

## Operating Instructions (Overall)

### AC Servo Motor & Driver MINAS A5-series



\* This product image is 200W type of A5-series.

- Thank you for purchasing this Panasonic product.
- Before operating this product, please read the instructions carefully, and save this manual for future use.

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Thank you for purchasing Digital AC Servo Motor & Driver, MINAS A5-series. This instruction manual contains information necessary to correctly and safely use the MINAS A5-series motor and driver. By reading this instruction manual, you will learn how to identify the model of the motor and driver that will be best suitable your application, how to wire and set up them, how to set parameters, and how to locate possible cause of symptom and to take corrective action.

This is the original instruction.

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**Caution** ❖

- 1) Any part or whole of this document shall not be reproduced without written permission from us.
- 2) Contents of this document are subject to change without notice.

## 1. Before Using the Products

### Check of the Driver Model ... Installation

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Describes how to identify and select the desired product and components, how to read the specifications, and how to install the equipment.

## 2. Preparation

### Operating requirements and procedure

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Shows the timing chart and the list of parameters, and describes how to make wiring and to use the front panel.

## 3. Connection

### Wiring ... I/O settings

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Shows block diagrams for each control mode and connection diagrams to the host controller, I/O settings.

## 4. Setup

### Describes parameters ... JOG running

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Shows describes parameters and procedure of test operation.

## 5. Adjustment

### Gain adjustment ... Auto tuning

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Describes various adjusting method including auto tuning and manual gain tuning.

## 6. When in Trouble

Read this section when you encounter trouble or error.

## 7. Supplement

Contains S-T characteristic diagram, dimensional outline drawing, supplemental description on communications and operation.

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# Safety Precautions

Please observe safety precautions fully.

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

- Misuses that could result in harm or damage are shown as follows, classified according to the degree of potential harm or damage.

	<b>Danger</b>	Indicates great possibility of death or serious injury.
	<b>Caution</b>	Indicates the possibility of injury or property damage.

- The following indications show things that must be observed.

	Indicates something that must not be done.
	Indicates something that must be done.

## **Danger**

	<b>Do not subject the Product to water, corrosive or flammable gases, and combustibles.</b>	Failure to observe this instruction could result in fire, electrical shocks, damages and breakdowns.
	<b>Do not place combustibles near by the motor, driverd regenerative resistor and dynamic brake resistor..</b>	Failure to observe this instruction could result in electrical shock, injury or fire.
	<b>Don't use the motor in a place subject to excessive vibration or shock.</b>	Failure to observe this instruction could result in electrical shocks, damages and breakdowns.
	<b>Don't use cables soaked in water or oil.</b>	Failure to observe this instruction could result in fire and breakdowns.
	<b>The installation area should be away from heat generating objects such as a heater and a large wire wound resistor.</b>	Failure to observe this instruction could result in electrical shock, injury or fire.
	<b>Never connect the motor directly to the commercial power supply.</b>	Failure to observe this instruction could result in burn and electrical shocks.
	<b>Don't attempt to carry out wiring or manual operation with wet hand.</b>	
	<b>Do not put your hands in the servo driver.</b>	

	<b>In the case of the motor with shaft end keyway, do not touch the keyway with bare hands.</b>	Failure to observe this instruction could result in personal injury.
	<b>Do not touch the rotating portion of the motor while it is running. Failure to observe this instruction could result in damages and breakdowns.</b>	
	<b>Do not touch the motor, servo driver, heat sink, regenerative resistor and dynamic brake resistor, since they become very hot.</b>	Failure to observe this instruction could result in burns.
	<b>Do not drive the motor with external power.</b>	Failure to observe this instruction could result in fire.
	<b>Do not subject the cables to excessive force, heavy object, or pinching force, nor damage the cables.</b>	Failure to observe this instruction could result in electrical shocks, damages and breakdowns.
	<b>Installation area should be free from excessive dust, and from splashing water and oil.</b>	Failure to heed this precaution will result in electric shock, personal injury, fire, malfunction or damage.
	<b>Mount the motor, driver and peripheral equipments on incombustible material such as metal.</b>	Installation on a flammable material may cause fire.
	<b>Wiring has to be carried out by the qualified and authorized specialist.</b>	Allowing a person with no expertise to carry out wiring will result in electrical shocks.
	<b>Correctly run and arrange wiring.</b>	Incorrect wiring will result in short circuit, electric shock, personal injury, etc.
	<b>After correctly connecting cables, insulate the live parts with insulator.</b>	Incorrect wiring will result short circuit, electric shock, fire or malfunction.
	<b>Ground the earth terminal of the motor and driver without fail.</b>	Floating ground circuit will cause electric shock.
	<b>Install and mount the Product and machinery securely to prevent any possible fire or accidents incurred by earthquake.</b>	Failure to heed this requirement will result in electric shock, personal injury, fire, malfunction or damage.
	<b>Install an emergency stop circuit externally so that you can stop the operation and shut off the power immediately.</b>	
	<b>Install an overcurrent protection, earth leakage breaker, over-temperature protection and emergency stop apparatus without fail.</b>	Failure to heed these requirements will result in electric shock, personal injury or fire.
	<b>Check and confirm the safety of the operation after the earthquake.</b>	
<b>Before transporting, wiring and inspecting the driver, turn off power and wait for a time longer than that specified on the name plate on the side panel of the product; and make sure that there is no risk of electrical shock.</b>	Energized circuit will cause electric shock.	

# Safety Precautions

Please observe safety precautions fully.



## Caution

	<b>Do not hold the motor cable or motor shaft during the transportation.</b>	Failure to observe this instruction could result in injuries.
	<b>Don't drop or cause topple over of something during transportation or installation.</b>	Failure to observe this instruction could result in injuries and breakdowns.
	<b>Do not step on the Product nor place the heavy object on them.</b>	Failure to observe this instruction could result in electrical shocks, injuries, breakdowns and damages.
	<b>Don't use the equipment under direct sunshine.</b>	Failure to heed these instructions will cause personal injury or fire.
	<b>Do not block the heat dissipating holes or put the foreign particles into them.</b>	Failure to observe this instruction could result in electrical shocks and fire.
	<b>Do not give strong impact shock to the Product.</b>	Failure to observe this instruction could result in breakdowns.
	<b>Do not give strong impact shock to the motor shaft.</b>	Failure to observe this instruction could result in a failure of the detector etc.
	<b>Do not turn on and off the main power of the driver repeatedly.</b>	Failure to observe this instruction could result in breakdowns.
	<b>Never run or stop the motor with the electro-magnetic contactor installed in the main power side.</b>	
	<b>Do not make an extreme gain adjustment or change of the drive. Do not keep the machine running/operating unstably.</b>	Failure to observe this instruction could result in injuries.
	<b>Do not use the built-in brake as a "Braking" to stop the moving load.</b>	Failure to observe this instruction could result in injuries and breakdowns.
	<b>Do not approach to the machine since it may suddenly restart after the power resumption. Design the machine to secure the safety for the operator even at a sudden restart.</b>	Failure to observe this instruction could result in injuries.
	<b>Never attempt to perform modification, dismantle or repair.</b>	Failure to heed this instruction will result in fire, electric shock, personal injury or malfunction.



	<b>Make an appropriate mounting of the Product matching to its wight and output rating.</b>	Failure to heed these requirements will result in personal injury or malfunction.
	<b>Observe the specified mounting method and direction.</b>	
	<b>Use the eye bolt of the motor for transportation of the motor only, and never use this for transportation of the machine.</b>	Using it for transportation of the machine will cause personal injury or malfunction.
	<b>Don't place any obstacle object around the motor and peripheral, which blocks air passage.</b>	Temperature rise will cause burn injury or fire.
	<b>Adjust the motor and driver ambient environmental condition to match the motor operating temperature and humidity.</b>	Failure to heed these requirements will result in personal injury or malfunction.
	<b>Create the specified clearance between the driver and the control panel inner surface or other devices.</b>	
	<b>Observe the specified voltage.</b>	Operation from a voltage outside the rated voltage will cause electric shock, personal injury or fire.
	<b>Connect the brake control relay to the relay which is to shut off at emergency stop in series.</b>	Missing of one of these devices will result in personal injury or malfunction.
	<b>Provide protection device against idling of electromagnetic brake or gear head, or grease leakage from gear head.</b>	No protection will cause personal injury, damage, pollution or fire.
	<b>Use the motor and the driver in the specified combination.</b>	Not using the motor and the driver in the specified combination will result in fire.
	<b>Test-run the securely fixed motor without loading to verify normal operation, and then connect it to the mechanical system.</b>	Operation using a wrong model or wrong wiring connection will result in personal injury.
	<b>When any error occurs, remove the cause and release the error after securing the safety, then restart.</b>	Not removing the cause of the error will result in personal injury.
	<b>If the driver fails, shut off the power on the power supply side of the driver.</b>	Allowing a large current to continue to pass will result in fire.
	<b>Maintenance must be performed by an experienced personnel.</b>	Wrong wiring will cause personal injury or electric shock.
<b>Always keep power disconnected when the power is not necessary for a long time.</b>	Improper operation will cause personal injury.	
<b>When you dispose the batteries, observe any applicable regulations or laws after insulating them with tape.</b>		
<b>This Product shall be treated as Industrial Waste when you dispose.</b>		

# Conformance to international standards



## Conformed Standards

		Driver	Motor
EC Direc- tives	EMC Directives	EN55011 EN61000-6-2 EN61800-3	—
	Low-Voltage Directives	EN61800-5-1	EN60034-1 EN60034-5
	Machinery Directives Functional safety (*1)	EN954-1 (Cat. 3) ISO13849-1 (PL c,d)(Cat. 3) EN61508 (SIL 2) EN62061 (SIL 2) EN61800-5-2 (STO) IEC61326-3-1	—
UL Standards	UL508C (E164620)	UL1004-1 ( E327868: to 750W (200V) from 6.0kW ) UL1004 ( E327868: 400W (400V) 600W (400V), 750W (400V) 0.9kW to 5.0kW )	
CSA Standards	C22.2 No.14	C22.2 No.100	

IEC : International Electrotechnical Commission

EN : Europäischen Normen

EMC : Electromagnetic Compatibility

UL : Underwriters Laboratories

CSA : Canadian Standards Association

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

Panasonic Testing Centre

Panasonic Service Europe, a division of

Panasonic Marketing Europe GmbH

Winsbergring 15, 22525 Hamburg, F.R. Germany

\* Products shall conform to the statutory regulations applied in the place of destination.

\* Only for position control type does not support functional safety>(\*1) standards.

### Note

For details on compatibility with international standard, refer to P.2-2 Conformance to international standards.

**Routine maintenance and inspection of the driver and motor are essential for the proper and safe operation.**

## Notes on Maintenance and Inspection

- 1) Turn on and turn off should be done by operators or inspectors themselves. When establishing a system using safety functions, completely understand the applicable safety standards and the operating instruction manual or technical documents for the product.
- 2) Internal circuit of the driver is kept charged with high voltage for a while even after power-off. Turn off the power and allow 15 minutes or longer after LED display of the front panel has gone off, before performing maintenance and inspection.
- 3) Disconnect all of the connection to the driver when performing megger test (Insulation resistance measurement) to the driver, otherwise it could result in breakdown of the driver.
- 4) Do not use benzene, thinner, alcohol, acidic cleaner and alkaline cleaner because they can discolor or damage the exterior case.
- 5) The upper fan on H-frame driver is kept deactivated while servo is off, for the purpose of energy saving. This is normal.

## Inspection Items and Cycles

General and normal running condition

**Ambient conditions : 30°C (annual average), load factor of 80% or lower, operating hours of 20 hours or less per day.**

Perform the daily and periodical inspection as per the items below.

Type	Cycles	Items to be inspected
Daily inspection	Daily	<ul style="list-style-type: none"> <li>• Ambient temperature, humidity, speck, dust or foreign object</li> <li>• Abnormal vibration and noise</li> <li>• Main circuit voltage</li> <li>• Odor</li> <li>• Lint or other particles at air holes</li> <li>• Cleanness at front portion of the driver and connector</li> <li>• Damage of the cables</li> <li>• Loose connection or misalignment between the motor and machine or equipment</li> <li>• Pinching of foreign object at the load</li> </ul>
Motor with Gear Reducer	Annual	<ul style="list-style-type: none"> <li>• Loose tightening</li> <li>• Trace of overheat</li> <li>• Damage to the terminal block</li> <li>• Loose fasteners on terminal block</li> </ul>

**Note**

Inspection cycle may change when the running conditions of the above change.

# Maintenance and Inspections

## Guideline for Parts Replacement

Use the table below for a reference. Parts replacement cycle varies depending on the actual operating conditions. Defective parts should be replaced or repaired when any error have occurred.

 <b>Prohibited</b>	<b>Disassembling for inspection and repair should be carried out only by authorized dealers or service company.</b>
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Product	Component	Standard replacement cycles (hour)	Note
Driver	Smoothing condenser	Approx. 5 years	These hours or cycles are reference. When you experience any error, replacement is required even before this standard replacement cycle.
	Cooling fan	2 to 3 years (10,000 to 30,000 hours)	
	Aluminum electrolytic capacitor (on PCB)	Approx. 5 years	
	Rush current preventive relay	Approx. 100,000 times (depending on working condition)	
	Rush current preventive resistor	Approx. 20,000 times (depending on working condition)	
Motor	Bearing	3 to 5 years (20,000 to 30,000 hours)	
	Oil seal	5000 hours	
	Encoder	3 to 5 years (20,000 to 30,000 hours)	
	Battery for absolute encoder	Life time varies depending on working conditions. Refer to the Operating Instructions attached to the battery for absolute encoder.	

# 1. Before Using the Products

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The AC Servo Motor & Driver, MINAS A5-series is the latest servo system that meets all demands from a variety of machines which require high speed, high precision and high performance or which require simplified settings.

Compared with the preceding A4-series, product of A5-series offers superior performance while requiring simple setup and adjustment by the user.

Newly designed motors have wide range of outputs from 50 W to 15.0 kW, associated with 20-bit incremental encoder and reduced cogging torque.

(Only for position control type have range of outputs from 50 W to 5.0 kW.)

They are compatible with 2 closed controls (serial communication type and A-/B-phase output type) and provided with various automatic adjusting functions such as real time auto tuning with many automatic setting parameters to make complex tuning easy.

(Only for position control type do not conform to full-closed control.)

These motors assure higher stability with low stiffness machine and high-speed, high accurate operation with high stiffness machine. They can be used in combination with a wide variety of machines.

This manual is written as a complete guide for you so that you can fully and correctly make use of all functions available from MINAS A5.

- Make sure that the model is what you have ordered.
- Check if the product is damaged or not during transportation.
- Check if the Operating Instructions (safety) are included or not.
- Check if the power connector, motor connectors, connector for external regenerative resistor connection (D-frame (400 V) and E-frame) and safety by-pass plug are included or not.

(Neither the power connector nor motor connector are included to F-frame to H-frame.)

(Safety bypass plug is not supplied with only for position control type because it does not use this plug.)

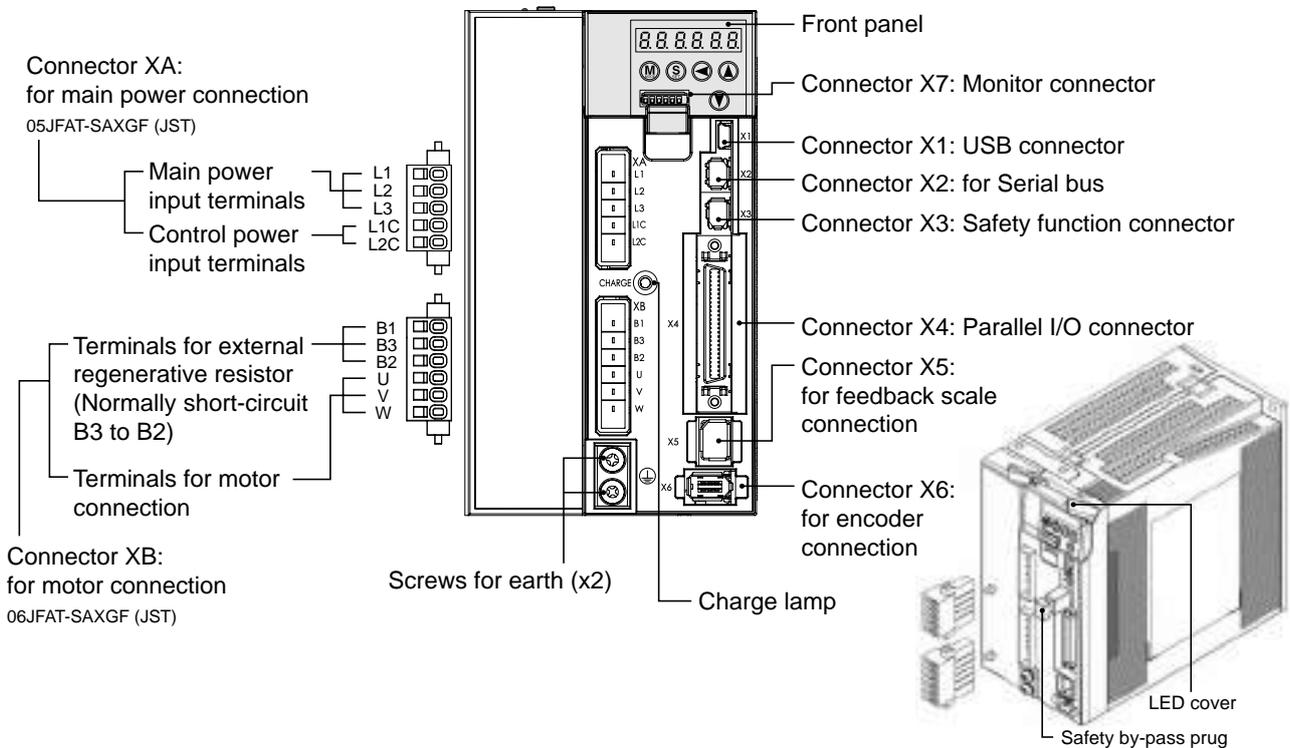
**Contact to a dealer if you find any failures.**



