connector symbol	Part name	Part number	Manufacturer
X3	Connector	2013595-1	Tyco Electronics
X4	Solder plug (soldering type)	10126-3000PE	Sumitomo 3M
	Shell kit	10326-52A0-008	
X5	Connector	MUF-PK10K-X	J. S. T. Mfg
X6	Connector	3E206-0100KV	Sumitomo 3M
		3E306-3200-008	
X7	Connector	51004-0600	Molex
	Connector pin	50011-8100	

Use connectors listed above or equivalents.

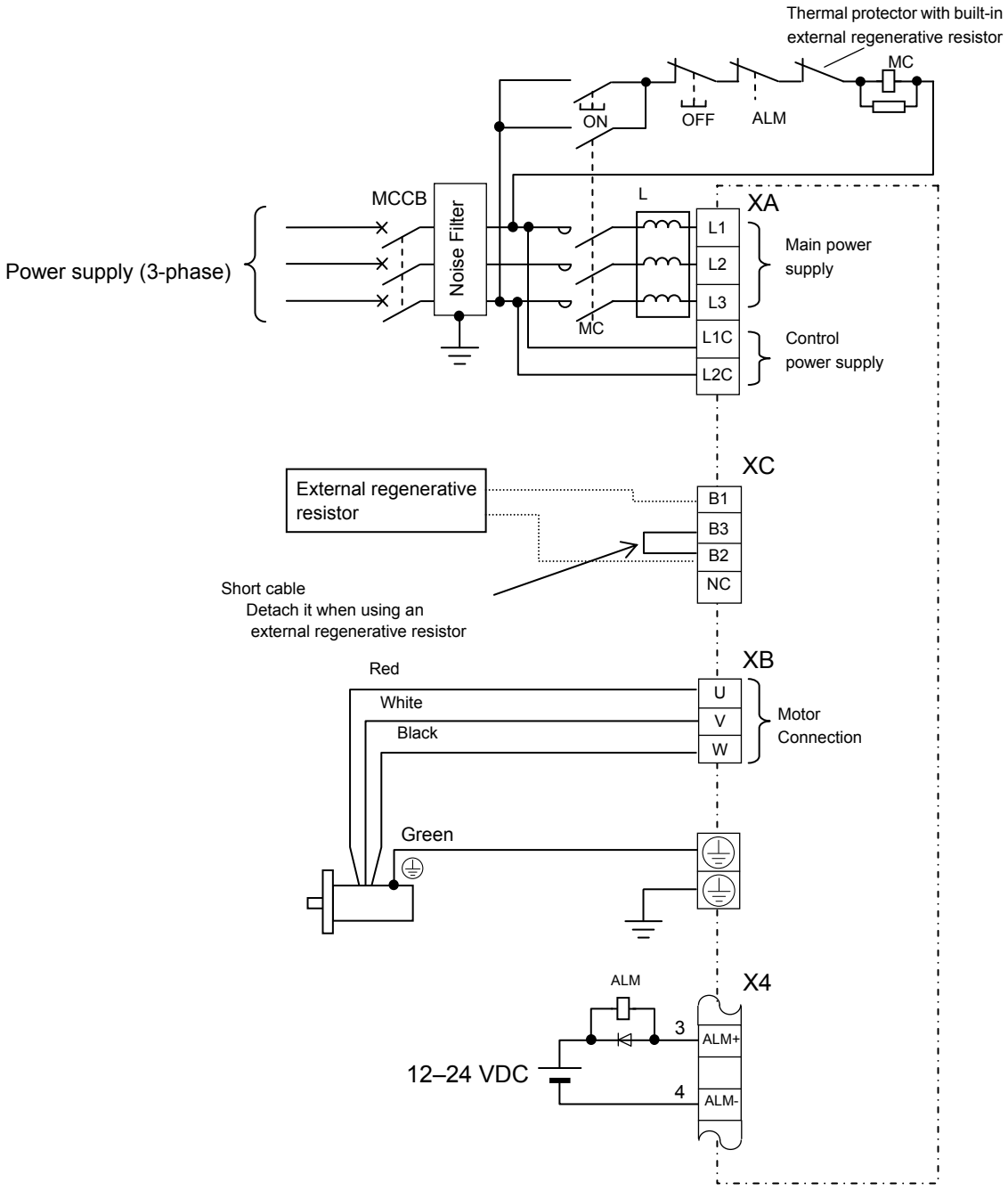
8-3 Precautions for Wiring

(1) Wiring to power connector and terminal block

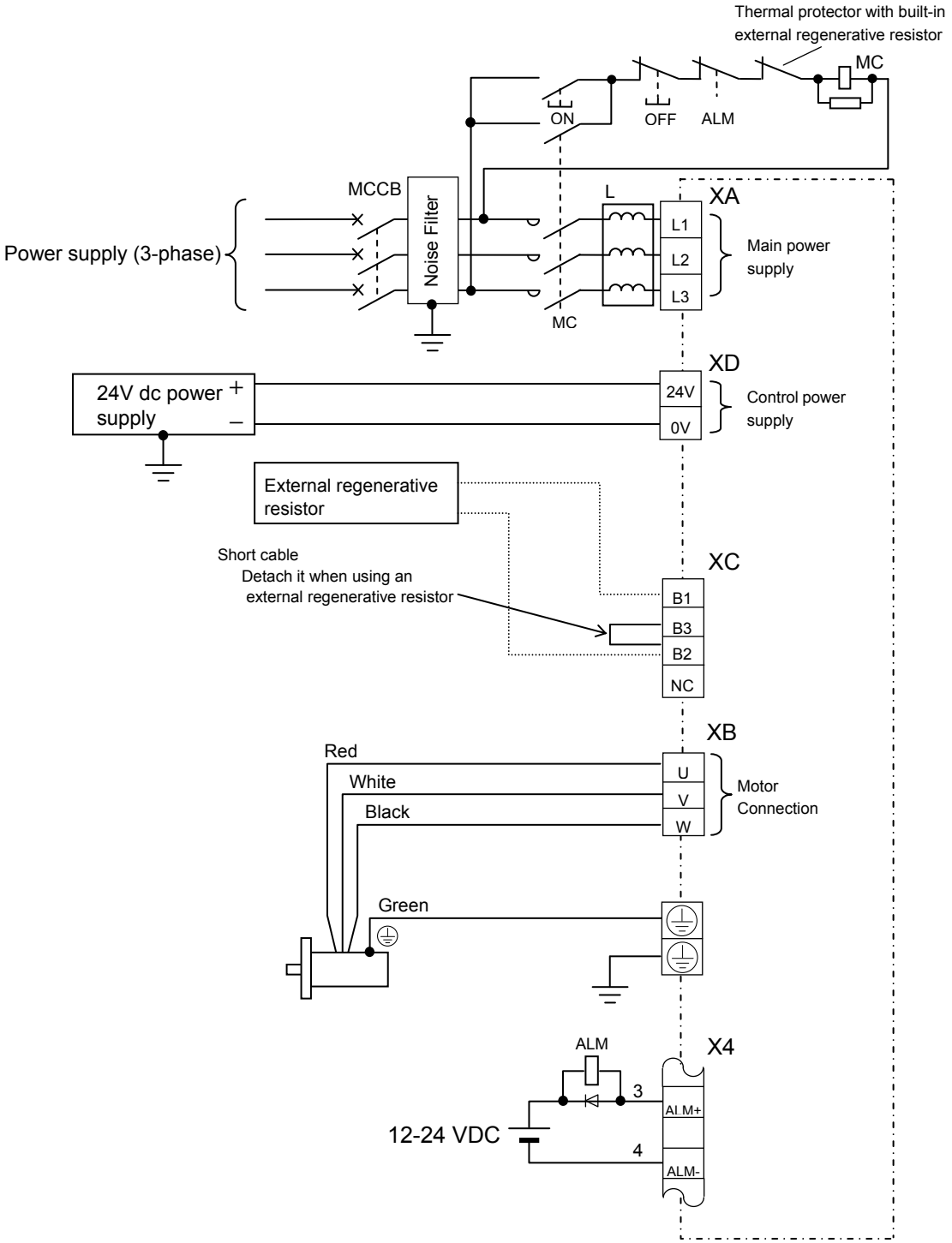
100/200 V Sizes A–D:



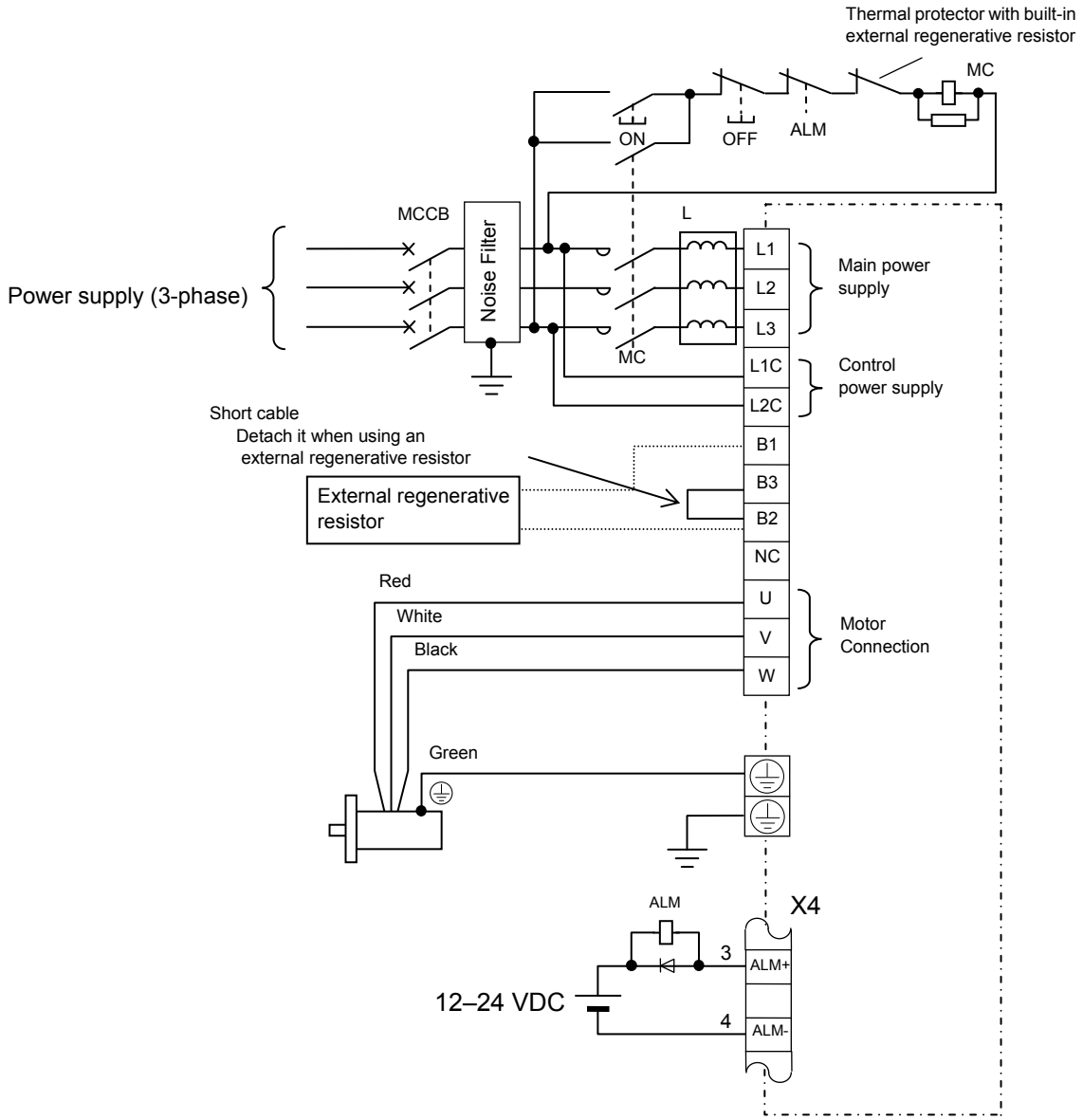
200 V Size E


Thermal protector with built-in external regenerative resistor
MC
ON
OFF
ALM
MCCB
Noise Filter
L
XA
Power supply (3-phase)
L1
L2
L3
Main power supply
MC
L1C
L2C
Control power supply
XC
External regenerative resistor
B1
B3
B2
NC
Short cable
Detach it when using an external regenerative resistor
XB
Red
White
Black
U
V
W
Motor Connection
Green
ALM
X4
3
ALM+
12–24 VDC
4
ALM-

