

Reference Specifications

Model

AC Servo Drive
MINAS-A4N (High-speed network type)

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REVISIONS

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Contents

1. Scope	1
2. Model No.	1
3. Applicable motor	2
4. Specifications	5
4-1 General specifications.....	5
4-2 Specifications by model	6
5. Dimensions.....	7
6. Appearance	13
7. Configuration of connectors	16
7-1 Power connectors X1 , X2 or terminal block	16
7-2 Encoder connector X6	16
7-3 Interface connector X5	17
7-4 RS232 communication connector X4	21
7-5 Network connectors X3A X3B	21
7-6 External scale connector X7	22
8. Wiring	23
8-1 Cable material and max. length.....	23
8-2 I/O, Encoder and External scale connection	23
8-3 Cautions on wiring	24
9. Safety precautions on installation	38
10. Safety precautions on using the drive	39
11. Life and Warranty	40
11-1 Expected life time of the drive.....	40
11-2 Typical life	40
11-3 Warranty period	40
12. Conformity to EC Directive and UL Standards.....	41
12-1 EC Directives	41
12-2 Configuration of peripheral equipments.....	42
12-3 Servo drive and list of applicable peripheral equipments	44
12-4 Conformity to UL Standards	45
13. Compliance with SEMI F47 standard	45
14. Others.....	46

Appendix

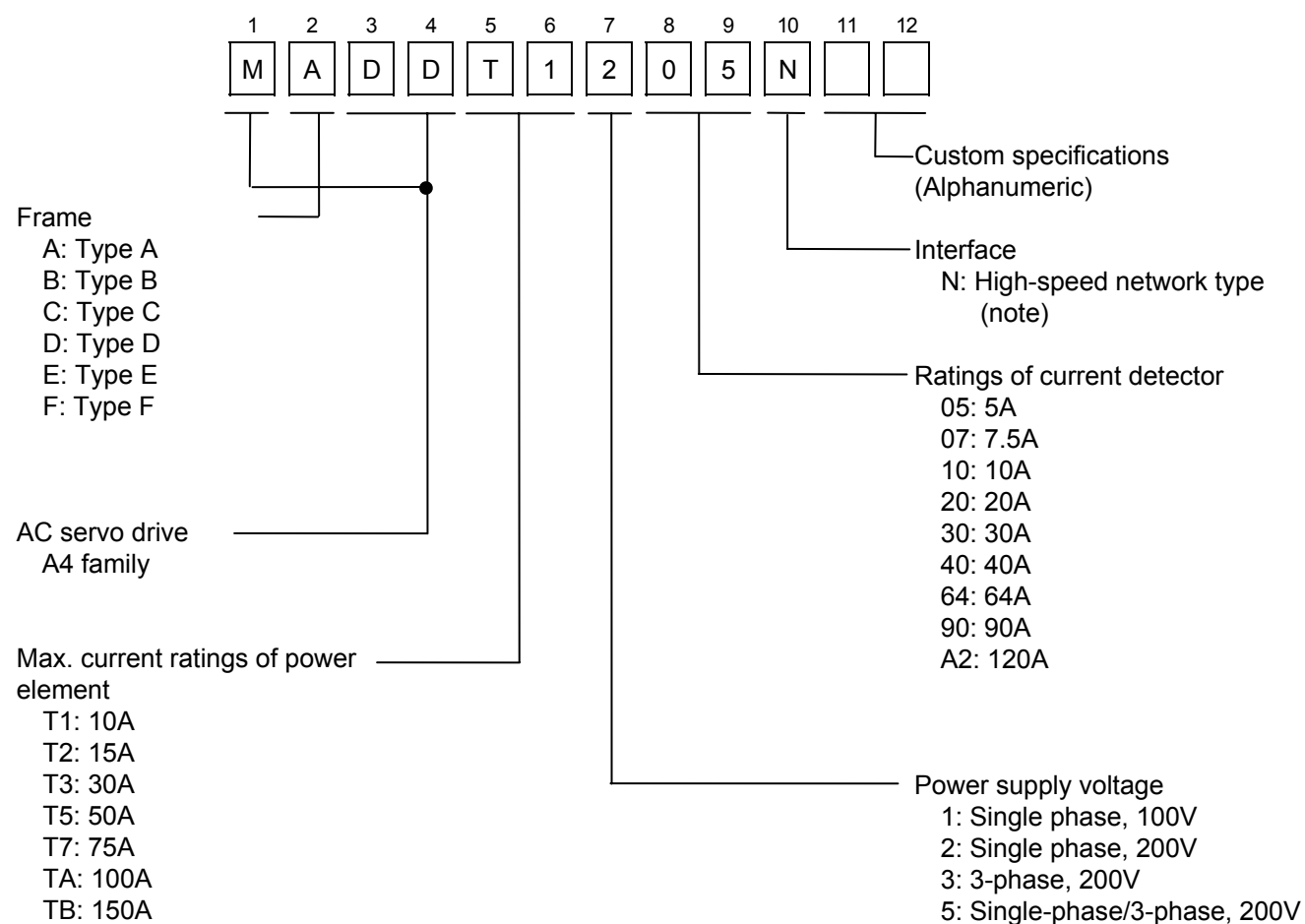
Specifications by model

1. Scope

This document specifies the servo drive for the AC servo system
manufactured and supplied by Motor Company, Matsushita Electric Industrial Co., Ltd.

2. Model No.

Notation of the model No. is as follows:



(Note) It means 100Mbps real-time communication.

3. Applicable motor

Servo Drive			Applicable Motor				
Model No.	Frame Type	Power supply input	Model No.	Voltage	Rated output	Rated speed	Encoder spec.
MADDT1105N	A	Single phase 100V	MSMD5AZP1*	100V	50W	3000r/min	5-wire 2500 p/r
			MSMD5AZS1*	100V	50W	3000r/min	7-wire, 17-bit
MADDT1107N	A	Single-phase 100V	MSMD011P1*	100V	100W	3000r/min	5-wire 2500 p/r
			MSMD011S1*	100V	100W	3000r/min	7-wire, 17-bit
			MQMA011P1*	100V	100W	3000r/min	5-wire 2500 p/r
			MQMA011S1*	100V	100W	3000r/min	7-wire, 17-bit
MADDT1205N	A	Single-phase 200V	MSMD5AZP1*	200V	50W	3000r/min	5-wire 2500 p/r
			MSMD5AZS1*	200V	50W	3000r/min	7-wire, 17-bit
			MSMD012P1*	200V	100W	3000r/min	5-wire 2500 p/r
			MSMD012S1*	200V	100W	3000r/min	7-wire, 17-bit
			MQMA012P1*	200V	100W	3000r/min	5-wire 2500 p/r
			MQMA012S1*	200V	100W	3000r/min	7-wire, 17-bit
MADDT1207N	A	Single-phase 200V	MSMD022P1*	200V	200W	3000r/min	5-wire 2500 p/r
			MSMD022S1*	200V	200W	3000r/min	7-wire, 17-bit
			MAMA012P1*	200V	100W	5000r/min	5-wire 2500 p/r
			MAMA012S1*	200V	100W	5000r/min	7-wire, 17-bit
			MQMA022P1*	200V	200W	3000r/min	5-wire 2500 p/r
			MQMA022S1*	200V	200W	3000r/min	7-wire, 17-bit
MBDDT2110N	B	Single-phase 100V	MSMD021P1*	100V	200W	3000r/min	5-wire 2500 p/r
			MSMD021S1*	100V	200W	3000r/min	7-wire, 17-bit
			MQMA021P1*	100V	200W	3000r/min	5-wire 2500 p/r
			MQMA021S1*	100V	200W	3000r/min	7-wire, 17-bit
MBDDT2210N	B	Single-phase 200V	MSMD042P1*	200V	400W	3000r/min	5-wire 2500 p/r
			MSMD042S1*	200V	400W	3000r/min	7-wire, 17-bit
			MAMA022P1*	200V	200W	5000r/min	5-wire 2500 p/r
			MAMA022S1*	200V	200W	5000r/min	7-wire, 17-bit
			MQMA042P1*	200V	400W	3000r/min	5-wire 2500 p/r
			MQMA042S1*	200V	400W	3000r/min	7-wire, 17-bit
MCDDT3120N	C	Single-phase 100V	MSMD041P1*	100V	400W	3000r/min	5-wire 2500 p/r
			MSMD041S1*	100V	400W	3000r/min	7-wire, 17-bit
			MQMA041P1*	100V	400W	3000r/min	5-wire 2500 p/r
			MQMA041S1*	100V	400W	3000r/min	7-wire, 17-bit
MCDDT3520N	C	Single/3- phase, 200V	MSMD082P1*	200V	750W	3000r/min	5-wire 2500 p/r
			MSMD082S1*	200V	750W	3000r/min	7-wire, 17-bit
			MAMA042P1*	200V	400W	5000r/min	5-wire 2500 p/r
			MAMA042S1*	200V	400W	5000r/min	7-wire, 17-bit
			MFMA042P1*	200V	400W	2000r/min	5-wire 2500 p/r
			MFMA042S1*	200V	400W	2000r/min	7-wire, 17-bit
			MHMA052P1*	200V	500W	2000r/min	5-wire 2500 p/r
			MHMA052S1*	200V	500W	2000r/min	7-wire, 17-bit

Servo Drive			Applicable Motor				
Model No.	Frame Type	Power supply input	Model No.	Voltage	Rated output	Rated speed	Encoder spec.
MDDDT3530N	D	Single/3-phase, 200V	MDMA102P1*	200V	1.0kW	2000r/min	5-wire 2500 p/r
			MDMA102S1*	200V	1.0kW	2000r/min	7-wire, 17-bit
			MHMA102P1*	200V	1.0kW	2000r/min	5-wire 2500 p/r
			MHMA102S1*	200V	1.0kW	2000r/min	7-wire, 17-bit
MDDDT5540N	D	Single/3-phase, 200V	MGMA092P1*	200V	900W	1000r/min	5-wire 2500 p/r
			MGMA092S1*	200V	900W	1000r/min	7-wire, 17-bit
			MSMA102P1*	200V	1.0kW	3000r/min	5-wire 2500 p/r
			MSMA102S1*	200V	1.0kW	3000r/min	7-wire, 17-bit
			MHMA152P1*	200V	1.5kW	2000r/min	5-wire 2500 p/r
			MHMA152S1*	200V	1.5kW	2000r/min	7-wire, 17-bit
			MDMA152P1*	200V	1.5kW	2000r/min	5-wire 2500 p/r
			MDMA152S1*	200V	1.5kW	2000r/min	7-wire, 17-bit
			MSMA152P1*	200V	1.5kW	3000r/min	5-wire 2500 p/r
			MSMA152S1*	200V	1.5kW	3000r/min	7-wire, 17-bit
			MFMA152P1*	200V	1.5kW	2000r/min	5-wire 2500 p/r
			MFMA152S1*	200V	1.5kW	2000r/min	7-wire, 17-bit
			MAMA082P1*	200V	750W	5000r/min	5-wire 2500 p/r
			MAMA082S1*	200V	750W	5000r/min	7-wire, 17-bit

Servo Drive			Applicable Motor				
Model No.	Frame Type	Power supply input	Model No.	Voltage	Rated output	Rated speed	Encoder spec.
MEDDT7364N	E	3-phase, 200V	MDMA202P1*	200V	2.0kW	2000r/min	5-wire 2500 p/r
			MDMA202S1*	200V	2.0kW	2000r/min	7-wire, 17-bit
			MSMA202P1*	200V	2.0kW	3000r/min	5-wire 2500 p/r
			MSMA202S1*	200V	2.0kW	3000r/min	7-wire, 17-bit
			MHMA202P1*	200V	2.0kW	2000r/min	5-wire 2500 p/r
			MHMA202S1*	200V	2.0kW	2000r/min	7-wire, 17-bit
			MFMA252P1*	200V	2.5kW	2000r/min	5-wire 2500 p/r
			MFMA252S1*	200V	2.5kW	2000r/min	7-wire, 17-bit
MFDDTA390N	F	3-phase, 200V	MGMA202P1*	200V	2.0kW	1000r/min	5-wire 2500 p/r
			MGMA202S1*	200V	2.0kW	1000r/min	7-wire, 17-bit
			MDMA302P1*	200V	3.0kW	2000r/min	5-wire 2500 p/r
			MDMA302S1*	200V	3.0kW	2000r/min	7-wire, 17-bit
			MHMA302P1*	200V	3.0kW	2000r/min	5-wire 2500 p/r
			MHMA302S1*	200V	3.0kW	2000r/min	7-wire, 17-bit
			MSMA302P1*	200V	3.0kW	3000r/min	5-wire 2500 p/r
			MSMA302S1*	200V	3.0kW	3000r/min	7-wire, 17-bit
MFDDTB3A2N	F	3-phase, 200V	MGMA302P1*	200V	3.0kW	1000r/min	5-wire 2500 p/r
			MGMA302S1*	200V	3.0kW	1000r/min	7-wire, 17-bit
			MDMA402P1*	200V	4.0kW	2000r/min	5-wire 2500 p/r
			MDMA402S1*	200V	4.0kW	2000r/min	7-wire, 17-bit
			MHMA402P1*	200V	4.0kW	2000r/min	5-wire 2500 p/r
			MHMA402S1*	200V	4.0kW	2000r/min	7-wire, 17-bit
			MSMA402P1*	200V	4.0kW	3000r/min	5-wire 2500 p/r
			MSMA402S1*	200V	4.0kW	3000r/min	7-wire, 17-bit
			MFMA452P1*	200V	4.5kW	2000r/min	5-wire 2500 p/r
			MFMA452S1*	200V	4.5kW	2000r/min	7-wire, 17-bit
			MGMA452P1*	200V	4.5kW	1000r/min	5-wire 2500 p/r
			MGMA452S1*	200V	4.5kW	1000r/min	7-wire, 17-bit
			MDMA502P1*	200V	5.0kW	2000r/min	5-wire 2500 p/r
			MDMA502S1*	200V	5.0kW	2000r/min	7-wire, 17-bit
			MHMA502P1*	200V	5.0kW	2000r/min	5-wire 2500 p/r
			MHMA502S1*	200V	5.0kW	2000r/min	7-wire, 17-bit
			MSMA502P1*	200V	5.0kW	3000r/min	5-wire 2500 p/r
			MSMA502S1*	200V	5.0kW	3000r/min	7-wire, 17-bit

4. Specifications

4-1 General specifications

Basic specifications	Input power supply	100V type	Main circuit		Single-phase 100 to 115V	+10% -15%	50/60Hz
			Control circuit		Single-phase 100 to 115V	+10% -15%	50/60Hz
		200V type	Main circuit	Type A and B	Single-phase 200 to 240V	+10% -15%	50/60Hz
				Type C and D	Single-phase/3- phase 200 to 240V	+10% -15%	50/60Hz
				Type E and F	3 phase 200 to 230V	+10% -15%	50/60Hz
			Control circuit	Type A to D	Single phase 200 to 240V	+10% -15%	50/60Hz
				Type E and F	Single phase 200 to 230V	+10% -15%	50/60Hz
				Temperature		Operating: 0 to 55degrees C Storage: -20 to 80degrees C	
	Humidity		Operating and storage: 90%RH or less (free from dew)				
	Altitude		1000m or lower				
	Vibration		5.88m/s ² or less, 10 to 60Hz (no continuous run at resonance point)				
	Control method			IGBT PWM control, sinusoidal wave drive			
	Encoder feedback			17Bit(131072 resolutions) 7-wire serial absolute encoder 2500p/r(10000 resolutions) 5-wire serial incremental encoder			
	External scale feedback			AT500 or ST771 series by Mitutoyo Corporation.			
	Motion command input			Motion command input via network enabled			
	Control signal		Input	8 inputs 1) CCW over-travel, 2) CW over-travel, 3) HOME, 4) Emergency stop, 5)External Servo-ON/ External input4, 6) External input 1, 7) External input 2, 8) External input 3			
			Output	4 outputs 1) Servo alarm, 2) External brake release signal, 3) External output 1, 4) External output 2			
	Pulse signal		Out put	3 outputs Output Encoder or External Scale A/B/Z-phase pulse in differential mode			
	Communication		RS232	For the personal computer or the console			
	Front panel			1) Rotary switch (Setup of node address(MAC-ID)) 2) 7-segment LED (2-digit) 3) Network status LED (COM , LINK) 4) Analog monitor pin (Velocity monitor and Torque monitor)			
	Regeneration			Type A and B: No built-in regenerative resistor (External resistor only) Type C to F: Built-in regenerative resistor (External resistor connectable)			
	Dynamic brake			Built in			
	Control mode			1) Position control, 2) Full-closed control			

