

Communication cycle 0.0625 ms

Ultra-high-speed network driver

RTEX
Realtime Express

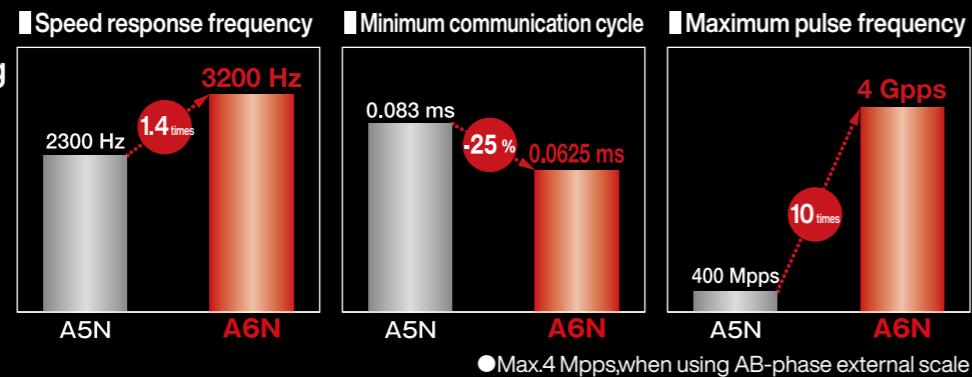
Realtime Express(RTEX)
AC servo motor & driver

MINAS A6N Series



Pursuit of ultimate real-time processing

Pursuit of ultimate real-time processing



Multifunctional capabilities to match various needs

- Supports all positions, speeds and torque modes (w/built-in positioning function)
- High-precision position latch and comparison
- Communication cycle can be set to any time between 2 ms and 62.5 μ s.

● Easy setup with setup support software "PANATERM".

Simple network

- Satisfies both high performance and low cost requirements
- Synchronization established by communication IC
- Easier development of compatible equipment

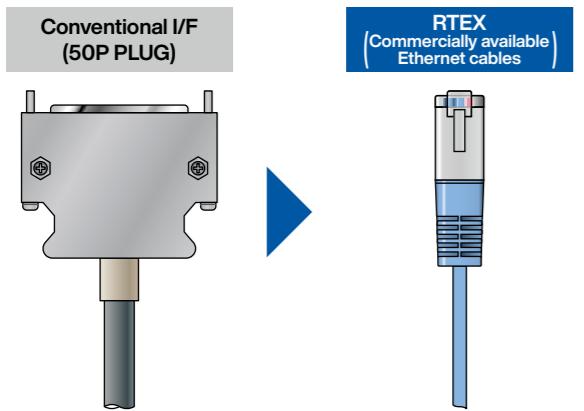
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● The "Conventional I/F" used in this document means a pulse train and analog I/F.

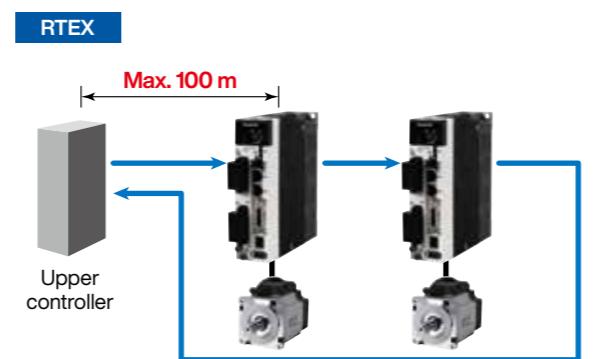
Wire-saving

Wire-saving reduces various troubles relating to wires. The cables used are widely available Ethernet cables, which are easy to obtain and inexpensive.



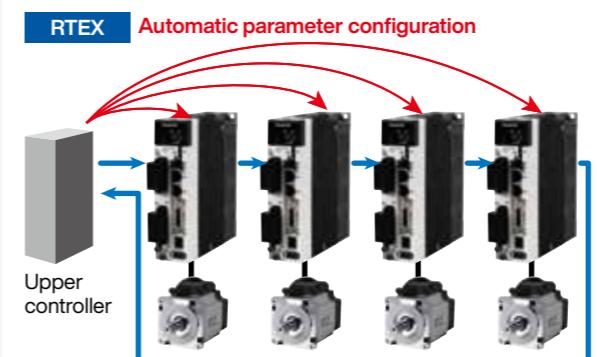
Maximum length of the node-to-node cable is 100 m.

Flexibility increases in the layout of an upper controller and servo motors. The RTEXs can also support large-scale systems.



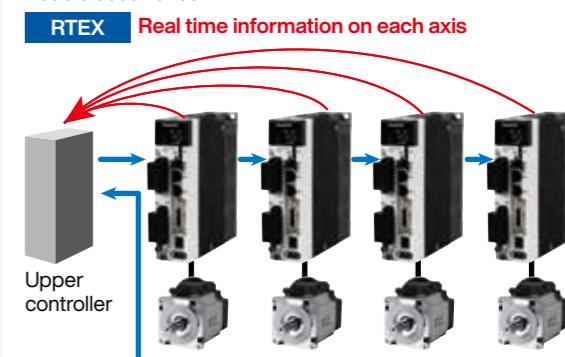
Configurable parameter settings

Upper controllers can configure servo parameters. This enables parameters to be configured automatically instead by human at installation.



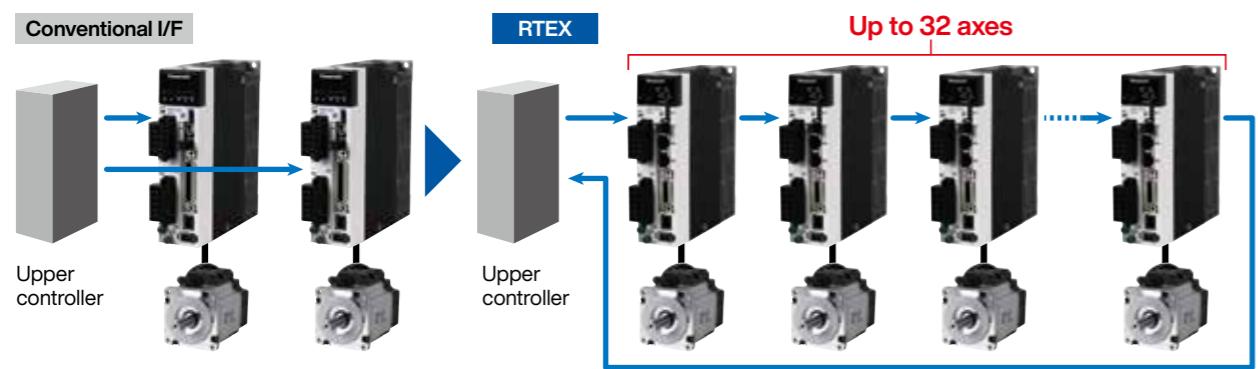
Real time monitoring is enabled.

Upper controllers can monitor various information, such as position, speed, and torque, etc. in real time. Since alarm codes can also be read out, analysis can be performed promptly at trouble occurrence.



Up to 32 axes can be controlled.

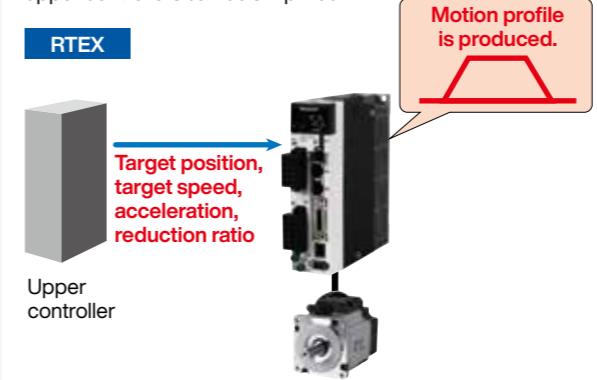
In comparison with conventional I/Fs, the number of axes increases that can be controlled by next upper controllers.



* If devices other than servo motors are also connected, up to 32 nodes can be connected as entire slaves including the servo motors. Actual number of controllable axes depends on the specification of an upper controller.

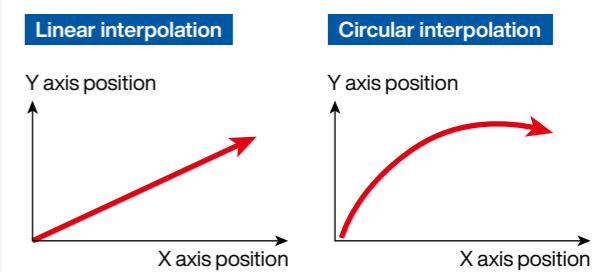
Profile position mode is supported

Profile position mode is supported for PTP control as well as cyclic position, speed, and torque. The processing done by upper controllers can be simplified.



High synchronization capability among axes

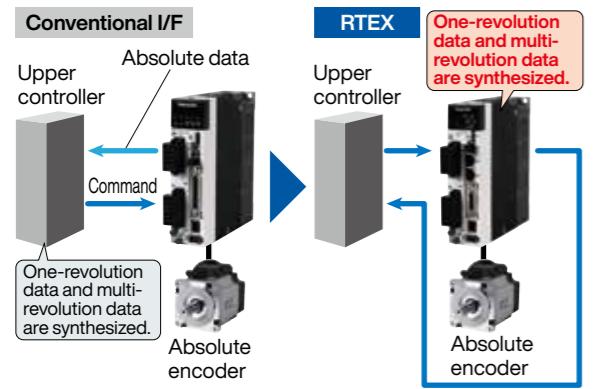
Upper controllers synchronize with entire servo motor axes at high accuracy. With the synchronization capability higher than that of conventional I/F, the RTEX is best suitable for machine tools, robots, gantry systems, and others.



* Interpolation depends on the specification of upper controllers. This is not the function of individual servo motor.

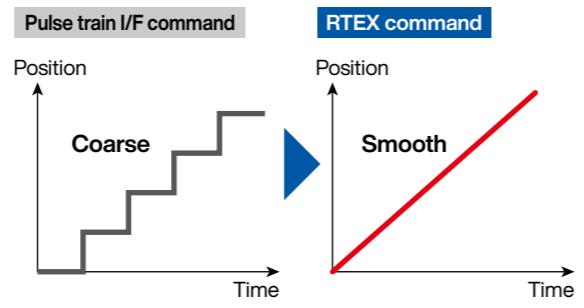
Absolute system can easily be built.

Conventional I/F requires an additional wire to transmit absolute data, while the RTEX doesn't. Each servo motor synthesizes one-revolution data and multi-revolution data to produce an actual position, so that the amount of work to be done by an upper controller is decreased.



High resolution command is enabled

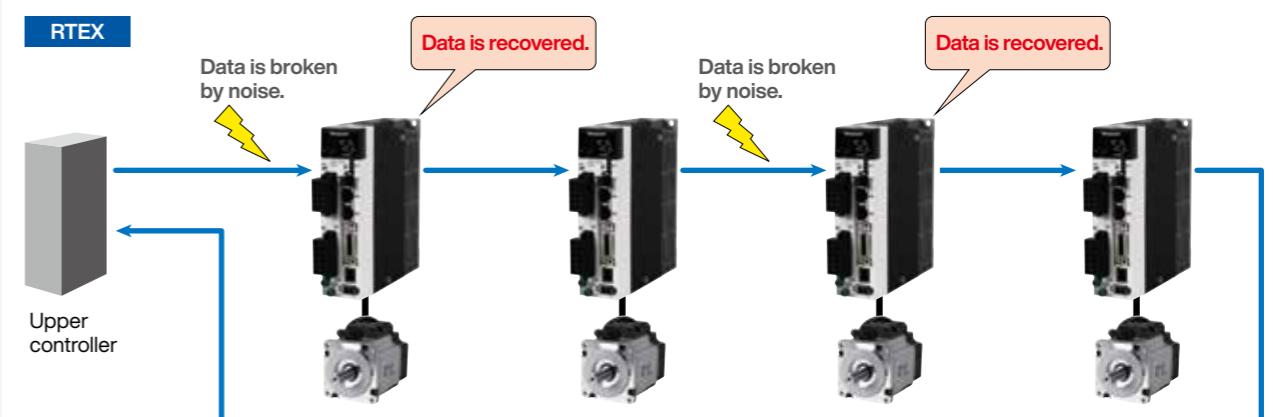
The position command rate of max. 8 Mpps* in a pulse train I/F is improved to 4 Gpps* in the RTEX. Vibrations are reduced due to a smooth command sent to a servo motor using the advantage of the high-resolution encoder.



* Max. 8 Mpps is a rate when A6 servo driver is used.
Max. 4 Gpps is a rate when A6N servo driver is used.

High noise-proof property

With a patented error correction function, noise-proof property is at least 2.5 KV. This conforms to IEC61000-4-4 standard.



* For combination of elements of model number, refer to Index P.448.

Servo Motor

M	S	M	F	5	A	Z	
		(1)	(2)	(3)	(4)	(5)	
① Type				② Series			
Symbol				Symbol			
MSM				Series name			
Low inertia				F			
MQM				A6 Family			
MDM							
MGM							
MHM							
High inertia							
③ Motor rated output							
Symbol		Rated output		Symbol		Rated output	
5A		50 W		13		1.3 kW	
01		100 W		15		1.5 kW	
02		200 W		18		1.8 kW	
04		400 W		20		2.0 kW	
08		750 W		24		2.4 kW	
09		0.85 kW, (130 mm sq.)		29		2.9 kW	
10		1000 W (80 mm sq.)		30		3.0 kW	
				40		4.0 kW	

④ Voltage specifications		⑥ Design order	
Symbol	Specifications	Symbol	Specifications
1	100 V	1	Standard
2	200 V		
Z	100 V/200 V common (50 W only)		

<Note>

When using a rotary encoder as an incrementer, select the standard design.

⑥ Design order

tal system (not using multi-turn data), do not

<Note>
When using a rotary encoder as an incremental system (not using multi-turn data), do not connect a battery for absolute encoder.

⑤ Rotary encoder specification

Symbol	Format	Pulse counts	Resolution	Wires
L	Absolute	23-bit	8388608	7

⑦ Motor specifications: IP67^{*2} 100 mm sq. to 220 mm sq.
MSMF, MHMF, MDMF, MGMF

Symbol	Shaft		Holding brake		Oil seal		Encoder terminal	
	Round	Key-way	without	with	with	With protective lip	Connector JN2 (Small size)	Connector JL10 (Large size) ¹³
C 5	●		●		●		●	
C 6	●		●		●			●
C 7	●		●			●	●	
C 8	●		●			●		●
D 5	●			●	●		●	
D 6	●			●	●			●
D 7	●			●		●	●	
D 8	●			●		●		●
G 5		●	●		●		●	
G 6		●	●		●			●
G 7		●	●			●	●	
G 8		●	●			●		●
H 5		●		●	●		●	
H 6		●		●	●			●
H 7		●		●		●	●	
H 8		●		●		●		●

*1 Connector type: IP67, Lead wire type: IP65 *2 22.0 kW: IP44

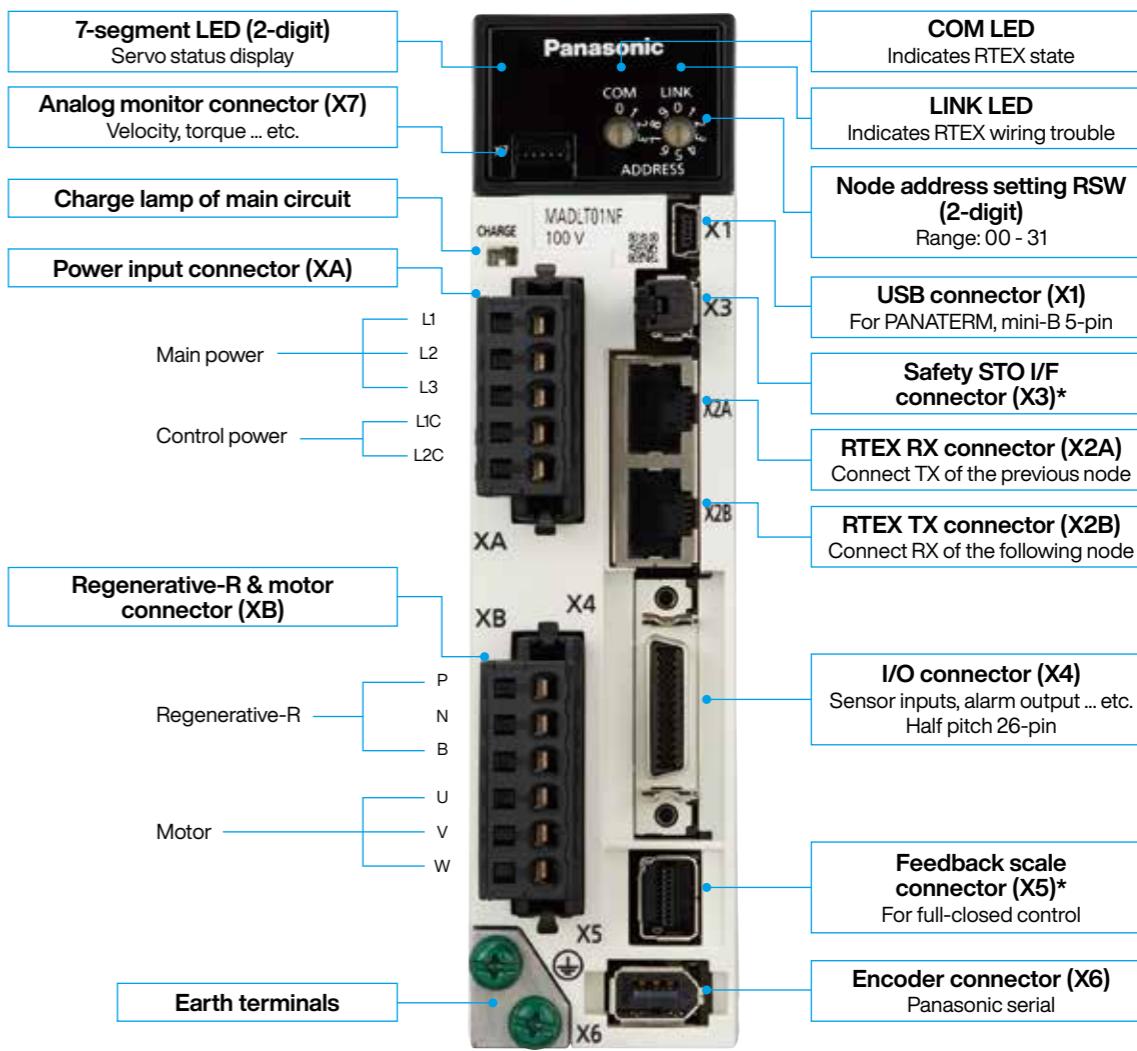
*3 Connector on the motor side encoder. (Also applicable to screwed type.)

Servo Driver

M	A	D	L	N	1	5	N	E										
①	②	③	④	⑤	⑥	⑦												
① Frame symbol					④ Max. current rating													
<table border="1"> <tr><td>Symbol</td><td>Frame</td></tr> <tr><td>MAD</td><td>A-Frame</td></tr> <tr><td>MBD</td><td>B-Frame</td></tr> <tr><td>MCD</td><td>C-Frame</td></tr> <tr><td>MDD</td><td>D-Frame</td></tr> </table>					Symbol	Frame	MAD	A-Frame	MBD	B-Frame	MCD	C-Frame	MDD	D-Frame	Symbol	Current rating	Symbol	Current rating
Symbol	Frame																	
MAD	A-Frame																	
MBD	B-Frame																	
MCD	C-Frame																	
MDD	D-Frame																	
<table border="1"> <tr><td>Symbol</td><td>Frame</td></tr> <tr><td>MED</td><td>E-Frame</td></tr> <tr><td>MFD</td><td>F-Frame</td></tr> <tr><td>MGD</td><td>G-Frame</td></tr> <tr><td>MHD</td><td>H-Frame</td></tr> </table>					Symbol	Frame	MED	E-Frame	MFD	F-Frame	MGD	G-Frame	MHD	H-Frame	0	6 A	9	80 A
Symbol	Frame																	
MED	E-Frame																	
MFD	F-Frame																	
MGD	G-Frame																	
MHD	H-Frame																	
					1	8 A	A	100 A										
					2	12 A	B	120 A										
					3	22 A	C	160 A										
					4	24 A	E	240 A										
					5	40 A	F	360 A										
					8	60 A												
② Series					⑤ Supply voltage specifications													
Symbol	Series name																	
L	A6 Family																	
③ Safety Function *4					Specifications													
Symbol	Specifications				1	Single phase 100 V												
N	without the safety function				3	3-phase 200 V												
T	with the safety function				5	Single/3-phase 200 V												

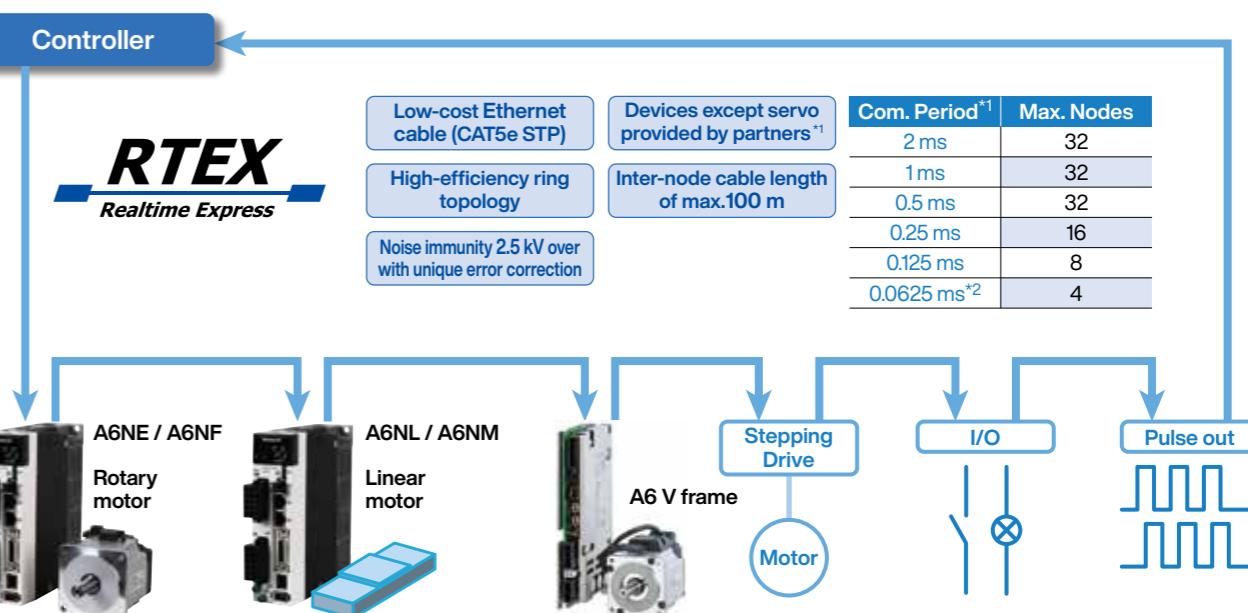
*4 Standard type (with a part number ending in E or L) has no safety function. Multi-function type (with a part number ending in F or M) has a safety function.

Appearance



* The photo is A6NF series. There are no X3 and X5 connectors in the A6NE series.

Typical system configuration



*1: The communication period and connection of slave devices depend on the controller specification.
*2: For communication period 0.0625 ms, command update period is 0.125 ms only.

● 80 mm sq. or less 50 W to 1000 W MSMF, MQMF, MHMF Leadwire type IP65

Motor		Driver		Power capacity (at rated load)			
Motor series		Power supply	Output (W)	Part No.	A6N series Part No.	Dimension Frame	
MSMF (Leadwire type) 3000 r/min Low inertia		Single phase 100 V	50	MSMF5AZL1 □ 2	MADL★01N★	A-frame	Approx. 0.4 kVA
			100	MSMF011L1 □ 2	MADL★11N★		
			200	MSMF021L1 □ 2	MBDL★21N★	B-frame	Approx. 0.5 kVA
			400	MSMF041L1 □ 2	MCDL★31N★	C-frame	Approx. 0.9 kVA
		Single phase/ 3-phase 200 V	50	MSMF5AZL1 □ 2*	MADL★05N★	A-frame	Approx. 0.5 kVA
			100	MSMF012L1 □ 2*			
			200	MSMF022L1 □ 2*	MADL★15N★		
			400	MSMF042L1 □ 2*	MBDL★25N★	B-frame	Approx. 0.9 kVA
			750	MSMF082L1 □ 2*	MCDL★35N★	C-frame	Approx. 1.8 kVA
			1000	MSMF092L1 □ 2*	MDDL★45N★	D-frame	Approx. 2.4 kVA
MQMF (Leadwire type) 3000 r/min Middle inertia Flat type		Single phase 100 V	100	MQMF011L1 □□	MADL★11N★	A-frame	Approx. 0.4 kVA
			200	MQMF021L1 □□	MBDL★21N★	B-frame	Approx. 0.5 kVA
			400	MQMF041L1 □□	MCDL★31N★	C-frame	Approx. 0.9 kVA
		Single phase/ 3-phase 200 V	100	MQMF012L1 □□*	MADL★05N★	A-frame	Approx. 0.5 kVA
			200	MQMF022L1 □□*	MADL★15N★		
			400	MQMF042L1 □□*	MBDL★25N★	B-frame	Approx. 0.9 kVA
MHMF (Leadwire type) 3000 r/min High inertia		Single phase 100 V	50	MHMF5AZL1 □□	MADL★01N★	A-frame	Approx. 0.4 kVA
			100	MHMF011L1 □□	MADL★11N★		
			200	MHMF021L1 □□	MBDL★21N★	B-frame	Approx. 0.5 kVA
			400	MHMF041L1 □□	MCDL★31N★	C-frame	Approx. 0.9 kVA
		Single phase/ 3-phase 200 V	50	MHMF5AZL1 □□*	MADL★05N★	A-frame	Approx. 0.5 kVA
			100	MHMF012L1 □□*			
			200	MHMF022L1 □□*	MADL★15N★		
			400	MHMF042L1 □□*	MBDL★25N★	B-frame	Approx. 0.9 kVA
			750	MHMF082L1 □□*	MCDL★35N★	C-frame	Approx. 1.8 kVA
			1000	MHMF092L1 □□*	MDDL★55N★	D-frame	Approx. 2.4 kVA

□ ★ * : For more information, refer to "Model Designation" on P.353.

● 80 mm sq. or less 50 W to 1000 W MSMF, MQMF, MHMF Connector type IP67

Motor		Driver		Power capacity (at rated load)			
Motor series		Power supply	Output (W)	Part No.	A6N series Part No.	Dimension Frame	
MSMF (Connector type) 3000 r/min Low inertia		Single phase 100 V	50	MSMF5AZL1 □ 1	MADL★01N★	A-frame	Approx. 0.4 kVA
			100	MSMF011L1 □ 1	MADL★11N★		
			200	MSMF021L1 □ 1	MBDL★21N★	B-frame	Approx. 0.5 kVA
			400	MSMF041L1 □ 1	MCDL★31N★	C-frame	Approx. 0.9 kVA
		Single phase/ 3-phase 200 V	50	MSMF5AZL1 □ 1	MADL★05N★	A-frame	Approx. 0.5 kVA
			100	MSMF012L1 □ 1			
			200	MSMF022L1 □ 1	MADL★15N★		
			400	MSMF042L1 □ 1	MBDL★25N★	B-frame	Approx. 0.9 kVA
			750	MSMF082L1 □ 1	MCDL★35N★	C-frame	Approx. 1.8 kVA
			1000	MSMF092L1 □ 1	MDDL★45N★	D-frame	Approx. 2.4 kVA
MQMF (Connector type) 3000 r/min Middle inertia Flat type		Single phase 100 V	100	MQMF011L1 □□	MADL★11N★	A-frame	Approx. 0.4 kVA
			200	MQMF021L1 □□	MBDL★21N★	B-frame	Approx. 0.5 kVA
			400	MQMF041L1 □□	MCDL★31N★	C-frame	Approx. 0.9 kVA
		Single phase/ 3-phase 200 V	100	MQMF012L1 □□*	MADL★05N★	A-frame	Approx. 0.5 kVA
			200	MQMF022L1 □□*	MADL★15N★		
			400	MQMF042L1 □□*	MBDL★25N★	B-frame	Approx. 0.9 kVA
			1000	MQMF092L1 □□	MDDL★55N★	D-frame	Approx. 2.4 kVA
MHMF (Connector type) 3000 r/min High inertia		Single phase 100 V	50	MHMF5AZL1 □□	MADL★01N★	A-frame	Approx. 0.4 kVA
			100	MHMF011L1 □□	MADL★11N★		
			200	MHMF021L1 □□	MBDL★21N★	B-frame	Approx. 0.5 kVA
			400	MHMF041L1 □□	MCDL★31N★	C-frame	Approx. 0.9 kVA
		Single phase/ 3-phase 200 V	50	MHMF5AZL1 □□*	MADL★05N★	A-frame	Approx. 0.5 kVA
			100	MHMF012L1 □□*			
			200	MHMF022L1 □□*	MADL★15N★		
			400	MHMF042L1 □□*	MBDL★25N★	B-frame	Approx. 0.9 kVA
			750	MHMF082L1 □□*	MCDL★35N★	C-frame	Approx. 1.8 kVA
			1000	MHMF092L1 □□*	MDDL★55N★	D-frame	Approx. 2.4 kVA

□ ★ : For more information, refer to "Model Designation" on P.353.