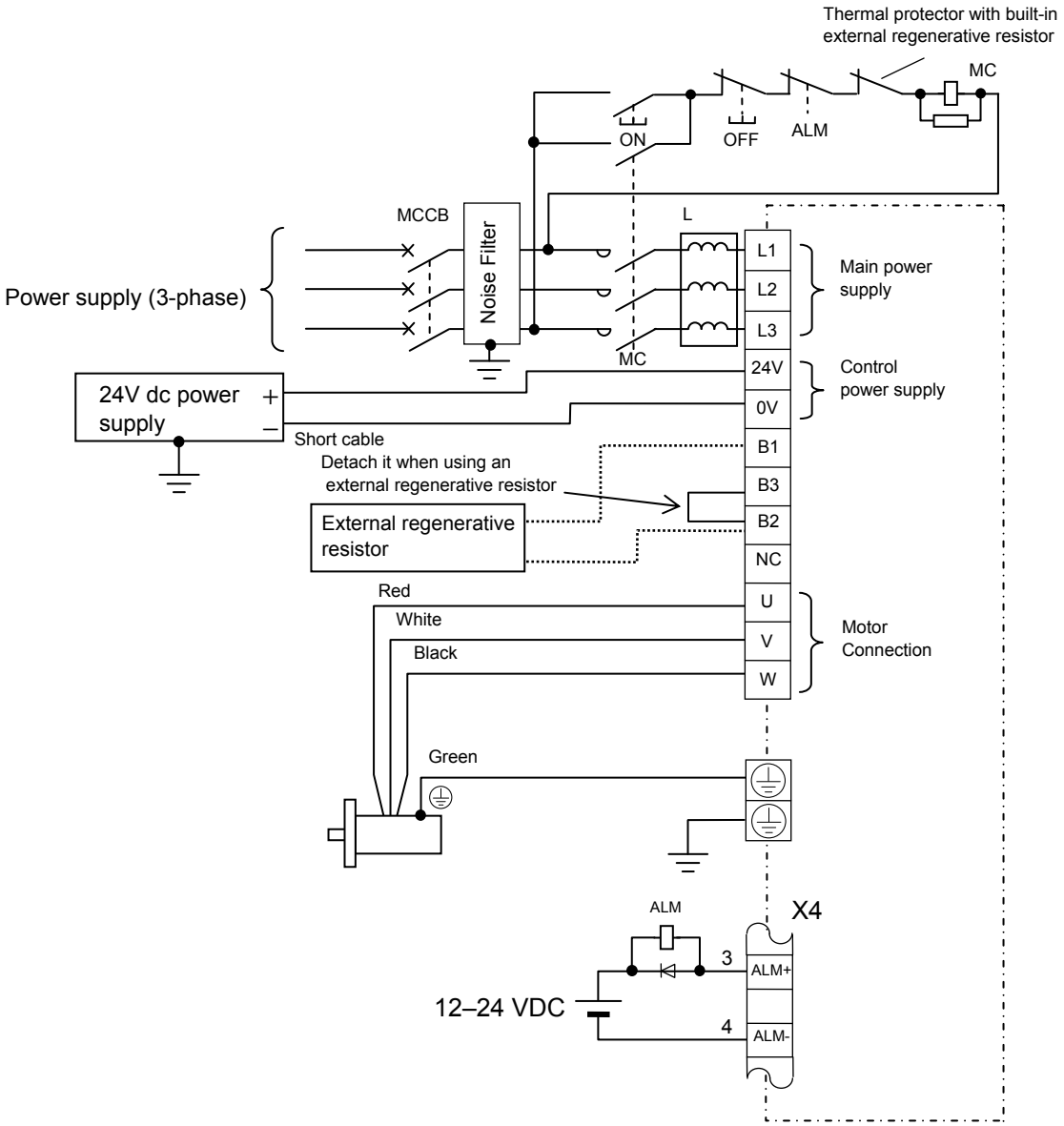
400 V Sizes D and E



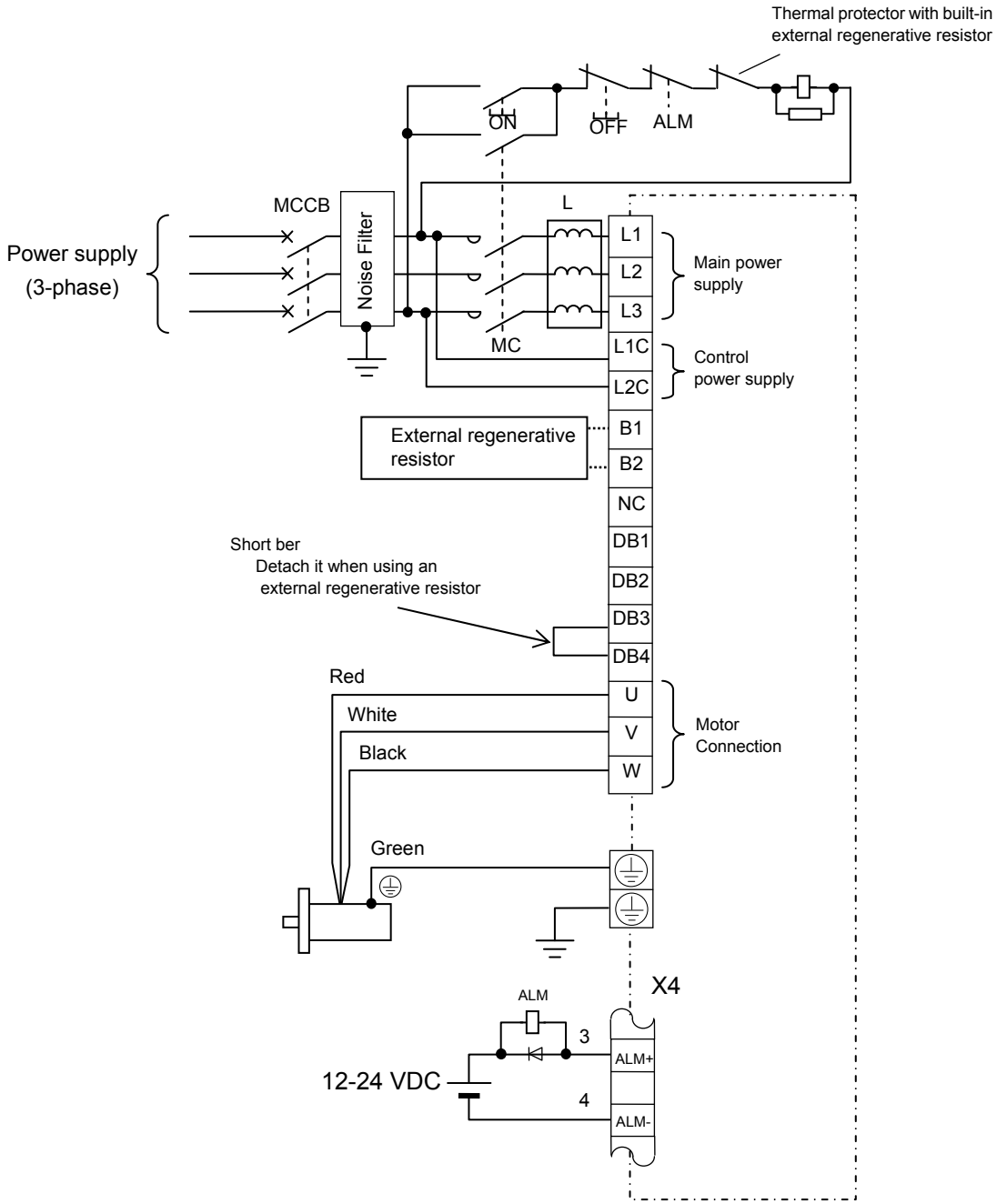
200 V Size F


Thermal protector with built-in external regenerative resistor
MC
ON
OFF
ALM
MCCB
Noise Filter
L
Power supply (3-phase)
L1
L2
L3
Main power supply
MC
L1C
L2C
Control power supply
Short cable
Detach it when using an external regenerative resistor
External regenerative resistor
B1
B3
B2
NC
Red
White
Black
U
V
W
Motor Connection
Green
ALM
X4
3
ALM+
12–24 VDC
4
ALM-

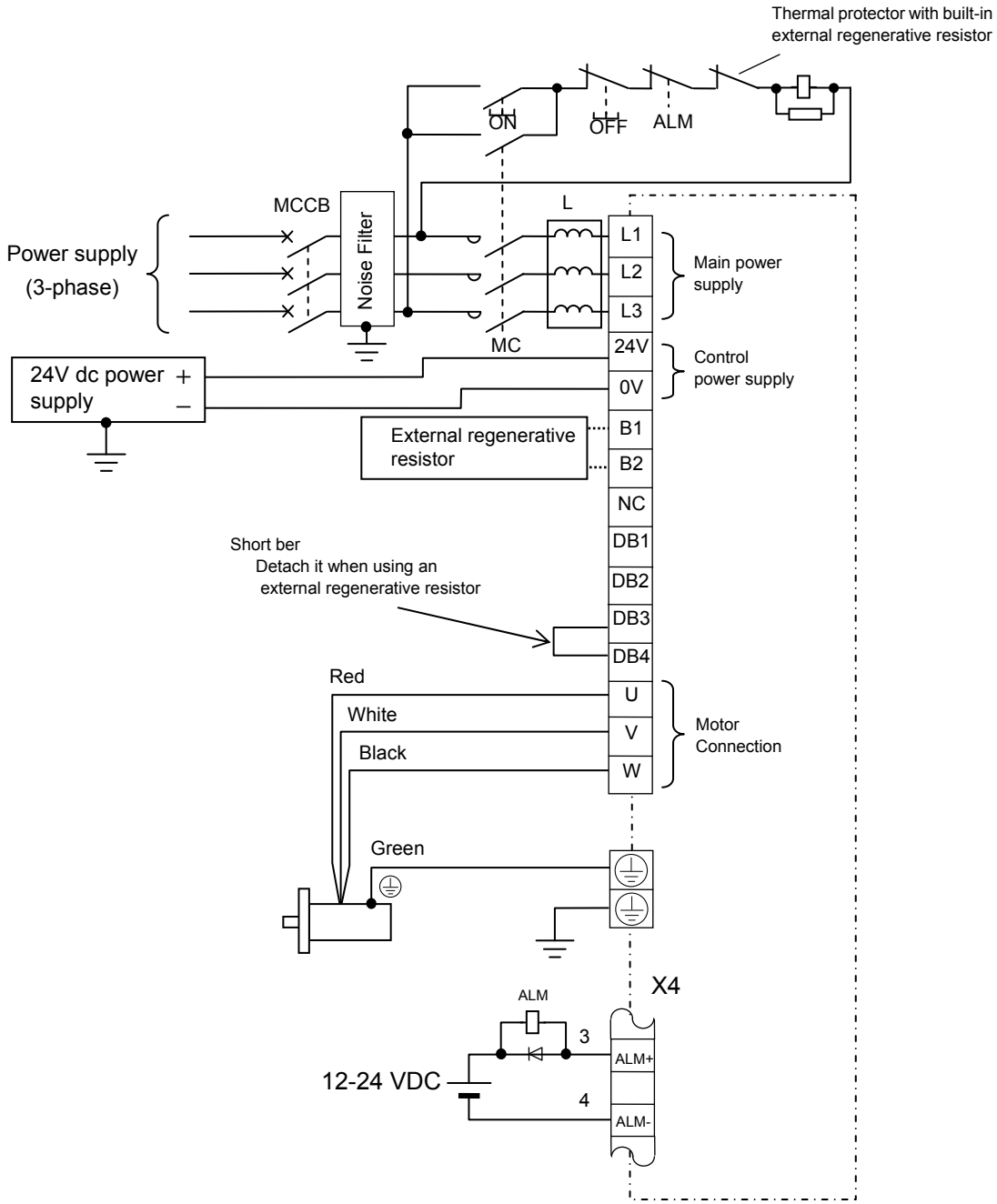
400 V Size F


Thermal protector with built-in external regenerative resistor
MC
ON
OFF
ALM
MCCB
Noise Filter
L
Power supply (3-phase)
L1
L2
L3
Main power supply
MC
24V
0V
Control power supply
24V dc power supply
+
–
Short cable
Detach it when using an external regenerative resistor
B1
B3
B2
NC
External regenerative resistor
Red
White
Black
U
V
W
Motor Connection
Green
ALM
X4
3
ALM+
12–24 VDC
4
ALM-

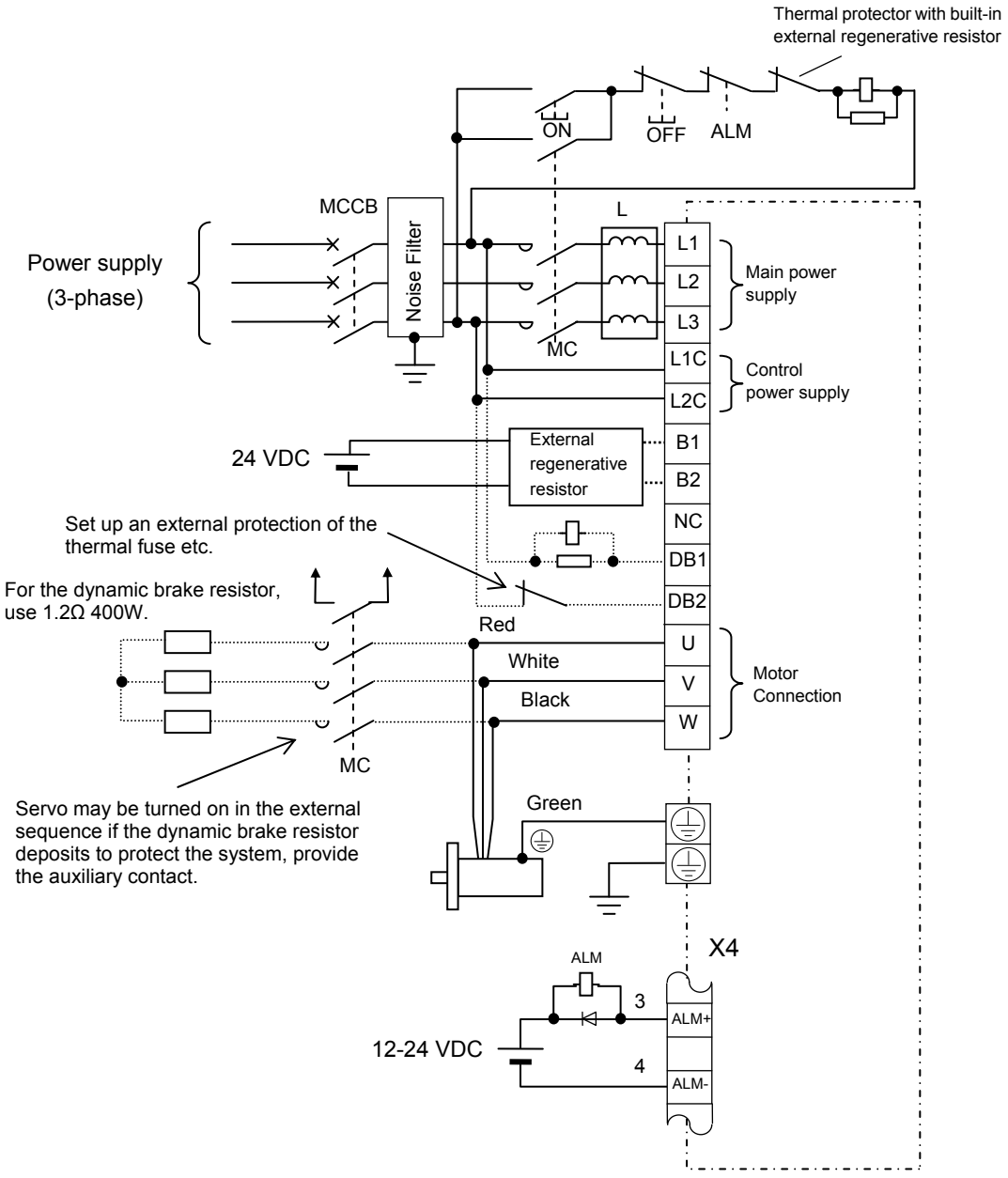
200 V Size G


Thermal protector with built-in external regenerative resistor
ON
OFF
ALM
MCCB
Noise Filter
L
Power supply (3-phase)
MC
L1
L2
L3
Main power supply
L1C
L2C
Control power supply
External regenerative resistor
B1
B2
NC
DB1
DB2
DB3
DB4
Short ber
Detach it when using an external regenerative resistor
Red
White
Black
U
V
W
Motor Connection
Green
X4
ALM
3
ALM+
12-24 VDC
4
ALM-

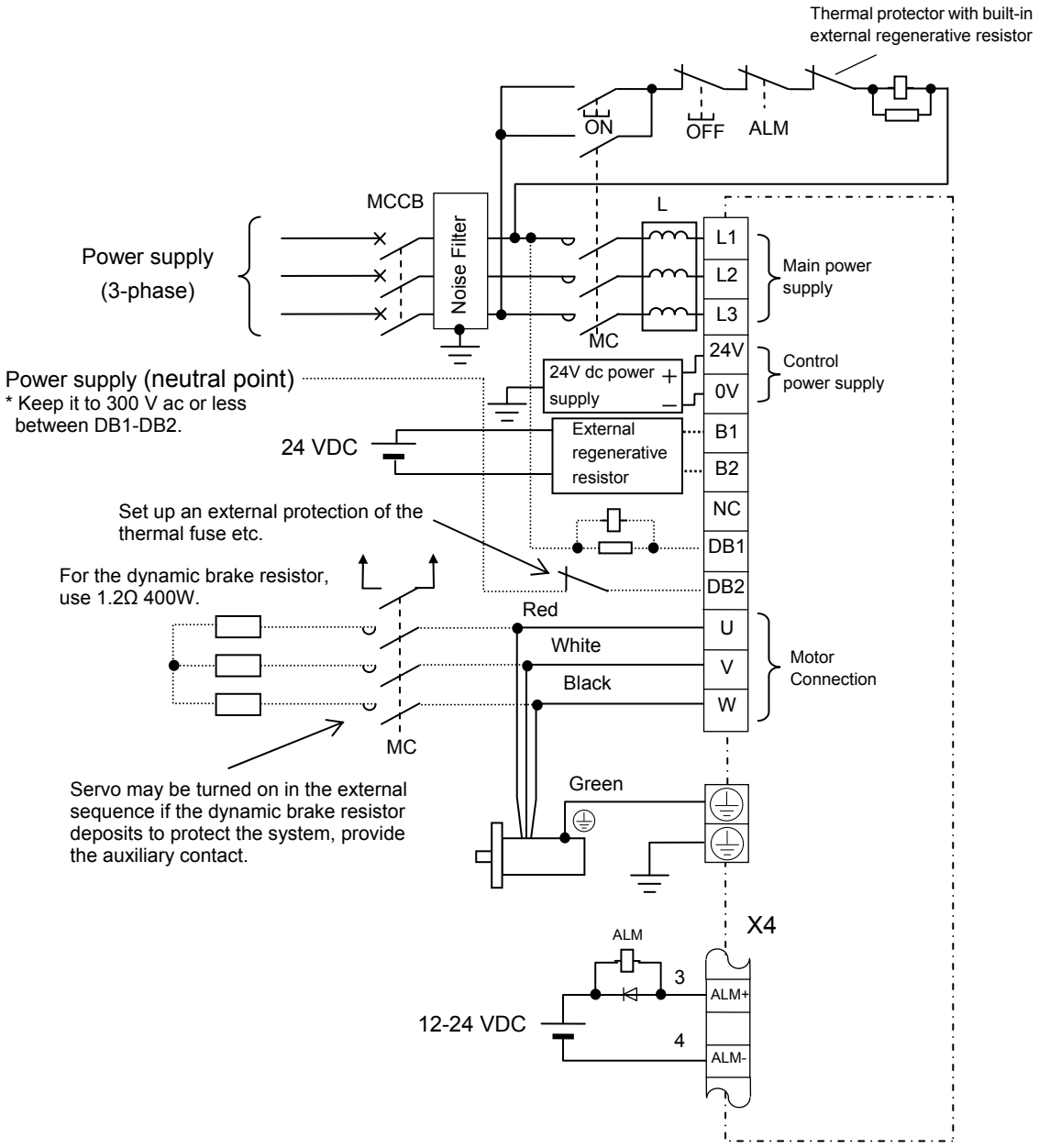
400 V Size G


Thermal protector with built-in external regenerative resistor
ON
OFF
ALM
MCCB
Noise Filter
L
MC
Power supply (3-phase)
L1
L2
L3
Main power supply
24V
0V
Control power supply
24V dc power supply
+
–
External regenerative resistor
B1
B2
NC
DB1
DB2
DB3
DB4
Short ber
Detach it when using an external regenerative resistor
Red
White
Black
U
V
W
Motor Connection
Green
X4
ALM
3
4
12-24 VDC
ALM+
ALM-

200 V Size H


Thermal protector with built-in external regenerative resistor
ON
OFF
ALM
MCCB
Noise Filter
L
Power supply (3-phase)
L1
L2
L3
Main power supply
MC
L1C
L2C
Control power supply
24 VDC
External regenerative resistor
B1
B2
NC
DB1
DB2
Set up an external protection of the thermal fuse etc.
For the dynamic brake resistor, use 1.2Ω 400W.
Red
White
Black
U
V
W
Motor Connection
MC
Servo may be turned on in the external sequence if the dynamic brake resistor deposits to protect the system, provide the auxiliary contact.
Green
X4
ALM
3
ALM+
12-24 VDC
4
ALM-

400 V Size H


Thermal protector with built-in external regenerative resistor
ON
OFF
ALM
MCCB
Noise Filter
L
Power supply (3-phase)
L1
L2
L3
Main power supply
MC
24V
0V
Control power supply
24V dc power supply
Power supply (neutral point)
* Keep it to 300 V ac or less between DB1-DB2.
24 VDC
External regenerative resistor
B1
B2
NC
DB1
DB2
Set up an external protection of the thermal fuse etc.
For the dynamic brake resistor, use 1.2Ω 400W.
Red
White
Black
U
V
W
Motor Connection
MC
Servo may be turned on in the external sequence if the dynamic brake resistor deposits to protect the system, provide the auxiliary contact.
Green
X4
ALM
3
ALM+
12-24 VDC
4
ALM-

[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] Surely insert the connector into place until it clicks.