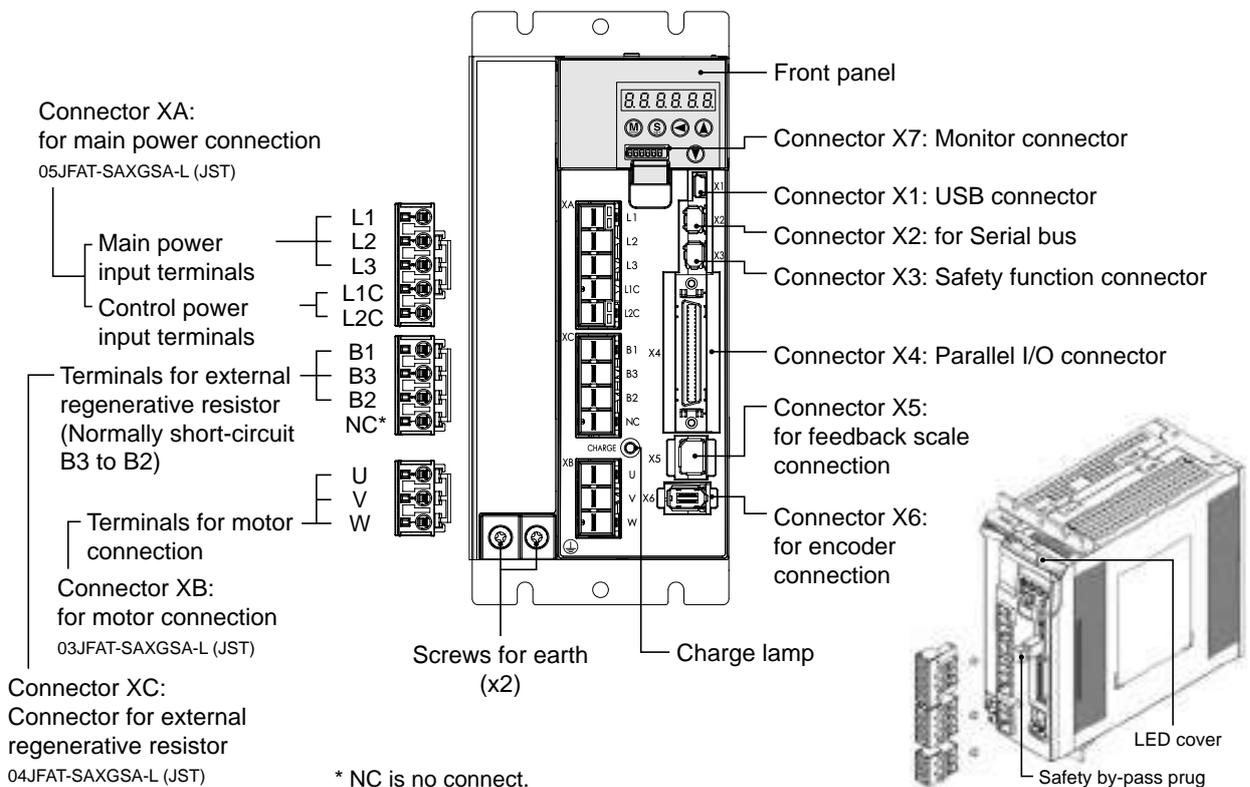
# 1 Before Using the Products

# 2. Driver Parts Description

## A to D-frame



## E-frame



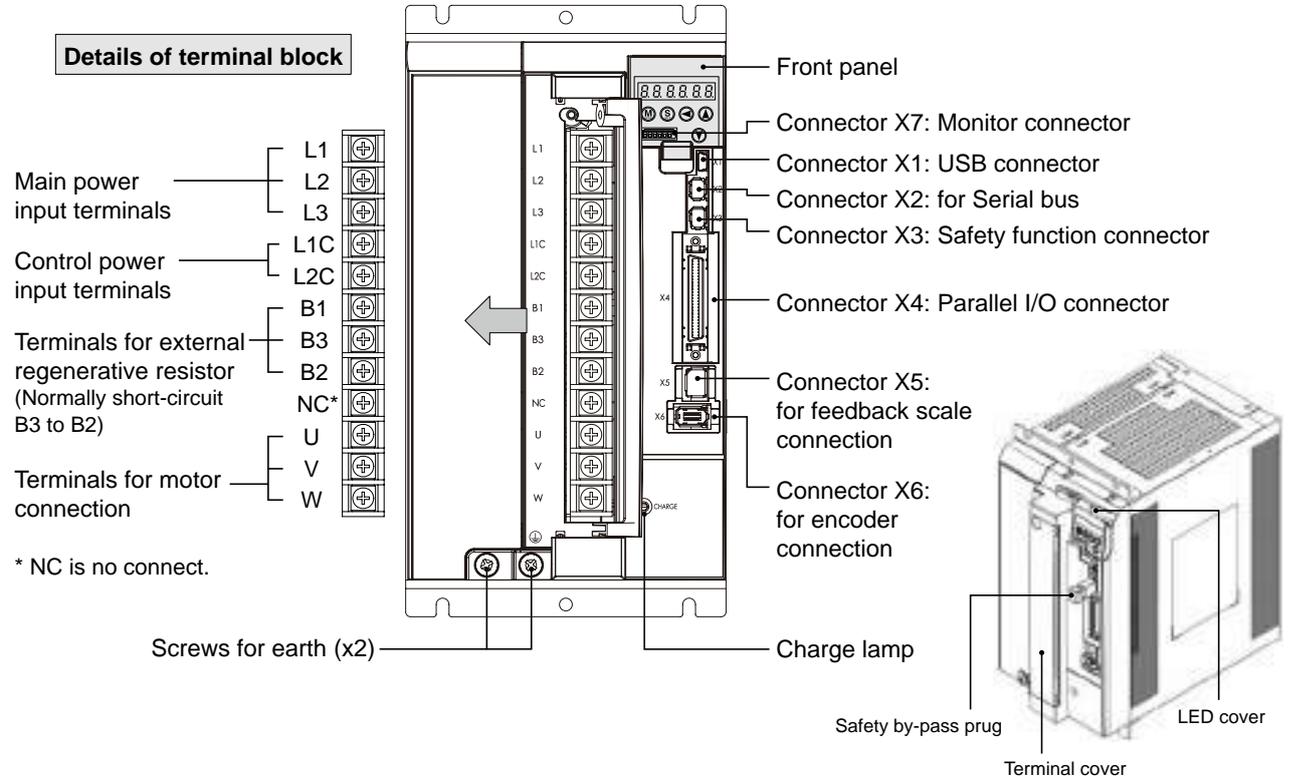
### Note

- Connector XA and XB are attached in A to D-frame driver.
- Connector XA, XB and XC are attached in E-frame driver.
- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

## 2. Driver

### Parts Description

## F-frame



#### Note

The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

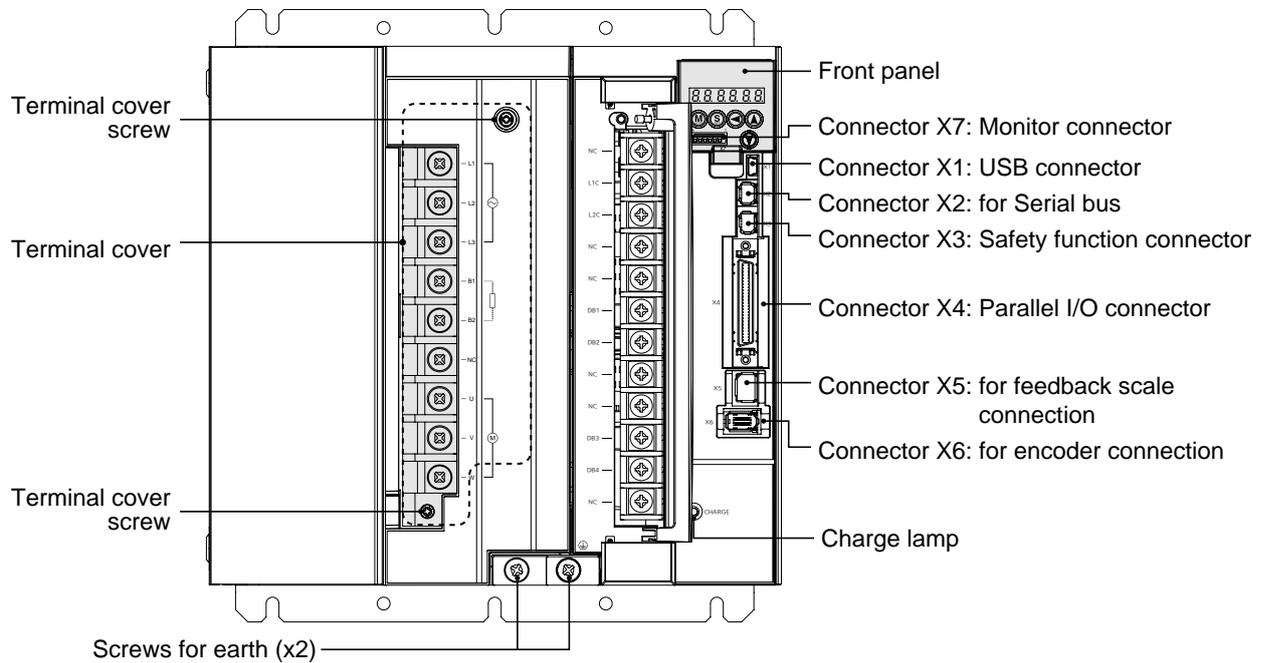
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• P.2-10 "Driver and List of Applicable Peripheral Equipments" • P.7-73 to 7-78 "Dimensions"

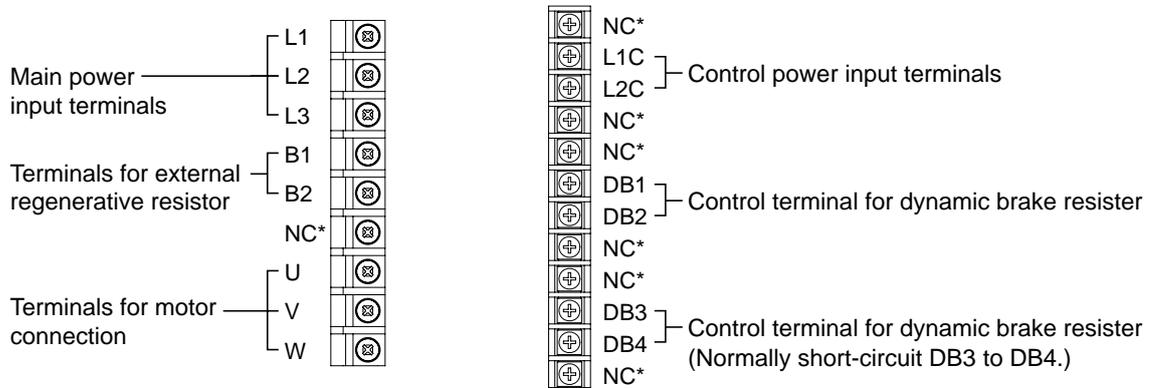
## 2. Driver

### Parts Description

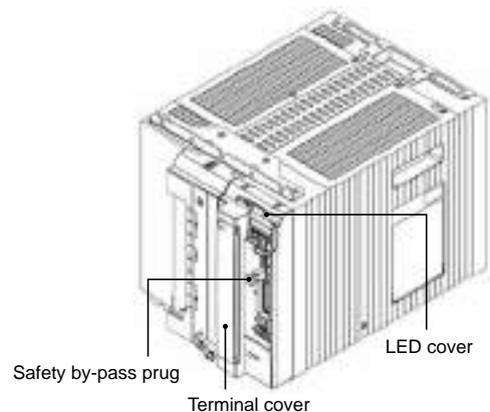
#### G-frame



#### Details of terminal block



\* NC is no connect.



#### Note

The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

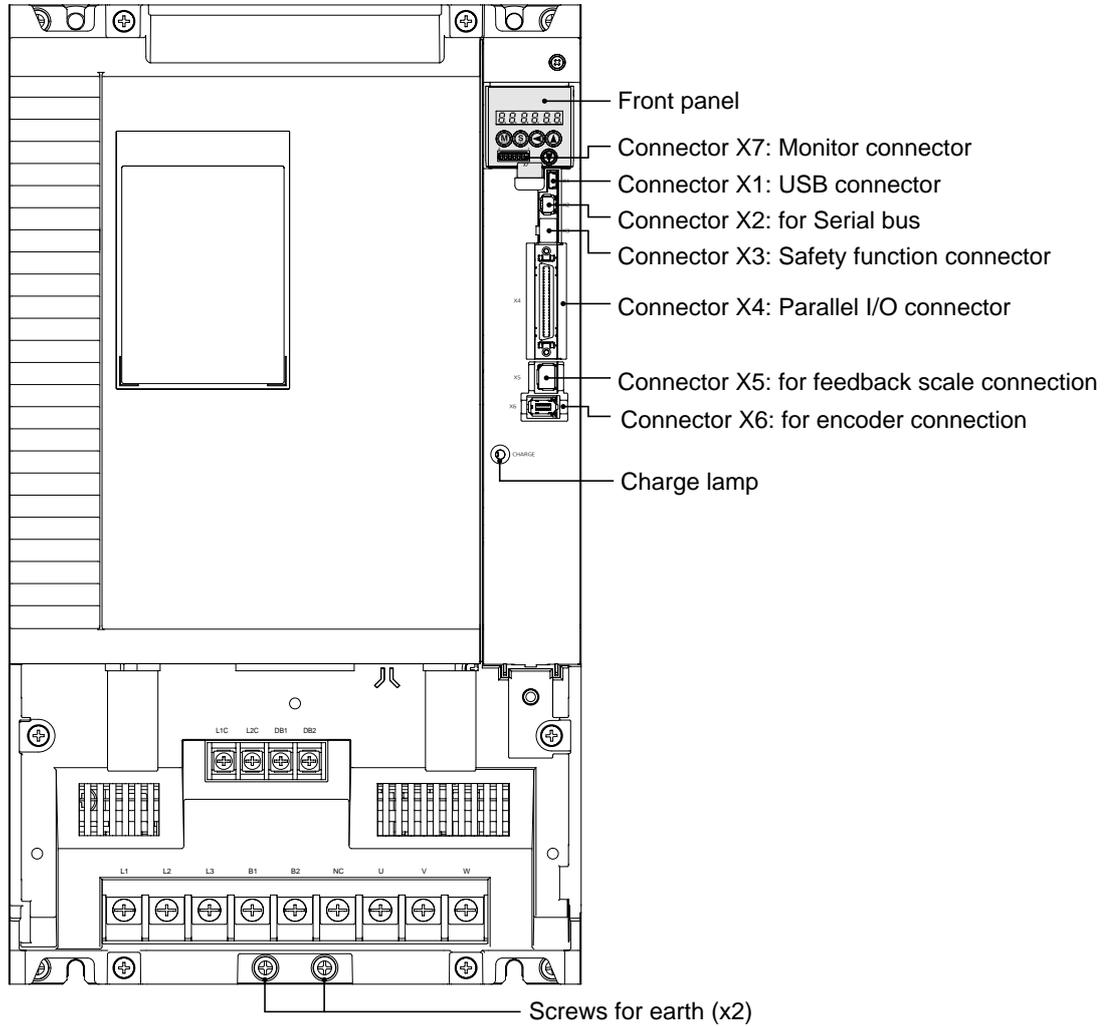
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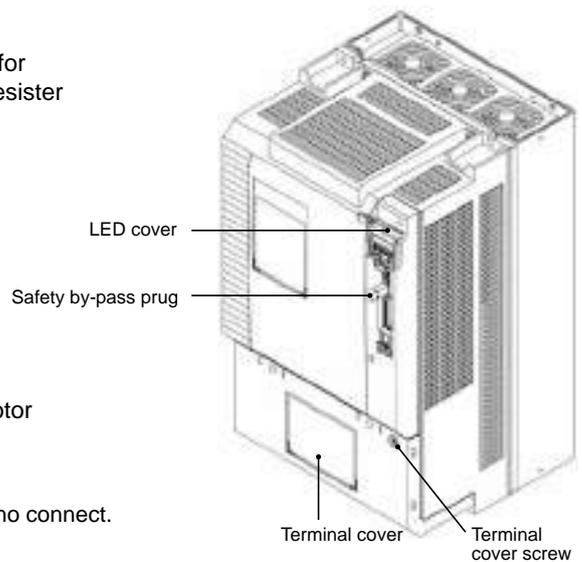
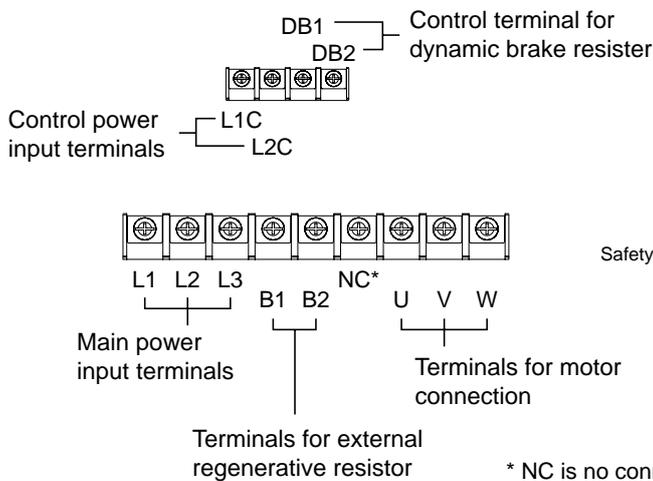
## 2. Driver

### Parts Description

### H-frame



#### Details of terminal block



#### Note

- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

#### Related page

- P.1-23 "Check of the Combination of the Driver and the Motor" • P.1-28 "Installation"
- P.2-10 "Driver and List of Applicable Peripheral Equipments" • P.7-73 to 7-78 "Dimensions"

## 2. Driver

### Parts Description

#### D, E-frame (400 V)

Connector XA:

for main power connection

03JFAT-SAYGSA-L (JST)

Connector XD:

Control power input terminals

02MJFAT-SAGF (JST)

Control power

input terminals

24V

0V

Main power

input terminals

L1

L2

L3

Terminals for external

regenerative resistor

(Normally short-circuit

B3 to B2)

B1

B3

B2

NC\*

Terminals for

motor connection

U

V

W

Connector XB:

for motor connection

03JFAT-SAXGSA-L (JST)

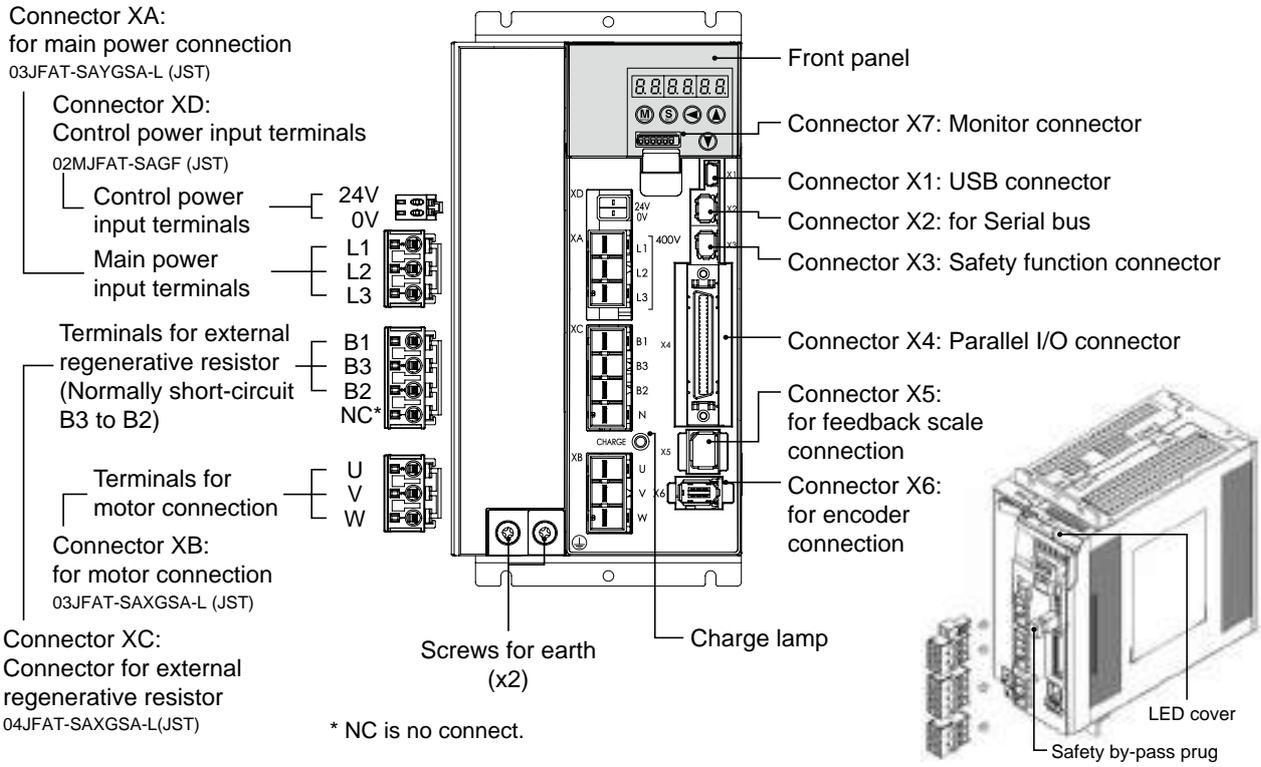
Connector XC:

Connector for external

regenerative resistor

04JFAT-SAXGSA-L(JST)

\* NC is no connect.