● 100 mm sq. or more 0.85 kW to 5.0 kW MSMF, MDMF, MGMF, MHMF
Encoder connector (Large size JL10)^{*1} type IP67

Motor				Driver		Power capacity (at rated load)	
Motor series	Power supply	Output (W)	Part No.	A6N series Part No.	Dimension Frame		
MSMF (Large size JL10 type) 3000 r/min Low inertia IP67	Single phase/ 3-phase 200 V	1000	MSMF102L1 □□*	MDDL★55N☆	D-frame	Approx. 2.9 kVA	
		1500	MSMF152L1 □□*		E-frame	Approx. 3.8 kVA	
		2000	MSMF202L1 □□*	MEDL★83N☆	F-frame	Approx. 5.2 kVA	
		3000	MSMF302L1 □□*			Approx. 7.8 kVA	
		4000	MSMF402L1 □□*				
	3-phase 200 V	5000	MSMF502L1 □□*	MFDL★B3N☆			
		1000	MDMF102L1 □□*				
		1500	MDMF152L1 □□*				
		2000	MDMF202L1 □□*				
		3000	MDMF302L1 □□*				
MDMF (Large size JL10 type) 2000 r/min Middle inertia IP67	Single phase/ 3-phase 200 V	4000	MDMF402L1 □□*				
		5000	MDMF502L1 □□*				
	3-phase 200 V	1000	MGMF092L1 □□*	MDDL★45N☆	D-frame	Approx. 2.4 kVA	
		1300	MGMF132L1 □□*		E-frame	Approx. 2.9 kVA	
		1800	MGMF182L1 □□*	MEDL★83N☆	F-frame	Approx. 3.8 kVA	
		2400	MGMF242L1 □□*			Approx. 4.5 kVA	
		2900	MGMF292L1 □□*			Approx. 7.8 kVA	
	3-phase 200 V	4400	MGMF442L1 □□*	MFDL★B3N☆			
		1000	MHMF102L1 □□*				
		1500	MHMF152L1 □□*				
		2000	MHMF202L1 □□*				
		3000	MHMF302L1 □□*				
MHMF (Large size JL10 type) 2000 r/min High inertia IP67	Single phase/ 3-phase 200 V	4000	MHMF402L1 □□*				
		5000	MHMF502L1 □□*				
	3-phase 200 V	1000	MHMF102L1 □□*	MDDL★45N☆	D-frame	Approx. 2.4 kVA	
		1500	MHMF152L1 □□*		E-frame	Approx. 2.9 kVA	
		2000	MHMF202L1 □□*	MEDL★83N☆	F-frame	Approx. 3.8 kVA	
		3000	MHMF302L1 □□*			Approx. 5.2 kVA	
		4000	MHMF402L1 □□*			Approx. 7.8 kVA	
	3-phase 200 V	5000	MHMF502L1 □□*	MFDL★B3N☆			

□ ☆ * : For more information, refer to "Model Designation" on P.353.

● 100 mm sq. or more 0.85 kW to 5.0 kW MSMF, MDMF, MGMF, MHMF
Encoder connector (Small size JN2)^{*2} type IP67

Motor				Driver		Power capacity (at rated load)	
Motor series	Power supply	Output (W)	Part No.	A6N series Part No.	Dimension Frame		
MSMF (Small size JN2 type) 3000 r/min Low inertia IP67	Single phase/ 3-phase 200 V	1000	MSMF102L1 □□	MDDL★55N☆	D-frame	Approx. 2.9 kVA	
		1500	MSMF152L1 □□		E-frame	Approx. 3.8 kVA	
		2000	MSMF202L1 □□	MEDL★83N☆	F-frame	Approx. 5.2 kVA	
		3000	MSMF302L1 □□			Approx. 7.8 kVA	
		4000	MSMF402L1 □□				
	3-phase 200 V	5000	MSMF502L1 □□	MFDL★B3N☆			
		1000	MDMF102L1 □□				
		1500	MDMF152L1 □□				
		2000	MDMF202L1 □□				
		3000	MDMF302L1 □□				
MDMF (Small size JN2 type) 2000 r/min Middle inertia IP67	Single phase/ 3-phase 200 V	4000	MDMF402L1 □□				
		5000	MDMF502L1 □□				
	3-phase 200 V	1000	MGMF092L1 □□	MDDL★45N☆	D-frame	Approx. 2.4 kVA	
		1300	MGMF132L1 □□		E-frame	Approx. 2.9 kVA	
		1800	MGMF182L1 □□	MEDL★83N☆	F-frame	Approx. 3.8 kVA	
		2400	MGMF242L1 □□			Approx. 4.5 kVA	
		2900	MGMF292L1 □□			Approx. 7.8 kVA	
	3-phase 200 V	4400	MGMF442L1 □□	MFDL★B3N☆			
		1000	MHMF102L1 □□				
		1500	MHMF152L1 □□				
		2000	MHMF202L1 □□				
		3000	MHMF302L1 □□				
MHMF (Small size JN2 type) 2000 r/min High inertia IP67	Single phase/ 3-phase 200 V	4000	MHMF402L1 □□	MDDL★45N☆	D-frame	Approx. 2.4 kVA	
		5000	MHMF502L1 □□		E-frame	Approx. 2.9 kVA	
		1000	MHMF102L1 □□	MEDL★83N☆	F-frame	Approx. 3.8 kVA	
		1500	MHMF152L1 □□			Approx. 5.2 kVA	
		2000	MHMF202L1 □□			Approx. 7.8 kVA	
	3-phase 200 V	3000	MHMF302L1 □□	MFDL★B3N☆			
		4000	MHMF402L1 □□				
		5000	MHMF502L1 □□				

□ ☆ * : For more information, refer to "Model Designation" on P.353.

● 176 mm sq. or more 5.5 kW or more MDMF, MGMF, MHMF
Encoder connector (Large size JL10)^{*1} type IP67

Motor				Driver		Power capacity (at rated load)
Motor series	Power supply	Output (W)	Part No.	A6N series Part No.	Dimension Frame	
MDMF (Large size JL10 type) 1500 r/min Middle inertia IP67 ³	3-phase 200 V	7500	MDMF752L1 □ 6*	MGDLTC3NF	G-frame	Approx. 11 kVA
		11000	MDMFC12L1 □ 6		H-frame	Approx. 15 kVA
		15000	MDMFC52L1 □ 6			Approx. 20 kVA
		22000 ³	MDMFD22L1 □ 6			Approx. 28 kVA
MGMF (Large size JL10 type) [Low speed/ High torque type] 1500 r/min Middle inertia IP67	3-phase 200 V	5500	MGMF552L1 □ 6*	MGDLTC3NF	G-frame	Approx. 8.5 kVA
		7500	MHMF752L1 □ 6*			

□ ☆ * : For more information, refer to "Model Designation" on P.353.

● 176 mm sq. or more 5.5 kW or more MDMF, MGMF, MHMF
Encoder connector (Small size JN2)^{*2} type IP67

Motor			
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Input power	100 V	Main circuit	Single phase 100 V $\frac{+10\%}{-15\%}$ to 120 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
		Control circuit	Single phase 100 V $\frac{+10\%}{-15\%}$ to 120 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
	200 V	Main circuit A-frame to D-frame	Single/3-phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
		E-frame to H-frame	3-phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
		Control circuit A-frame to D-frame	Single phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
		E-frame to H-frame	Single phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
	Environment	temperature	Ambient temperature: 0 °C to 55 °C (free from freezing) Storage temperature: -20 °C to 65 °C (Max.temperature guarantee: 80 °C for 72 hours free from condensation*)
		humidity	Both operating and storage : 20 %RH to 85 %RH (free from condensation*)
		Altitude	Lower than 1000 m
		Vibration	5.88 m/s ² or less, 10 Hz to 60 Hz
Basic Specifications	Control method		IGBT PWM Sinusoidal wave drive
	Encoder feedback		23-bit (8388608 resolution) absolute encoder, 7-wire serial * When using it as an incremental system (not using multi-turn data), do not connect the battery for absolute encoder. Parameter Pr. 0.15 must be set to "1" (factory settings).
	External scale feedback		A/B phase, homing signal differential input. Serial communication is also supported. Manufacturers that support serial communication scale: Fagor Automation S.Coop., HEIDENHAIN, Magnescale Co., Ltd., Mitutoyo Corporation Nidec Sankyo Corporation, Renishaw plc
	Interface connector	Control signal Input	Each 8 input can be assigned by the parameter.
		Output	Each 3 output can be assigned by the parameter.
		Analog signal	Output 2 outputs for analog monitors 1 and 2
		Pulse signal	Output Line driver output for encoder pulses (A/B phase signal) or external scale pulses.
	Communication	Realtime Express (RTEX)	Communication for transmission of a real-time operation command, the parameter setting, or the status monitoring.
		USB	USB interface to connect to computers (setup support software PANATERM) for parameter setting or status monitoring.
	Safety terminal		Terminal to support safety function.
	Front panel		(1) 7 segment LED (double digits) (2) Network status LED(LINK,COM) (3) Rotary switch for node address setting (4) Analog monitor output(Analog monitors 1 and 2)
	Regeneration		Size A, B, G and H: Without built-in regenerative resistor (use external resistor) Size C to F: Built-in regenerative resistor (External regenerative resistor is also available)
	Dynamic brake		A to G frame: built-in H frame: External resistor only
	Control mode		(1) Semi-closed control Position control: Profile position control (PP), Cyclic position control (CP) Velocity control: Cyclic velocity control (CV) Torque control: Cyclic torque control (CT) (2) Full-closed control Position control: Profile position control (PP), Cyclic position control (CP) • The two modes, [1] and [2] above are switched by parameters. • Switch PP/CP/CV/CT mode according to the RTEX communication command.

*1 Air containing water vapor will become saturated with water vapor as the temperature falls, causing dew.

Position control	Control input	Positive direction drive inhibit input, Negative direction drive inhibit, Latch signal, Near home position, etc
	Control output	Positioning completion etc.
	Position command input	Command type by RTEX command
	Smoothing filter	Either a primary delay filter or a FIR type filter can be selected against command input.
	Damping control	Available (Up to 3 frequency settings,out of 4 settings in total,can be used simultaneously.)
	Model type damping filter	Available (2 filter available used simultaneously)
	Feed forward function	Available (speed/torque)
	Load variation suppression control	Available
	Gain 3 switching function	Available
	Quadrant glitch inhibit function	Available
Speed control	Two-degree-of-freedom control mode	Available
	Motor operable setup function	Available
	External scale position information monitor	Available
	Other available functions	Friction torque compensation, Torque limit switching function, Torque saturation protection function, Single-turn absolute function, Continuous rotating absolute encoder function
	Control input	Positive direction drive inhibit input , Negative direction drive inhibit, Latch signal, etc
	Control output	At speed etc.
	Position command input	Command type by RTEX command
	Input mode	0 s to 10 s / 1000 r/min Acceleration and deceleration can be set separately. S-curve acceleration/deceleration is also available.
	Soft start/slowdown function	Available (torque)
	Feed forward function	Available
Torque control	Load variation suppression control	Available
	Two-degree-of-freedom control mode	Available (standard type)
	External scale position information monitor	Available
	Other available functions	Friction torque compensation, Torque limit switching function, Torque saturation protection function, Single-turn absolute function, Continuous rotating absolute encoder function
	Control input	Positive direction drive inhibit input, Negative direction drive inhibit, Latch signal, etc
	Control output	At speed etc.
	Position command input	Command type by RTEX command
	Input mode	Speed limit value can be set by parameter. (Switched by RTEX command.)
	Speed limit function	Available
	External scale position information monitor	Single-turn absolute function Continuous rotating absolute encoder function
Full-closed control	Other available functions	Setting range of external scale division/multiplication.
	Control input	Positive direction drive inhibit input , Negative direction drive inhibit, Latch signal, Near home position , etc
	Control output	Positioning completion etc.
	Position command input	Command type by RTEX command
	Smoothing filter	Either a primary delay filter or a FIR type filter can be selected against command input.
	Setting range of external scale division/multiplication.	1/40 times to 125200 times Although the ratio of the encoder pulse (numerator) and external scale pulse (denominator) can be set anywhere between the range of 1 to 2^{32} for the numerator and 1 to 2^{32} for the denominator, Please use within the range indicated above.
	Damping control	Available(Up to 3 frequency settings,out of 4 settings in total,can be used simultaneously.)
	Feed forward function	Available (speed/torque)
	Load variation suppression control	Available
	Gain 3 switching function	Available
Common	Hybrid vibration suppression function	Available
	Quadrant glitch inhibit function	Available
	Two-degree-of-freedom control mode	Available (standard type)
	Motor operable setup function	Available
	External scale position information monitor	Available
	Other available functions	Friction torque compensation, Torque limit switching function, Torque saturation protection function
	Electronic gear ratio setting	Applicable scaling ratio: 1/1000 to 8000 Although any value of 1 to 2^{30} (numerator) and any value of 1 to 2^{30} (denominator) can be used, resulting value should be within the range shown above.
	Auto tuning	Identifies the load inertia real-time and automatically sets up the gain that meets the stiffness setting when the motor is running with upper and internal operation commands.
	Notch filter	Available (5 filters available)
	Gain switching function	Available
Information	2-step torque filter	Available
	Position comparison output function	Available
	Protective function	Over-voltage, under-voltage, over-speed, over-load, over-heat, over-current, encoder error, excess position deviation, EEPROM error etc.
	Alarm data trace back function	Tracing back of alarm data is available
	Deterioration diagnosis function	Available
	Special Order Product	
	E Series	
	AGB Series	
	A6 Series	
	AGN Series	
	A6N Series	

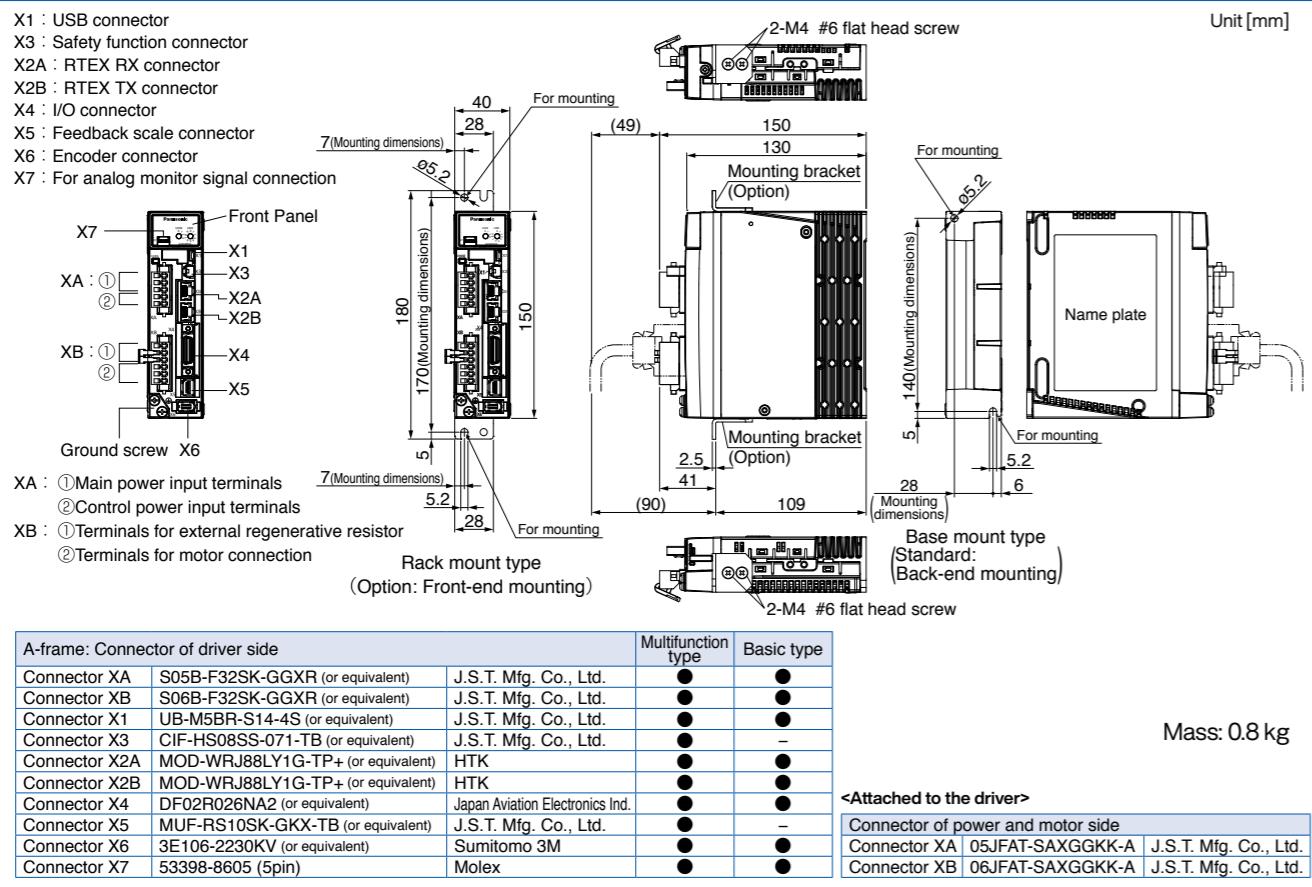
Input power	100 V	Main circuit	Single phase 100 V $\frac{+10\%}{-15\%}$ to 120 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
		Control circuit	Single phase 100 V $\frac{+10\%}{-15\%}$ to 120 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
	200 V	Main circuit A-frame to D-frame	Single/3-phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
		E-frame, F-frame	3-phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
	Control circuit A-frame to D-frame	Single phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz	
		E-frame, F-frame	Single phase 200 V $\frac{+10\%}{-15\%}$ to 240 V $\frac{+10\%}{-15\%}$ 50 Hz / 60 Hz
	temperature		Ambient temperature: 0 °C to 55 °C (free from freezing) Storage temperature: -20 °C to 65 °C (Max.temperature guarantee: 80 °C for 72 hours free from condensation*)
	humidity		Both operating and storage : 20 %RH to 85 %RH (free from condensation*)
	Altitude		Lower than 1000 m
	Vibration		5.88 m/s ² or less, 10 Hz to 60 Hz
Basic Specifications	Control method		IGBT PWM Sinusoidal wave drive
	Encoder feedback		23-bit (8388608 resolution) absolute encoder, 7-wire serial * When using it as an incremental system (not using multi-turn data), do not connect the battery for absolute encoder. Parameter Pr. 0.15 must be set to "1" (factory settings).
	Interface connector	Control signal Input	Each 8 input can be assigned by the parameter.
			Each 3 output can be assigned by the parameter.
		Analog signal Output	2 outputs for analog monitors 1 and 2
		Pulse signal Output	Line driver output for encoder pulses (A/B phase signal).
	Communication	Realtime Express (RTEX)	Communication for transmission of a real-time operation command, the parameter setting, or the status monitoring.
		USB	USB interface to connect to computers (setup support software PANATERM) for parameter setting or status monitoring.
	Front panel		(1) 7 segment LED (double digits) (2) Network status LED(LINK,COM) (3) Rotary switch for node address setting (4) Analog monitor output(Analog monitors 1 and 2)
	Regeneration		Size A and B: Without built-in regenerative resistor (use external resistor) Size C to F: Built-in regenerative resistor (External regenerative resistor is also available)
	Dynamic brake		A to F frame: built-in
	Control mode		(1) Semi-closed control Position control: Profile position control (PP), Cyclic position control (CP) Velocity control: Cyclic velocity control (CV) Torque control: Cyclic torque control (CT) • Switch PP/CP/CV/CT mode according to the RTEX communication command.

*1 Air containing water vapor will become saturated with water vapor as the temperature falls, causing dew.

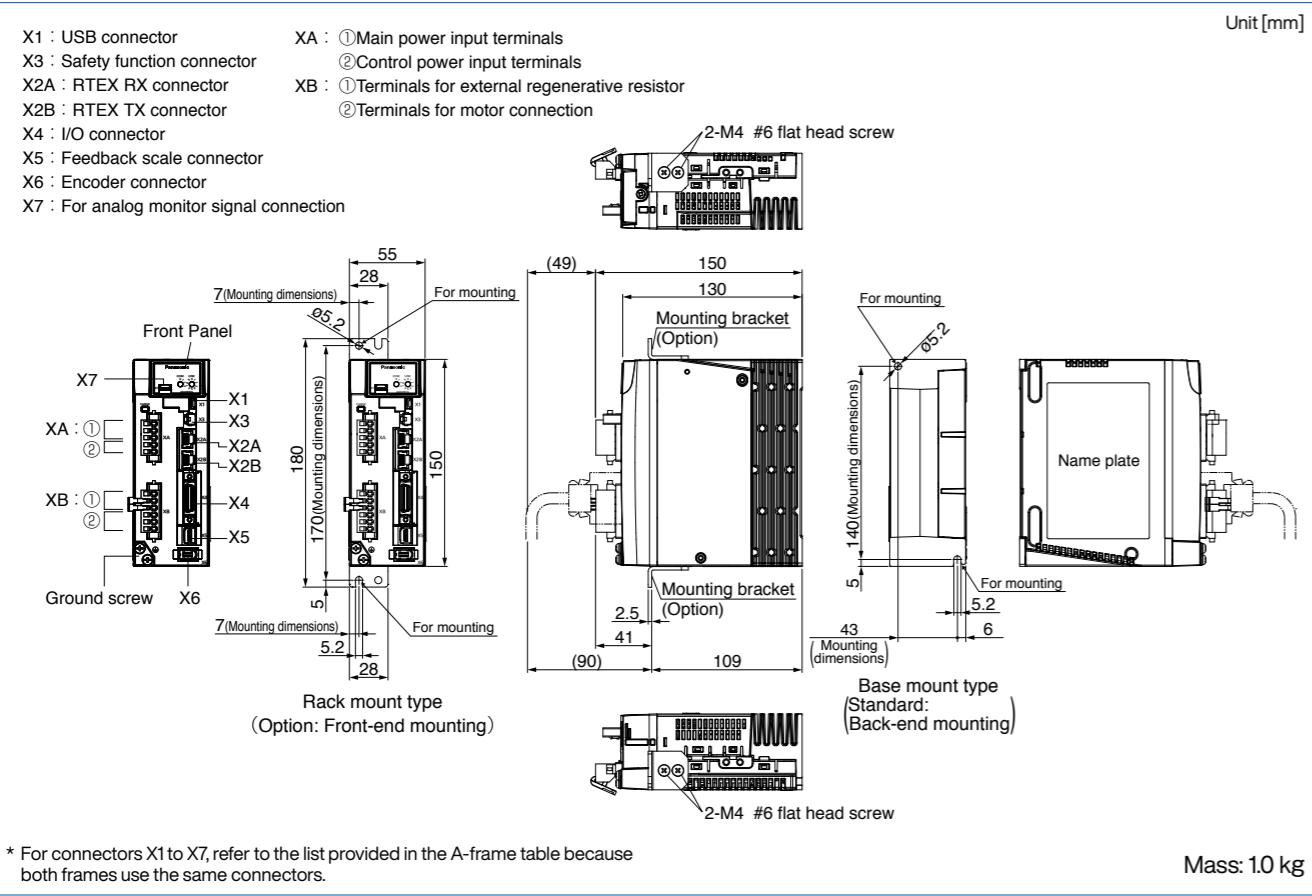
Position control	Control input	Positive direction drive inhibit input, Negative direction drive inhibit, Latch signal, Near home position , etc
	Control output	Positioning completion etc.
	Position command input Input mode	Command type by RTEX command
	Smoothing filter	Either a primary delay filter or a FIR type filter can be selected against command input.
	Damping control	Available(Up to 3 frequency settings,out of 4 settings in total,can be used simultaneously.)
	Model type damping filter	Available(2 filter available used simultaneously)
	Feed forward function	Available (speed/torque)
	Load variation suppression control	Available
	Gain 3 switching function	Available
	Quadrant glitch inhibit function	Available
Speed control	Two-degree-of-freedom control mode	Available
	Motor operable setup function	Available
	Other available functions	Friction torque compensation, Torque limit switching function, Torque saturation protection function, Single-turn absolute function, Continuous rotating absolute encoder function
	Control input	Positive direction drive inhibit input , Negative direction drive inhibit, Latch signal, etc
	Control output	At speed etc.
	Position command input Input mode	Command type by RTEX command
	Soft start/slowdown function	0 s to 10 s / 1000 r/min Acceleration and deceleration can be set separately. S-curve acceleration/deceleration is also available.
	Feed forward function	Available (torque)
	Load variation suppression control	Available
	Two-degree-of-freedom control mode	Available (standard type)
Torque control	Other available functions	Friction torque compensation, Torque limit switching function, Torque saturation protection function, Single-turn absolute function, Continuous rotating absolute encoder function
	Control input	Positive direction drive inhibit input, Negative direction drive inhibit, Latch signal, etc
	Control output	At speed etc.
	Position command input Input mode	Command type by RTEX command
	Speed limit function	Speed limit value can be set by parameter. (Switched by RTEX command.)
	Other available functions	Single-turn absolute function Continuous rotating absolute encoder function
	Electronic gear ratio setting	Applicable scaling ratio: 1/1000 to 8000 Although any value of 1 to 2^{30} (numerator) and any value of 1 to 2^{30} (denominator) can be used,resulting value should be within the range shown above.
	Auto tuning	Identifies the load inertia real-time and automatically sets up the gain that meets the stiffness setting when the motor is running with upper and internal operation commands.
	Notch filter	Available (5 filters available)
	Gain switching function	Available
Common	2-step torque filter	Available
	Position comparison output function	Available
	Protective function	Over-voltage, under-voltage, over-speed, over-load, over-heat, over-current, encoder error, excess position deviation, EEPROM error etc.
	Alarm data trace back function	Tracing back of alarm data is available
	Deterioration diagnosis function	Available

* All dimensions shown in this catalog are for the A6NF series, but outer dimensions are the same as the A6NE series.