[3] Make sure to use an insulation coated crimp terminal when connecting to each terminal on the terminal block.

[4] Terminal block cover is fixed with screws. When wiring to the terminal block, unscrew these screws to uncover the cover. Tighten the cover fixing screw with the torque of 0. 2 N•m or less.

[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] Because high voltage is applied to the power connectors XA, XB, XC , XD and the terminal block, never touch them on any account. It may cause electric shock.

[9] For 750 W or higher models: When the installation is protected through the circuit breaker up to 20 A capacity, the maximum power available to the circuit is 5,000 Arms at 240 V. Do not overload the system.

[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] Surely connect the ground terminals of the motor and the servo driver and earth the ground terminal as well as that of the noise filter. In addition, earth the equipment unit. To earth them, use the earth type D (ground resistance: 100 ohm or less) for grounding. (In order to avoid the impact of electrolytic corrosion, do not immediately have any contact between aluminum and copper.)

[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. 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 the regenerative resistor,

- The regenerative resistor is not built into A, B, G, and H frame.
- The regenerative resistor is built into F frame. The regenerative resistor becomes effective when the short-circuited between the terminal B2 and B3. Use it usually under such a condition.
  (When shipping it, between the terminal B2 and B3 of A, B, G, and H frame is opened because the regenerative resistor is not built-in.)
  When a trip occurs due to the regenerative load protection error, externally install a regenerative resistor.
  To externally install a regenerative resistor, remove a connection cable between terminals B2 and B3 and then connect the regenerative resistor between terminals B1 and B2.
  To use an external regenerative resistor, set Pr0.16 (external regenerative resistor selection) to 1 or 2.

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

	Input power voltage		
Size	Single phase 100 V	Single/3 phase 200 V	3 phase 400 V
A	DV0P4280	DV0P4281 (100 W or less), DV0P4283 (200 W)	-
B	DV0P4283	DV0P4283	
C	DV0P4282	DV0P4283	
D	-	DV0P4284	DV0PM20048
E		DV0P4284 x 2 in parallel or DV0P4285 x 1	DV0PM20049
F		DV0P4285 x 2 in parallel	DV0PM20049 x 2 in parallel
G		DV0P4285 x 3 in parallel	DV0PM20049 x 3 in parallel
H		DV0P4285 x 6 in parallel or DV0PM20058	DV0PM20049 x 6 in parallel or DV0PM20059

Manufacturer by Iwaki Musen Kenkyusho Co.,Ltd.

Our part number	Manufacturer part number	Specification			Built-in thermal protector operational temperature
		Resistance value [Ω]	Rated power (for reference) *		
			Free air [W]	Fan used [W] (1 m/s)	
DV0P4280	RF70M	50	10	25	140 ± 5 deg. Celsius Contact point B Open/close capacity (resistance load) 1A 125VAC, 6000 times 0. 5A 250VAC, 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	
DV0PM20048	RF240	120	35	80	
DV0PM20049	RH450F	80	65	190	
DV0PM20058	-	3.3	-	780	
DV0PM20059	-	13.33	-	1140	

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

For safety, a temperature fuse and a thermal protector are built in.

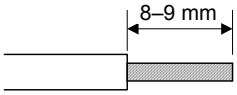
- Configure the circuit so as to turn off the power supply when the thermal protector is running.
- The built-in temperature fuse can break according to the radiation condition, the used temperature range, the power supply voltage, and the load change.
  Install a thermal fuse so that the surface temperature of the regeneration resistor does not exceed 100°C in a condition in which regeneration occurs easily (power supply voltage is high, load inertia is large, and deceleration time is short etc.) and perform an operation check.
- Attach the regenerative resistor on the incombustibles such as metal.
- Install the regenerative resistor so that people cannot directly touch it, such as the incombustible to cover it.
- Keep the temperature of places, which people can directly touch, below 70 deg. Celsius.

Method for connection to power connector

Use the following procedure for connection to connectors XA, XB, XC and XD.

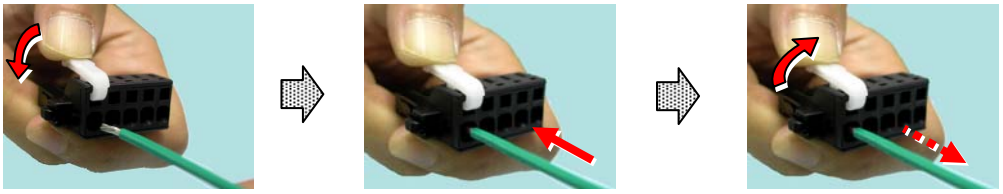
<Method for connection>

1. Strip off the insulation of the wire



2 Insert a wire into the connector. The following 2 methods can be used to insert the wire.
(a) Insert a wire using the lever attached.
(b) Use a flat-head (-) screwdriver (with a tip width 3.0–3.5 mm).

(a) Using the lever

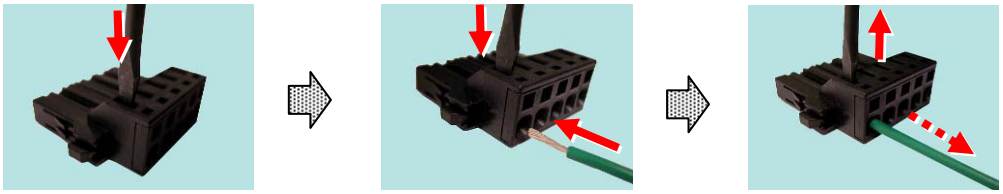


[1] Press the lever attached above the upper slot with a finger to push down the spring.

[2] While pressing down the lever, insert a wire into the insertion opening (round hole) until it stops.

[3] Release the lever to connect the wire.

(b) Using a screwdriver, Part 2



[1] Placing a dedicated screwdriver on the upper slot, press down the spring.

[2] Insert a wire, with the insulation stripped off correctly, into the wire insertion opening until it stops.

[3] Release the screwdriver to connect the wire.

<Precautions>

- Strip off correct length of insulation of a wire.
- When connecting a wire to the connector, be sure to disconnect the connector from the servo driver in advance.
- Insert only 1 wire into a wire insertion opening.
- Connected wire can be removed in the same way as it is inserted.
- Be careful not to be injured when using a screwdriver.

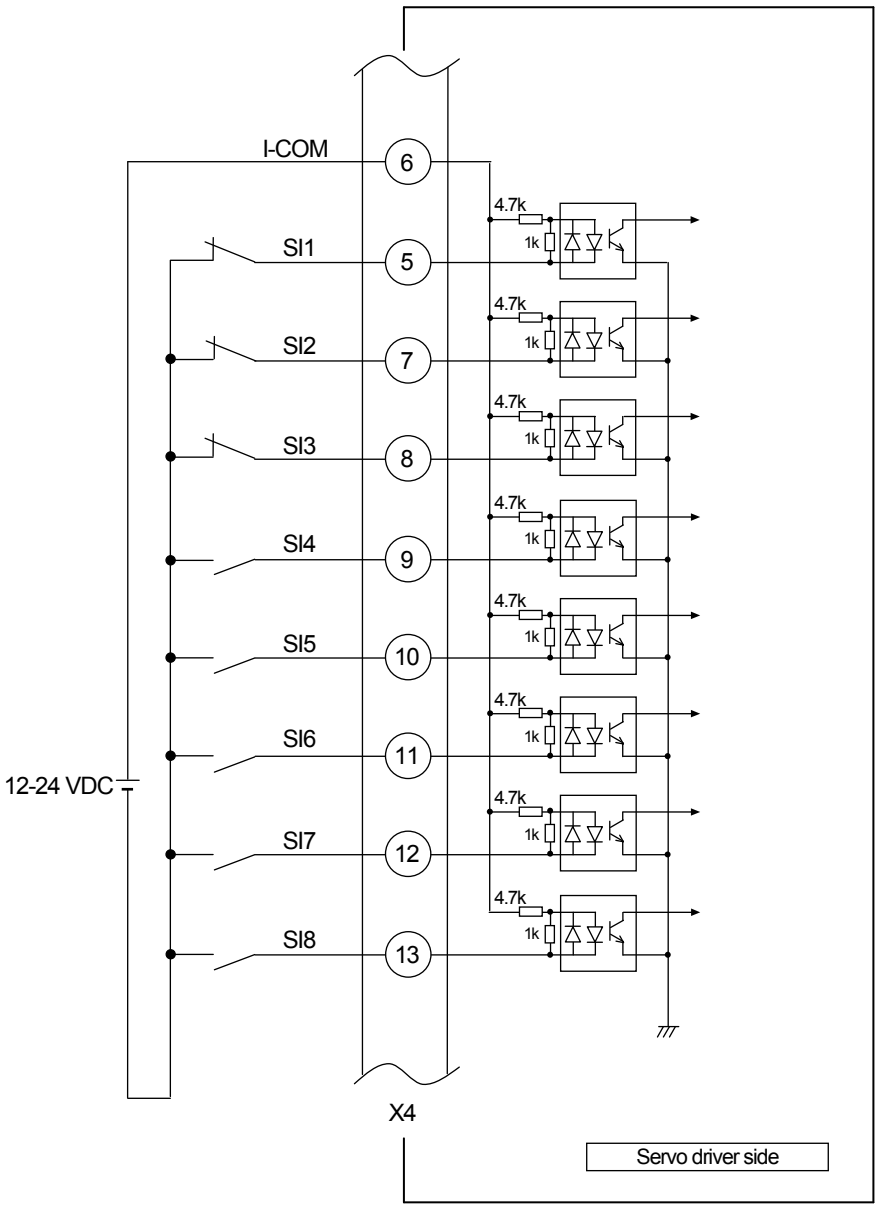
(2) Wiring to connector X4

[1] The 12–24 VDC power supply for the external control signal connected to the I-COM should be prepared by the customer.

[2] Place the servo driver and its peripheral device as nearly as possible (up to 3 m) so as to shorten the wiring.

[3] Wire the wiring as far away as possible (30 cm or more) from the power lines (L1, L2, L3, L1C, L2C, U, V, W, ⏚).
Do not put them in the same duct or bind them together.

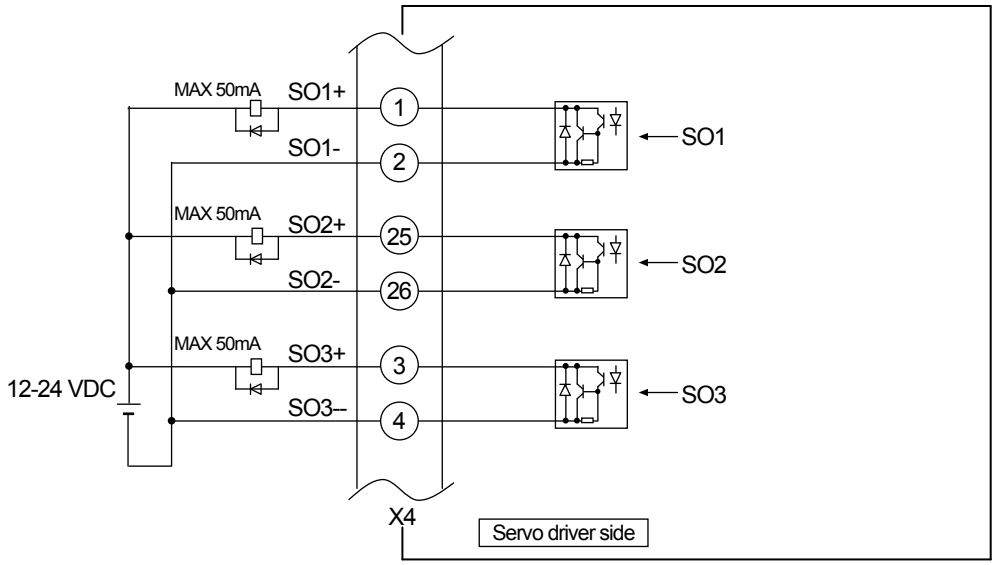
Digital Input



The functions of the pins SI1-SI8 are assigned by parameters. For factory default settings, refer to Appendix "Specification for Each Model".

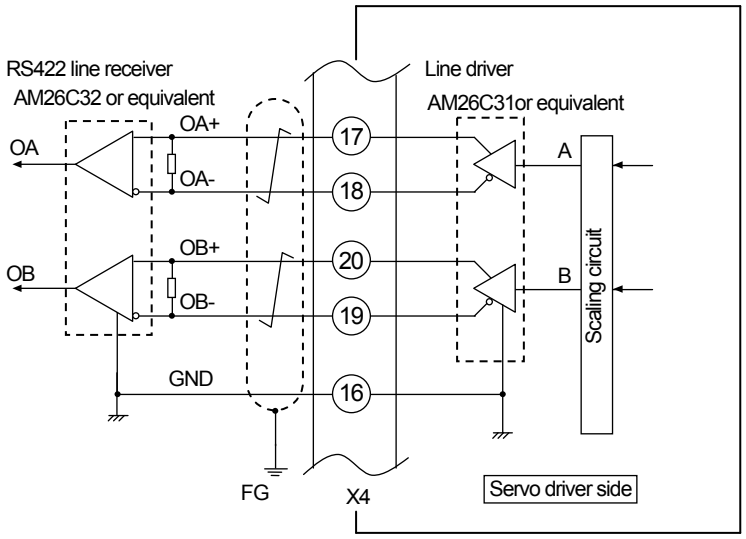
Digital Output

[4] Be aware of the polarity of the power supply for control signals. The polarity connection contrary to the figure shown above can damage the servo driver.
[5] To directly drive the relay with each output signal, make sure to attach a diode in parallel to the relay and in the direction as shown in the figure below. The servo driver can be damaged if the diode is not attached or the diode is attached in the reverse direction.
[6] When a logic circuit such as a gate receives each output signal, take care so that a noise does not impact on the circuit.
[7] Apply 50 mA or less of current to each output.



The functions of the pins S01-S03 are assigned by parameters. For factory default settings, refer to Appendix "Specification for Each Model".

Feedback pulse of rotary encoder and external scale



Note:
[1] To receive the output pulse, use RS422 line receiver (AM26C32 or equivalent), with an appropriate termination resistor (approx. 330 Ω) connected across its inputs.

(3) Wiring to connector X6

[1] As for the encoder cable, use the batch shielded twisted wire pairs whose core is 0.18 mm^2 or more.

[2] The cable length should be up to 20 m. When the wiring is long, we recommend you to use the double wiring for the 5 V power supply in order to reduce the impact of voltage drop.

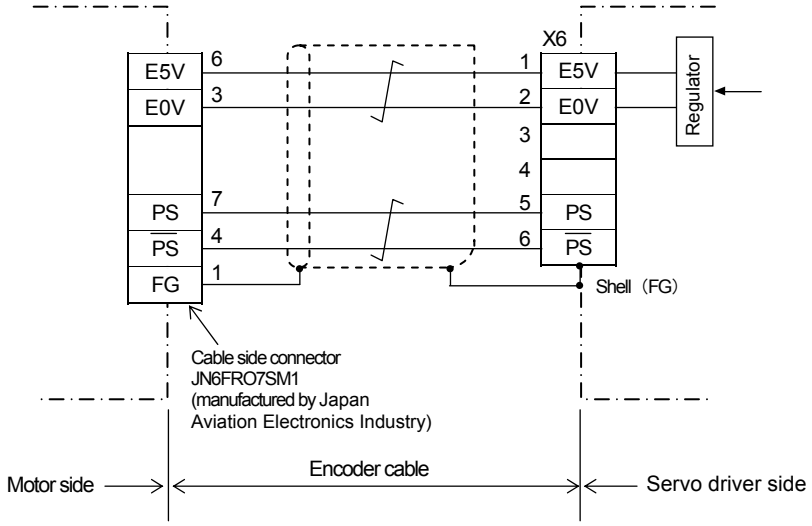
[3] Connect the coat of shielded cable at the motor side to the shield of shielded cable from the encoder. Make sure to connect the coat of shielded cable at the servo driver side to the shell (FG) of X6.