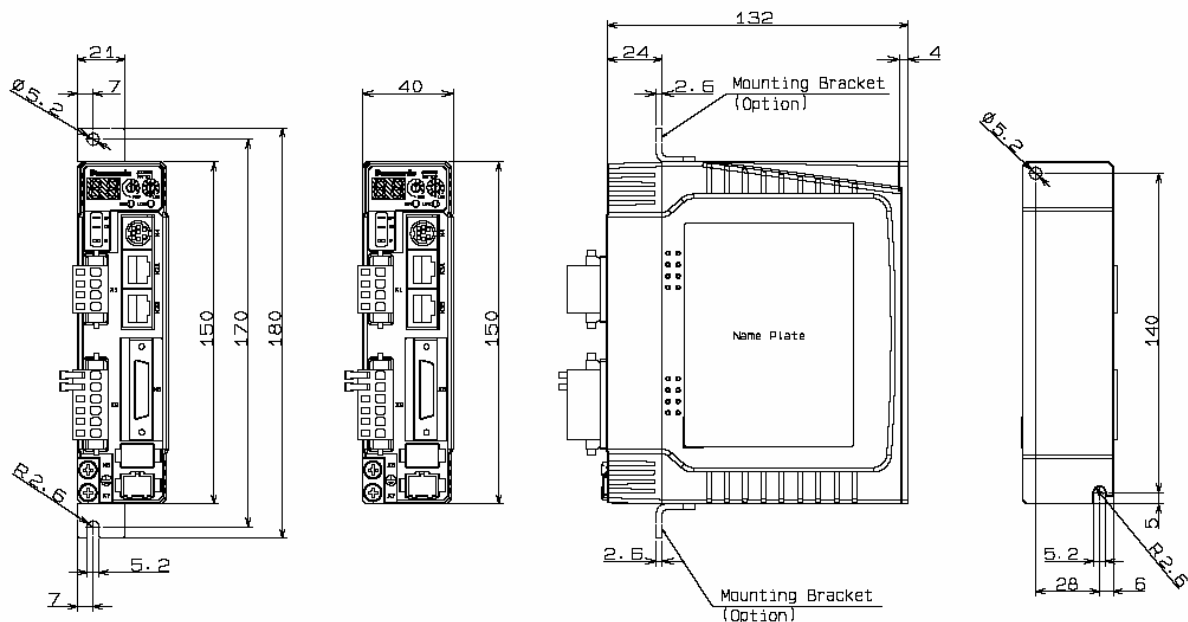
Function	Smoothing filter		Select the primary delay filter or the FIR filter for position command
	Setup range of Multiple Ratio for External scale		Ratio between the encoder pulse (numerator) and the external scale pulse (denominator) can be set within the setting range : $(1-10000 \cdot 2^{(0-17)})/(1-10000)$
	Instantaneous velocity observer	Position control with 17bit encoder	Enabled
		Excluding the above	Disabled
	Vibration suppression control		Enabled
	Auto-gain tuning	Real-time	Drive estimates the load inertia at actual running condition in real time, and the sets up the gain automatically, corresponding to the stiffness setup.
		Normal mode	Drive estimates the load inertia by driving the machine with the internal action command of the drive and sets the gain corresponding to the stiffness setup.
	Masking function of unnecessary input		The Following control input signals can be masked 1) Over-travel input, 2) Emergency stop, 3) External Servo-ON
	Multiple Ratio for Encoder feedback pulse output		Max. Output pulses a rotation : Encoder Resolution.
	Protective function	Hard error	Over-voltage, Under-voltage, Over-load, Over-heat, Over-current, and Encoder error etc.
		Soft error	Continuous communication error, Communication time out, Excess position deviation, Motion Command error, EEPROM error, etc.
	Trace back function of alarm data		Trace up to 14 latest data including the present enable

4-2 Specifications by model

See the appendix placed at the end of this document.

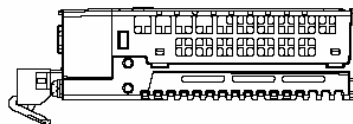
5. Dimensions

Dimensions: Type A



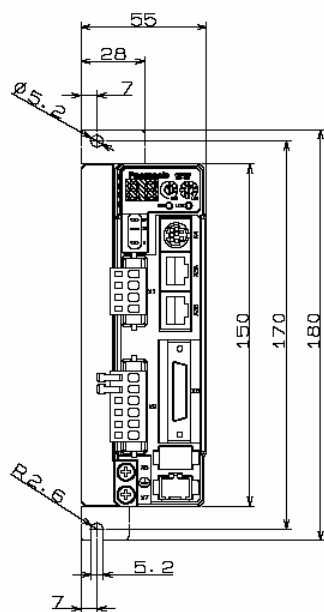
Rack-Mounting Type
[Option: Mounted On The Front]

Standard: Mounted On The Back

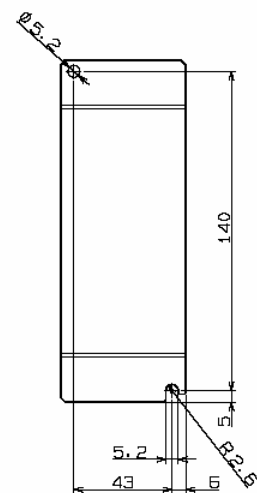
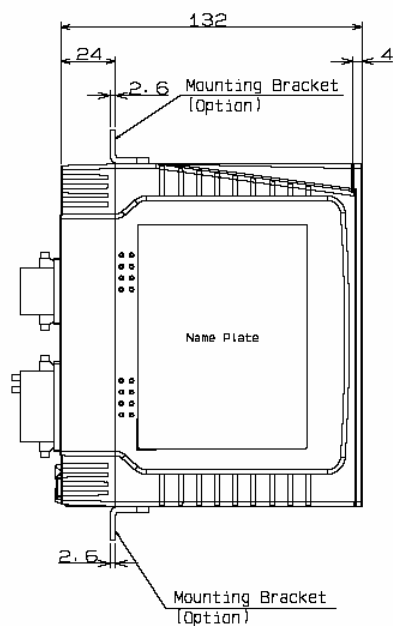
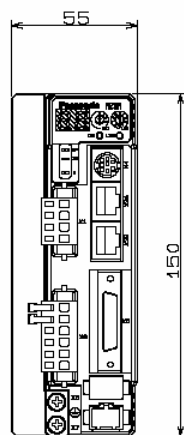


Unit : mm

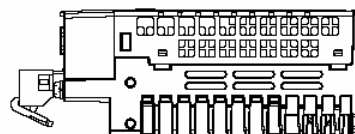
Dimensions: Type B



Rack-Mounting Type
(Option: Mounted On The Front)

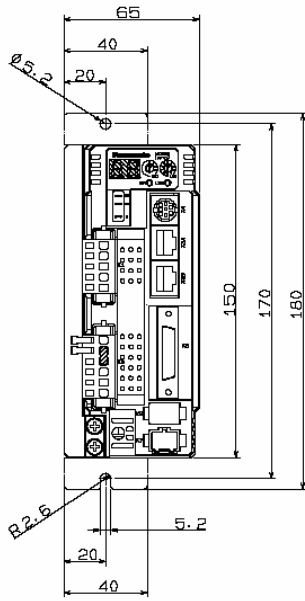


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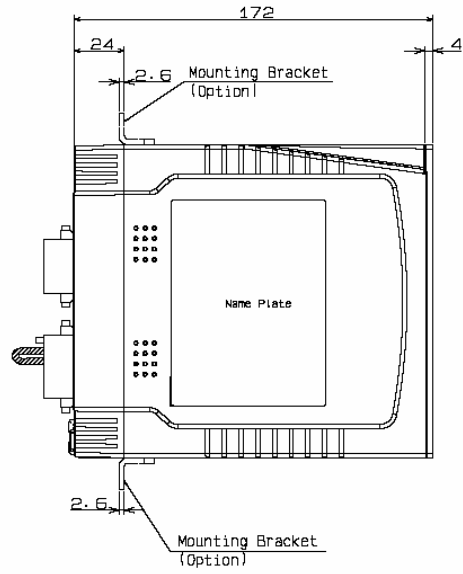
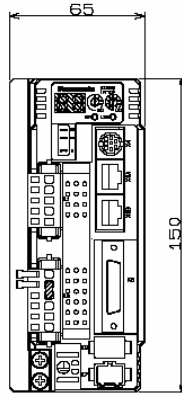


Unit : mm

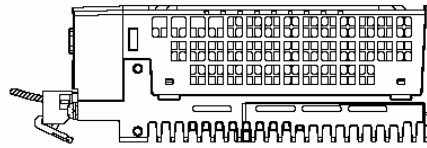
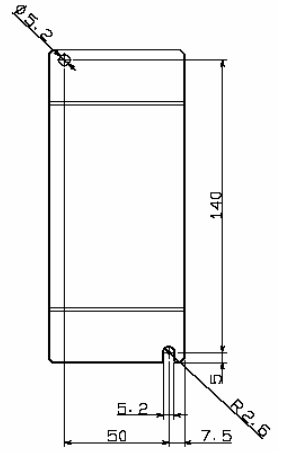
Dimensions: Type C



Rack-Mounting Type
(Option: Mounted On The Front)

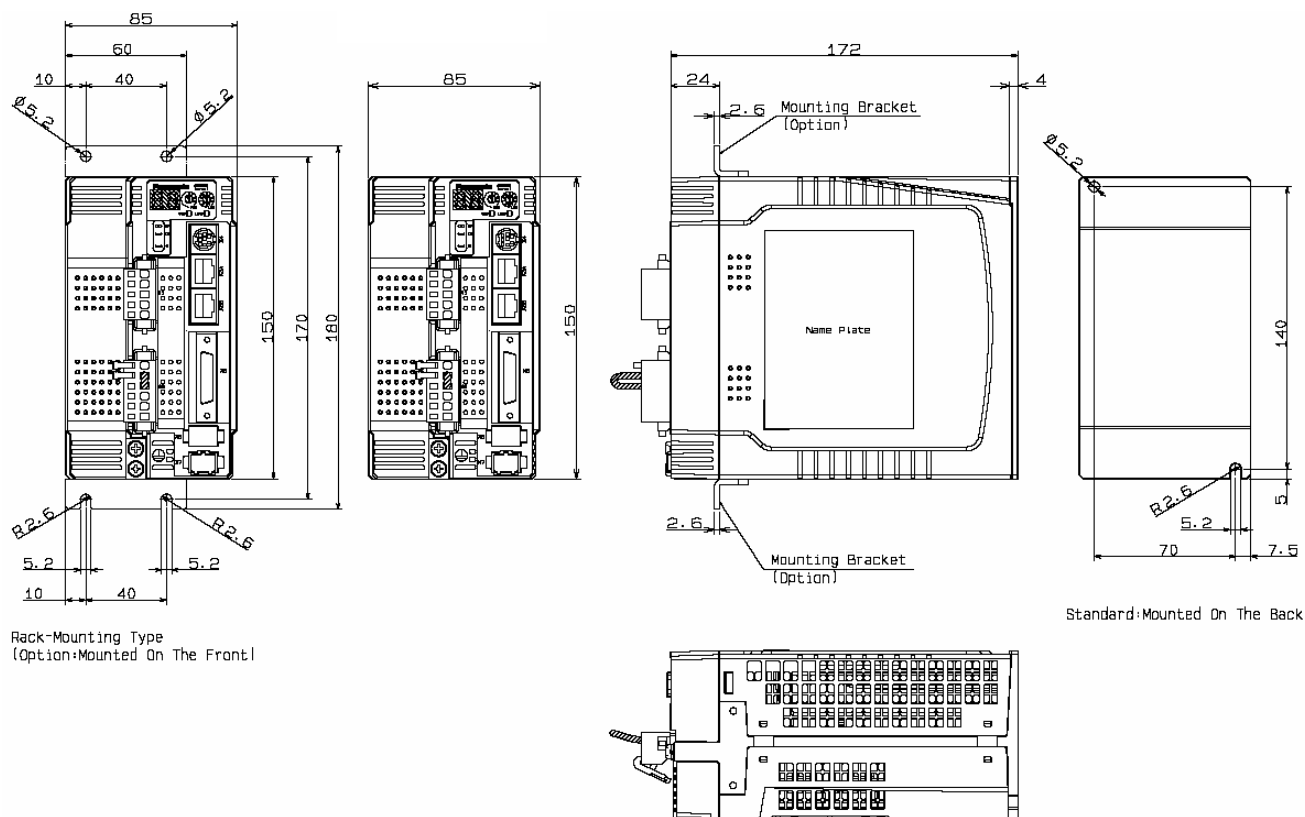


Standard: Mounted On The Back



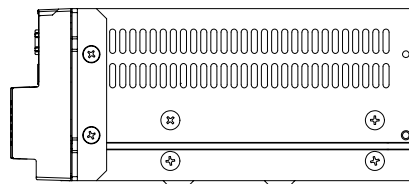
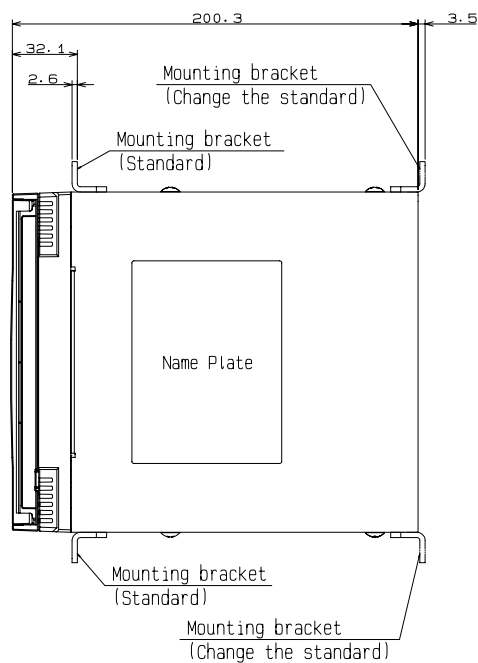
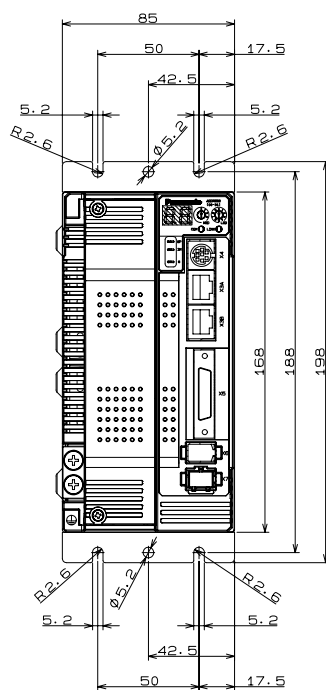
Unit : mm

Dimensions: Type D



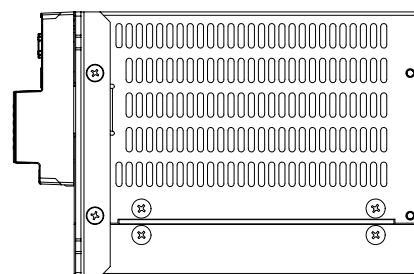
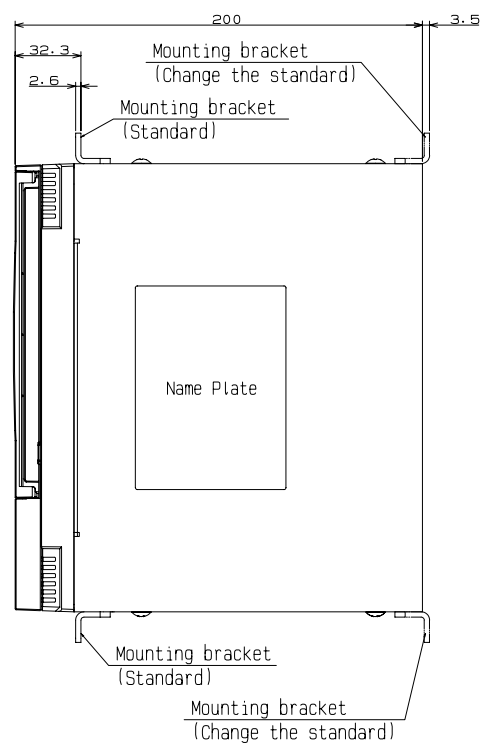
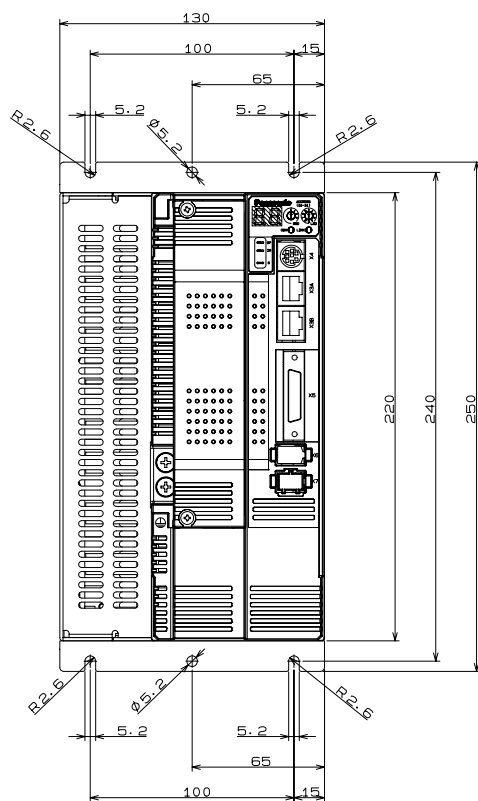
Unit :mm