A-frame

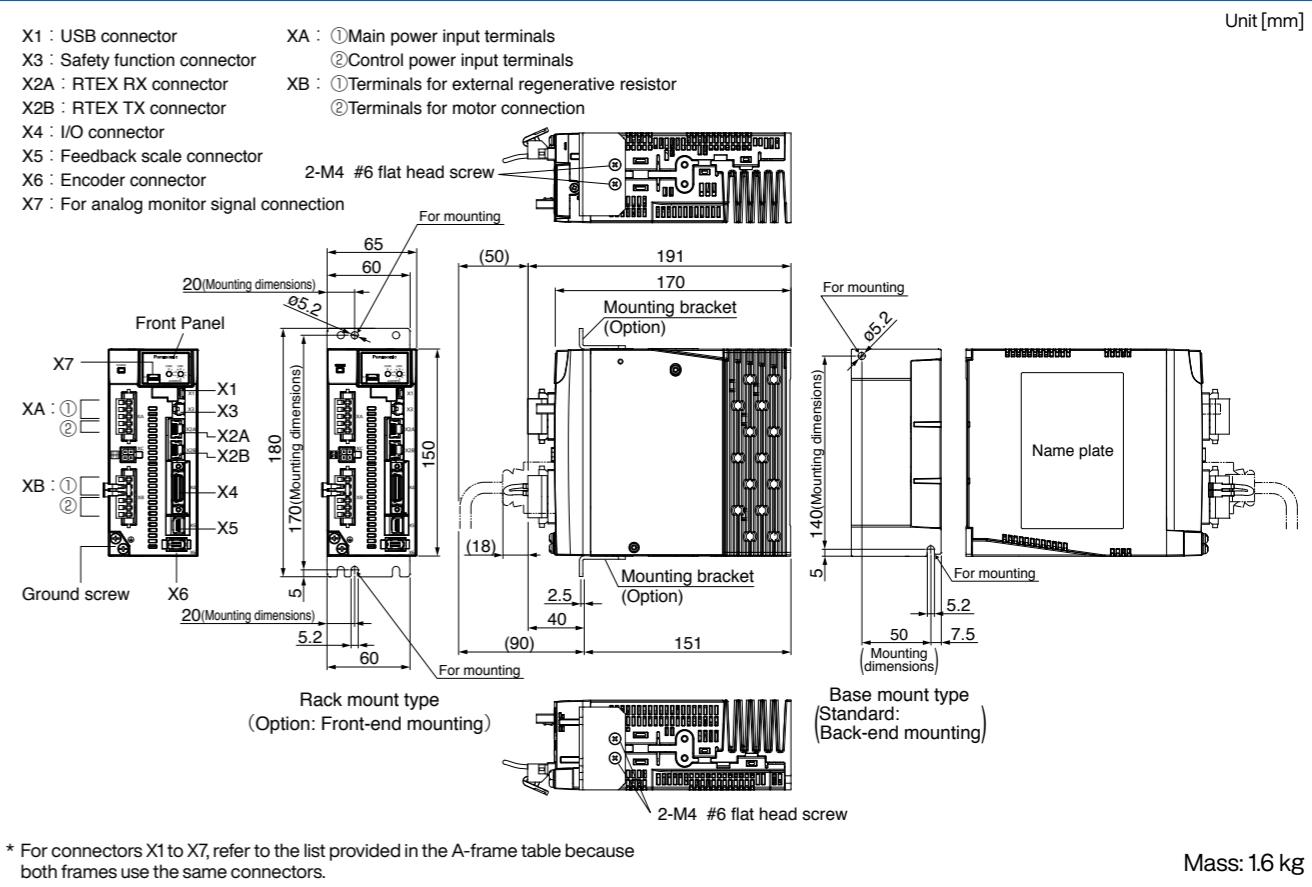


B-frame



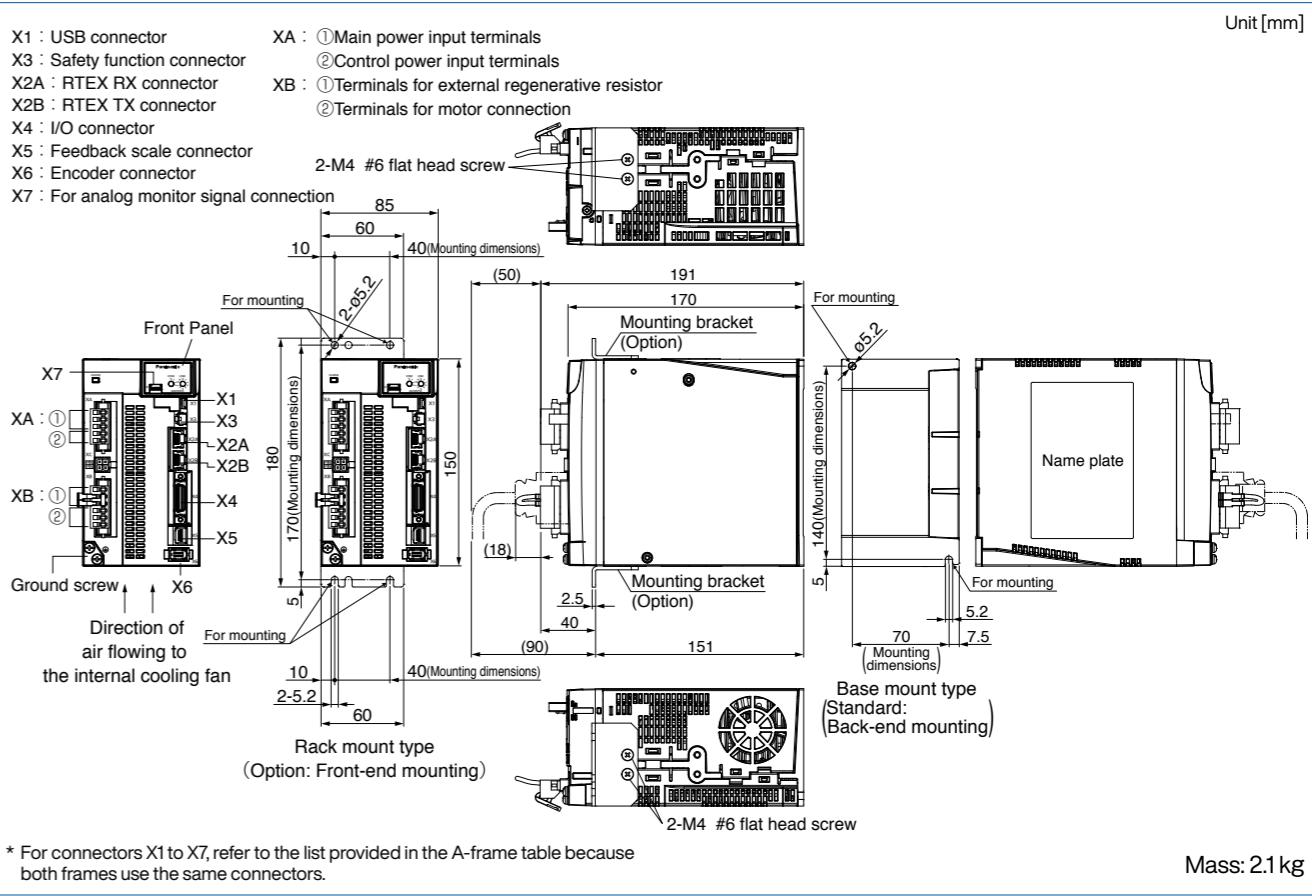
* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

C-frame



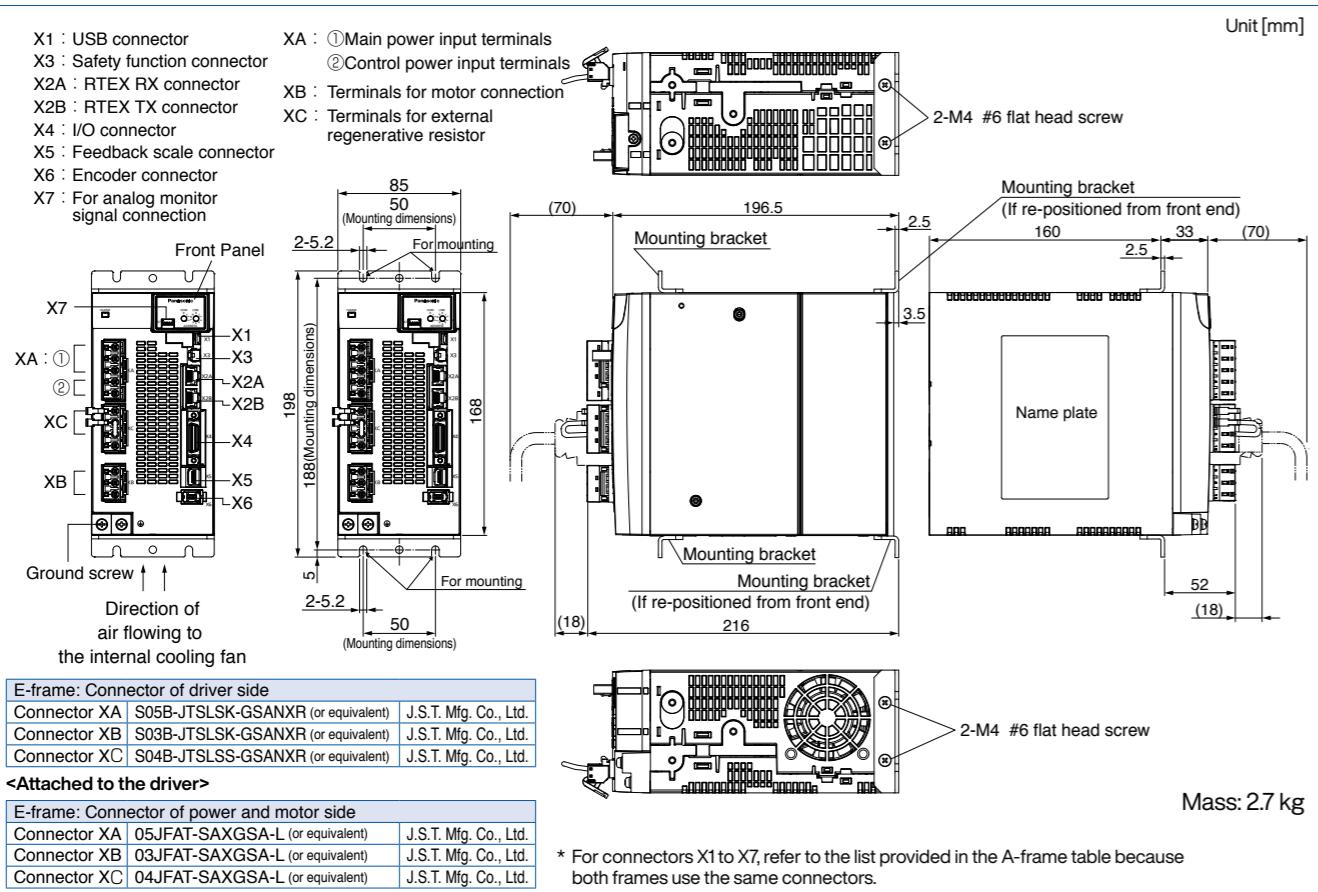
* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

D-frame (200 V)

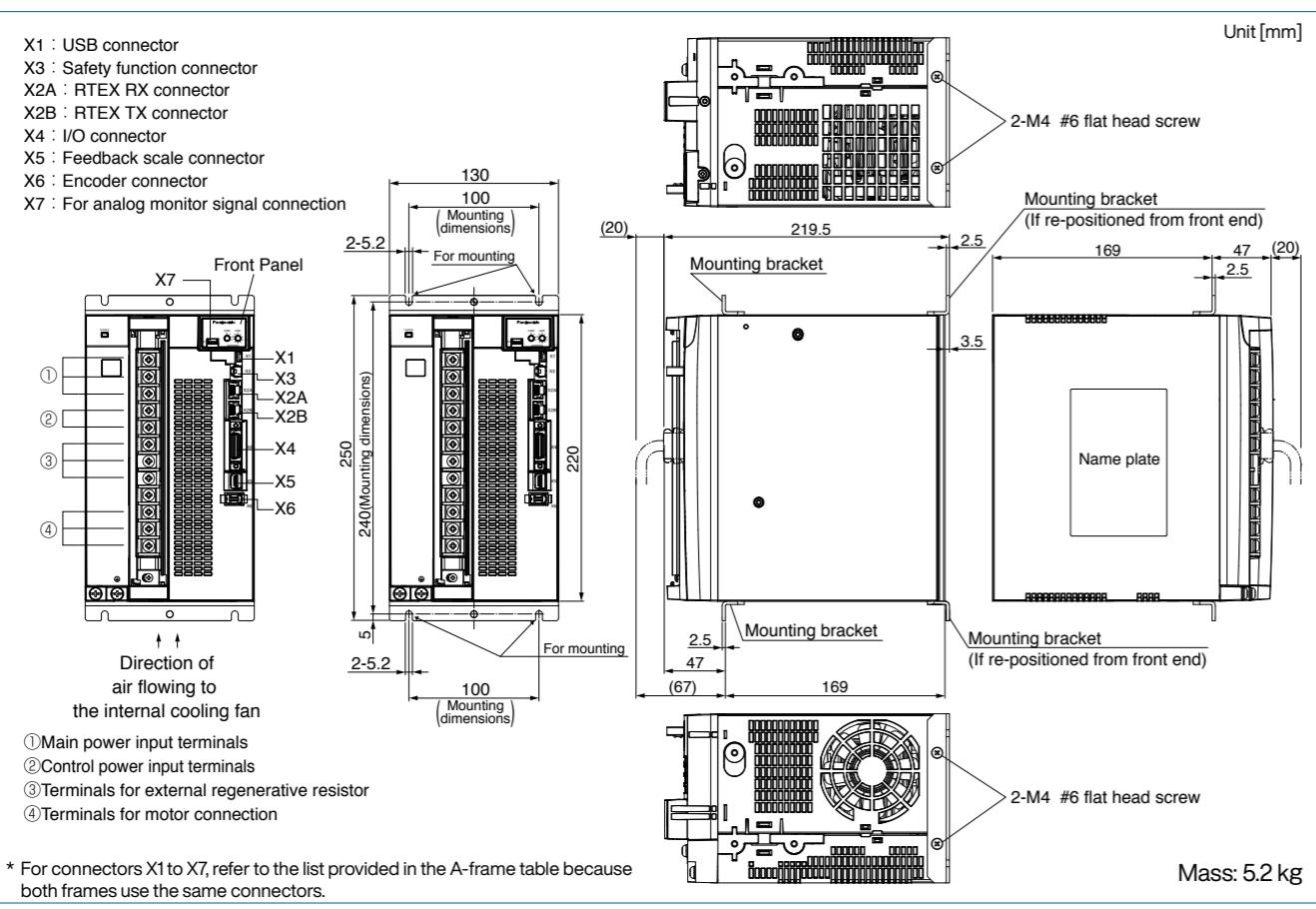


* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

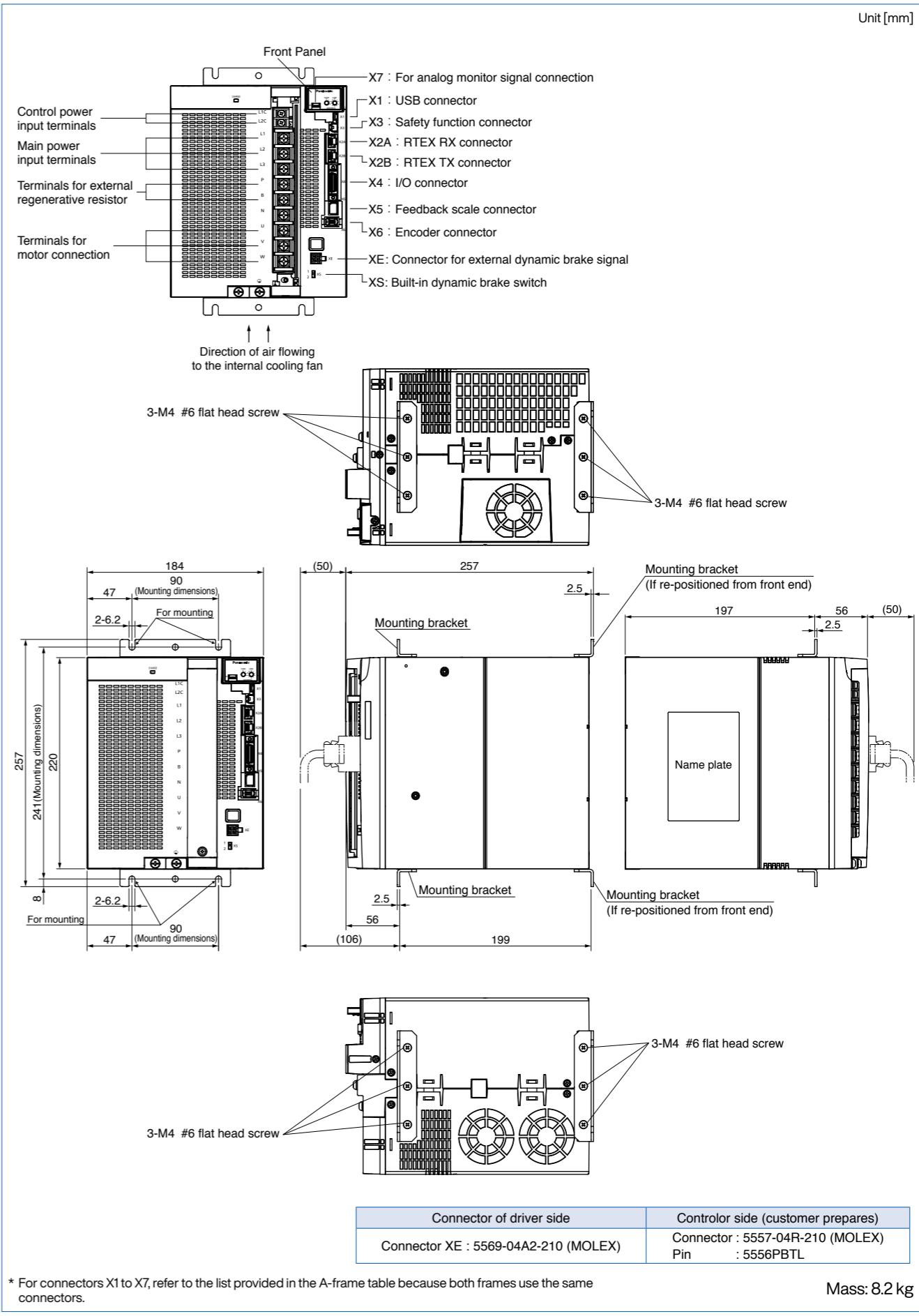
E-frame (200 V)



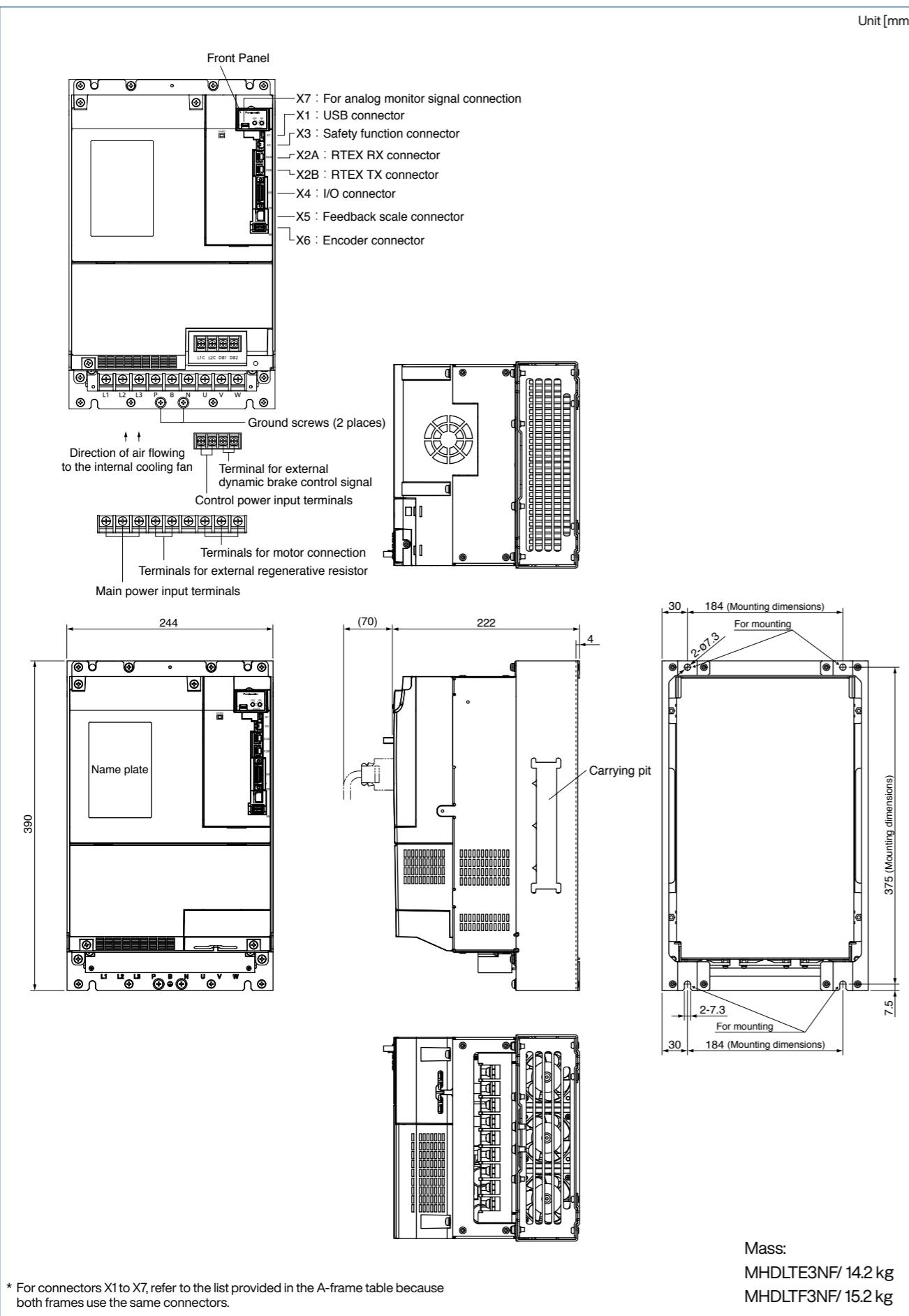
F-frame (200 V)



G-frame (200 V) (A6NE series are not available.)



H-frame (200 V) (A6NE series are not available.)



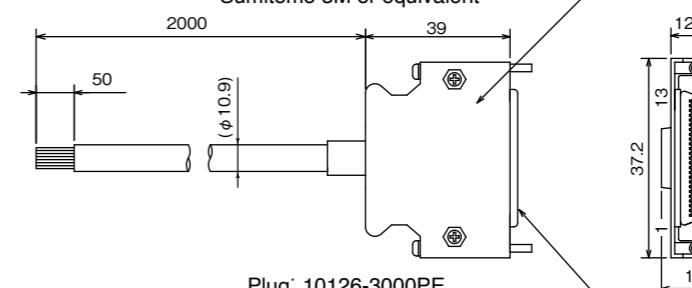
* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

Refer to P.29 to P.42 for other options than the interface cable and interface connector kit.

Cable for Interface

Part No. DVOP0800

Cable length 2 m, core wire AWG 26 is connected.

DimensionsShell kit: 10326-52AO-008
Sumitomo 3M or equivalent

[Unit: mm]

Table for wiring

Pin No.	Signal name	color	Pin No.	Signal name	color	Pin No.	Signal name	color
1*	BRK-OFF+	Orange (Red1)	10*	HOME	Pink (Black1)	19	OB-/OCMP2-	Pink (Red2)
2*	BRK-OFF-	Orange (Black1)	11*	EXT2	Orange (Red2)	20	OB+/OCMP2+	Pink (Black2)
3*	ALM+	Gray (Red1)	12*	EXT3	Orange (Black2)	21	OCMP3+	Orange (Red3)
4*	ALM-	Gray (Black1)	13*	SI-MON4	Gray (Red2)	22	OCMP3-	Gray (Red3)
5*	SI-MON5	White (Red1)	14	BTP-I	Gray (Black2)	23	-	Gray (Black3)
6	I-COM	White (Black1)	15	BTN-I	White (Red2)	24	-	White (Red3)
7*	POT	Yellow (Red1)	16	GND	White (Black2)	25*	EX-OUT1+	White (Black3)
8*	NOT	Yellow (Black1)	17	OA+/OCMP1+	Yellow (Red2)	26*	EX-OUT1-	Orange (Black3)
9*	SI-MON1	Pink (Red1)	18	OA-/OCMP1-	Yellow (Black2)			

The signals allocated to the pin No. with "*" in the table are factory default.

<Remarks>

Color designation of the cable e.g.) Pin-1 Cable color : Orange (Red1) : One red dot on the cable

<Caution>

The shield of this cable is not connected to the terminal of the connector.

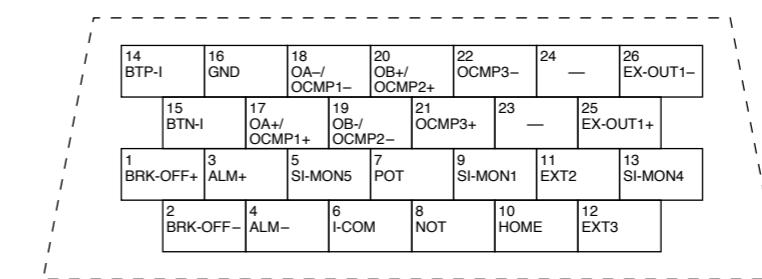
The shielded wire of the cable is connected to the connector shell of the cable, and is connected to the FG via the connector shell on the Driver side. When connecting the shielded wire of the cable to GND, use the connector kit DVOP0770 for the interface. At that time, please note that if you connect the shield and the connector shell on the cable side and process it, FG and GND will be connected.

Connector Kit for Interface

Part No. DVOP0770

Components

Title	Part No.	Number	Manufacturer	Note
Connector	10126-3000PE	1	Sumitomo 3M (or equivalent)	
Connector cover	10326-52AO-008	1		For CN X4 (26-pins)

• Pin disposition: Connector X4 (26 pins) (viewed from the soldering side)**<Remarks>**

- Check the stamped pin-No. on the connector body while making a wiring.
- For the symbols representing the signal names or the functions of the signals in the figure above, refer to the operation manual.

Servo driver with EtherCAT open network



EtherCAT
AC servo motor & driver

MINAS A6B Series Special Order Product



A6BE Series
A6BF Series

Quickly

Response frequency 3200 Hz & communication rate 100 Mbps enable fast and highly accurate operation.

Configurable even for motors with a maximum rotating speed 6500 r/min.*

* MHMF and MQMF types with a maximum wattage 400 W

Wisely

New algorithm "Two-degree-of-freedom control method" is used to improve machining accuracy and productivity.

Easily

Easy and speedy set-up with set-up support software "PANATERM"

● Fully-featured EtherCAT application (7 control modes, 32 origin-return modes, 2 synchronous modes, and an asynchronous mode.) ● Capable of system upgrade with various slaves. ● Capable of establishing PC-based systems without needing dedicated hardware. ● Planned to pass official EtherCAT Conformance Test. ● A6BF with safety I/F^{*2} corresponding to international standard, and A6BL/A6BM supporting linear motors *2 : IEC61800-5-2 STO, IEC61508 SIL3.

● The EtherCAT is a registered trademark of patented technology licensed from Beckhoff Automation GmbH in Germany.