[4] Wire the wiring as far away as possible (30 cm or more) from the power lines (L1, L2, L3, L1C, L2C, U, V, W, ⏚). Do not put them in the same duct or bind them together.

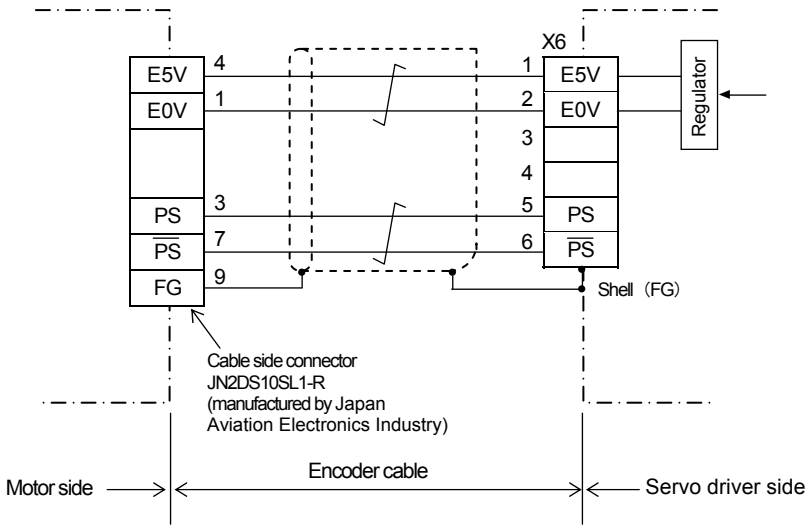
[5] Do not connect anything to the empty pins of X6.

5 wires incremental encoder

• MSME 50W - 750W

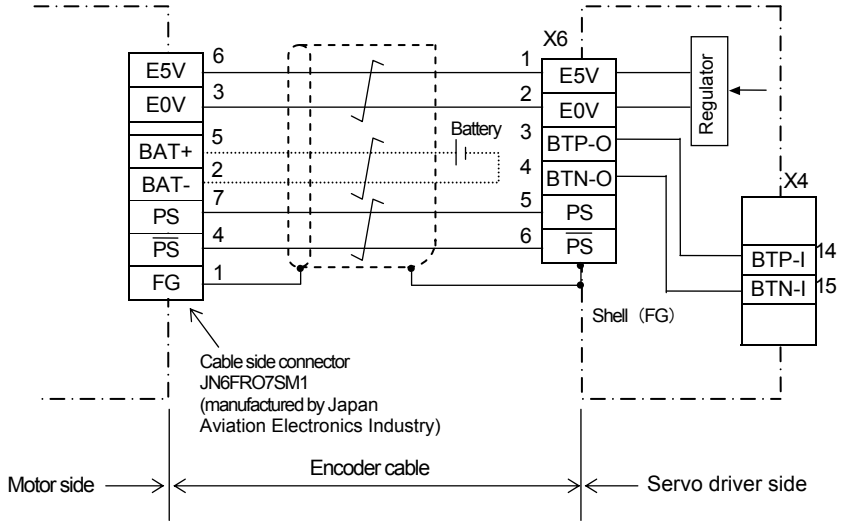


• MSME 1.0 kW – 5.0 kW
MDME 1.0 kW – 5.0 kW
MHME 1.0 kW – 5.0 kW
MGME 0.9 kW – 3.0 kW

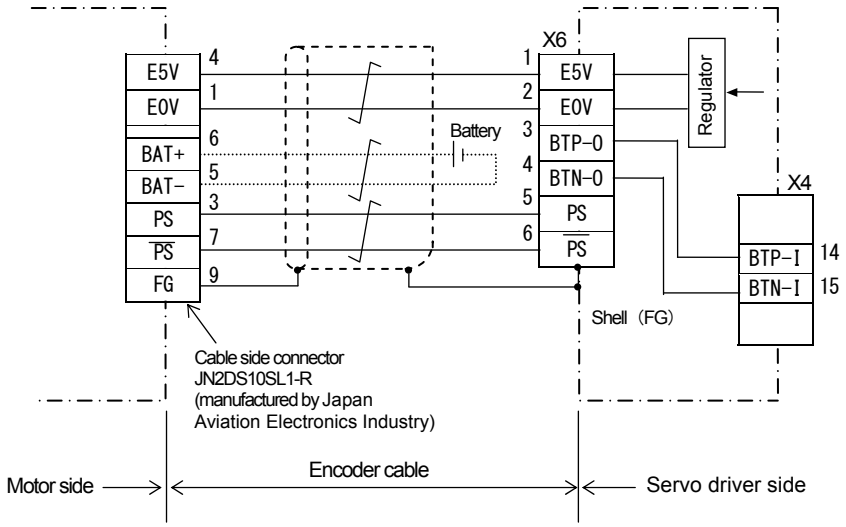


7 wires absolute encoder:

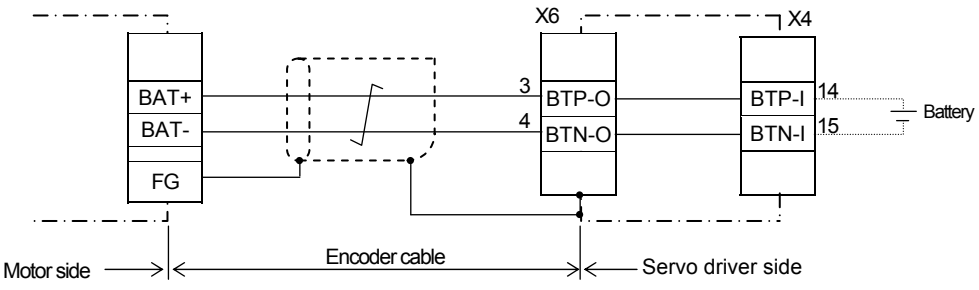
• MSME 50W - 750W



• MSME 1.0 kW – 5.0 kW
MDME 1.0 kW – 5.0 kW
MHME 1.0 kW – 5.0 kW
MGME 0.9 kW – 3.0 kW



Connect the absolute encoder battery directly to the BAT+ and BAT- connectors of the encoder at the motor. Or, it is also possible to connect the battery to the 14 and 15 pins of the X4, and then connect through the pins 3 and 4 of the X6.



Note: If the battery is directly connected to the encoder connectors at the motor, do not connect any wire to the pins 3 and 4 of the X6.

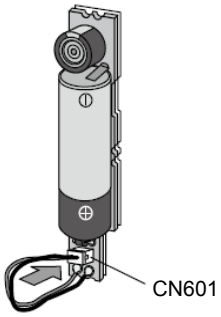
Precautions in using a battery for absolute encoder

An error arises from the absolute encoder when a battery voltage drop occurs.
The voltage drop occurs due to the life span of a battery or voltage delay.

(1) The life span of a battery may become short depending on ambient environment.
(2) Lithium batteries have a transient minimum voltage effect (voltage delay phenomenon), in which a voltage drop may occur temporarily when discharge starts. For this reason, the batteries should be refreshed when used.

<When a battery is used for the first time>

Before using our optional battery unit DV0P2990, connect the connector with lead wires to the battery as shown in the right figure and leave it for about 5 minutes. And then disconnect the connector from the CN601, and install it to the servo driver.
If using another battery, we recommend that you also refresh the battery. For refreshing a battery, consult with the manufacturer of the battery.



<After installing battery>

We recommend that control power be turned on/off once a day.

Other precautions

- If used incorrectly, batteries may cause troubles such as corrosion due to leakage and hazards such as explosion. So, observe the following rules:
  [1] Insert a battery correctly without confusing + and - terminals.
  [2] If a battery used for a long time or no longer used is left inside equipment, a trouble such as leakage may occur. Replace such a battery as soon as possible. (As a standard, we recommend replacing batteries every 2 years.)
    • The battery electrolyte is highly corrosive. It not only corrodes surrounding parts, but it also causes hazards such as a short-circuit due to its conductivity. Replace batteries periodically.
  [3] Do not disassemble batteries or throw them into fire.
    • Do not disassemble the battery because it is very dangerous if a splash of the contents comes into an eye. Also, do not throw the battery into fire or heat it because it may burst, causing hazards.
  [4] Do not short-circuit the battery or remove its tube.
    • If the battery + and - terminals are connected together with a conductive material such as a metal, a large current flows, not only weakening the battery, but also generating excessive heat, resulting in a burst to cause hazards.
  [5] Never attempt to charge the battery because it is not rechargeable.
- Disposal of old batteries after replacement may be restricted by local governments. Dispose of batteries following such a restriction.
- Air transportation
  Application for approval of hazardous material air transportation is required (for both passenger and cargo airplanes). (UN packing is required.)
  When you ask for air transportation, you are requested to submit necessary documents (parameter sheets and MSDS etc.). In this case, make a request to us through a dealer you purchased from.
- UN packing
  Consult with your transport company.

(4) Wiring to connector X5

[1] As for the external scale cable, use the batch shielded twisted wire pairs whose core is 0.18 mm^2 or more.

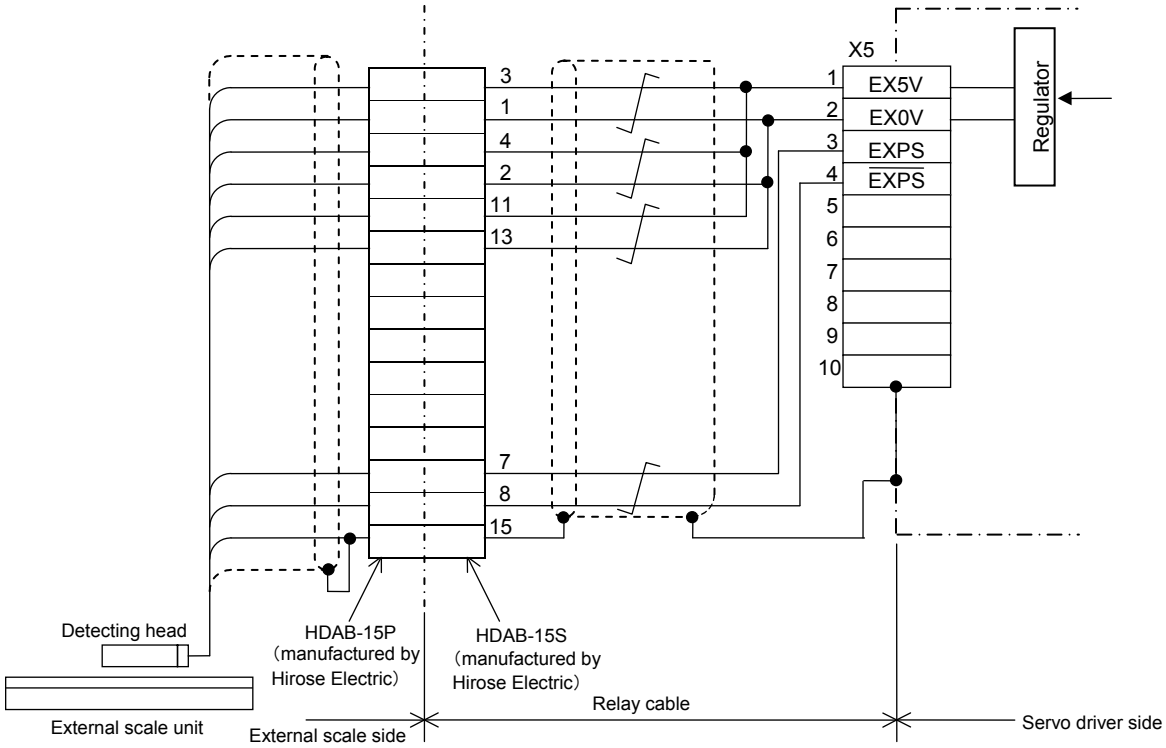
[2] The cable length should be up to 20 m. When the wiring is long, we recommend you to use the double wiring for the 5 V power supply in order to reduce the impact of voltage drop.

[3] Connect the coat of shielded cable at the motor side to the shield of shielded cable from the external scale. Make sure to connect the coat of shielded cable at the servo driver side to the shell (FG) of X5.

[4] Wire the wiring as far away as possible (30 cm or more) from the power lines (L1, L2, L3, L1C, L2C, U, V, W, ⏚). Do not put them in the same duct or bind them together.

[5] Do not connect anything to the empty pins of X5.

[6] X5 is capable to supply up to 5.2 V ± 5% 300 mA power supply. When using an external scale at more consumption current than this, customer is responsible for the power supply. Some external scales may take longer time in initialization after turning on the power. Design the power supply so as to meet the running timing after power-on which is described in "Basic function specifications."



The figure above shows connections to ST770A/ST770AL manufactured by Mitsutoyo.

(5) Wiring to connector X2A , X2B

[1] Use shielded twisted pair (STP) compatible with category 5e of SIA/EIA-568 or higher specifications.

If both ends of the shield are not grounded, EMC performance will degrade.

When installing connector plug on both ends of shielded cable, positively connect the shield to the metallic plug shell.

For colors of wire and matching connector pins, refer to TIA/E1A568B (see figure below).

Pins 3 and 6 are for signal wire.

Connect wire to 3 pin pairs on the connector: 1–2, 4–5 and 7–8.

When using 2-pair wire in place of 4-pair wire, use pins 1–2 and 3–6 and leave pins 4–5 and 7–8 on connector unconnected.

[2] Length of communication cable

a. Between 2 nodes: max. 100 m
b. Total length of cables between all nodes in the communication loop: max. 200 m

Both requirements shuld be met.

If the requirement b above cannot be met, consult with us.

Because specifications such as flexural characteristic, temperature range and insulation material differ from manufacturer to manufacturer, select the cable best suitable for your application.

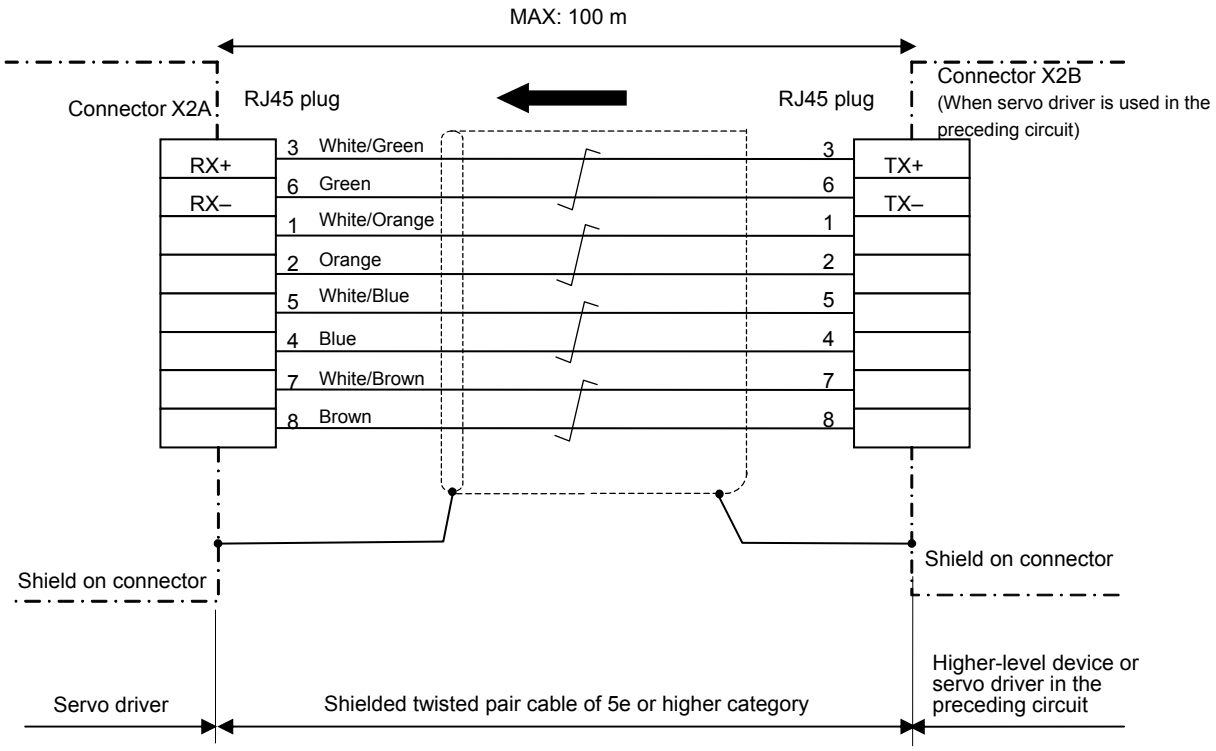
Select the cable for movable application according to your operating condition.