Dimensions: Type E



Unit : mm

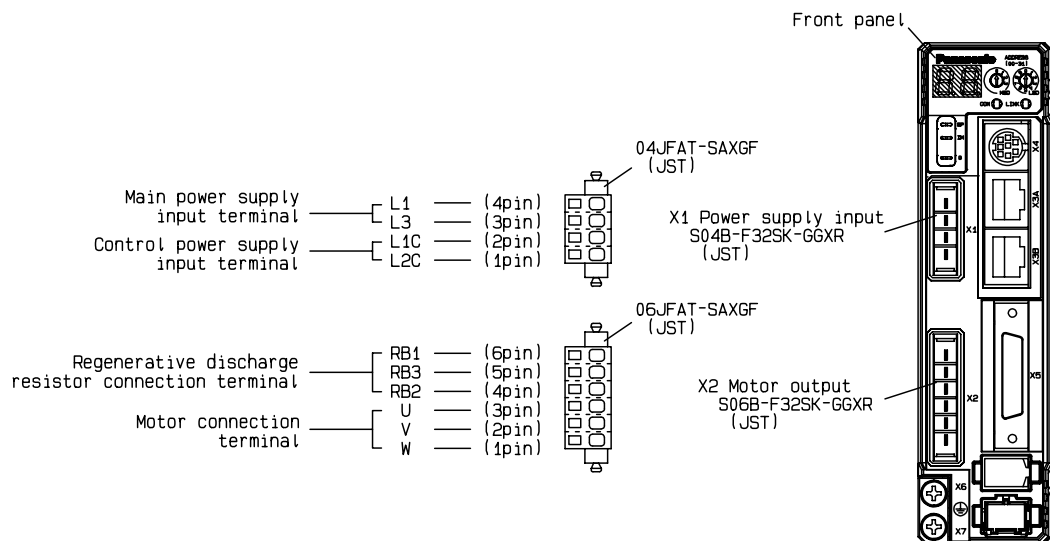
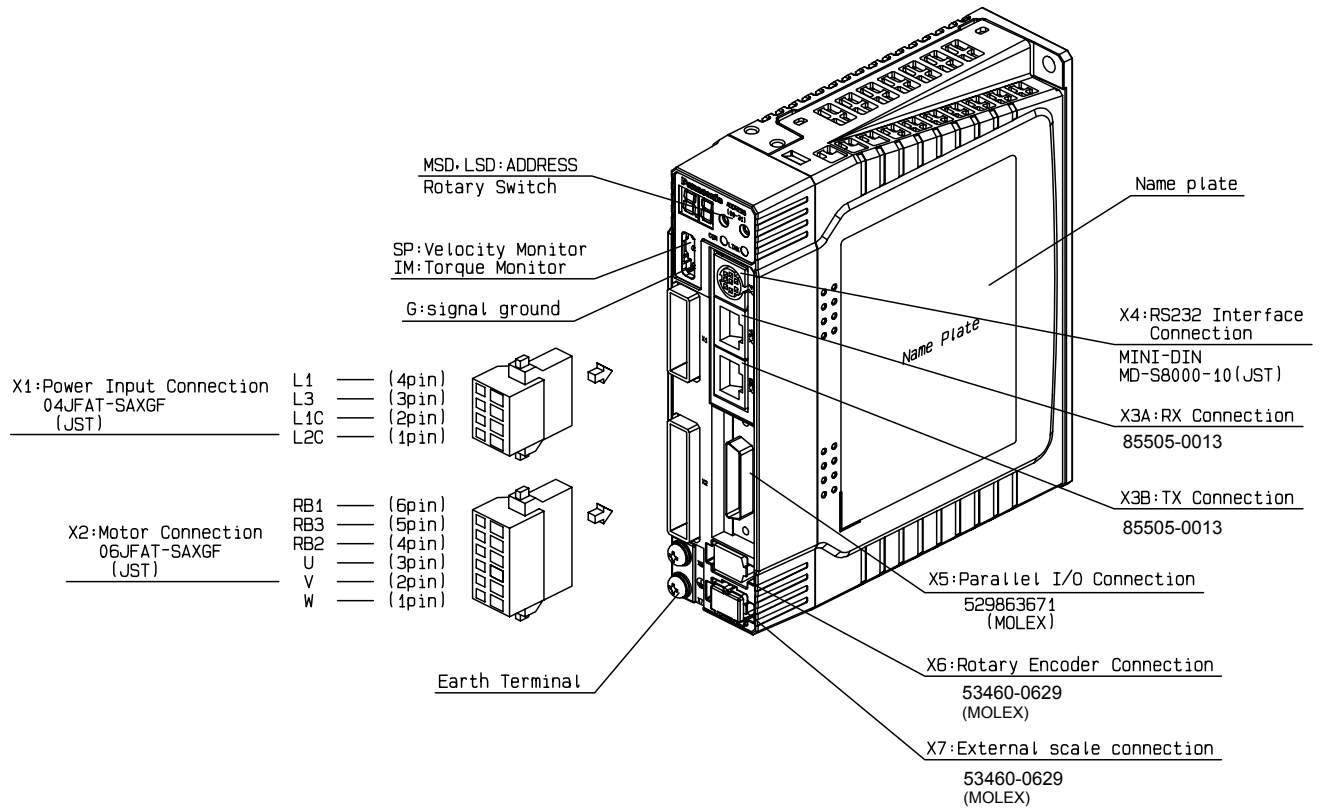
Dimensions: Type F



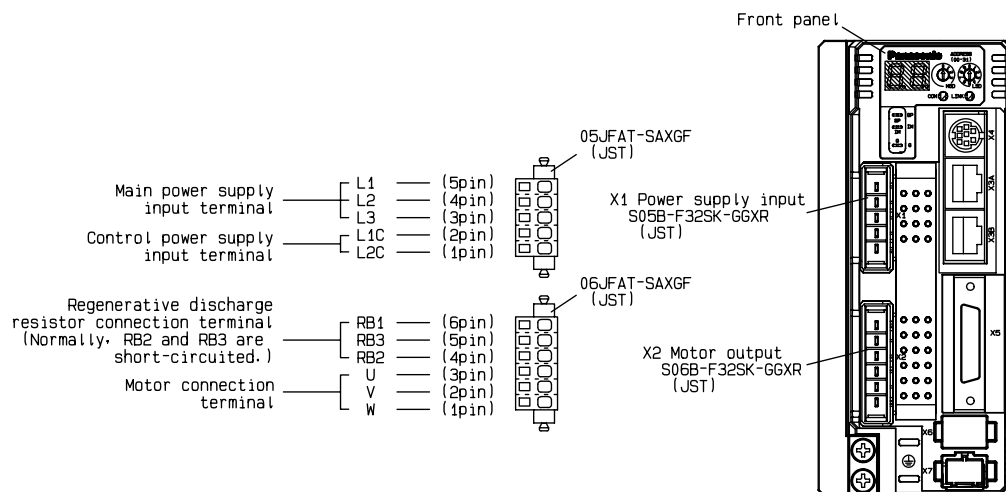
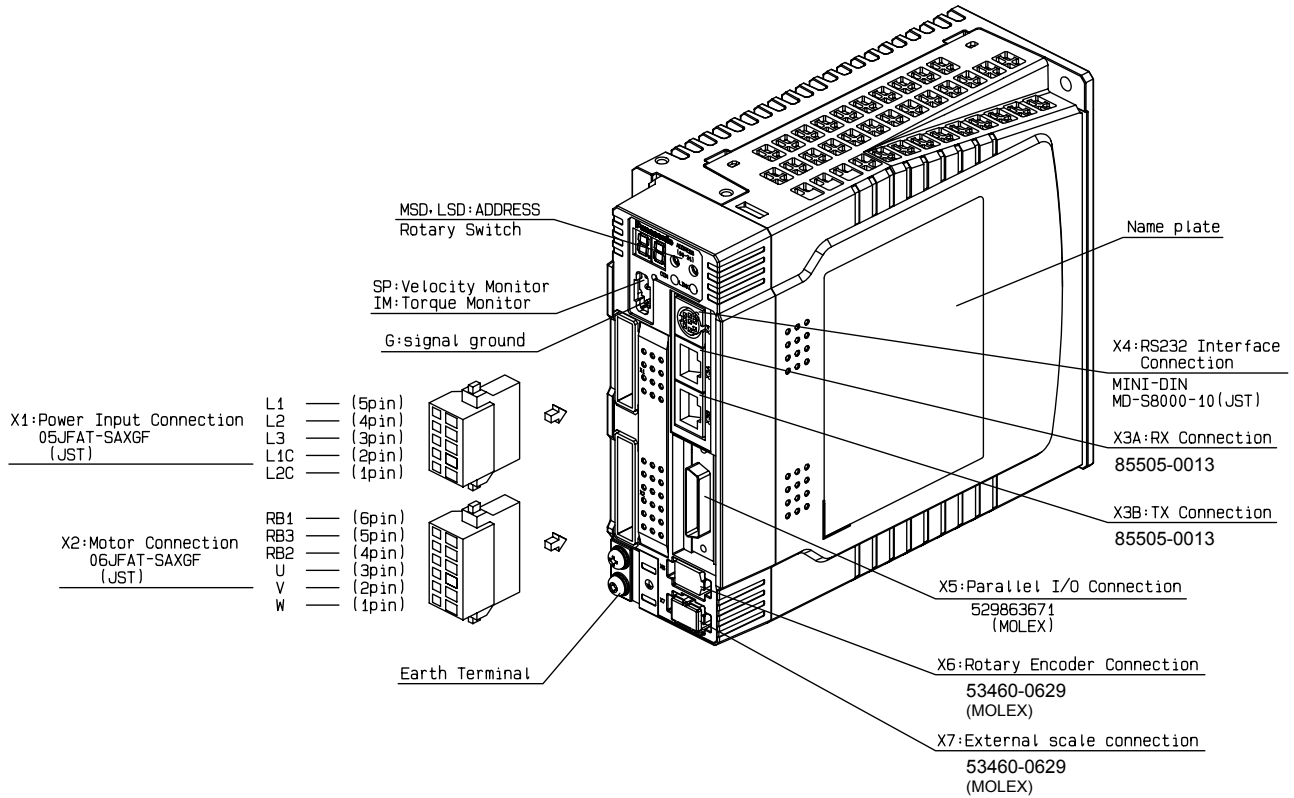
Unit : mm

6. Appearance

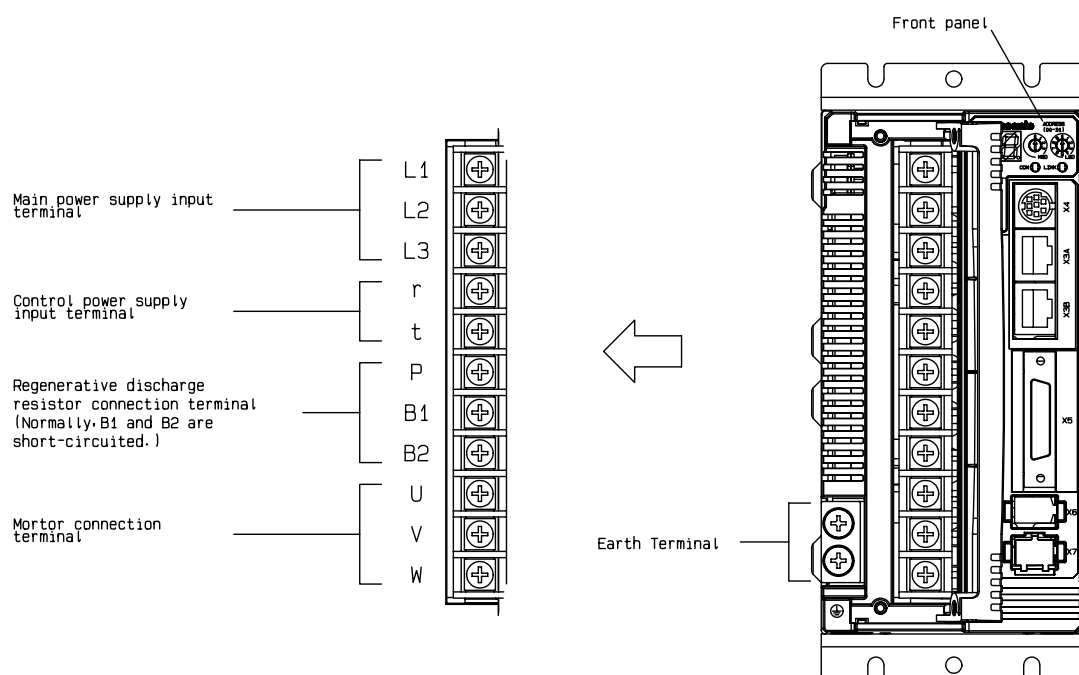
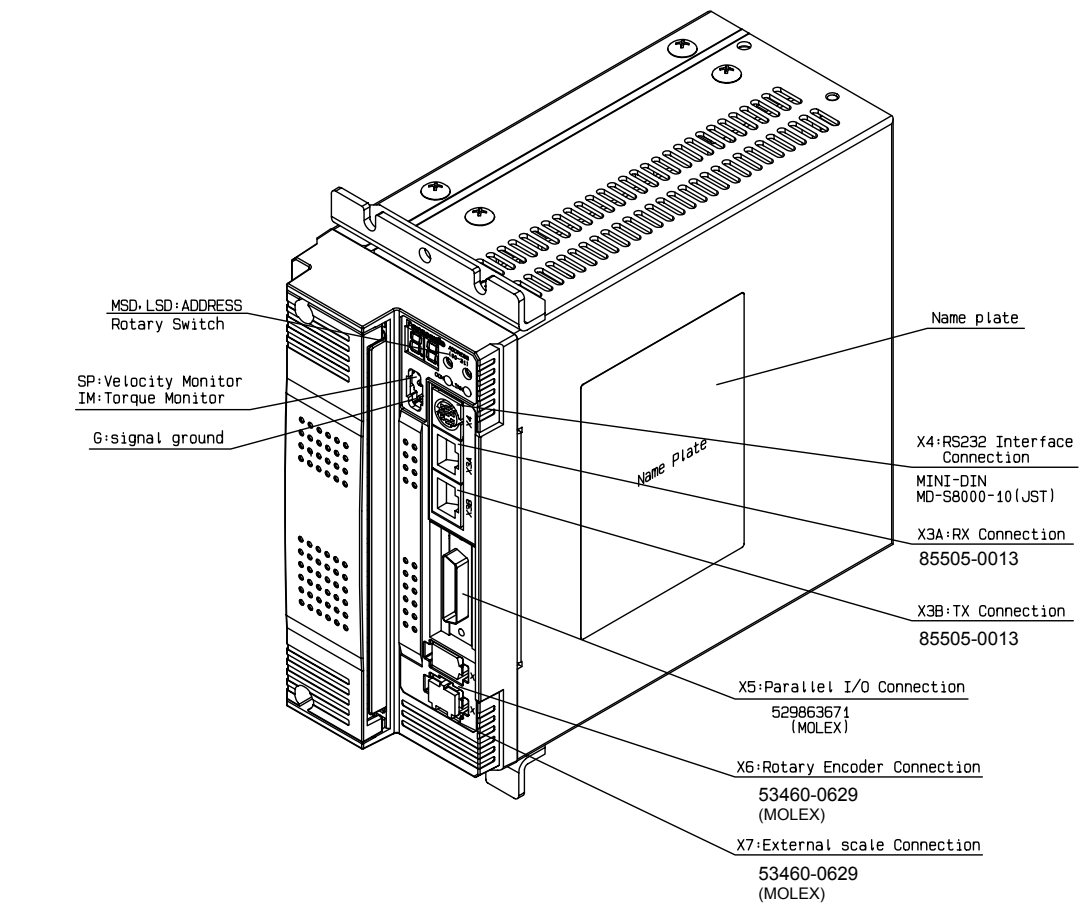
Type A and B



Type C and D



Type E and F



7. Configuration of connectors

7-1 Power connectors X1 , X2 or terminal block

X1 for Type A and B : JST 04JFATSAXGF


Terminal block for Type E and F : M5

for Type C and D : JST 05JFATSAXZF

Earth Terminal for Type A and D : M4

X2 for Type A to D : JST 06JFATSAXGF

Type E and F : M5

Symbol						Name	Description	
Connector					Terminal block			
	Type A,B		Type C,D		Type E,F			
X1	L1	4pin	L1	5pin	L1	Main power supply Input	100V type	Enter single phase 100 to 115V $+10\%$, 50/60Hz between L1 and L3. -15%
	—	—	L2	4pin	L2		200V type	For Type A/B, enter single phase, 200 to 240V $+10\%$, 50/60Hz, -15% For Type C/D, enter single-phase/3-phase, $+10\%$,50/60Hz 200 to 240V -15%
	L3	3pin	L3	3pin	L3			For Type E/F, enter 3-phase, 200 to 230V $+10\%$, 50/60Hz -15% Use L1 and L3 terminals for single phase input
	L1C	2pin	L1C	2pin	r	Control power supply input	100V type	Enter single phase, 100 to 115V $+10\%$, 50/60Hz -15%
	L2C	1pin	L2C	1pin	t		200V type	Enter single phase, 200 to 240V $+10\%$, 50/60Hz -15%
X2	RB1	6pin	RB1	6pin	P	Regenerative discharge resistor connection	When not using external regenerative resistor. [Pr.6C=0 or 3] Type A,B: Do not connect RB1, RB2, and RB3 terminal. Type C to F: Connects RB2(B2) and RB3(B1) terminal for using internal regenerative resistor. When [Err.18], use external regenerative resistor. When using external regenerative resistor. [Pr.6C=1 or 2] Type A or B: Connect external regenerative resistor between RB1 and RB2 terminal. Type C to F: Remove the connection line of RB2(B2) and RB3(B1) terminal. And connect external regenerative resistor between RB1(P) and RB2(B2) terminal.	
	RB3	5pin	RB3	5pin	B1			
	RB2	4pin	RB2	4pin	B2			
	U	3pin	U	3pin	U	Motor connection	Connect each phase of the motor winding. U: U phase V: V phase W: W phase	
	V	2pin	V	2pin	V			
	W	1pin	W	1pin	W			
						Earth	Connect the motor's earth wire for grounding.	

