

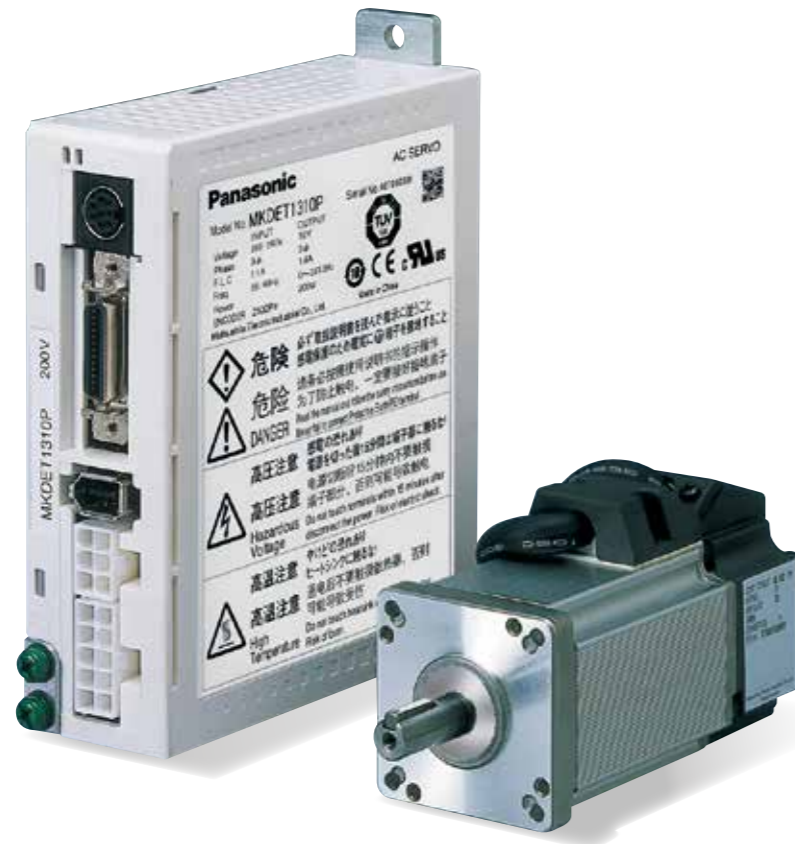
# Compact Servo Only for

# 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. <sup>(Note)</sup>
- 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

#### Contents

Features.....	377
Motor Line-up.....	381
Model Designation.....	382
Overall Wiring.....	383
Driver and List of Applicable Peripheral Devices.....	383
Driver.....	385
Driver Specifications.....	385
Standard Wiring Example of Main Circuit.....	386
Encoder Wiring Diagram.....	386
Control Circuit Standard Wiring Example.....	387
Dimensions of Driver.....	388
Motor.....	389
Specifications/Model designation/Torque Characteristics.....	389
Dimensions of Motor.....	393
Motors with Gear Reducer.....	394
Options.....	398
Setup Support Software.....	398
Cable part No. Designation.....	399
Cable Set.....	400
Encoder Cable.....	400
Motor Cable.....	400
Brake Cable.....	400
Connector Kit.....	401
Interface Cable.....	403
Communication Cable.....	403
Console.....	403
DIN Rail Mounting Unit.....	404
External Regenerative Resistor.....	404
Reactor.....	405
Surge Absorber for Motor Brake.....	405
List of Peripheral Devices.....	406

# 1. Easy to Handle, Easy to Use

## High-functionality Real-Time Auto-Gain Tuning (Note 1)

- 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.

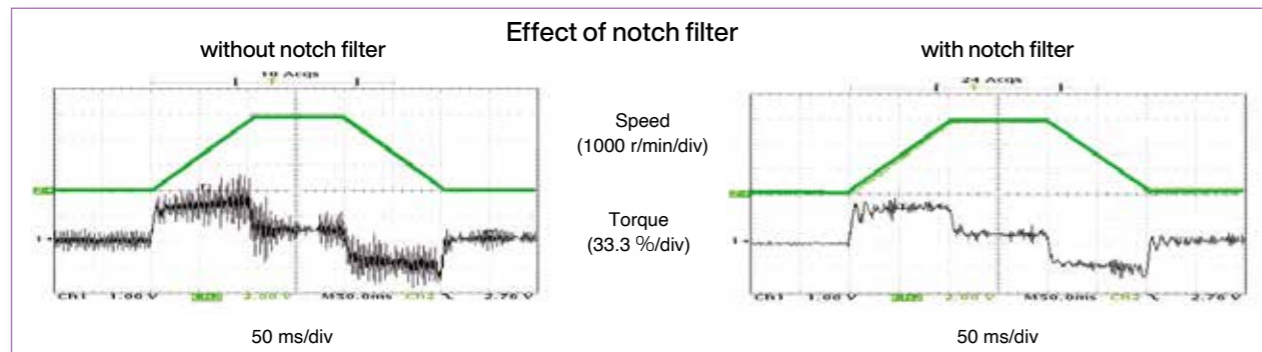
# 2. Further Reduction of Vibration

## 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.

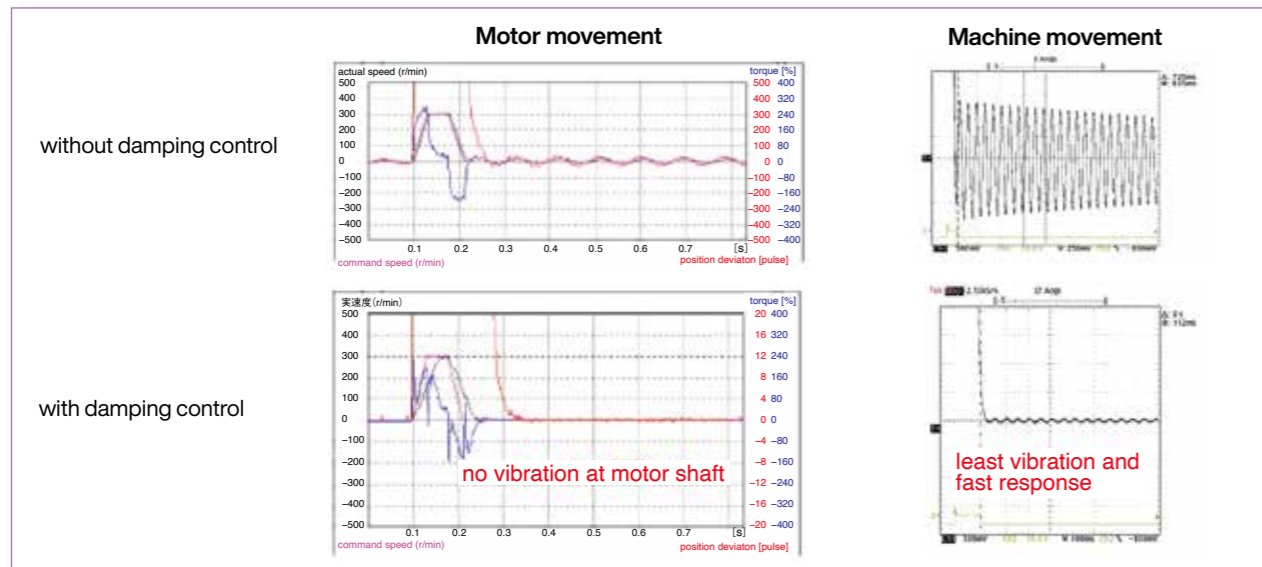
## Notch filter (Note1)

- 1-channel notch filter is equipped in the driver independent from adaptive filter.
- Each of 2 filters can set up frequency and notch width, and frequency in 1Hz unit. Suppression of "Judder" noise of the machine which has multiple resonance points 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.

## Command control modes

- Offers 2 command modes, "Position control" and "Internal velocity control".
- You can make a 4-speed running at preset values with parameter at internal velocity control mode.

## Inrush current suppressing function

- Inrush suppressing resistor, which prevent the circuit breaker shutdown of the power supply caused by inrush current at power-on, is equipped in this driver.
- Prevents unintentional shutdown of the power supply circuit breaker in multi axis application and does not give load to the power line.

## Regeneration discharging function

- Discharges the regenerative energy with external resistor, where energy is generated while stopping the load with large moment of inertia, or use in up-down operation, and is returned to the driver from the motor.
- No regenerative resistor is installed in the driver.
- It is highly recommended to install an external regenerative resistor (option).

## Built-in dynamic brake

- You can select the dynamic brake action which short the servo motor windings of U, V and W, at Servo-OFF, CW/CCW over-travel inhibition, power shutdown and trip.
- You can select the action sequence depending on the machine requirement.

## Setup support software (Option)

- With the setup support software, "PANATERM" via RS232 / RS485 communication port, you can monitor the running status of the driver and set up parameters. Note) Refer to P.398 for setup support software.

## Key-way shaft and tapped shaft end

- Easy pulley attachment and easy maintenance
- Attache screw to the tapped shaft to prevent key or pulley from being pulled out.

## 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
		UL508C CSA22.2 No. 14	
Motor and driver	EN55011	Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment	Conforms to references by EU EMC Directives/UK EMC Regulation
	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	Lightening 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 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	Holding	High precision				
<b>MUMA</b>  	<b>0.05 to 0.4</b>	3000 (5000)	○	—	○	○	○	IP65 Except shaft throughhole and connector	Small capacity Ultra low inertia	SMT machines Inserters High repetitive positioning application
	0.05									
	0.1									
	0.2									
0.4										

■ Servo Motor

**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
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

Special specifications

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**

Symbol	Series
MUMA	Ultra low inertia (100 W 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	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	●	●	●	For high accuracy
2N	1/9	●	●	●	
4N	1/25	●	●	●	

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

Special specifications

Control mode

Symbol	Specifications
P	Pulse train

Current detector current rating

Symbol	Current rating
05	5 A
10	10 A

See P.385 for driver specifications

**- Wiring of main circuit**

**Circuit Breaker (MCCB)**  
Protects the power lines. Shuts off the circuit when overcurrent passes.

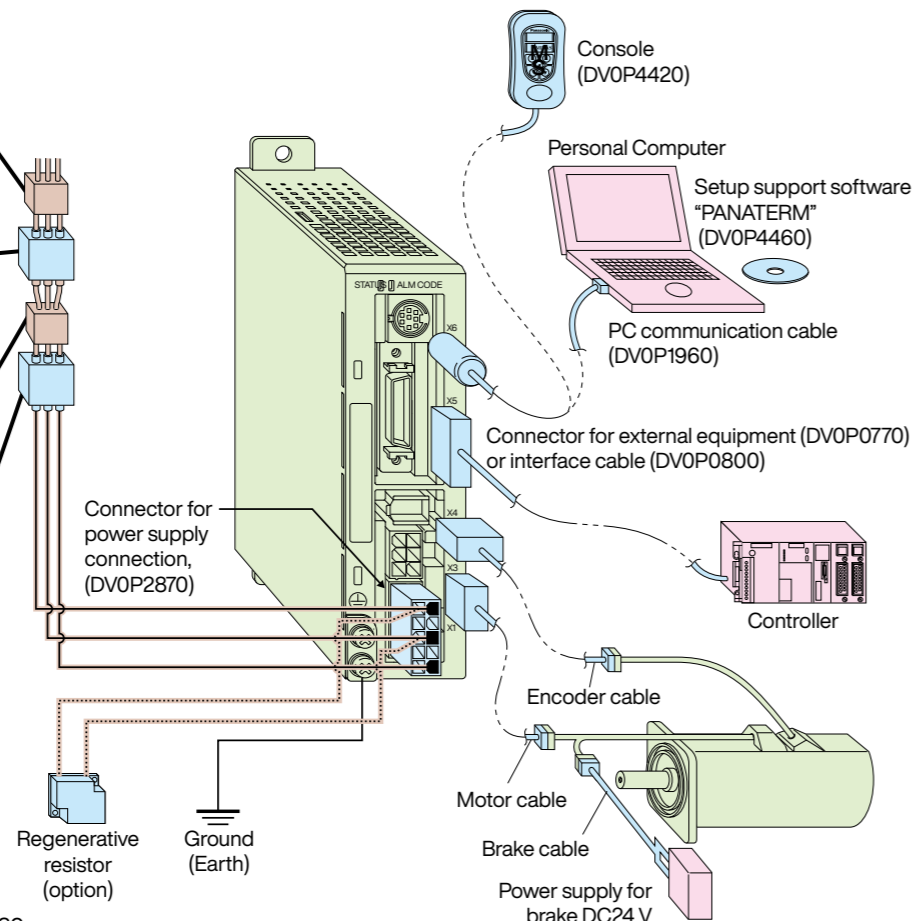
**Noise Filter (NF)**  
Prevents external noise from the power lines. And reduces an effect of the noise generated by the servo driver.

**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 P.404 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 <sup>2</sup> to 0.85 mm <sup>2</sup> AWG18
		100 W	0.4 kVA	10 A			
		200 W	0.5 kVA	10 A			
Single phase, 200 V	MUMA	50 W	0.3 kVA	5 A	DV0P4160	15 A (3P+1a)	0.75 mm <sup>2</sup> to 0.85 mm <sup>2</sup> AWG18
		100 W	0.4 kVA	10 A			
		200 W	0.5 kVA	10 A			
3-phase 200 V	MUMA	50 W	0.3 kVA	5 A	DV0P4160	10 A (3P+1a)	0.75 mm <sup>2</sup> to 0.85 mm <sup>2</sup> AWG18
		100 W	0.4 kVA	10 A			
		200 W	0.5 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 mm<sup>2</sup> (AWG14) or larger.

**Fastening torque list**

Ground terminal screw		Connector to host controller[X5]	
Nominal size	Fastening torque (N•m) <sup>(Note 3)</sup>	Nominal size	Fastening torque (N•m) <sup>(Note 3)</sup>
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	398	
	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) <sup>(Note 4)</sup>	DV0P37300	400	
Cable Set (5 m) <sup>(Note 4)</sup>	DV0P39200	400	
DIN Rail Mount Unit	DV0P3811	404	
External Regenerative Resistor	100 V 50 Ω 10 W	DV0P2890	404
	200 V 100 Ω 10 W	DV0P2891	
Reactor	100 V	DV0P227	405
		DV0P228	
	200 V	DV0P220	
Noise Filter		DV0P4160	416
Surge Absorber	Single phase 100 V, 200 V	DV0P4190	416
	3-phase 200 V	DV0P1450	
Ferrite core		DV0P1460	416

(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 <sup>(Note 1)</sup>	Rating/Spec. (page)	Driver	Dimensions (Frame symbol)	Encoder Cable <sup>(Note 2)</sup>	Motor Cable <sup>(Note 2)</sup>	Brake Cable <sup>(Note 2)</sup>	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	MKDET1110P	388 (K)							
	200	MUMA021P1 □	389	MLDET2110P	388 (L)							
Single phase 200 V	50	MUMA5AZP1 □	391	MKDET1505P	388 (K)							
	100	MUMA012P1 □	391	MKDET1505P	388 (K)							
	200	MUMA022P1 □	391	MLDET2210P	388 (L)							
3-phase 200 V	400	MUMA042P1 □	391	MLDET2510P	388 (L)							
	50	MUMA5AZP1 □	391	MKDET1505P	388 (K)							
	100	MUMA012P1 □	391	MKDET1505P	388 (K)							
	200	MUMA022P1 □	391	MKDET1310P	388 (K)							
	400	MUMA042P1 □	391	MLDET2510P	388 (L)							
				MLDET2310P								

Note) 1 Motor model number suffix: □

S: Key way with center tap, without brake

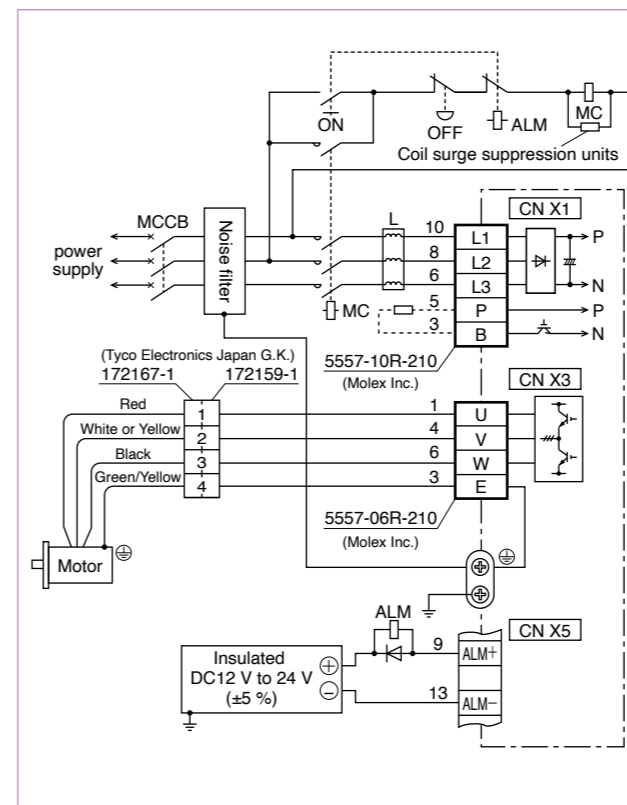
T: Key way with center tap, with brake

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

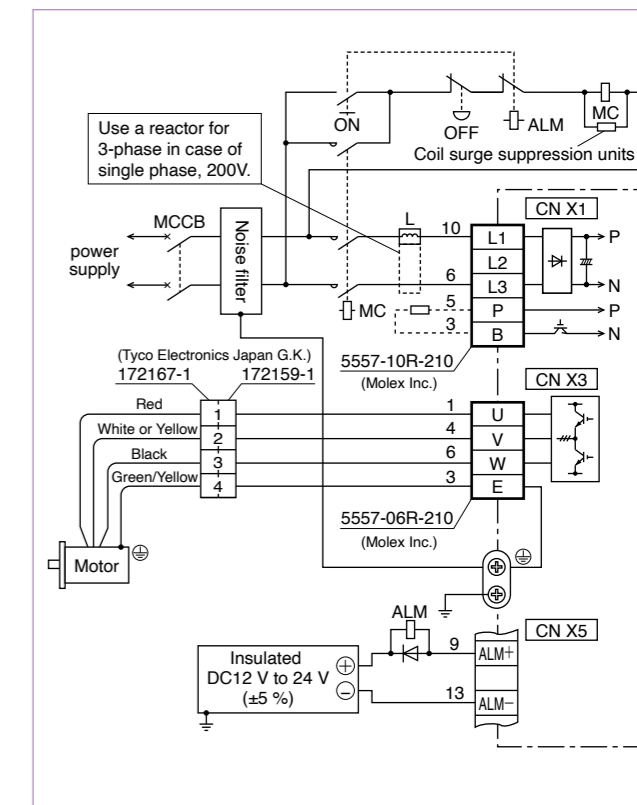
Basic Specifications	Input power	Single phase, 100 V	Single phase, 100 V to 115 V +10% -15%	50 Hz/60 Hz	
		Single phase, 200 V	Single phase, 200 V to 240 V +10% -15%	50 Hz/60 Hz	
		3-phase, 200 V	3-phase, 200 V to 240 V +10% -15%	50 Hz/60 Hz	
	Environment	Temperature	Operating : 0 °C to 55 °C, Storage : -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 <sup>2</sup> or less, 10 Hz to 60 Hz (No continuous use at resonance frequency)		
	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	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	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.		
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 mode	3 modes of (1) High-speed position control, (2) Internal velocity control and (3) High-functionality positioning control are selectable with parameter.				
Position control	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	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)		
		Electronic gear (Division/Multiplication) of command pulse	Setup of electronic gear ratio Setup range of (1-10000) × 2 <sup>(0-17)</sup> /(1-10000)		
Smoothing filter	Primary delay filter or FIR type filter is selectable to the command input.				
Internal speed control	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.			
Auto-gain tuning	Zero-speed clamp	0-clamp of internal speed command with speed zero clamp input is enabled.			
	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.			
Common	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	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.		
	Traceability of alarm data	Traceable up to past 14 alarms including the present one.			
	Damping control function	Manual setup with parameter			
	Setup	Manual	Console		
		Setup support software	PANATERM (Supporting OS : Windows98, Windows ME, Windows2000, and WindowsXP)		