<Communication cable used in our evaluation>

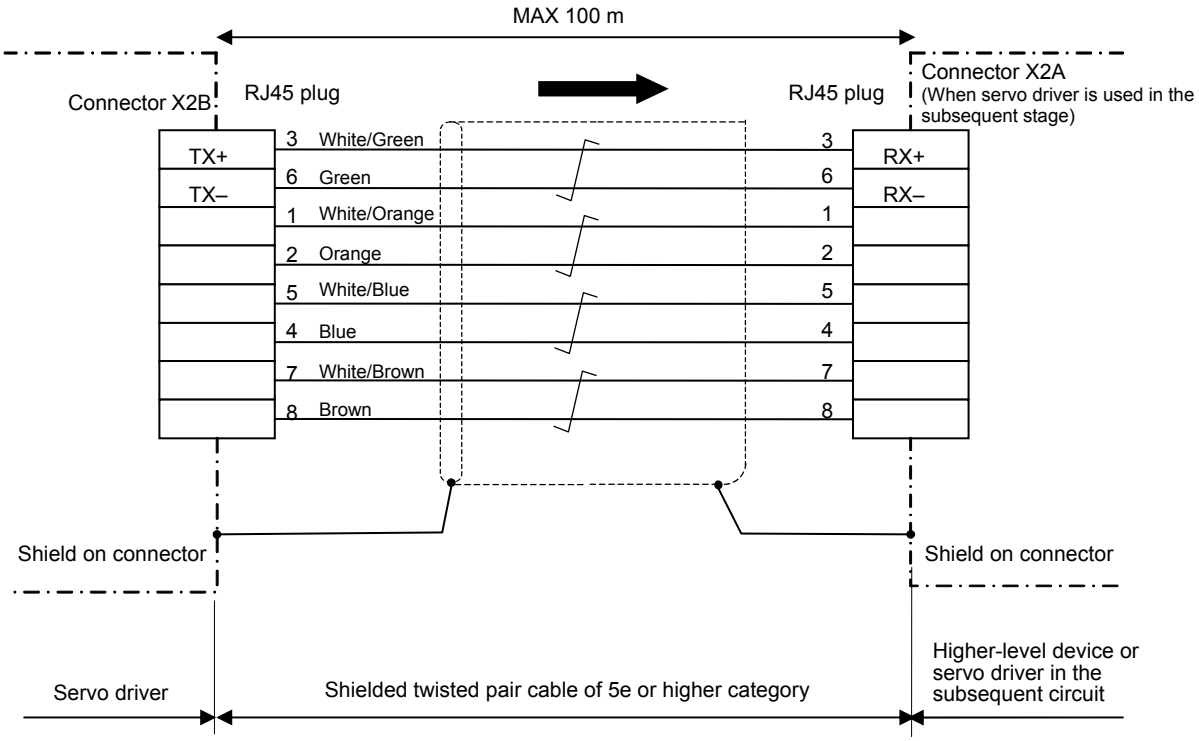
Manufacturer: Sanwa Supply Inc.

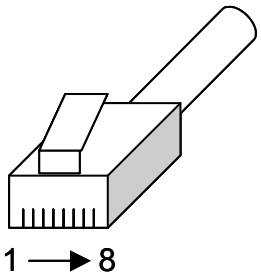
Part No.: KB-STP-*K, Category: 5e, STP

Connection to X2A



Wiring to connector X2B





Pins on RJ45 plug

9. Compliance with European EC Directive/UL Standard

9-1 European EC Directive

European EC directive is applied to all electronic products that are exported to EU, have the inherent functions, and are directly sold to the consuming public. These products are obliged to be compliant with the unified EU safety standard and paste the CE marking indicating the compliance to the products.
Our products, in order to make it easy for the embedded equipment and devices to be compliant with EC directive, provide the compliance with the standards associated with low voltage directive.

9-1-1 Compliance with EMC Directive

Our servo system determines the model (conditions) such as the installed distance and the wiring of the servo driver and the servo motor and makes the model compliant with the standards associated with EMC directive. When equipment and devices are embedded in practice, wiring and grounding conditions, etc. may be not the same as the model. Thus, it is necessary to measure how the final equipment and devices where the servo driver and the servo motor are embedded are compliant (especially unnecessary radiation noise, noise terminal voltage) with EMC directive.

9-1-2 Conforming Standards

		Servo driver	Motor
European EC directive	EMC directive	EN55011 EN61000-6-2 EN61800-3	
	Low voltage directive	EN61800-5-1	IEC60034-1 IEC60034-5
	Machinery Directives Functional safety	EN954-1 (Cat. 3) ISO13849-1 (PL d) EN61508 (SIL 2) EN62061 (SIL 2) EN61800-5-2 (STO) IEC61326-3-1 (SIL 2)	
UL standard		UL508C (File No. E164620)	UL1004 (File No. E166557)
CSA standard		C22. 2 No. 14	C22. 2 No. 100

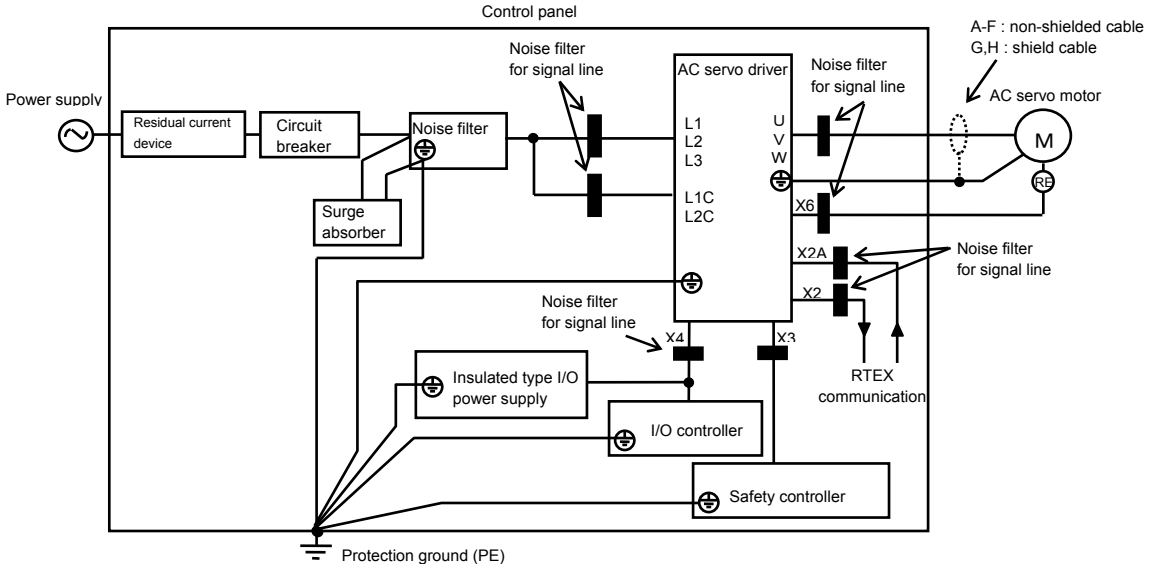
IEC : International Electrotechnical Commission
EN : Europaischen Norman
EMC : Electromagnetic Compatibility
UL : Under writers Laboratoris
CSA : Canadian Standards Association
ISO : International Organization for Standardization

9-2 Peripheral Device Configuration

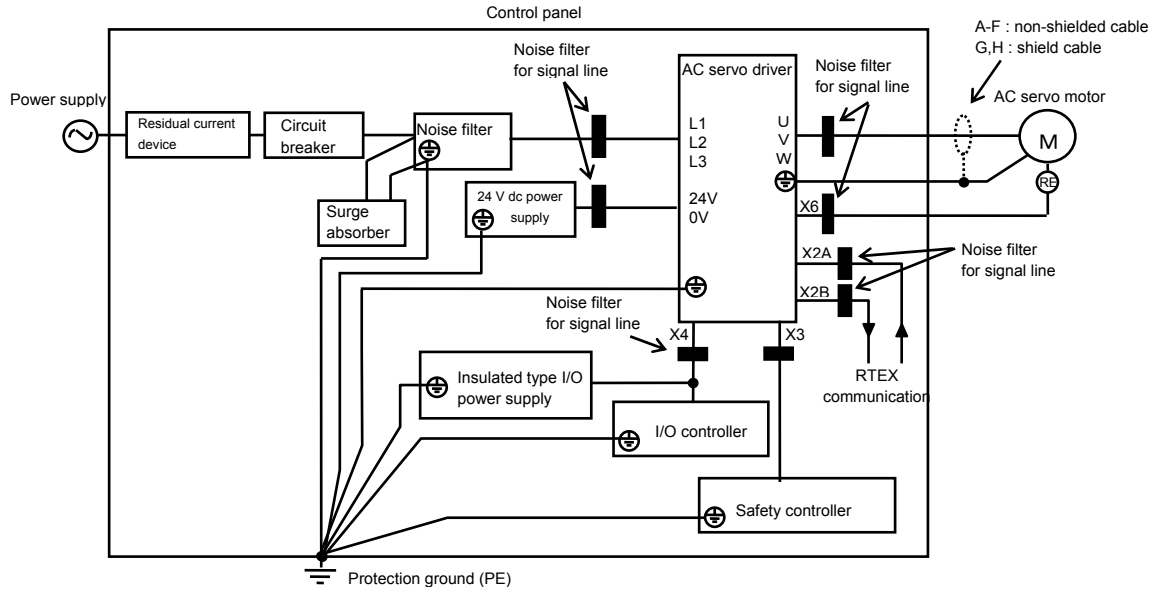
9-2-1 Installation Environment

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

- 100 V/200 V system



- 400 V system



9-2-2 Power Supply

100 V system: Single phase 100 V – 120 V $^{+10\%}_{-15\%}$ 50/60 Hz

200 V system (Sizes A–D): Single/ 3 phase 200 V – 240 V $^{+10\%}_{-15\%}$ 50/60 Hz

200 V system (Sizes E–H): 3 phase 200 V – 230 V $^{+10\%}_{-15\%}$ 50/60 Hz

400 V system (Sizes D–H): 3 phase 380 V – 480 V $^{+10\%}_{-15\%}$ 50/60 Hz
Control power supply 24 V dc +/- 15%

(1) Use it under the environment of overvoltage category II defined in IEC60664-1.
(2) As for the interface power supply, use the CE marking conforming product or the 12–24 VDC power supply of insulation type compliant with EN standard (EN60950).

9-2-3 Circuit Breaker

Make sure to connect a circuit breaker compliant with IEC standard and UL certification (marked with LISTED, Ⓤʟ) between the power supply and the noise filter.

9-2-4 Noise Filter

To install one noise filter as a whole in the power unit when multiple servo drivers are used, consult the noise filter manufacturer.

9-2-5 Surge Absorber

Install the surge absorber in the primary side of the noise filter.
Please!
To carry out a pressure test of equipment and devices, make sure to detach the surge absorber.
Otherwise, the surge absorber can be damaged.

9-2-6 Noise Filter for Signal Line

Install the noise filters for signal lines in all cables (power supply, motor, encoder, and interface cables).
For size D, install three noise filters in the power supply cable.

9-2-7 Grounding

(1) In order to avoid an electric shock, make sure to connect a protection ground terminal (⏚) of the servo driver and the protection ground (PE) of the control panel.
(2) Do not tighten the connection to the ground terminal (⏚) along with other parts. The servo driver has two ground terminals.

9-3 List of Peripheral Devices Applicable to Servo Driver

Driver	Applicable motor	Voltage *1	Rated output	Required Power (at the rated load)	Circuit breaker (rated current)	Noise filter (Single phase 3-phase)	Surge absorber (Single phase 3-phase)	Noise filter for signal	Rated operating current of magnetic contactor Contact configuration *2	Diameter and withstand voltage of main circuit cable	Crimp terminal for main circuit terminal block	Diameter and withstand voltage of control power supply cable	Crimp terminal for control power supply terminal block	Diameter and withstand voltage of motor cable *4	Diameter and withstand voltage of brake cable
MADH	MSME	Single phase, 100V	50W to 100W	approx. 0.4kVA	10A	DV0P4170	DV0P4190	DV0P1460	20A (3P+1a)	0.75mm²/ AWG18 600 VAC or more	Connection to exclusive connector	0.75mm²/ AWG18 600 VAC or more	Connection to exclusive connector	2.0mm²/ AWG14 600 VAC or more	0.75mm²/ AWG18 100 VAC or more
		Single/ 3-phase, 200V	50W to 200W	approx. 0.5kVA		DV0P4170 DV0PM20042	DV0P4190 DV0P1450								
MBDH	MSME	Single 100V	200W	approx. 0.5kVA		DV0P4170	DV0P4190								
		Single/ 3-phase, 200V	400W	approx. 0.9kVA		DV0P4170 DV0PM20042	DV0P4190 DV0P1450								
MCDH	MSME	Single 100V	400W	approx. 0.9kVA		DV0PM20042	DV0P4190								
		Single/ 3-phase, 200V	750W	approx. 1.3kVA	15A										
MDDH	MDME MHME	3-phase, 200V	1.0kW	approx. 1.8kVA		DV0P4220	DV0P4190 DV0P1450		30A (3P+1a)						
	MGME		0.9kW	approx. 1.8kVA	20A										
	MSME		1.0kW	approx. 1.8kVA											
	MHME MDME MFME MSME		1.5kW	approx. 2.3kVA											
	MSME MDME MHME	3-phase, 400V	1.0kW	approx. 1.8kVA	10A	FN258L-16-07 (Recommended component)	DV0PM20050		20A (3P+1a)	2.0mm²/ AWG14 600V VAC or more		0.52mm²/ AWG20 100 VAC or more			
	MGME		0.9kW												
	MSME MDME MFME MHME		1.5kW	approx. 2.3kVA											
MEDH	MDME MSME MHME	3-phase, 200V	2.0kW	approx. 3.3kVA	30A	DV0PM20043	DV0P1450	DV0P1460 RJ8035 (Recommended component) *5	60A (3P+1a)			0.75mm²/ AWG18 600 VAC or more			
	MFME		2.5kW	approx. 3.8kVA											
	MSME MDME MHME	3-phase, 400V	2.0kW	approx. 3.3kVA	15A	FN258L-16-07 (Recommended component)	DV0PM20050	DV0P1460	30A (3P+1a)			0.52mm²/ AWG20 100 VAC or more			
	MFME		2.5kW	approx. 3.8kVA											
MFDH	MGME	3-phase, 200V	2.0kW	approx. 3.8kVA	50A	DV0P3410	DV0P1450	DV0P1460 RJ8035 (Recommended component) *5	60A (3P+1a)	3.5mm²/ AWG12 600 VAC or more	11mm or smaller ø5.3 Terminal block M5	0.75mm²/ AWG18 600 VAC or more	11mm or smaller ø5.3 Terminal block M5	3.5mm²/ AWG12 600 VAC or more	
	MDME MHME MSME		3.0kW	approx. 4.5kVA											
	MGME MDME MHME		4.0kW	approx. 6.0kVA					100A (3P+1a)						
	MSME MFME		4.5kW	approx. 6.8kVA											
	MGME MDME MHME MSME		5.0kW	approx. 7.5kVA											
	MGME	3-phase, 400V	2.0kW	approx. 3.8kVA	30A	FN258L-30-07 (Recommended component)	DV0PM20050	DV0P1460	60A (3P+1a)		10mm or smaller ø4.3 Terminal block M4	0.75mm²/ AWG18 100 VAC or more	7mm or smaller ø3.2 Terminal block M3		
	MSME MDME MGME MHME		3.0kW	approx. 4.5kVA											
	MSME MDME MHME		4.0kW	approx. 6.0kVA											
	MFME		4.5kW	approx. 6.8kVA											
	MGME MSME MDME MHME		5.0kW	approx. 7.5kVA											

Driver	Applicable motor	Voltage *1	Rated output	Required Power (at the rated load)	Circuit breaker (rated current)	Noise filter	Surge absorber	Noise filter for signal	Rated operating current of magnetic (contactor Contact configuration) *2	Diameter and withstand voltage of main circuit cable	Crimp terminal for main circuit terminal block	Diameter and withstand voltage of control power supply cable	Crimp terminal for control power supply terminal block	Diameter and withstand voltage of motor cable *4	Diameter and withstand voltage of brake cable
MGDH	MDME	3-phase, 200V	7.5kW	approx. 11kVA	60A	FS5559-35-33 (Recommended component)	DV0P1450	DV0P1460 RJ8095 (Recommended component) T400-61D (Recommended component) *5	100A (3P+1a)	5.3mm²/ AWG10 600 VAC or more	11mm or smaller ø5.3 Terminal block M5	0.75mm²/ AWG18 600 VAC or more	10mm or smaller ø5.3 Terminal block M5	13.3 mm²/ AWG6 600 VAC or more	0.75mm²/ AWG18 100 VAC or more
	MGME		6.0kW	approx. 9.0kVA											
	MHME		7.5kW	approx. 11kVA											
	MDME	3-phase, 400V	7.5kW	approx. 11kVA	30A	FN258-42-07 or FN258-42-33 (Recommended component)	DV0PM20050		60A (3P+1a)			0.75mm²/ AWG18 100 VAC or more			
	MGME		6.0kW	approx. 9.0kVA											
	MHME		7.5kW	approx. 11kVA											
MHDH	MDME	3-phase, 200V	11kW	approx. 17kVA	100A	FS5559-80-34 (Recommended component)	DV0P1450		150A (3P+1a)	13.3mm²/ AWG6 600 VAC or more *3	16mm or smaller ø6.4 Terminal block M6	0.75mm²/ AWG18 600 VAC or more	10mm or smaller ø4.3 Terminal block M4	21.1 mm²/ AWG4 600 VAC or more	
			15kW	approx. 22kVA	125A									13.3 mm²/ AWG6 600 VAC or more	
		3-phase, 400V	11kW	approx. 17kVA	50A	FN258-42-07 or FN258-42-33 (Recommended component)	DV0PM20050		100A (3P+1a)			0.75mm²/ AWG18 100 VAC or more		21.1 mm²/ AWG4 600 VAC or more	
			15kW	approx. 22kVA	60A										

- Select the specification common to single/3 phase 200 V according to the power supply.
- To become compliant with European EC directive, make sure to connect a circuit breaker compliant with IEC standard and UL certification (marked with LISTED) between the power supply and the noise filter.