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A6 Series

A6N Series

A6B Series
Special Order Product

E Series

Information

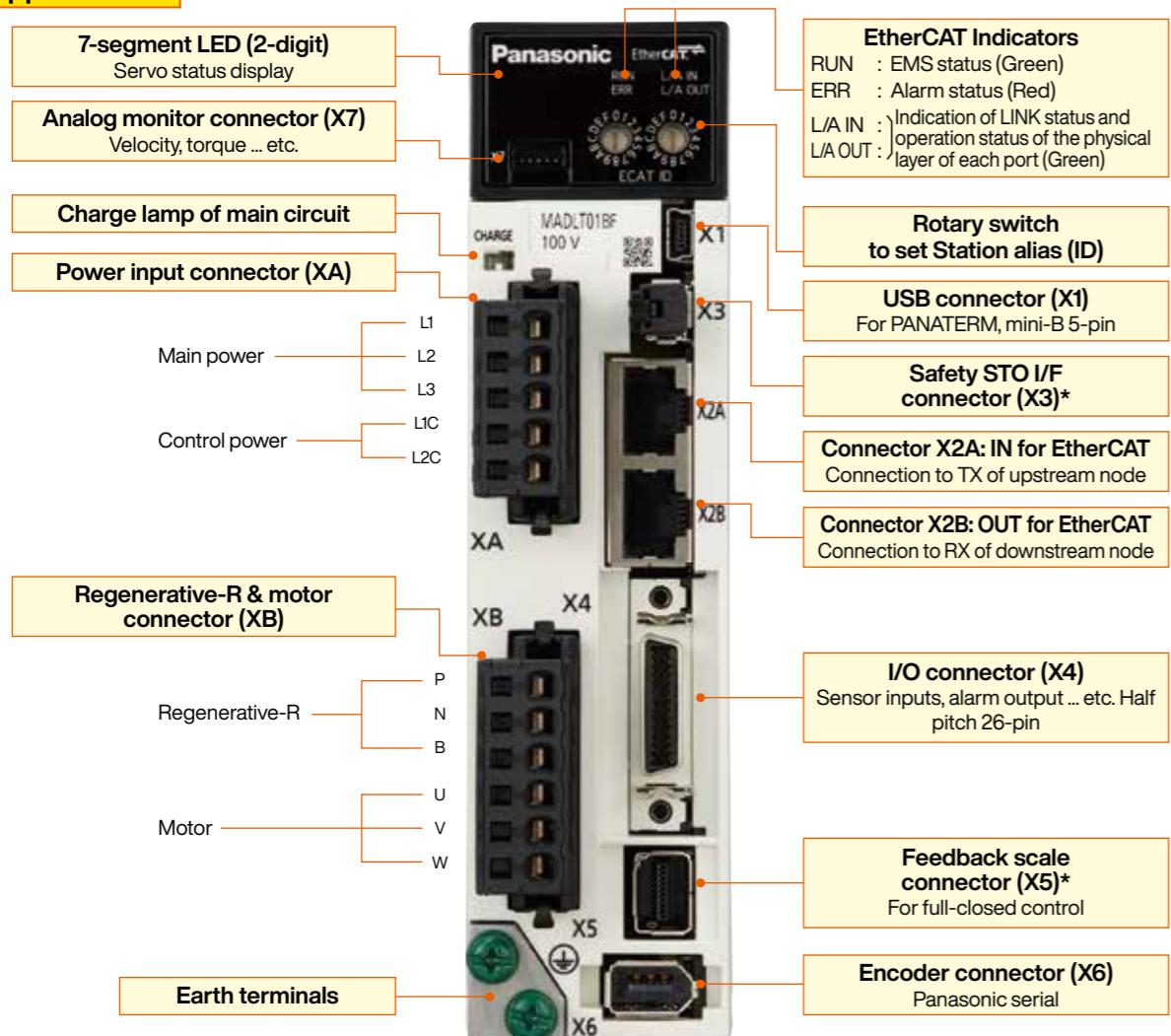
MINAS A6B Series							Model Designation Special Order Product		For more information, please visit our website or request to our distributors separately.			
■ Servo Driver												
M	A	D	L	N	1	5	B	E	*	*	*	Special specifications
① Frame symbol	② Series	③ Safety Function ^{*1}	④ Max. current rating	⑤ Supply voltage specifications	⑥ I/f specifications	⑦ Classification of type ^{*1}						
Symbol	Frame	Symbol	Frame	Symbol	Current rating	Symbol	Current rating	Symbol	Specifications	Symbol	Specification	
MAD	A-Frame	MED	E-Frame	0	6 A	9	80 A	E	Standard for rotary motor Special Order Product			
MBD	B-Frame	MFD	F-Frame	1	8 A	A	100 A	F	Multifunction for rotary motor Special Order Product			
MCD	C-Frame	MGD	G-Frame	2	12 A	B	120 A	L	Standard for linear/ DD motor Special Order Product			
MDD	D-Frame	MHD	H-Frame	3	22 A	C	160 A	M	Multifunction for linear/ DD motor Special Order Product			
				4	24 A	E	240 A					
				5	40 A	F	360 A					
				8	60 A							

*1 Standard type (with a part number ending in E or L) has no safety function.
Multi-function type (with a part number ending in F or M) has a safety function.

* All dimensions shown in this catalog are for the A6BF series, but outer dimensions are the same as the A6BE series.

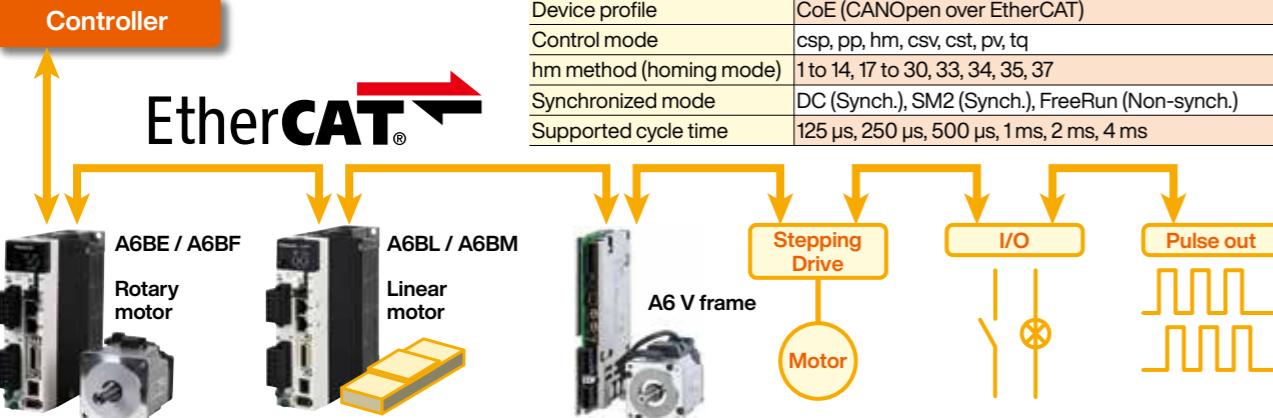
Dimensions of Driver
Special Order Product

Appearance



* The photo is A6BF series. There are no X3 and X5 connectors in the A6BE series.

Typical system configuration



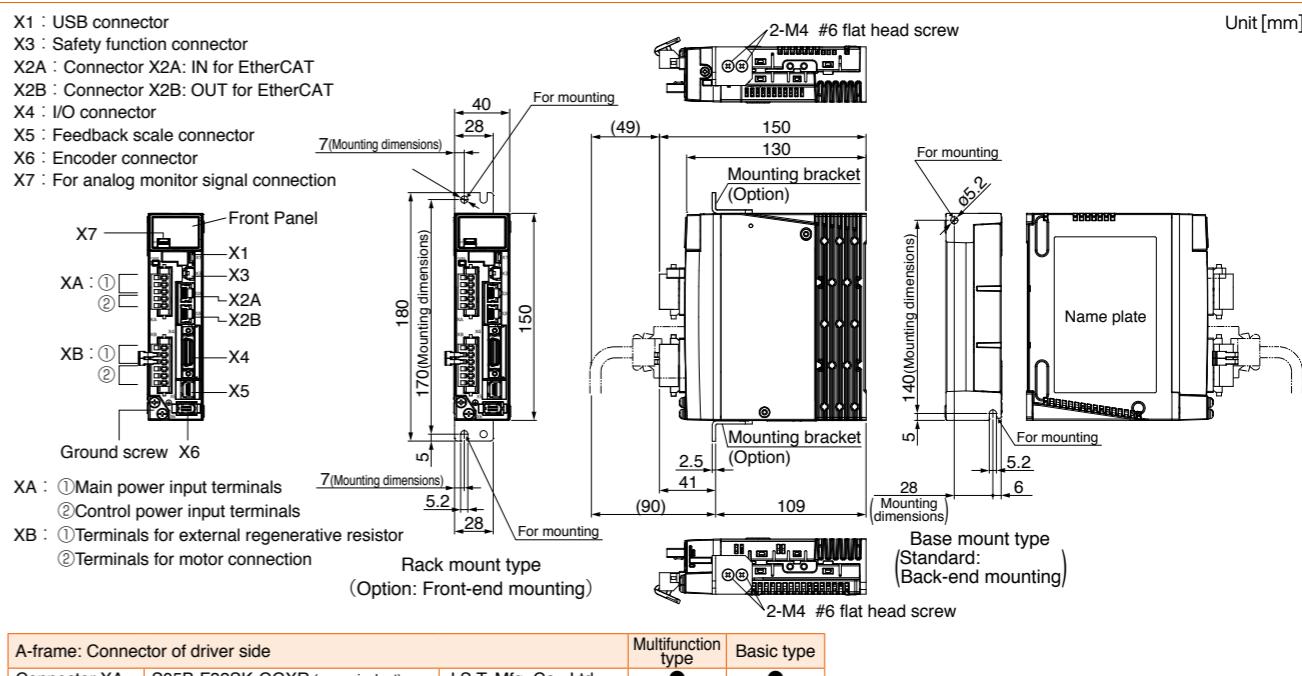
Applicable motor Please refer to P.29 to P.42 of the A6 series.

Applicable option

Interface cable	DVOP0800
Interface connector kit	DVOP0770
Options other than interface cables and interface connectors	Please refer to P.29 to P.42 of the A6 series.

* Refer to P.368 of the A6N series for the "parallel I/O connector (X4)" option. The "signal names" and "pin assignments" for the parallel I/O connector (X4) option "interface cable" and "interface connector kit" are different from those described on P.368. For details, please refer to the specifications of the A6B series.

A-frame



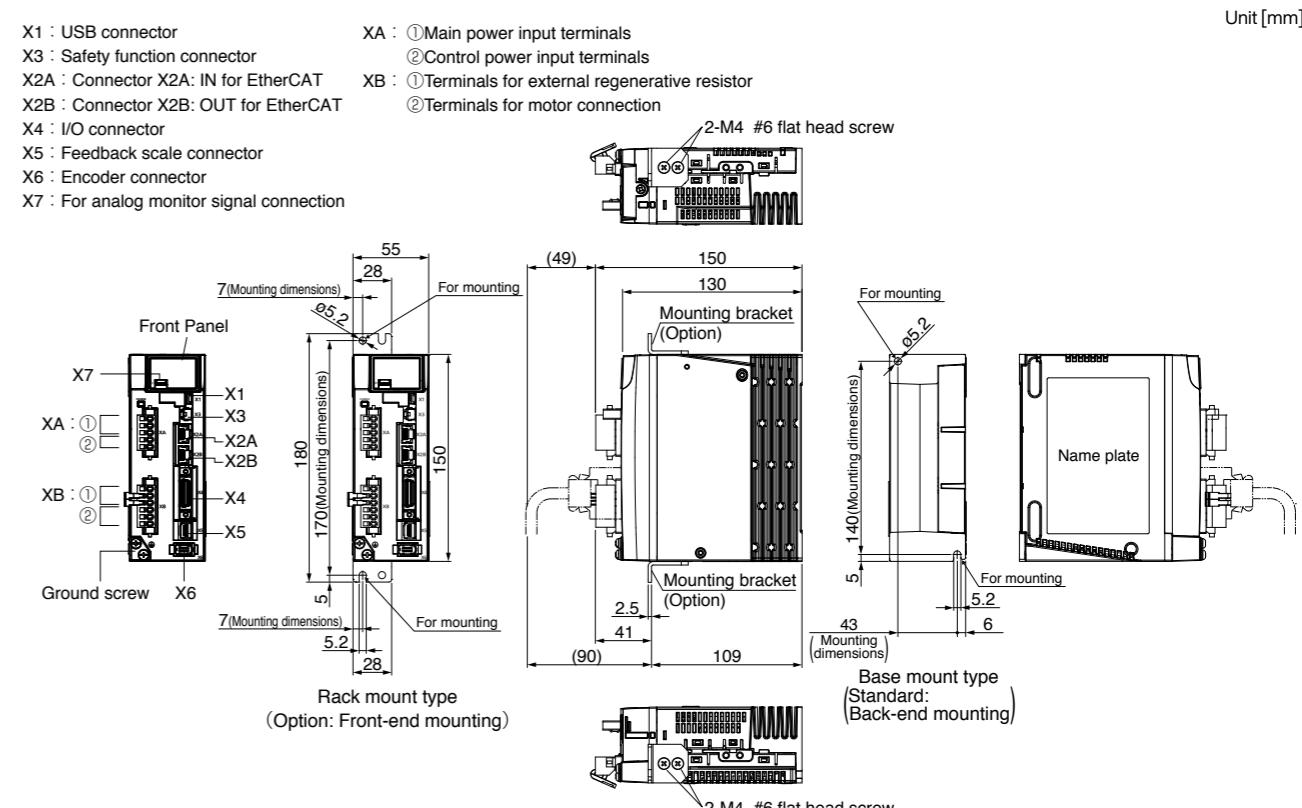
Unit [mm]

Mass: 0.8 kg

<Attached to the driver>

Connector of power and motor side	
Connector XA	05JFAT-SAXGGKK-A
Connector XB	06JFAT-SAXGGKK-A

B-frame



Unit [mm]

Mass: 1.0 kg

* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

A6 Series

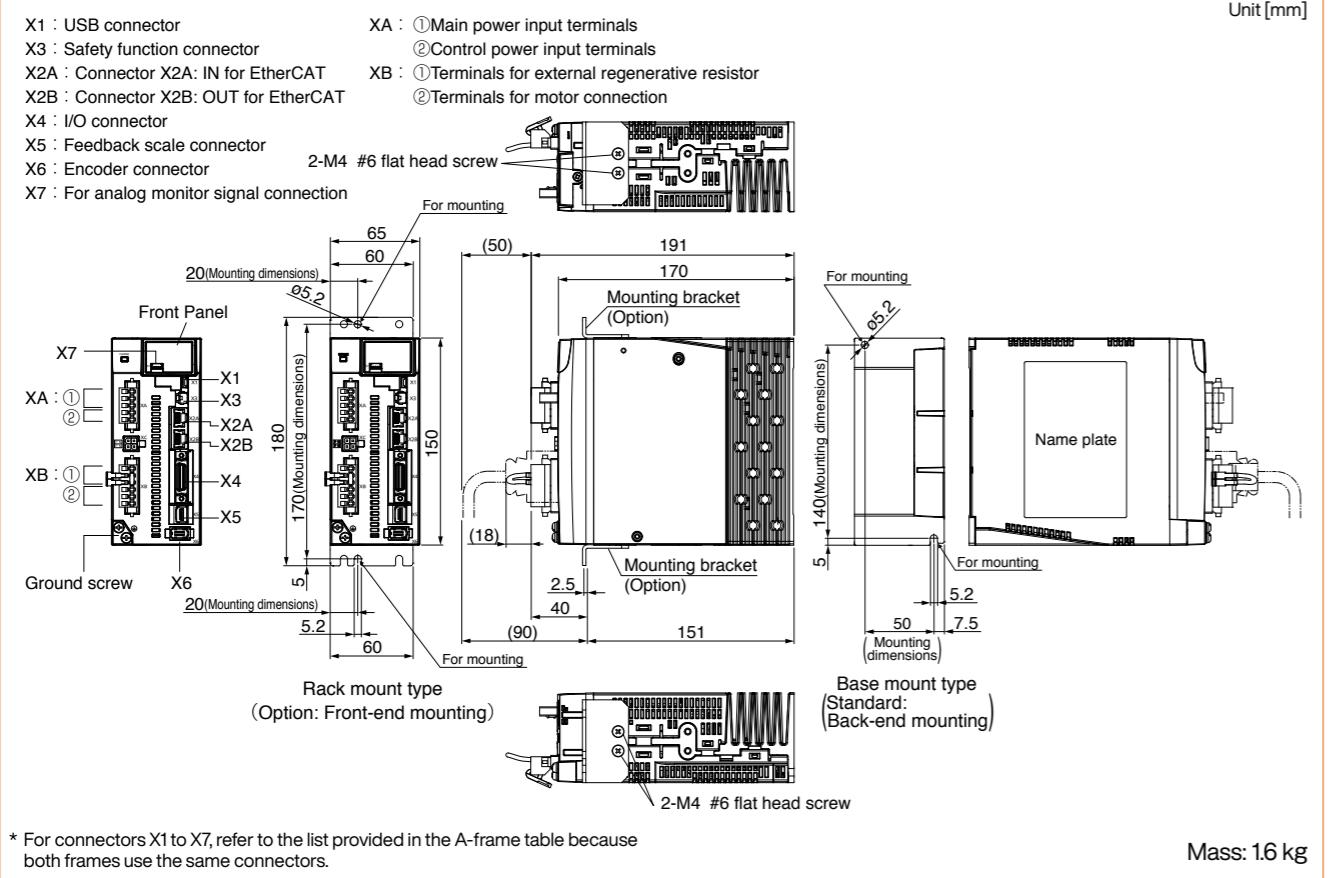
A6N Series

A6B Series
Special Order Product

E Series

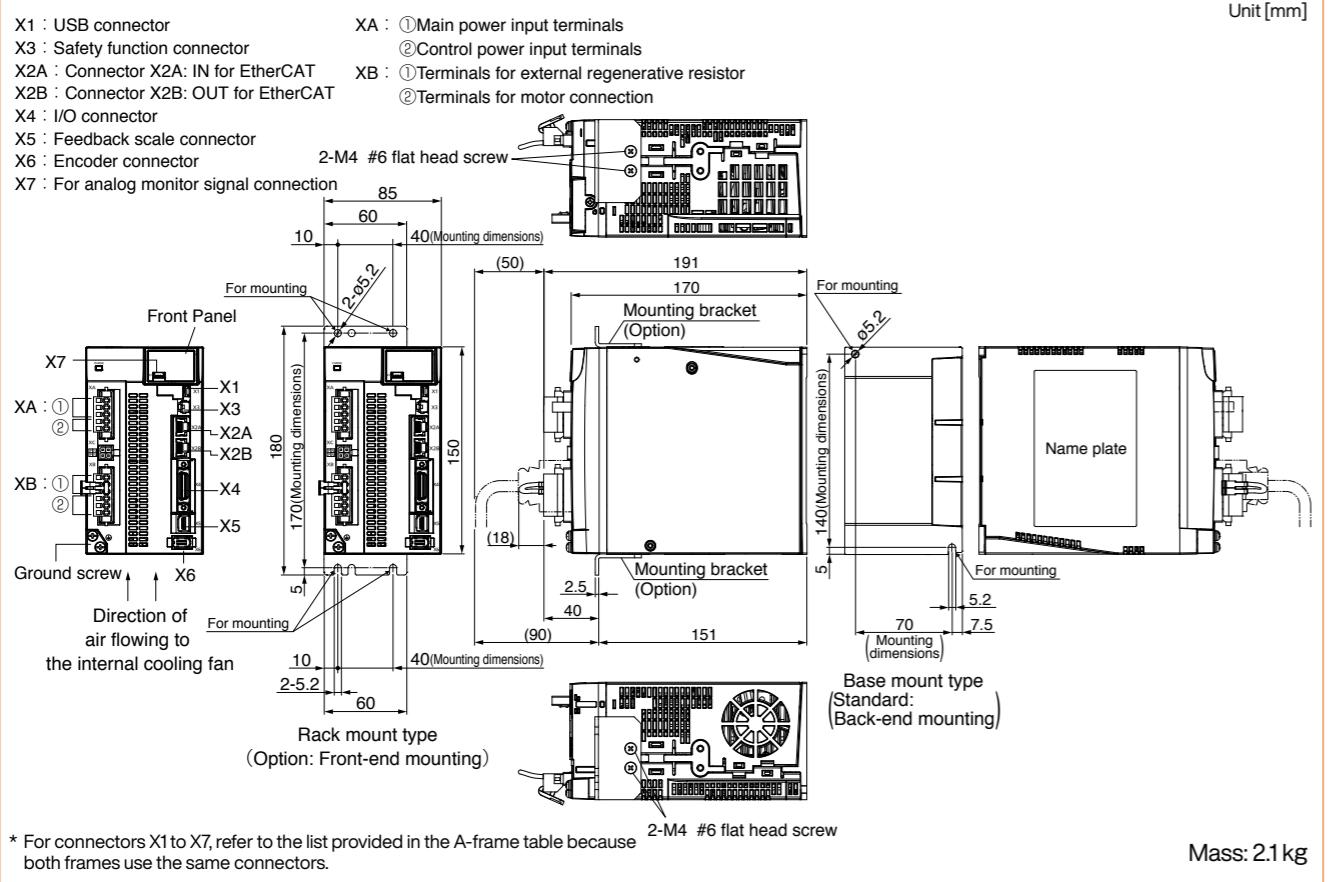
Information

C-frame



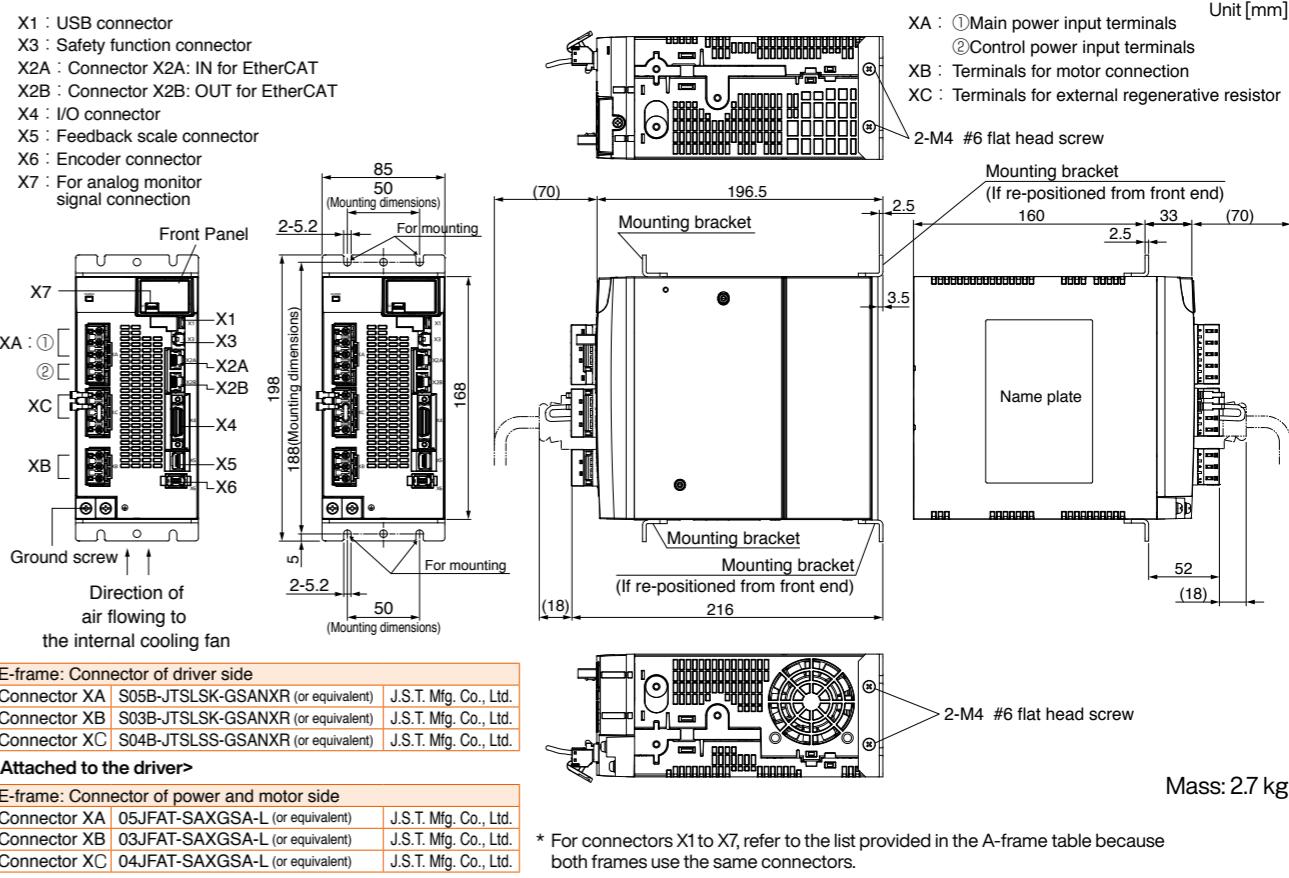
* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

D-frame (200 V)



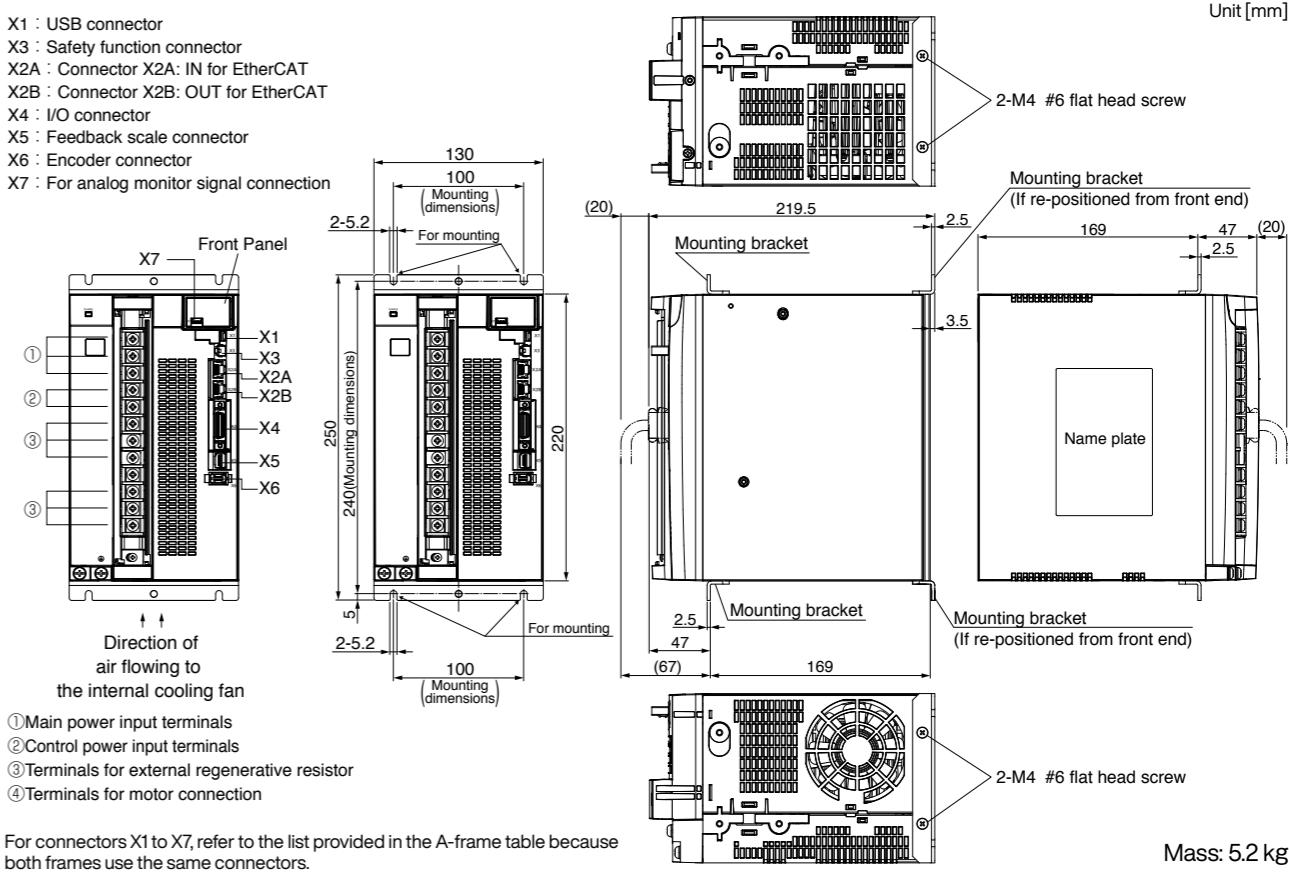
* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

E-frame (200 V)