Standard Wiring Example of Main Circuit

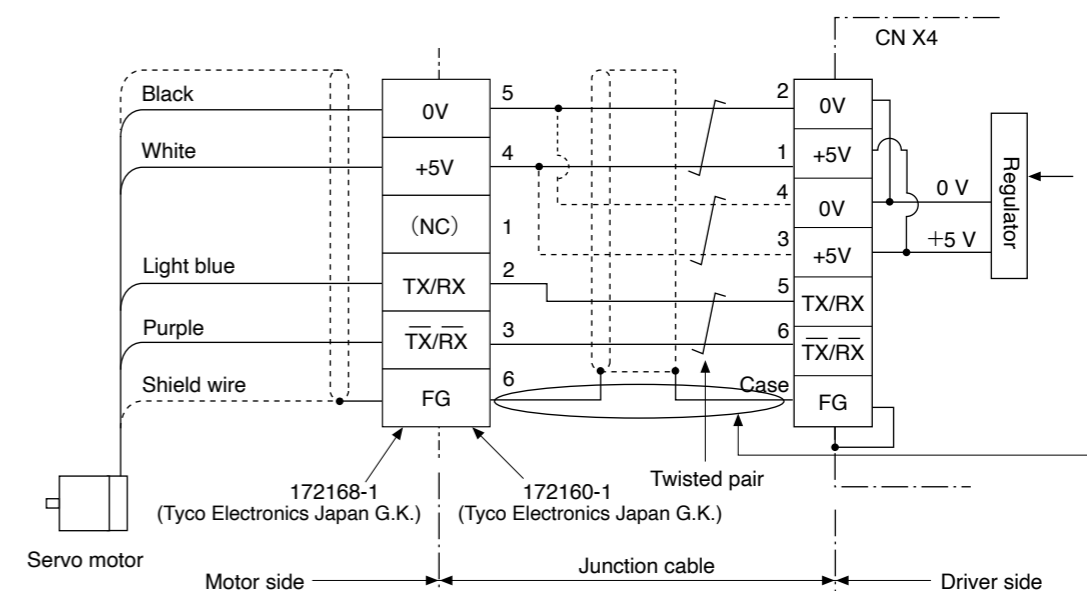
3-Phase, 200 V



Single Phase, 100 V / 200 V



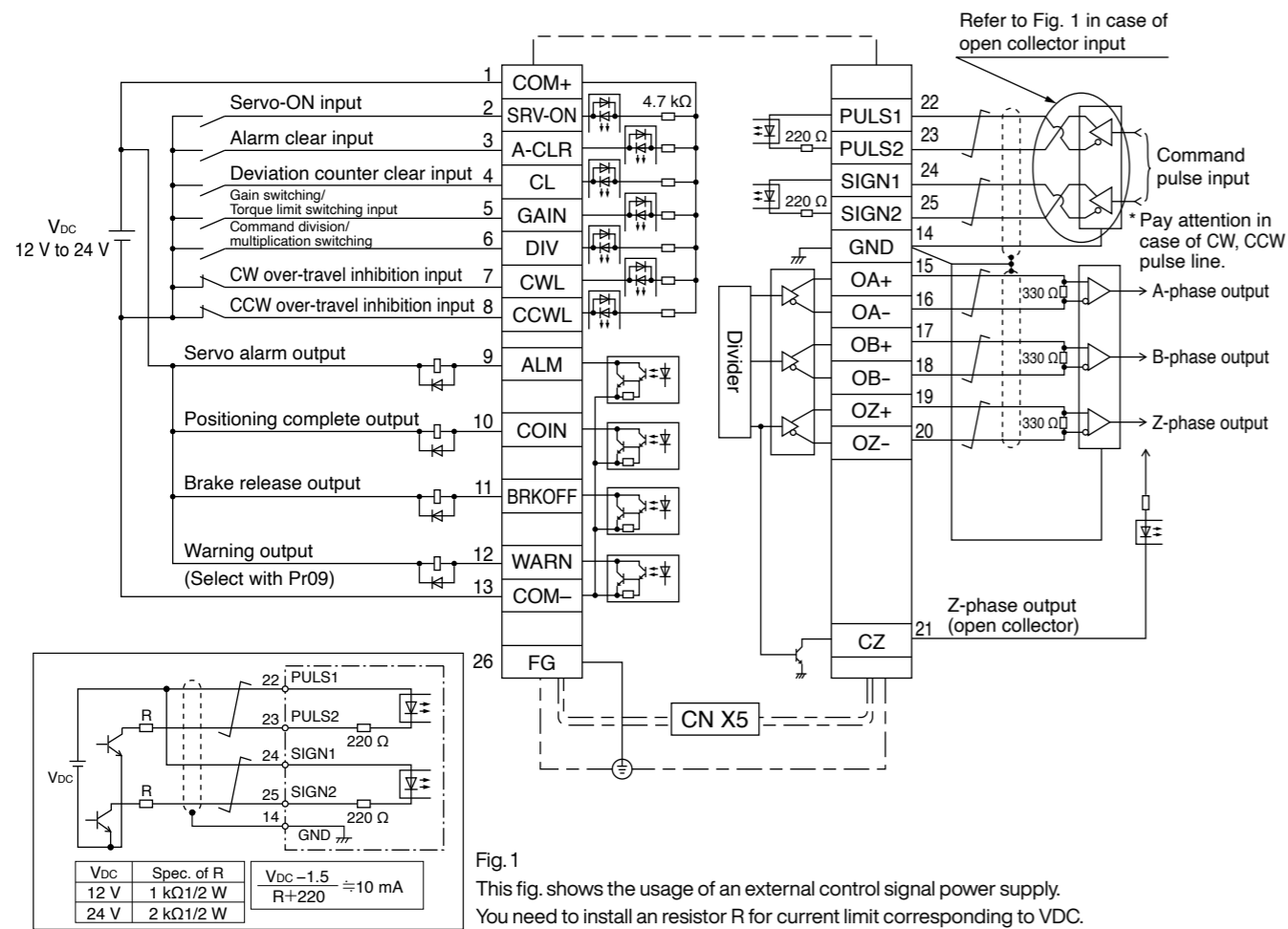
Encoder Wiring Diagram



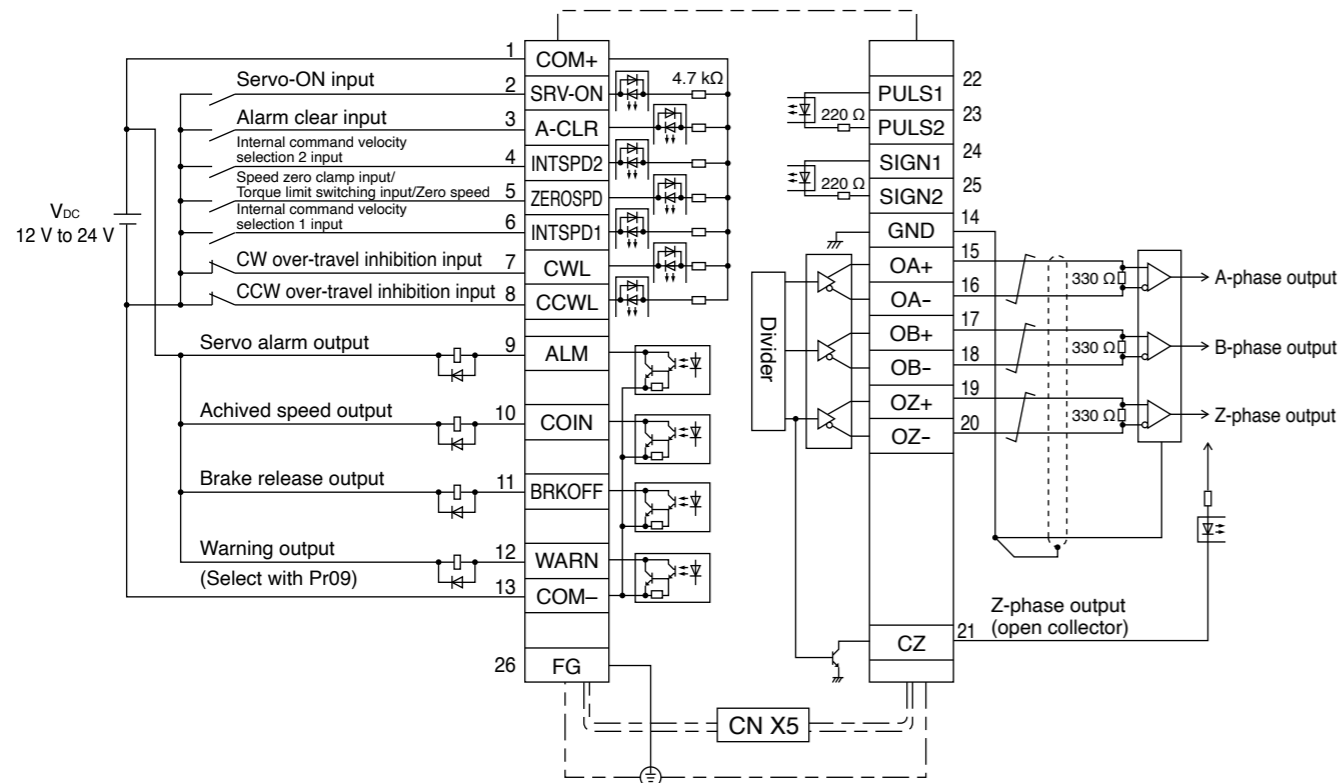
When you make your own junction cable for encoder (Refer to P.401, P.402 "Options" for connector.)

- 1) Refer the wiring diagram.
- 2) Use the twisted pair wire with shield, with core diameter of 0.18 mm<sup>2</sup> (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.

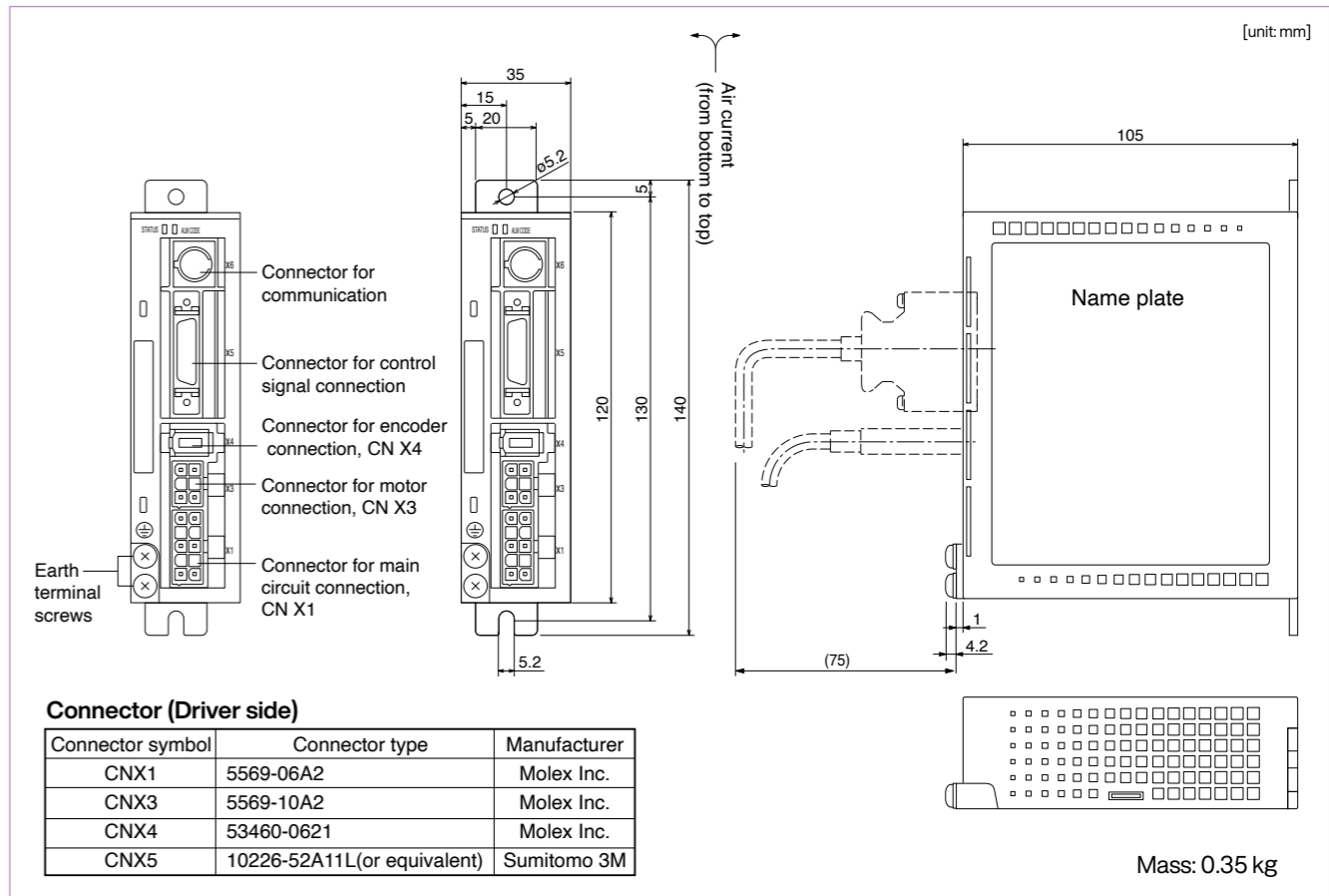
CN X 5 Wiring Example at Position Control Mode



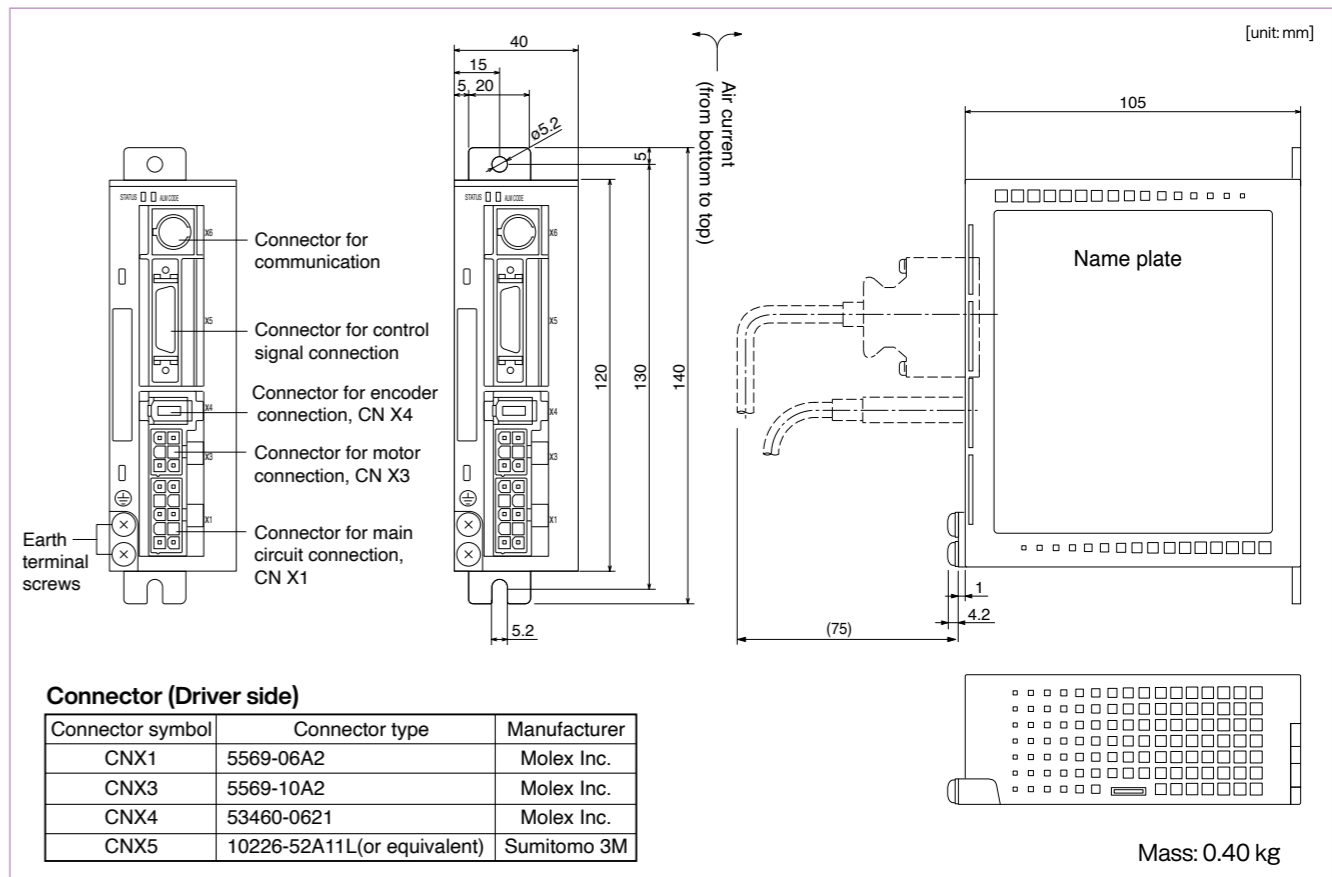
CN X 5 Wiring Example at Internal Velocity Control Mode