Please!

- Select a circuit breaker and a noise filter with the capacity comparable to the power capacity (by taking into account the load condition).
- Terminal block and earth terminal
  For wiring, use the copper conductor cable of the temperature rating 75 deg. Celsius or more.

- Tightening torque view (Terminal block and terminal cover)

Driver		Terminal screw		Terminal cover fixing screw	
Frame	Terminal Symbol	Nominal designation	Tightening torque (Nm)	Nominal designation	Tightening torque (Nm)
F 200 V	L1,L2,L3,L1C,L2C,B1,B2,B3,NC,U,V,W	M5	1.0-1.7	M3	0.19-0.21
F 400 V	24V,0V	M3	0.4-0.6		
	L1,L2,L3,B1,B2,B3,NC,U,V,W	M4	0.7-1.0		
G	L1C,L2C,24V,0V,DB1,DB2,DB3,DB4,NC	M5	1.0-1.7		
	L1,L2,L3,B1,B2,NC,U,V,W	M5	2.0-2.4	M3	0.3-0.5
H	L1C,L2C,24V,0V,DB1,DB2	M4	0.7-1.0	M5	2.0-2.5
	L1,L2,L3,B1,B2,NC,U,V,W	M6	2.2-2.5		

- Tightening torque view (Earth terminal and I/O connector X4)

Driver	Earth terminal		I/O connector X4	
Frame	Nominal designation	Tightening torque (Nm)	Nominal designation	Tightening torque (Nm)
A-E	M4	0.7-0.8	M2.6	0.3-0.35
F,G	M5	1.4-1.6		
H	M6	2.4-2.6		

- The terminal block can be damaged if the screw tightening torque exceeds the maximum value.
- For the earth wire dia. and dynamic brake resister wire dia., use more than the motor wire diameter.
- For Sizes A–E, use the dedicated connector which came with the product.
  In this case, the stripped cable length should be 8–9 mm.

	Optional Part Number	Part Number of Manufacturer	Manufacturer
Surge absorber	DV0P1450	R•A•V-781BXZ-4	Okaya Electric Industries
	DV0P4190	R•A•V-781BWZ-4	
	DV0PM20050	R•A•V-801BXZ-4	
Noise filter for signal line	DV0P1460	ZCAT3035-1330	TDK
	—	RJ8035	Konno Kogyousho
	—	RJ8095	
	—	T400-61D	MICROMETALS
Noise filter	DV0P4170	SUP-EK5-ER-6	Okaya Electric Industries
	DV0P4180	3SUP-HQ10-ER-6	
	DV0P4220	3SUP-HU30-ER-6	
	DV0P3410	3SUP-HL50-ER-6B	
	DV0PM20042	3SUP-HU10-ER-6	
	DV0PM20043	3SUP-HU50-ER-6	
	—	FN258L-16-07(29)	Schaffner
	—	FN258L-30-07(33)	
	—	FS5559-60-34	
	—	FS5559-80-34	
	—	FN258-42-07(33)	

9-4 Compliance with UL Standard

Certified by the UL508C (file No. E164620) standard by observing the installation conditions [1], [2] below.

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

[2] Make sure to connect a circuit breaker or fuse compliant with UL certification (marked with LISTED, Ⓤʟ) between the power supply and the noise filter.
For information about rated current of the circuit breaker/ fuse, refer to "9-3 List of Peripheral Devices Applicable to Servo Driver".
For wiring, use the copper conductor cable of the temperature rating 60 deg. Celsius or more.
The terminal block can be damaged if the screw tightening torque exceeds the maximum value (M4: 1.2 N•m, M5: 2.0 N•m.).

[3] Overload protection level
The overload protection function of the servo driver works when the effective current will be 115% or more of the rated current based on the time property. Check that effective current of the servo driver does not exceed the rated current by monitoring the load factor using PANATERM or by other methods. Set up the maximum instantaneous allowable current at the Pr 0.13 (first torque limit) and Pr 5.22 (second torque limit).

[4] The servo driver will comply with UL in the power supply environment of 5,000 Arms or lower.

[5] Motor over-temperature protection is not provided. Motor over-load-temperature protection shall be provided at the final installation upon required by the NEC (National Electric Code).

10. Compliance with SEMI F47 Instantaneous Stop Standard

- This function corresponds to the F47 power supply instantaneous stop standard in the SEMI standard during no/ light load condition.
- Useful when used in the semiconductor manufacturing equipment.

Warning:

[1] Not applicable to the servo driver which has a single phase 100 V specification and a 24 VDC specification for control power input.

[2] Make sure to evaluate and confirm the compliance with F47 power supply instantaneous stop standard with an actual device.

11. Compliance with KC mark

Conformity of Korea Certification mark is registered by suiting EMC directive.

Registration No. KCC-REM-FAN-M-D

SAFETY PRECAUTIONS

12. Safety Precautions

■ Danger and damage caused when the safety precautions are ignored are described in the following categories and signs:

DANGER	Description of this sign indicates “urgent danger that may cause death or serious injury.”
CAUTION	Description of this sign indicates “danger that may cause injury or property damage.”

■ Rules to keep are categorized and described with the following graphics.

	This graphic indicates “Prohibited” acts that are not permitted.
	This graphic indicates “Mandatory” acts that must be performed forcibly.

DANGER

(1) Be sure not to store or use the equipment under conditions subjected to vibrations (5.88 m/s2 or heavier) or an impact shock, foreign matters such as dust, metal particles oil mist, liquids such as water, oil and polishing liquid, near flammable objects, in an atmosphere of corrosive gas (such as H2S, SO2, NO2, Cl2), or in an atmosphere of flammable gas.

(2) Do not place any flammable objects near a motor, a servo driver, or a regenerative resistor.

(3) Do not drive the motor with an external force.

(4) Do not damage or strain the cable, or do not apply excessive stress. Do not place a heavy item on the cable or do not pinch the cable.

(5) Do not use the equipment with the cable soaked in oil or water.

(6) Do not install the equipment near a heating object such as a heater or a large wire-wound resistor. (Install a thermal shield, etc. to avoid the influences of heating object.)

(7) Do not connect the motor directly with a commercial power.

(8) Do not use the equipment under conditions subject to strong vibrations or an impact shock.

(9) Be sure not to touch a rotating part of a motor during operation.

(10) Do not touch the key flutes of motor output shaft with bare hands.

(11) Be sure not to touch inside a servo driver.

(12) Motor servo driver heat sink and peripheral device become very hot. Do not touch them.

(13) Do not carry out wiring or do not operate the equipment with wet hands.

(14) Wiring work is strictly allowed only for an engineer specializing electrical work.

SAFETY PRECAUTIONS

(15) A motor other than specified is not provided with a protection device. Protect a motor with an overcurrent protection device, a ground-fault interrupter, overheating protection device, and emergency stop device, etc.

(16) When operating the servo driver after an earthquake, inspect installation conditions of the servo driver and the motor and safety of the equipment to make sure that no fault exists.

(17) After turning off the power, the inside circuit remains charged at a high voltage for a while. When moving, wiring or inspection the equipment, completely shut off the power supply input outside the servo driver and leave for 15 minutes or longer before working.

(18) Install and mount the equipment securely to prevent personal injury caused by poor installation or mounting on an earthquake.

(19) Install an external emergency shutoff circuit to stop operation and interrupt power immediately upon emergency.
Emission of smoke or dust may occur due to a fault of a motor or a servo driver used in combination. For example, if the system is energized with the regenerative control power transistor shorted by failure, overheating of a regenerative resistor installed outside the servo driver may occur and it may emit smoke and dust. If a regenerative resistor is connected outside a servo driver, provide a means of detecting overheating such as a thermal protector to shut off power upon detecting abnormal heating.

(20) Mount the motor, the servo driver and the peripheral devices on a noncombustible material such as metal.

(21) Provide correct and secure wiring. Insecure wiring or incorrect wiring may cause runaway or burning of a motor. During wiring work, avoid entry of conductive dust such as wire chippings in a servo driver.

(22) Connect cables securely and provide secure insulation on current-carrying parts using insulation material.

(23) Be sure to install a fuseless breaker in a power supply. Be sure to connect grounding terminals and grounding wires.
To prevent an electric shock and malfunction, Class D grounding (grounding resistance at 100 Ω or lower) or higher grade is recommended.

CAUTION

(24) Do not hold cables or motor shaft when carrying the equipment.

(25) Do not adjust or change servo driver gains extremely, and do not make operations of the machine instable.

(26) The equipment may suddenly restart after recovery from shutdown upon a power failure. Keep away from the equipment.
Specify settings of the equipment to secure safety for human against such restart operations.

(27) When the equipment is energized, keep away from the motor and mechanism driven by the motor in case of malfunction.

(28) Avoid a strong shock to the motor shaft.

(29) Avoid a strong shock to the product.

(30) Be sure not to use the electromagnetic contactor installed on the main power supply to start or stop the motor.

(31) Avoid frequent switching on and off the main power supply of the servo driver.

(32) The built-in brake of the motor is used for holding only. Do not use the brake to stop (braking) for securing safety of the equipment.

SAFETY PRECAUTIONS

CAUTION

(33) Do not fall or topple over the equipment when carrying or installing.

(34) Do not climb the motor or do not place a heavy item on the motor.

(35) Do not block radiation slits of the servo driver and do not put a foreign matter into the servo driver.

(36) Do not use the equipment under direct sunlight. When storing the equipment, avoid direct sunlight and store under conditions of operating temperatures and humidity.

(37) Be sure not to disassemble or modify the equipment.
Disassembling and repair is allowed only for the manufacturer or sales agency authorized by the manufacturer.

(38) Use a motor and a servo driver in combination specified by the manufacturer. A customer shall be responsible for verifying performances and safety of combination with other servo driver.

(39) A failure of a motor or a combined servo driver may cause burning of motor, or emission of smoke and dust. Take this into consideration when the application of the machine is clean room related.

(40) Install the equipment adequately in consideration of output and main unit weight.

(41) Keep the ambient conditions of an installed motor within a range of allowable ambient temperatures and of allowable humidity.

(42) Install the equipment by specified procedures and in specified orientation.

(43) Install the devices by keeping specified distances between a servo driver and inside control panel or other devices.

(44) If a motor has an eyebolt, use the eyebolt to carry the motor only. Do not use the eyebolt to carry equipment.

(45) Connect a relay breaking upon emergency stop in series with a brake control relay.

(46) For a test run, hold down a motor and disconnect from a mechanical system to verify operations before installing on the equipment.
(A motor must run smoothly at 30 r/min driven with a servo driver.)

(47) Verify that an input power supply voltage satisfies the servo driver specifications before turning on the power and start operation.
An input voltage higher than rated may cause ignition and smoking in the servo driver, which may cause runaway or burning of a motor in some cases.

(48) When an alarm status occurs, remove a cause of the problem before restarting.
Careless restarting without removing a cause of problem may cause malfunction or burning of a motor.

(49) The built-in brake of the motor may not be able to hold due to expiring useful life or a mechanical structure.
Install a braking device on the equipment to secure safety.

(50) Pay attention to heat radiation. The servo driver generates heat by operating a motor. A servo driver used in a sealed control box may cause an extreme rise of temperature.
Consider cooling so that an ambient temperature around the servo driver satisfies an operating range.

(51) Maintenance and inspection is allowed only for a specializing person.

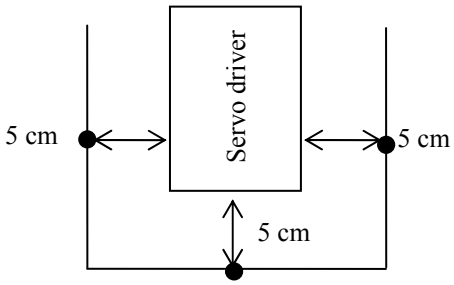
(52) Turn off the power when the equipment is not used for a long term.

- 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 the operating manual (safety book) before use.

⚠ SAFETY PRECAUTIONS

Servo driver's ambient temperature

The driver's service life significantly depends on the ambient temperature.
Make sure that the servo driver's ambient temperature (at 5 cm distant from the servo driver) does not exceed the operating temperature range.



Operating temperature range: 0 to 55°C

We have made the best efforts to ensure quality of this product. However, application of external noise (include radiation) or static electricity, or a defect of the input power supply, wiring or components may cause the servo driver to operate beyond the preset conditions. Therefore, you should exercise thorough caution to ensure safety against an unexpected operation.

The direction of the installation and the interval.

- Reserve enough surrounding space for effective cooling.
- Install fans to provide uniform distribution of temperature in the control panel.
- D - H frame is provided with a cooling fan at the bottom. (On the H-frame, the cooling fan is also installed on the upper side.)
- Observe the environmental conditions of the control panel described in the previous page.
- It is recommended to use the conductive paint when you make your own mounting bracket, or repaint after peeling off the paint on the machine for installing the products, in order to make noise countermeasure.

13. Life and Warranty

13-1 Life Expectancy of the Driver

The Servo driver has 28,000 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 source: 100 VAC, single phase, 50/60 Hz
  200 VAC single/three phase, 50/60 Hz,
  400 VAC single/three phase, 50/60 Hz
- Ambient temperature: 55°C
- Output torque: Rated constant value
- No. of revolutions: Rated constant No. of revolutions

Note that the life varies due to the working conditions.

13-2 Typical Life

[1] In-rush current prevention relay

Replace the in-rush current prevention relay when it is activated typically 20,000 times. Note that the criteria may vary depending on the environmental and working condition.

[2] Cooling fan

Replace the cooling fan in 10,000 to 30,000 hours. Note that the criteria may vary depending on the environmental and working condition.

13-3 Warranty Period

(1) Warranty period

For a period of 12 months from the date of delivery or 18 months from the manufacturing month. whichever is shorter.

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, lightning, flood, damage from salt, abnormal voltage or other act of God, or other disaster.
[5] defects resulting from the intrusion of foreign material to the product, such as water, oil or metallic particles.

This warranty shall be exempted when the life of component exceeds its rated standard life.

(2) Warranty scope

Panasonic warrants the replacement of the defected parts of the product or repair of them when the defects of the product occur during the warranty period, and when the defects are under Panasonic responsibility. This warranty only covers the product itself and does not cover any damage incurred by such defects.

14. Others

- Precautions for export of this product and the equipment incorporating this product
  If the end user or end purpose of this product relates to military affairs, armament and so on, this product may be subject to the export regulations prescribed in “Foreign Exchange and Foreign Trade Control Law”. To export this product, take thorough examination, and follow the required export procedure.
- We cannot warrant this product, if it is used beyond the specified operating conditions.
- Compliance with the relevant standards should be considered by the user.
- The final decision on the compatibility with the installations and components at the user’s site, in terms of structure, dimensions, characteristics and other conditions, should be made by the user.
- When using this product in your equipment, be careful about the compatibility with the servo motor and the servo driver to be used together.
- 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.
- Any specification change shall be based on our authorized specifications or the documents presented by the user. If a specification change may affect the functions and characteristics of this product, we will produce a trial product, and conduct examination in advance.
  Note that the produce price may be changed with a change in its specifications.
- We have made the best efforts to ensure the product quality. However, complete equipment at customer’s site may malfunction due to a failure of this product. Therefore, take precautions by providing fail-safe design at customer’s site, and ensure safety within the operating range of the work place.
- Failure of this product depending on its content, may generate smoke of about one cigarette.
  Take this into consideration when the application of the machine is clean room related.
- When the equipment runs without connecting the servomotor’s shaft electrically to ground, electrolytic corrosion may occur on the motor bearing and the bearing noise may get louder depending on the equipment and installing environment. So, customer is responsible to check and verify it.
- A customer must verify and inspect the equipment. Please be careful when using in an environment with high concentrations of sulphur or sulphuric gases, as sulpharation can lead to disconnection from the chip resistor or a poor contact connection.
- Take care to avoid inputting a supply voltage which significantly exceeds the rated range to the power supply of this product. Failure to heed this caution may result in damage to the internal parts, causing smoking and/or a fire and other trouble.
- When discard batteries, provide insulation using a tape etc. and discard the batteries abiding by a municipal law.
- When discarding the equipment, process the item as an industrial waste.