#### F-frame (400 V)

##### Details of terminal block

Control power

input terminals

24V

0V

Main power

input terminals

L1

L2

L3

Terminals for external

regenerative resistor

(Normally short-circuit

B3 to B2)

B1

B3

B2

NC\*

Terminals for motor

connection

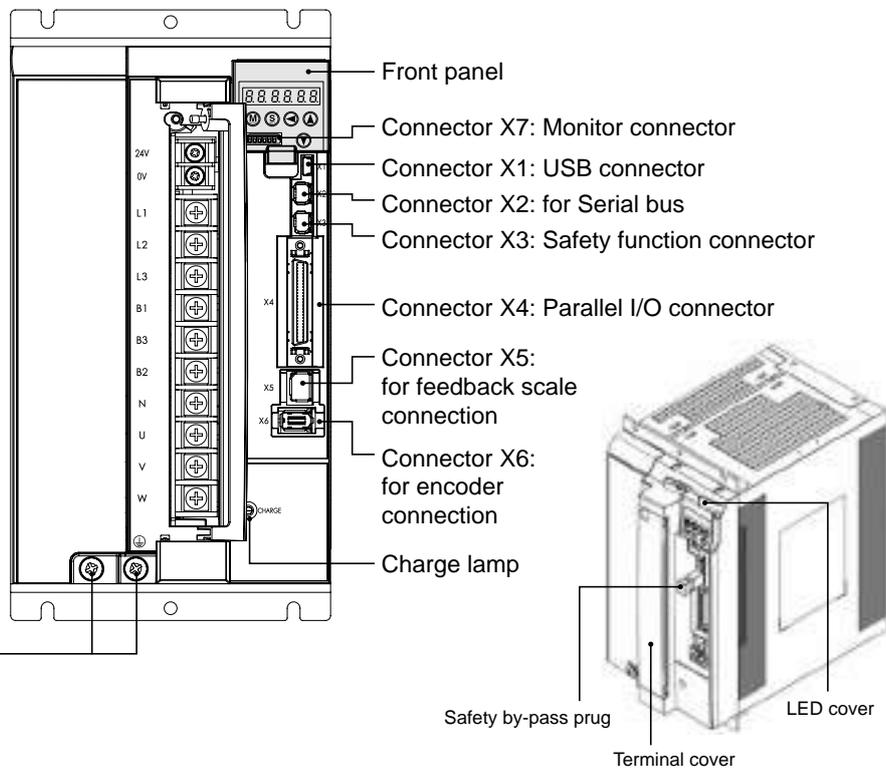
U

V

W

\* NC is no connect.

Screws for earth (x2)



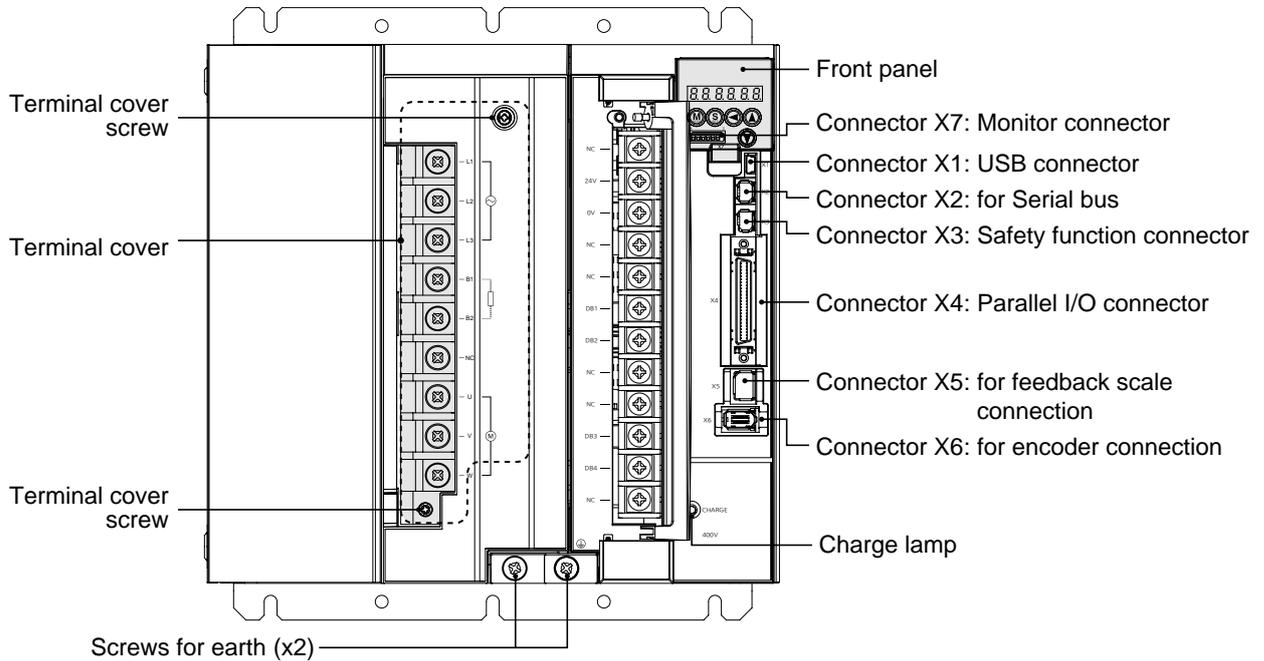
#### Note

- Connector X1 and X2 are attached in A to D-frame driver.
- Connector XA, XB, XC and XD are attached in D and E-frame (400 V) driver.
- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

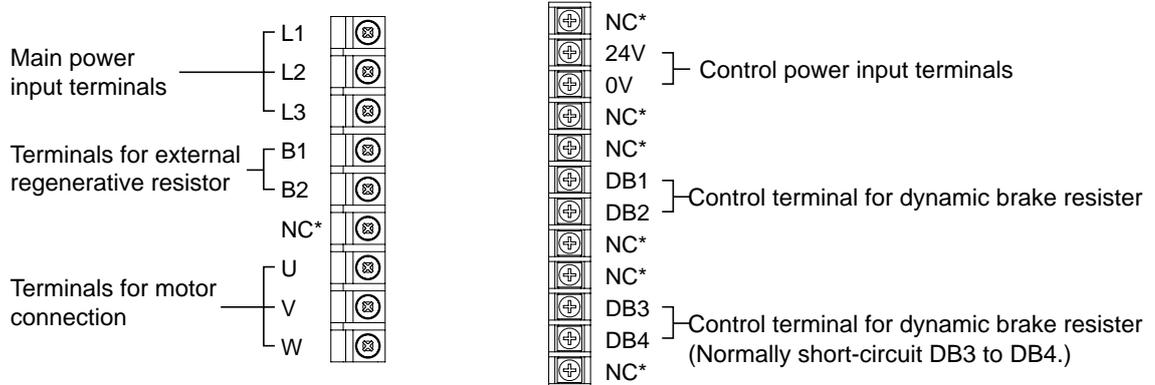
## 2. Driver

### Parts Description

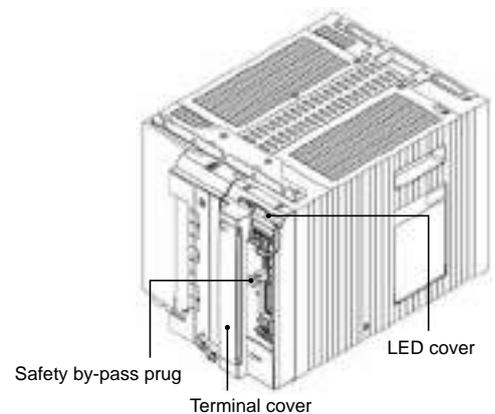
#### G-frame (400 V)



#### Details of terminal block



\* NC is no connect.



#### Note

The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

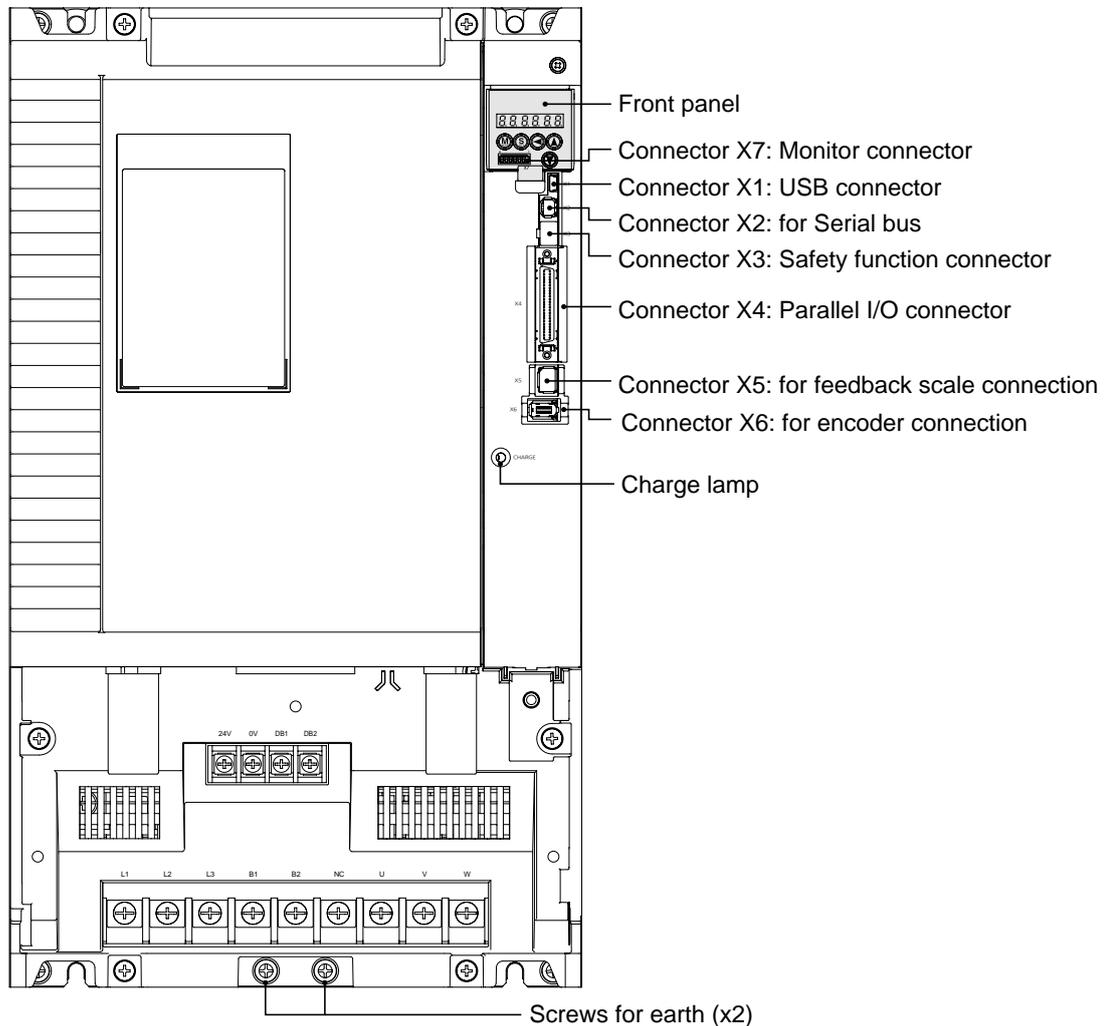
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• P.1-23 "Check of the Combination of the Driver and the Motor" • P.1-28 "Installation"  
• P.2-10 "Driver and List of Applicable Peripheral Equipments" • P.7-73 to 7-78 "Dimensions"

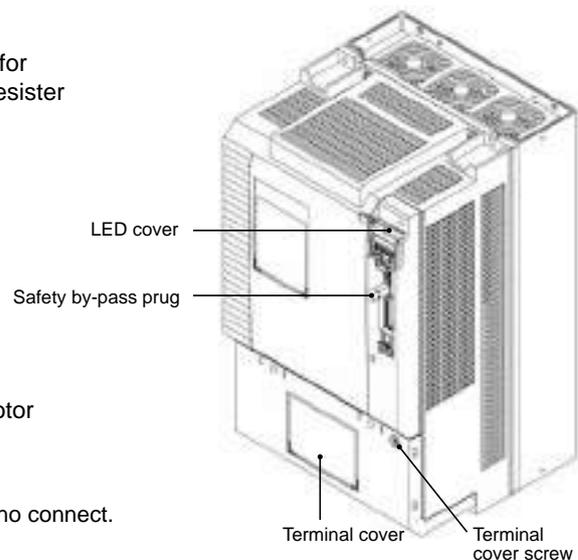
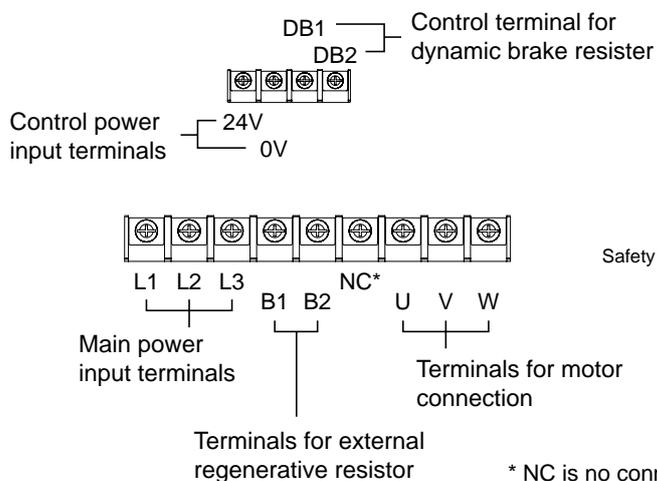
## 2. Driver

### Parts Description

## H-frame (400 V)



### Details of terminal block



### Note

- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

### Related page

- P.1-23 "Check of the Combination of the Driver and the Motor" • P.1-28 "Installation"
- P.2-10 "Driver and List of Applicable Peripheral Equipments" • P.7-73 to 7-78 "Dimensions"

# 1 Before Using the Products

## 2. Driver

### Specifications (Velocity, position, torque, full-closed control type)

Basic Specifications	Input power	100V	Main circuit	Single phase, 100 to 120V	+10% -15%	50/60Hz	
			Control circuit	Single phase, 100 to 120V	+10% -15%	50/60Hz	
		200V	Main circuit	A to D-frame	Single/3-phase, 200 to 240V	+10% -15%	50/60Hz
				E to H-frame	3-phase, 200 to 230V	+10% -15%	50/60Hz
			Control circuit	A to D-frame	Single phase, 200 to 240V	+10% -15%	50/60Hz
				E to H-frame	Single phase, 200 to 230V	+10% -15%	50/60Hz
		400V *1	Main circuit	3-phase, 380 to 480V	+10% -15%	50/60Hz	
			Control circuit	DC24V ± 15%			
		Withstand voltage		Primary to earth: withstand 1500 VAC, 1 min, (sensed current: 20 mA) [100V/200V] withstand 1960 VAC, 1 min, (sensed current: 20 mA) [400V] * 400V control circuit is excluded.			
		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 <sup>2</sup> )			
	humidity		Both operating and storage : 20 to 85%RH or less (free from condensation <sup>2</sup> )				
	Altitude		Lower than 1000m				
	Vibration		5.88m/s <sup>2</sup> or less, 10 to 60Hz (No continuous use at resonance frequency)				
	Control method		IGBT PWM Sinusoidal wave drive				
	Encoder feedback		17-bit (131072 resolution) absolute encoder, 7-wire serial 20-bit (1048576 resolution) incremental encoder, 5-wire serial				
	Feedback scale feedback		A/B phase, initialization signal differential input. Manufacturers that support serial communication scale: Mitsutoyo Corp. Magnescale Co., Ltd. (old Sony Manufacturing Systems Corp.)				
	Parallel I/O connector	Control signal	Input	General purpose 10 inputs The function of general-purpose input is selected by parameters.			
			Output	General purpose 6 outputs The function of general-purpose input is selected by parameters.			
		Analog signal	Input	3 inputs (16Bit A/D : 1 input, 12Bit A/D : 2 inputs)			
			Output	2 outputs (Analog monitor: 2 output)			
Pulse signal		Input	2 inputs (Photo-coupler input, Line receiver input) Photocoupler input is compatible with both line driver I/F and open collector I/F. Line receiver input is compatible with line driver I/F.				
		Output	4 outputs ( Line driver: 3 output, open collector: 1 output) Feed out the encoder feedback pulse (A, B and Z-phase) or feedback scale pulse (EXA, EXB and EXZ-phase) in line driver. Z-phase and EXZ-phase pulse is also fed out in open collector.				
Communication function		USB	Connection with PC etc.				
		RS232	1 : 1 communication to a host.				
	RS485	1 : n communication to a host.					
Safety function		Used for functional safety.					
Front panel		(1) 5 keys (MODE, SET, UP, DOWN, SHIFT) (2) LED (6-digit) (3) Monitor connector (Analog monitor output (2ch), Digital monitor output (1ch))					
Regeneration		A, B, G and H-frame: no built-in regenerative resistor (external resistor only) C to F-frame: Built-in regenerative resistor (external resistor is also enabled.)					
Dynamic brake		A to G-frame: Built-in (external resistor is also available to G-frame) H-frame: External only					
Control mode		Switching among the following 7 mode is enabled, (1) Position control (2) Velocity control (3) Toque control (4) Position/Velocity control (5) Position/Torque control (6) Velocity/Torque control (7) Full-closed control					

#### Caution

\*1 The specification out of Japan.

\*2 Air containing water vapor will become saturated with water vapor as the temperature falls, causing dew.