Frame K



Frame L



		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) Note)1	Without option	No limit Note)2		No limit Note)2	
	DV0P2890	No limit Note)2		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 <sup>2</sup> )	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)			
Environment		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 <sup>2</sup> 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 $\pm$ 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	
Symbol	Rated output
5A	50 W
01	100 W
02	200 W

Voltage specifications	
Symbol	Specifications
1	100 V
Z	100/200 V (50 W only)

Design order 1: Standard

**Motor structure**

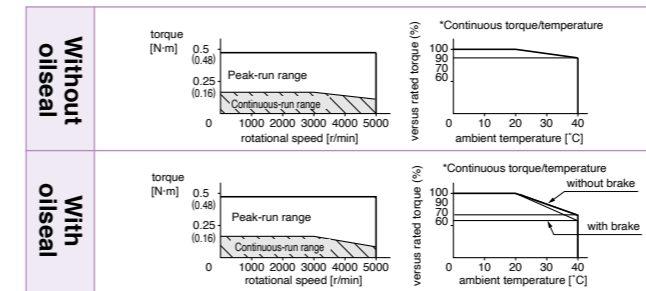
Symbol	Shaft	Holding brake		Oil seal	
	Key-way, center tap	without	with	without	with
S	●	●		●	
T	●		●	●	

**Rotary encoder specifications**

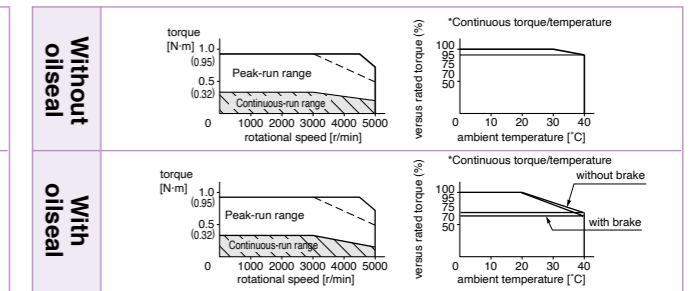
Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

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

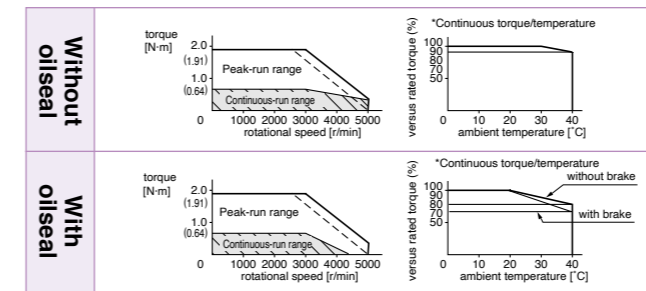
**MUMA5AZP1□**



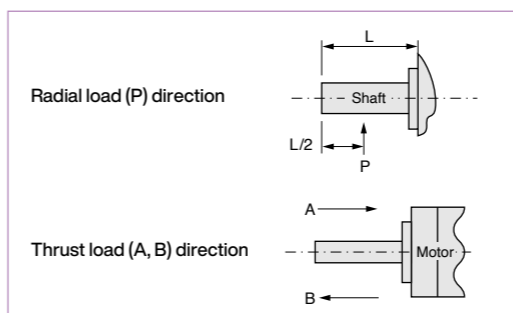
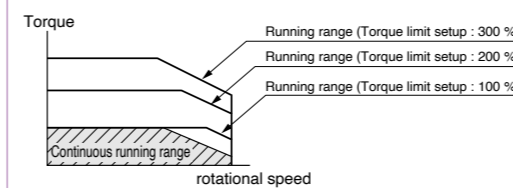
**MUMA011P1□**



**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 K Frame L	Frame L
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 (A <sub>o-p</sub> )		4.3	4.3	7.5	11.7
Regenerative brake frequency (times/min)	Without option	No limit Note)2		No limit Note)2	
	Note)1 DV0P2891	No limit Note)2		No limit Note)2	
Rated rotational speed (r/min)		3000			
Max. rotational speed (r/min)		5000			
Moment of inertia of rotor (×10 <sup>-4</sup> kg·m <sup>2</sup> )	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			
	Resolution per single turn	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 <normal 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 <sup>2</sup> 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 P.393, and for the driver, refer to P.388.  
 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)

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

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

Design order 1: Standard

#### Motor structure

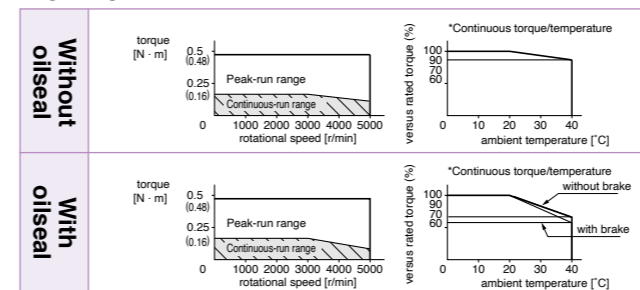
Symbol	Shaft	Holding brake		Oil seal	
	Key-way, center tap	without	with	without	with
S	●	●		●	
T	●		●	●	

#### Rotary encoder specifications

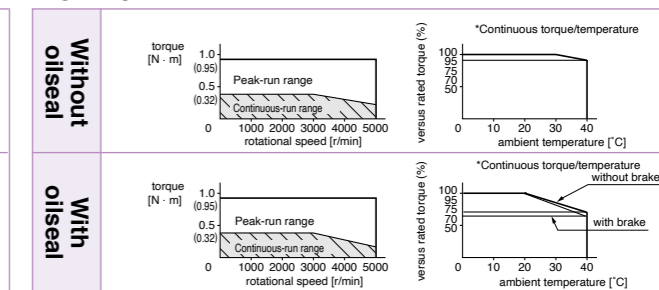
Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500 P/r	10000	5

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

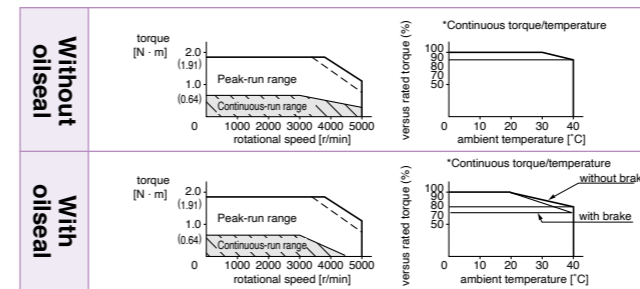
#### MUMA5AZP1□



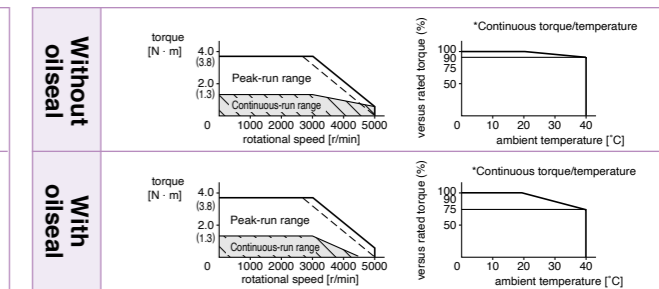
#### MUMA012P1□



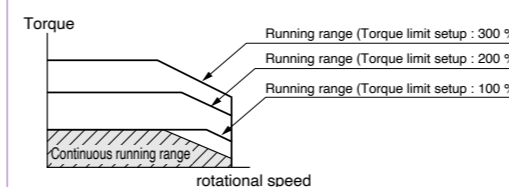
#### MUMA022P1□



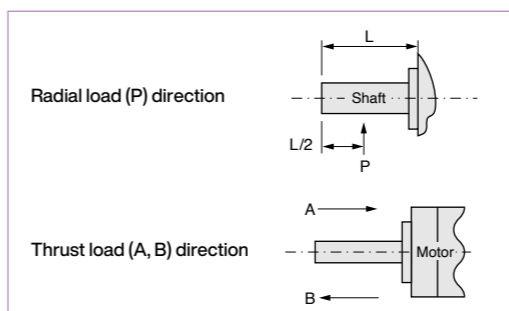
#### MUMA042P1□



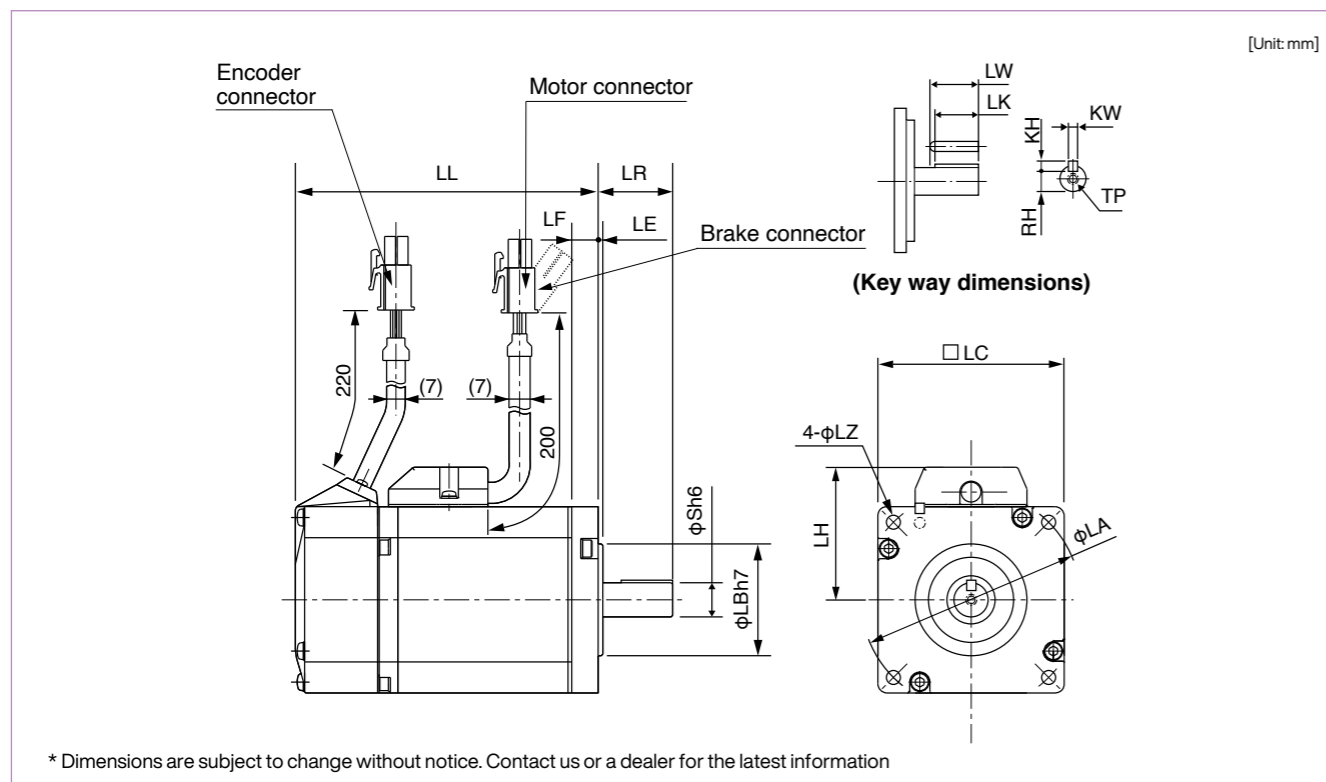
\*When you lower the torque limit setup (Pr5E and 5F), running range at high speed might be lowered as well.



- 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 = (load moment of inertia) / (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 as running speed frequently changes or vertical feeding, consult us or a dealer.
- If the effective torque is within the rated torque, there is no limit in regenerative brake.
  - Consult us or a dealer if the load moment of inertia exceeds the specified value.
  - 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)







		MUMA series (Ultra low inertia)			
Motor output		50 W	100 W	200 W	400 W
Motor model	<b>MUMA</b>	<b>5A□P1□</b>	<b>01□P1□</b>	<b>02□P1□</b>	<b>04□P1□</b>
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
Key way	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 x 6 (depth)	M3 x 6 (depth)	M4 x 8 (depth)	M5 x 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.			

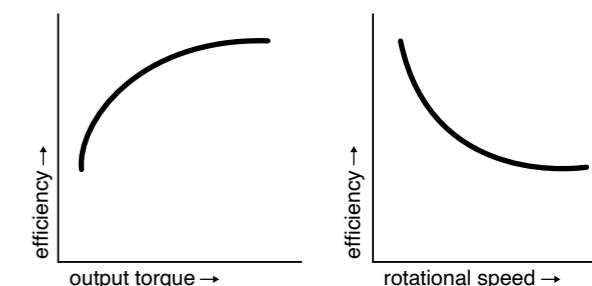
<Cautions>  
Reduce the moment of inertia ratio if high speed response operation is required.  
Read the Instruction Manual carefully and understand all precautions and remarks before using the products.

# 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 Key-way		Holding brake	
	without	with	without	with
3	●	●	●	●
4	●	●	●	●

## Specifications of Motor with Gear Reducer

Motor series		MUMA
Gear reducer	Backlash	3 minutes or smaller (initial value) at output shaft of the reducer
	Composition of gear	Planetary gear
	Gear efficiency	65 % to 85 %
	Rotational direction at output shaft (of reducer)	Same direction as the motor output shaft
	Composition of gear	Planetary gear
	Mounting method	Flange mounting
Environment	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)
	Ambient temperature	0 °C to 40 °C
	Ambient humidity	85 %RH (free from condensation) or less
	Vibration resistance	49 m/s <sup>2</sup> or less (at motor frame)
	Impact resistance	98 m/s <sup>2</sup> or less

Table of Motor with Gear Reducer Specifications

Model	Motor		MUMA with gear reducer										
	Output (W)	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) J (× 10 <sup>-4</sup> kg·m <sup>2</sup> )		Mass (kg)		Permissible radial load (N)	Permissible thrust load (N)
								w/o brake	w/ brake	w/o brake	w/ brake		
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

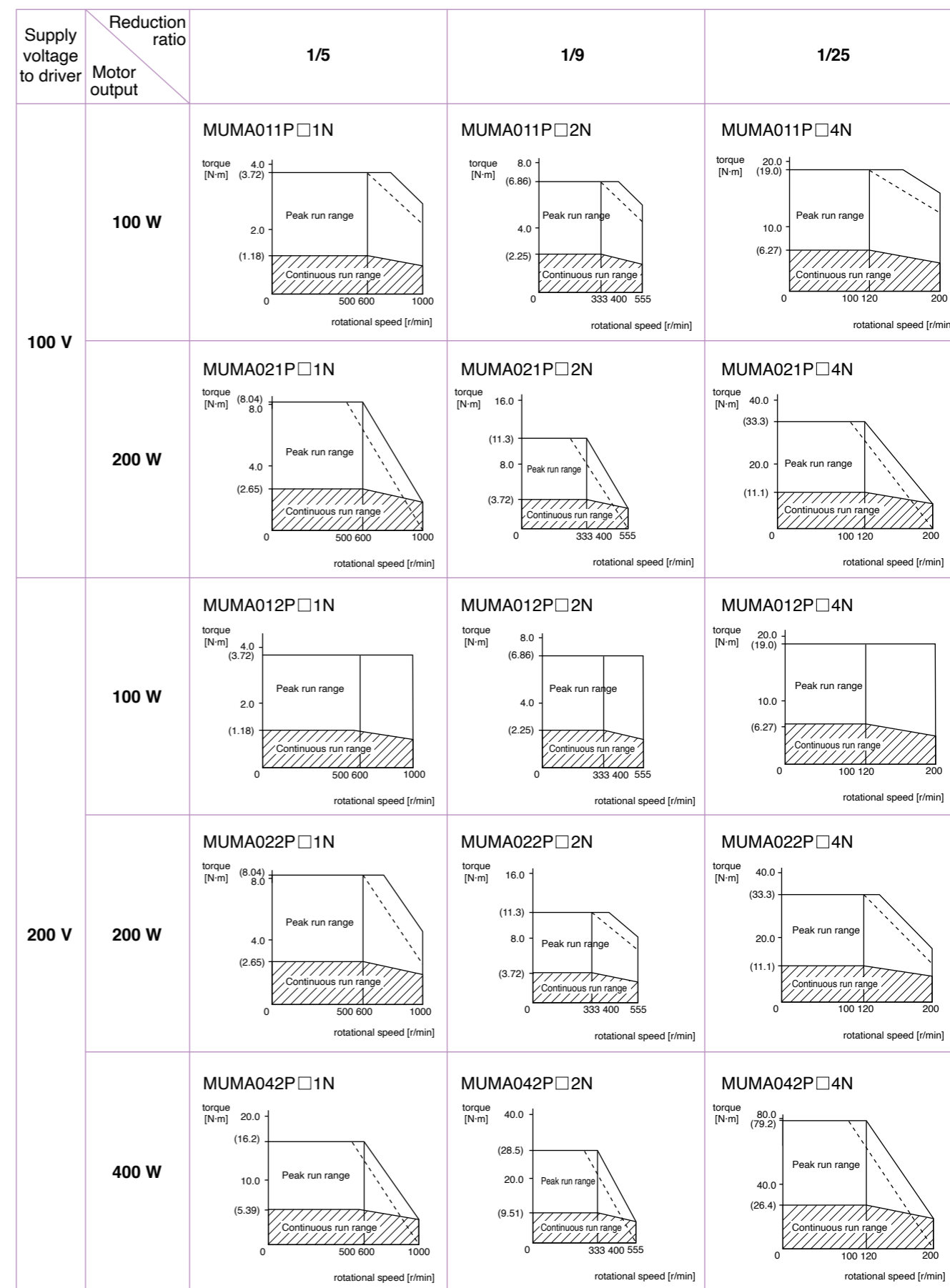
For dimensions, refer to P.397.