7-2 Encoder connector X6 (Molex 53460-0629 or equivalent)

Name	Pin No.	Symbol
Power supply output for encoder	1	E5V
	2	E0V (Note 1)
Battery output for multi-tune data storage	3	BTP-O
	4	BTN-O
Encoder signal I/O (Serial signal)	5	PS
	6	PS
Frame ground	Shell	FG

Note 1) In the servo drive, the E0V is connected to the signal ground of connector X5 .

7-3 Interface connector **X5** (Molex 529863671 or equivalent)**Input signal and its function**

Name	symbol	Pin No.	Description	Type.
Power supply for control signal	I-COM	1	<ul style="list-style-type: none"> Connected to the [+] terminal of an external DC power supply (12 to 24 V) Use a 12 V ($\pm 5\%$) to 24 V ($\pm 5\%$) power supply. 	-
CW over travel	CWL	20	<ul style="list-style-type: none"> Input for inhibition of CW over-travel (CWL). Make a connection so as to make the connection to the external DC power supply (reverse polarity to I-COM) open when the moving part of the machine exceeds the permissible range to CW direction. This input is reflected as status of Response on the network. CWL input will be invalidated by setting Pr.04 (over-travel input inhibit) to 1. Default of Pr.04 is 1 (invalid). Note that the setup of Pr.04 has no affect to the response. You can select the action when CWL input is valid by the setup of Pr.66 (Error response at over travel limit). Default is set as a sudden stop with dynamic brake action (Pr.66=0). Direction which stops with the limit is motor's rotational direction and will not be changed by the setup Pr.43 (Direction of motion). 	i-1
CCW over travel	CCWL	19	<ul style="list-style-type: none"> Input for inhibition of CCW over-travel (CCWL). Make a connection so as to make the connection to the external DC power supply (reverse polarity to I-COM) open when the moving part of the machine exceeds the permissible range to CCW direction. This input is reflected as status of Response on the network. CWL input will be invalidated by setting Pr.04 (over-travel input inhibit) to 1. Default of Pr.04 is 1 (invalid). Note that the setup of Pr.04 has no affect to the response. You can select the action when CCWL input is valid by the setup of Pr.66 (Error response at over travel limit). Default is set as a sudden stop action with dynamic brake (Pr.66=0). Direction which stops with the limit is motor's rotational direction and will not be changed by the setup Pr.43 (Direction of motion). 	i-1
Emergency stop	EMG-STP	2	<ul style="list-style-type: none"> This input is reflected as status of Response on the network. You can use this as an emergency stop input by setting up Pr.41 (Emergency stop enable) to 1 (valid). Default is valid (Pr.41=1). Note that the setup Pr.41 has no affect to the response. The drive will trip due to Err.87 (Emergency stop inputted) by opening this. 	i-1
HOME input	HOME	21	<ul style="list-style-type: none"> Enter a sensor signal when HOME is used for homing operation. Set up the connecting logic with the external DC power supply (reverse polarity to I-COM) by Pr.42 (Home input logic). Default is logic that becomes active while closing. (Pr.42=1). This input is reflected as status of Response on the network. 	i-1

(Note) Command : Data block to be transmitted from the Host to the servo drive via network

Response : Data block to be transmitted from the servo drive to the Host via network

Name	Symbol	Pin No.	Description	Type.
External Servo-ON/ External input 4	EX-SON /EX-IN4	23	<ul style="list-style-type: none"> • This input is reflected as status of Response on the network. • You can use this as an external Servo-ON input (EX-SON) by setting up Pr.40 (External servo-on enable) to 1 (valid). You can use this as a general input 4 (EX-IN4) by setting up 0. • Current to the motor will be shut off by opening this to make Servo-OFF status while the external Servo-ON input is valid. • The motor will be energized and turn to Servo-ON while this is closed and Byte2, bit7 of the command (drive to host) is 1. Here, returns 1 to Byte2, bit7 of the response (drive to host). <p><Attention ></p> <ol style="list-style-type: none"> 1. External Servo-ON input will be validated approx. 2 sec after the power-up. 2. Do not run/stop the motor with Servo-ON/OFF. 3. Allow 100ms or more before entering an action command after shifting to Servo-ON. 4. You can select the dynamic brake and deviation counter clear with Pr. 69 (Sequence at Servo-OFF). 5. External Servo-On input will be automatically enabled during normal mode auto-gain tuning, frequency characteristics measuring function and JOG running regardless of the setup of Pr. 40, and cannot be used as a general input 4. 	i-1
External input 1	EX-IN1	5	• This input is reflected as status of Response on the network.	i-1
External input 2	EX-IN2	4	• This input is reflected as status of Response on the network.	i-1
External input 3	EX-IN3	3	• This input is reflected as status of Response on the network.	i-1

(Note) Command : Data block to be transmitted from the Host to the servo drive via network

Response : Data block to be transmitted from the servo drive to the Host via network

Power supply input for encoder backup

Name	Symbol	Pin No.	Description	Type.
Battery input for absolute encoder	BTP-I	34	<ul style="list-style-type: none"> • Connect the battery for absolute encoder. (Recommended battery: Toshiba Battery, ER6V 3.6V) • Supply the power for storage of multi-turn data to absolute encoder via BTP-0 (Pin-3) and BTN-0 (Pin-4) of connector (X6) for encoder connection. • Select either to connect the battery directly to the encoder cable, or connect the battery by using this connector. 	—
	BTN-I	33		

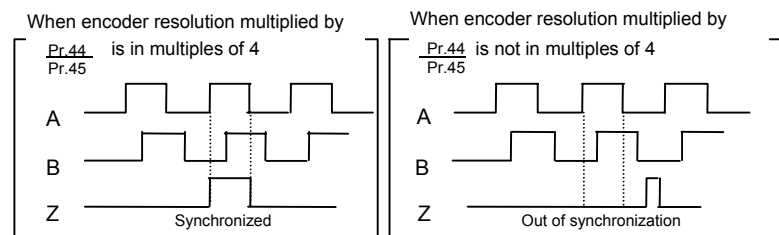
Output signal and its function

Name	Symbol	Pin No.	Description	Type.
Servo-alarm	ALM+ ALM-	15 16	<ul style="list-style-type: none"> Output signal which shows an alarm occurrence The transistor turns ON at normal status and turns OFF when an alarm occurs. 	o-1
Brake release	BRK-OFF+ BRK-OFF-	36 35	<ul style="list-style-type: none"> Feeds out a timing signal to activate an electro-magnetic brake of the motor. Turns on the output transistor at a release timing of an electro-magnetic brake. You can set up the output timing of this signal with Pr.6A (Mechanical brake delay at motor standstill) and Pr.6B (Mechanical brake delay at motor in motion) . 	
External output 1	EX-OUT1+ EX-OUT1-	29 30	This output is operated with Command via the network.	
External output 2	EX-OUT2+ EX-OUT2-	31 32	This output is operated with Command via the network.	

Output signal (pulse train) and its function

Name	Symbol	Connector pin No.	Description	Type.
A-phase output	OA+	11	- Division-processed encoder signal or external scale signal (A/B/Z-phase) is output in differential mode. (RS422)	Do-1
	OA-	12	- Pr.44 (numerator of output pulse ratio) and Pr.45 (denominator of output pulse ratio) can be used to set the division ratio.	
B-phase output	OB+	13	- Pr.46 (pulse output logic inversion) can be used to select the logic relation of phase B with regard to the pulse of phase A, and its output source.	
	OB-	14	- When using an external scale signal as its output source, Pr.47 (Z-phase of external scale setup) can be used to set the interval periods of outputs for phase Z pulse.	
Z-phase output	OZ+	9	- Ground of line drive of the output circuit is connected to signal ground (GND); not insulated.	
	OZ-	10	- The maximum output frequency is 4 Mpps (after being multiplied by 4).	

- Phase Z is output in synchronization with phase A when encoder resolution multiplied by $\frac{\text{Pr.44}}{\text{Pr.45}}$ is in multiples of 4, but otherwise, the width of phase Z is narrower than that of phase A as it is output based on encoder resolution, and does not synchronize with phase A.

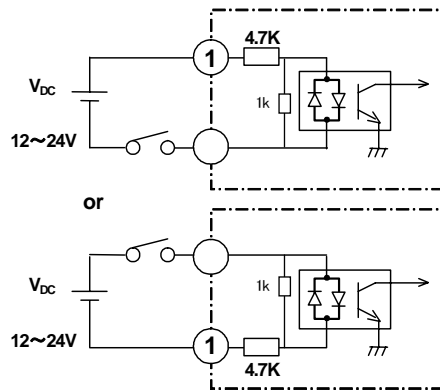
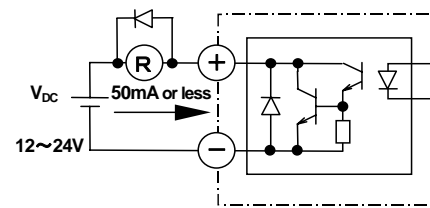


Note) In the case of 5-wire 2500P/r incremental encoder, the pulse position may be displaced until the first phase Z is output. When using phase Z as a control signal, use the second signal or others available thereafter.

Others

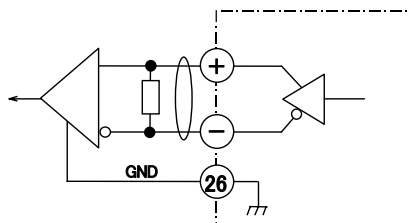
Name	Symbol	Pin No.	Description	Type.
Frame ground	FG	18	<ul style="list-style-type: none"> This is connected to the earth terminal in the servo drive. 	—
Signal ground	GND	26	<ul style="list-style-type: none"> Signal ground This is insulated from the control signal power supply (for I-COM) inside of the server drive. 	—

Type of I/O signal

i-1o-1

+: Pin-15 and 36, -: Pin-16 and 35

Note) Install a diode in parallel with a relay to the same direction of above fig. when you directly drive a relay.

Do - 1

+: Pins 11, 13 and 9 -: Pins 12, 14 and 10

7-4 RS232 communication connector X4 (JST MD-S8000-10 or equivalent)

You can make a RS232 communication with a personal computer or the handy console, and make operations such as setup/change of parameters, monitoring of control status, reference of error status and history and saving/loading of parameters and so on.

This drive supports the setup support software “PANATERM”, and its communication cable as options.

For the operation of the “PANATERM”, refer to its instruction manual.

·PANATERM(WIN98/NT/2000/XP)	DV0P4460
·Connection cable to PC (DOS/V)	DV0P1960
·Console	DV0P4420

7-5 Network connectors X3A X3B (Molex 85505-0013 or equivalent)

RJ45 Connector for network interface

[X3A] RX connector

Name	Pin No.		Description
Unused	1	-	Connect to Pin-1 of TX connector of node at transmitter side.
Unused	2	-	Connect to Pin-2 of TX connector of node at transmitter side.
Network input +	3	RX+	Connect to Pin-3 of TX connector of node at transmitter side.
Unused	4	-	Connect to Pin-4 of TX connector of node at transmitter side.
Unused	5	-	Connect to Pin-5 of TX connector of node at transmitter side.
Network input -	6	RX-	Connect to Pin-6 of TX connector of node at transmitter side.
Unused	7	-	Connect to Pin-7 of TX connector of node at transmitter side.
Unused	8	-	Connect to Pin-8 of TX connector of node at transmitter side.
Frame ground	Shell	FG	Connect to the shield of the cable.

[X3B] TX connector

Name	Pin No.		Description
Unused	1	-	Connect to Pin-1 of RX connector of node at reception side.
Unused	2	-	Connect to Pin-2 of RX connector of node at reception side.
Network input +	3	TX+	Connect to Pin-3 of RX connector of node at reception side.
Unused	4	-	Connect to Pin-4 of RX connector of node at reception side.
Unused	5	-	Connect to Pin-5 of RX connector of node at reception side.
Network input -	6	TX-	Connect to Pin-6 of RX connector of node at reception side.
Unused	7	-	Connect to Pin-7 of RX connector of node at reception side.
Unused	8	-	Connect to Pin-8 of RX connector of node at reception side.
Frame ground	Shell	FG	Connect to the shield of the cable.

* Use the shielded twisted pair (STP) cable of category 5e or better specified in TIA/EIA-568 without fail. Category 6 or better is recommended.

(Note) Use the cable with 8-wire (4 pair), “straight” connection



7-6 External scale connector X7 (Molex 53460-0629 or equivalent)

Name	Pin No.	Symbol
External scale power output	1	EX5V
	2	EX0V (NOTE1)
Unused	3	Do not connect
Unused	4	Do not connect
External scale signal I/O (serial signal)	5	EXPS
	6	$\overline{\text{EXPS}}$
Frame ground	Shell	FG

Note) In the servo drive, the EX0V is connected with the signal ground linked to the connector X5.

8. Wiring

8-1 Cable material and max. length

Item	Symbol	Max. length	Cable specifications
Main power supply	L1 , L2 , L3	–	Per attached specifications by model
Control power supply	L1C , L2C / r , t	–	HVSF 0.75mm ²
Motor connection	U , V , W , 	20m	Per attached specifications by model (Note 1)
Earth		1m	Per attached specifications by model
Encoder connection	X6	20m	Bundle shield twisted pair Conductor 0.18mm ² or larger
I/O connection	X5	3m	
Network connection	X3A/X3B	60m (Note 2)	Shield twisted pair (STP) cable of category 5e or better

(Note 1) When using Tyco Electronics AMP connector, 172167-1 and 172159-1 for motor junction connector, max cable size will be 1.3mm²

(Note 2) Refer to section 8-3-(4) Wiring to connector, X3A X3B .

8-2 I/O, Encoder and External scale connector

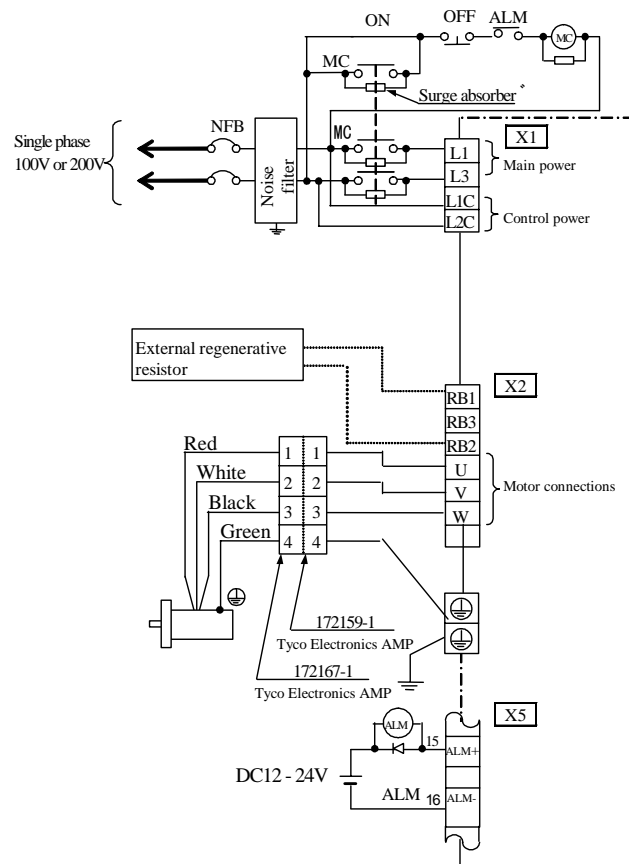
Symbol	Item	Part No.	Manufacture
X5	Solder plug (Soldering type)	54306-3611	Molex
	Shell kit	54331-0361	
X6, X7	Connector	55100-0670	

Use the above or equivalent.

8-3 Cautions on wiring

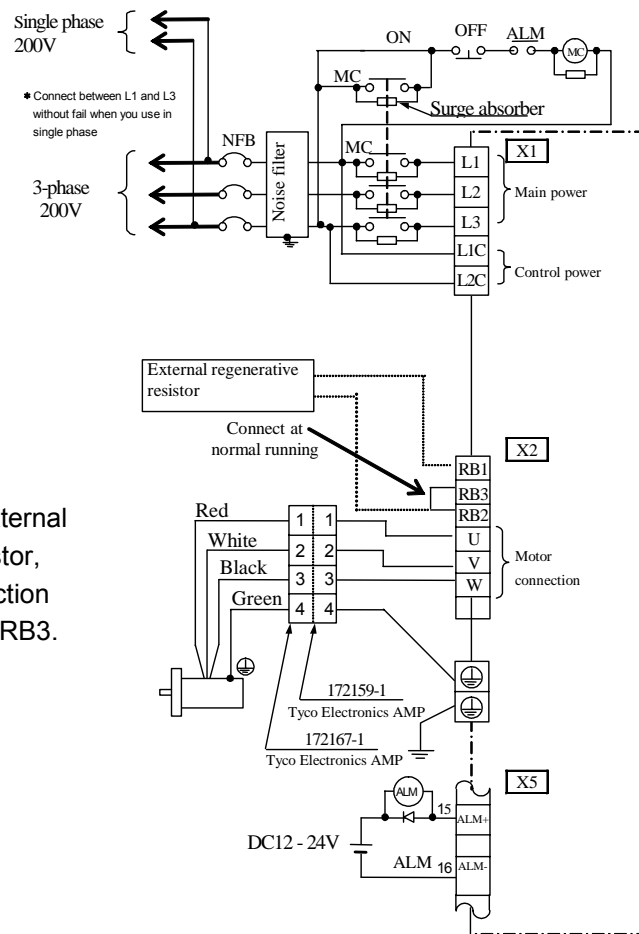
(1) Wiring to power connector or terminal block

Type A and B



Type C and D

Note:
When using the external
Regenerative resistor,
remove the connection
between RB2 and RB3.