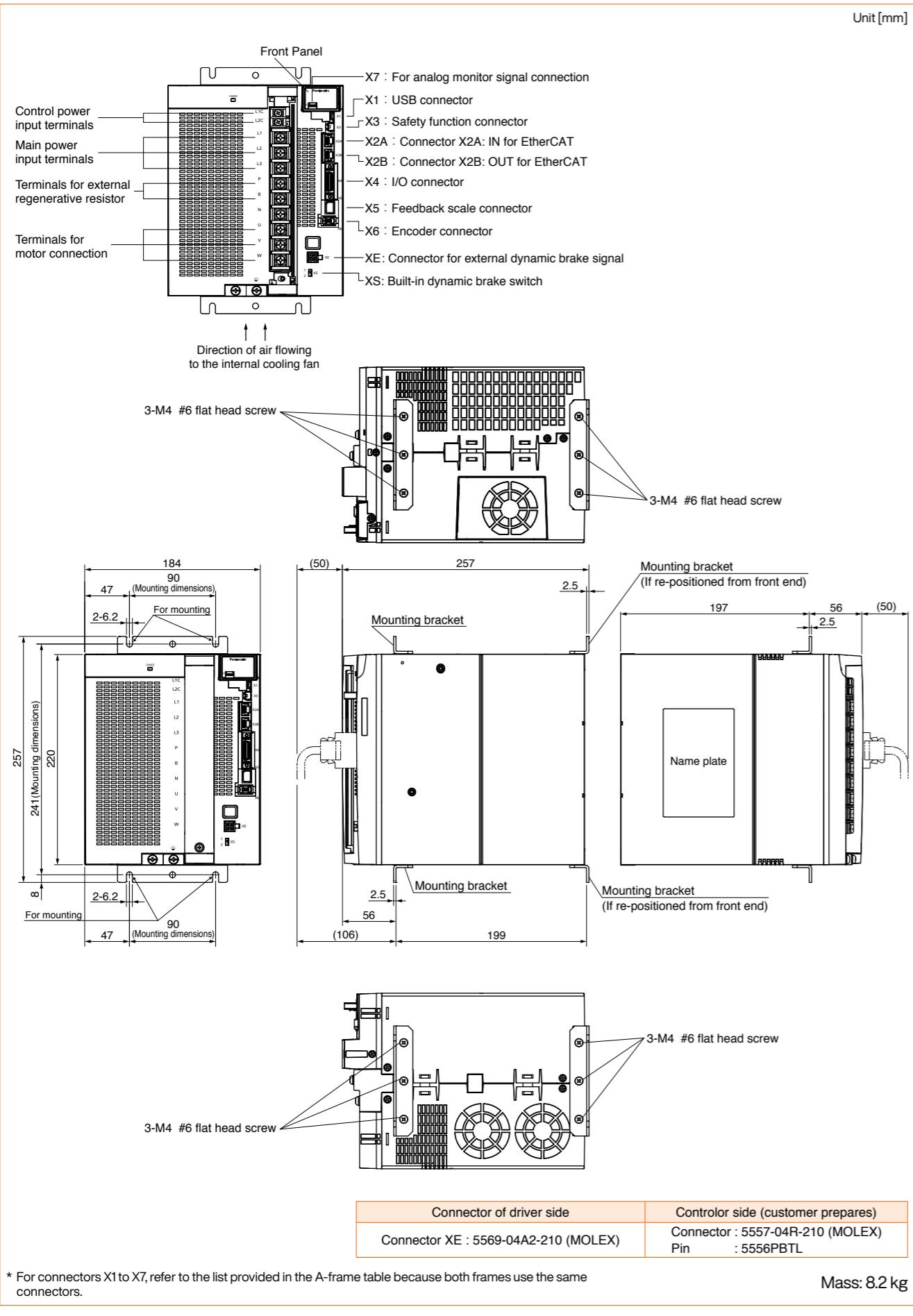
* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

F-frame (200 V)



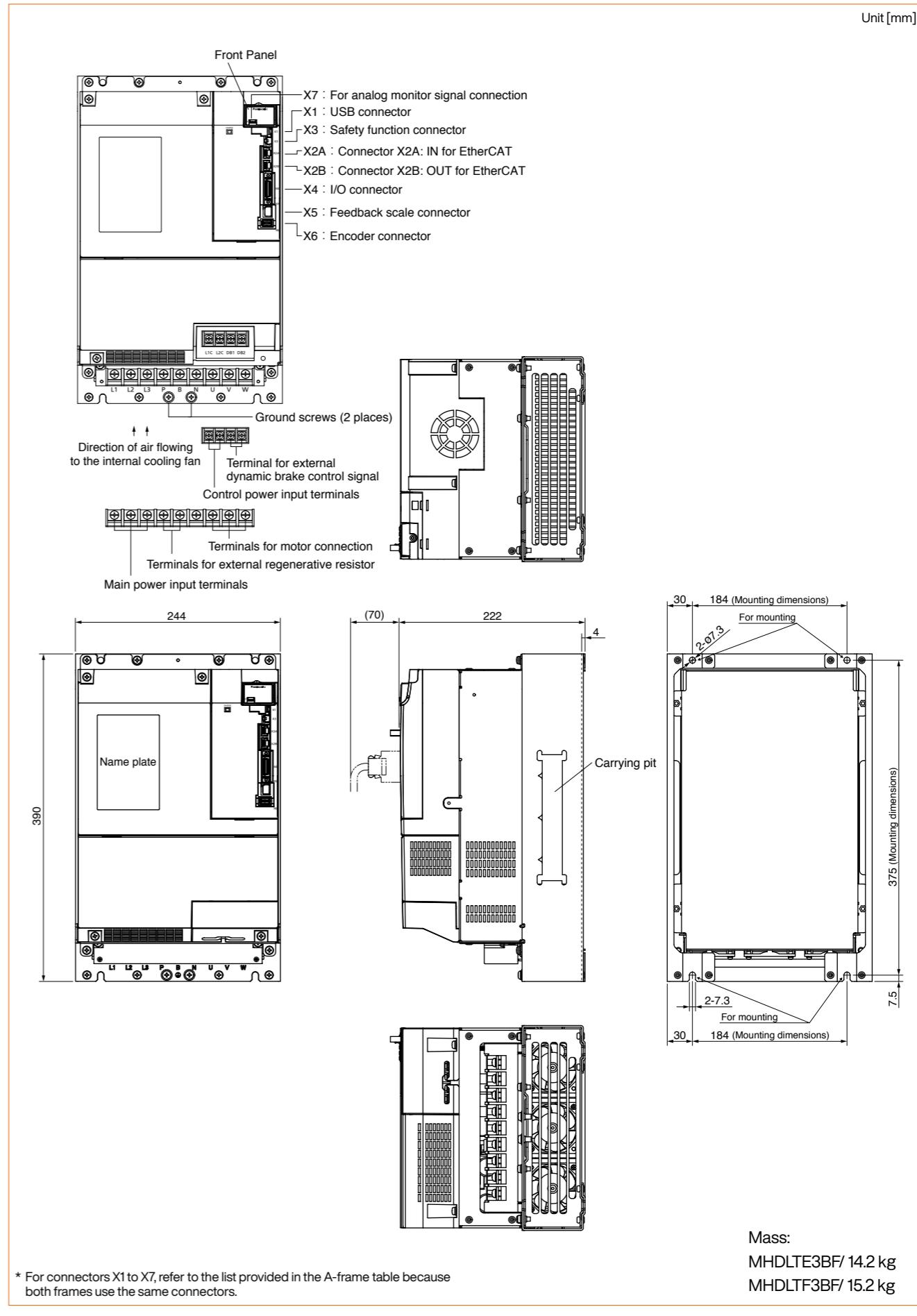
* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

G-frame (200 V) (A6BE series are not available.)



* For connectors X1 to X7, refer to the list provided in the A-frame table because both frames use the same connectors.

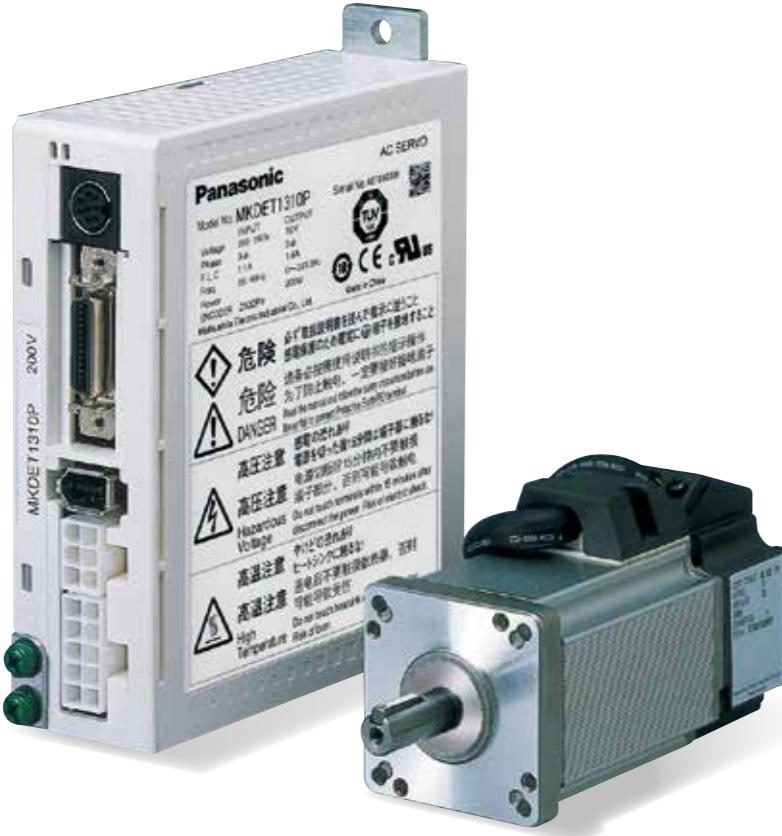
H-frame (200 V) (A6BE series are not available.)



Compact Servo Only for Position Control.

Ultra compact
position control type

MINAS E Series



Last Order Date: April 30, 2025
After this date, we will no longer accept new orders for the product.

1 Best Fit to Small Drives

- Further evolution in down-sizing, by 47 % in size. (Note)
- Exclusively designed for position control.

(Note) Compared to MUDS043A1

2 Easy to Handle, Easy to Use

- DIN-rail mounting unit (option) improves handling/installation.
- User-friendly Console makes the setup easy.
- High functionality Real-Time Auto-Gain Tuning enables adjustment-free operation.



3 High-Speed Positioning with Resonance Suppression Filters

- Built-In notch filter suppresses resonance of the machine.
- Built-in adaptive filter detect resonance frequency and suppress vibration.

4 Smoother operation for Low Stiffness Machine

- Damping control function suppresses vibration during acceleration/deceleration

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A6 Series

A6N Series

A6B Series

E Series

Information

1. Easy to Handle, Easy to Use

High-functionality Real-Time Auto-Gain Tuning^(Note1)

- Offers real automatic gain tuning for low and high stiffness machines with a combination of an adaptive filter.
- Supports the vertical axis application where the load torque is different in rotational direction.

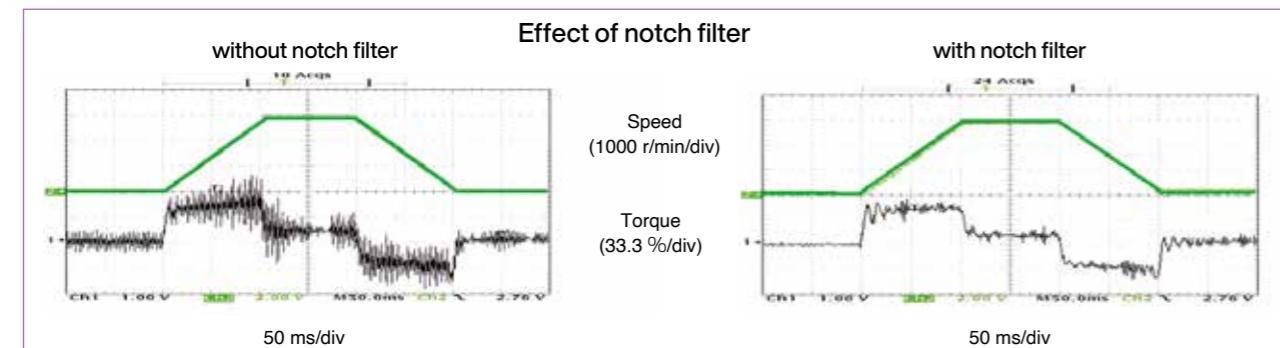
DIN-rail mounting unit (option)

- DIN-rail mounting unit allows parallel mounting with small control devices such as PLC.
- Easy to mount and easy to dismount.

2. Further Reduction of Vibration

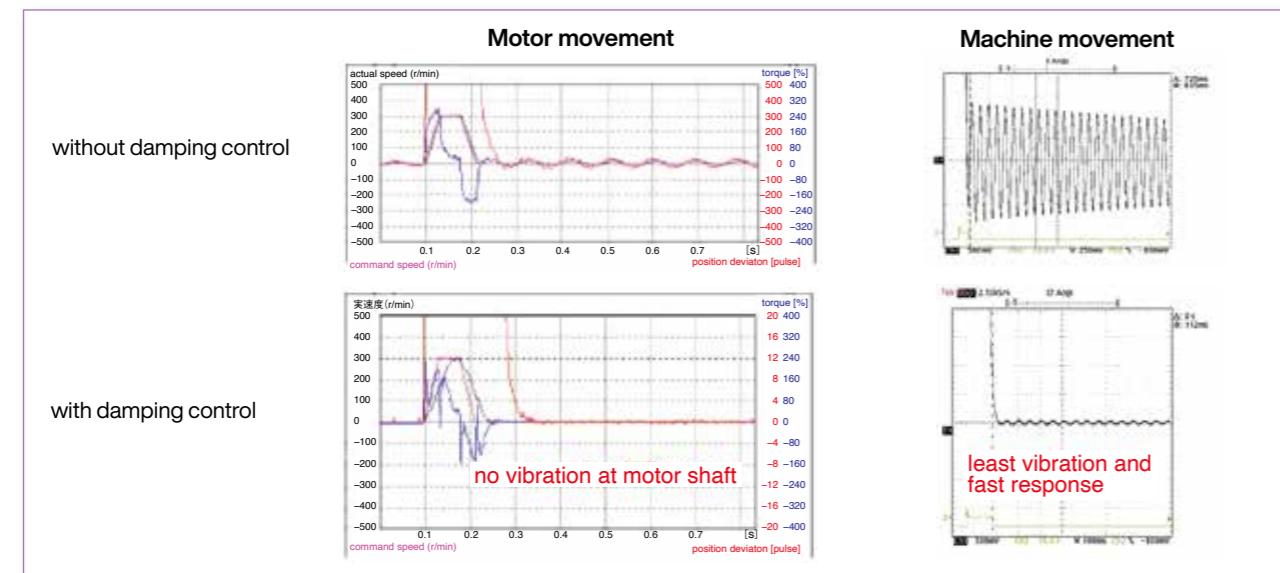
Adaptive filter^(Note1)

- Makes the notch filter frequency automatically follow the machine resonance frequency in real-time auto-gain tuning.
- Suppression of "Judder" noise of the machine, which is caused by variation of the machines or resonance frequency due to aging, can be expected.



Damping control^(Note1)

- You can suppress vibration occurring at both starting and stopping in low stiffness machine, by manually setting up vibration frequency in 0.1 Hz unit. Note) Only applies to manual adjustment



(Note1) Select at positioning action mode.

- At high speed positioning mode (Pr02=0) Select either one of notch filter, damping control or high-functionality real-time auto-gain tuning.
- Not possible to use them all at the same time.
- Adaptive filter cannot be used.

- At high-functionality positioning mode (Pr02=1) All of notch filter, damping control, high-functionality real-time auto-gain tuning and adaptive filter can be used at the same time.

3. Further Flexibility and Multiplicity

Console (Option)

- You can set up parameters, copy and make a JOG run.
- Convenient for maintenance at site.
- Refer to P.403, Options.

Wave-form graphic function

- With the setup support software, "PANATERM", you can monitor the "Command speed", "Actual speed", "Torque", "Position deviation" and "Positioning complete signal".
- Helps you to analyze the machine and shorten the setup time.

Note) Refer to P.398 for setup support software.

Frequency analyzing function

- You can confirm the response frequency characteristics of total machine mechanism including the servo motor with the setup support software, "PANATERM".
- Helps you to analyze the machine and shorten the setup time.

Note) Refer to P.398 for setup support software.

Torque limit switching function

- You can select 2 preset torque limit value from external input.
- Use this function for tension control or press-hold control.

Conformity to CE and UL Standards



Subject	Standard conformed	
Motor	IEC60034-1 IEC60034-5 UL1004 CSA22.2 No.100	Conforms to EU Low Voltage Directives/UK Low Voltage Regulation
Motor and driver	UL508C CSA22.2 No.14	Conforms to references by EU EMC Directives/UK EMC Regulation
	EN55011 Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment	
	EN61000-6-2 Immunity for Industrial Environments	
	EC61000-4-2 Electrostatic Discharge Immunity Test	
	IEC61000-4-3 Radio Frequency Electromagnetic Field Immunity Test	
	IEC61000-4-4 Electric High-Speed Transition Phenomenon/Burst Immunity Test	
	IEC61000-4-5 Lightning Surge Immunity Test	
	IEC61000-4-6 High Frequency Conduction Immunity Test	
	IEC61000-4-11 Instantaneous Outage Immunity Test	

IEC : International Electrotechnical Commission

EN : Europaischen Normen

EMC : Electromagnetic Compatibility

UL : Underwriters Laboratories

CSA : Canadian Standards Association

Pursuant to at the directive 2004/108/EC, article 9(2)

* When exporting this product, follow statutory provisions of the destination country.

Motor series	Rated output (kW)	Rated rotational speed (Max. speed) (r/min)	Rotary encoder		Brake	Gear	UL/ CSA	Enclosure	Features	Applications
			2500 P/r incremental	17bit absolute/ incremental						
MUMA	0.05 to 0.4	3000 (5000)	○	—	○	○	○	IP65 Except shaft throughhole and connector	Small capacity Ultra low inertia	SMT machines Insters High repetitive positioning application
Ultra low inertia	0.05 0.1 0.2 0.4									

■ Servo Motor

M U M A 5 A Z P 1 S * *

Special specifications

Symbol	Series
MUMA	Ultra low inertia (50 W to 400 W)

Motor rated output

Symbol	Rated output
5A	50 W
01	100 W
02	200 W
04	400 W

Voltage specifications

Symbol	Specifications
1	100 V
2	200 V
Z	100 V/200 V common (50 W only)

Rotary encoder specifications

Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

Motor structure

Symbol	Shaft	Holding brake	Oil seal		
	Key-way, center tap	without	with	without	with*
S	●	●	●	●	
T	●	●	●	●	●

* Motor with oil seal is manufactured by order.

Design order

Symbol	Specifications
1	Standard

See P.389 for motor specifications

■ Motor with gear reducer

M U M A 0 1 1 P 3 1 N

Motor rated output

Symbol	Series
MUMA	Ultra low inertia (100 W to 400 W)

Symbol	Rated output
01	100 W
02	200 W
04	400 W

Voltage specifications

Symbol	Specifications
1	100 V
2	200 V

Rotary encoder specifications

Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

Gear reduction ratio, gear type

Symbol	Gear reduction ratio	Motor output (W)			Gear type
		100	200	400	
1N	1/5	●	●	●	
2N	1/9	●	●	●	
4N	1/25	●	●	●	For high accuracy

Motor structure

Symbol	Shaft	Holding brake	
	Key-way	without	with
3	●	●	
4	●	●	●

See P.394 for motor with gear reducer specifications

■ Servo Driver

M K D E T 1 3 1 0 P * *

Frame symbol

Symbol	Frame
MKDE	E series, K-frame
MLDE	E series, L-frame

Power device

Max. current rating

Symbol	Current rating
T1	10 A
T2	15 A

Supply voltage specifications

Symbol	Specifications
1	Single phase, 100 V
2	Single phase, 200 V
3	3-phase, 200 V
5	Single/3-phase, 200 V

See P.385 for driver specifications

• Wiring of main circuit

Circuit Breaker (MCCB)
Protects the power lines.

Shuts off the circuit when overcurrent passes.

Noise Filter (NF)
Prevents external noise from the power lines. And reduces an effect of the noise generated by the servo driver.

Magnetic Contactor (MC)
Turns on/off the main power of the servo driver.
Surge absorber to be used together with this.

Reactor (L)
Reduces harmonic current of the main power.

Pin-5 and Pin-3 of CN POWER
• Connect an external regenerative resistor (option) between P(pin-5) and B(pin-3) of connector, CN X1, when regenerative energy is large. (Refer to P404 for regenerative resistor.)

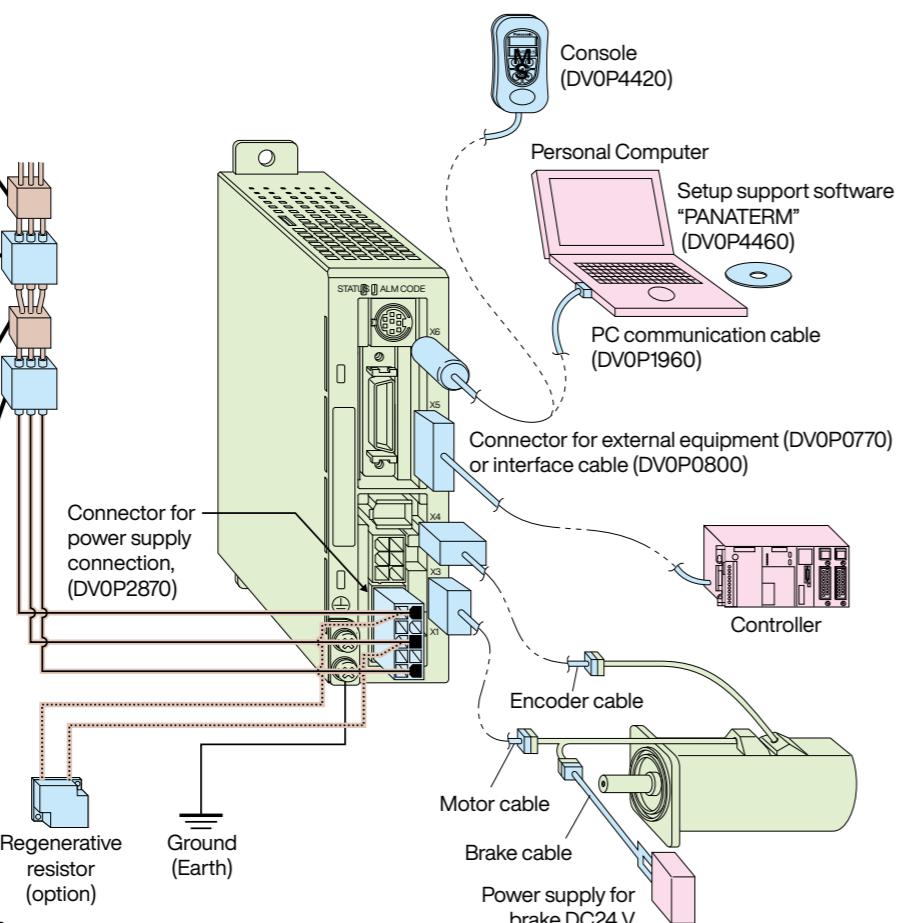
Motor to P.389

Driver to P.385

Option to P.398

Recommended equipments

Parts customer to prepare

**List of recommended peripheral devices**

Power supply	Motor		Power capacity (at rated output)	Circuit Breaker (Rated current)	Noise Filter	Magnetic Contactor Contact (Composition)	Wire diameter (L1, L2, L3, U, V and W)
	Series	Output					
Single phase, 100 V	MUMA	50 W	0.3 kVA	5 A	DV0P4160	10 A (3P+1a)	0.75 mm ² to 0.85 mm ² AWG18
		100 W	0.4 kVA				
		200 W	0.5 kVA	10 A			
	MUMA	50 W	0.3 kVA	5 A		15 A (3P+1a)	
		100 W	0.5 kVA				
		200 W	0.9 kVA	10 A			
		400 W	0.9 kVA				
	3-phase 200 V	50 W	0.3 kVA	5 A			
		100 W	0.5 kVA				
		200 W	0.9 kVA				
		400 W	0.9 kVA	10 A			

* Select the single and 3-phase common specifications corresponding to the power supplies.

● To conform to EU Directives/UK Regulation, install a circuit breaker which conforms to IEC and UL Standards (Listed, marked) between noise filter and power supply.

● For details of the noise filters, refer to 416.

<Remarks>

• Use a copper conductor cables with temperature rating of 60 °C or higher for main power connector and ground terminal wiring.

Use a cable for ground with diameter of 2.0 mm² (AWG14) or larger.

Fastening torque list

Ground terminal screw		Connector to host controller[X5]	
Nominal size	Fastening torque (N·m) ^(Note 3)	Nominal size	Fastening torque (N·m) ^(Note 3)
M4	0.7~0.8	M2.6	0.2±0.05

(Note 3) <Caution>

• Applying fastening torque larger than the maximum value may result in damage to the product.

<Remarks>

• To check for looseness, conduct periodic inspection of fastening torque once a year.

Carrying page

Options	Part No.	Carrying page
Console	DV0P4420	403
Setup Support Software, PANATERM	Japanese	DV0P4460
	English	
RS232 Communication Cable (for Connection with PC)	DV0P1960	403
Interface Cable	DV0P0800	403
Connector Kit for Interface	DV0P0770	402
Connector Kit for Motor and Encoder	DV0P3670	401
Connector Kit for Driver Power Supply	DV0P2870	401
Encoder Cable	MFECA0 ** 0EAM	400
Motor Cable	MFMCA0 ** 0AEB	400
Brake Cable	MFMCB0 ** 0GET	400
Cable Set (3 m) ^(Note 4)	DV0P37300	400
Cable Set (5 m) ^(Note 4)	DV0P39200	400
DIN Rail Mount Unit	DV0P3811	404
External Regenerative Resistor	100 V	50 Ω 10 W DV0P2890
	200 V	100 Ω 10 W DV0P2891
Reactor	100 V	DV0P227
	200 V	DV0P228
		DV0P220
Noise Filter		DV0P4160
Surge Absorber	Single phase 100 V, 200 V	DV0P4190
	3-phase 200 V	DV0P1450
Ferrite core		DV0P1460

(Note 4) Cable set (3 m) contains,

- 1) Interface cable: DV0P0800
 - 2) Encoder cable (3 m) : MFECA0030EAM
 - 3) Motor cable (3 m) : MFMCA0030AEB
 - 4) Connector kit for driver power supply connection : DV0P2870
- Cable set (5 m) contains,
- 1) Interface cable: DV0P0800
 - 2) Encoder cable (5 m) : MFECA0050EAM
 - 3) Motor cable (5 m) : MFMCA0050AEB
 - 4) Connector kit for driver power supply connection : DV0P2870

Table of Part Numbers and Options

Power supply	Output (W)	2500P/r, Incremental				Option						
		Motor Note 1	Rating/Spec. (page)	Driver	Dimensions (Frame symbol)	Encoder Cable Note 2	Motor Cable Note 2		Brake Cable Note 2	External Regenerative Resistor	Reactor	Noise Filter
Single phase 100 V	50	MUMA5AZP1 □	389	MKDET1105P	388 (K)	MFECA0 ** 0EAM	MFMCA0 ** 0AEB		DV0P2890	DV0P227	DV0P4160	
	100	MUMA011P1 □	389	MKDET110P	388 (K)							
	200	MUMA021P1 □	389	MLDET2110P	388 (L)							
Single phase 200 V	50	MUMA5AZP1 □	391	MKDET1505P	388 (K)	MFMCB0 ** 0GET	DV0P2891	DV0P220	DV0P228	DV0P220		
	100	MUMA012P1 □	391	MKDET1505P	388 (K)							
	200	MUMA022P1 □	391	MLDET2210P	388 (L)							
	400	MUMA042P1 □	391	MLDET2510P	388 (L)							
3-phase 200 V	50	MUMA5AZP1 □	391	MKDET1505P	388 (K)							
	100	MUMA012P1 □	391	MKDET1505P	388 (K)							
	200	MUMA022P1 □	391	MKDET1310P	388 (K)							
	400	MUMA042P1 □	391	MLDET2510P	388 (L)							

Note) 1 Motor model number suffix: □

S: Key way with center tap, without brake

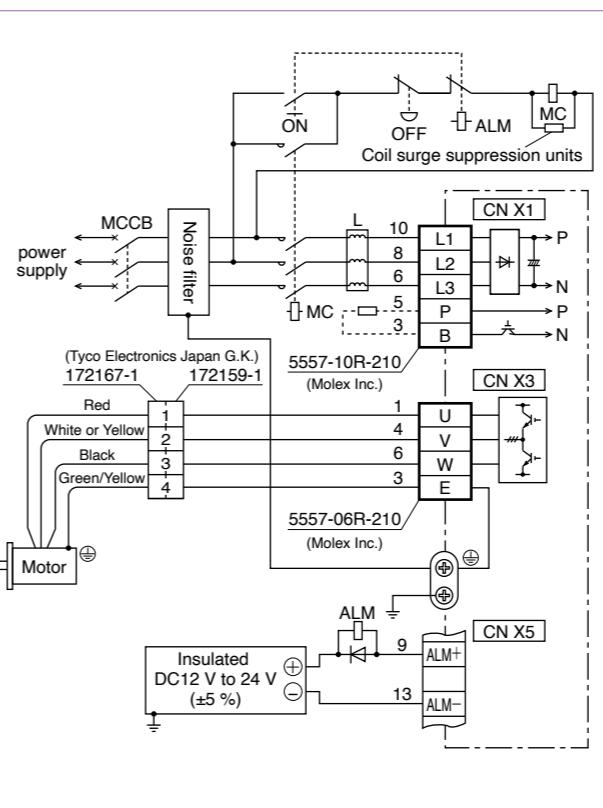
T: Key way with center tap, with brake

Note) 2 * * represents cable length. For details, refer to P.399.