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	Single phase, 200 V	
			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 MLDET2310P	MLDET2510P	

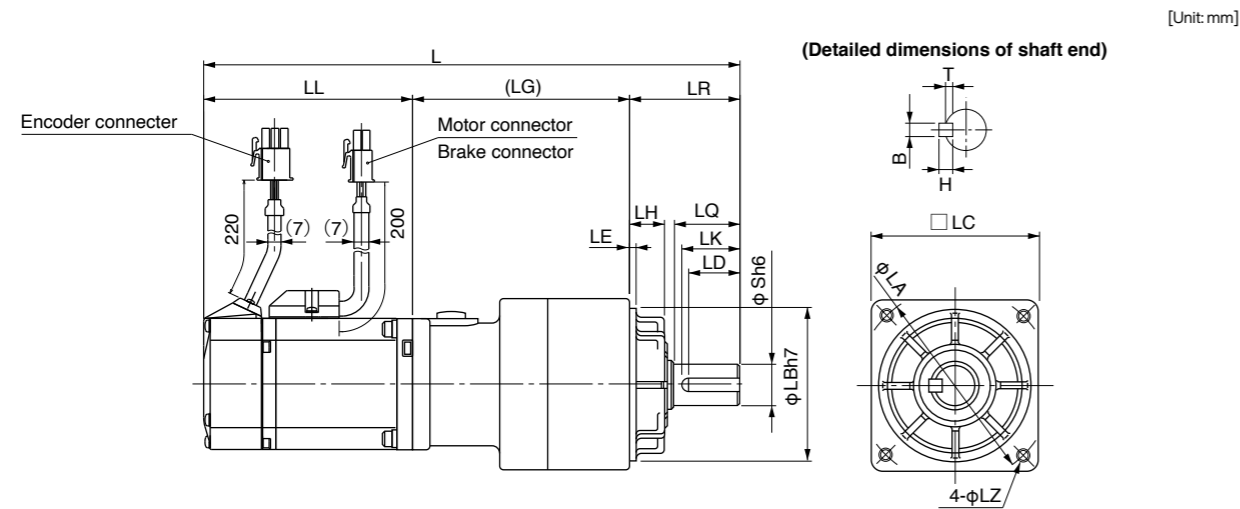
For dimensions of driver, refer to P.388.

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



Dotted line represents the torque at 10 % less supply voltage.

MUMA series with Gear Reducer



2500 P/r Encoder

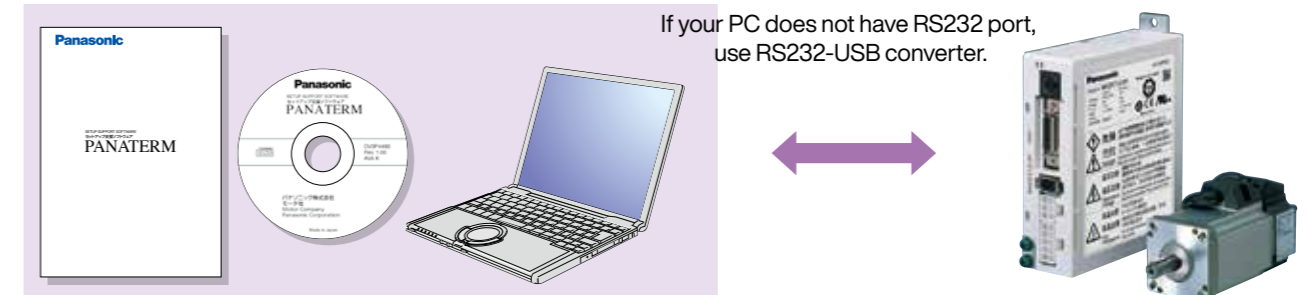
Model	Motor output	Reduction ratio	L	LL	LR	LQ	LC	LB	LA	S	LH	LZ	LK	(LG)	LE	Key way BxHxLD	T
MUMA01□P□1N	100 W	1 / 5	192	92.5	32	20	52	50	60	12	10	M5 (Depth: 12)	18	67.5	3	4x4x16	2.5
			223.5	124													
MUMA01□P□2N		1 / 9	192	92.5													
			223.5	124													
MUMA01□P□4N		1/25	234.5	92.5													
			266	124													
MUMA02□P□1N	200 W	1 / 5	200.5	96	50	30	78	70	90	19	17	M6 (Depth: 20)	26	92	3	6x6x22	3.5
			233.5	129													
MUMA02□P□2N		1 / 9	235.5	96													
			268.5	129													
MUMA02□P□4N		1/25	246	96													
			279	129													
MUMA042P□1N	400 W	1 / 5	263	123.5	61	40	98	90	115	24	18	M8 (Depth: 20)	35	104	5	8x7x30	4
			296	156.5													
MUMA042P□2N		1 / 9	263	123.5													
			296	156.5													
MUMA042P□4N		1/25	288.5	123.5													
			321.5	156.5													

Upper column : without brake  
Lower column : with brake

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

Part No. DV0P4460 (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.



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.

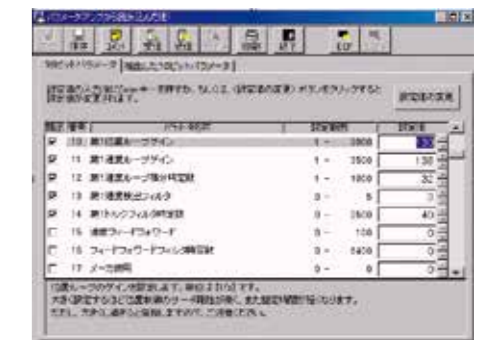
- Absolute encoder setup
  - Clears absolute encoder at the origin.
  - Displays single revolution/multi-revolution data.
  - Displays absolute encoder status.

Analysis of Mechanical Operation Data

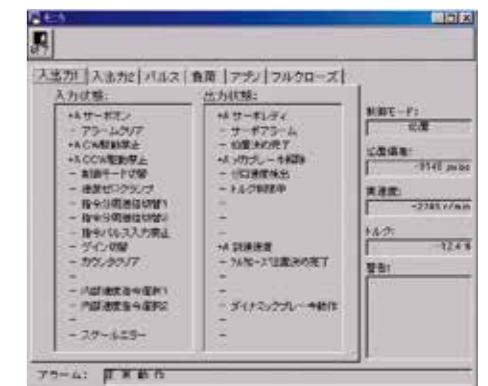
- Frequency analysis
  - Measures frequency characteristics of the machine, and displays Bode diagram.

Can not use with A5, A6 Family.

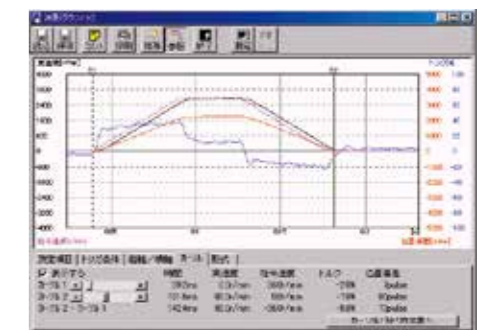
**Hardware configuration**  
 [Personal computer] • CPU : Pentium 100MHz or more • Memory : 16 MB or more (32 MB recommended)  
 • Hard disk capacity (vacancy of 25 MB or more recommended) • OS : Windows® 98, Windows® Me, Windows® 2000, Windows® XP (US version)  
 • Communication speed of serial communication 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



Parameter

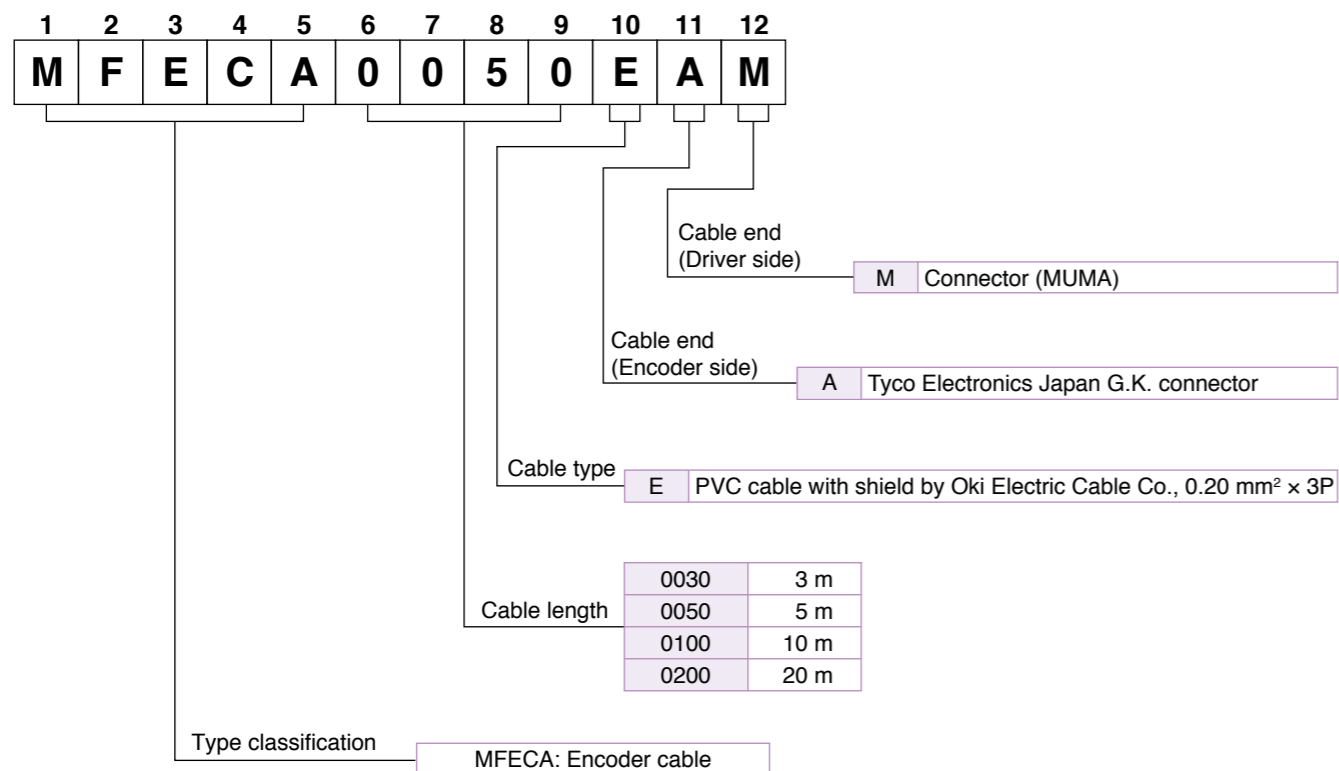


Monitor

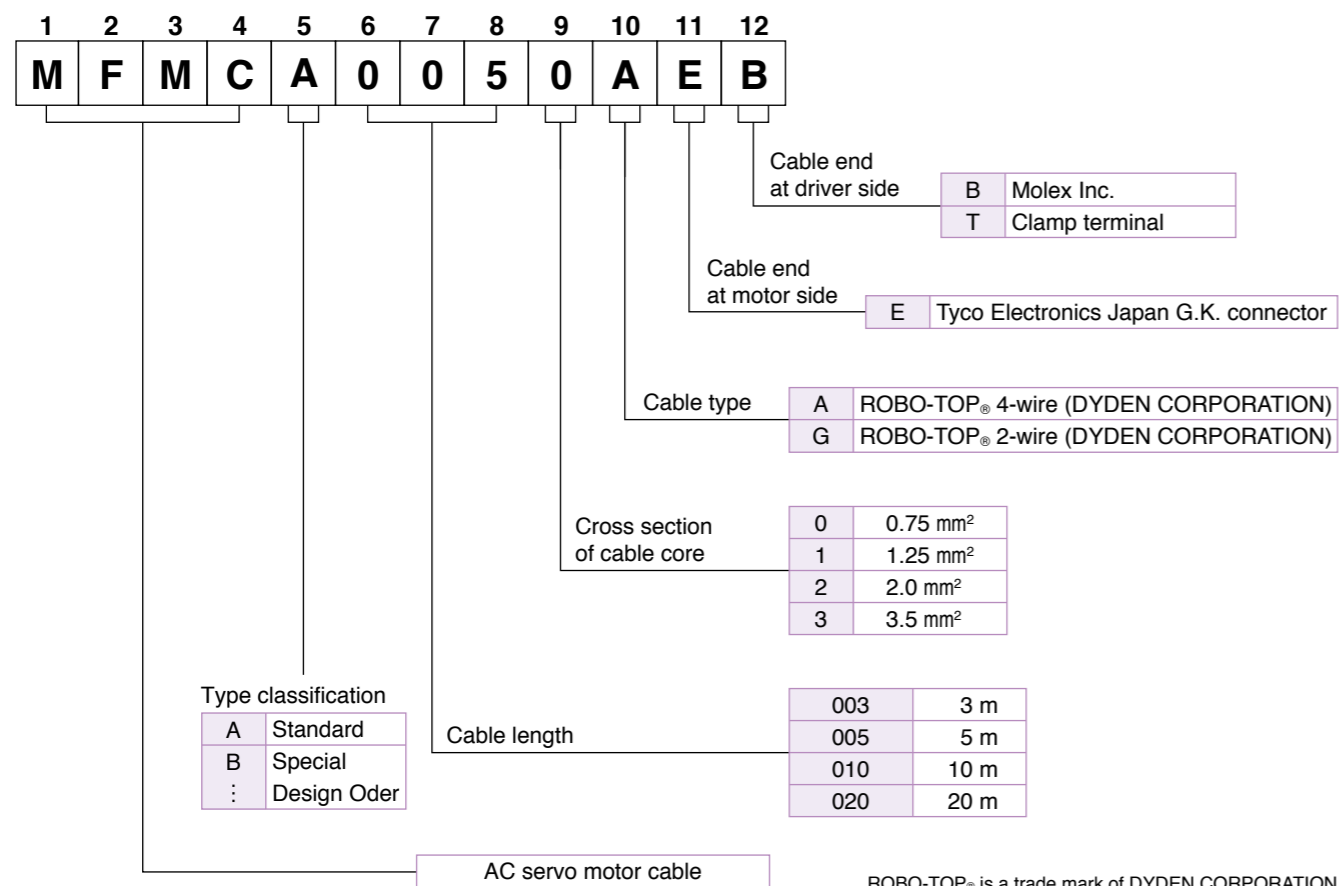


Graphic waveform display

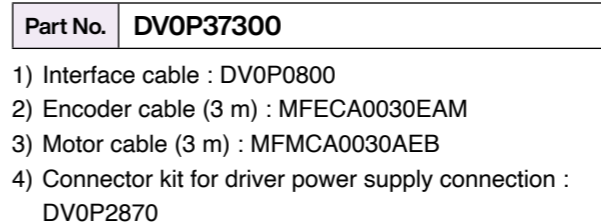
**Encoder Cable** For available optional items, please refer to P.400.



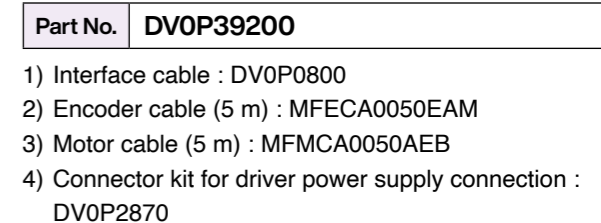
**Motor Cable, Brake Cable** For available optional items, please refer to P.400.



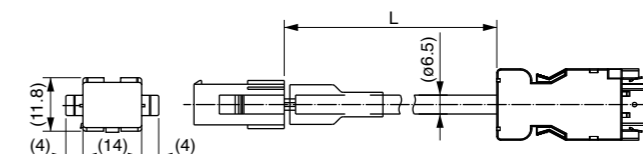
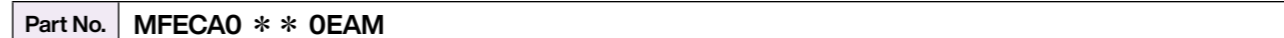
**Cable Set (3 m)**



**Cable Set (5 m)**



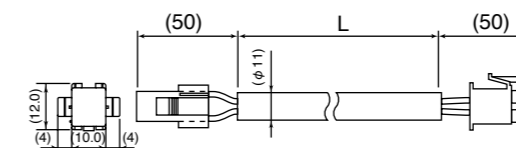
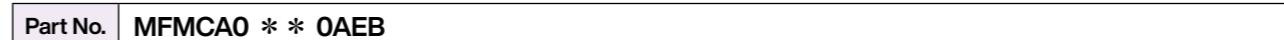
**Encoder Cable**



Title	Part No.	Manufacturer	L (m)	Part No.
Connector (Driver side)	3E206-0100KV	Sumitomo 3M	3	MFECA0030EAM
Shell kit	3E306-3200-008	or equivalent	5	MFECA0050EAM
Connector	172160-1	Tyco Electronics	10	MFECA0100EAM
Connector Pin	170365-1		20	MFECA0200EAM
Cable	0.20 mm <sup>2</sup> × 3P	Oki Electric Cable Co., Ltd.		

**Motor Cable (ROBO-TOP® 105 °C 600 V . DP)**

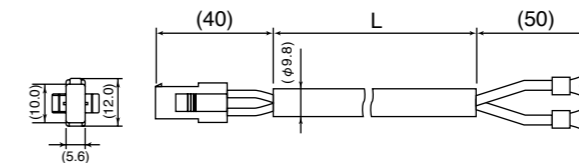
ROBO-TOP® is a trade mark of DYDEN CORPORATION



Title	Part No.	Manufacturer	L (m)	Part No.
Connector	172159-1	Tyco Electronics	3	MFMCA0030AEB
Connector Pin	170362-1, 170366-1		5	MFMCA0050AEB
Connector	5557-06R-210	Molex Inc	10	MFMCA0100AEB
Connector Pin	5556T		20	MFMCA0200AEB
Cable	ROBO-TOP 600 V 0.75 mm <sup>2</sup>	Daiden Co.,Ltd.		

**Brake Cable (ROBO-TOP® 105 °C 600V . DP)**

ROBO-TOP® is a trade mark of DYDEN CORPORATION



Title	Part No.	Manufacturer	L (m)	Part No.
Connector	172157-1	Tyco Electronics	3	MFMCB0030GET
Connector Pin	170362-1, 170366-1		5	MFMCB0050GET
Nylon insulated round terminal	N1.25-M4	J.S.T Mfg. Co., Ltd.	10	MFMCB0100GET
Cable	ROBO-TOP 600 V 0.75 mm <sup>2</sup>	Daiden Co.,Ltd.	20	MFMCB0200GET

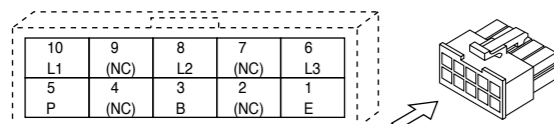
## Connector Kit for Power Supply Connection

Part No. DV0P2870

## ● 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

## &lt;Cautions&gt;

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. DV0P3670 (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.)