#### Related page

• P.1-28 "Installation of Driver" • P.1-32 "Installation of Motor"

## 2. Driver

### Specifications (Velocity, position, torque, full-closed control type)

Function	Control input		(1) Servo-ON input (2) Alarm clear input (3) Gain switching input (4) Positive direction over-travel inhibition input (5) Negative direction over-travel inhibition input (6) Forced alarm input (7) Inertia ratio switching input	
	Control output		(1) Servo-Alarm output (2) Servo-Ready output (3) External brake release signal (4) Speed arrival output (5) Torque in-limit signal output (6) Zero-speed detection output signal (7) Alarm output (8) Alarm attribute output	
	Position control	Control input		(1) Deviation counter clear (2) Command pulse inhibition (3) Command dividing gradual increase switching (4) Damping control switching (5) Torque limit switching (6) Control mode switching
		Control output		(1) Positioning complete (In-position) (2) Positional command ON/OFF output
		Pulse input	Max. command pulse frequency	Exclusive interface for Photo-coupler: 500kpps Exclusive interface for line driver : 4Mpps
			Input pulse signal format	Differential input. Selectable with parameter. ((1) Positive and Negative direction, (2) A and B-phase, (3) Command and direction)
			Electronic gear (Division/Multiplication of command pulse)	Process command pulse frequency × electronic gear ratio $\left(\frac{1 \text{ to } 2^{30}}{1 \text{ to } 2^{30}}\right)$ as positional command input. Use electronic gear ratio in the range 1/1000 to 1000 times.
			Smoothing filter	Primary delay filter or FIR type filter is adaptable to the command input
		Analog input	Torque limit command input	Individual torque limit for both positive and negative direction is enabled.
			Torque feed forward input	Analog voltage can be used as torque feed forward input.
		Instantaneous Speed Observer		Available
		Damping Control		Available
	Velocity control	Control input		(1) Selection of internal velocity setup (2) Speed zero clamp (3) Speed command sign input (4) Control mode switching
		Control output		(1) Speed coincidence output (2) Speed command ON/OFF output
		Analog input	Velocity command input	Speed command input can be provided by means of analog voltage. Parameters are used for scale setting and command polarity. (6V/Rated rotational speed Default)
			Torque limit command input	Individual torque limit for both positive and negative direction is enabled.
			Torque feed forward input	Analog voltage can be used as torque feed forward input.
		Internal velocity command		Switching the internal 8speed is enabled by command input.
		Soft-start/down function		Individual setup of acceleration and deceleration is enabled, with 0 to 10s/1000r/min. Sigmoid acceleration/deceleration is also enabled.
		Zero-speed clamp		0-clamp of internal velocity command with speed zero clamp input is enabled.
	Instantaneous Speed Observer		Available	
	Torque control	Control input		(1) Speed zero clamp (2) Torque command sign input (3) Control mode switching
		Control output		(1) Speed coincidence output (2) Speed in-limit output
		Analog input	Torque command input	Torque command input can be provided by means of analog voltage. Parameters are used for scale setting and command polarity. (3V/rated torque Default)
		Speed limit function		Speed limit value with parameter t is enabled.
	Full-closed control	Control input		(1) Deviation counter clear (2) Command pulse inhibition (3) Command dividing gradual increase switching (4) Damping control switching (5) Torque limit switching
Control output		(1) Full-closed positioning complete (2) Positional command ON/OFF output		
Pulse input		Max. command pulse frequency	Exclusive interface for Photo-coupler: 500kpps Exclusive interface for line driver : 4Mpps	
		Input pulse signal format	Differential input. Selectable with parameter. ((1) Positive and Negative direction, (2) A and B-phase, (3) Command and direction)	
		Electronic gear (Division/Multiplication of command pulse)	Process command pulse frequency × electronic gear ratio $\left(\frac{1 \text{ to } 2^{30}}{1 \text{ to } 2^{30}}\right)$ as positional command input. Use electronic gear ratio in the range 1/1000 to 1000 times.	
		Smoothing filter	Primary delay filter or FIR type filter is adaptable to the command input	
Analog input		Torque limit command input	Individual torque limit for both positive and negative direction is enabled.	
		Torque feed forward input	Analog voltage can be used as torque feed forward input.	
Setup range of division/multiplication of feedback scale		1/40 to 160 times The ratio of encoder pulse (numerator) to external scale pulse (denominator) can be set to 1 to 2 <sup>20</sup> (numerator) to 1 to 2 <sup>20</sup> (denominator), but should be set to a ratio within the range shown above.		
Common		Auto tuning		The load inertia is identified in real time by the driving state of the motor operating according to the command given by the controlling device and set up support software "PANATERM". The gain is set automatically in accordance with the rigidity setting.
	Division of encoder feedback pulse		Set up of any value is enabled (encoder feedback pulses count is the max.).	
	Protective function	Hard error	Over-voltage, under-voltage, over-speed, over-load, over-heat, over-current and encoder error etc.	
		Soft error	Excess position deviation, command pulse division error, EEPROM error etc.	
Traceability of alarm data		The alarm data history can be referred to.		

# 1 Before Using the Products

## 2. Driver

### Specifications (Only for position control type)

Basic Specifications	Input power	100V	Main circuit		Single phase, 100 to 120V	+10% -15%	50/60Hz		
			Control circuit		Single phase, 100 to 120V	+10% -15%	50/60Hz		
		200V	Main circuit	A to D-frame	Single/3-phase, 200 to 240V	+10% -15%	50/60Hz		
				E to F-frame	3-phase, 200 to 230V	+10% -15%	50/60Hz		
			Control circuit	A to D-frame	Single phase, 200 to 240V	+10% -15%	50/60Hz		
				E to F-frame	Single phase, 200 to 230V	+10% -15%	50/60Hz		
		400V	Main circuit	D to F-frame	3-phase, 380 to 480V	+10% -15%	50/60Hz		
			Control circuit	D to F-frame	DC 24V ± 15%				
		Withstand voltage					Primary to earth: withstand 1500 VAC, 1 min, (sensed current: 20 mA) [100V/200V] withstand 1960 VAC, 1 min, (sensed current: 20 mA) [400V] * 400V control circuit is excluded.		
		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 <sup>2)</sup> )				
	humidity			Both operating and storage : 20 to 85%RH or less (free from condensation)					
	Altitude			Lower than 1000m					
	Vibration			5.88m/s <sup>2</sup> or less, 10 to 60Hz (No continuous use at resonance frequency)					
	Control method			IGBT PWM Sinusoidal wave drive					
	Encoder feedback			20-bit (1048576 resolution) incremental encoder, 5-wire serial					
	Parallel I/O connector		Control signal	Input	General purpose 10 inputs The function of general-purpose input is selected by parameters.				
				Output	General purpose 6 outputs The function of general-purpose input is selected by parameters.				
			Analog signal	Output	2 outputs (Analog monitor: 2 output)				
			Pulse signal	Input	2 inputs (Photo-coupler input, Line receiver input) Photocoupler input is compatible with both line driver I/F and open collector I/F. Line receiver input is compatible with line driver I/F.				
	Output	4 outputs ( Line driver: 3 output, open collector: 1 output) Feed out the encoder feedback pulse (A, B and Z-phase) or feedback scale pulse (EXA, EXB and EXZ-phase) in line driver. Z-phase and EXZ-phase pulse is also fed out in open collector.							
Communication function		USB	Connection with PC etc.						
Front panel			(1) 5 keys (2) LED (6-digit) (3) Analog monitor output (2ch)						
Regeneration			A, B-frame: no built-in regenerative resistor (external resistor only) C to F-frame: Built-in regenerative resistor (external resistor is also enabled.)						
Dynamic brake			A to F-frame: Built-in						
Control mode			(1) Position control (2) Internal velocity control (3) Position/ Internal velocity control						

#### Caution

\*1 The specification out of Japan.

\*2 Air containing water vapor will become saturated with water vapor as the temperature falls, causing dew.

#### Related page

• P.1-28 "Installation of Driver" • P.1-32 "Installation of Motor"

#### Caution

Only for position control type is provided A-Frame to F-frame.

## 2. Driver

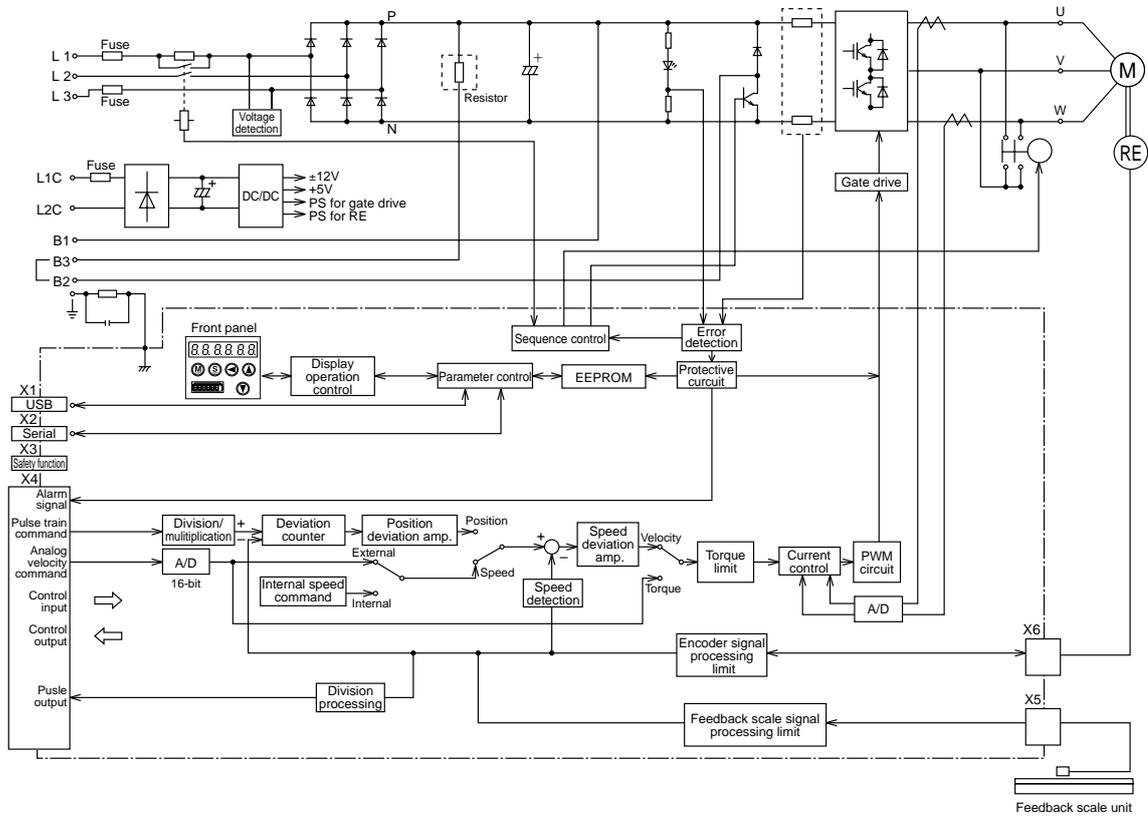
### Specifications (Only for position control type)

Function	Position control	Control input		(1) Deviation counter clear (2) Command pulse inhibition (3) Command dividing gradual increase switching (4) Damping control switching etc.	
		Control output		Positioning complete (In-position) etc.	
		Pulse input	Max. command pulse frequency	Exclusive interface for Photo-coupler: 500kpps Exclusive interface for line driver : 4Mpps	
			Input pulse signal format	Differential input ((1) Positive and Negative direction, (2) A and B-phase, (3) Command and direction)	
			Electronic gear (Division/Multiplication of command pulse)	Process command pulse frequency × electronic gear ratio $\left(\frac{1}{1} \text{ to } \frac{2^{30}}{1}\right)$ as positional command input. Use electronic gear ratio in the range 1/1000 to 1000 times.	
			Smoothing filter	Primary delay filter or FIR type filter is adaptable to the command input	
		Instantaneous Speed Observer		Available	
	Damping Control		Available		
	Internal velocity control	Control input		(1) Selection of internal velocity setup (2) Speed zero clamp	
		Control output		Speed arrival	
		Internal velocity command		Switching the internal 8speed is enabled by command input.	
		Soft-start/down function		Individual setup of acceleration and deceleration is enabled, with 0 to 10s/1000r/min. Sigmoid acceleration/deceleration is also enabled.	
		Zero-speed clamp		0-clamp of internal velocity command with speed zero clamp input is enabled.	
		Instantaneous Speed Observer		Available	
	Common	Auto tuning		The load inertia is identified in real time by the driving state of the motor operating according to the command given by the controlling device and set up support software "PANATERM". The gain is set automatically in accordance with the rigidity setting.	
		Division of encoder feedback pulse		Set up of any value is enabled (encoder pulses count is the max.).	
		Protective function	Hard error	Over-voltage, under-voltage, over-speed, over-load, over-heat, over-current and encoder error etc.	
			Soft error	Excess position deviation, command pulse division error, EEPROM error etc.	
		Traceability of alarm data		The alarm data history can be referred to.	