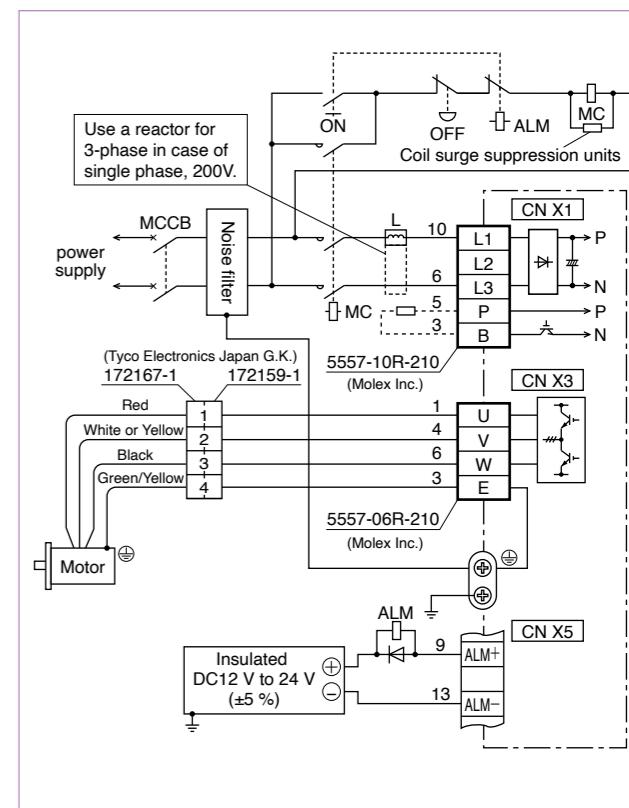
Input power	Single phase, 100 V	Single phase, 100 V to 115 V +10 % -15 % 50 Hz/60 Hz										
	Single phase, 200 V	Single phase, 200 V to 240 V +10 % -15 % 50 Hz/60 Hz										
	3-phase, 200 V	3-phase, 200 V to 240 V +10 % -15 % 50 Hz/60 Hz										
Environment	Temperature	Operating : 0 °C to 55 °C, Storage : -20 °C to 65 °C (Max.temperature guarantee 80 °C for 72 hours <Normal temperature>)										
	Humidity	Both operating and storage : 90 %RH or less (free from condensation)										
	Altitude	1000 m or lower										
	Vibration	5.88 m/s ² or less, 10 Hz to 60 Hz (No continuous use at resonance frequency)										
Basic Specifications	Withstand voltage	Should be 1500 VAC (Sensed current: 20 mA) for 1 minute between Primary and Ground.										
	Control method	IGBT PWM Sinusoidal wave drive										
	Encoder feedback	2500 P/r (10000 resolution) incremental encoder										
	Control signal	<table border="1"> <tr> <td>Input</td> <td>7 inputs (1) Servo-ON, (2) Alarm clear and other inputs vary depending on the control mode.</td> </tr> <tr> <td>Output</td> <td>4 outputs (1) Servo alarm, (2) Alarm, (3) Release signal of external brake and other outputs vary depending on the control mode.</td> </tr> </table>	Input	7 inputs (1) Servo-ON, (2) Alarm clear and other inputs vary depending on the control mode.	Output	4 outputs (1) Servo alarm, (2) Alarm, (3) Release signal of external brake and other outputs vary depending on the control mode.						
Input	7 inputs (1) Servo-ON, (2) Alarm clear and other inputs vary depending on the control mode.											
Output	4 outputs (1) Servo alarm, (2) Alarm, (3) Release signal of external brake and other outputs vary depending on the control mode.											
Pulse signal	<table border="1"> <tr> <td>Input</td> <td>2 inputs Supports both line driver I/F and open collector I/F.</td> </tr> <tr> <td>Output</td> <td>4 outputs Feed out the encoder pulse (A, B and Z-phase) in line driver. Z-phase pulse is also feed out in open collector.</td> </tr> </table>	Input	2 inputs Supports both line driver I/F and open collector I/F.	Output	4 outputs Feed out the encoder pulse (A, B and Z-phase) in line driver. Z-phase pulse is also feed out in open collector.							
Input	2 inputs Supports both line driver I/F and open collector I/F.											
Output	4 outputs Feed out the encoder pulse (A, B and Z-phase) in line driver. Z-phase pulse is also feed out in open collector.											
Control mode	Communication function	RS232 1 : 1 communication to a host with RS232 interface is enabled.										
	Display LED	(1) Status LED (STATUS), (2) Alarm code LED (ALM-CODE)										
	Regeneration	No built-in regenerative resistor (external resistor only)										
	Dynamic brake	Built-in										
	Control input	(1) CW over-travel inhibition, (2) CCW over-travel inhibition, (3) Deviation counter clear, (4) Gain switching, (5) Electronic gear switching										
	Control output	(1) Positioning complete (In-position)										
	Pulse input	<table border="1"> <tr> <td>Max. command pulse frequency</td> <td>Line driver : 500 kpps, Open collector : 200 kpps</td> </tr> <tr> <td>Type of input pulse train</td> <td>Differential input. Selectable with parameter, ((1) CW/CCW, (2) A and B-phase, (3) Command and Direction)</td> </tr> </table>	Max. command pulse frequency	Line driver : 500 kpps, Open collector : 200 kpps	Type of input pulse train	Differential input. Selectable with parameter, ((1) CW/CCW, (2) A and B-phase, (3) Command and Direction)						
Max. command pulse frequency	Line driver : 500 kpps, Open collector : 200 kpps											
Type of input pulse train	Differential input. Selectable with parameter, ((1) CW/CCW, (2) A and B-phase, (3) Command and Direction)											
Smoothing filter	Primary delay filter or FIR type filter is selectable to the command input.											
Position control	Internal speed control	<table border="1"> <tr> <td>Control input</td> <td>(1) CW over-travel inhibition, (2) CCW over-travel inhibition, (3) Selection 1 of internal command speed, (4) Selection 2 of internal command speed, (5) Speed zero clamp</td> </tr> <tr> <td>Control output</td> <td>(1) Speed arrival (at-speed)</td> </tr> <tr> <td>Internal speed command</td> <td>Internal 4-speed is selectable with control input.</td> </tr> <tr> <td>Soft-start/down function</td> <td>Individual setup of acceleration and deceleration are enabled, with 0 s to 10 s/1000 r/min. Sigmoid acceleration/deceleration is also enabled.</td> </tr> <tr> <td>Zero-speed clamp</td> <td>0-clamp of internal speed command with speed zero clamp input is enabled.</td> </tr> </table>	Control input	(1) CW over-travel inhibition, (2) CCW over-travel inhibition, (3) Selection 1 of internal command speed, (4) Selection 2 of internal command speed, (5) Speed zero clamp	Control output	(1) Speed arrival (at-speed)	Internal speed command	Internal 4-speed is selectable with control input.	Soft-start/down function	Individual setup of acceleration and deceleration are enabled, with 0 s to 10 s/1000 r/min. Sigmoid acceleration/deceleration is also enabled.	Zero-speed clamp	0-clamp of internal speed command with speed zero clamp input is enabled.
Control input	(1) CW over-travel inhibition, (2) CCW over-travel inhibition, (3) Selection 1 of internal command speed, (4) Selection 2 of internal command speed, (5) Speed zero clamp											
Control output	(1) Speed arrival (at-speed)											
Internal speed command	Internal 4-speed is selectable with control input.											
Soft-start/down function	Individual setup of acceleration and deceleration are enabled, with 0 s to 10 s/1000 r/min. Sigmoid acceleration/deceleration is also enabled.											
Zero-speed clamp	0-clamp of internal speed command with speed zero clamp input is enabled.											
Auto-gain tuning	<table border="1"> <tr> <td>Real-time</td> <td>Estimates the load inertia in real-time in actual operation and sets up the gain automatically corresponding to the machine stiffness. Useable at (1) High-response position control, (2) Internal speed control and (3) High-functionality position control.</td> </tr> <tr> <td>Normal mode</td> <td>Estimates the load inertia with an action command inside of the driver, and sets up the gain automatically corresponding to setup of the machine stiffness. Useable at (1) High-response position control, (2) Internal speed control and (3) High-functionality position control.</td> </tr> </table>	Real-time	Estimates the load inertia in real-time in actual operation and sets up the gain automatically corresponding to the machine stiffness. Useable at (1) High-response position control, (2) Internal speed control and (3) High-functionality position control.	Normal mode	Estimates the load inertia with an action command inside of the driver, and sets up the gain automatically corresponding to setup of the machine stiffness. Useable at (1) High-response position control, (2) Internal speed control and (3) High-functionality position control.							
Real-time	Estimates the load inertia in real-time in actual operation and sets up the gain automatically corresponding to the machine stiffness. Useable at (1) High-response position control, (2) Internal speed control and (3) High-functionality position control.											
Normal mode	Estimates the load inertia with an action command inside of the driver, and sets up the gain automatically corresponding to setup of the machine stiffness. Useable at (1) High-response position control, (2) Internal speed control and (3) High-functionality position control.											
Masking of unnecessary input	Masking of the following input signal is enabled. (1) Over-travel inhibition, (2) Speed zero clamp, (3) Torque limit switching											
Division of encoder feedback pulse	1 P/r to 2500 P/r (encoder pulses count is the max.).											
Protective function	<table border="1"> <tr> <td>Hardware error</td> <td>Over-voltage, under-voltage, over-speed over-load, over-heat, over-current and encoder error etc.</td> </tr> <tr> <td>Software error</td> <td>Excess position deviation, command pulse division error, EEPROM error etc.</td> </tr> </table>	Hardware error	Over-voltage, under-voltage, over-speed over-load, over-heat, over-current and encoder error etc.	Software error	Excess position deviation, command pulse division error, EEPROM error etc.							
Hardware error	Over-voltage, under-voltage, over-speed over-load, over-heat, over-current and encoder error etc.											
Software error	Excess position deviation, command pulse division error, EEPROM error etc.											
Common	Traceability of alarm data	Traceable up to past 14 alarms including the present one.										
	Damping control function	Manual setup with parameter										
	Setup	<table border="1"> <tr> <td>Manual</td> <td>Console</td> </tr> <tr> <td>Setup support software</td> <td>PANATERM (Supporting OS : Windows98, Windows ME, Windows2000, and WindowsXP)</td> </tr> </table>	Manual	Console	Setup support software	PANATERM (Supporting OS : Windows98, Windows ME, Windows2000, and WindowsXP)						
Manual	Console											
Setup support software	PANATERM (Supporting OS : Windows98, Windows ME, Windows2000, and WindowsXP)											

Standard Wiring Example of Main Circuit

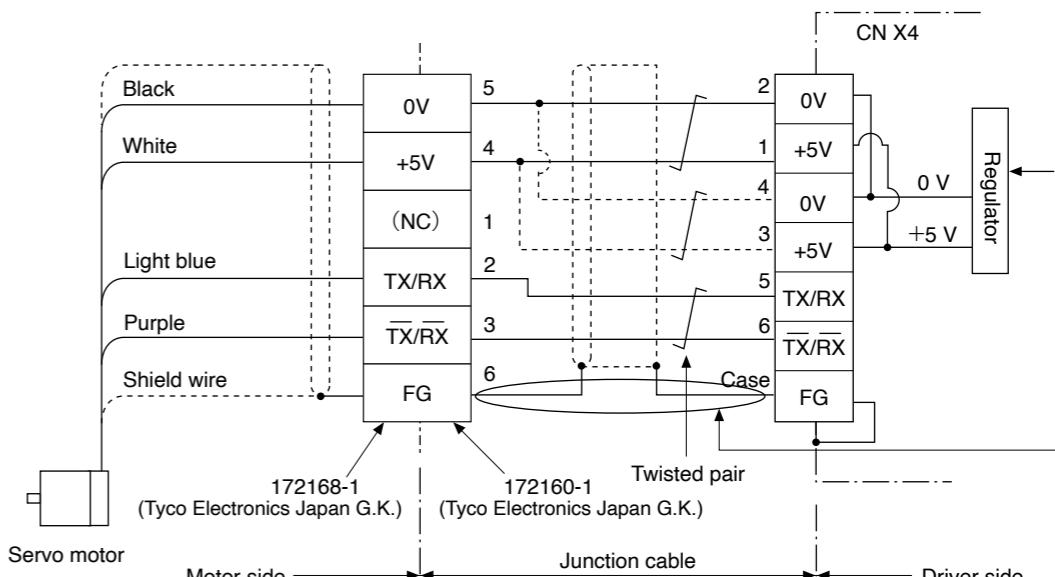
3-Phase, 200 V



Single Phase, 100 V / 200 V



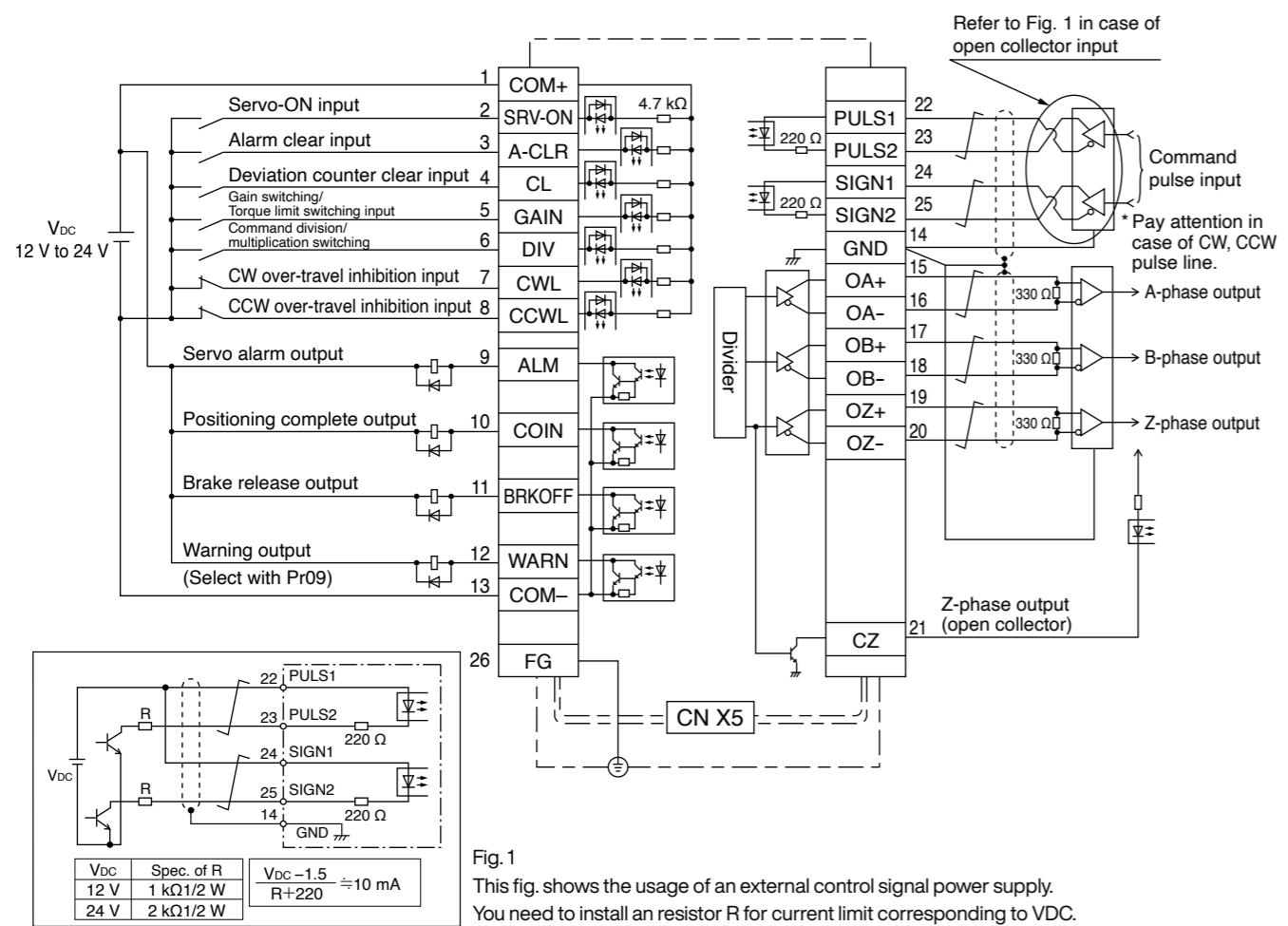
Encoder Wiring Diagram



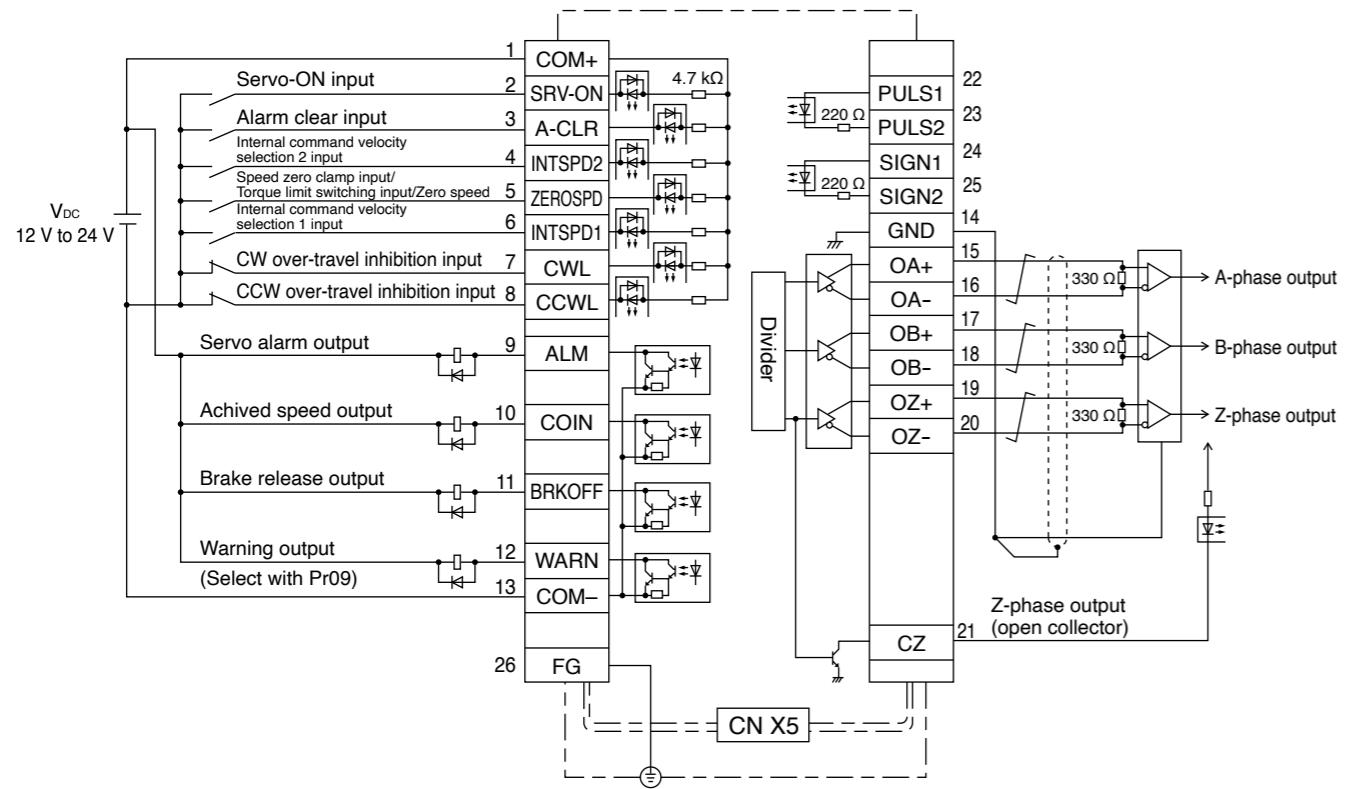
When you make your own junction cable for encoder (Refer to P.401, P.402 "Options" for connector.)

- 1) Refer the wiring diagram.
- 2) Use the twisted pair wire with shield, with core diameter of 0.18 mm² (AWG24) or larger, with higher bending resistance.
- 3) Use the twisted pair wire for the corresponding signal and power supply.
- 4) Shielding
Connect the shield of the driver to the case of CN X4.
Connect the shield of the motor to Pin-6.

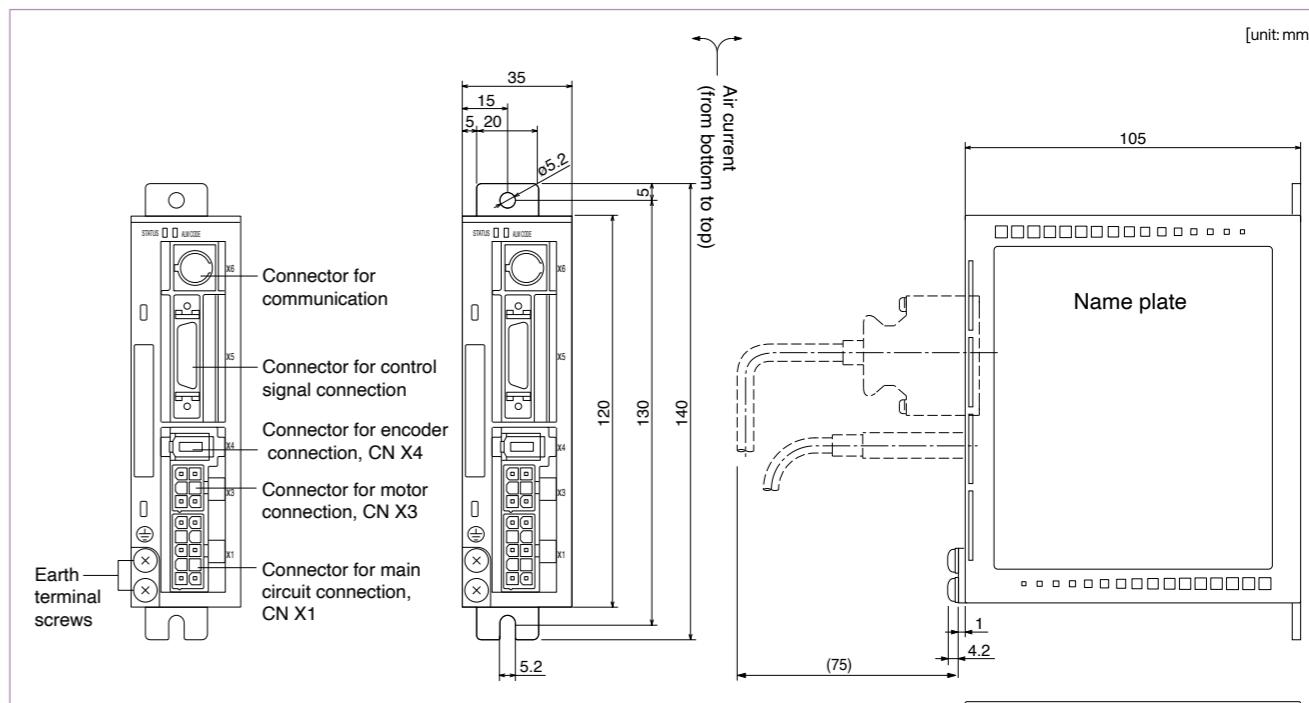
CN X 5 Wiring Example at Position Control Mode



CN X 5 Wiring Example at Internal Velocity Control Mode



Frame K

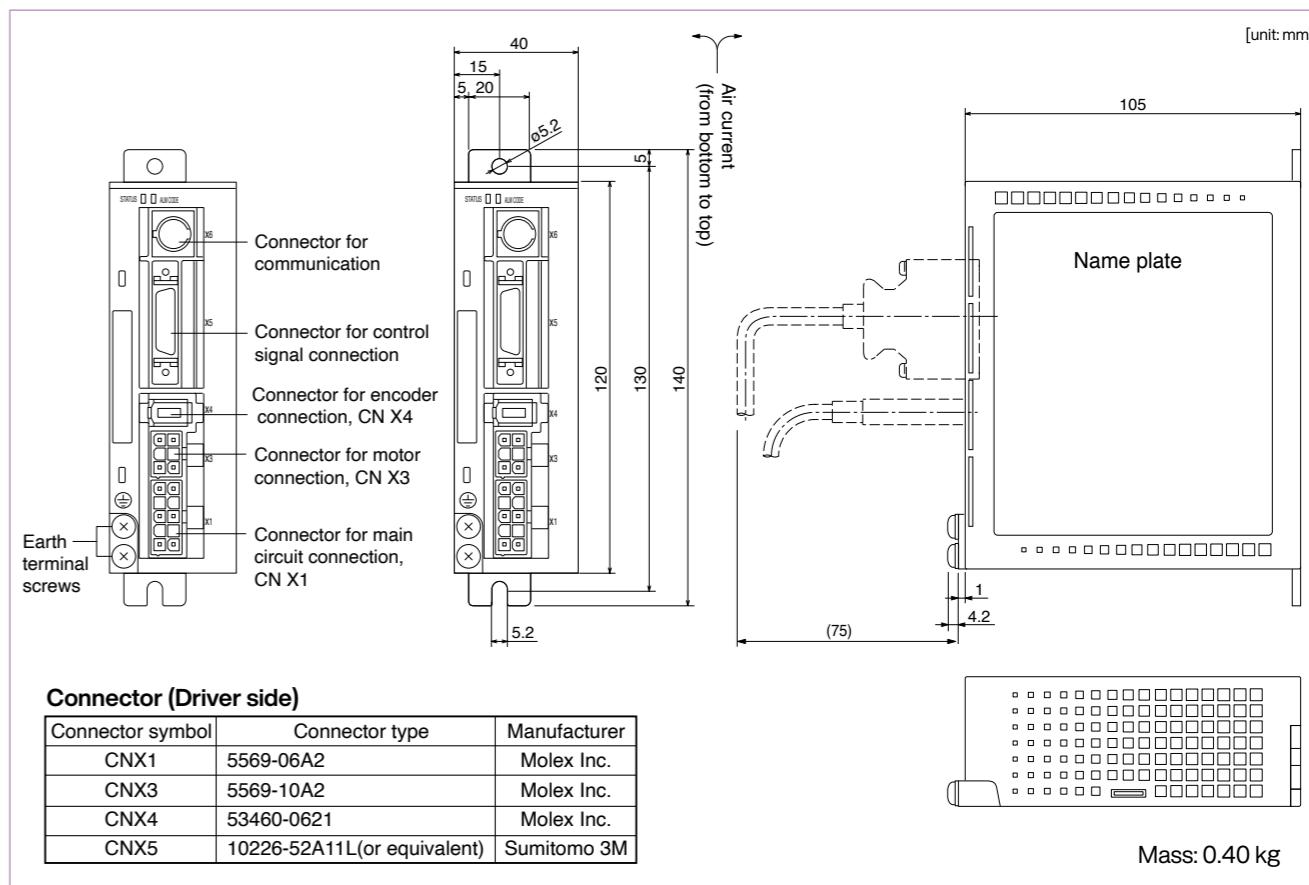


Connector (Driver side)

Connector symbol	Connector type	Manufacturer
CNX1	5569-06A2	Molex Inc.
CNX3	5569-10A2	Molex Inc.
CNX4	53460-0621	Molex Inc.
CNX5	10226-52A11L(or equivalent)	Sumitomo 3M

Mass: 0.35 kg

Frame L



Connector (Driver side)

Connector symbol	Connector type	Manufacturer
CNX1	5569-06A2	Molex Inc.
CNX3	5569-10A2	Molex Inc.
CNX4	53460-0621	Molex Inc.
CNX5	10226-52A11L(or equivalent)	Sumitomo 3M

Mass: 0.40 kg

AC100 V				
Motor model		MUMA		
		5AZP1□	011P1□	021P1□
Applicable driver	Model No.	MKDET1105P	MKDET1110P	MLDET2110P
	Frame symbol	Frame K		Frame L
Power supply capacity (kVA)		0.3	0.4	0.5
Rated output (W)		50	100	200
Rated torque (N·m)		0.16	0.32	0.64
Momentary Max. peak torque (N·m)		0.48	0.95	1.91
Rated current (Arms)		1.0	1.6	2.5
Max. current (Ao-p)		4.3	6.9	11.7
Regenerative brake frequency (times/min)	Without option	No limit	Note)2	
Note)1 DVOP2890		No limit	Note)2	
				3000
Max. rotational speed (r/min)		5000		
Moment of inertia of rotor ($\times 10^{-4}$ kg·m ²)	Without brake	0.021	0.032	0.10
	With brake	0.026	0.036	0.13
Recommended moment of inertia ratio of the load and the rotor Note)3		30 times or less		
Rotary encoder specifications		2500 P/r		
		Incremental		
		Resolution per single turn		10000
Protective enclosure rating		IP65 (except rotating portion of output shaft and lead wire end)		
		0 °C to 40 °C (free from freezing), Storage : -20 °C to 65 °C (Max.temperature guarantee 80 °C for 72 hours <nomal humidity>)		
Environment	Ambient temperature			
	Ambient humidity	85 %RH or lower (free from condensing)		
	Installation location	Indoors (no direct sunlight), free from corrosive gas, inflammable gas, oil mist and dust		
	Altitude	1000 m or lower		
	Vibration resistance	49 m/s ² or less		
Mass (kg), () represents holding brake type		0.4 (0.6)	0.5 (0.7)	0.96 (1.36)
Brake specifications (This brake will be released when it is energized. Do not use this for braking the motor in motion.)				
Static friction torque (N·m)		0.29	1.27	
Engaging time (ms)		25	50	
Releasing time (ms)	Note)4	20 (30)	15 (100)	
Exciting current (DC) (A)		0.26	0.36	
Releasing voltage		DC 1 V or more		
Exciting voltage		DV 24 V ±10 %		
Permissible load				
During assembly	Radial load P-direction (N)	147	392	
	Thrust load A-direction (N)	88	147	
	Thrust load B-direction (N)	117	196	
During operation	Radial load P-direction (N)	68	245	
	Thrust load A-direction (N)	58	98	
	Thrust load B-direction (N)	58	98	

For motor dimensions, refer to P.393, and for the driver, refer to P.388.