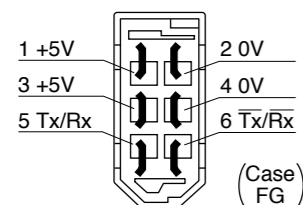
## ● Parts composition

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

## &lt;Remarks&gt;

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

## ● Pin configuration of connector CN X4 plug



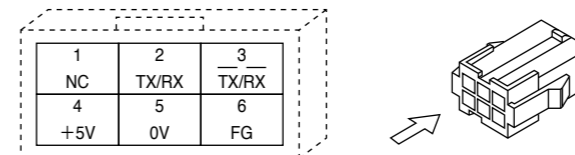
## ● Recommended manual crimping tool (to be prepared by customer)

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	Molex Inc.	UL1007
	57027-5000		UL1015

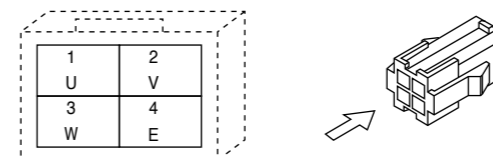
## &lt;Remarks&gt;

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.

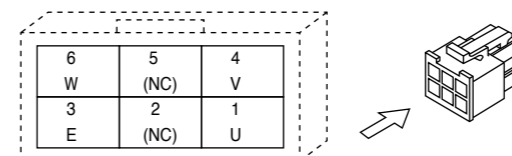
## ● Pin configuration of encoder cable junction



## ● Pin configuration of motor power cable junction



## ● Pin configuration of mating connector to CN X3 connector



## &lt;Cautions&gt;

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.

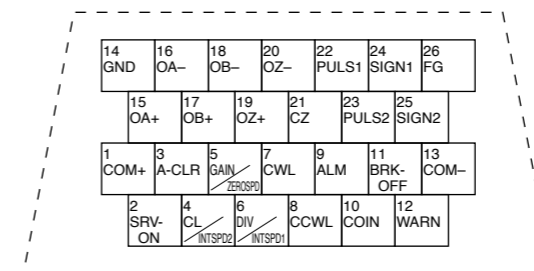
## Connector Kit for Interface

Part No. DV0P0770

## ● Parts composition

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

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



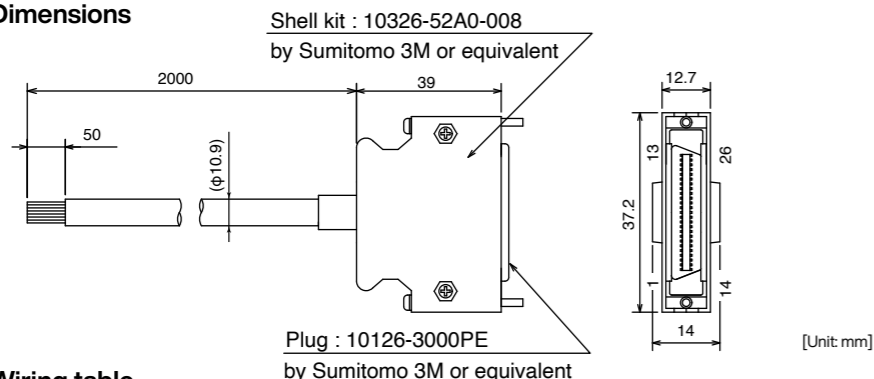
## &lt;Cautions&gt;

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. DV0P0800 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)			

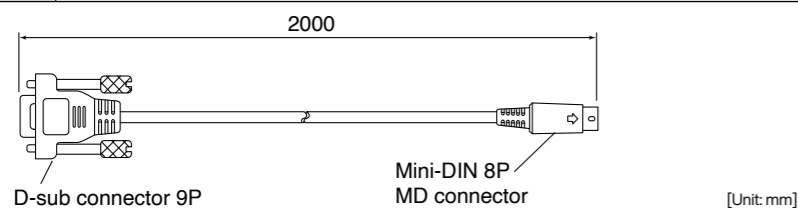
<Notes>  
e.g. of Pin No. designation :  
Pin No. 1... Wire color is orange, and one red dot.  
Pin No. 12... Wire color is orange, and two black dot.

<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.

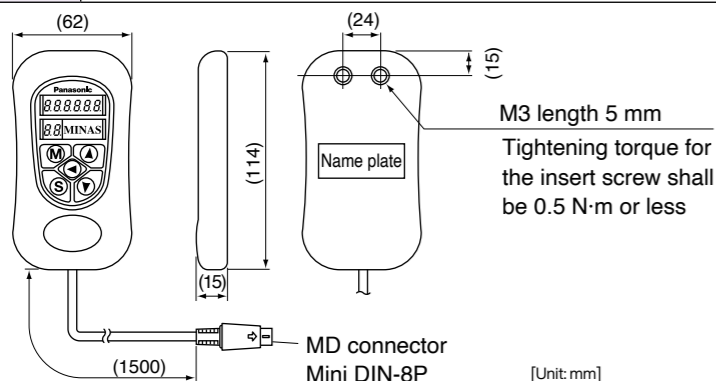
Communication Cable (For Connection with PC)

Part No. DV0P1960



Console

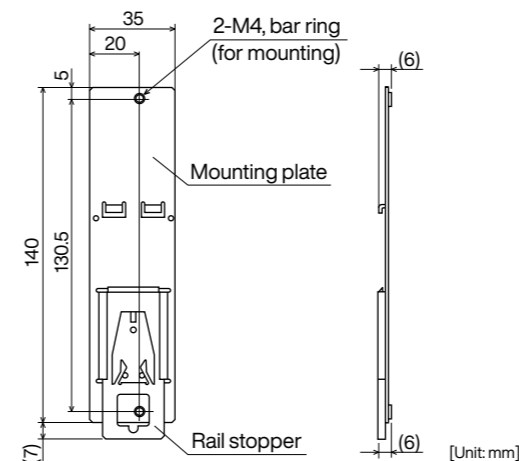
Part No. DV0P4420



DIN Rail Mounting Unit

Part No. DV0P3811

● Dimensions

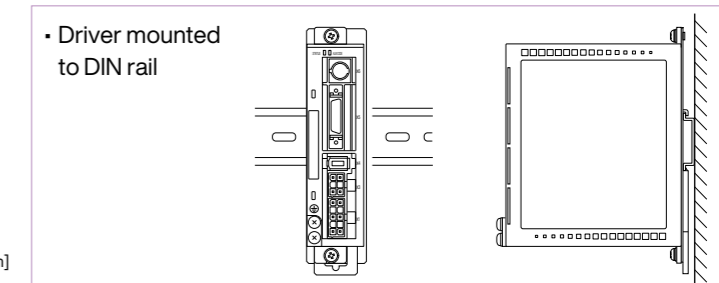


<Notes>

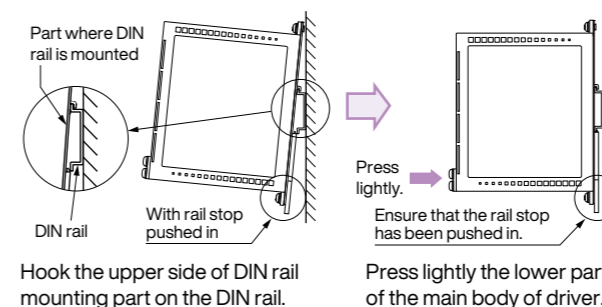
2 mounting screws (M4 X L8, Pan head) are attached.  
Rail stopper can be extended to max. 10 mm.

<Cautions>

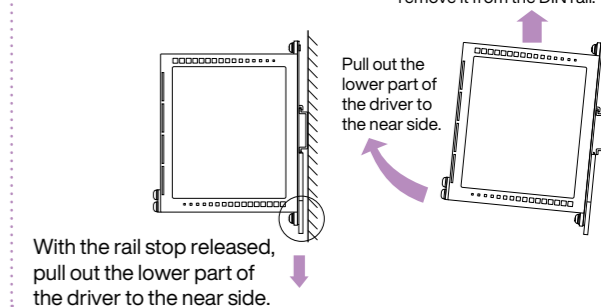
Please read carefully operation manual before using this product.  
In addition, please do not apply excessive stress to the product.



• How to Install



• Removing from DIN Rail

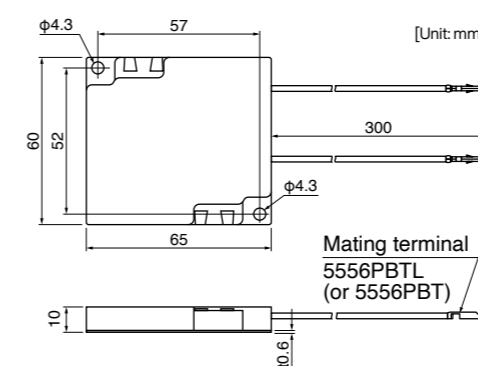


External Regenerative Resistor

Part No.	Manufacturer's Part No.	Specifications			Note (Input Power of drive)
		Resistance Ω	Rated power W	Activation temperature of built-in fuse °C	
DV0P2890	45M03	50	10	137 <sup>+3</sup> / <sub>-2</sub>	Single phase, 100 V
DV0P2891	45M03	100	10	137 <sup>+3</sup> / <sub>-2</sub>	Single/3-phase, 200 V

Manufactured by Iwaki Musen Kenkyusho 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 °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

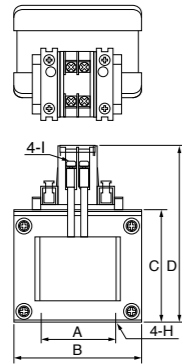
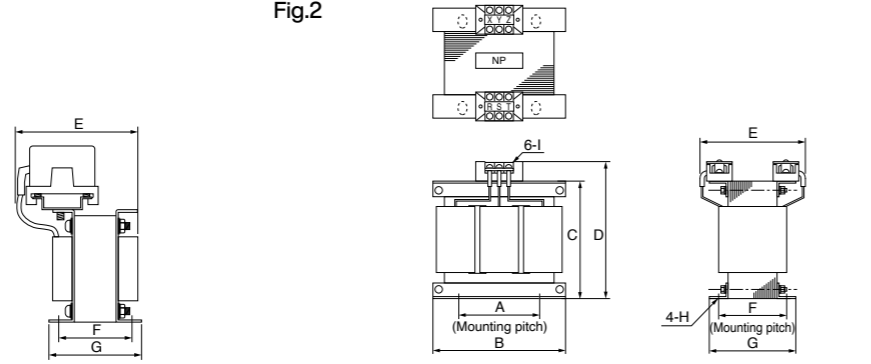
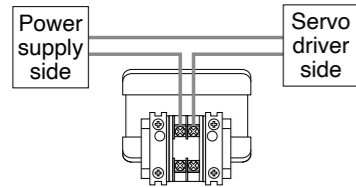


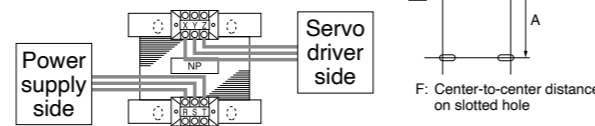
Fig.2



• Wiring of the reactor <Single phase>



• Wiring of the reactor <3-Phase>



F: Center-to-center distance on outer circular arc

F: Center-to-center distance on slotted hole

[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	4-5φ×10	M4	4.02	5
	DV0P228	55±0.7	76.5±1	66.5±1	110 Max	95	48.0±2	61±2	4-5φ×10	M4	2	8
Fig.2	DV0P220	65±1	125±1	(93)	136 Max	155	70+3/-0	85±2	4-7φ×12	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/](http://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

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

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

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MEMO

A series of horizontal dashed lines for writing.



## Contents

<b>A6 Family</b> .....	<b>409</b>
EU Directives/ UK Regulation/ Conformity to UL Standards/ KC.....	409
Composition of Peripheral Devices.....	411
<b>E Series</b> .....	<b>415</b>
Compliance to EU/ UK Regulation and EMC Directives.....	415
Composition of Peripheral Components.....	416
<b>Motor Capacity Selection Software</b> .....	<b>417</b>
AC Servo Motor Capacity Selection Software.....	417
Option Selection Software for AC Servo Motor.....	417
<b>Guide to the International System of Units (SI)</b> .....	<b>418</b>
<b>Selecting Motor Capacity</b> .....	<b>420</b>
<b>Request Sheet for Motor Selection</b> .....	<b>426</b>
<b>Connection Between Driver and Controller</b> .....	<b>434</b>
Connection Between A6 Family Driver and Controller.....	434
Replacing Old Model Servo Driver with MINAS A6 series.....	439
Connection Between E Series Driver and Controller.....	443
<b>Index</b> .....	<b>448</b>
<b>Sales Office of Overseas</b> .....	<b>462</b>


### EU Directives/ UK Regulation

The EU Directives/ UK Regulation apply to all such electronic products as those having specific functions and have been exported to EU and directly sold to general consumers. Those products are required to conform to the EU unified standards and to furnish the CE marking on the products. However, our AC servos meet the relevant EU Directives for EU Low Voltage Directives/UK Low Voltage Regulation Equipment so that the machine or equipment comprising our AC servos can meet EU Directives.

### EU EMC Directives/UK EMC Regulation

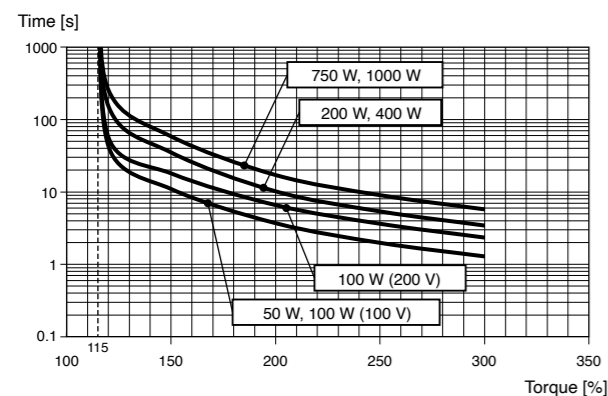
MINAS Servo System conforms to relevant standard under EU EMC Directives/UK EMC Regulation setting up certain model (condition) with certain locating distance and wiring of the servo motor and the driver. And actual working condition often differs from this model condition especially in wiring and grounding. Therefore, in order for the machine to conform to the EU EMC Directives/UK EMC Regulation, especially for noise emission and noise terminal voltage, it is necessary to examine the machine incorporating our servos.

### Conformity to UL Standards

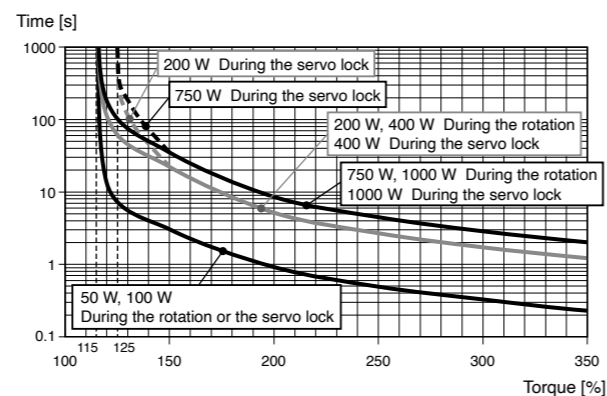
- Observe the following conditions of (1) and (2) to make the system conform to UL508C (E164620).
- Use the driver in an environment of Pollution Degree 2 or 1 prescribed in IEC60664-1. (e.g. Install in the control box with IP54 enclosure.)
  - Make sure to install a circuit breaker or fuse which are UL recognized (Listed ) marked) between the power supply and the noise filter. For rated current of circuit breaker and fuse, refer to P.27 "Driver and List of Applicable Peripheral Devices". Use a copper cable with temperature rating of 75 °C or higher.
  - Over-load protection level  
Over-load protective function will be activated when the effective current exceeds 115 % or more than the rated current based on the time characteristics (see the graph). Confirm that the effective current of the driver does not exceed the rated current. Set up the peak permissible current with Pr0.13 (Setup of 1st torque limit) and Pr5.22 (Setup 2nd torque limit).