Specification for Each Model

● MINAS-A5N Series standard models

• Size A 100 V and 200 V

Model	MADHT1105NA1	MADHT1107NA1	MADHT1505NA1	MADHT1507NA1
Power supply input	Single phase 100 V	Single phase 100 V	Single phase/ 3 phase 200 V	Single phase/ 3 phase 200 V
Maximum instantaneous output current	10 A	10 A	10 A	10 A
Maximum continuous output current	5 A	7. 5 A	5 A	7. 5 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Externally connected	Externally connected	Externally connected	Externally connected
Auto gain tuning function	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Unprovided	Unprovided	Unprovided	Unprovided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.75mm²
	AWG18	AWG18	AWG18	AWG18
Main power supply cable	HVSF 0. 75–2. 0 mm²	HVSF 0. 75–2. 0 mm²	HVSF 0. 75–2. 0 mm²	HVSF 0. 75–2. 0 mm²
	AWG14–18	AWG14–18	AWG14–18	AWG14–18
Ground cable	HVSF 2. 0 mm²	HVSF 2. 0 mm²	HVSF 2. 0 mm²	HVSF 2. 0 mm²
	AWG14	AWG14	AWG14	AWG14
Motor cable	HVSF 0. 75–2. 0 mm²	HVSF 0. 75–2. 0 mm²	HVSF 0. 75–2. 0 mm²	HVSF 0. 75–2. 0 mm²
	AWG14–18	AWG14–18	AWG14–18	AWG14–18
Inrush Current (Main Power Supply) *2	Max. 7 A	Max. 7 A	Max. 14 A	Max. 14 A
Inrush Current (Control Power Supply) *2	Max. 14 A	Max. 14 A	Max. 28 A	Max. 28 A
Weight	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg
Dimensions	Size A	Size A	Size A	Size A

*1 When using an encoder with the specification of 17-bit incremental/absolute.

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 100 V or 200 V.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N Series standard models

• Size B 100 V and 200 V

Model	MBDHT2110NA1	MBDHT2510NA1
Power supply input	Single phase 100 V	Single phase/ 3 phase 200 V
Maximum instantaneous output current	15 A	15 A
Maximum continuous output current	10 A	10 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Externally connected	Externally connected
Auto gain tuning function	Provided	Provided
Dynamic brake function	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE
Safety function	Unprovided	Unprovided
Ambient temperature	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²
	AWG18	AWG18
Main power supply cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Ground cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Motor cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Inrush current (Main power supply) *2	Max. 7 A	Max. 14 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 28 A
Weight	Approx. 1.0 kg	Approx. 1.0 kg
Dimensions	Size B	Size B

*1 When using an encoder with the specification of 17-bit incremental/absolute.

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 100 V or 200 V.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N Series standard models

• Size C 100 V and 200 V

Model	MCDHT3120NA1	MCDHT3520NA1
Power supply input	Single phase 100 V	Single phase/ 3 phase 200 V
Maximum instantaneous output current	30 A	30 A
Maximum continuous output current	20 A	20 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Built-in	Built-in
Auto gain tuning function	Provided	Provided
Dynamic brake function	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE
Safety function	Unprovided	Unprovided
Ambient temperature	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²
	AWG18	AWG18
Main power supply cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Ground cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Motor cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Inrush current (Main power supply) *2	Max. 15 A	Max. 29 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 28 A
Weight	Approx.1.6 kg	Approx.1.6 kg
Dimensions	Size C	Size C

*1 When using an encoder with the specification of 17-bit incremental/absolute.

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 100 V or 200 V.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N Series standard models

• Size D 200 V and 400 V

Model	MDDHT3530NA1	MDDHT5540NA1	MDDHT2407NA1	MDDHT2412NA1	MDDHT3420NA1
Power supply input	Single phase/ 3 phase 200 V	Single phase/ 3 phase 200 V	3 phase 400 V	3 phase 400 V	3 phase 400 V
Max. instantaneous output current	50 A	50 A	15 A	15 A	30 A
Max. continuous output current	30 A	40 A	7.5 A	12 A	20 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Built-in	Built-in	Built-in	Built-in	Built-in
Auto gain tuning function	Provided	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Unprovided	Unprovided	Unprovided	Unprovided	Unprovided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.5mm²	HVSF 0.5mm²	HVSF 0.5mm²
	AWG18	AWG18	AWG20	AWG20	AWG20
Main power supply cable	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2
	AWG14	AWG14	AWG14	AWG14	AWG14
Ground cable	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2
	AWG14	AWG14	AWG14	AWG14	AWG14
Motor cable	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2
	AWG14	AWG14	AWG14	AWG14	AWG14
Inrush current (Main power supply) *2	Max. 29 A	Max. 29 A	Max. 28 A	Max. 28 A	Max. 28 A
Inrush current (Control power supply) *2	Max. 28 A	Max. 28 A	Max. 48 A	Max. 48 A	Max. 48 A
Weight	Approx. 1.8 kg	Approx. 1.8 kg	Approx. 1.9 kg	Approx. 1.9 kg	Approx. 1.9 kg
Dimensions	Size D	Size D	Size D	Size D	Size D

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400 V or 24 V dc.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N Series standard models

• Size E 200 V and 400 V

Model	MEDHT7364NA1	MEDHT4430NA1
Power supply input	3 phase 200 V	3 phase 400 V
Maximum instantaneous output current	75 A	35 A
Maximum continuous output current	64 A	30 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Built-in	Built-in
Auto gain tuning function	Provided	Provided
Dynamic brake function	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE
Safety function	Unprovided	Unprovided
Ambient temperature	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.5mm²
	AWG18	AWG20
Main power supply cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Ground cable	HVSF 3.5 mm²	HVSF 2.0 mm²
	AWG12	AWG14
Motor cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Inrush current (Main power supply) *2	Max. 29 A	Max. 32 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 48 A
Weight	Approx. 2.7 kg	Approx. 2.7 kg
Dimensions	Size E	Size E

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400 V or 24 V dc.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N Series standard models

• Size F 200 V and 400 V

Model	MFDHTA390NA1	MFDHTB3A2NA1	MFDHT5440NA1	MFDHTA464NA1
Power supply input	3 phase 200 V	3 phase 200 V	3 phase 400 V	3 phase 400 V
Maximum instantaneous output current	100 A	150 A	50 A	100 A
Maximum continuous output current	90 A	120 A	40 A	64 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge 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 *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Unprovided	Unprovided	Unprovided	Unprovided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.75mm²
	AWG18	AWG18	AWG18	AWG18
Main power supply cable	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²
	AWG12	AWG12	AWG12	AWG12
Ground cable	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²
	AWG12	AWG12	AWG12	AWG12
Motor cable	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²
	AWG12	AWG12	AWG12	AWG12
Inrush current (Main power supply) *2	Max. 22 A	Max. 22 A	Max. 32 A	Max. 32 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 14 A	Max. 48 A	Max. 48 A
Weight	Approx. 4.8 kg	Approx. 4.8 kg	Approx. 4.7 kg	Approx. 4.7 kg
Dimensions	Size F	Size F	Size F	Size F

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400 V or 24 V dc.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N Series standard models

• Sizes G/H 200 V and 400 V

Model	MGDHTC3B4NA1	MGDHTB4A2NA1	MHDHTC3B4NA1	MHDHTB4A2NA1
Power supply input	3 phase 200 V	3 phase 400 V	3 phase 200 V	3 phase 400 V
Maximum instantaneous output current	300 A	150 A	300 A	150 A
Maximum continuous output current	240 A	120 A	240 A	120 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Externally connected	Externally connected	Externally connected	Externally connected
Auto gain tuning function	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Unprovided	Unprovided	Unprovided	Unprovided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C
Control power cable	HVSF 0.75 mm^2	HVSF 0.75mm^2	HVSF 0.75 mm^2	HVSF 0.75 mm^2
	AWG18	AWG18	AWG18	AWG18
Main power supply cable	HVSF 5.3 mm^2	HVSF 5.3mm^2	HVSF 13.3 mm^2	HVSF 13.3 mm^2
	AWG10	AWG10	AWG6	AWG6
Ground cable	HVSF 13.3 mm^2	HVSF 13.3 mm^2	HVSF 21.1 mm^2	HVSF 21.1 mm^2
	AWG6	AWG6	AWG4	AWG4
Motor cable	HVSF 13.3 mm^2	HVSF 13.3 mm^2	HVSF 21.1 mm^2	HVSF 21.1 mm^2
	AWG6	AWG6	AWG4	AWG4
Inrush current (Main power supply) *2	Max. 66 A	Max. 32 A	Max. 66 A	Max. 32 A
Inrush current (Control power supply) *2	Max. 15 A	Max. 48 A	Max. 15 A	Max. 48 A
Weight	Approx. 13.5 kg	Approx. 13.5 kg	Approx. 21 kg	Approx. 21 kg
Dimensions	Size G	Size G	Size H	Size H

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400V and 24 V dc.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N01 Series

• Size A 100 V and 200 V

Model	MADHT1105N01	MADHT1107N01	MADHT1505N01	MADHT1507N01
Power supply input	Single phase 100 V	Single phase 100 V	Single phase/ 3 phase 200 V	Single phase/ 3 phase 200 V
Maximum instantaneous output current	10 A	10 A	10 A	10 A
Maximum continuous output current	5 A	7. 5 A	5 A	7. 5 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Externally connected	Externally connected	Externally connected	Externally connected
Auto gain tuning function	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Provided	Provided	Provided	Provided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm^2	HVSF 0.75mm^2	HVSF 0.75mm^2	HVSF 0.75mm^2
	AWG18	AWG18	AWG18	AWG18
Main power supply cable	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
Ground cable	HVSF 2. 0 mm^2	HVSF 2. 0 mm^2	HVSF 2. 0 mm^2	HVSF 2. 0 mm^2
	AWG14	AWG14	AWG14	AWG14
Motor cable	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) *2	Max. 7 A	Max. 7 A	Max. 14 A	Max. 14 A
Inrush Current (Control Power Supply) *2	Max. 14 A	Max. 14 A	Max. 28 A	Max. 28 A
Weight	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg
Dimensions	Size A	Size A	Size A	Size A

*1 When using an encoder with the specification of 17-bit incremental/absolute.

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 100 V or 200 V.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N01 Series

• Size B 100 V and 200 V

Model	MBDHT2110N01	MBDHT2510N01
Power supply input	Single phase 100 V	Single phase/ 3 phase 200 V
Maximum instantaneous output current	15 A	15 A
Maximum continuous output current	10 A	10 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Externally connected	Externally connected
Auto gain tuning function	Provided	Provided
Dynamic brake function	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE
Safety function	Provided	Provided
Ambient temperature	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²
	AWG18	AWG18
Main power supply cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Ground cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Motor cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Inrush current (Main power supply) *2	Max. 7 A	Max. 14 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 28 A
Weight	Approx. 1.0 kg	Approx. 1.0 kg
Dimensions	Size B	Size B

*1 When using an encoder with the specification of 17-bit incremental/absolute.

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 100 V or 200 V.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N01 Series

• Size C 100 V and 200 V

Model	MCDHT3120N01	MCDHT3520N01
Power supply input	Single phase 100 V	Single phase/ 3 phase 200 V
Maximum instantaneous output current	30 A	30 A
Maximum continuous output current	20 A	20 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Built-in	Built-in
Auto gain tuning function	Provided	Provided
Dynamic brake function	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE
Safety function	Provided	Provided
Ambient temperature	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²
	AWG18	AWG18
Main power supply cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Ground cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Motor cable	HVSF 0.75–2.0 mm²	HVSF 0.75–2.0 mm²
	AWG14–18	AWG14–18
Inrush current (Main power supply) *2	Max. 15 A	Max. 29 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 28 A
Weight	Approx.1.6 kg	Approx.1.6 kg
Dimensions	Size C	Size C

*1 When using an encoder with the specification of 17-bit incremental/absolute.

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 100 V or 200 V.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N01 Series

• Size D 200 V and 400 V

Model	MDDHT3530N01	MDDHT5540N01	MDDHT2407N01	MDDHT2412N01	MDDHT3420N01
Power supply input	Single phase/ 3 phase 200 V	Single phase/ 3 phase 200 V	3 phase 400 V	3 phase 400 V	3 phase 400 V
Max. instantaneous output current	50 A	50 A	15 A	15 A	30 A
Max. continuous output current	30 A	40 A	7.5 A	12 A	20 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Built-in	Built-in	Built-in	Built-in	Built-in
Auto gain tuning function	Provided	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Provided	Provided	Provided	Provided	Provided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.5mm²	HVSF 0.5mm²	HVSF 0.5mm²
	AWG18	AWG18	AWG20	AWG20	AWG20
Main power supply cable	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2
	AWG14	AWG14	AWG14	AWG14	AWG14
Ground cable	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2
	AWG14	AWG14	AWG14	AWG14	AWG14
Motor cable	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2	HVSF 2.0 mm^2
	AWG14	AWG14	AWG14	AWG14	AWG14
Inrush current (Main power supply) *2	Max. 29 A	Max. 29 A	Max. 28 A	Max. 28 A	Max. 28 A
Inrush current (Control power supply) *2	Max. 28 A	Max. 28 A	Max. 48 A	Max. 48 A	Max. 48 A
Weight	Approx. 1.8 kg	Approx. 1.8 kg	Approx. 1.9 kg	Approx. 1.9 kg	Approx. 1.9 kg
Dimensions	Size D	Size D	Size D	Size D	Size D

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400 V or 24 V dc.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N01 Series

• Size E 200 V and 400 V

Model	MEDHT7364N01	MEDHT4430N01
Power supply input	3 phase 200 V	3 phase 400 V
Maximum instantaneous output current	75 A	35 A
Maximum continuous output current	64 A	30 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Built-in	Built-in
Auto gain tuning function	Provided	Provided
Dynamic brake function	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE
Safety function	Provided	Provided
Ambient temperature	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.5mm²
	AWG18	AWG20
Main power supply cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Ground cable	HVSF 3.5 mm²	HVSF 2.0 mm²
	AWG12	AWG14
Motor cable	HVSF 2.0 mm²	HVSF 2.0 mm²
	AWG14	AWG14
Inrush current (Main power supply) *2	Max. 29 A	Max. 32 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 48 A
Weight	Approx. 2.7 kg	Approx. 2.7 kg
Dimensions	Size E	Size E

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400 V or 24 V dc.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N01 Series

• Size F 200 V and 400 V

Model	MFDHTA390N01	MFDHTB3A2N01	MFDHT5440N01	MFDHTA464N01
Power supply input	3 phase 200 V	3 phase 200 V	3 phase 400 V	3 phase 400 V
Maximum instantaneous output current	100 A	150 A	50 A	100 A
Maximum continuous output current	90 A	120 A	40 A	64 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge 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 *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Provided	Provided	Provided	Provided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C
Control power supply cable	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.75mm²	HVSF 0.75mm²
	AWG18	AWG18	AWG18	AWG18
Main power supply cable	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²
	AWG12	AWG12	AWG12	AWG12
Ground cable	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²
	AWG12	AWG12	AWG12	AWG12
Motor cable	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²	HVSF 3.5 mm²
	AWG12	AWG12	AWG12	AWG12
Inrush current (Main power supply) *2	Max. 22 A	Max. 22 A	Max. 32 A	Max. 32 A
Inrush current (Control power supply) *2	Max. 14 A	Max. 14 A	Max. 48 A	Max. 48 A
Weight	Approx. 4.8 kg	Approx. 4.8 kg	Approx. 4.7 kg	Approx. 4.7 kg
Dimensions	Size F	Size F	Size F	Size F

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400 V or 24 V dc.

Note: The absolute encoder backup battery is externally connected.