Model Designation

e.g.) M U M A 5 A Z P 1 S

Symbol	Series
MUMA	Ultra low inertia (50 W to 200 W)

Motor rated output	Voltage specifications
Symbol	Specifications
5A	50 W
01	100 W
Z	100/200 V (50 W only)
02	200 W

Design order
1: Standard

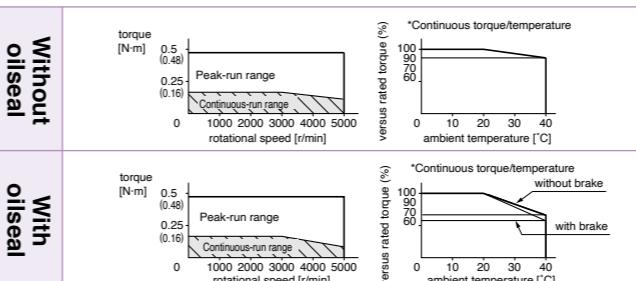
Symbol	Shaft	Holding brake	Oil seal
S	Key-way, center tap	without	with
T	●	●	●

Rotary encoder specifications

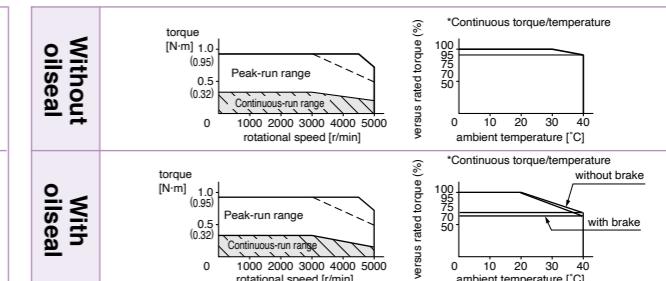
Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

Torque Characteristics [at AC100 V of power voltage (Dotted line represents the torque at 10 % less supply voltage.)]

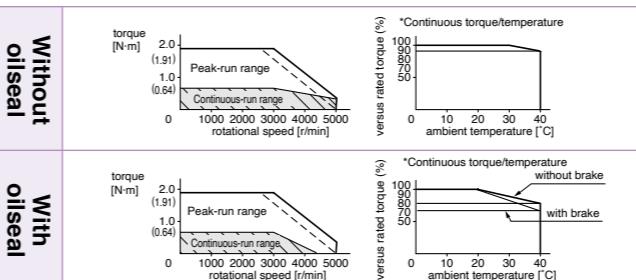
MUMA5AZP1□



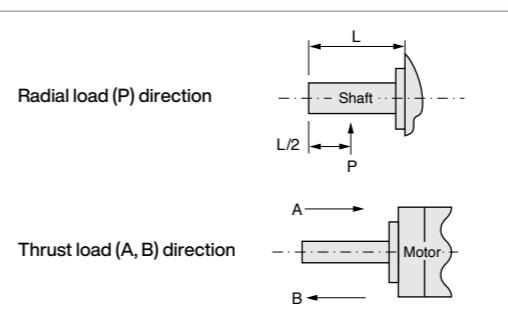
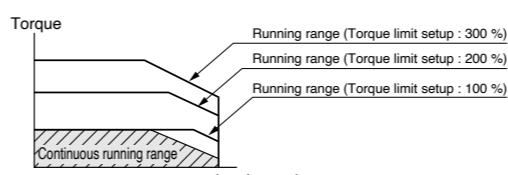
MUMA011P1□



MUMA021P1□



*When you lower the torque limit setup (Pr5E and 5F), running range at high speed might be lowered as well.



- Note) 1. Regenerative brake frequency represents the frequency of the motor's stops from the rated speed with deceleration without load.
 • If the load is connected, frequency will be defined as $1/(m+1)$, where $m = (\text{load moment of inertia}) / (\text{rotor moment of inertia})$.
 • When the motor speed exceeds the rated speed, regenerative brake frequency is in inverse proportion to the square of (running speed/rated speed).
 • Power supply voltage is AC115 V (at 100 V of the main voltage). If the supply voltage fluctuates, frequency is in inverse proportion to the square of (Running supply voltage/115) relative to the value in the table.
 • When regeneration occurs continuously such cases as running speed frequently changes or vertical feeding, consult us or a dealer.
 2. If the effective torque is within the rated torque, there is no limit in regenerative brake.
 3. Consult us or a dealer if the load moment of inertia exceeds the specified value.
 4. Specified releasing time is obtained with the use of surge absorber for brake (Z15D151 by SEMITEC Corporation or equivalent). () represents the actually measured value using a diode (200 V, 1 A or equivalent)

AC200 V						
Motor model		MUMA	5AZP1□	012P1□	022P1□	042P1□
Applicable driver	Model No.	MKDET1505P		MKDET1310P	MLDET2310P	
		Frame symbol		Frame K	Frame L	
		Frame K				
Power supply capacity (kVA)		0.3	0.3	0.5	0.9	
Rated output (W)		50	100	200	400	
Rated torque (N·m)		0.16	0.32	0.64	1.3	
Momentary Max. peak torque (N·m)		0.48	0.95	1.91	3.8	
Rated current (Arms)		1.0	1.0	1.6	2.5	
Max. current (Ao-p)		4.3	4.3	7.5	11.7	
Regenerative brake frequency (times/min)	Without option	No limit	Note)2			
Note)1 DVOP2891		No limit	Note)2			
Rated rotational speed (r/min)		3000				
Max. rotational speed (r/min)		5000				
Moment of inertia of rotor ($\times 10^{-4}$ kg·m ²)	Without brake	0.021	0.032	0.10	0.17	
	With brake	0.026	0.036	0.13	0.20	
Recommended moment of inertia ratio of the load and the rotor	Note)3	30 times or less				
Rotary encoder specifications		2500 P/r Incremental 10000				
Protective enclosure rating		IP65 (except rotating portion of output shaft and lead wire end)				
Environment	Ambient temperature	0 °C to 40 °C (free from freezing), Storage : -20 °C to 65 °C (Max.temperature guarantee 80 °C for 72 hours <nomal humidity>)				
	Ambient humidity	85 %RH or lower (free from condensing)				
	Installation location	Indoors (no direct sunlight), free from corrosive gas, inflammable gas, oil mist and dust				
	Altitude	1000 m or lower				
	Vibration resistance	49 m/s ² or less				
Mass (kg), () represents holding brake type	0.4 (0.6)	0.5 (0.7)	0.96 (1.36)	1.5 (1.9)		
Brake specifications (This brake will be released when it is energized. Do not use this for braking the motor in motion.)						
Static friction torque (N·m)		0.29		1.27		
Engaging time (ms)		25		50		
Releasing time (ms) Note)4		20 (30)		15 (100)		
Exciting current (DC) (A)		0.26		0.36		
Releasing voltage		DC 1 V or more				
Exciting voltage		DV 24 V ±10 %				
Permissible load						
During assembly	Radial load P-direction (N)	147		392		
	Thrust load A-direction (N)	88		147		
	Thrust load B-direction (N)	117		196		
During operation	Radial load P-direction (N)	68		245		
	Thrust load A-direction (N)	58		98		
	Thrust load B-direction (N)	58		98		

For motor dimensions, refer to P393, and for the driver, refer to P388.

Note) Driver for 50 W and 100 W has a common power supply of single phase and 3-phase 200 V.

Driver for 200 W, the upper row is the power supply of 3-phase 200 V, and lower is the power supply of single-phase 200 V.

Driver for 400 W, the upper row is the power supply of 3-phase 200 V, and lower is the common power supply of single-phase and 3-phase 200 V.

Model Designation

e.g.) M U M A 5 A Z P 1 S

Symbol	Series
MUMA	Ultra low inertia (50 W to 400 W)

Motor rated output

Symbol	Rated output
5A	50 W
01	100 W
02	200 W
04	400 W

Voltage specifications

Symbol	Specifications
2	200 V
Z	100/200 V (50 W only)

Design order
1: Standard

Motor structure

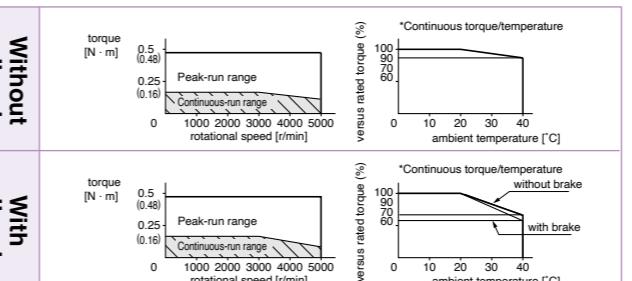
Symbol	Shaft	Holding brake	Oil seal
S	Key-way, center tap	without	with
T	●	●	●

Rotary encoder specifications

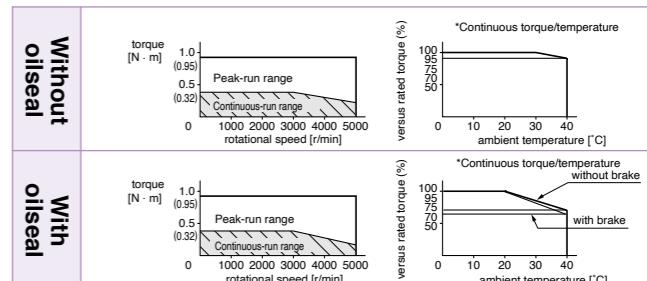
Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

Torque Characteristics [at AC200 V of power voltage (Dotted line represents the torque at 10 % less supply voltage.)]

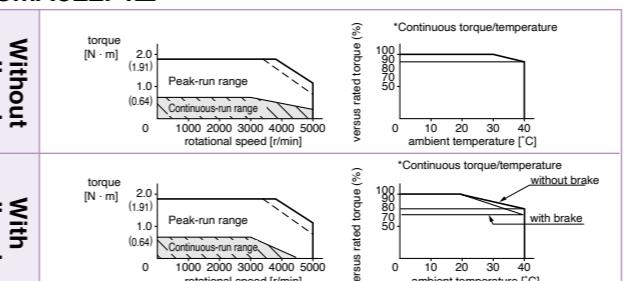
MUMA5AZP1□



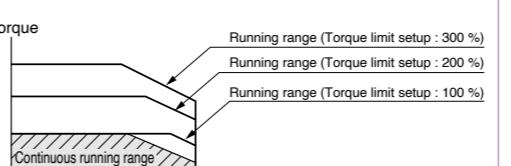
MUMA012P1□



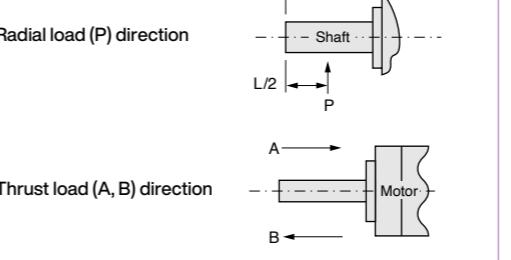
MUMA022P1□



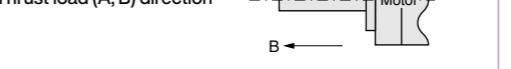
*When you lower the torque limit setup (Pr5E and 5F), running range at high speed might be lowered as well.



Radial load (P) direction



Thrust load (A, B) direction



Note) 1. Regenerative brake frequency represents the frequency of the motor's stops from the rated speed with deceleration without load.

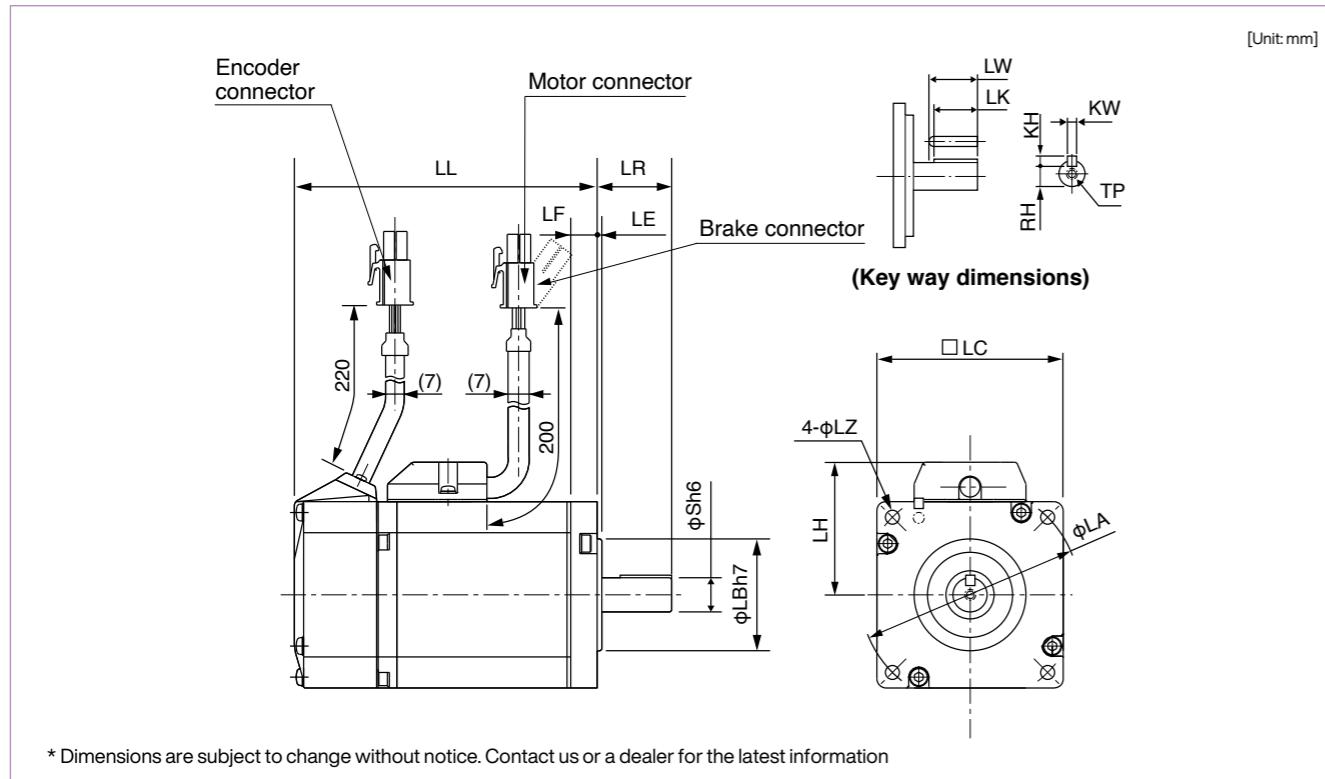
- If the load is connected, frequency will be defined as $1/(m+1)$, where $m = (\text{load moment of inertia}) / (\text{rotor moment of inertia})$.
- When the motor speed exceeds the rated speed, regenerative brake frequency is in inverse proportion to the square of (running speed/rated speed).
- Power supply voltage is AC240 V (at 200 V of the main voltage). If the supply voltage fluctuates, frequency is in inverse proportion to the square of (Running supply voltage/240) relative to the value in the table.
- When regeneration occurs continuously such cases as running speed frequently changes or vertical feeding, consult us or a dealer.

2. If the effective torque is within the rated torque, there is no limit in regenerative brake.

3. Consult us or a dealer if the load moment of inertia exceeds the specified value.

4. Specified releasing time is obtained with the use of surge absorber for brake (Z15D151 by SEMITEC Corporation or equivalent).

() represents the actually measured value using a diode (200 V, 1A or equivalent)



* Dimensions are subject to change without notice. Contact us or a dealer for the latest information.

MUMA series (Ultra low inertia)				
Motor output	50 W	100 W	200 W	400 W
Motor model	MUMA	5A□P1□	01□P1□	02□P1□
Rotary encoder specifications	2500 P/r Incremental	2500 P/r Incremental	2500 P/r Incremental	2500 P/r Incremental
LL	Without brake 75.5	92.5	96	123.5
	With brake 107	124	129	156.5
LR	24	24	30	30
S	8	8	11	14
LA	48	48	70	70
LB	22	22	50	50
LC	42	42	60	60
LE	2	2	3	3
LF	7	7	7	7
LH	34	34	43	43
LZ	3.4	3.4	4.5	4.5
LW	14	14	20	25
LK	12.5	12.5	18	22.5
KW	3h9	3h9	4h9	5h9
KH	3	3	4	5
RH	6.2	6.2	8.5	11
TP	M3 × 6 (depth)	M3 × 6 (depth)	M4 × 8 (depth)	M5 × 10 (depth)
Mass (kg)	Without brake 0.40	0.50	0.96	1.5
	With brake 0.60	0.70	1.36	1.9
Connector/Plug specifications	refer to Options, P.401, P.402.			

<Cautions>

Reduce the moment of inertia ratio if high speed response operation is required.

Read the Instruction Manual carefully and understand all precautions and remarks before using the products.

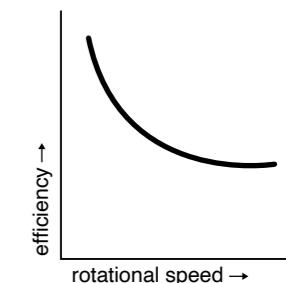
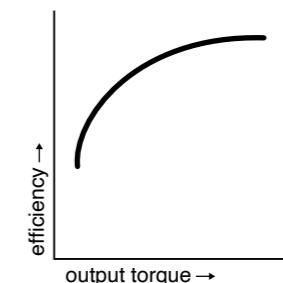
MINAS E Series

Motors with Gear Reducer

Motor Types with Gear Reducer

Reduction ratio	Motor output (W)			Type of reducer
	100	200	400	
1/5	●	●	●	For high precision
1/9	●	●	●	
1/25	●	●	●	

Efficiency of the gear reducer shows the following inclination in relation to output torque and rotational speed.



Model No. Designation

e.g.) M U M A 0 1 1 P 3 1 N

Symbol	Series
MUMA	Low inertia (100 to 400 W)

Motor rated output

Symbol	Rated output
01	100 W
02	200 W
04	400 W

Voltage specifications

Symbol	Specifications
1	100 V
2	200 V

Rotary encoder specifications

Symbol	Format	Pulse counts	Pulse counts	Wire
P	Incremental	2500 P/r	10000	5

Motor types with gear reducer

Symbol	Reduction ratio	Motor output			Type of reducer
		100	200	400	
1N	1/5	●	●	●	For High precision
2N	1/9	●	●	●	
4N	1/25	●	●	●	

Motor structure

Symbol	Shaft	Holding brake	
	Key-way	without	with
3	●	●	
4	●		●

Specifications of Motor with Gear Reducer

Gear reducer	Motor series			MUMA
	Backlash	Composition of gear	Gear efficiency	3 minutes or smaller (initial value) at output shaft of the reducer
				Planetary gear
				65 % to 85 %
				Same direction as the motor output shaft
				Planetary gear
				Flange mounting
			Permissible moment of inertia of the load (conversion to the motor shaft)	10 times or smaller than rotor moment of inertia of the motor
			Protective structure	IP44 (at gear reducer)
Environment	Ambient temperature			0 °C to 40 °C
	Ambient humidity			85 %RH (free from condensation) or less
	Vibration resistance			49 m/s ² or less (at motor frame)
	Impact resistance			98 m/s ² or less

Table of Motor with Gear Reducer Specifications

Model	Motor Output (W)	MUMA with gear reducer											
		Reduction ratio	Output (W)	Rated speed (r/min)	Max. speed (r/min)	Rated torque (N·m)	Peak max. torque (N·m)	Moment of inertia (motor + reducer/converted to motor shaft) ($\times 10^{-4}$ kg·m ²)	Mass		Permissible radial load (N)	Permissible thrust load (N)	
									w/o brake	w/ brake			
	(W)							J ($\times 10^{-4}$ kg·m ²)	(kg)	(N)	(N)		
MUMA01□P□1N	100	1/5	75	600	1000	1.18	3.72	0.072	0.076	1.05	1.25	490	245
MUMA01□P□2N		1/9	80	333	555	2.25	6.86	0.0663	0.0703	1.05	1.25	588	294
MUMA01□P□4N		1/25	80	120	200	6.27	19.0	0.0645	0.0685	2.20	2.40	1670	833
MUMA02□P□1N	200	1/5	170	600	1000	2.65	8.04	0.218	0.248	1.68	2.08	490	245
MUMA02□P□2N		1/9	132	333	555	3.72	11.3	0.368	0.398	2.66	3.06	1180	588
MUMA02□P□4N		1/25	140	120	200	11.1	33.3	0.388	0.418	2.66	3.06	1670	833
MUMA042P□1N	400	1/5	340	600	1000	5.39	16.2	0.533	0.563	3.2	3.6	980	490
MUMA042P□2N		1/9	332	333	555	9.51	28.5	0.438	0.468	3.2	3.6	1180	588
MUMA042P□4N		1/25	332	120	200	26.4	79.2	0.470	0.500	4.7	5.1	2060	1030

For dimensions, refer to P.397.

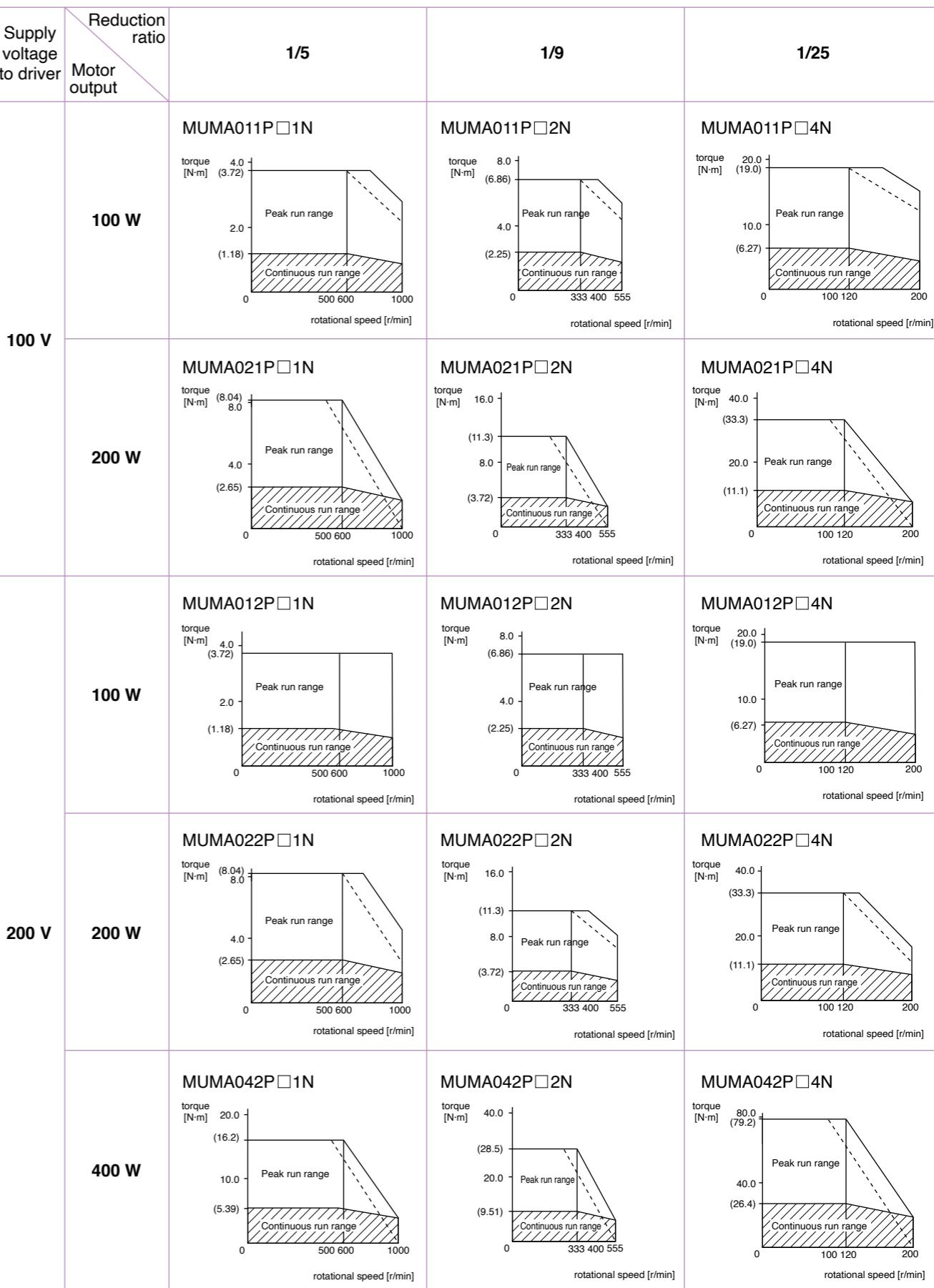
The Combination of the Driver and the Motor with Gear Reducer

Combination with driver		100 V			200 V		
Encoder	Motor output	Part No. of motor with gear reducer	Single phase, 100 V		Part No. of motor with gear reducer	3-phase, 200 V	
			Part No. of driver	Part No. of driver		Part No. of driver	Part No. of driver
2500 P/r Incremental	100 W	MUMA011P□□N	MKDET1110P	MUMA012P□□N	MKDET1505P	MKDET1505P	
	200 W	MUMA021P□□N	MLDET2110P	MUMA022P□□N	MKDET1310P	MLDET2210P	
	400 W	-	-	MUMA042P□□N	MLDET2510P	MLDET2510P	MLDET2310P

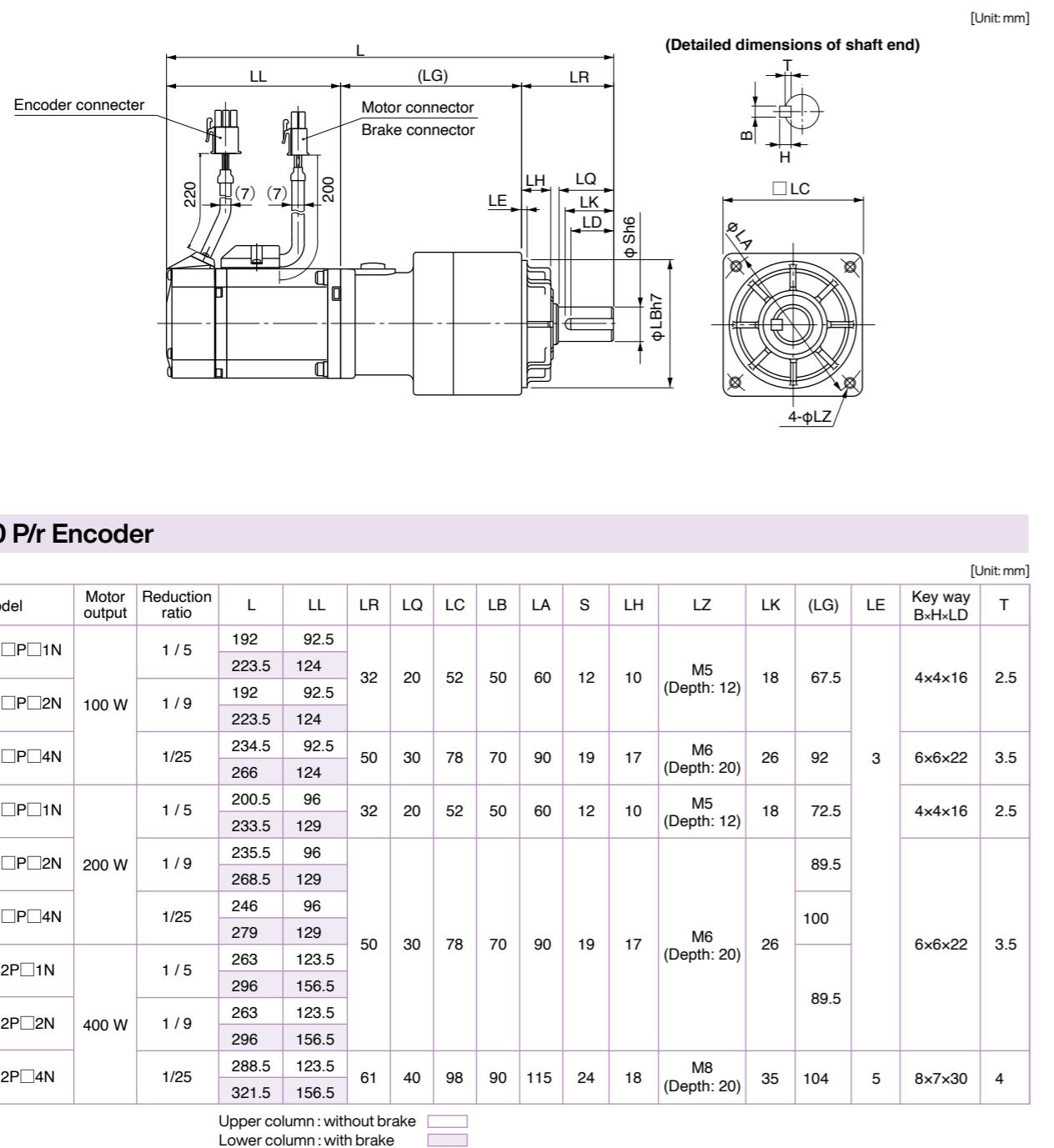
For dimensions of driver, refer to P.388.