#### Overload protection time characteristics

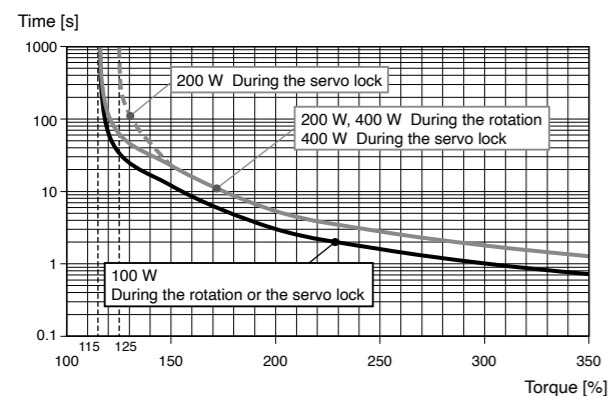
Motor type: 80 mm sq. or less MSMF



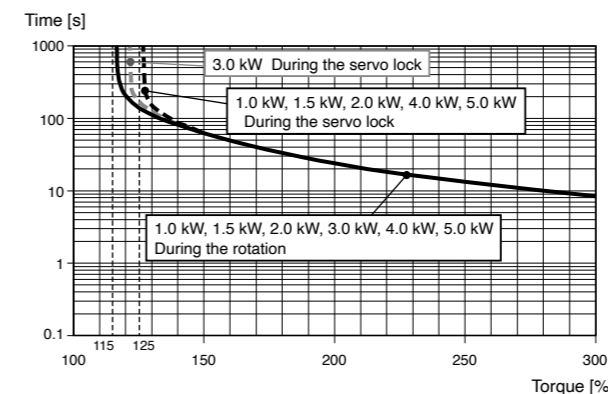
Motor type: 80 mm sq. or less MHMF



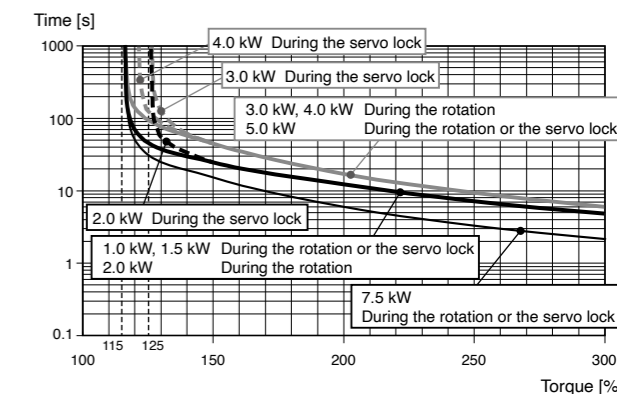
Motor type: 80 mm sq. or less MQMF



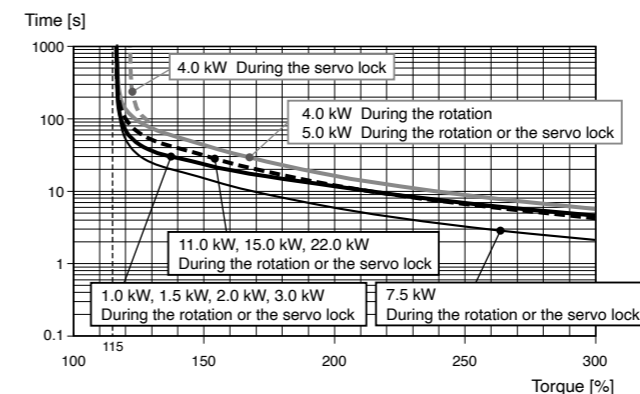
Motor type: 100 mm sq. or more MSMF



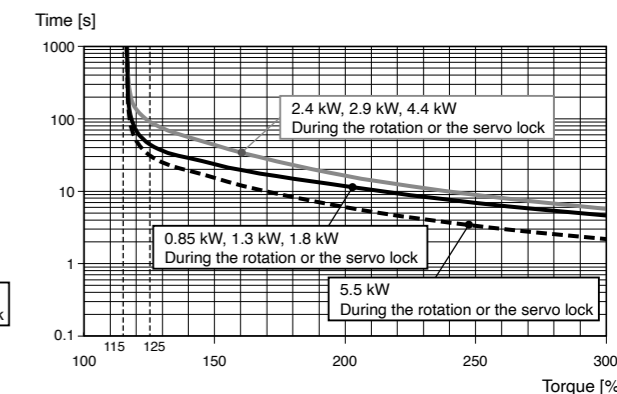
Motor type: 100 mm sq. or more MHMF



Motor type: 100 mm sq. or more MDMF



Motor type: 100 mm sq. or more MGMF



### Conformed Standards

	Driver	Motor
EU/UK Standards	EU EMC Directives/ UK EMC Regulation	EN55011 EN61000-6-2 EN61000-6-4 EN61800-3
	EU Low Voltage Directives/ UK Low Voltage Regulation	EN61800-5-1
	Machinery (Functional safety *1)	ISO13849-1(PL e, Cat.3) EN61508(SIL3) EN62061(SILCL 3) EN61800-5-2(SIL3, STO)
UL Standards	UL61800-5-1 (E164620)	UL1004-1, UL1004-6 (E327868)
CSA Standards	C22.2 No.14	C22.2 No.100
Radio Waves Act (South Korea) (KC) *2	KN11 KN61000-4-2,3,4,5,6,8,11	—

IEC : International Electrotechnical Commission  
EN : Europaischen Normen  
EMC : Electromagnetic Compatibility  
UL : Underwriters Laboratories  
CSA : Canadian Standards Association

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

● When export this product, follow statutory provisions of the destination country.

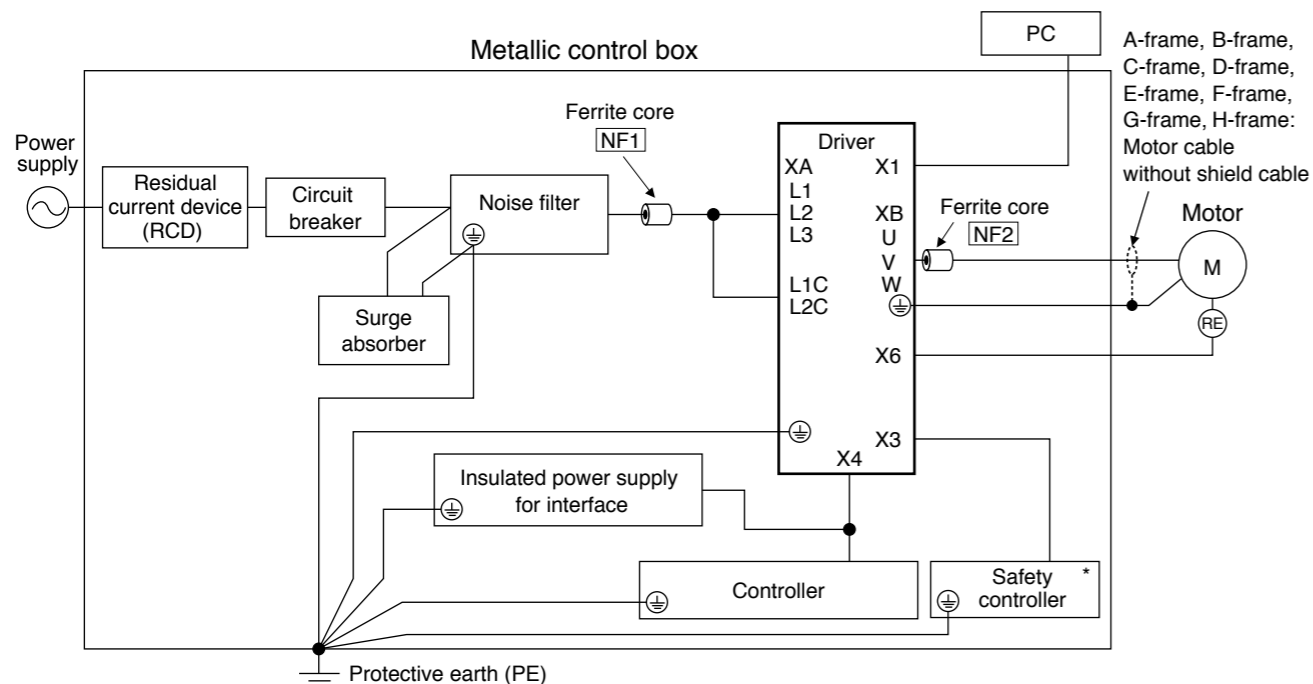
\*1 A6SE, A6SG, A6NE, A6BE series doesn't correspond to the functional safety standard.

\*2 Information related to the Korea Radio Law  
This servo driver is a Class A commercial broadcasting radio wave generator not designed for home use. The user and dealer should be aware of this fact.

A 급 기기 (업무용 방송통신기자재)  
이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.  
(대상기종 : Servo Driver)

Installation Environment

Use the servo driver in the environment of Pollution Degree 1 or 2 prescribed in IEC-60664-1 (e.g. Install the driver in control panel with IP54 protection structure.)



For [NF1] to [NF2], refer to the Table "Ferrite core" (P.414).  
 \* A6SE, A6SG, A6NE, A6BE is not provided with X3 terminal.

<Caution>

Use options correctly after reading Operating Instructions of the options to better understand the precautions. Take care not to apply excessive stress to each optional part.

Power Supply

100 V type (A-frame to C-frame)	Single phase, 100 V +10% to -15% to 120 V +10% to -15%	50 Hz/60 Hz
200 V type (A-frame to D-frame)	Single/3-phase, 200 V +10% to -15% to 240 V +10% to -15%	50 Hz/60 Hz
200 V type (E-frame to H-frame)	3-phase, 200 V +10% to -15% to 240 V +10% to -15%	50 Hz/60 Hz

- (1) This product is designed to be used in over-voltage category (installation category) III of EN 61800-5-1:2007.
- (2) Use an insulated power supply of DC12 V to 24 V which has CE marking or complies with EN60950.

Circuit Breaker

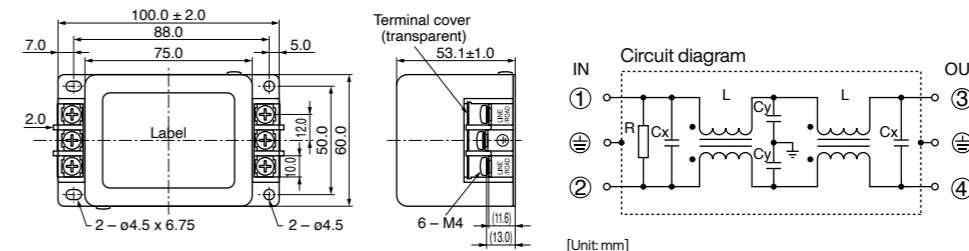
Install a circuit breaker which complies with IEC Standards and UL recognized (Listed and marked) between power supply and noise filter. The short-circuit protection circuit on the product is not for protection of branch circuit. The branch circuit should be protected in accordance with NEC and the applicable local regulations in your area.

Noise Filter

When you install one noise filter at the power supply for multi-axes application, contact the manufacturer of the noise filter. If noise margin is required, connect 2 filters in series to emphasize effectiveness.

Options

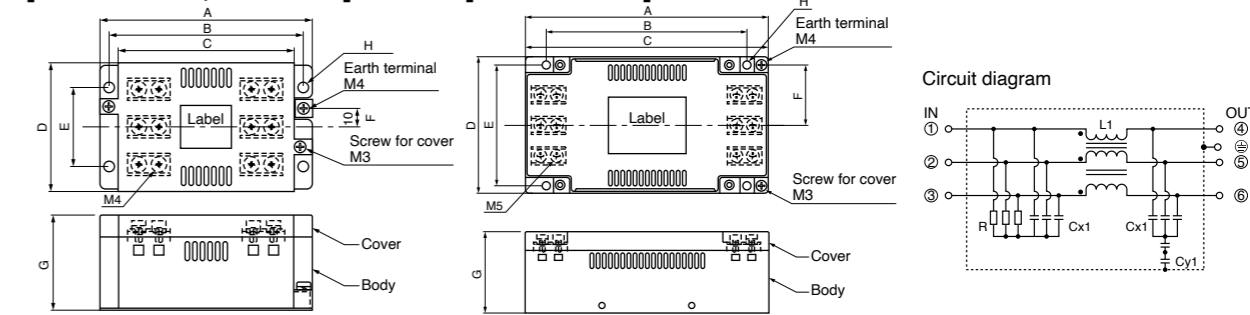
Option part No.	Voltage specifications for driver	Manufacturer's part No.	Applicable driver (frame)	Manufacturer
DV0P4170	Single phase 100 V, 200 V	SUP-EK5-ER-6	A-frame and B-frame	Okaya Electric Ind.



Option part No.	Voltage specifications for driver	Manufacturer's part No.	Applicable driver (frame)	Manufacturer
DV0PM20042	3-phase 200 V	3SUP-HU10-ER-6	A-frame and B-frame	Okaya Electric Ind.
DV0P4220	Single phase 100 V, 200 V		C-frame	
DV0PM20043	3-phase 200 V	3SUP-HU30-ER-6	D-frame	
		3SUP-HU50-ER-6	E-frame	

[DV0PM20042, DV0P4220]

[DV0PM20043]

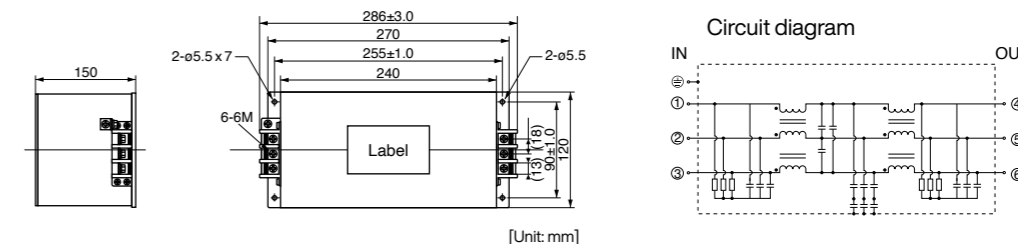


[Size] [Unit: mm]

	A	B	C	D	E	F	G	H
DV0PM20042	115	105	95	70	43	10	52	5.5
DV0P4220	145	135	125	70	50	10	52	5.5
DV0PM20043	165	136	165	90	80	40	54	5.5

For single phase application, use 2 terminals among 3 terminals, leaving the remaining terminal unconnected.

Option part No.	Voltage specifications for driver	Manufacturer's part No.	Applicable driver (frame)	Manufacturer
DV0P3410	3-phase 200 V	3SUP-HL50-ER-6B	F-frame	Okaya Electric Ind.



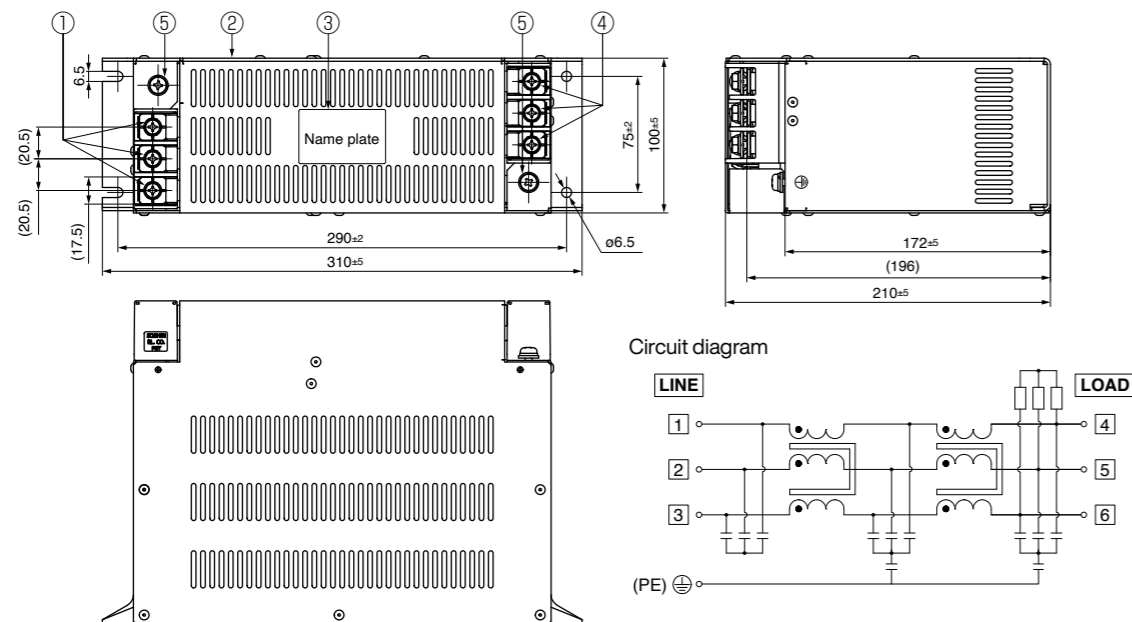
<Remarks>

- Select a noise filter of capacity that exceeds the capacity of the power source (also check for load condition).
- For detailed specification of the filter, contact the manufacturer.

Noise Filter

Recommended components

Part No.	Voltage specifications for driver	Rated current (A)	Applicable driver (frame)	Manufacturer
HF3080C-SZA	3-phase 200 V	80	G	SOSHIN ELECTRIC CO.,LTD.
HF3100C-SZA		100	H	



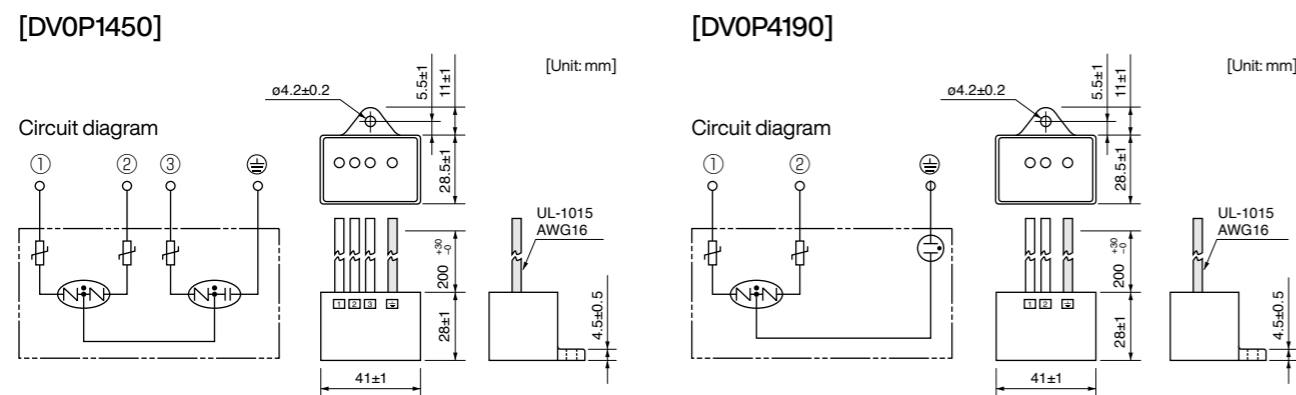
<Remarks>

- Select a noise filter of capacity that exceeds the capacity of the power source (also check for load condition).
- For detailed specification of the filter, contact the manufacturer.
- When you install one noise filter at the power supply for multi-axes application, contact the manufacturer of the noise filter.

Surge Absorber

Provide a surge absorber for the primary side of noise filter.

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



<Remarks>

Remove this surge absorber when you perform dielectric test on the machine, or surge absorber might be damaged.

Ferrite core

Install ferrite core to power cable and motor cable

Symbol <sup>1</sup>	Cable Name	Applicable driver (frame)	Option part No.	Manufacturer's part No.	Manufacturer	Required number
NF1	Power cable	A, B, E	DV0P1460	ZCAT3035-1330	TDK Corp.	1
		G, H	—	RJ8095	Konno Kogyosho Co.Ltd	3
NF2	Motor cable	A, B, C, D, E	DV0P1460	ZCAT3035-1330	TDK Corp.	1
		F				2
		G, H	—	T400-61D	MICROMETALS	3

\*1 For symbols, refer to the Block Diagram "Installation Environment" (P.411).

- The number of turns is all 1.
- NF1 is not required for C frame, D frame, F frame.

<Remarks>

To connect the ferrite core to the connector XB connection cable, adjust the sheath length at the tip of the cable, as required.

<Caution>

Fix the ferrite core in order to prevent excessive stress to the cables.