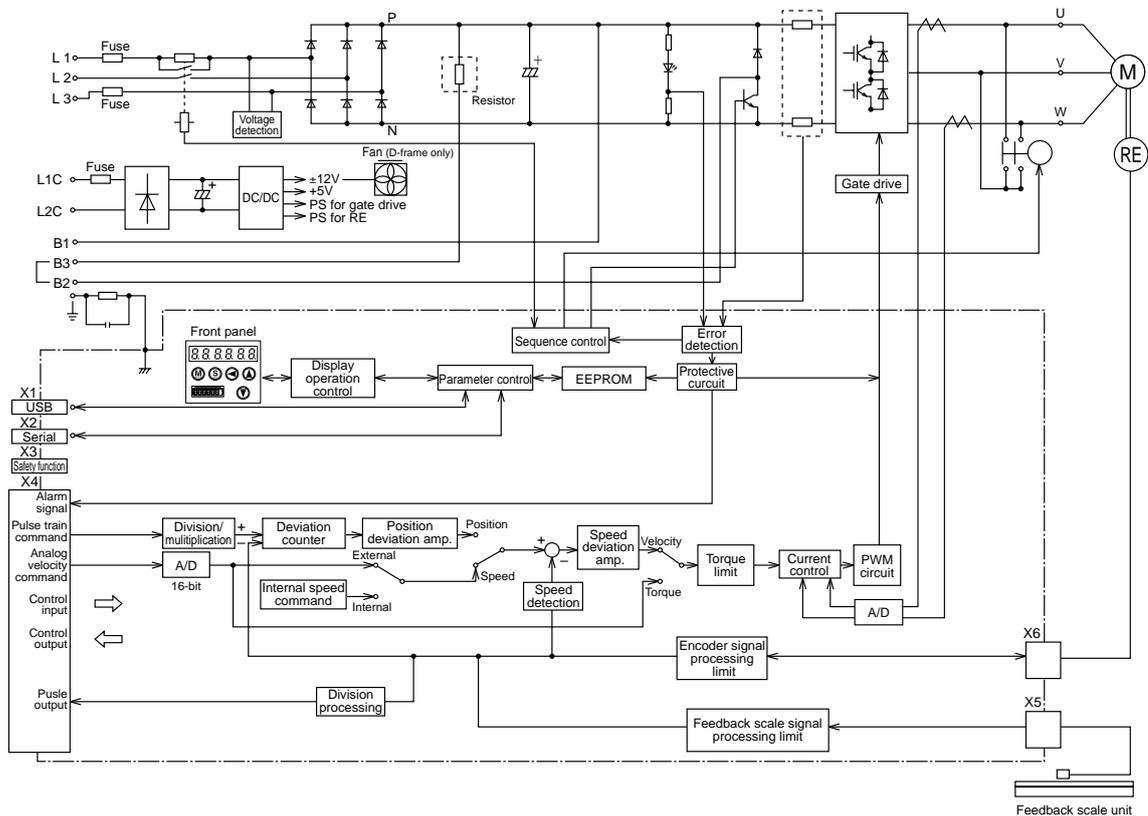
# 1 Before Using the Products

# 2. Driver Block Diagram

## A, B-frame (100/200 V)



## C, D-frame (100/200 V)



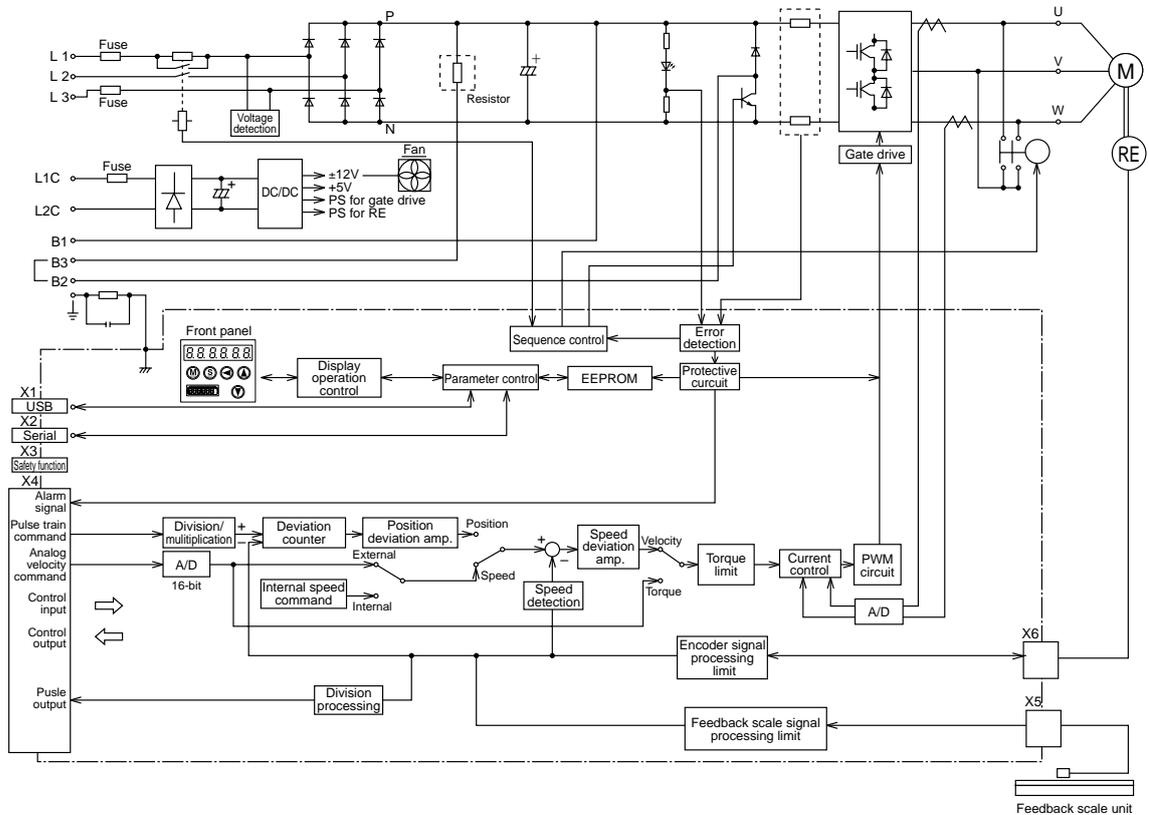
### Note

The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

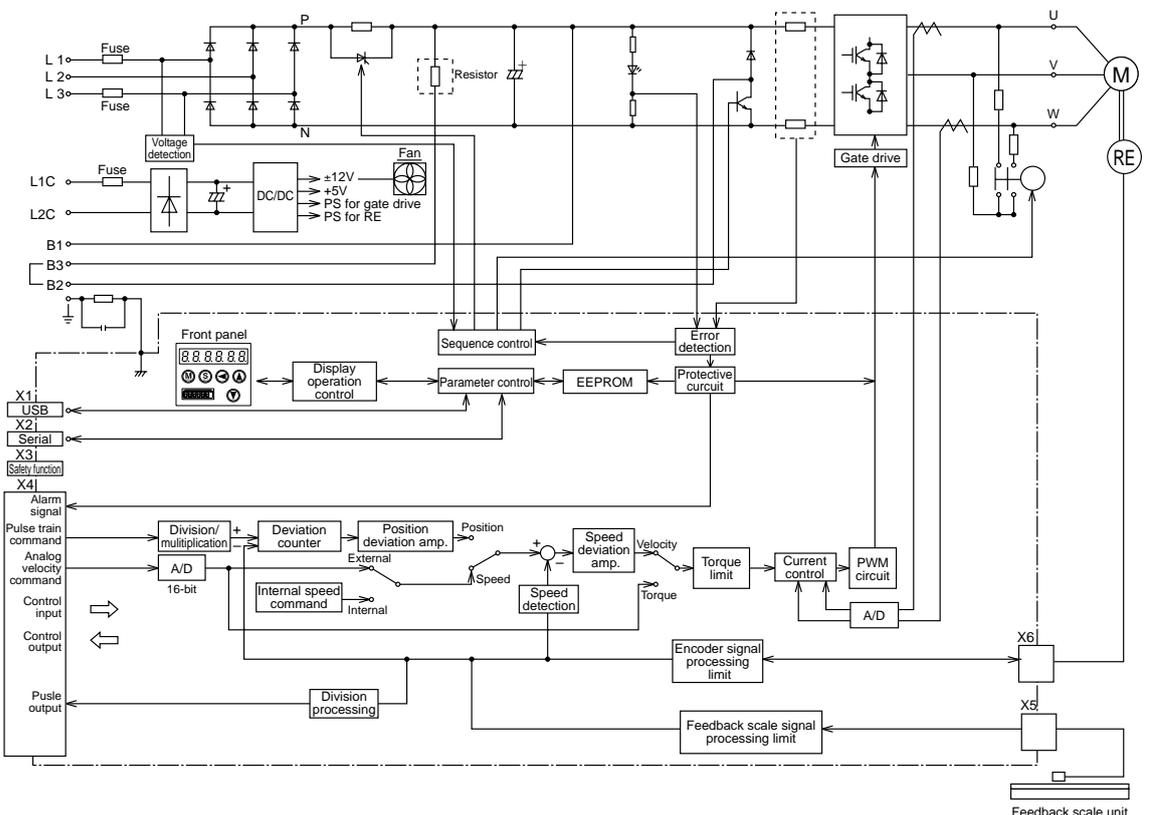
## 2. Driver

### Block Diagram

#### E-frame (200 V)



#### F-frame (200 V)



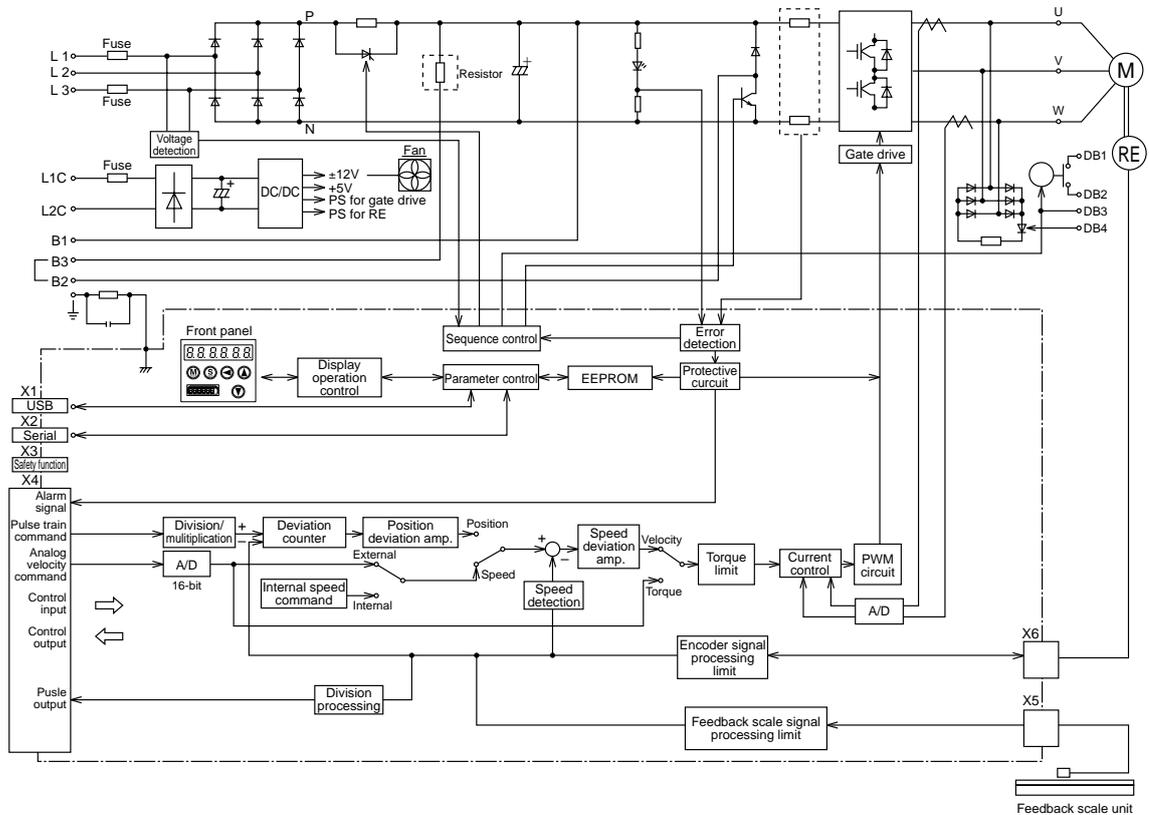
#### Note

- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

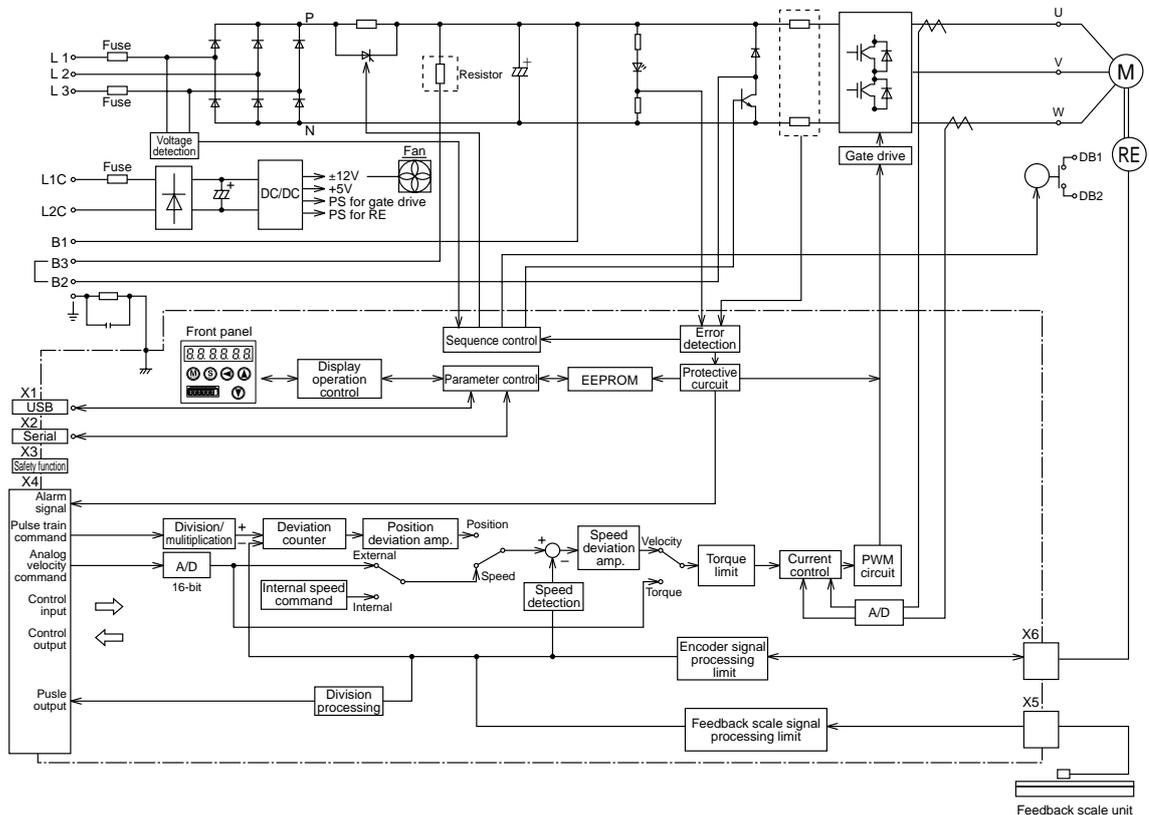
## 2. Driver

### Block Diagram

#### G-frame (200 V)



#### H-frame (200 V)



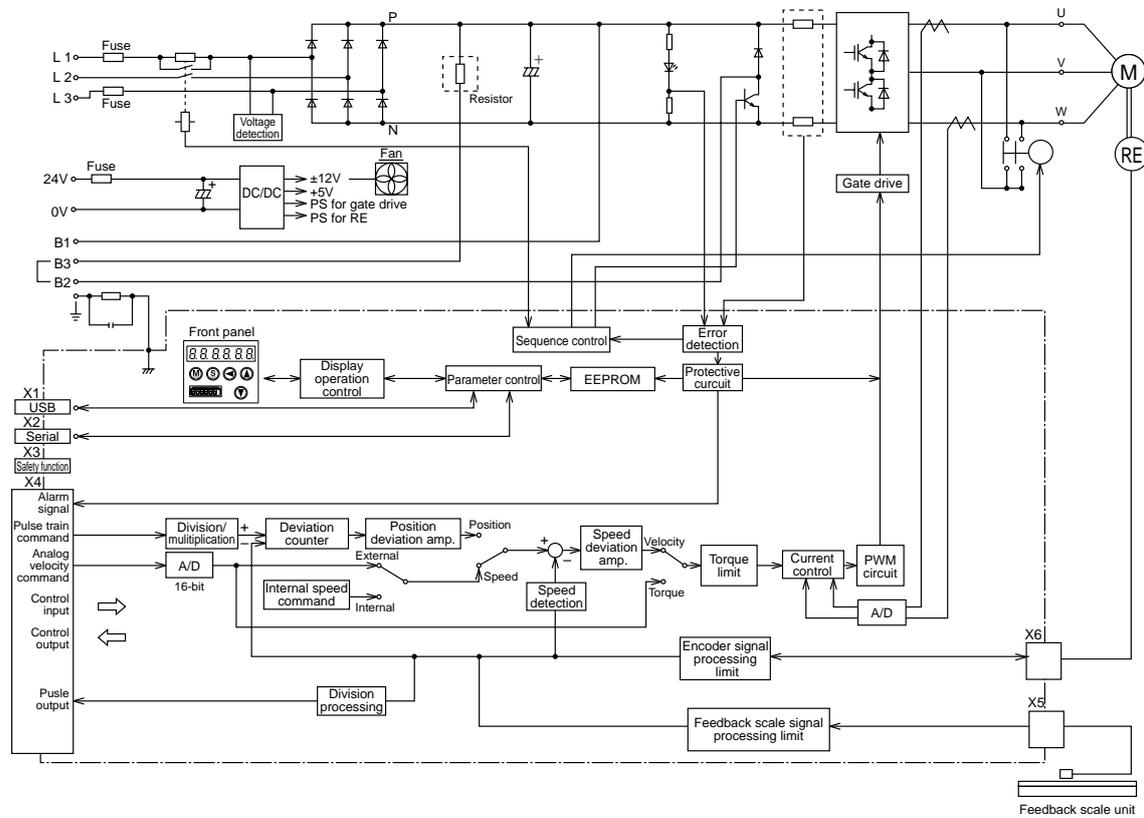
#### Note

• The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

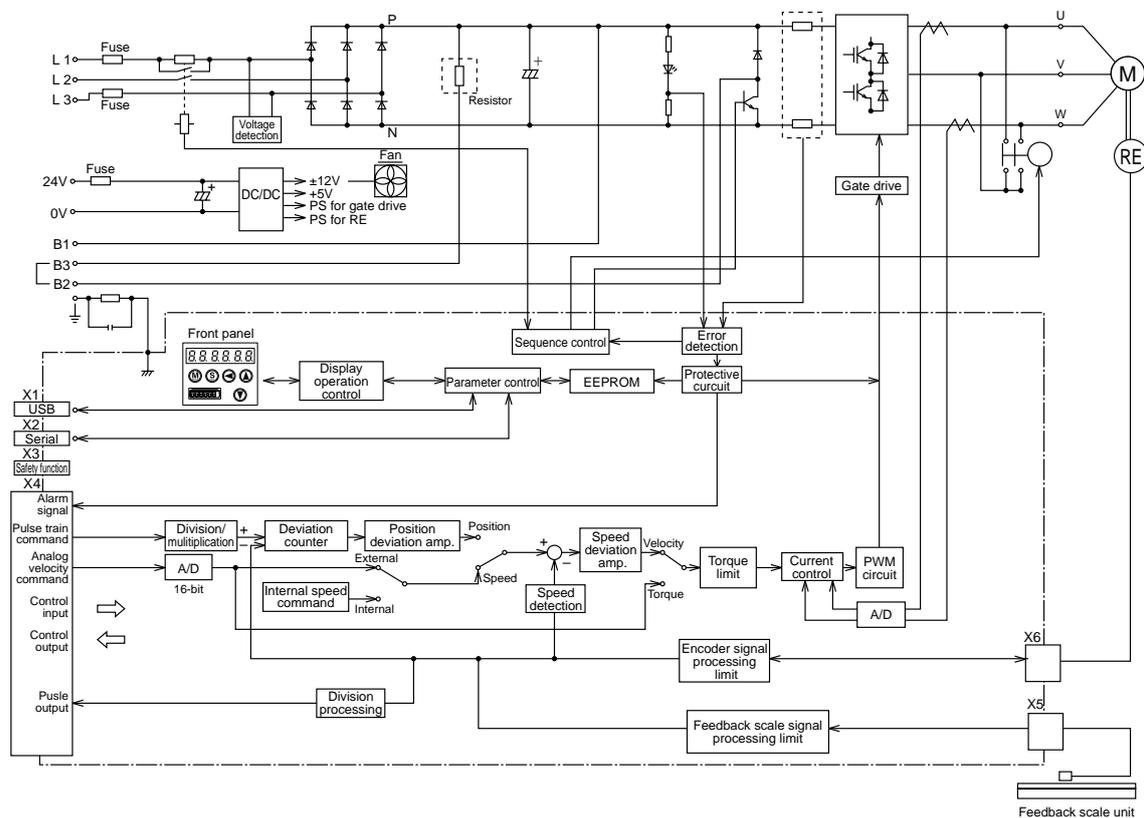
## 2. Driver

### Block Diagram

#### D-frame (400 V)



#### E-frame (400 V)



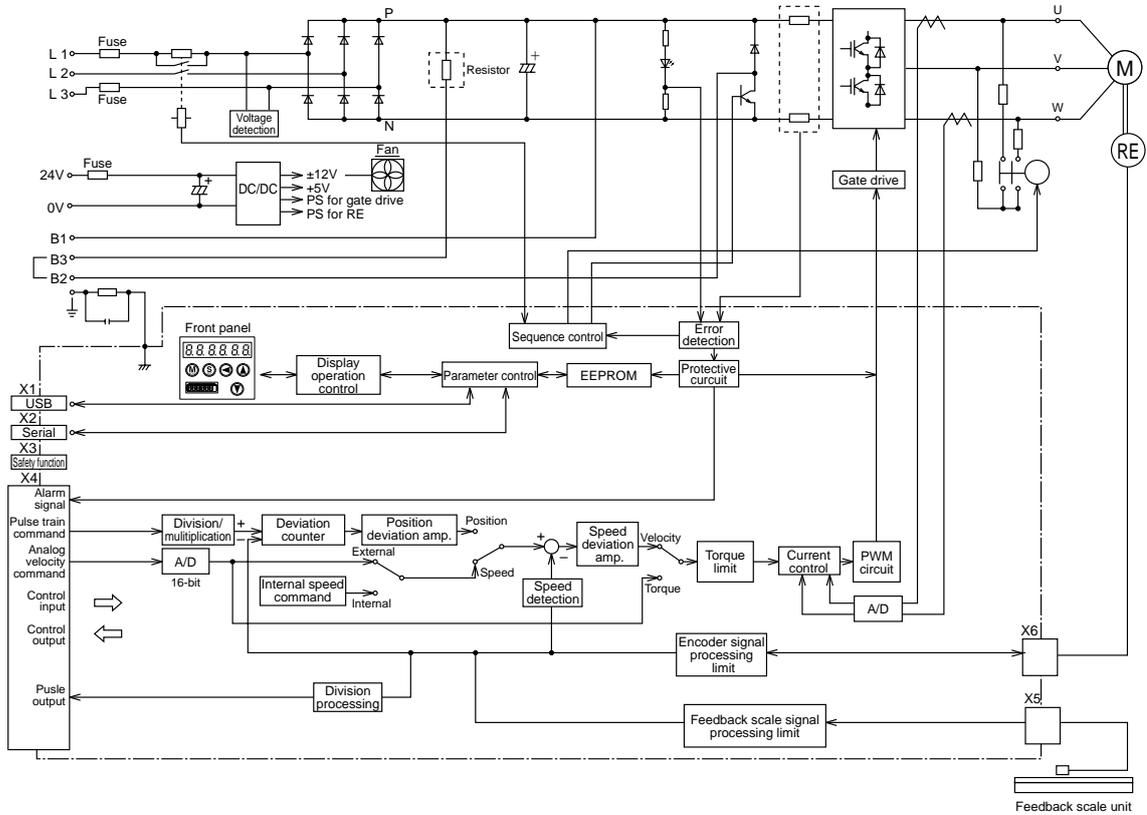
#### Note

- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.

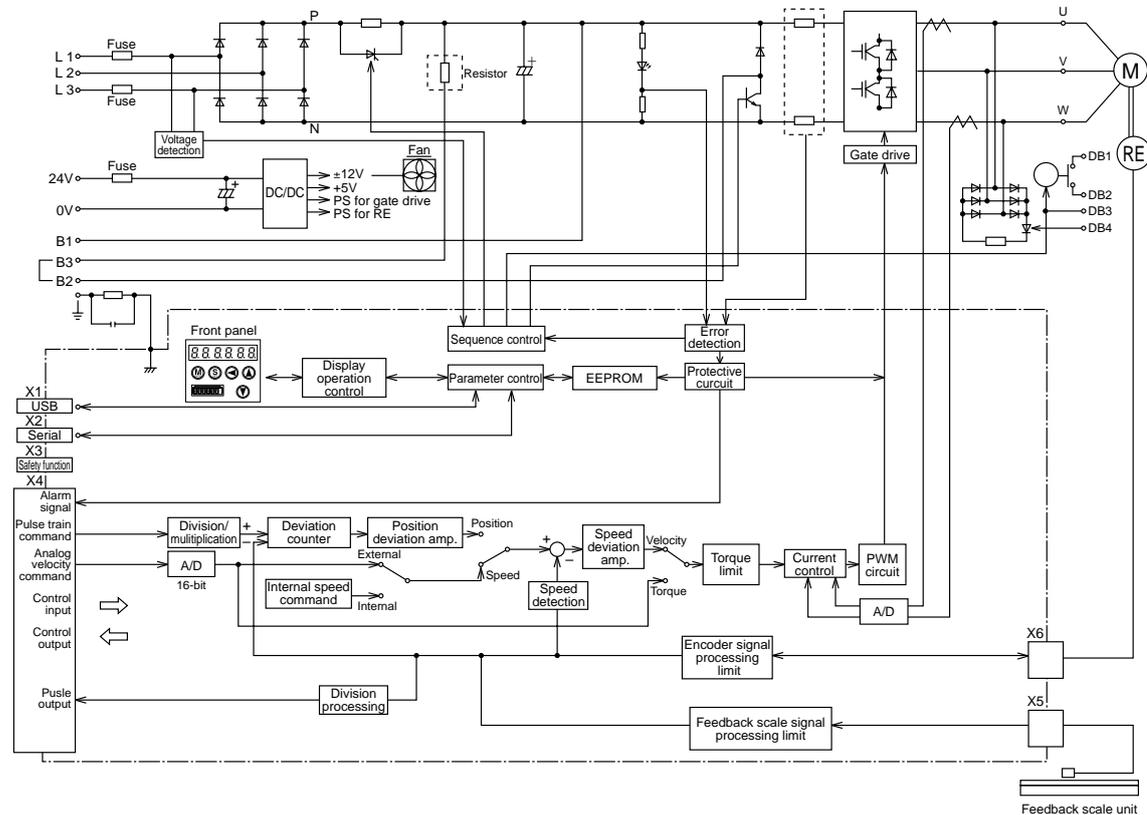
## 2. Driver

### Block Diagram

#### F-frame (400 V)



#### G-frame (400 V)



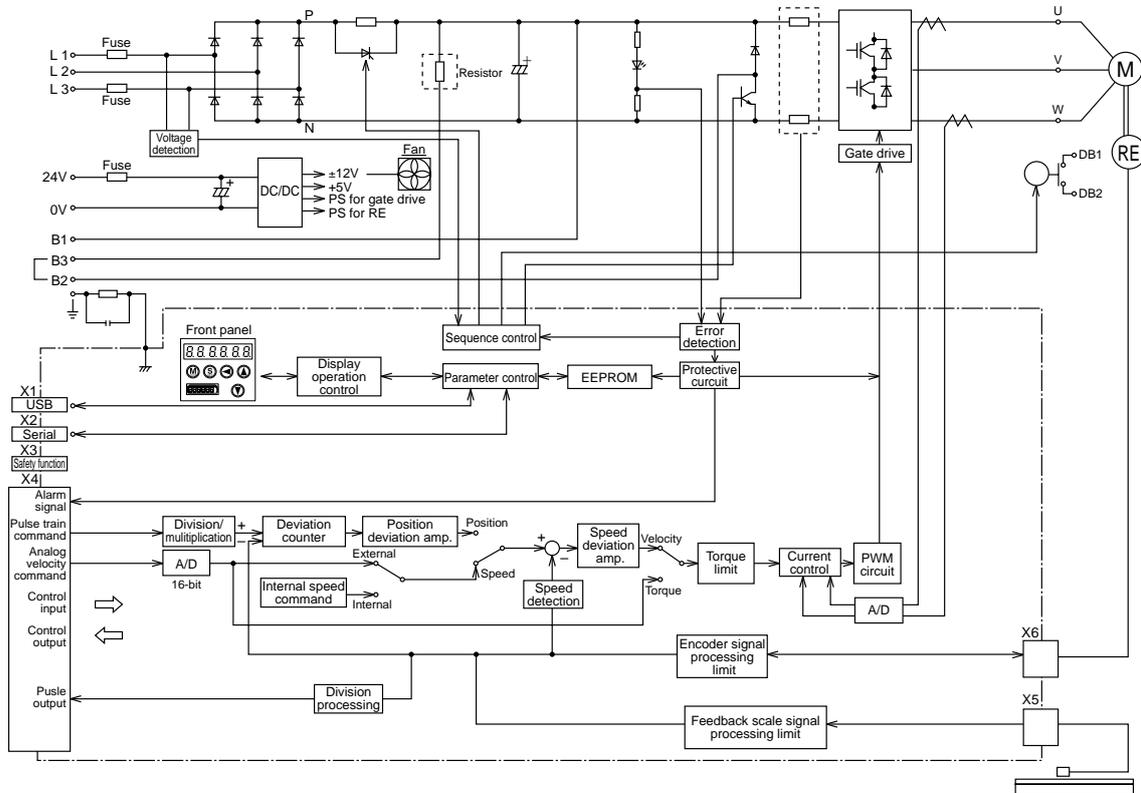
#### Note

- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided with X2, X3 and X5.
- G-frame: Only for position control type is not provided.