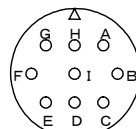
* To use with servo motor other than MAMA082*** at Type D
to the table below.

Motor portion



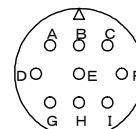
JL04V-2E20-4PE-B
JL04HV-2E22-22PE-B

Pin No.	Application
A	U-phase
B	V-phase
C	W-phase
D	Earth



JL04V-2E20-18PE-B

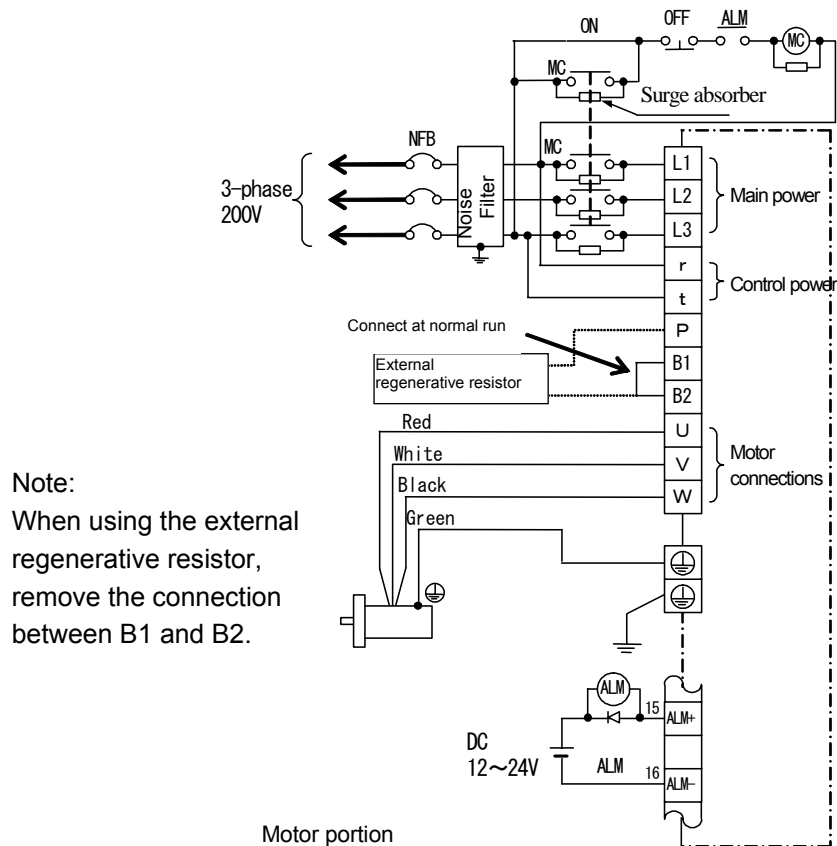
Pin No.	Application
G	Brake
H	Brake
A	NC
F	U-phase
I	V-phase
B	W-phase
E	Earth
D	Earth
C	NC



JL04V-2E24-11PE-B

Pin No.	Application
A	Brake
B	Brake
C	NC
D	U-phase
E	V-phase
F	W-phase
G	Earth
H	Earth
I	NC

Type E and D



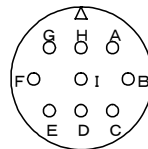
Note:
When using the external regenerative resistor, remove the connection between B1 and B2.

Motor portion



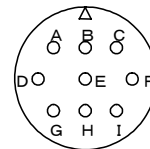
JL04V-2E20-4PE-B
JL04HV-2E22-22PE-B

Pin No.	Application
A	U-phase
B	V-phase
C	W-phase
D	Earth



JL04V-2E20-18PE-B

Pin No.	Application
G	Brake
H	Brake
A	NC
F	NC
I	V-phase
B	W-phase
E	Earth
D	Earth
C	NC



JL04V-2E24-11PE-B

Pin No.	Application
A	Brake
B	Brake
C	NC
D	U-phase
E	V-phase
F	W-phase
G	Earth
H	Earth
I	NC

- 1) When you use the drive of type C and D with single phase input, connect to L1 and L3 of the main power input terminal. Do not connect anything to L2 terminal.
- 2) Use the insulated crimp terminal for the connection to the terminal block.
- 3) Cover of the terminal block is fastened with screws. Take off these screws to open the cover for connection.
- 4) When you do not use an external regenerative resistor, short between RB2(B2)and RB3(B1)terminal.
It is required to install an external regenerative resistor when the drive trips due to regenerative resistor overload (No.18).
Connect the external regenerative resistor between RB1 (P) and RB2 (B2) terminal after taking off the short bar between RB2 (B2) and RB3 (B1).
Since type A and B drive is not equipped with built-in regenerative resistor, Shorting between RB2 and RB3 is not required, however connect the external regenerative resistor when the drive trip due to the same error as the above.
Set up 1 or 2 to Pr.6C(Selection of external regenerative resistor).
- 5) Apply the voltage to the drive as specified in the name plate.
- 6) Do not make reversed connection of power input terminals(L1, L2, L3) and motor output terminals(U, V, W).
- 7) Do not ground fault motor output terminals (U, V, W)or short them each other.
- 8) Never touch power connectors, X1 and X 2 since high voltage is applied to them. Risk of electric shocks.
- 9) When the max current of circuit breaker for 750W or larger model is protected by 20A, max. capacity to be delivered
to the circuit will be 50Arms 240V. Do not make the load get larger than this.
- 10) You cannot change the rotational direction of the servo motor by switching the 3 phases like an induction motor. Match up the output terminals (U, V, W) of the servo drive and color of the motor cables (pin No. in case of a cannon plug).
- 11) Connect the earth terminal of the servo drive and that of the motor securely, and ground them together with the earth terminal of the noise filter. Ground the machine itself. Grounding to be with grounding resistance of 100[ohm] or less. Use the insulated crimp terminals for connection.
- 12) Insert a surge absorbing circuit between contacts of electro-magnetic contactor and relays, or to coil or brake winding of the motor with brake for noise prevention.
- 13) Install a non-fuse breaker to shut off the power externally in emergency case. Use a ground-fault breaker with a harmonic measure.
- 14) Install a noise filter to reduce terminal noise voltage.
- 15) Power supply for the motor brake to be prepared by customer.
- 16) Make the power supply to apply voltage only after the wiring is finished.

◁ External regenerative resistor ▷

The Following resistors are recommended for the external regenerative resistor

Type	Input power voltage	
	Single phase 100V	Single phase 200V / 3-phase 200V
A	DV0P4280	DV0P4281
B	DV0P4283	DV0P4283
C	DV0P4282	DV0P4283
D	-	DV0P4284
E		DV0P4285 x 2 in parallel
F		

Part No.	Manufac- turer's Model No.	Specifications					Built-in thermostat	Built-in thermal fuse
		Resistance [ohm]	Rated power[W]					
			Free air	With fan				
				1m/s	2m/s	3m/s		
DV0P4280	RF70M	50	10	25	35	45	140±5degrees C	182±2degrees C
DV0P4281	RF70M	100	10	25	35	45	B-contact	
DV0P4282	RF180B	25	17	50	60	75	Open-Close(resistance load)	
DV0P4283	RF180B	50	17	50	60	75	4.0A 125VAC 10,000 times	
DV0P4284	RF240	30	40	100	120	150	2.5A 250VAC 10,000 times	
DV0P4285	RH450F	20	52	130	160	200		

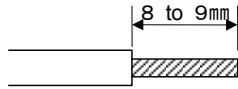
Manufacturer: Iwaki Musen Kenkyusho

<Wiring method to terminal block>

Make the wiring to power connector, **X1** and **X2** in the following procedures.

Wiring method

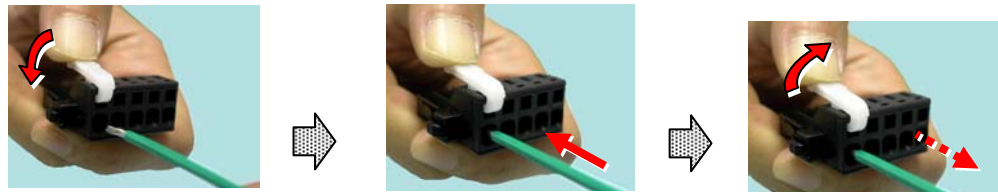
1. Peel off the insulation cover of the cable.



2. Insert the cable to the connector. There are 2 inserting methods as below.

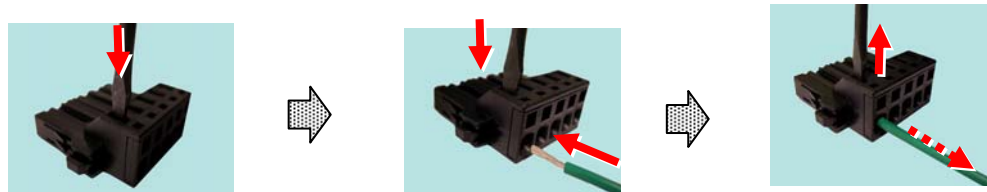
- (a) Use the attached handle lever
- (b) Use the standard screw drive (blade width: 3.0 to 3.5mm).

(a) Using a handle lever



- 1) Press the lever on the handle slot to push down the spring.
- 2) Insert the cable until it hits the insertion slot (round hole) while pressing down the lever.
- 3) Release the lever.

(b) Using a standard screw drive



- 1) Press the screw drive to the handle slot to push down the spring.
- 2) Insert the peeled off cable until it hits the insertion slot (round hole).
- 3) Release the screw drive.

* You can pull out the cable by pushing down the spring.

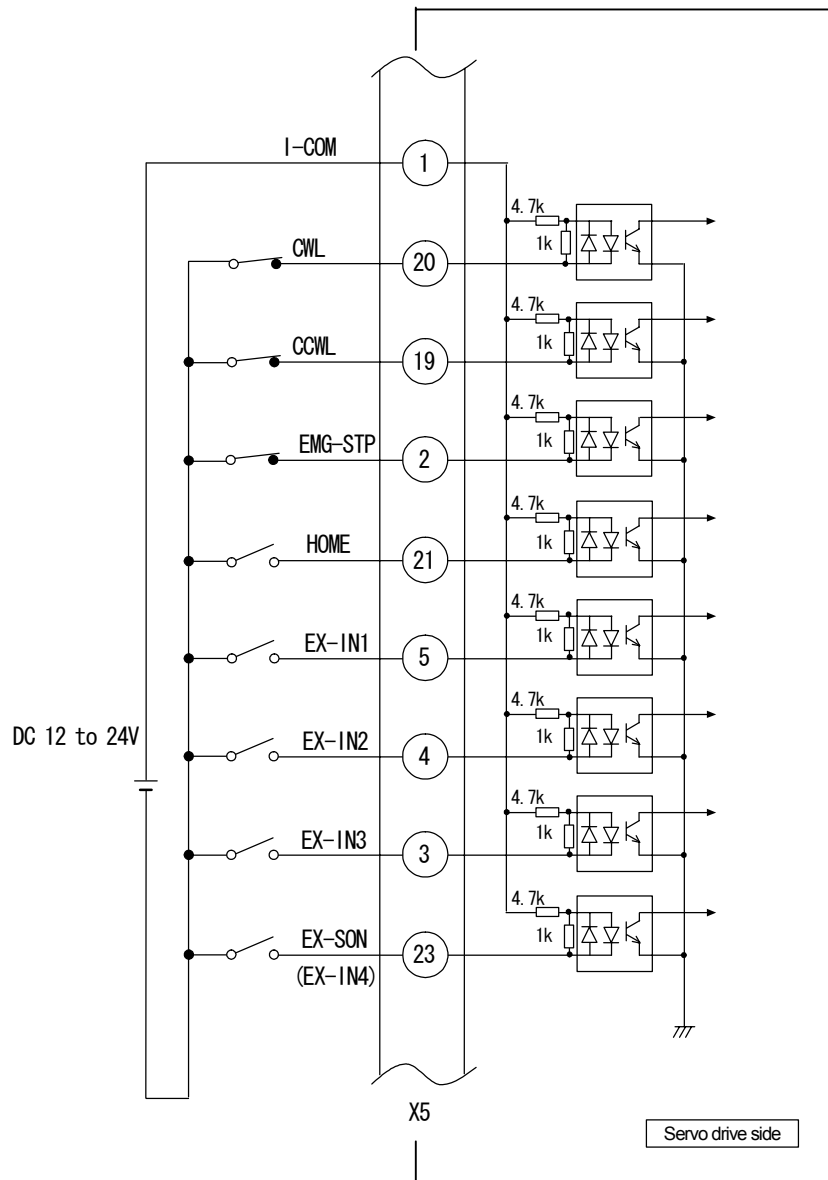
Cautions

- Peel off the cable by specified 8 to 9mm.
- Remove the connector from the drive while making a wiring.
- Insert one cable into one insertion slot.
- Be careful not being injured while using a screw drive.

(2) Wiring to connector, **X5** .

- ① Control Power supply (DC12 to 24V) connected to I –COM shall be prepared by yourself.
- ② Wiring between the servo drive and peripheral equipment shall as short as possible (within 3m).
- ③ Separate from the power line (L1, L2, L3, L1C(r) , L2C(t) , U , V, W , \oplus) as far as possible (30cm or more). Do not run them in the same duct nor bundle them together.

Control input



Input logic:

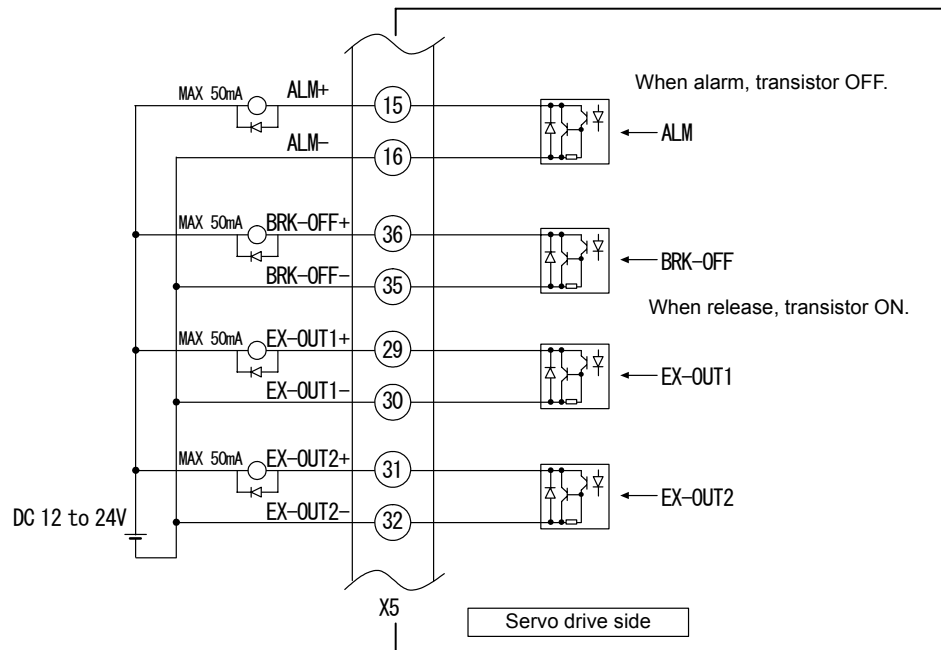
	Signal
Normally open	EX-IN, EX-IN2, EX-IN3, EX-SON
Normally closed	CWL, CCWL, EMG-STP
Depend on parameter	HOME (Set with Pr.42)

Note:

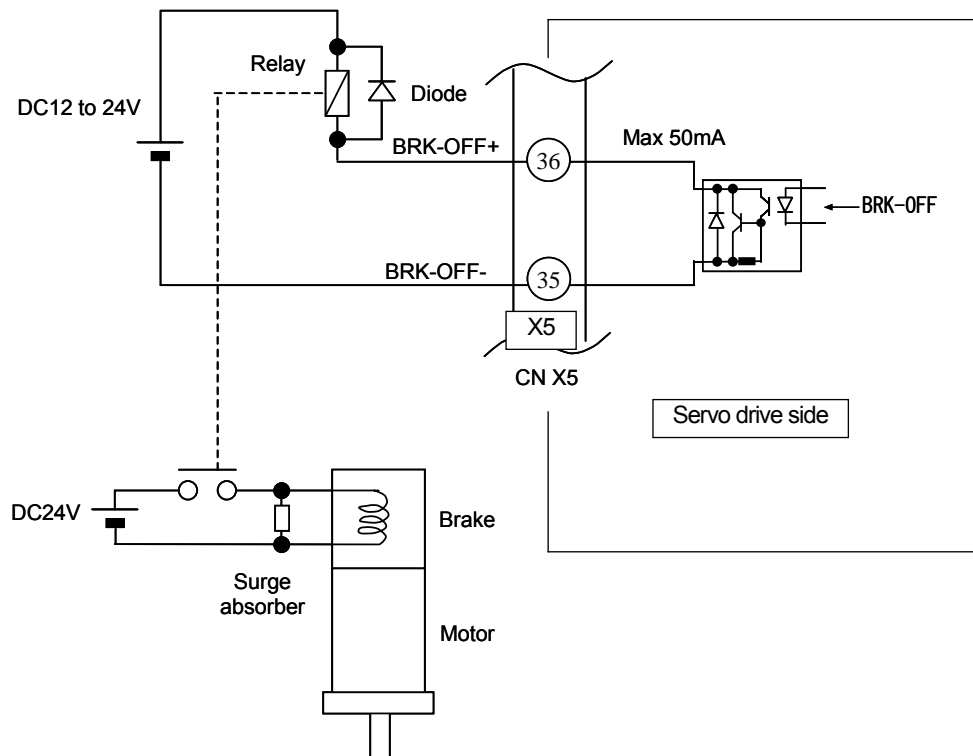
As default setting, EMG-STP input is enabled.
When this input is not used, Pr.41 should be set to 0 (disable).