Fig.1: DV0P1460 (Option) 4 pieces

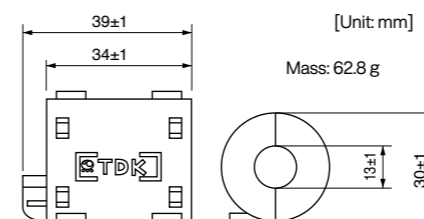


Fig.3: T400-61D (Recommended components) 1 pieces

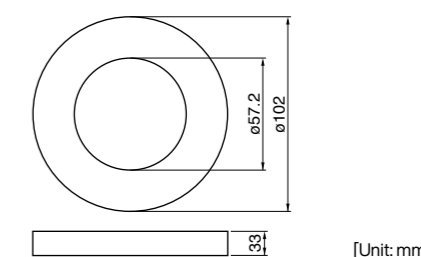
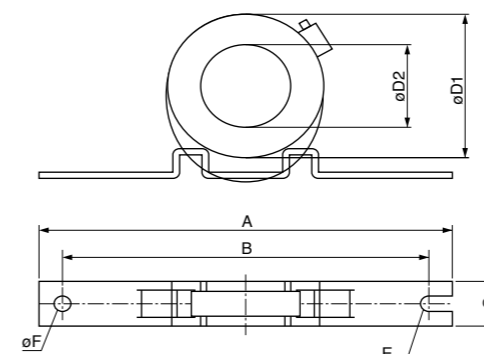


Fig.2: RJ8095 (Recommended components) 1 pieces



Manufacturer's part No.	Current value	100 kHz (μH)	Size [Unit: mm]							
			A	B	C	D1	D2	Core thickness	E	F
RJ8095	95 A	7.9±3	200	180	34	130	107	35	R3.5	7

Residual Current Device

Install a type B Residual current device (RCD) at primary side of the power supply. Type B: Residual current device which detects a direct-current ingredient.

Grounding

- (1) Connect the protective earth terminal (⊕) of the driver and the protective earth terminal (PE) of the control box without fail to prevent electrical shocks.
- (2) Do not make a joint connection to the protective earth terminals (⊕). 2 terminals are provided for protective earth.

<Note>

For driver and applicable peripheral devices, refer to P.27 "Driver and List of Applicable Peripheral Devices".

## Compliance to EU/ UK Regulation and EMC Directives

### EU Directives/ UK Regulation

The EU Directives/ UK Regulation apply to all such electronic products as those having specific functions and have been exported to EU and directly sold to general consumers. Those products are required to conform to the EU unified standards and to furnish the CE marking on the products. MINAS AC Servos conforms to the EU Directives for EU Low Voltage Directives/ UK Low Voltage Regulation Equipment so that the machine incorporating our servos has an easy access to the conformity to relevant EU Directives for the machine.

### EU EMC Directives/UK EMC Regulation

MINAS Servo System conform to relevant standard under EU EMC Directives/UK EMC Regulation setting up certain model (condition) with certain locating distance and wiring of the servo motor and the driver. And actual working condition often differs from this model condition especially in wiring and grounding. Therefore, in order for the machine to conform to the EU EMC Directives/UK EMC Regulation, especially for noise emission and noise terminal voltage, it is necessary to examine the machine incorporating our servos.

### Conformed Standards

Subject	Conformed Standard		
Motor	IEC60034-1	IEC60034-5	UL1004 CSA22.2 No.100
Motor and driver	UL61800-5-1		CSA22.2 No.14
	EN55011	Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment	
	EN61000-6-2	Immunity for Industrial Environments	
	IEC61000-4-2	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	Lightening Surge Immunity Test	
	IEC61000-4-6	High Frequency Conduction Immunity Test	
IEC61000-4-11	Instantaneous Outage Immunity Test		

IEC : International Electrotechnical Commission  
EN : Europäischen Normen  
EMC : Electromagnetic Compatibility  
UL : Underwriters Laboratories  
CSA : Canadian Standards Association

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

Conforms to EU Low Voltage Directives/UK Low Voltage Regulation  
Conforms to references by EU EMC Directives/UK EMC Regulation

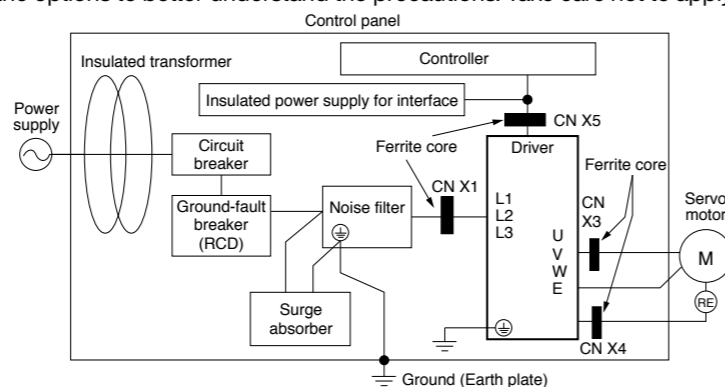
## Composition of Peripheral Components

### <Precautions in using options>

Use options correctly after reading operation manuals of the options to better understand the precautions. Take care not to apply excessive stress to each optional part.

### Installation Environment

Use Minas driver in environment of Pollution Degree 1 or 2 prescribed in IEC-60664-1 (e.g. Install the driver in control panel with IP54 protection structure.)



### Power Supply

100 V system	Single phase, 100 V	+10 % -15 %	to	115 V	+10 % -15 %	50 Hz/60 Hz
200 V system	Single phase, 200 V	+10 % -15 %	to	240 V	+10 % -15 %	50 Hz/60 Hz
200 V system	3-phase, 200 V	+10 % -15 %	to	240 V	+10 % -15 %	50 Hz/60 Hz

- Use the power supply under an environment of Overvoltage Category II specified in IEC60664-1.
- For a interface power supply, use the insulated one with 12 VDC to 24 VDC which conforms to CE Marking or EN Standards (EN60950).

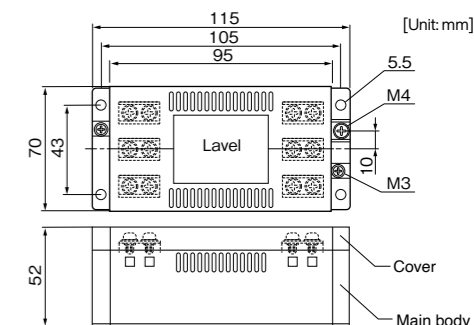
### Circuit Breaker

Connect a circuit breaker which conforms to IEC standards and is UL recognized (UL Listed, marked), between the power supply and the noise filter.

### Noise Filter

When you install one noise filter in the power supply for multi axis application, consult with the manufacture of the filter.

Option part No.	Part No.	Manufacturer
DV0P4160	3SUP-HU10-ER-6	Okaya Electric Industries Co.

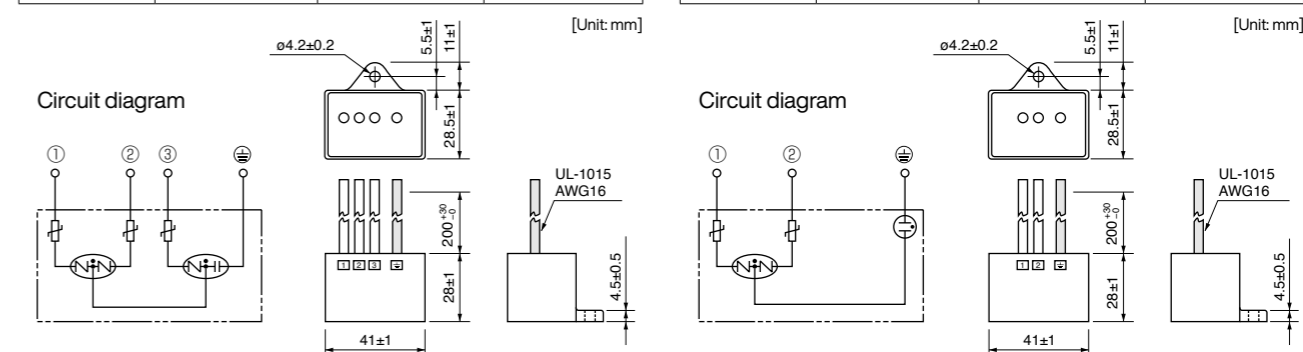


### Surge Absorber

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

Option part No.	Driver voltage spec	Part No.	Manufacturer
DV0P1450	3-phase, 200 V	R·A·V-781BXZ-4	Okaya Electric

Option part No.	Driver voltage spec	Part No.	Manufacturer
DV0P4190	Single phase, 100 V, 200 V	R·A·V-781BWZ-4	Okaya Electric



### <Remarks>

Remove this surge absorber when you perform dielectric test on the machine, or surge absorber might be damaged.

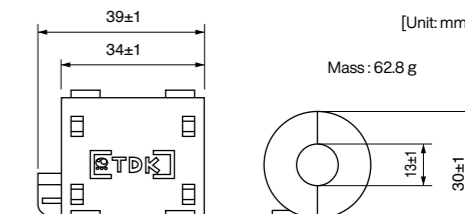
### Ferrite core

Install ferrite core to all cables (Power line, motor cable, encoder cable, interface cable)

### <Caution>

- Please fix a ferrite core to avoid excessive stress to the cable.
- When using multiple axes, noise generated from each driver might influence driver and peripheral equipment and result to malfunction. Please insert a ferrite core between driver and motor wires (U, V, W but grounding). (Please refer to P.415 "Composition of Peripheral Components".)

Option part No.	Part No.	Qty.	Manufacturer
DV0P1460	ZCAT3035-1330	4	TDK Corp.



### Grounding

- Connect the protective earth terminal of the driver () and protective earth terminal of the control panel (PE) without fail to prevent electrical shocks.
- Do not co-clamp to the ground terminals (). Two ground terminals are provided.

### Ground-Fault Breaker

Install a ground fault circuit breaker (RCD) to the primary side of the power supply. Please use B-type (DC sensitive) ground fault circuit breakers defined in IEC60947-2, JISC8201-2-2.

AC Servo Motor Capacity Selection Software

We have prepared PC software "M-SELECT" for AC servo motor capacity selection. Consult our sales representative or authorized distributor.

Three-step selection

1. Select components and specified values

Select appropriate mechanical parameter items and fill them with parameter values derived from the real machine. To simulate the target machine as practical as possible, use maximum number of parameters available.



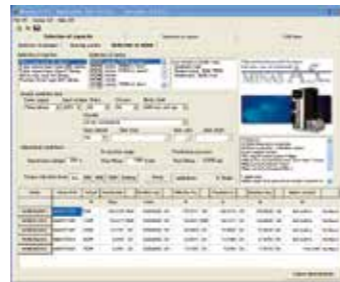
2. Enter operation pattern

Input the planned operation pattern that will contain [speed and rotation standard] or [absolute position standard] with optional settings such as S-acceleration/deceleration.



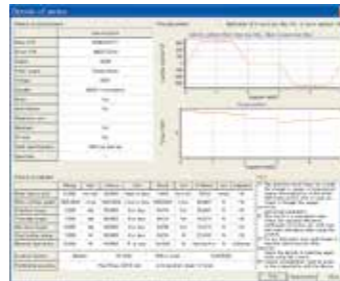
3. Select the motor

When the data required in step 1 and 2 above have been input, the software lists the motors, which will be appropriate to use with your machine. Select the motor that is best suitable for your machine application.



Details of motor

Once the motor is selected, specifications of the motor and driver, and details of reason for determination are displayed and may be printed out.



Option Selection Software for AC Servo Motor

We have prepared PC software to enable fast, easy, and correct option selection, a complicated job without the software.

Two procedures for option selection

1. Selection according to driver series and motor type

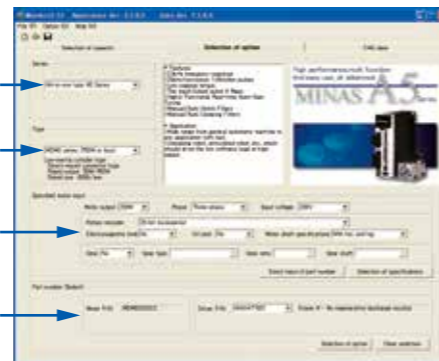
Suitable option can be selected by selecting driver series, motor type and motor specification through pull-down menu.

Driver series

Motor type

Motor specification

Model number input area



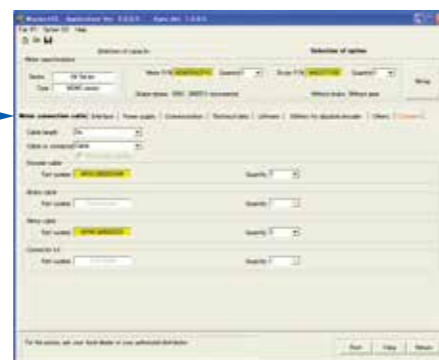
2. Entry of model number

If you know the model number based on the servo motor and driver currently used, enter the model number.

Result of selection

Tab sheet specific to each of option model numbers is used for easier identification of the desired option.

Tab



\* When you are using the motor capacity selection software, simply press [Option Selection] tab and the screen as shown right will appear.

Please download from our web site and use after install to the PC.  
<https://industrial.panasonic.com/ww/products/motors-compressors/fa-motors/ac-servo-motors/minas-a5-panatarm>

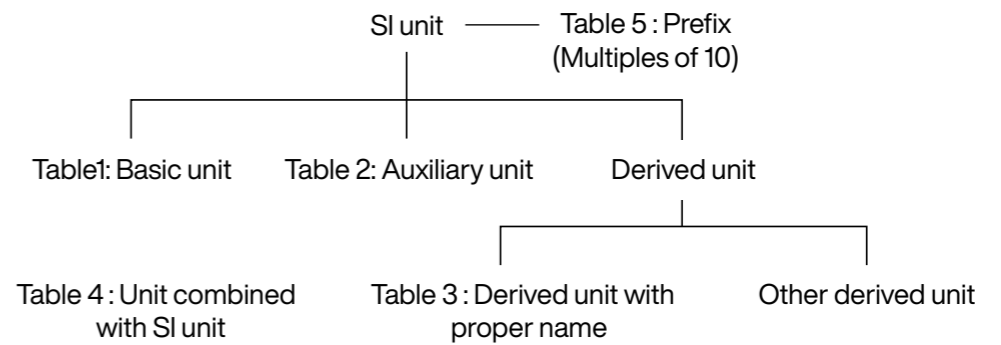


Table 1: Basic unit

Quantity	Name of unit	Symbol of unit
Length	meter	m
Weight	kilogram	kg
Time	second	s
Current	ampere	A
Thermodynamic temperature	kelvin	K
Amount of substance	mol	mol
Luminous intensity	candela	cd

Table 2: Auxiliary unit

Quantity	Name of unit	Symbol of unit
Plane angle	radian	rad
Solid angle	steradian	sr

Table 3: Major derived unit with proper name

Quantity	Name	Symbol of unit	Derivation from basic unit, auxiliary unit or other derived unit
Frequency	hertz	Hz	1 Hz = 1 s <sup>-1</sup>
Force	newton	N	1 N = 1 kg·m/s <sup>2</sup>
Pressure, Stress	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>
Energy, Work, Amount of heat	joule	J	1 J = 1 N·m
Amount of work, Work efficiency, Power, Electric power	watt	W	1 W = 1 J/s
Electric charge, Amount of electricity	coulomb	C	1 C = 1 A·s
Electric potential, Potential difference, Voltage, Electromotive force	volt	V	1 V = 1 J/C
Electrostatic capacity, Capacitance	farad	F	1 F = 1 C/V
Electric resistance	ohm	Ω	1 Ω = 1 V/A
Electric conductance	siemens	S	1 S = 1 Ω <sup>-1</sup>
Magnetic flux	weber	Wb	1 Wb = 1 V·s
Magnetic flux density, Magnetic induction	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Inductance	henry	H	1 H = 1 Wb/A
Degree centigrade (Celsius)	degree centigrade (Celsius)/ degree	°C	t °C = (t+273.15) K
Luminous flux	lumen	lm	1 lm = 1 cd·sr
Illuminance	lux	lx	1 lx = 1 lm/m <sup>2</sup>

Table 4: Unit combined with SI unit

Quantity	Name	Symbol of unit
Time	minute	min
	hour	h
	day	d
Plane angle	degree	°
	minute	'
	second	"
Volume	liter	l, L
Weight	ton	t

Table 5: Prefix

Multiples powered to unit	Prefix	
	Name	Symbol
10 <sup>18</sup>	exa	E
10 <sup>15</sup>	peta	P
10 <sup>12</sup>	tera	T
10 <sup>9</sup>	giga	G
10 <sup>6</sup>	mega	M
10 <sup>3</sup>	kilo	k
10 <sup>2</sup>	hecto	h
10	deca	da
10 <sup>-1</sup>	deci	d
10 <sup>-2</sup>	centi	c
10 <sup>-3</sup>	milli	m
10 <sup>-6</sup>	micro	μ
10 <sup>-9</sup>	nano	n
10 <sup>-12</sup>	pico	p
10 <sup>-15</sup>	femto	f
10 <sup>-18</sup>	atto	a