## 2. Driver

### Block Diagram

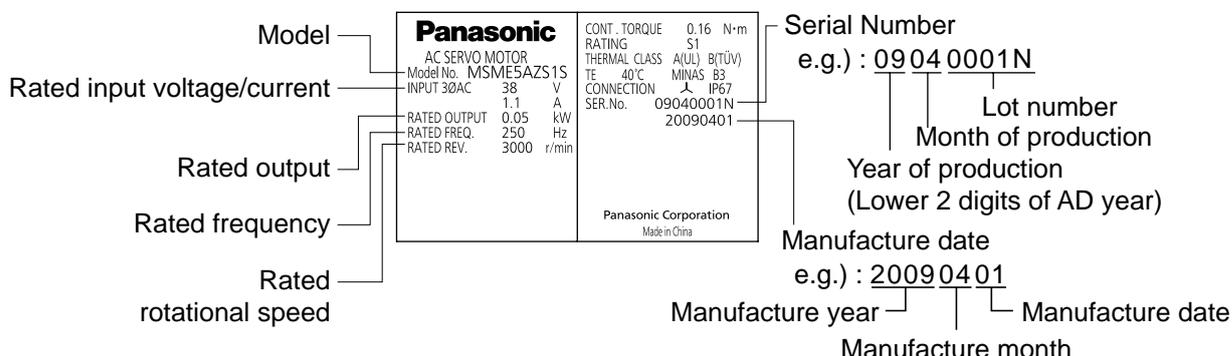
#### H-frame (400 V)



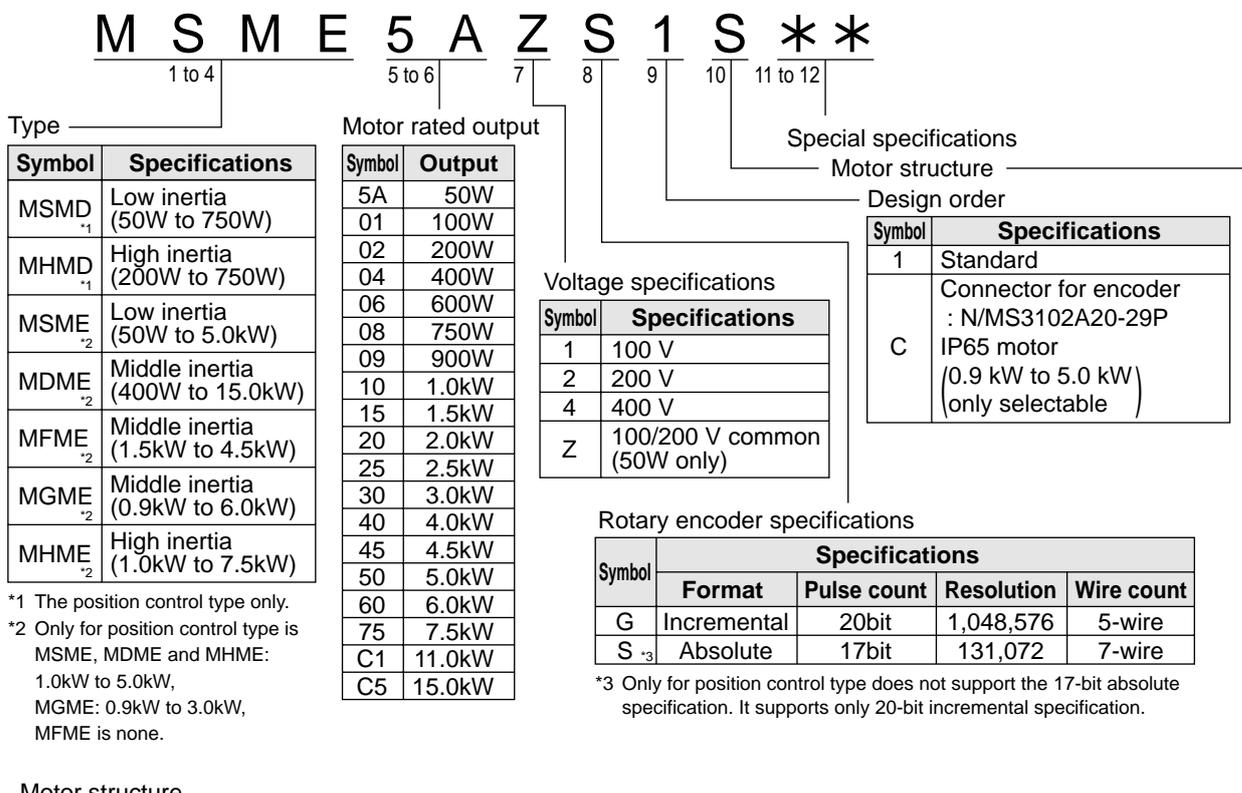
#### Note

- The figure above shows connections on velocity, position, torque and full-closed mode driver. Only for position control type is not provided.

## Contents of Name Plate



## Model Designation



Motor structure

MSME (50W to 750W)

Symbol	Shaft		Holding brake		Oil seal	
	Round	Key way	Without	With	Without	With <sup>*4</sup>
A	●		●		●	
B	●			●	●	
S		● <sup>*5</sup>	●		●	
T		● <sup>*5</sup>		●	●	

MSME (750W(400V), 1.0kW to 5.0kW), MDME, MFME, MGME, MHME

Symbol	Shaft		Holding brake		Oil seal	
	Round	Key way	Without	With	Without	With
C	●		●			●
D	●			●		●
G		●	●			●
H		●		●		●

\*4 The product with oil seal is a special order product. \*5 Key way with center tap [Products are standard stock items or manufactured by order. For details, inquire the dealer.]

### Note

• For details of specific model, refer to the Dimensions of Supplement.

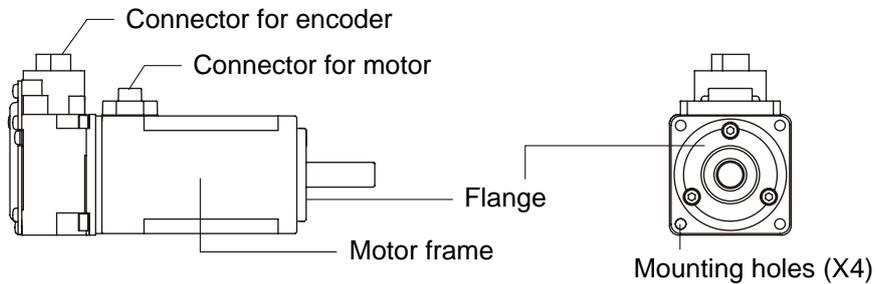
### Related page

• P.1-23 "Check of the Combination of the Driver and the Motor" • P.7-79 to 7-93 "Dimensions"

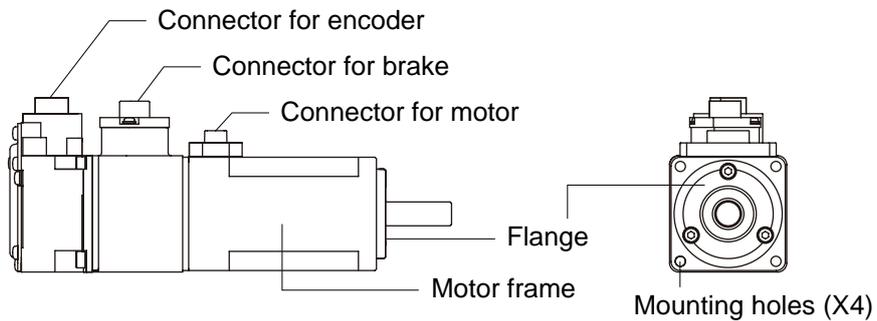
# 1 Before Using the Products

## 3. Motor Parts Description

- MSME 50W to 750W

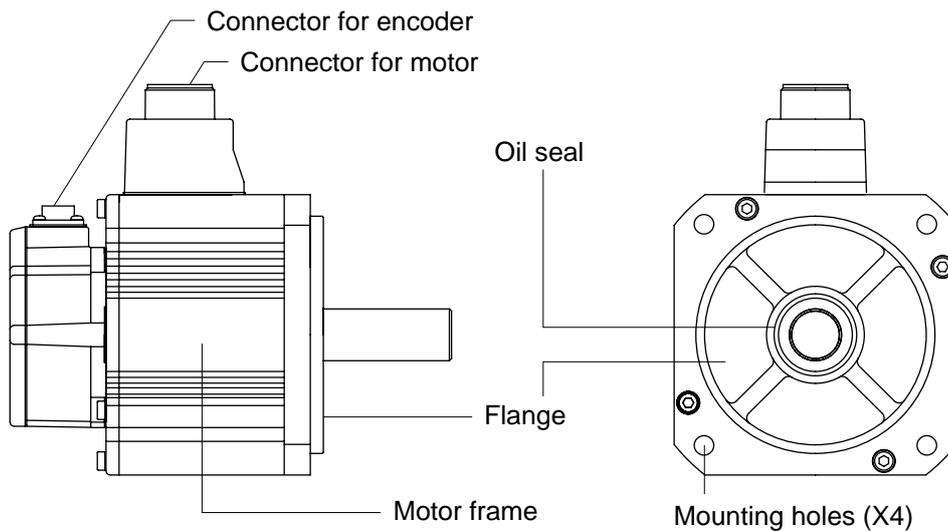


[with Brake]



e.g.) : Low inertia type (MSME series, 50W)

- MSME 750W(400V), 1.0kW to 5.0kW
- MDME 400W to 15.0kW
- MFME 1.5kW to 4.5kW
- MGMA 0.9kW to 6.0kW
- MHME 1.0kW to 7.5kW



e.g.) : Middle inertia type (MDME series, 1.0kW)

### Note

For details of specific model, refer to the Dimensions of Supplement. (P.7-79 to 7-93)

This driver is designed to be used in a combination with the motor which are specified by us. Check the series name of the motor, rated output torque, voltage specifications and encoder specifications.

**Remarks** ❄️ **Do not use in other combinations than those listed below.**

Power supply	Type	Motor			Driver		
		Rated rotational speed	Model	Rated output	Model of velocity, position, torque and full-closed control type	Model of Only for position control type	Frame
Single phase, 100V	MSMD Low inertia	3000r/min	MSMD5AZG1 *	50W	MADHT1105	MADHT1105E	A-frame
			MSMD011G1 *	100W	MADHT1107	MADHT1107E	A-frame
			MSMD021G1 *	200W	MBDHT2110	MBDHT2110E	B-frame
			MSMD041G1 *	400W	MCDHT3120	MCDHT3120E	C-frame
Single/ 3-phase, 200V	MSMD Low inertia	3000r/min	MSME5AZG1 *	50W	MADHT1505	MADHT1505E	A-frame
			MSME012G1 *	100W			
			MSME022G1 *	200W	MADHT1507	MADHT1507E	A-frame
			MSME042G1 *	400W	MBDHT2510	MBDHT2510E	B-frame
Single phase, 100V	MSME Low inertia	3000r/min	MSME082G1 *	750W	MCDHT3520	MCDHT3520E	C-frame
			MSME5AZG1 *	50W	MADHT1105	MADHT1105E	A-frame
			MSME011G1 *	100W	MADHT1107	MADHT1107E	A-frame
			MSME021G1 *	200W	MBDHT2110	MBDHT2110E	B-frame
Single/ 3-phase, 200V	MSME Low inertia	3000r/min	MSME041G1 *	400W	MCDHT3120	MCDHT3120E	C-frame
			MSME5AZG1 *	50W	MADHT1505	MADHT1505E	A-frame
			MSME012G1 *	100W			
			MSME022G1 *	200W	MADHT1507	MADHT1507E	A-frame
3-phase, 200V	MSME Low inertia	3000r/min	MSME042G1 *	400W	MBDHT2510	MBDHT2510E	B-frame
			MSME082G1 *	750W	MCDHT3520	MCDHT3520E	C-frame
			MSME102G□ *	1.0kW	MDDHT5540	MDDHT5540E	D-frame
			MSME152G□ *	1.5kW			
3-phase, 400V	MSME Low inertia	3000r/min	MSME202G□ *	2.0kW	MEDHT7364	MEDHT7364E	E-frame
			MSME302G□ *	3.0kW	MFDHTA390	MFDHTA390E	F-frame
			MSME402G□ *	4.0kW	MFDHTB3A2	MFDHTB3A2E	F-frame
			MSME502G□ *	5.0kW			
Single/ 3-phase, 200V	MSME Low inertia	2000r/min	MSME084G1 *	750W	MDDHT2412	MDDHT2412E	D-frame
			MSME104G□ *	1.0kW	MDDHT3420	MDDHT3420E	D-frame
			MSME154G□ *	1.5kW	MDDHT3420	MDDHT3420E	D-frame
			MSME204G□ *	2.0kW	MEDHT4430	MEDHT4430E	E-frame
3-phase, 200V	MSME Low inertia	2000r/min	MSME304G□ *	3.0kW	MFDHT5440	MFDHT5440E	F-frame
			MSME404G□ *	4.0kW	MFDHTA464	MFDHTA464E	F-frame
			MSME504G□ *	5.0kW			
			MDME102G□ *	1.0kW	MDDHT3530	MDDHT3530E	D-frame
3-phase, 200V	MSME Low inertia	2000r/min	MDME152G□ *	1.5kW	MDDHT5540	MDDHT5540E	D-frame
			MDME202G□ *	2.0kW	MEDHT7364	MEDHT7364E	E-frame
			MDME302G□ *	3.0kW	MFDHTA390	MFDHTA390E	F-frame
			MDME402G□ *	4.0kW	MFDHTB3A2	MFDHTB3A2E	F-frame
MDME502G□ *	5.0kW						
3-phase, 400V	MSME Low inertia	2000r/min	MDME752G1 *	7.5kW	MGDHTC3B4	-	G-frame
			MDMEC12G1 *	11.0kW	MHDHTC3B4		H-frame
			MDMEC52G1 *	15.0kW		MDDHT2407	MDDHT2407E
			MDME044G1 *	400W			
3-phase, 400V	MSME Low inertia	2000r/min	MDME064G1 *	600W	MDDHT2412	MDDHT2412E	D-frame
			MDME104G□ *	1.0kW			
			MDME154G□ *	1.5kW	MDDHT3420	MDDHT3420E	D-frame
			MDME204G□ *	2.0kW	MEDHT4430	MEDHT4430E	E-frame
3-phase, 400V	MSME Low inertia	2000r/min	MDME304G□ *	3.0kW	MFDHT5440	MFDHT5440E	F-frame
			MDME404G□ *	4.0kW	MFDHTA464	MFDHTA464E	F-frame
			MDME504G□ *	5.0kW			
			MDME754G1 *	7.5kW	MGDHTB4A2	-	G-frame
MDMEC14G1 *	11.0kW	MHDHTB4A2	H-frame				
MDMEC54G1 *	15.0kW						

**Note** ❄️

- Suffix of "□" in the applicable motor model represents design order.
- Suffix of "\*" in the applicable motor model represents the motor structure.

## 4. Check of the Combination of the Driver and the Motor

Incremental Specifications, 20-bit

Motor					Driver		
Power supply	Type	Rated rotational speed	Model	Rated output	Model of velocity, position, torque and full-closed control type	Model of Only for position control type	Frame
Single/3-phase, 200V	MFME Middle inertia	2000r/min	MFME152G1 *	1.5kW	MDDHT5540	MDDHT5540E	D-frame
3-phase, 200V			MFME252G1 *	2.5kW	MEDHT7364	MEDHT7364E	E-frame
			MFME452G1 *	4.5kW	MFDHTB3A2	MFDHTB3A2E	F-frame
3-phase, 400V			MFME154G1 *	1.5kW	MDDHT3420	MDDHT3420E	D-frame
			MFME254G1 *	2.5kW	MEDHT4430	MEDHT4430E	E-frame
			MFME454G1 *	4.5kW	MFDHTA464	MFDHTA464E	F-frame
Single/3-phase, 200V	MGME Middle inertia	1000r/min	MGME092G□ *	0.9kW	MDDHT5540	MDDHT5540E	D-frame
3-phase, 200V			MGME202G□ *	2.0kW	MFDHTA390	MFDHTA390E	F-frame
			MGME302G□ *	3.0kW	MFDHTB3A2	MFDHTB3A2E	
			MGME452G1 *	4.5kW			MGDHTC3B4
3-phase, 400V			MGME602G1 *	6.0kW	MDDHT3420	MDDHT3420E	D-frame
			MGME094G□ *	0.9kW	MFDHT5440	MFDHT5440E	F-frame
			MGME204G□ *	2.0kW	MFDHTA464	MFDHTA464E	
			MGME304G□ *	3.0kW			
			MGME454G1 *	4.5kW	MGDHTB4A2	—	G-frame
Single phase, 100V			MHMD High inertia	2000r/min	MHMD021G1 *	200W	MBDHT2110
Single/3-phase, 200V	MHMD041G1 *	400W			MCDHT3120	MCDHT3120E	C-frame
	MHMD022G1 *	200W			MADHT1507	MADHT1507E	A-frame
	MHMD042G1 *	400W			MBDHT2510	MBDHT2510E	B-frame
	MHMD082G1 *	750W			MCDHT3520	MCDHT3520E	C-frame
Single/3-phase, 200V	MHME High inertia	2000r/min	MHME102G□ *	1.0kW	MDDHT3530	MDDHT3530E	D-frame
3-phase, 200V			MHME152G□ *	1.5kW	MDDHT5540	MDDHT5540E	
			MHME202G□ *	2.0kW	MEDHT7364	MEDHT7364E	E-frame
			MHME302G□ *	3.0kW	MFDHTA390	MFDHTA390E	F-frame
			MHME402G□ *	4.0kW			
			MHME502G□ *	5.0kW			
3-phase, 400V		1500r/min	MHME752G1 *	7.5kW	MGDHTC3B4	—	G-frame
		2000r/min	MHME104G□ *	1.0kW	MDDHT2412	MDDHT2412E	D-frame
			MHME154G□ *	1.5kW	MDDHT3420	MDDHT3420E	
			MHME204G□ *	2.0kW	MEDHT4430	MEDHT4430E	E-frame
			MHME304G□ *	3.0kW	MFDHT5440	MFDHT5440E	F-frame
			MHME404G□ *	4.0kW			
MHME504G□ *	5.0kW						
1500r/min	MHME754G1 *	7.5kW	MGDHTB4A2	—	G-frame		

### Note

- Suffix of "□" in the applicable motor model represents design order.
- Suffix of "\*" in the applicable motor model represents the motor structure.