Torque Characteristics

For High Precision (MUMA Series 100 W to 400 W)



MUMA series with Gear Reducer



2500 P/r Encoder

Model	Motor output	Reduction ratio	L	LL	LR	LQ	LC	LB	LA	S	LH	LZ	LK	(LG)	LE	Key way BxHxLD	T	
MUMA01□P□1N	100 W	1 / 5	192	92.5	32	20	52	50	60	12	10	M5 (Depth: 12)	18	67.5	4x4x16	2.5	Parameter	
			223.5	124														
		1 / 9	192	92.5														
			223.5	124														
		1/25	234.5	92.5	50	30	78	70	90	19	17	M6 (Depth: 20)	26	92	3	Monitoring Control Conditions		
			266	124														
MUMA02□P□1N	200 W	1 / 5	200.5	96	32	20	52	50	60	12	10	M5 (Depth: 12)	18	72.5	Setup	Information		
			233.5	129														
		1 / 9	235.5	96														
			268.5	129														
		1/25	246	96	50	30	78	70	90	19	17	M6 (Depth: 20)	26	100				
			279	129														
MUMA042P□1N	400 W	1 / 5	263	123.5	50	30	78	70	90	19	17	M6 (Depth: 20)	26	89.5				
			296	156.5														
		1 / 9	263	123.5														
			296	156.5														
		1/25	288.5	123.5	61	40	98	90	115	24	18	M8 (Depth: 20)	35	104	5	Analysis of Mechanical Operation Data	Graphic waveform display	
			321.5	156.5														

Upper column : without brake

Lower column : with brake

Setup Support Software

Options

E Series

Setup Support Software "PANATERM" for MINAS series AC Servo Motor & Driver

Part No. DVOP4460 (Japanese/English version)

The PANATERM assists users in setting parameters, monitoring control conditions, setup support, and analyzing mechanical operation data on the PC screen, when installed in a commercially available personal computer, and connected to the MINAS A4 series, E series through the RS232 serial interface.



If your PC does not have RS232 port,
use RS232-USB converter.



Basic Function

● Parameter setup

- After a parameter is defined on the screen, it will be sent to the driver immediately.
- Once you register parameters you frequently use, they can be easily set up on the screen.

Monitoring Control Conditions

● Monitor

- Control conditions: Control mode, velocity, torque, error and warning
- Driver input signal
- Load conditions: Total count of command/feedback pulses, Load ratio, Regenerative resistor load ratio

● Alarm

- Displays the numbers and contents of the current alarm and up to 14 error events in the past.
- Clears the numbers and contents of the current alarm and up to 14 error events in the past.

Setup

● Auto tuning

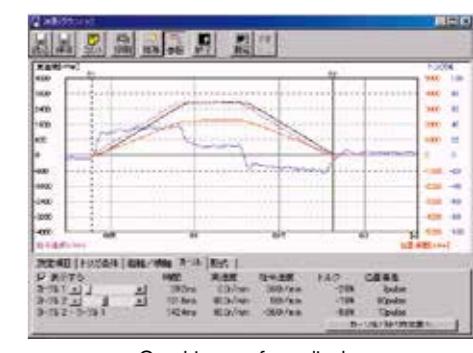
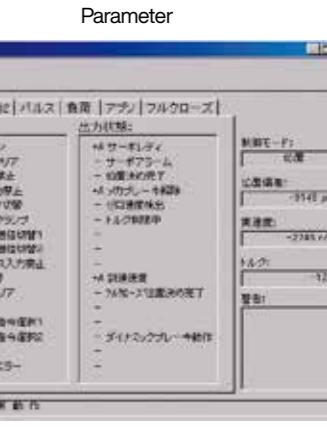
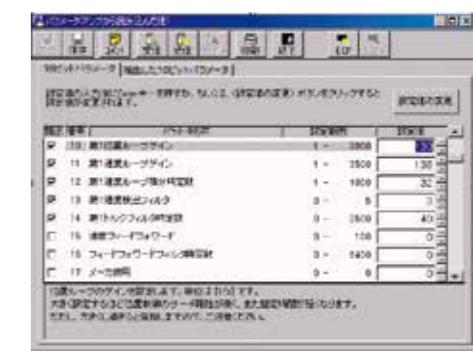
- Gain adjustment and inertia ratio measurement

● Graphic waveform display

- The graphic display shows command velocity, actual velocity, torque, and error waveforms.

● Absolute encoder setup

- Clears absolute encoder at the origin.
- Displays single revolution/multi-revolution data.
- Displays absolute encoder status.



Analysis of Mechanical Operation Data

● Frequency analysis

- Measures frequency characteristics of the machine, and displays Bode diagram.

■ Can not use with A5, A6 Family.

Hardware configuration

- [Personal computer] • CPU: Pentium 100MHz or more • Memory: 16 MB or more (32 MB recommended)
- Hard disk capacity (vacancy of 25 MB or more recommended) • OS: Windows® 98, Windows® Me, Windows® 2000, Windows® XP (US version)
- Communication speed of serial communication port: 2400 bps or more (The software may not operate normally using USB-to-Serial adapter.)
- [Display] • Resolution: 640*480 (VGA) or more (desirably 1024*768) • Number of colors: 256 colors or more
- [CD-ROM drive] • CD-ROM drive operable on the above-mentioned personal computer

E Series	Options	Cable part No. Designation	Cable	Options	E Series																								
Encoder Cable For available optional items, please refer to P.400.																													
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>M</td><td>F</td><td>E</td><td>C</td><td>A</td><td>0</td><td>0</td><td>5</td><td>0</td><td>E</td><td>A</td><td>M</td></tr> </table>					1	2	3	4	5	6	7	8	9	10	11	12	M	F	E	C	A	0	0	5	0	E	A	M	
1	2	3	4	5	6	7	8	9	10	11	12																		
M	F	E	C	A	0	0	5	0	E	A	M																		
Motor Cable, Brake Cable For available optional items, please refer to P.400.																													
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>M</td><td>F</td><td>M</td><td>C</td><td>A</td><td>0</td><td>0</td><td>5</td><td>0</td><td>A</td><td>E</td><td>B</td></tr> </table>					1	2	3	4	5	6	7	8	9	10	11	12	M	F	M	C	A	0	0	5	0	A	E	B	
1	2	3	4	5	6	7	8	9	10	11	12																		
M	F	M	C	A	0	0	5	0	A	E	B																		
ROBO-TOP® is a trade mark of DYDEN CORPORATION																													
Cable			Cable Set (3 m)																										
			<table border="1"> <tr><td>Part No.</td><td>DV0P37300</td></tr> </table>			Part No.	DV0P37300																						
Part No.	DV0P37300																												
			<p>1) Interface cable : DV0P0800 2) Encoder cable (3 m) : MFECA0030EAM 3) Motor cable (3 m) : MFMCA0030AEB 4) Connector kit for driver power supply connection : DV0P2870</p>																										
Cable Set (5 m)			<table border="1"> <tr><td>Part No.</td><td>DV0P39200</td></tr> </table>			Part No.	DV0P39200																						
Part No.	DV0P39200																												
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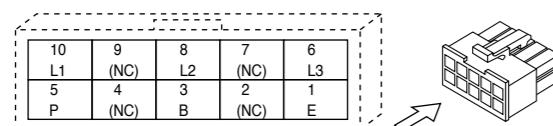
Connector Kit for Power Supply Connection

Part No. DVOP2870

● Parts composition

Title	Part No.	Number	Manufacturer	Note
Connector (10 pins)	5557-10R-210	1	Molex Inc.	For connector, CN X1 (10 pins)
Connector pin	5556PBTL	6		

● Pin configuration of connector CN X1



● Recommended manual crimping tool (to be prepared by customer)

Part No.	Cable material
57026-5000	UL1007
57027-5000	UL1015

<Cautions>

1. The above pin disposition is shown when viewed from the terminal inserting direction. Make a correct wiring by checking the stamped pin numbers on the connector itself.
2. Refer to P.386 for wiring and connection.
3. Do not connect anything to pins marked "NC".

Connector Kit for Motor/Encoder Connection

Part No. DVOP3670 (Incremental 2500 pulse, 5-wire)

This option is required when you make your own encoder cable and motor cable. (Brake cable is required for brake.)

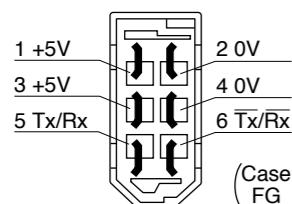
● Parts composition

Title	Part No.	Number	Manufacturer	Note
Connector (Driver side)	3E206-0100 KV	1	Sumitomo 3M or equivalent	For connector, CN X4 (6 pins)
Shell kit	3E306-3200-008	1		
Connector (6 pins)	172160-1	1	Tyco Electronics	For junction to encoder cable (6 pins)
Connector pin	170365-1	6	Tyco Electronics	
Connector (4 pins)	172159-1	1	Tyco Electronics	For junction to motor power cable (4 pins)
Connector pin	170366-1	4	Tyco Electronics	
Connector (6 pins)	5557-06R-210	1	Molex Inc.	For connector, CN X3 (6 pins)
Connector pin	5556PBTL	4		

<Remarks>

We may use parts equivalent to the above for shell and connector cover.

● Pin configuration of connector CN X4 plug



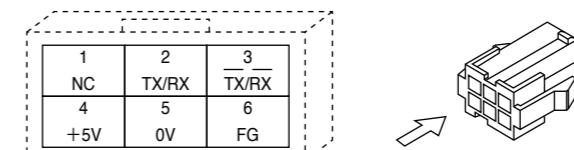
● Recommended manual crimping tool (to be prepared by customer)

Title	Part No.	Manufacturer	Cable material
For encoder cable junction	755330-1	Tyco Electronics	—
For motor power cable junction	755331-1		
For Connector CN X3	57026-5000 57027-5000	Molex Inc.	UL1007 UL1015

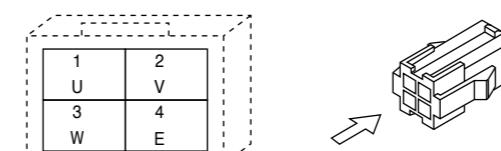
<Remarks>

1. The above pin configuration is shown when viewed from the pin-soldering direction. Make a correct wiring by checking the stamped pin numbers on the connector itself.
2. Connect the shield of the wire to the case (FG) without fail.
3. For wiring and connection, refer to P.386.

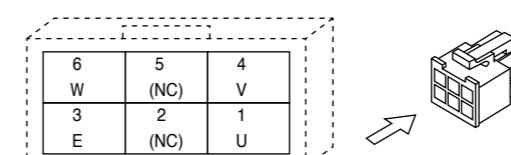
● Pin configuration of encoder cable junction



● Pin configuration of motor power cable junction



● Pin configuration of mating connector to CN X3 connector



<Cautions>

1. The above pin configuration is shown when viewed from the terminal inserting direction. Make a correct wiring by checking the stamped pin numbers on the connector itself.
2. Refer to P.386 for wiring and connection.

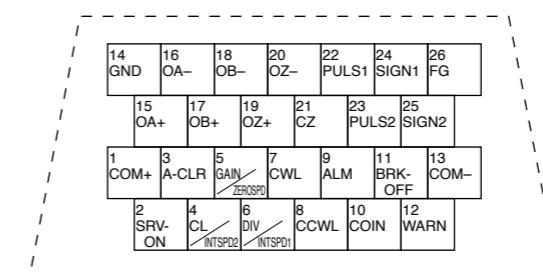
Connector Kit for Interface

Part No. DVOP0770

● Parts composition

Title	Part No.	Number	Manufacturer	Note
Connector	10126-3000PE	1	Sumitomo 3M or equivalent	For connector, CN X5 (26 pins)
Connector cover	10326-52A0-008	1		

● Pin configuration of connector CN X5 (26 pins) (viewed from the soldering side)



<Cautions>

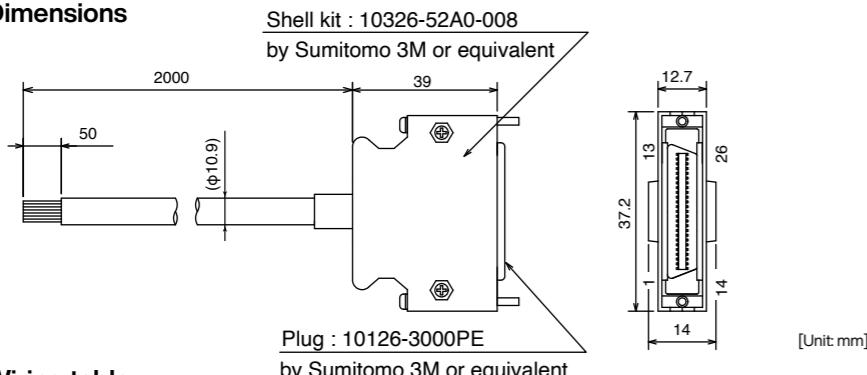
1. Make a correct wiring by checking the stamped pin numbers on the connector itself.
2. Refer to P.387 for symbols and functions of the above signals.

Interface Cable

Part No. DVOP0800

Cable of 2 m is connected.

● Dimensions



● Wiring table

Pin No.	Title of signal	Color or cable	Pin No.	Title of signal	Color or cable	Pin No.	Title of signal	Color or cable
1	COM+	Orange (Red 1)	10	COIN	Pink (Black 1)	19	OZ+	Pink (Red 2)
2	SRV-ON	Orange (Black 1)	11	BRK-OFF	Orange (Red 2)	20	OZ-	Pink (Black 2)
3	A-CLR	Gray (Red 1)	12	WARN	Orange (Black 2)	21	CZ	Orange (Red 3)
4	CL/INTSPD2	Gray (Black 1)	13	COM-	Gray (Red 2)	22	PULS1	Gray (Red 3)
5	GAIN/ZEROSPD	White (Red 1)	14	GND	Gray (Black 2)	23	PULS2	Gray (Black 3)
6	DIV/INTSPD1	White (Black 1)	15	OA+	White (Red 2)	24	SIGN1	White (Red 3)
7	CWL	Yellow (Red 1)	16	OA-	White (Black 2)	25	SIGN2	White (Black 3)
8	CCWL	Yellow (Black 1)	17	OB+	Yellow (Red 2)	26	FG	Orange (Black 3)
9	ALM	Pink (Red 1)	18	OB-	Yellow (Black 2)			

<Notes>

e.g. of Pin No.
designation:
Pin No.1... Wire color
is orange, and one
red dot.
Pin No.12... Wire
color is orange, and
two black dot.

<Caution>

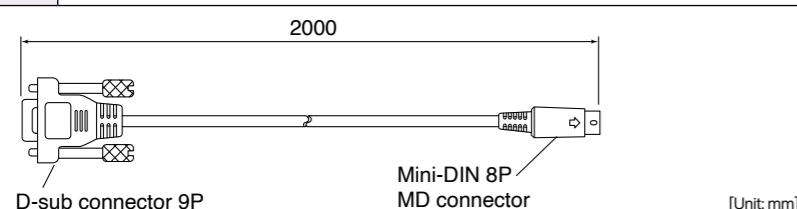
Cable pin No. 26 is not connected to the connector shell (housing) or shielded wire (net wire).

Pin No. 26 of the Driver is connected to the shell (housing) of the connector.

The shielded wire (net wire) of the cable is connected to the shell (housing) of the connector of the cable, and by connecting the connector of the optional cable to the Driver, pin No. 26 of the cable and the shielded wire (net wire) of the cable gets connected via the Driver.

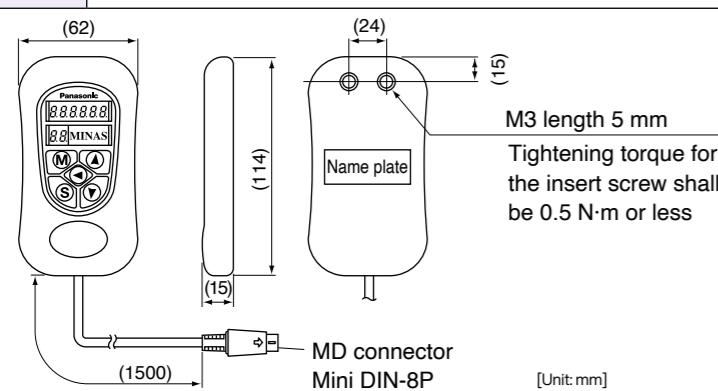
Communication Cable (For Connection with PC)

Part No. DVOP1960



Console

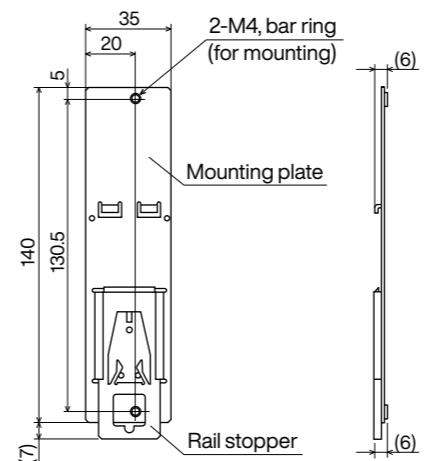
Part No. DVOP4420



DIN Rail Mounting Unit

Part No. DVOP3811

● Dimensions



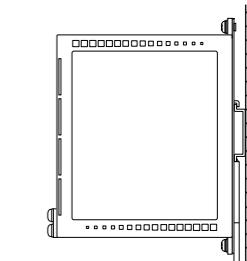
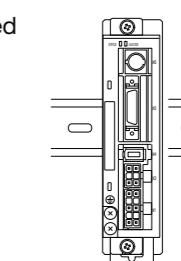
<Notes>

2 mounting screws (M4 X L8, Pan head) are attached.
Rail stopper can be extended to max. 10 mm.

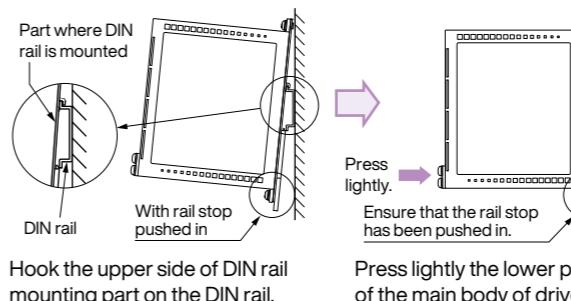
<Caution>

Please read carefully operation manual before using this product.
In addition, please do not apply excessive stress to the product.

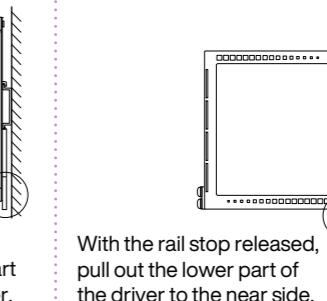
- Driver mounted to DIN rail



● How to Install



● Removing from DIN Rail

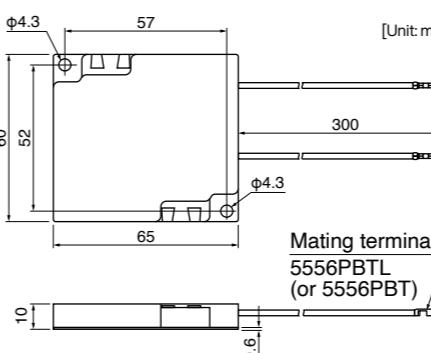


External Regenerative Resistor

Part No.	Manufacturer's Part No.	Specifications			Note (Input Power of drive)
		Resistance Ω	Rated power W	Activation temperature of built-in fuse $^{\circ}\text{C}$	
DVOP2890	45M03	50	10	137 $^{+3}_{-2}$	Single phase, 100 V
DVOP2891	45M03	100	10	137 $^{+3}_{-2}$	Single/3-phase, 200 V

Manufactured by Iwaki Musen Kenkyuusho Co, Ltd.

● Dimensions



<Caution of when using external regeneration resistor>

Since it becomes high temperature, external regeneration resistor must be installed according to the contents shown below.

- Attach to incombustibles, such as metal.
 - Install in the place which cannot touch directly by covering with incombustibles etc.
 - Do not install near the combustibles.
- Although the thermal cutoff is built in external regeneration resistor, the skin temperature of regeneration resistor may become high exceeding the operating temperature of thermal cutoff by the time the thermal cutoff operates in driver failure.
- The thermal cutoff is for preventing ignition of the regeneration resistor in driver failure, and is not for controlling the skin temperature of resistor.

<Remarks>

Thermal fuse is installed for safety.

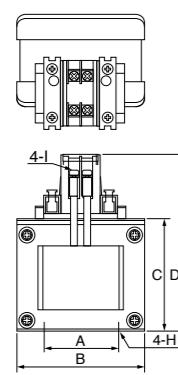
The thermal fuse may blow due to heat dissipating condition, working temperature, supply voltage or load fluctuation.

Make it sure that the surface temperature of the resistor may not exceed 100 $^{\circ}\text{C}$ at the worst running conditions with the machine, which brings large regeneration (such case as high supply voltage, load inertia is large or deceleration time is short) Please carry out air cooling if needed.

Reactor

Frame symbol of driver	Power supply specifications	Rated output	Part No.	Fig.
MKDE	Single phase, 100 V	50 W to 100 W	DV0P227	1
	Single phase, 200 V	50 W to 100 W	DV0P220	2
	3-phase, 200 V	50 W to 200 W		
MLDE	Single phase, 100 V	200 W	DV0P228	1
	Single phase, 200 V	200 W to 400 W	DV0P220	2
	3-phase, 200 V	400 W		

Fig.1



• Wiring of the reactor <Single phase>

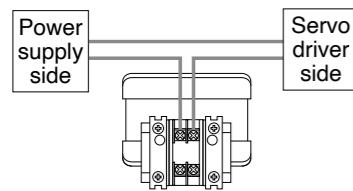
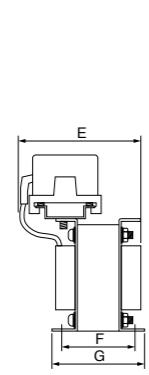
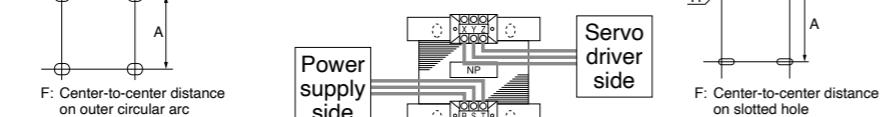


Fig.2



• Wiring of the reactor <3-Phase>



[Unit: mm]

	Part No.	A	B	C	D	E (Max)	F	G	H	I	Inductance (mH)	Rated current (A)
Fig.1	DV0P227	55±0.7	76.5±1	66.5±1	110 Max	90	43.6±2	56±2	4-5φx10	M4	4.02	5
	DV0P228	55±0.7	76.5±1	66.5±1	110 Max	95	48.0±2	61±2	4-5φx10	M4	2	8
Fig.2	DV0P220	65±1	125±1	(93)	136 Max	155	70+3/-0	85±2	4-7φx12	M4	6.81	3

Harmonic restraint

Harmonic restraint measures are not common to all countries. Therefore, prepare the measures that meet the requirements of the destination country.

When installing a product for Japan, refer to the instruction manual available on our website.

【Panasonic Industry Co., Ltd. web site】

industrial.panasonic.com/ac/e/

<Remarks>

When using a reactor, be sure to install one reactor to one servo driver.

■ Recommended devices**Surge Absorber for Motor Brake**

Motor	Surge absorber for motor brake	
	Part No. (Manufacturer's)	Manufacturer
MUMA 50 W to 400 W	Z15D151	SEMITEC Corporation

List of Peripheral Devices

Options

E Series

List of Peripheral Devices

Manufacturer	Tel No. / Home Page	Peripheral devices
Iwaki Musen Kenkyusho Co., Ltd.	+81-44-833-4311 http://www.iwakimusen.co.jp/	Regenerative resistor
SEMITEC Corporation	+81-3-3621-2703 http://www.semitec.co.jp/english2/	Surge absorber for motor brake
TDK Corporation	+81-3-5201-7229 http://www.global.tdk.com/	Ferrite core
Okaya Electric Industries Co. Ltd.	+81-3-4544-7040 http://www.okayaelec.co.jp/english/index.html	Surge absorber Noise filter
Sumitomo 3M	+81-3-5716-7290 http://solutions.3m.com/wps/portal/3M/ja_JP/WW2/Country/	
Tyco Electronics Japan G.K.	+81-44-844-8052 http://www.te.com/ja/home.html	Connector
Japan Molex Inc.	+81-462-65-2313 http://www.molex.co.jp	
DYDEN CORPORATION	+81-3-5805-5880 http://www.dyden.co.jp/english/index.htm	Cable

* The above list is for reference only. We may change the manufacturer without notice.

MEMO