Control output

- 1) Pay attention to the polarity of the control power supply. The servo drive will be damaged with a reverse polarity connection to the fig. below.
- 2) When the relays are directly driven by each output signal, install a diode in parallel with a relay in the same direction as the fig. below without fail. The servo drive will be damaged if no diode, or installed in reverse direction.
- 3) Pay attention not to subject to the noise disturbance when each output signal is received by a logic circuit such as a gate IC.
- 4) Limit the current to each output to 50mA or less.

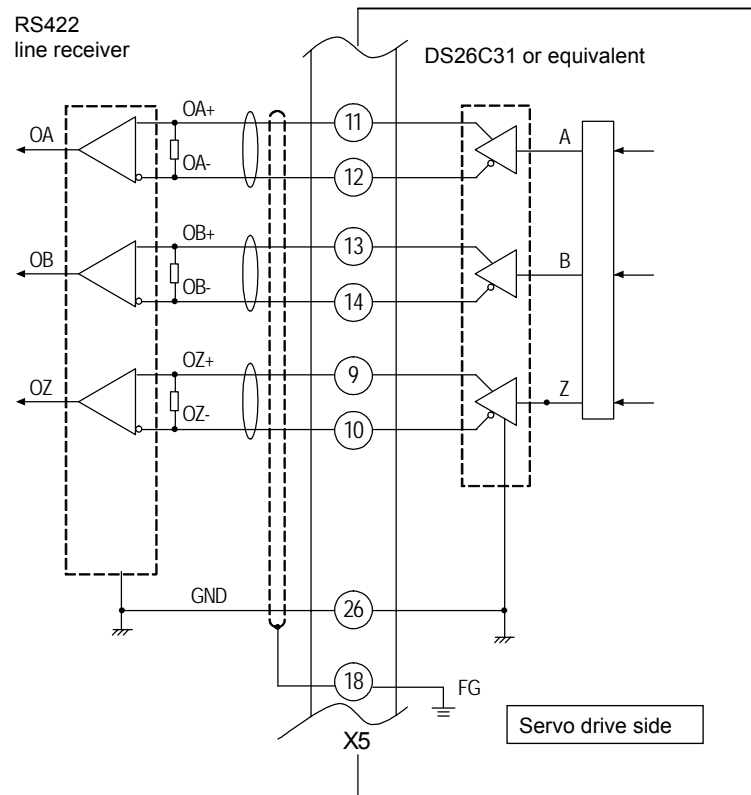


- 5) Connect the circuit externally as the following figure when operating the brake with BRK-OFF output.



Note: If necessary, connect a fuse in series with the surge absorber.

Rotary encoder. External scale feedback pulse

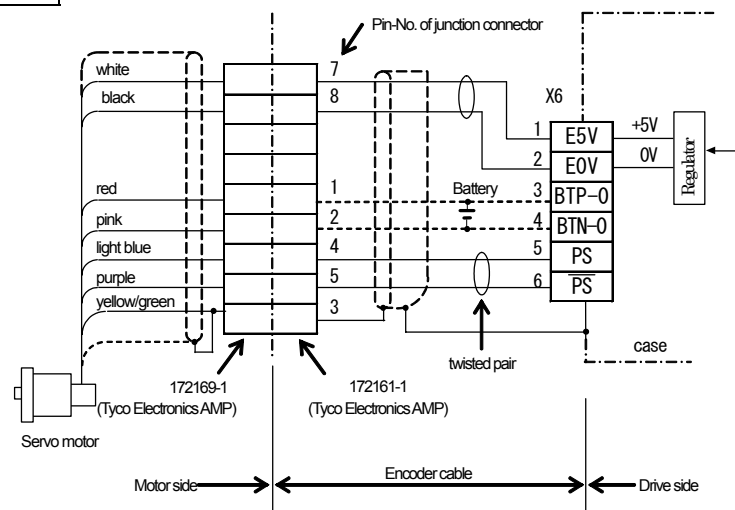


NOTE)

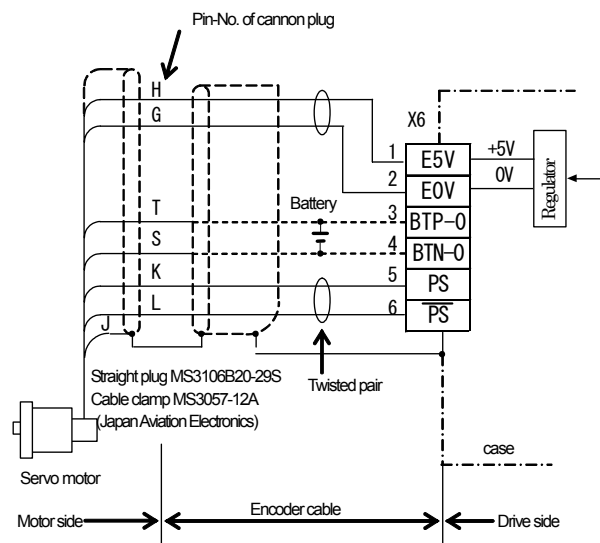
- 1) To receive output pulses, use a RS422 line receiver (AM26C32 or equivalent). To do so, provide a proper termination resistor (approx. 330Ω) between the line receiver's input pair.
- 2) Set the maximum output frequency to 4Mpps or less (after being multiplied by 4).

(3) Wiring to connector, **X6**.

- 1) Use a cable with 0.18mm^2 (AWG24) or larger conductor, bundle shield twisted pair wire for encoder cable.
- 2) Cable length shall be 20m max. Double wiring is recommended for 5V power supply to reduce voltage drop when the cable length is long.
- 3) Connect the outer shield for the drive side to the shell (FG) of **X6**.
- 4) When the canon plug, connect the outer shield to Pin-J of the canon plug.
- 5) Separate from the power lines(L1,L2,L3,L1C(r) , L2C(t),U,V, W, \oplus) as far as possible (30cm or more). Do not run them in the same duct, nor bundle them together.
- 6) Do not connect anything to vacant pins of each connector.

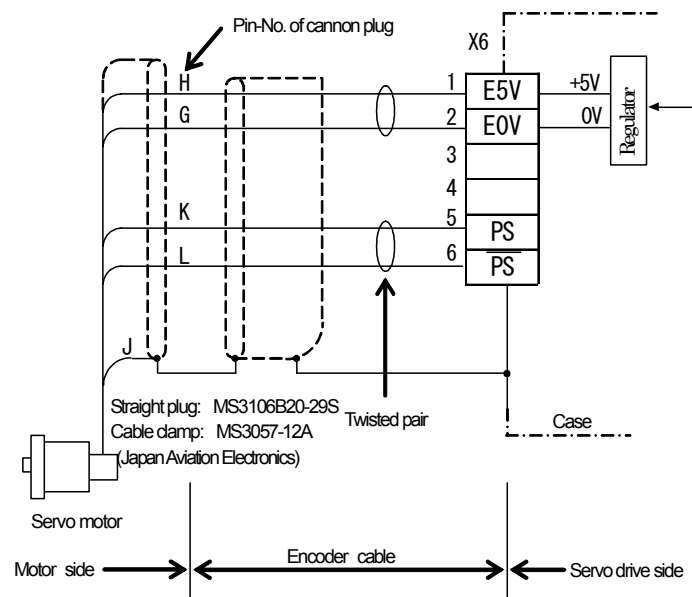
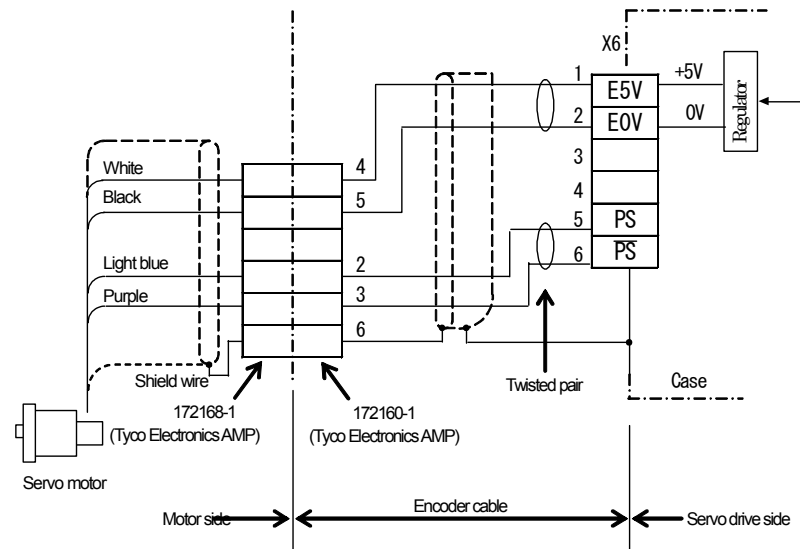
7-wire absolute encoder

Connect the battery for absolute encoder either between Pin-1 and 2 of the junction connector, or connector X5. Battery holder and connecting cable shall be prepared by yourself.



Connect the battery for absolute encoder either between T and S of the canon plug, or connector X5. Battery holder and connection cable shall be prepared by yourself.

5-wire incremental encoder



(4) Connection to connector, **X3A** and **X3B** .

- 1) Use a shield twisted pair (STP) cable with Category 5e or better.
 EMC characteristics will be deteriorated if both ends of the shield are not grounded.
 When you attach connector plug to both ends of the cable, connect the shield wire to the metal shell of the plug securely.
 Use the colors based on TIA/EIA568B.
 Pin-3 and 6 are signal lines.
 Also, Make wirings of 3 pairs of Pin1-2, 4-5, and 7-8.

2) Wiring length for communication

- a. Between each node : 60m or shorter
- b. Overall cable length of communication loop : 200m or shorter

Observe the above 2 conditions.

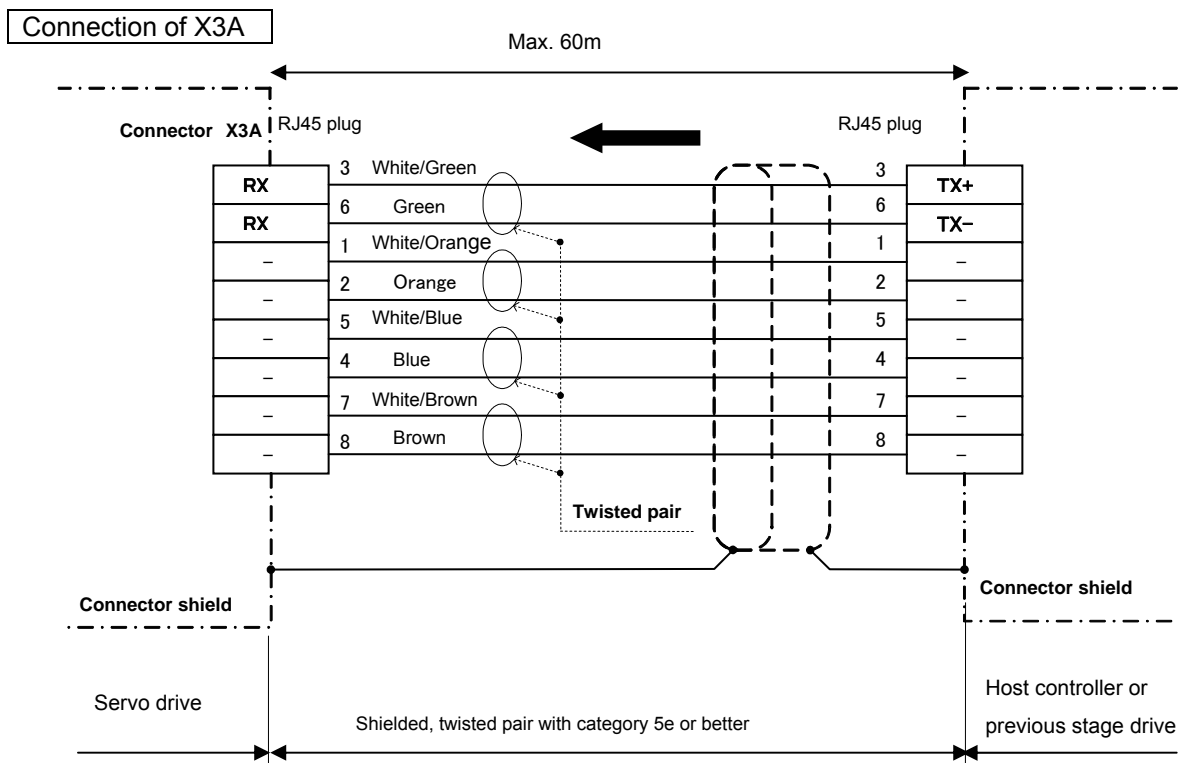
Consult us when you use exceeding the b) condition.

Bending characteristics, temperature range, material of the cover or other specifications are different by manufacturers of the cables with Category 5e. Select the cable based on your working condition.
 Select a moving cable based on your working condition as well.

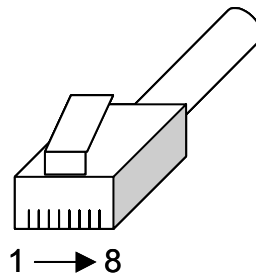
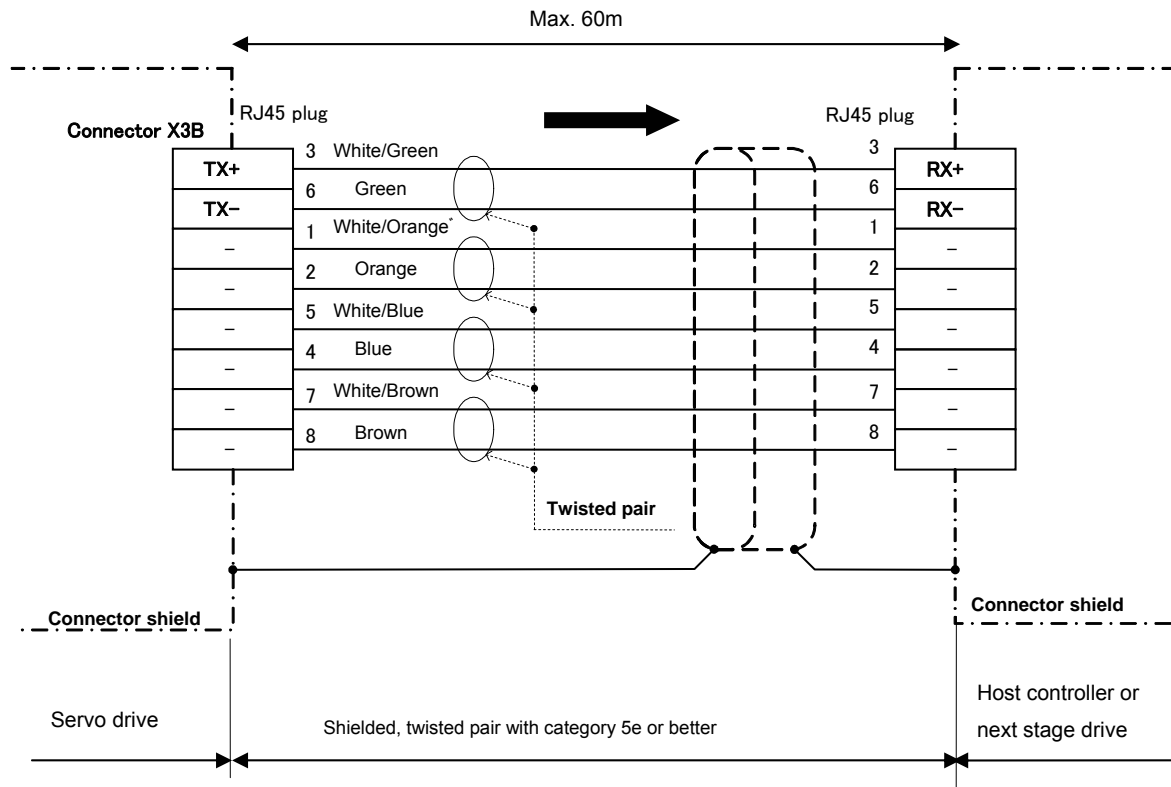
<Communication cable used for our evaluation test>

Manufacturer :Sanwa Supply Inc.