This driver is designed to be used in a combination with the motor which are specified by us. Check the series name of the motor, rated output torque, voltage specifications and encoder specifications.

**Remarks** Do not use in other combinations than those listed below.

		Motor			Driver	
Power supply	Type	Rated rotational speed	Model	Rated output	Model of velocity, position, torque and full-closed control type	Frame
Single phase, 100V	MSME Low inertia	3000r/min	MSME5AZS1 *	50W	MADHT1105	A-frame
			MSME011S1 *	100W	MADHT1107	
			MSME021S1 *	200W	MBDHT2110	B-frame
			MSME041S1 *	400W	MCDHT3120	C-frame
Single/ 3-phase, 200V			MSME5AZS1 *	50W	MADHT1505	A-frame
			MSME012S1 *	100W		
			MSME022S1 *	200W	MADHT1507	B-frame
			MSME042S1 *	400W	MBDHT2510	C-frame
3-phase, 200V			MSME082S1 *	750W	MCDHT3520	C-frame
			MSME102S□ *	1.0kW	MDDHT5540	D-frame
			MSME152S□ *	1.5kW		
			MSME202S□ *	2.0kW	MEDHT7364	E-frame
3-phase, 400V		MSME302S□ *	3.0kW	MFDHTA390	F-frame	
		MSME402S□ *	4.0kW			
		MSME502S□ *	5.0kW	MFDHTB3A2	F-frame	
		MSME084S1 *	750W	MDDHT2412	D-frame	
MSME104S□ *	1.0kW	MDDHT3420				
MSME154S□ *	1.5kW	MDDHT3420	E-frame			
MSME204S□ *	2.0kW	MEDHT4430	E-frame			
Single/3-phase, 200V	MDME Middle inertia	2000r/min	MSME304S□ *	3.0kW	MFDHT5440	F-frame
			MSME404S□ *	4.0kW	MFDHTA464	
			MSME504S□ *	5.0kW		MFDHTA464
			MDME102S□ *	1.0kW	MDDHT3530	
MDME152S□ *			1.5kW	MDDHT5540	D-frame	
MDME202S□ *			2.0kW	MEDHT7364	E-frame	
3-phase, 200V		MDME302S□ *	3.0kW	MFDHTA390	F-frame	
		MDME402S□ *	4.0kW			
		MDME502S□ *	5.0kW	MFDHTB3A2	F-frame	
		MDME752S1 *	7.5kW	MGDHTC3B4	G-frame	
3-phase, 400V		MDMEC12S1 *	11.0kW	MHDHTC3B4	H-frame	
		MDMEC52S1 *	15.0kW			
		2000r/min	MDME044S1 *	400W	MDDHT2407	D-frame
			MDME064S1 *	600W		
MDME104S□ *			1.0kW	MDDHT2412	D-frame	
MDME154S□ *			1.5kW	MDDHT3420	E-frame	
MDME204S□ *	2.0kW		MEDHT4430	E-frame		
MDME304S□ *	3.0kW		MFDHT5440	E-frame		
MDME404S□ *	4.0kW		MFDHTA464	F-frame		
MDME504S□ *	5.0kW					
1500r/min	MDME754S1 *	7.5kW	MGDHTB4A2	G-frame		
	MDMEC14S1 *	11.0kW	MHDHTB4A2	H-frame		
	MDMEC54S1 *	15.0kW				

**Note**

- Suffix of "□" in the applicable motor model represents design order.
- Suffix of "\*" in the applicable motor model represents the motor structure.
- Default of the driver is set for the incremental encoder specifications. When you use in absolute, make the following operations.
  - a) Install a battery for absolute encoder.
  - b) Switch the parameter Pr0.15 (Absolute encoder setup) from "1 (default)" to "0".
- Only for position control type does not support the 17-bit absolute specification. It supports only 20-bit incremental specification.

## 4. Check of the Combination of the Driver and the Motor

### Absolute Specifications, 17-bit

Motor					Driver	
Power supply	Type	Rated rotational speed	Model	Rated output	Model of velocity, position, torque and full-closed control type	Frame
Single/3-phase, 200V	MFME Middle inertia	2000r/min	MFME152S1 *	1.5kW	MDDHT5540	D-frame
3-phase, 200V			MFME252S1 *	2.5kW	MEDHT7364	E-frame
3-phase, 400V			MFME452S1 *	4.5kW	MFDHTB3A2	F-frame
			MFME154S1 *	1.5kW	MDDHT3420	D-frame
			MFME254S1 *	2.5kW	MEDHT4430	E-frame
			MFME454S1 *	4.5kW	MFDHTA464	F-frame
Single/3-phase, 200V	MGME Middle inertia	1000r/min	MGME092S□ *	0.9kW	MDDHT5540	D-frame
3-phase, 200V			MGME202S□ *	2.0kW	MFDHTA390	F-frame
			MGME302S□ *	3.0kW	MFDHTB3A2	
			MGME452S1 *	4.5kW		MGDHTC3B4
3-phase, 400V			MGME602S1 *	6.0kW	MDDHT3420	D-frame
			MGME094S□ *	0.9kW	MFDHT5440	F-frame
			MGME204S□ *	2.0kW	MFDHTA464	
			MGME304S□ *	3.0kW		MGDHTB4A2
			MGME454S1 *	4.5kW	MGDHTC3B4	G-frame
			MGME604S1 *	6.0kW		
Single/3-phase, 200V			MHME High inertia	2000r/min	MHME102S□ *	1.0kW
3-phase, 200V	MHME152S□ *	1.5kW			MDDHT5540	E-frame
	MHME202S□ *	2.0kW			MEDHT7364	
	MHME302S□ *	3.0kW			MFDHTA390	F-frame
	MHME402S□ *	4.0kW			MFDHTB3A2	
	MHME502S□ *	5.0kW				
3-phase, 400V	1500r/min	MHME752S1 *		7.5kW	MGDHTC3B4	G-frame
	2000r/min	MHME104S□ *		1.0kW	MDDHT2412	D-frame
		MHME154S□ *		1.5kW	MDDHT3420	E-frame
		MHME204S□ *		2.0kW	MEDHT4430	
		MHME304S□ *		3.0kW	MFDHT5440	F-frame
		MHME404S□ *		4.0kW	MFDHTA464	
		MHME504S□ *		5.0kW		
		1500r/min		MHME754S1 *	7.5kW	MGDHTB4A2

#### Note

- Suffix of "□" in the applicable motor model represents design order.
- Suffix of "\*" in the applicable motor model represents the motor structure.
- Default of the driver is set for the incremental encoder specifications.  
When you use in absolute, make the following operations.
  - a) Install a battery for absolute encoder.
  - b) Switch the parameter Pr0.15 (Absolute encoder setup) from "1 (default)" to "0".
- Only for position control type does not support the 17-bit absolute specification.  
It supports only 20-bit incremental specification.

### Encoder cable

Motor series	Incremental Specifications, 20-bit <sup>Note)1</sup>	Absolute Specifications, 17-bit <sup>Note)1</sup>	Detail page
MSMD 50W to 750W	MFECA0 ** 0EAM	—	7-98
MSME 50W to 750W (200V)	MFECA0 ** 0MJD (Highly bendable type, Direction of motor shaft)	MFECA0 ** 0MJE (Highly bendable type, Direction of motor shaft)	7-98
	MFECA0 ** 0MKD (Highly bendable type, Opposite direction of motor shaft)	MFECA0 ** 0MKE (Highly bendable type, Opposite direction of motor shaft)	
	MFECA0 ** 0TJD (Standard bendable type, Direction of motor shaft)	MFECA0 ** 0TJE (Standard bendable type, Direction of motor shaft)	7-99
	MFECA0 ** 0TKD (Standard bendable type, Opposite direction of motor shaft)	MFECA0 ** 0TKE (Standard bendable type, Opposite direction of motor shaft)	
MSME 750W (400V), 1.0kW to 5.0kW	MFECA0 ** 0ESD <sup>note)2</sup> MFECA0 ** 0ETD <sup>note)3</sup>	MFECA0 ** 0ESE <sup>note)2</sup> MFECA0 ** 0ETE <sup>note)3</sup>	7-99 to 7-100
MDME 400W to 15.0kW	MFECA0 ** 0ESD <sup>note)2</sup> MFECA0 ** 0ETD <sup>note)3</sup>	MFECA0 ** 0ESE <sup>note)2</sup> MFECA0 ** 0ETE <sup>note)3</sup>	
MFME 1.5kW to 4.5kW	MFECA0 ** 0ETD	MFECA0 ** 0ETE	
MGME 0.9kW to 6.0kW	MFECA0 ** 0ESD <sup>note)2</sup> MFECA0 ** 0ETD <sup>note)3</sup>	MFECA0 ** 0ESE <sup>note)2</sup> MFECA0 ** 0ETE <sup>note)3</sup>	
MHMD 200W to 750W	MFECA0 ** 0EAM	—	
MHME 1.0kW to 7.5kW	MFECA0 ** 0ESD <sup>note)2</sup> MFECA0 ** 0ETD <sup>note)3</sup>	MFECA0 ** 0ESE <sup>note)2</sup> MFECA0 ** 0ETE <sup>note)3</sup>	

Note)1 “ \*\* ” represents the cable length. Note)2 Design order: C (0.9kW to 5.0kW (MGME: to 3.0kW)) Note)3 Design order:1

### Motor cable/ Brake cable

Motor series	Motor cable <sup>Note)1</sup>		Brake cable <sup>Note)1</sup>	Detail page
	without Brake	with Brake		
MSMD 50W to 750W	MFMCA0 ** 0EED	—	MFMCB0 ** 0GET	7-101 7-106
MSME 50W to 750W	MFMCA0 ** 0NJD (Highly bendable type, ) (Direction of motor shaft)	—	MFMCB0 ** 0PJT (Highly bendable type, ) (Direction of motor shaft)	7-101 7-106
	MFMCA0 ** 0NKD (Highly bendable type, ) (Opposite direction of motor shaft)		MFMCB0 ** 0PKT (Highly bendable type, ) (Opposite direction of motor shaft)	
	MFMCA0 ** 0RJD (Standard bendable type, ) (Direction of motor shaft)		MFMCB0 ** 0SJT (Standard bendable type, ) (Direction of motor shaft)	
	MFMCA0 ** 0RKD (Standard bendable type, ) (Opposite direction of motor shaft)		MFMCB0 ** 0SKT (Standard bendable type, ) (Opposite direction of motor shaft)	
MSME 1.0kW to 2.0kW (200V)	MFMCD0 ** 2ECD	MFMCA0 ** 2FCD	—	7-102 to 7-106
MSME 750W to 2.0kW (400V)		MFMCE0 ** 2FCD		
MSME 3.0kW to 5.0kW	MFMCA0 ** 3ECT	MFMCA0 ** 3FCT	—	
MDME 1.0kW to 2.0kW (200V)	MFMCD0 ** 2ECD	MFMCA0 ** 2FCD		
MDME 400W to 2.0kW (400V)		MFMCE0 ** 2FCD		
MDME 3.0kW to 5.0kW	MFMCA0 ** 3ECT	MFMCA0 ** 3FCT	—	
MFME 1.5kW (200V)	MFMCF0 ** 2ECD	MFMCA0 ** 2FCD		
MFME 1.5kW (400V)		MFMCE0 ** 2FCD		
MFME 2.5kW				
MFME 4.5kW	MFMCD0 ** 3ECT	MFMCA0 ** 3FCT	—	
MGME 0.9kW (200V)	MFMCD0 ** 2ECD	MFMCA0 ** 2FCD		
MGME 0.9kW (400V)		MFMCE0 ** 2FCD		
MGME 2.0kW to 4.5kW	MFMCA0 ** 3ECT	MFMCA0 ** 3FCT	MFMCB0 ** 0GET	
MHMD 200W to 750W	MFMCA0 ** 0EED	—		
MHME 1.0kW, 1.5kW (200V)	MFMCD0 ** 2ECD	MFMCA0 ** 2FCD		
		MFMCE0 ** 2FCD		
MHME 1.0kW, 1.5kW (400V)	MFMCE0 ** 2ECD	—		
MHME 2.0kW	MFMCA0 ** 3ECT	MFMCA0 ** 3FCT		

Note)1 “ \*\* ” represents the cable length.

#### Caution

- Motor cable (for MHME 7.5kW, MGME 6.0kW, MDME 7.5kW to 15.0kW) is not prepared in option.

#### Related page

- For other cable, connector and connector kit, refer to P.7-100 “Options”

Install the driver properly to avoid a breakdown or an accident.

## Installation Place

- 1) Install the driver in a control panel enclosed in noncombustible material and placed indoor where the product is not subjected to rain or direct sunlight. The products are not waterproof.
- 2) Where the products are not subjected to corrosive atmospheres such as hydrogen sulfide, sulfurous acid, chlorine, ammonia, sulfur, chloric gas, sulfuric gas, acid, alkaline and salt and so on, and are free from splash of inflammable gas.
- 3) Where the motor is free from grinding oil, oil mist, iron powder or chips.
- 4) Well-ventilated and low humidity and dust-free place.
- 5) Vibration-free place.
- 6) Do not use benzine, thinner, alcohol, acidic cleaner and alkaline cleaner because they can discolor or damage the exterior case.

## Environmental Conditions

Item	Conditions
Ambient temperature	0°C to 55°C (free from freezing)
Ambient humidity	20% to 85% RH (free from condensation)
Storage temperature*1	-20°C to 65°C (Max. temperature guarantee: 80°C for 72 hours free from condensation*2)
Storage humidity	20% to 85% RH (free from condensation*2)
Vibration	Lower than 5.88m/s <sup>2</sup> (0.6G), 10 to 60Hz
Altitude	Lower than 1000m

\*1 Extreme temperatures are permissible only for short period such as during transportation.

\*2 Air containing water vapor will become saturated with water vapor as the temperature falls, causing dew.

## How to Install

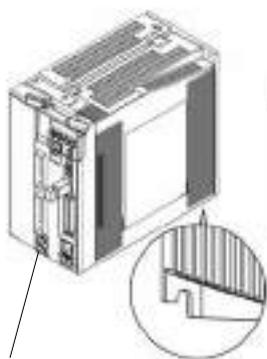
- 1) Rack-mount type. Install in vertical position, and reserve enough space around the servo driver for ventilation.
- 2) Base mount (rear mount) is standard for A/B/C/D-frame driver.
- 3) To change the mounting surface of A/B/C/D-frame driver, use the optional mounting bracket. For choosing the correct optional mounting bracket, refer to P.7-119 "Mounting Bracket".
- 4) In consideration of strength of the screws and the material of the mounting base, select appropriate fastening torque for the product mounting screws, so that the screws will not be loosened or damaged.

Example) To tighten a steel screw into a steel base

A to G-frame: M5 2.7 to 3.3 N·m, H-frame: M6 4.68 to 5.72 N·m

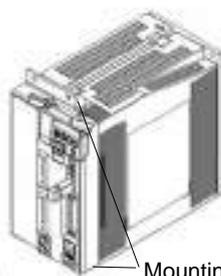
### A to D-frame

Basemount (Standard)  
[Rear mount]



Fastening torque of ground terminal (M4)  
to be 0.7 to 0.8 N·m.

Frontmount  
[Use mounting bracket]



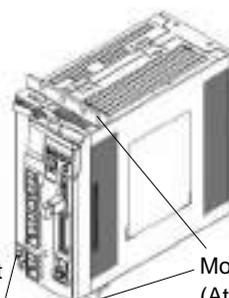
Mounting bracket  
(optional parts)

<E-frame>

<F, G-frame>

### E to G-frame

Front or rear mount  
[Use mounting bracket]



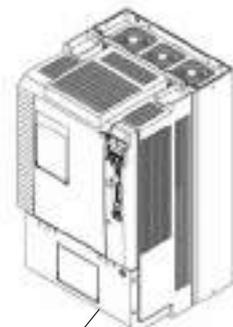
Mounting bracket  
(Attachment)

Fastening torque of ground terminal (M4)  
to be 0.7 to 0.8 N·m.

Fastening torque of ground terminal (M5)  
to be 1.4 to 1.6 N·m.

### H-frame

Rearmount [Basemount]



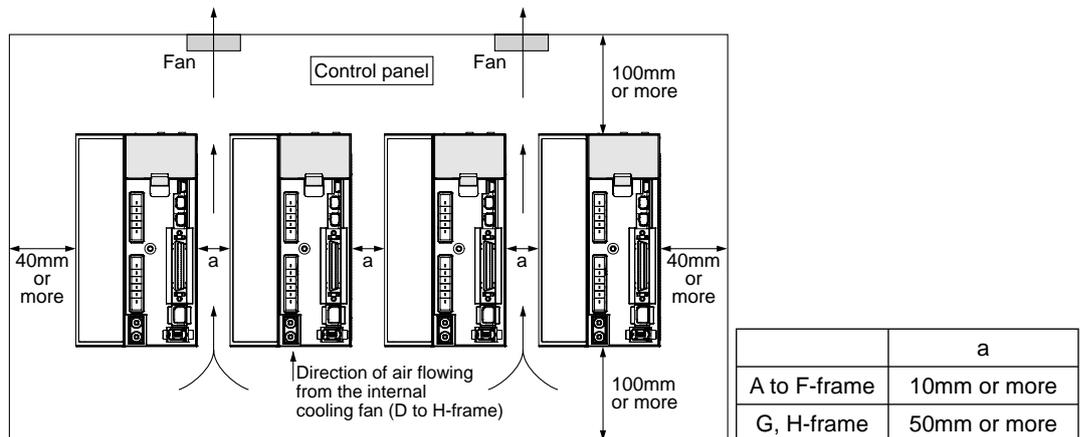
Fastening torque of  
ground terminal (M6)  
to be 2.4 to 2.6 N·m.

## 5. Installation

Driver

### Mounting Direction and Spacing

- Reserve enough surrounding space for effective cooling.
- Install fans to provide uniform distribution of temperature in the control panel.
- D to H-frame is provided with a cooling fan at the bottom. (On the H-frame, the cooling fan is also installed on the upper side.)
- Observe the environmental conditions of the control panel described in the previous page.



#### Note

It is recommended to use the conductive paint when you make your own mounting bracket, or repaint after peeling off the paint on the machine for installing the products, in order to make noise countermeasure.