● MINAS-A5N01 Series

• Sizes G/H 200 V and 400 V

Model	MGDHTC3B4N01	MGDHTB4A2N01	MHDHTC3B4N01	MHDHTB4A2N01
Power supply input	3 phase 200 V	3 phase 400 V	3 phase 200 V	3 phase 400 V
Maximum instantaneous output current	300 A	150 A	300 A	150 A
Maximum continuous output current	240 A	120 A	240 A	120 A
Rotary encoder feedback signal	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r	Resolution: 1048576 P/r
	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r	Resolution: 131072 P/r
Regenerative discharge resistor	Externally connected	Externally connected	Externally connected	Externally connected
Auto gain tuning function	Provided	Provided	Provided	Provided
Dynamic brake function	Provided	Provided	Provided	Provided
Absolute system *1	Available NOTE	Available NOTE	Available NOTE	Available NOTE
Safety function	Provided	Provided	Provided	Provided
Ambient temperature	0–55°C	0–55°C	0–55°C	0–55°C
Control power cable	HVSF 0.75 mm^2	HVSF 0.75mm^2	HVSF 0.75 mm^2	HVSF 0.75 mm^2
	AWG18	AWG18	AWG18	AWG18
Main power supply cable	HVSF 5.3 mm^2	HVSF 5.3mm^2	HVSF 13.3 mm^2	HVSF 13.3 mm^2
	AWG10	AWG10	AWG6	AWG6
Ground cable	HVSF 13.3 mm^2	HVSF 13.3 mm^2	HVSF 21.1 mm^2	HVSF 21.1 mm^2
	AWG6	AWG6	AWG4	AWG4
Motor cable	HVSF 13.3 mm^2	HVSF 13.3 mm^2	HVSF 21.1 mm^2	HVSF 21.1 mm^2
	AWG6	AWG6	AWG4	AWG4
Inrush current (Main power supply) *2	Max. 66 A	Max. 32 A	Max. 66 A	Max. 32 A
Inrush current (Control power supply) *2	Max. 15 A	Max. 48 A	Max. 15 A	Max. 48 A
Weight	Approx. 13.5 kg	Approx. 13.5 kg	Approx. 21 kg	Approx. 21 kg
Dimensions	Size G	Size G	Size H	Size H

*1 When using Encoder Specifications: 17 bit incremental/absolute

*2 Current values were calculated on the basis of the power supply input described above, assuming a voltage of 200 V, 400V and 24 V dc.

Note: The absolute encoder backup battery is externally connected.

I/O connector (X4) default function allocation

X4 connector		Default function		
Name	Pin number	Signal name	Symbol	Logic
SI1	5	General monitor input 5	SI-MON5	NO contact
SI2	7	CW drive inhibit input	POT	NC contact
SI3	8	CCW drive inhibit input	NOT	NC contact
SI4	9	General monitor input 1	SI-MON1	NO contact
SI5	10	Near origin input	HOME	NO contact
SI6	11	External latch input 2	EXT2	NO contact
SI7	12	External latch input 3	EXT3	NO contact
SI8	13	General monitor input 4	SI-MON4	NO contact
SO1	1,2	External brake release signal	BRK-OFF	NO contact
SO2	25,26	RTEX operation output 1	EX-OUT1	NO contact
SO3	3,4	Alarm output	ALM	NC contact

[Default value of the parameters(1/2)]

No. SX-DSV02201

PARAMETER	MODEL	MINAS-A5N and A5N01 series all common

Category	Pr.	Parameter	Default value
0	0	Rotational direction setup	1
	1	Control mode setup	0
	2	Real-time auto tuning setup	1
	3	Machine stiffness at real-time auto tuning	Size A-C: 13 Size D-H: 11
	4	Inertia ratio	250
	5	Not used	-
	6	Not used	-
	7	Not used	-
	8	Command pulse counts per motor revolution	0
	9	Numerator of electronic gear	1
	10	Denominator of electronic gear	1
	11	Output pulse counts per motor revolution	2500
	12	Reversal of pulse output logic	0
	13	1st Torque limit	500 *1
	14	Position deviation excess setup	100000
	15	Absolute encoder setup	1
	16	External regenerative resistor setup	Size A,B,G,H: 3 Size C-F: 0
	17	Load factor of external regenerative resistor	0
1	0	1st gain of position loop	Size A-C: 48.0 Size D-H: 32.0
	1	1st gain of velocity loop	Size A-C: 27.0 Size D-H: 18.0
	2	1st time constant of velocity loop integration	Size A-C: 21.0 Size D-H: 31.0
	3	1st filter of speed detection	0
	4	1st time constant of torque filter	Size A-C: 0.84 Size D-H: 1.26
	5	2nd gain of position loop	Size A-C: 57.0 Size D-H: 38.0
	6	2nd gain of velocity loop	Size A-C: 27.0 Size D-H: 18.0
	7	2nd time constant of velocity loop integration	1000.0
	8	2nd filter of speed detection	0
	9	2nd time constant of torque filter	Size A-C: 0.84 Size D-H: 1.26
	10	Velocity feed forward gain	30.0
	11	Velocity feed forward filter	0.50
	12	Torque feed forward gain	0.0
1	13	Torque feed forward filter	0.00
	14	2nd gain setup	1
	15	Mode of position control switching	0
	16	Delay time of position control switching	5.0
	17	Level of position control switching	50
	18	Hysteresis at position control switching	33
	19	Position gain switching time	3.3
	20	Mode of velocity control switching	0
	21	Delay time of velocity control switching	0.0
	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	0.0
	26	Level of torque control switching	0
	27	Hysteresis at torque control switching	0
2	0	Adaptive filter mode setup	0
	1	1st notch frequency	5000
	2	1st notch width selection	2
	3	1st notch depth selection	0
	4	2nd notch frequency	5000
	5	2nd notch width selection	2
	6	2nd notch depth selection	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
2	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	Position command smoothing filter	0.0
	23	Position command FIR filter	0.0
3	0	Not used	-
	1	Not used	-
	2	Not used	-
	3	Not used	-
	4	For manufacturer's use	0
	5	For manufacturer's use	0
	6	Not used	-
	7	Not used	-
	8	Not used	-
	9	Not used	-
	10	Not used	-
	11	Not used	-
	12	Acceleration time setup	0
	13	Deceleration time setup	0
	14	S-curve acceleration/deceleration time setup	0
	15	Not used	-
	16	Not used	-
	17	Speed limit selection	0
	18	Not used	-
	19	Not used	-
	20	Not used	-
	21	Speed limit value 1	0
	22	Speed limit value 2	0
3	23	External scale selection	0
	24	Numerator of external scale division	0
	25	Denominator of external scale division	10000
	26	Reversal of external scale direction	0
	27	External scale Z-phase disconnection detection disable	0
	28	Hybrid deviation excess setup	16000
	29	Hybrid deviation clear setup	0
4	0	SI1 input selection	3289650
	1	SI2 input selection	8487297
	2	SI3 input selection	8553090
	3	SI4 input selection	3026478
	4	SI5 input selection	2236962
	5	SI6 input selection	2171169
	6	SI7 input selection	2829099
	7	SI8 input selection	3223857
	8	Not used	-
	9	Not used	-
	10	SO1 output selection	197379
	11	SO2 output selection	1052688
	12	SO3 output selection	65793
	13	Not used	-
	14	Not used	-
	15	Not used	-
	16	Analog monitor 1 type	0
	17	Analog monitor 1 output gain	0
	18	Analog monitor 2 type	4
	19	Analog monitor 2 output gain	0
	20	Not used	-
	21	Analog monitor output setup	0
	22	For manufacturer's use	0
	23	For manufacturer's use	0.00
4	24	For manufacturer's use	0
	25	Not used	-
	26	Not used	-
	27	Not used	-
	28	Not used	-
	29	Not used	-
	30	Not used	-
	31	In-position range	10
	32	In-position output setup	0
	33	INP hold time	0
	34	Zero-speed	50
	35	Speed coincidence range	50
	36	At-speed	1000
	37	Mechanical brake action in stop	0
	38	Mechanical brake action in motion	0
	39	Brake release speed setup	30
	40	Warning output 1 selection	0
	41	Warning output 2 selection	0
	42	2nd in-position range	10
5	0	Not used	-
	1	Not used	-
	2	Not used	-
	3	Denominator of pulse output division	0
	4	Over-travel inhibit input setup	1
	5	Sequence at over-travel inhibit	0
	6	Sequence at servo-off	0
	7	Sequence at main power off	0
	8	LV trip selection at main power off	1
	9	Detection time of main power off	70
	10	Sequence at alarm	0
	11	Torque setup for quick stop	0

*1 The maximum Torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.Refer to "The maximum value of Torque limit setup"

[Default value of the parameters(2/2)]

No. SX-DSV02201

PARAMETER	MODEL	MINAS-A5N and A5N01 series all common

Category	Pr.	Parameter	Default value
5	12	Over-load level setup	0
	13	Over-speed level setup	0
	14	Motor working range setup	1.0
	15	Control input reading setup	0
	16	Not used	-
	17	Not used	-
	18	Not used	-
	19	Not used	-
	20	Position unit selection	0
	21	Torque limit selection	1
	22	2nd torque limit	500 *1
	23	Not used	-
	24	Not used	-
	25	Positive direction torque limit	500 *1
	26	Negative direction torque limit	500 *1
	27	Not used	-
	28	Not used	-
	29	For manufacturer's use	2
	30	Not used	-
	31	USB axis address	1
	32	Not used	-
	33	Pulse regenerative output limit setup	0
	34	For manufacturer's use	4
6	0	Not used	-
	1	Not used	-
	2	Velocity deviation excess setup	0
	3	Not used	-
	4	Not used	-
	5	Position 3rd gain valid time	0.0
	6	Position 3rd gain scaling factor	100
	7	Torque command additional value	0

Category	Pr.	Parameter	Default value
6	8	Positive direction torque compensation	0
	9	Negative direction torque compensation	0
	10	Function expansion setup	0
	11	Current response setup	100
	12	Not used	-
	13	Not used	-
	14	Quick stop time at alarm	200
	15	2nd over-speed level setup	0
	16	Not used	-
	17	Not used	-
	18	Power-up wait time	0
	19	For manufacturer's use	0
	20	For manufacturer's use	0
	21	For manufacturer's use	0
	22	A/B-phase external scale pulse output selection	0
	23	Disturbance torque compensating gain	0
	24	Disturbance observer filter	0.53
	25	Not used	-
	26	Not used	-
	27	Warning latch setup	0
	28	Not used	-
	29	Not used	-
	30	Not used	-
	31	Real-time auto tuning estimation speed	1
	32	Real-time auto tuning custom setup	0
	33	Not used	-
	34	Hybrid vibration suppression gain	0.0
	35	Hybrid vibration suppression filter	0.10
	36	Not used	-
	37	Oscillation detecting level	0.0
	38	Warning mask setup	4

Category	Pr.	Parameter	Default value
6	39	For manufacturer's use	0
	40	For manufacturer's use	0
	41	1st damping filter depth	0
	42	2 stage torque filter	0
	43	2 stage torque filter damping	1000
7	0	LED display	0
	1	Address indicated time at power-up	0
	2	Not used	-
	3	Torque limited output setup	0
	4	For manufacturer's use	0
	5	For manufacturer's use	0
	6	For manufacturer's use	0
	7	For manufacturer's use	0
	8	For manufacturer's use	0
	9	For manufacturer's use	360
	10	Software-limit function	0
	11	Positive software-limit value	500000
	12	Negative software-limit value	-500000
	13	home offset for absolute encoder	0
	14	Detection time of main power off warning	0
	15	NEAR range	10
	16	Number of times of torque saturation warning protection	0
	17	Not used	-
	18	Not used	-
	19	Not used	-
	20	RTEX communication period	3
	21	RTEX command update period	2
	22	RTEX function expansion 1	0
	23	RTEX function expansion 2	18
	24	RTEX function expansion 3	0
	25	RTEX velocity unit	0

Category	Pr.	Parameter	Default value
7	26	RTEX warning setup of continuous com. error	0
	27	RTEX warning setup of cumulative com. error	0
	28	RTEX update counter warning setup	0
	29	RTEX monitor selection 1	0
	30	RTEX monitor selection 2	0
	31	RTEX monitor selection 3	0
	32	RTEX monitor selection 4	0
	33	RTEX monitor selection 5	0
	34	RTEX monitor selection 6	0
	35	RTEX command setup 1	0
	36	RTEX command setup 2	0
	37	RTEX command setup 3	0
	38	RTEX update counter warning protection setup	0
	39	For manufacturer's use	0
8	0	For manufacturer's use	0
	1	Profile linear acceleration	100
	2	For manufacturer's use	0
	3	For manufacturer's use	0
	4	Profile linear deceleration	100
	5	For manufacturer's use	0
	6	Not used	-
	7	Not used	-
	8	Not used	-
	9	Not used	-
	10	Profile distance after position latched	0
	11	Not used	-
	12	Profile homing mode	0
	13	Profile homing speed 1	50
	14	Profile homing speed 2	5
	15	For manufacturer's use	0
	16	Not used	-

Category	Pr.	Parameter	Default value
8	17	Not used	-
	18	Not used	-
	19	For manufacturer's use	0

*1 The maximum Torque limit value (Pr.0.13,Pr.5.22,Pr.5.25,Pr.5.26) varies by the applicable motor.Refer to "The maximum value of Torque limit setup"

[The maximum value of Torque limit setup]

No. SX-DSV02201

Size	Mode	Applicable motor	The maximum value of Torque limit setup
A	MADHT1105NA1	MSME5AZG**	300
		MSME5AZS**	300
	MADHT1107NA1	MSME011G**	300
		MSME011S**	300
	MADHT1505NA1	MSME5AZG**	300
		MSME5AZS**	300
		MSME012G**	300
		MSME012S**	300
	MADHT1507NA1	MSME022G**	300
		MSME022S**	300
B	MBDHT2110NA1	MSME021G**	300
		MSME021S**	300
	MBDHT2510NA1	MSME042G**	300
		MSME042S**	300
C	MCDHT3120NA1	MSME041G**	300
		MSME041S**	300
	MCDHT3520NA1	MSME082G**	300
		MSME082S**	300
D	MDDHT3530NA1	MDME102G**	300
		MDME102S**	300
		MHME102G**	300
		MHME102S**	300
	MDDHT5540NA1	MGME092G**	225
		MGME092S**	225
		MSME102G**	300
		MSME102S**	300
		MDME152G**	300
		MDME152S**	300
		MSME152G**	300
		MSME152S**	300

Size	Mode	Applicable motor	The maximum value of Torque limit setup
D	MDDHT5540NA1	MHME152G**	300
		MHME152S**	300
		MFME152G**	300
		MFME152S**	300
	MDDHT2407NA1	MDME044G**	300
		MDME044S**	300
		MDME064G**	300
		MDME064S**	300
	MDDHT2412NA1	MSME084G**	300
		MSME084S**	300
		MDME104G**	300
		MDME104S**	300
		MHME104G**	300
		MHME104S**	300
	MDDHT3420NA1	MGME094G**	225
		MGME094S**	225
		MSME104G**	300
		MSME104S**	300
		MDME154G**	300
		MDME154S**	300
		MHME154G**	300
		MHME154S**	300
		MSME154G**	300
		MSME154S**	300
		MFME154G**	300
		MFME154S**	300

Size	Mode	Applicable motor	The maximum value of Torque limit setup
E	MEDHT7364NA1	MDME202G**	300
		MDME202S**	300
		MSME202G**	300
		MSME202S**	300
		MHME202G**	300
		MHME202S**	300
		MFME252G**	300
		MFME252S**	300
	MEDHT4430NA1	MDME204G**	300
		MDME204S**	300
		MSME204G**	300
		MSME204S**	300
		MHME204G**	300
		MHME204S**	300
		MFME254G**	300
		MFME254S**	300
F	MFDHTA390NA1	MGME202G**	250
		MGME202S**	250
		MDME302G**	300
		MDME302S**	300
		MHME302G**	300
		MHME302S**	300
		MSME302G**	300
		MSME302S**	300
F	MFDHTB3A2NA1	MGME302G**	250
		MGME302S**	250
		MDME402G**	300
		MDME402S**	300

Size	Mode	Applicable motor	The maximum value of Torque limit setup
F	MFDHTB3A2NA1	MHME402G**	300
		MHME402S**	300
		MSME402G**	300
		MSME402S**	300
		MGME452G**	262
		MGME452S**	262
		MFME452G**	300
		MFME452S**	300
		MDME502G**	300
		MDME502S**	300
		MHME502G**	300
		MHME502S**	300
		MSME502G**	300
		MSME502S**	300
	MFDHT5440NA1	MGME204G**	250
		MGME204S**	250
		MDME304G**	300
		MDME304S**	300
		MHME304G**	300
		MHME304S**	300
		MSME304G**	300
		MSME304S**	300
	MFDHTA464NA1	MGME304G**	250
		MGME304S**	250
		MDME404G**	300
		MDME404S**	300
		MSME404G**	300
		MSME404S**	300

Size	Mode	Applicable motor	The maximum value of Torque limit setup
F	MFDHTA464NA1	MHME404G**	300
		MHME404S**	300
		MGME454G**	263
		MGME454S**	263
		MFME454G**	300
		MFME454S**	300
		MSME504G**	300
		MSME504S**	300
		MDME504G**	300
		MDME504S**	300
		MHME504G**	300
		MHME504S**	300
G	MGDHTC3B4NA1	MGME602G**	272
		MGME602S**	272
		MDME752G**	265
		MDME752S**	265
		MHME752G**	265
		MHME752S**	265
	MGDHTB4A2NA1	MGME604G**	272
		MGME604S**	272
		MDME754G**	267
		MDME754S**	267
		MHME754G**	267
		MHME754S**	267
H	MHDHTC3B4NA1	MDMEC12G**	265
		MDMEC12S**	265
		MDMEC52G**	253
		MDMEC52S**	253
	MHDHTB4A2NA1	MDMEC14G**	265
		MDMEC14S**	265
		MDMEC54G**	253
		MDMEC54S**	253