Part No. :KB-STP-*K (Category-5e, shielded twisted pair cable)



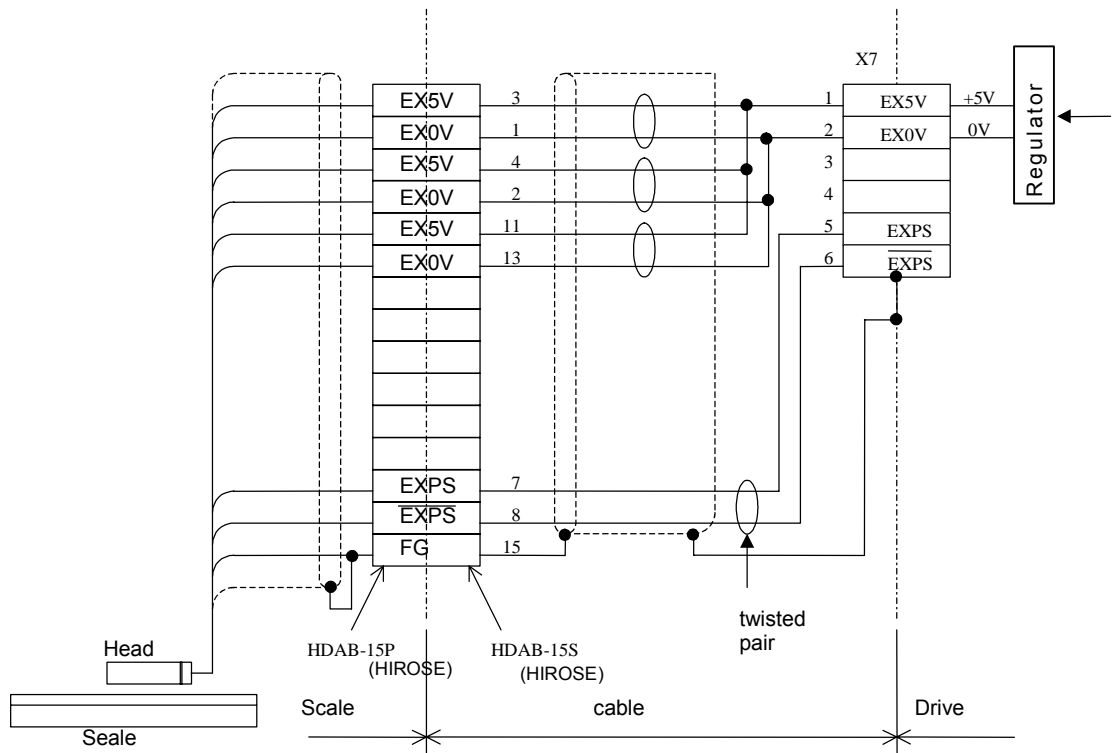
Connection of X3B



Pins of RJ45 plug

(5) Connecting cables to connector **X7**

- 1) For the external scale cable, use a shielded twisted pair cable with strand core size of 0.18mm² or more.
- 2) The allowable cable length is 20 m max. To use a long cable for the 5V power supply, double-wiring is recommended to reduce the influence of a voltage drop.
- 3) Be sure to connect the outer shield for the drive side to the shell (FG) of **X7**.
- 4) Place the scale cable away from the power cables (L1, L2, L3, L1C(r), L2C(t), U, V, W and Ground) as far as possible (at 30 cm or longer distance). Do not place the encoder cables in the same conduit as the power cables, or bundle these cables together.
- 5) Do not connect unused pins of each connector.





Safety precautions

9. Safety precautions on installation

- (1) Install a non-fuse breaker at power supply side without fail.
Ground the earth terminal without fail
(Ground resistance of 100[ohm] or less is recommended to prevent electrical shocks and miss-operation.)
- (2) Install the drive on incombustible materials such as metal.
- (3) Use the motor and the drive in the specified combination.
- (4) Make a correct and secure wiring. Insecure wiring and mi-wiring may result in runaway or burnout of the motor
- (5) Confirm the input power voltage is per the specifications of the serve drive, and then turn on the power to run. Entry of the voltage exceeding the rating may result in combustion or smoke generation, and in the worst case result in runaway of burnout of the motor.
- (6) Install an emergency stop circuit externally to shut off the power to stop running immediately at emergency.
Due to a failure of the motor or the servo drive, there might be a chance of a smoke or dust generation. One of the examples is when, the drive is charged while the built-in transistor for regenerative control has been shorted, the generation of smoke or dust might occur due to an over-heat of the external regenerative resistor. Install an over-heat detection method such as a thermal protector so that the power may be shut off when an abnormal noise is detected, when you use an external regenerative resistor.
- (7) Never use the servo drive where vibration of 5.88m/s^2 or more or impact shock would be applied, or where the drive would be subjected to dust, metallic particles, water oil or grinding oil, or never use nor store this nearby combustible materials, nor in environment of corrosive gas, inflammable gas.
- (8) Store the drive within the specified temperature and humidity avoiding direct sun beams.
- (9) Cautions on battery for backup of absolute encoder
 - 1) Air transportation
When you transport the battery by air in group package, you may need to apply as dangerous goods depending on the quantity (both by passenger and cargo flight) (UN certified package required). When you are required to submit necessary documents (parameter sheets or MSDS etc.) by a carrier, contact to a dealer for the submission of these documents.
 - 2) UN certified package
Ask for details to transportation company



Safety precautions

(10) Pay attention to heat dissipation.

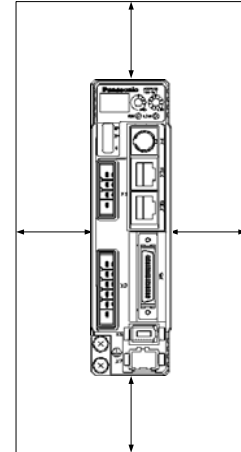
Servo drive will generate heat while driving the motor. Temperature of the control box may increase extraordinary while the servo drives are used in an enclosed control box. Take a necessary cooling measure so that the ambient temperature may not exceed the working range.

(11) Do not place the drive nearby a heater or heat generating object such as large winding resistor.
(Install a heat shielding plate so that the heat might not affect the drive.)

Ambient temperature of the drive

Life of the drive is affected largely by ambient temperature. Make sure that the ambient temperature around 50mm from the drive may not exceed the Operating temperature

Operating temperature range : 0 to 55 degrees



(Installation example : when no fan is used in the control box)

10. Safety precautions on using the drive

- (1) Never touch the inside of the drive. Repair should be performed by an authorized dealer or by us.
- (2) Internal circuit will be kept charged by high voltage for a while after turning off the power. Wait for more than 15 minutes before making a transportation, wiring and inspection after shutting off the power input externally .
- (3) Do not get close to the motor and the machine driven by the motor while turning on the power by way of precaution to malfunction.
- (4) Turn off the power if the machine has not been/will not been used for a long time.
- (5) When an alarm has occurred, remove the cause, and then start it again. If you start without removing the cause, it may result in motor runaway or burnout.
- (6) Capacitor in rectifying circuit of the power will loose its capacity over the years. It is recommended to replace it in 5 years to prevent secondary accident. Replacement should be done by a authorized dealer or us.

Maximum effort has been paid by us to secure the quality of our drive, however, unexpected behavior might occur when the drive is subjected to a larger external noise or static electricity than estimation, or when input power, wiring and components are in failure. Extra attention should be paid to secure safety for unexpected actions.

11. Life and Warranty

11-1 Expected life time of the drive

The Amplifier 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.

Conditions	Input power	: Single phase AC 100V, 50 / 60Hz , 3 phase AC 200V, 50 / 60Hz
	Ambient temperature.	: 55 degree C
	Output torque	: Constant torque at rating
	Speed	: Constant speed at rating

Note that the life varies due to the operating conditions. Life expectancy becomes twice as longer if the ambient temperature lowers by 10 degree.

11-2 Typical life

1) Relay and resistor preventing in-rush current

Replace the relay and resistor for in-rush current prevention when it is activated typically 20,000 times.

Note the criteria may vary depending on the environmental and operating condition.

2) Cooling fan

Replace the cooling fan in 28,000 hours. Note that the criteria may vary depending on the environmental and operating condition.

11-3 Warranty period

(1) Warranty period shall be 12 months from the ex-factory date or 18 months from the date of manufacturing. This Warranty shall be exempted in the following cases,

- 1) defects resulting from misuse and / or repair or modification by the customer
- 2) defects resulting from drop of the Product or damage during transportation
- 3) defects resulting from improper usage of the Product beyond the Specifications
- 4) defects resulting from fire, earthquake, lightening, flood, damage from salt, abnormal voltage or other 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 the components described in 11-2 exceeds its typical life.

(2) Warranty scope

Panasonic warrants the replacement of the defected parts of Product or repair of them when the defects 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.

12. Conformity with EC Directive and UL Standard

12-1 EC Directive

The EC Directive is applied to all electronic products that provide proper functions and are exported to EU (European Union) for direct sales for general consumers. These products must conform to the EU-uniformed safety standards, and the CE marking that indicates the conformity with the standards must be affixed to the products.

To facilitate the conformity of the machinery or equipment that incorporates the AC servo to the EC Directive, Matsushita Electric Industrial Co., Ltd. realizes conformity with the relevant standards of the Low Voltage Directive.

12-1-1 Conformity with the EMC Directive

For our servo systems, we define the models (conditions) of the servo amplifier - servo motor installation distance and wiring, and provides the conformity of the models with the relevant standards of the EMC directive. Therefore, when the servo system is actually incorporated in machinery or equipment, its wiring and grounding conditions may be different from the model. For this reason, the machinery or equipment that incorporates the servo amplifier and servo motor must undergo the final examination to verify the conformity with the EMC Directive (especially for electromagnetic interference and conducted emission).

12-1-2 Conformable standards

Target	Conformable standards	
Motor	IEC60034-1 IEC60034-5 UL1004 CSA22.2 No.100	Conforms to the relevant standards of the Low Voltage Directive.
Motor / Servo drive	EN50178 UL508C	
	EN55011 Radio Interference Wave Characteristics for Industrial, Scientific and Medical High-frequency Equipment	Conforms to the relevant standards of the EMC Directive.
	EN61000-6-2 Immunity for Industrial Environments	
	IEC61000-4-2 Electrostatic Discharge Immunity Test	
	IEC61000-4-3 Radio Frequency Radiation Electromagnetic Field Immunity Test	
	IEC61000-4-4 Electrical High-speed Transient Phenomena / Burst Immunity Test	
	IEC61000-4-5 Lightning Surge Immunity Test	
	IEC61000-4-6 High-frequency Conduction Immunity Test	
	IEC61000-4-11 Momentary Power Failure Immunity Test	

IEC: International Electrotechnical Commission

EN: Europäischen Normen

EMC: Electromagnetic Compatibility

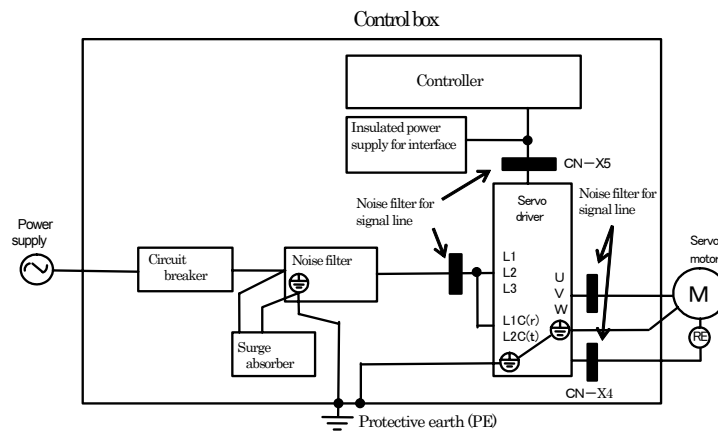
UL: Underwriters Laboratories

CSA: Canadian Standards Association

12-2 Configuration of peripheral equipments

12-2-1 Setup environment

Use the servo drive in environment of Pollution Degree 2 or 1 prescribed in IEC 60664-1. (E.g. Install inside of the control box of IP54)



12-2-2 Power supply

100V type: Single phase 100V to 115V $\begin{matrix} +10\% \\ -15\% \end{matrix}$ 50/60Hz

200V type: (A to D-frame) Single/3-phase 200V to 240V $\begin{matrix} +10\% \\ -15\% \end{matrix}$ 50/60Hz

200V type: (E and F-frame) 3-phase 200V to 230V $\begin{matrix} +10\% \\ -15\% \end{matrix}$ 50/60Hz

- (1) Use under environment of over-voltage category-II prescribed in IEC 60664-1.
- (2) Use an interface power supply of DC12 to 24V, insulated type, which conforms to CE marking or EN Standard (EN60950).

12-2-3 Circuit breaker

Connect a circuit breaker which conforms to IEC Standard and is UL recognized (UL Listed and UL Marked) between the power supply and the noise filter without fail.

12-2-4 Noise filter

When you install one noise filter at the power supply in multi-axes application, consult with the manufacture of the filter.

Option part No.	Voltage for drive	Manufacturer's part No.	Applied to	Manufacturer
DV0P4170	Single phase 100V 200V	SUP-EK5-ER-6	type A and B	Okaya Electric Industries Co., Ltd.
DV0P4180	3-phase 200V	3SUP-HQ10-ER-6	type C	
DV0P4220		3SUP-HU30-ER-6	type D and E	
DV0P3410		3SUP-HL50-ER-6	type F	

12-2-5 Surge absorber

Install a surge absorber at primary side of a noise filter.

(Remarks)

Take off the surge absorber when you execute dielectric test to the machine, or it may damage the surge absorber.

Option part No.	Voltage for drive	Manufacturer's part No.	Manufacturer
DV0P1450	3-phase 200V	R·A·V-781BXZ-4	Okaya Electric Industries Co., Ltd.
DV0P4190	Single phase 100V 200V	R·A·V-781BWZ-4	


12-2-6 Noise filter for signal line


Install noise filter for signal line to all cables (power line, motor cable, encoder cable and interface cable)

Install 3 filters to the power line.

Option part No.	Manufacturer's part No.	Manufacturer
DV0P1460	ZCAT3035-1330	TDK

12-2-7 Earth

(1) Connect the protective earth terminal () and protective earth of the control box (PE) without fail.

(2) Do not make a joint connection to the protective earth terminal (). 2 protective terminals are provided.

12-3 Servo drive and list of applicable peripheral equipments

Servo drive	motor	Voltage Spec.	Rated output	Circuit Breaker (Rated current)	Noise filter	Surge absorber	Noise filter for signal line	Electromagnetic contactor	Main circuit cable diameter	Control Power Cable diameter	Terminals on the feminalblock
MADD	MSMD	100V, single-phase	50W～100W	10A	DV0P4170	DV0P4190	DV0P1460	BMFT61041N (3P+1a)	0.75～2.0mm2	0.75mm2	Connect to the exclusive connectors.
		200V, single-phase	50W～200W					BMFT61541N (3P+1a)			
MBDD	MSMD	100V, single-phase	200W					BMFT61041N (3P+1a)			
		200V, single-phase	400W					BMFT61541N (3P+1a)			
MCDD	MSMD	100V, single-phase	400W	15A	DV0P4180	DV0P4150		BMFT61541N (3P+1a)	2.0mm2 AWG14	M5	
	MSMD	200V, single-phase/3 phase	750W					BMFT61042N (3P+1a)			
MDDD	MDMA	200V, single-phase/3 phase	1kW	20A	DV0P4220			BMFT61042N (3P+1a)			
	MDMA	200V, single-phase/3 phase	1.5kW					BMFT61042N (3P+1a)			
MEDD	MDMA	200V, 3 phase	2.5kW	30A	DV0P3410			BM6352N (3P+2a2b)	2.0mm2 AWG14		
	MDMA		3.0kW					3.5mm2 AWG11			
MFDD	MDMA	200V, 3 phase	5.0kW	50A			BM6652N (3P+2a2b)	5.3mm2 AWG10			

*Select the single/3-phase common drive based on the power supply to be used.

- Manufacturer of circuit breaker and magnetic contactor: Matsushita Electric Works, Ltd.
Connect a circuit breaker which conforms to IEC Standard and is UL recognized (UL Listed and marked) between the power supply and the noise filter without fail in order to make the machine conform to EC Directives.
- For details of noise filter, refer to section 12-2-4.
<Remarks>
- Select the circuit breaker and noise filter matching to the power capacity (including the load condition).
- Terminal block and earth terminal
Use a cable of copper conductor with temperature rating of 60degrees or higher.
Protective earth terminal is M4 for A to D-frame.
Use an earth cable with diameter of 2.0mm2 (AWG14) or larger for 50W to 1.5kW
- For A to D-frame, use the attached exclusive connector and keep the peel-off length of 8 to 9mm.

12-4 Conformity to UL Standards

Observe the following conditions of 1) and 2) to make the system conform to UL508C (File No. E164620).

- 1) Use the servo drive in environment of Pollution Degree 2 or 1 prescribed in IEC-60664-1.
(E.g. Install in the control box with IP54).
- 2) Connect a UL recognized (UL Listed, UL marked) circuit breaker or UL recognized fuse (UL Listed, UL marked) between the power and the noise filter without fail.
For rated current of the circuit breaker/fuse, refer to section 12-3, List of peripheral Equipments.
Use a cable of copper conductor with temperature rating of 60degrees or more.
Terminal block might be damaged when a tightening torque of screw exceeds the max. value (M4: 1.2N·m, M5: 2.0N·m).
- 3) Overload protection level
Overload protection function will be activated according to the time characteristics, when effective current exceeds 115% or more of the rated current. Confirm that the effective current of the drive has not exceeded the rated current. Set up the peak permissible current with Pr.5E (1st torque limit) and Pr.5F (2nd torque limit).

13. Compliance with SEMI F47 standard

- The control power supply of AC200V type servo drive is applicable to SEMI F47 voltage sag immunity standard.
- This function is useful when it is used for semiconductor manufacturing equipment.

(Note)

- (1) This function is not applicable to a AC100V single-phase type servo drive.
- (2) When momentary power failure occurs in main power, torque may fall for a moment.
- (3) Make sure to mount the servo drive on the actual equipment, and validate its compliance with the SEMI F47 standard.