### Caution on Installation

#### Caution

- Whenever lifting the product (during transportation/installation of H frame servo driver), two or more persons should hold it by metallic member, not by **plastic member**.
- We have been making the best effort to ensure the highest quality, however, application of exceptionally large external noise disturbance and static electricity, or failure in input power, wiring and components may result in unexpected action. It is highly recommended that you make a fail-safe design and secure the safety in the operative range.
- If stranded wires are used as the cable, bunch the conductors of the cable using a rod terminals or a round terminals. If stranded wires are used as they are, unexpected accidents such as an electric shock and short circuit or injury may result.
- There might be a chance of smoke generation due to the failure of these products. Pay an extra attention when you apply these products in a clean room environment.
- Be sure to install a no-fuse breaker in the power supply. In addition, be sure to ground the grounding terminal or grounding wire provided. (In order to prevent electric shock and malfunctions, Class D grounding (grounding resistance of 100Ω or less) is recommended.)  
If the product is grounded insufficiently, not only the driver may not deliver its performance sufficiently, but also safety hazards such as a malfunction due to a electrification or a disturbance may be caused.
- If electric wires are bound and run through metal duct, they cannot carry the rated current due to temperature rise. If they are forced to carry the rated current, they may burn. When determining size of the wire.
- Do not use or store the product in a place subject to 5.88 m/s<sup>2</sup> or more vibration or shock, foreign materials such as dust, metallic powder and oilmist, liquids such as water, oil and grinding fluid, close to flammable materials, or in an atmosphere of corrosive gas (H<sub>2</sub>S, SO<sub>2</sub>, NO<sub>2</sub>, Cl<sub>2</sub>, etc.) or inflammable gas under any circumstance.

#### Related page

- P.1-11 "Specifications" • P.1-32 "Installation of motor"
- P.7-73 "Dimensions" • P.7-119 "Mounting bracket"

## 5. Installation

### Driver

- Be sure to conduct wiring properly and securely. Insecure or improper wiring may cause the motor running out of control or being damaged from overheating. In addition, pay attention not to allow conductive materials, such as wire chips, entering the driver during the installation and wiring.
- Secure the screws and earth screw on the terminal block with the torque specified in the specification.
- When establishing a system using safety functions, completely understand the applicable safety standards and the operating instruction manual or technical documents for the product.
- Never make an approach to the motor and the machine(s) driven by the motor while power is applied because they may become failure or malfunction.
- Do not use servo-on signal (SRV-ON) as the start/stop signal. Doing so may damage the built-in dynamic brake circuit in the driver.
- Pay attention to the heat dissipation. The driver will generate heat while the motor is in operation. Using the driver in a sealed control box may cause an abnormal heating of the control box. A proper consideration should be given to cool the driver so that the ambient temperature matches the specified operating temperature range.
- There is a possibility that the motor will be damaged by heat or emit smoke or dust due to a fault in the motor itself or the driver coupled with it. A proper consideration should be given if the motor is used in a clean room or similar environment.
- The upper fan on the H-frame driver stops during servo OFF to save energy. This is normal.
- If the dynamic brake is applied during operation at a high speed, provide approx. 10-minute dwell period.  
Restarting the motor earlier may cause a broken wire in the dynamic brake making the brake inoperable.
- The capacitance of capacitor in the power supply rectifier circuit decreases its capacitance with age.  
To prevent a secondary accident due to malfunction, it should be replaced with new one after 5-year use.  
Replacement should be performed by us or our authorized distributor.
- Before using the product, be sure to read the instruction manual (Safety part).

### Recommended Electric Wires for Driver

- For the main circuit, use electric wire that withstands at least 600 VAC with temperature rating 75°C or higher.
- When using bundled wires running through metallic conduit, the amounts of current determined according to the reduction rate must be subtracted from the nominal allowable current.
- Electric wires
  - <In high ambient temperature>  
Use heat resistant wire.  
Common polyvinyl chloride wires will deteriorate by heat at a higher rate.
  - <In low ambient temperature>  
The surface of vinyl chloride insulation becomes hardened and brittle at low temperature and needs specific protective measure when used in cold region.
- Bend radius of the cable must be 10 times or more its finish outside diameter.
- Cables cannot be used for continuous regeneration because they are not designed for such application.

## 5. Installation

Driver

### Relationship between Wire Diameter and Permissible Current

- When selecting a cable, refer to the following selection guide showing relationship between cable specification and current carrying capacity.

#### Example: Power supply 3-phase, 200 V, 35 A, ambient temperature 30°C

Determine the fundamental permissible current according to the cable conductor material (example: stranded copper wire). (For the purpose of this example, the ampere indicated by ◇ is selected from the table right.)

Next, determine the number of conductors. (In this example, the cable contains 4 conductors (3 + ground).) Determine the applicable permissible current using the following formula.

#### Applicable permissible current

$$= \text{fundamental permissible current} \times \text{current reduction coefficient} \times \text{current correction coefficient}$$

$$= 37 \times 0.7 \times 1.414$$

$$\approx 36.6 \text{ (A)}$$

This permissible value is larger than 35 A to be carried though the cable. Therefore, according to the list of recommended eco-cables, the cable to be selected for the cable with nominal cross section 3.5 mm<sup>2</sup> is a polyethylene-insulated heat-resistant 4-conductor power cable having 13.5 mm finish O.D. (approx. 14.5 mm with shield).

#### <Supplement>

- The current correction coefficient is determined using the following formula:

$$\sqrt{(\text{Max. permissible temp.} - \text{ambient temp.}) \div 30}$$

The current correction coefficient is determined according to the cable. Check the specification of the cable used.

- The current reduction coefficient is provided for the case where the cable (4-conductor cable in the case of example), is housed in plastic race/sheath, plastic tube, metal race/sheath, metal tube or flexible conduit.

Because the neutral conductor is not counted as a wire, the current reduction coefficient for "3 or less" is applied as indicated by (⊙) in the table right.

#### • Recommended eco-cable

Wire category: 4-conductor polyethylene-insulated power cable with heat-resistant polyethylene sheath (Standard: EM JIS C 3605) Maximum permissible temperature: 90°C

#### • Fundamental permissible current

Stranded conductor (nominal cross section: mm <sup>2</sup> )	Copper wire (unit: A)
2 to 3.5 (excl.)	27
<b>3.5 to 5.5 (excl.)</b>	<b>37</b>
5.5 to 8 (excl.)	49
8 to 14 (excl.)	61
14 to 22 (excl.)	88
11 to 30 (excl.)	115
30 to 38 (excl.)	139
38 to 68 (excl.)	162
60 to 100 (excl.)	217
100 to 150 (excl.)	298
150 to 200 (excl.)	395

#### • Current reduction coefficient

No. of wires in a tube	Coefficient
<b>Up to 3</b>	<b>0.70</b>
4	0.63
5 or 6	0.56
7 to 15	0.49
16 to 40	0.43
41 to 60	0.39
61 or more	0.34

**Caution**

**Caution**

Conductor			Insulation thickness (mm)	Sheath thickness (mm)	(Reference) Finish O.D. (mm)	Max. conductor resistance (20°C) (W/km)	Test voltage (V/1 min.)	Minimum insulation resistance (MW·km)	(Reference) Approx. mass (kg/km)
Nominal cross section (mm <sup>2</sup> )	Structure or shape (wires/mm <sup>2</sup> )	Outside diameter (mm)							
2	7/0.6	1.8	0.8	1.5	12.0	9.42	1500	2500	170
3.5	7/0.8	2.4	0.8	1.5	13.5	5.30	1500	2500	250
5.5	7/1.0	3.0	1.0	1.5	16.0	3.40	1500	2500	360
8	7/1.2	3.6	1.0	1.5	17.0	2.36	1500	2000	475
14	Circular compression	4.4	1.0	1.5	19.0	1.34	2000	1500	730
22	Circular compression	5.5	1.2	1.6	23	0.849	2000	1500	1100
38	Circular compression	7.3	1.2	1.8	28	0.491	2500	1500	1800
60	Circular compression	9.3	1.5	2.0	35	0.311	2500	1500	2790
100	Circular compression	12.0	2.0	2.4	44	0.187	2500	1500	4630
150	Circular compression	14.7	2.0	2.6	51	0.124	3000	1000	6710
200	Circular compression	17.0	2.5	2.9	60	0.0933	3000	1500	8990

**Caution**

Shield will increase finish outside diameter by approx. 1 mm.

**Note**

- Appropriate cable should be selected to have sufficient allowance for parameters such as operating ambient temperature and current.
- Current reduction coefficient, fundamental permissible current, etc., stated on this page are subject to change due to e.g. standard revision. Consult cable manufacturers for the latest information.

Install the motor properly to avoid a breakdown or an accident.

**Installation Place**

Since the conditions of location affect a lot to the motor life, select a place which meets the conditions below.

- 1) Indoors, where the products are not subjected to rain or direct sun beam. The products are not waterproof.
- 2) Where the products are not subjected to corrosive atmospheres such as hydrogen sulfide, sulfurous acid, chlorine, ammonia, sulfur, chloric gas, sulfuric gas, acid, alkaline and salt and so on, and are free from splash of inflammable gas.
- 3) Where the motor is free from grinding oil, oil mist, iron powder or chips.
- 4) Well-ventilated and humid and dust-free place, far apart from the heat source such as a furnace.
- 5) Easy-to-access place for inspection and cleaning
- 6) Vibration-free place.
- 7) Avoid enclosed place. Motor may gets hot in those enclosure and shorten the motor life.

**Environmental Conditions**

Item		Conditions
Ambient temperature*1		0°C to 40°C (free from freezing)
Ambient humidity		20% to 85% RH (free from condensation)
Storage temperature*2		-20°C to 65°C (Max. temperature guarantee: 80°C for 72 hours free from condensation*5)
Storage humidity		20% to 85% RH (free from condensation*5)
Vibration	Motor only	Lower than 49m/s <sup>2</sup> (5G) at running, 24.5m/s <sup>2</sup> (2.5G) at stall
Impact	Motor only	Lower than 98m/s <sup>2</sup> (10G)
Enclosure rating	Motor only (Connector type)	IP67 (except rotating portion of output shaft and connecting pin part of the motor connector and the encoder connector)*3*4
Altitude		Lower than 1000m

\*1 Ambient temperature to be measured at 5cm away from the motor.

\*2 Permissible temperature for short duration such as transportation.

\*3 These motors conform to the test conditions specified in EN standards (EN60529, EN60034-5). Do not use these motors in application where water proof performance is required such as continuous wash-down operation.

\*4 This condition is applied when the connector mounting screw in case of motor 750W or less are tightened to the recommended tightening torque (Refer to P.2-11, 2-48). Be sure to use mounting screw supplied with the connector. Correctly install and secure the gasket supplied with the cable connector.

\*5 Air containing water vapor will become saturated with water vapor as the temperature falls, causing dew.

**How to Install**

You can mount the motor either horizontally or vertically as long as you observe the followings.

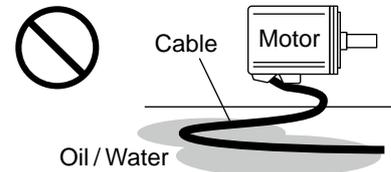
- 1) Horizontal mounting
  - Mount the motor with cable outlet facing downward for water/oil countermeasure.
- 2) Vertical mounting
  - Use the motor with oil seal (make-to-order in case of motor 750W or less) when mounting the motor with gear reducer to prevent the reducer oil/grease from entering to the motor.

## 5. Installation

### Motor

### Oil/Water Protection

- 1) Don't submerge the motor cable to water or oil.
- 2) Install the motor with the cable outlet facing downward.
- 3) Avoid a place where the motor is always subjected to oil or water.
- 4) Use the motor with an oil seal when used with the gear reducer, so that the oil may not enter to the motor through shaft.



### Stress to Cables

- 1) Avoid a stress application to the cable outlet and connecting portion by bending or self-weight.
- 2) Especially in an application where the motor itself travels, fix the junction cable into the bearer so that the stress by bending can be minimized.
- 3) Take the cable bending radius as large as possible. (When you use our optional cable, Minimum R20mm)

### Permissible Load to Output Shaft

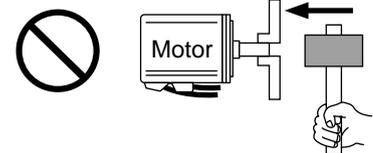
- 1) Design the mechanical system so that the applied radial load and/or thrust load to the motor shaft at installation and at normal operation can meet the permissible value specified to each model.
- 2) Pay an extra attention when you use a rigid coupling. (Excess bending load may damage the shaft or deteriorate the bearing life.)
- 3) Use a flexible coupling with high stiffness designed exclusively for servo application in order to make a radial thrust caused by micro misalignment smaller than the permissible value.

#### Note

For permissible load of each model, refer to P.1-35, "Permissible Load at Output Shaft".

### Notes on Installation

- 1) Do not apply direct impact to the shaft by hammer while attaching/detaching a coupling to and from the motor shaft.  
(Or it may damage the encoder mounted on the other side of the shaft.)
- 2) Make a full alignment. (incomplete alignment may cause vibration and damage the bearing.)
- 3) If the motor shaft is not electrically grounded, it may cause electrolytic corrosion to the bearing depending on the condition of the machine and its mounting environment, and may result in the bearing noise. Check and verification by customer is required.



#### Related page

- P.1-27 "Junction cable for motor" • P.1-28 "Installation of driver"
- P.1-35 "Permissible Load at Output Shaft" • P.7-79 "Dimensions"

### Wiring Precautions on Movable Section

When wiring cable bear, take the following precautions:

- **Cable bear wiring**

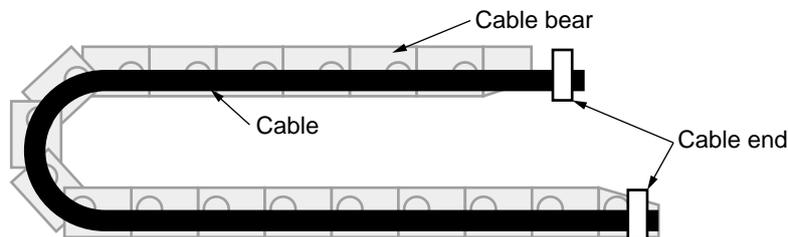
The bend radius of the cable must be 10 times or more its finish outside diameter.

(For finish outside diameter, refer to P.1-31 How to Install, “Relationship between Wire Diameter and Permissible Current” and associated tables.)

Do not fix or bundle wires in the cable bear.

When securing the cable, fix it only at non-movable ends of the cable bear where the cable is free from any stress (e.g. tension). (Avoid tight lock.)

**[Recommended cable bear wiring]**



**Caution** ❄

Do not keep the cable loosened (too long) or under tension (too short).

Otherwise, the sheath will be cracked by internal wall of the cable bear, tangled by other cable, etc., causing unpredictable troubles.

- **Cable distortion**

Keep the cable free from twists or kinks.

Distorted cable will cause loose connection, lowering performance and reliability.

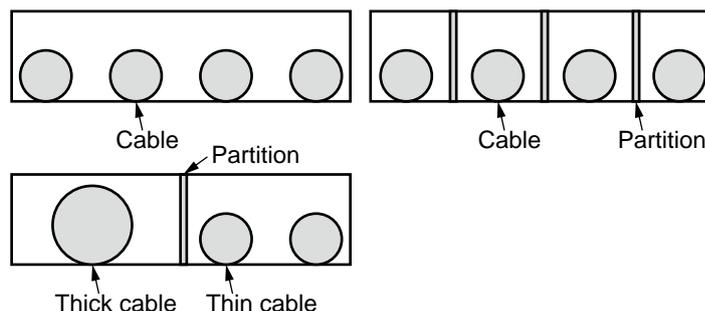
- **Lamination factor of cable in cable bear**

Place cables on a flat surface in parallel without bringing them into contact with each other and measure the dimension necessary to cover these cables. Then select a cable bear which is wider than the measured dimension.

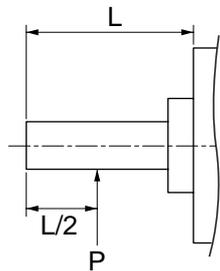
The lamination factor of cables should be lower than 60% (recommended factor is 30% or below).

Do not run smaller and larger size cables in the same cable bear. Thin cables may break under the pressure of thick cables. If it is necessary to mix cables of different size, isolate them by using suitable separating material such as partition.

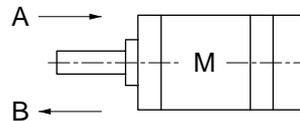
**[Wiring arrangement in cable bear – example]**



Radial load (P) direction



Thrust load (A and B) direction



Unit : N (1kgf=9.8N)

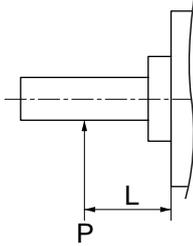
Motor series	Motor output	At assembly			During running	
		Radial thrust	Thrust load		Radial thrust	Thrust load A and B-direction
			A-direction	B-direction		
MSMD	50W, 100W	147	88	117.6	68.6	58.8
	200W, 400W	392	147	196	245	98
	750W	686	294	392	392	147
MSME	50W, 100W	147	88	117.6	68.6	58.8
	200W, 400W	392	147	196	245	98
	750W (200V)	686	294	392	392	147
	750W (400V), 1.0kW, 1.5kW, 2.0kW, 3.0kW	980	588	686	490	196
	4.0kW, 5.0kW				784	343
MDME	400W to 2.0kW	980	588	686	490	196
	3.0kW				784	343
	4.0kW					
	5.0kW	1666	784	980		
	7.5kW	2058	980	1176	1176	490
	11.0kW, 15.0kW	4508	1470	1764	2254	686
MGME	0.9kW	980	588	686	686	196
	2.0kW	1666	784	980	1176	490
	3.0kW	2058	980	1176	1470	
	4.5kW					
	6.0kW	1764	588			
MFME	1.5kW	980	588	686	490	196
	2.5kW, 4.0kW	1862	686		784	294
MHMD	200W, 400W	392	147	196	245	98
	750W	686	294	392	392	147
MHME	1.0kW, 1.5kW	980	588	686	490	196
	2.0kW to 5.0kW	1666	784	980	784	343
	7.5kW	2058	980	1176	1176	490

**Note**

When the load point varies, calculate the permissible radial load, P (N) from the distance of the load point, L (mm) from the mounting flange based on the formula of the right table, and make it smaller than the calculated result.

## 6. Permissible Load at Output Shaft

Motor



Motor series	Motor output	Formula of Load and load point relation	Motor series	Motor output	Formula of Load and load point relation
MSMD	50W	$P = \frac{3533}{L+39}$	MGME	0.9kW	$P = \frac{33957}{L+14.5}$
	100W	$P = \frac{4905}{L+59}$		2.0kW	$P = \frac{69384}{L+19}$
	200W	$P = \frac{14945}{L+46}$		3.0kW	$P = \frac{86730}{L+19}$
	400W	$P = \frac{19723}{L+65.5}$		4.5kW 6.0kW	$P = \frac{89964}{L+20}$
	750W	$P = \frac{37044}{L+77}$	MFME	1.5kW	$P = \frac{25235}{L+19}$
MSME	50W	$P = \frac{3533}{L+39}$		2.5kW	$P = \frac{40376}{L+19}$
	100W	$P = \frac{4905}{L+59}$	4.0kW	$P = \frac{42336}{L+19}$	
	200W	$P = \frac{14945}{L+46}$	MHMD	200W	$P = \frac{14945}{L+46}$
	400W	$P = \frac{19723}{L+65.5}$		400W	$P = \frac{19723}{L+65.5}$
	750W (200V)	$P = \frac{37044}{L+77}$		750W	$P = \frac{37044}{L+77}$
	750W (400V) 1.0kW to 3.0kW	$P = \frac{20090}{L+13.5}$	MHME	1.0kW 1.5kW	$P = \frac{24255}{L+14.5}$
	4.0kW 5.0kW	$P = \frac{36848}{L+14.5}$		2.0kW to 5.0kW	$P = \frac{46256}{L+19}$
400W 600W	$P = \frac{20090}{L+13.5}$	7.5kW		$P = \frac{89964}{L+20}$	
MDME	1.0kW to 2.0kW	$P = \frac{20580}{L+14.5}$			
	3.0kW	$P = \frac{36848}{L+14.5}$			
	4.0kW 5.0kW	$P = \frac{42336}{L+19}$			
	7.5kW	$P = \frac{89946}{L+20}$			
	11.0kW 15.0kW	$P = \frac{200606}{L+31}$			