14. Others

- Precautions for export of this product and 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 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.
- If the specifications of your installations are changed, exercise thorough caution to ensure their compatibility with the motor and servo drive.
- 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 is specifications.
- We have made the best efforts to ensure the product quality. However, complete equipment at your site may malfunction due to a failure of this product. Therefore, take precautions by providing fail-safe design at your 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.
- It the motor shaft is not electrically grounded, it may cause an electrolytic corrosion to the bearing, depending on the condition of the machine and it's mounting environment, and may result in the bearing noise. Checking and verification by customer is required.

Appendix

Specifications by model

●MINAS-A4N series (High-speed network type)

Model No.	MADDT1105N	MADDT1205N	MADDT1107N	MADDT1207N
Power input	Single phase, 100V	Single phase, 200V	Single phase, 100V	Single phase, 200V
Max. current rating of power device	10A	10A	10A	10A
Current rating of current detector	5A	5A	7.5A	7.5A
Feedback signal of rotary encoder	10000 resolution	10000 resolution	10000 resolution	10000 resolution
	131072 resolution	131072 resolution	131072 resolution	131072 resolution
Regenerative resistor	External	External	External	External
Absolute system	Enabled (*1)	Enabled (*1)	Enabled (*1)	Enabled (*1)
Cooling fan	None	None	None	None
Ambient temperature	0 to 55degrees	0 to 55degrees	0 to 55degrees	0 to 55degrees
Main power cable	HVSF0.75to20mm ²	HVSF0.75to20mm ²	HVSF0.75to20mm ²	HVSF0.75to20mm ²
	AWG14 to 18	AWG14 to 18	AWG14 to 18	AWG14 to 18
Earth 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	HVSF0.75to20mm ²	HVSF0.75to20mm ²	HVSF0.75to20mm ²	HVSF0.75to20mm ²
	AWG14 to 18	AWG14 to 18	AWG14 to 18	AWG14 to 18
Inrush current (Main power) (*2)	Max. 7A	Max. 14A	Max. 7A	Max. 14A
Inrush current (Control power) (*2)	Max. 14A	Max. 28A	Max. 14A	Max. 28A
Mass	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 0.8 kg
Frame size	A -frame	A -frame	A -frame	A -frame

(*1) Enabled when encoder is 17-bit and is used as an absolute.

Back up battery for absolute encoder is externally attached.

(*2) Current is a result of based on the conditions of power supply input column calculation.

Model No.	MBDDT2110N	MBDDT2210N
Power input	Single phase, 100V	Single phase, 100V
Max. current rating of power device	15A	15A
Current rating of current detector	10A	10A
Feedback signal of rotary encoder	10000 resolution	10000 resolution
	131072 resolution	131072 resolution
Regenerative resistor	External	External
Absolute system	Enabled (*1)	Enabled (*1)
Cooling fan	None	None
Ambient temperature	0 to 55degrees	0 to 55degrees
Main power cable	HVSF 0.75 to 20mm ²	HVSF 0.75 to 20mm ²
	AWG14 to 18	AWG14 to 18
Earth cable	HVSF 2.0 mm ²	HVSF 2.0 mm ²
	AWG14	AWG14
Motor cable	HVSF 0.75 to 20mm ²	HVSF 0.75 to 20mm ²
	AWG14 to 18	AWG14 to 18
Inrush current (Main power) (*2)	Max. 7A	Max. 14A
Inrush current (Control power) (*2)	Max. 14A	Max. 28A
Mass	Approx. 1.1 kg	Approx. 1.1 kg
Frame size	B-frame	B-frame

(*1) Enabled when encoder is 17-bit and is used as an absolute.

Back up battery for absolute encoder is externally attached.

(*2) Current is a result of based on the conditions of power supply input column calculation.

Model No.	MCDDT3120N	MCDDT3520N
Power input	Single phase, 100V	Single/3-phase, 200V
Max. current rating of power device	30A	30A
Current rating of current detector	20A	20A
Feedback signal of rotary encoder	10000 resolution	10000 resolution
	131072 resolution	131072 resolution
Regenerative resistor	Built-in	Built-in
Absolute system	Enabled (*1)	Enabled (*1)
Cooling fan	Built-in	Built-in
Ambient temperature	0 to 55degrees	0 to 55degrees
Main power cable	HVSF 0.75 to 20mm ²	HVSF 0.75 to 20mm ²
	AWG14 to 18	AWG14 to 18
Earth cable	HVSF 2.0 mm ²	HVSF 2.0 mm ²
	AWG14	AWG14
Motor cable	HVSF 0.75 to 20mm ²	HVSF 0.75 to 20mm ²
	AWG14 to 18	AWG14 to 18
Inrush current (Main power) (*2)	Max. 30A	Max. 60A
Inrush current (Control power) (*2)	Max. 14A	Max. 28A
Mass	Approx. 1.5 kg	Approx. 1.5 kg
Frame size	C-frame	C-frame

(*1) Enabled when encoder is 17-bit and is used as an absolute.

Back up battery for absolute encoder is externally attached.

(*2) Current is a result of based on the conditions of power supply input column calculation.

Model No.	MDDDT3530N	MDDDT5540N
Power input	Single/3-phase, 200V	Single/3-phase, 200V
Max. current rating of power device	30A	50A
Current rating of current detector	30A	40A
Feedback signal of rotary encoder	10000 resolution	10000 resolution
	131072 resolution	131072 resolution
Regenerative resistor	Built-in	Built-in
Absolute system	Enabled (*1)	Enabled (*1)
Cooling fan	Built-in	Built-in
Ambient temperature	0 to 55degrees	0 to 55degrees
Main power cable	HVSF20mm ²	HVSF20mm ²
	AWG14	AWG14
Earth cable	HVSF 2.0 mm ²	HVSF 2.0 mm ²
	AWG14	AWG14
Motor cable	HVSF20mm ²	HVSF20mm ²
	AWG14	AWG14
Inrush current (Main power) (*2)	Max. 29A	Max. 29A
Inrush current (Control power) (*2)	Max. 28A	Max. 28A
Mass	Approx. 1.7 kg	Approx. 1.7 kg
Frame size	D-frame	D-frame

(*1) Enabled when encoder is 17-bit and is used as an absolute.

Back up battery for absolute encoder is externally attached.

(*2) Current is a result of based on the conditions of power supply input column calculation.

Model No.	MEDDT7364N
Power input	3-phase, 200V
Max. current rating of power device	75A
Current rating of current detector	64A
Feedback signal of rotary encoder	10000 resolution
	131072 resolution
Regenerative resistor	Built-in
Absolute system	Enabled (*1)
Cooling fan	Built-in
Ambient temperature	0 to 55degrees
Main power cable	HVSF20mm ²
	AWG14
Earth cable	HVSF 3.5 mm ²
	AWG11
Motor cable	HVSF20mm ²
	AWG14
Inrush current (Main power) (*2)	Max. 29A
Inrush current (Control power) (*2)	Max. 14A
Mass	Approx. 3.2 kg
Frame size	E-frame

(*1) Enabled when encoder is 17-bit and is used as an absolute.

Back up battery for absolute encoder is externally attached.

(*2) Current is a result of based on the conditions of power supply input column calculation.

Model No.	MFDDTA390N	MFDDTB3A2N
Power input	3-phase,200V	3-phase,200V
Max. current rating of power device	100A	150A
Current rating of current detector	90A	120A
Feedback signal of rotary encoder	10000 resolution	10000 resolution
	131072 resolution	131072 resolution
Regenerative resistor	Built-in	Built-in
Absolute system	Enabled (*1)	Enabled (*1)
Cooling fan	Built-in	Built-in
Ambient temperature	0 to 55 degrees	0 to 55 degrees
Main power cable	HVSF3.5mm ²	(*2) HVSF3.5mm ²
	AWG11	AWG11
Earth cable	HVSF3.5mm ²	HVSF3.5mm ²
	AWG11	AWG11
Motor cable	HVSF3.5mm ²	(*3) HVSF3.5mm ²
	AWG11	AWG11
Inrush current (Main power) (*2)	Max. 22A	Max. 22A
Inrush current (Control power) (*2)	Max. 14A	Max. 14A
Mass	Approx. 6.0 kg	Approx. 6.0 kg
Frame size	F-frame	F-frame

(*1) Enabled when encoder is 17-bit and is used as an absolute.

Back up battery for absolute encoder is externally attached.

(*2) Current is a result of based on the conditions of power supply input column calculation.

(*3) Varies depending on the motor to be used. Use the cable with cable diameter as the table below shows, or larger.

Applicable motor	Main power cable	Motor cable
MFMA452***, MGMA452*** MHMA502***, MSMA502*** MDMA502***	HVSF5.3mm ²	HVSF5.3mm ²
	AWG10	AWG10

Specifications by model 【Default of parameter】 [A4N series (High-speed network type) Common to all models]

No.	Parameter Name	Default
00	For manufacturer use	1
01	LED display	0
02	Control mode	0
03	Torque limit selection	1
04	Over travel input inhibit	1
05	For manufacturer use	0
06	Address indicated time at power up	0
07	Speed monitor (SP) selection	3
08	Torque monitor (IM) selection	0
09	Unit of velocity	0
0A	Inhibit parameter change via network	0
0B	Absolute encoder set up	1
0C	Baud rate of RS232	2
0D	Warning setup of cumulative COM error	0
0E	Warning setup of continuous COM error	0
0F	Update counter warning setup	0
10	1st position loop gain (*2)	(63/32)
11	1st velocity loop gain (*2)	(35/18)
12	1st velocity loop integration time constant (*2)	(16/31)
13	1st speed detection filter	(0)
14	1st torque filter time constant (*2)	(65/126)
15	Velocity feed forward	(300)
16	Feed forward filter time constant	(50)
17	For manufacturer use	0
18	2nd position loop gain (*2)	(73/38)
19	2nd velocity loop gain (*2)	(35/18)
1A	2nd velocity loop integration time constant	(1000)
1B	2nd speed detection filter	(0)
1C	2nd torque filter time constant (*2)	(65/126)
1D	1st notch frequency	1500
1E	1st notch width selection	2
1F	For manufacturer use	0

No.	Parameter Name.	Default
20	Inertia ratio	(250)
21	Real time auto tuning set up	1
22	Machine stiffness at auto tuning (*2)	4/1
23	Adaptive filter mode	1
24	Vibration suppression filter selection	0
25	Normal auto tuning motion setup	0
26	Software limit set up	10
27	Velocity observer	(0)
28	2nd notch frequency	150
29	2nd notch width selection	2
2A	2nd notch depth selection	0
2B	1st vibration suppression frequency	0
2C	1st vibration suppression filter	0
2D	2nd vibration suppression frequency	0
2E	2nd vibration suppression filter	0
2F	Adaptive filter frequency	0
30	2nd gain action setup	(1)
31	Gain switching mode	(10)
32	Gain switching delay time	(30)
33	Gain switching level	(50)
34	Gain switching hysteresis	(33)
35	Position loop gain switching time	(20)
36	For manufacturer use	0
37	For manufacturer use	0
38	For manufacturer use	0
39	For manufacturer use	0
3A	For manufacturer use	0
3B	For manufacturer use	0
3C	For manufacturer use	0
3D	JOG speed	300
3E	For manufacturer use	0
3F	For manufacturer use	0

*1) Max values for Pr.5E and 5F(Setup of 1st and 2nd torque limit) vary depending on the applicable motor.

*2) Default of Pr.10~12,14,18,19,1C,22 and 6C vary depending on the driver.

*3) Parameters whose setup value is in parentheses(will be automatically set while executing real-time auto-gain tuning and normal auto-gain tuning.

Specifications by model **【Default of parameter】** **[A4N series (High-speed network type) Common to all models]**

No.	Parameter Name	Default
40	External Servo-ON enable	0
41	Emergency stop enable	1
42	Home input logic	1
43	Direction of motion	1
44	Numerator of output pulse ratio	2500
45	Denominator of output pulse ratio	0
46	Pulse output logic inversion	0
47	Z-phase of external scale setup	0
48	For manufacturer use	10000
49	For manufacturer use	0
4A	For manufacturer use	0
4B	For manufacturer use	10000
4C	Smoothing filter	1
4D	FIR filter setup	0
4E	For manufacturer use	0
4F	For manufacturer use	0
50	For manufacturer use	500
51	For manufacturer use	1
52	For manufacturer use	0
53	For manufacturer use	0
54	For manufacturer use	0
55	For manufacturer use	0
56	For manufacturer use	0
57	For manufacturer use	0
58	For manufacturer use	0
59	For manufacturer use	0
5A	For manufacturer use	0
5B	For manufacturer use	0
5C	For manufacturer use	30
5D	For manufacturer use	0
5E	1 st torque limit (*1)	500
5F	2 nd torque limit (*1)	500

*1) Max values for Pr.5E and 5F (1st and 2nd torque limit) vary depending on the applicable motor.

*2) Default of Pr.10 to 12,14,18,19,1C,22 and 6C vary depending on the driver.

*3) Parameters whose setup value is in parentheses () will be automatically set while executing real-time auto-gain tuning and normal auto-gain tuning.

No.	Parameter Name	Default
60	In-position range	131
61	Zero speed	50
62	For manufacturer use	0
63	In-position output setup	0
64	CT-offset re-calibration at servo-on	0
65	Undervoltage error response at main power-off	1
66	Error response at over travel limit	0
67	Error response at main power-off	0
68	Error response action	0
69	Sequence at Servo-OFF	0
6A	Mechanical brake delay at motor standstill	0
6B	Mechanical brake delay at motor in motion	0
6C	External regenerative resistor setup (*2)	3/0
6D	Main power-off detection time	35
6E	Emergency stop torque setup	0
6F	For manufacturer use	0
70	Position deviation error level	25000
71	For manufacturer use	0
72	Overload level	0
73	Over speed level	0
74	Command update period	2
75	For manufacturer use	0
76	For manufacturer use	0
77	For manufacturer use	0
78	Numerator of external scale ratio	0
79	Multiplier of numerator of external scale ratio	0
7A	Denominator of external scale ratio	10000
7B	Hybrid deviation error level	100
7C	External scale direction	0
7D	Absolute external scale setup	0
7E	For manufacturer use	0
7F	For manufacturer use	0

Specifications by model

【Max. value of Pr.5E (1st torque limit) and Pr.5F(2nd torque limit)】 [A4N series (High-speed network type)]

Type	Model Code	Applicable Motor	Max. value of Pr.5E, Pr.5F
Type A	MADDCT1105N	MSMD5AZP1*	300
		MSMD5AZS1*	300
	MADDT1107N	MSMD011P1*	300
		MSMD011S1*	300
		MQMA011P1*	300
		MQMA011S1*	300
	MADDT1205N	MSMD5AZP1*	300
		MSMD5AZS1*	300
		MSMD012P1*	300
		MSMD012S1*	300
		MQMA012P1*	300
		MQMA012S1*	300
	MADDT1207N	MSMD022P1*	300
		MSMD022S1*	300
		MAMA012P1*	500
		MAMA012S1*	500
		MQMA022P1*	300
		MQMA022S1*	300
Type B	MBDDT2110N	MSMD021P1*	300
		MSMD021S1*	300
		MQMA021P1*	300
		MQMA021S1*	300
	MBDDT2210N	MSMD042P1*	300
		MSMD042S1*	300
		MAMA022P1*	500
		MAMA022S1*	500
		MQMA042P1*	300
		MQMA042S1*	300

Type	Model Code	Applicable Motor	Max. value of Pr.5E, Pr.5F
Type C	MCDDT3120N	MSMD041P1*	300
		MSMD041S1*	300
		MQMA041P1*	300
		MQMA041S1*	300
	MCDDT3520N	MSMD082P1*	300
		MSMD082S1*	300
		MAMA042P1*	500
		MAMA042S1*	500
Type D	MDDDT3530N	MFMA042P1*	300
		MFMA042S1*	300
		MHMA052P1*	255
		MHMA052S1*	255
		MDMA102P1*	300
		MDMA102S1*	300
		MHMA102P1*	300
		MHMA102S1*	300
		MGMA092P1*	225
		MGMA092S1*	225
		MSMA102P1*	300
		MSMA102S1*	300
	MDDDT5540N	MHMA152P1*	300
		MHMA152S1*	300
		MDMA152P1*	300
		MDMA152S1*	300
		MSMA152P1*	300
		MSMA152S1*	300
		MFMA152P1*	300
		MFMA152S1*	300
		MAMA082P1*	500
		MAMA082S1*	500

Type	Model Code	Applicable Motor	Max. value of Pr.5E, Pr.5F
Type E	MEDDT7364N	MDMA202P1*	300
		MDMA202S1*	300
		MSMA202P1*	300
		MSMA202S1*	300
		MHMA202P1*	300
		MHMA202S1*	300
		MFMA252P1*	300
		MFMA252S1*	300
Type F	MFDDTA390N	MGMA202P1*	230
		MGMA202S1*	230
		MDMA302P1*	300
		MDMA302S1*	300
		MHMA302P1*	300
		MHMA302S1*	300
		MSMA302P1*	300
		MSMA302S1*	300
	MFDDTB3A2N	MGMA302P1*	235
		MGMA302S1*	235
		MDMA402P1*	300
		MDMA402S1*	300
		MHMA402P1*	300
		MHMA402S1*	300
		MSMA402P1*	300
		MSMA402S1*	300
		MFMA452P1*	300
		MFMA452S1*	300
		MGMA452P1*	255
		MGMA452S1*	255
		MDMA502P1*	300
		MDMA502S1*	300
		MHMA502P1*	300
		MHMA502S1*	300
		MSMA502P1*	300
		MSMA502S1*	300