Quantity	Symbol of conventional unit	Symbol of SI unit and compatible unit	Conversion value
Length	μ (micron)	μm	1 μ = 1 μm (micrometer)
Acceleration	Gal	m/s <sup>2</sup>	1 Gal = 10 <sup>-2</sup> m/s <sup>2</sup>
	G	m/s <sup>2</sup>	1 G = 9.80665 m/s <sup>2</sup>
Frequency	c/s, c	Hz	1 c/s = Hz
Revolving speed, Number of revolutions	rpm	s <sup>-1</sup> or min <sup>-1</sup> , r/min	1 rpm = 1 min <sup>-1</sup>
Weight	kgf	-	} Same value
Mass	-	kg	
Weight flow rate	kgf/s	-	} Same value
Mass flow rate	-	kg/s	
Specific weight	kgf/m <sup>3</sup>	-	} Same value
Density	-	kg/m <sup>3</sup>	
Specific volume	m <sup>3</sup> /kgf	m <sup>3</sup> /kg	Same value
Load	kgf	N	1 kgf = 9.80665 N
Force	kgf	N	1 kgf = 9.80665 N
	dyn	N	1 dyn = 10 <sup>-5</sup> N
Moment of force	kgf·m	N·m	1 kgf·m = 9.806 N·m
Pressure	kgf/cm <sup>2</sup>	Pa, bar <sup>(1)</sup> or kgf/cm <sup>2</sup>	1 kgf/cm <sup>2</sup> = 9.80665 × 10 <sup>4</sup> Pa = 0.980665 bar
	at (Engineering atmospheric pressure)	Pa	1 at = 9.80665 × 10 <sup>4</sup> Pa
	atm (Atmospheric pressure)	Pa	1 atm = 1.01325 × 10 <sup>5</sup> Pa
	mH <sub>2</sub> O, mAq	Pa	1 mH <sub>2</sub> O = 9.80665 × 10 <sup>3</sup> Pa
	mmHg Torr	Pa or mmHg <sup>(2)</sup> Pa	1 mmHg = 133.322 Pa
Stress	kgf/mm <sup>2</sup>	Pa or N/m <sup>2</sup>	1 kgf/mm <sup>2</sup> = 9.80665 × 10 <sup>6</sup> Pa = 9.80665 × 10 <sup>6</sup> N/m <sup>2</sup>
	kgf/cm <sup>2</sup>	Pa or N/m <sup>2</sup>	1 kgf/cm <sup>2</sup> = 9.80665 × 10 <sup>4</sup> Pa = 9.80665 × 10 <sup>4</sup> N/m <sup>2</sup>
Elastic modulus	kgf/m <sup>2</sup>	Pa or N/m <sup>2</sup>	1 kgf/m <sup>2</sup> = 9.80665 Pa = 9.80665 N/m <sup>2</sup>
			1 kgf/cm <sup>2</sup> = 9.80665 × 10 <sup>4</sup> N/m <sup>2</sup>
Energy, Work	kgf·m	J (joule)	1 kgf·m = 9.80665 J
	erg	J	1 erg = 10 <sup>-7</sup> J
Work efficiency, Power	kgf·m/s	W (watt)	1 kgf·m/s = 9.80665 W
	PS	W	1 PS = 0.7355 kW
Viscosity	PP	Pa·s	1 P = 0.1 Pa·s
Kinetic viscosity	St	mm <sup>2</sup> /s	10 <sup>-2</sup> St = 1 mm <sup>2</sup> /s
Thermodynamic temperature	K	K (kelvin)	1 K = 1 K
Temperature interval	deg	K <sup>(3)</sup>	1 deg = 1 K
Amount of heat	cal	J	1 cal = 4.18605 J
Heat capacity	cal/°C	J/K <sup>(3)</sup>	1 cal/°C = 4.18605 J/K
Specific heat, Specific heat capacity	cal/(kgf·°C)	cal/(kgf·K) <sup>(3)</sup>	1 cal/(kgf·°C) = 4.18605 J/(kg·K)
Entropy	cal/K	J/K	1 cal/K = 4.18605 J/K
Specific entropy	cal/(kgf·K)	J/(kg·K)	1 cal/(kgf·K) = 4.18605 J/(kg·K)
Internal energy (Enthalpy)	cal	J	1 cal = 4.18605 J
Specific internal energy (Specific enthalpy)	cal/kgf	J/kg	1 cal/kgf = 4.18605 J/kg
Heat flux	cal/h	W	1 kcal/h = 1.16279 W
Heat flux density	cal/(h·m <sup>2</sup> )	W/m <sup>2</sup>	1 kcal/(h·m <sup>2</sup> ) = 1.16279 W/m <sup>2</sup>
Thermal conductivity	cal/(h·m·°C)	W/(m·K) <sup>(3)</sup>	1 kcal/(h·m·°C) = 1.16279 W/(m·K)
Coefficient of thermal conductivity	cal/(h·m <sup>2</sup> ·°C)	W/(m <sup>2</sup> ·K) <sup>(3)</sup>	1 kcal/(h·m <sup>2</sup> ·°C) = 1.16279 W/(m <sup>2</sup> ·K)
Intensity of magnetic field	Oe	A/m	1 Oe = 10 <sup>3</sup> / (4π) A/m
Magnetic flux	Mx	Wb (weber)	1 Mx = 10 <sup>-8</sup> Wb
Magnetic flux density	Gs, G	T (tesla)	1 Gs = 10 <sup>-4</sup> T

**Note**

- (1) Applicable to liquid pressure. Also applicable to atmospheric pressure of meteorological data, when "bar" is used in international standard.
- (2) Applicable to scale or indication of blood pressure manometers.
- (3) "C" can be substituted for "K".

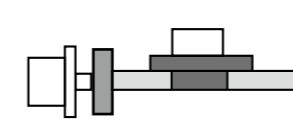
Flow of Motor Selection

**1. Definition of mechanism to be driven by motor.**

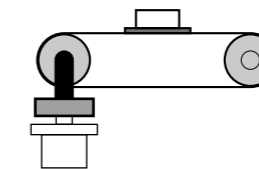
Define details of individual mechanical components (ball screw length, lead and pulley diameters, etc.)

<Typical mechanism>

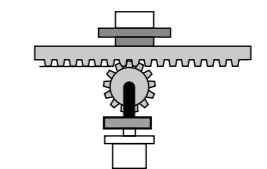
Ball screw mechanism



Belt mechanism

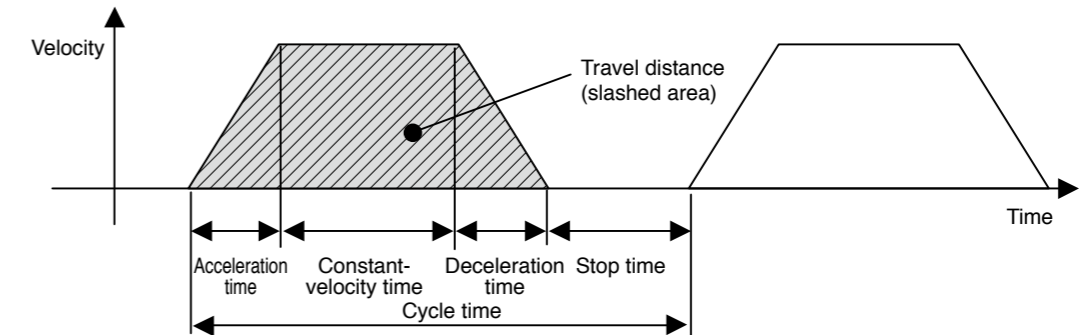


Rack & pinion, etc.



**2. Definition of operating pattern.**

Acceleration/deceleration time, Constant-velocity time, Stop time, Cycle time, Travel distance



Note) Selection of motor capacity significantly varies depending on the operating pattern. The motor capacity can be reduced if the acceleration/deceleration time and stop time are set as long as possible.

**3. Calculation of load inertia and inertia ratio.**

Calculate load inertia for each mechanical component. (Refer to "General inertia calculation method" described later.)

Divide the calculated load inertia by the inertia of the selected motor to check the inertia ratio.

For calculation of the inertia ratio, note that the catalog value of the motor inertia is expressed as "× 10<sup>-4</sup> kg·m<sup>2</sup>".

**4. Calculation of motor velocity**

Calculate the motor velocity from the moving distance, acceleration / deceleration time and constant-velocity time.

**5. Calculation of torque**

Calculate the required motor torque from the load inertia, acceleration/deceleration time and constant-velocity time.

**6. Calculation of motor**

Select a motor that meets the above 3 to 5 requirements.

Description on the Items Related to Motor Selection

1. Torque

(1) Peak torque

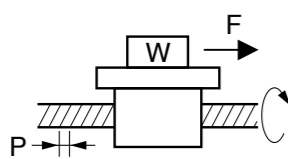
Indicate the maximum torque that the motor requires during operation (mainly in acceleration and deceleration steps). The reference value is 80% or less of the maximum motor torque. If the torque is a negative value, a regenerative discharge resistor may be required.

(2) Traveling torque, Stop holding torque

Indicates the torque that the motor requires for a long time. The reference value is 80% or less of the rated motor torque. If the torque is a negative value, a regenerative discharge resistor may be required.

Traveling torque calculation formula for each mechanism

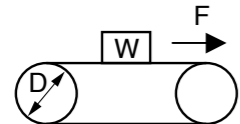
**Ball screw mechanism**



Traveling torque  $T_f = \frac{P}{2\pi\eta} (\mu gW + F)$

W : Weight [kg]       $\eta$  : Mechanical efficiency  
 P : Lead [m]       $\mu$  : Coefficient of friction  
 F : External force [N]      g : Acceleration of gravity 9.8[m/s<sup>2</sup>]

**Belt mechanism**



Traveling torque  $T_f = \frac{D}{2\pi\eta} (\mu gW + F)$

W : Weight [kg]       $\eta$  : Mechanical efficiency  
 P : Pulley diameter [m]       $\mu$  : Coefficient of friction  
 F : External force [N]      g : Acceleration of gravity 9.8[m/s<sup>2</sup>]

(3) Effective torque

Indicates a root-mean-square value of the total torque required for running and stopping the motor per unit time. The reference value is approx. 80% or less of the rated motor torque.

$$T_{rms} = \sqrt{\frac{T_a^2 \times t_a + T_f^2 \times t_b + T_d^2 \times t_d}{t_c}}$$

T<sub>a</sub> : Acceleration torque [N·m]      t<sub>a</sub> : Acceleration time [s]      t<sub>c</sub> : Cycle time [s]  
 T<sub>f</sub> : Traveling torque [N·m]      t<sub>b</sub> : Constant-velocity time [s]      (Run time + Stop time)  
 T<sub>d</sub> : Deceleration torque [N·m]      t<sub>d</sub> : Deceleration time [s]

2. Motor velocity

Maximum velocity

Maximum velocity of motor in operation: The reference value is the rated velocity or lower value. When the motor runs at the maximum velocity, you must pay attention to the motor torque and temperature rise. For actual calculation of motor velocity, see "Example of motor selection" described later.

3. Inertia and inertia ratio

Inertia is like the force to retain the current moving condition.

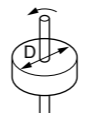
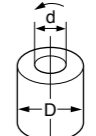
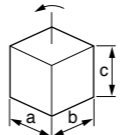
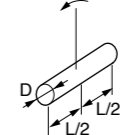
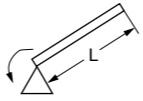
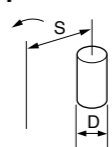
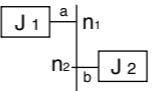
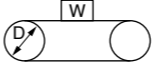
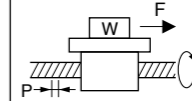
Inertia ratio is calculated by dividing load inertia by rotor inertia.

Generally, for motors with 750 W or lower capacity, the inertia ratio should be "20" or less. For motors with 1000 W or higher capacity, the inertia ratio should be "10" or less.

If you need quicker response, a lower inertia ratio is required.

(For example, when the motor takes several seconds in acceleration step, the inertia ratio can be further increased.)

General inertia calculation method

Shape	J calculation formula	Shape	J calculation formula
<b>Disk</b> 	$J = \frac{1}{8} WD^2$ [kg·m <sup>2</sup> ] W : Weight [kg] D : Outer diameter [m]	<b>Hollow cylinder</b> 	$J = \frac{1}{8} W(D^2 + d^2)$ [kg·m <sup>2</sup> ] W : Weight [kg] D : Outer diameter [m] d : Inner diameter [m]
<b>Prism</b> 	$J = \frac{1}{12} W(a^2 + b^2)$ [kg·m <sup>2</sup> ] W : Weight [kg] a, b, c : Side length [m]	<b>Uniform rod</b> 	$J = \frac{1}{48} W(3D^2 + 4L^2)$ [kg·m <sup>2</sup> ] W : Weight [kg] D : Outer diameter [m] L : Length [m]
<b>Straight rod</b> 	$J = \frac{1}{3} WL^2$ [kg·m <sup>2</sup> ] W : Weight [kg] L : Length [m]	<b>Separated rod</b> 	$J = \frac{1}{8} WD^2 + WS^2$ [kg·m <sup>2</sup> ] W : Weight [kg] D : Outer diameter [m] S : Distance [m]
<b>Reduction gear</b> 	Inertia on shaft "a" $J = J_1 + \left(\frac{n_2}{n_1}\right)^2 J_2$ [kg·m <sup>2</sup> ] n <sub>1</sub> : A rotational speed of a shaft [r/min] n <sub>2</sub> : A rotational speed of b shaft [r/min]		
<b>Conveyor</b> 	$J = \frac{1}{4} WD^2$ [kg·m <sup>2</sup> ] W : Workpiece weight on conveyor [kg] D : Drum diameter [m] * Excluding drum J	<b>Ball screw</b> 	$J = J_B + \frac{W \cdot P^2}{4\pi^2}$ [kg·m <sup>2</sup> ] W : Weight [kg] P : Lead J <sub>B</sub> : J of ball screw

If weight (W [kg]) is unknown, calculate it with the following formula:

Weight W[kg]=Density ρ [kg/m<sup>3</sup>] x Volume V[m<sup>3</sup>]

Density of each material

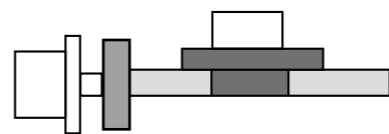
Iron ρ =7.9 x 10<sup>3</sup> [kg/m<sup>3</sup>]      Aluminum ρ =2.8 x 10<sup>3</sup> [kg/m<sup>3</sup>]  
 Brass ρ =8.5 x 10<sup>3</sup> [kg/m<sup>3</sup>]



To Drive Ball Screw Mechanism

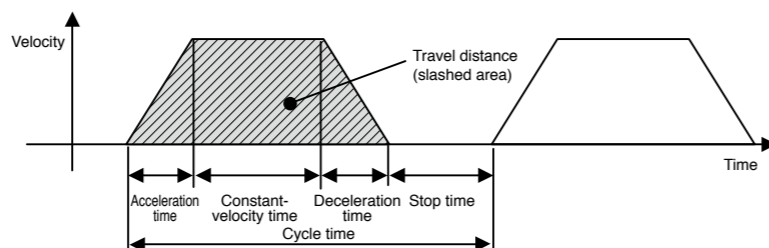
1. Example of motor selection for driving ball screw mechanism

- Workpiece weight WA = 10 [kg]
- Ball screw length BL = 0.5 [m]
- Ball screw diameter BD = 0.02 [m]
- Ball screw lead BP = 0.02 [m]
- Ball screw efficiency Bη = 0.9
- Travel distance 0.3[m]
- Coupling inertia Jc = 10 × 10<sup>-6</sup> [kg·m<sup>2</sup>] (Use manufacturer-specified catalog value, or calculation value.)



2. Running pattern :

- Acceleration time ta = 0.1 [s]
- Constant-velocity time tb = 0.8 [s]
- Deceleration time td = 0.1 [s]
- Cycle time tc = 2 [s]
- Travel distance 0.3[m]



3. Ball screw weight  $BW = \rho \times \pi \times \left(\frac{BD}{2}\right)^2 \times BL = 7.9 \times 10^3 \times \pi \times \left(\frac{0.02}{2}\right)^2 \times 0.5 = 1.24$  [kg]

4. Load inertia  $JL = Jc + JB = Jc + \frac{1}{8}BW \times BD^2 + \frac{WA \cdot BP^2}{4\pi^2} = 0.00001 + (1.24 \times 0.02^2) / 8 + 10 \times 0.02^2 / 4\pi^2 = 1.73 \times 10^{-4}$  [kg·m<sup>2</sup>]

5. Provisional motor selection

In case of MSMF 200 W motor : JM = 0.14 × 10<sup>-4</sup> [kg·m<sup>2</sup>]

6. Calculation of inertia ratio

JL / JM = 1.73 × 10<sup>-4</sup> / 0.14 × 10<sup>-4</sup> Therefore, the inertia ratio is "12.3" (less than "30")  
 (In case of MSMF 100 W motor: JM = 0.048 × 10<sup>-4</sup> Therefore, the inertia ratio is "36.0".)

7. Calculation of maximum velocity (Vmax)

$\frac{1}{2} \times \text{Acceleration time} \times V_{max} + \text{Constant-velocity time} \times V_{max} + \frac{1}{2} \times \text{Deceleration time} \times V_{max} = \text{Travel distance}$   
 $\frac{1}{2} \times 0.1 \times V_{max} + 0.8 \times V_{max} + \frac{1}{2} \times 0.1 \times V_{max} = 0.3$   
 $0.9 \times V_{max} = 0.3$   
 $V_{max} = 0.3 / 0.9 = 0.334$  [m/s]

8. Calculation of motor velocity (N [r/min]) Ball screw lead per resolution: BP = 0.02 [m]

$N = 0.334 / 0.02 = 16.7$  [r/s]  
 $= 16.7 \times 60 = 1002$  [r/min] < 3000 [r/min] (Rated velocity of MSMF 200 W motor)

9. Calculation of torque

Traveling torque  $Tf = \frac{BP}{2\pi B\eta} (\mu g WA + F) = \frac{0.02}{2\pi \times 0.9} (0.1 \times 9.8 \times 10 + 0) = 0.035$  [N·m]

Acceleration torque  $Ta = \frac{(JL + JM) \times 2\pi N [r/s]}{\text{Acceleration time [s]}} + \text{Traveling torque}$   
 $= \frac{(1.73 \times 10^{-4} + 0.14 \times 10^{-4}) \times 2\pi \times 16.7}{0.1} + 0.035 = 0.196 + 0.035 = 0.231$  [N·m]

Deceleration torque  $Td = \frac{(JL + JM) \times 2\pi N [r/s]}{\text{Deceleration time [s]}} - \text{Traveling torque}$   
 $= \frac{(1.73 \times 10^{-4} + 0.14 \times 10^{-4}) \times 2\pi \times 16.7}{0.1} - 0.035 = 0.196 - 0.035 = 0.161$  [N·m]

10. Verification of maximum torque

Acceleration torque = Ta = 0.231 [N·m] < 1.91 [N·m] (Maximum torque of MSMF 200 W motor)

11. Verification of effective torque

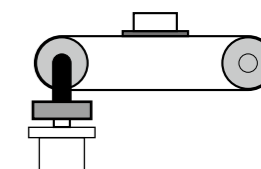
$T_{rms} = \sqrt{\frac{Ta^2 \times ta + Tf^2 \times tb + Td^2 \times td}{tc}}$   
 $= \sqrt{\frac{0.231^2 \times 0.1 + 0.035^2 \times 0.8 + 0.161^2 \times 0.1}{2}} = 0.067$  [N·m] < 0.64 [N·m] (Rated torque of MSMF 200 W motor)

12. Judging from the inertia ratio calculated above, selection of 200 W motor is preferable, although the torque margin is significantly large.

Example of Motor Selection

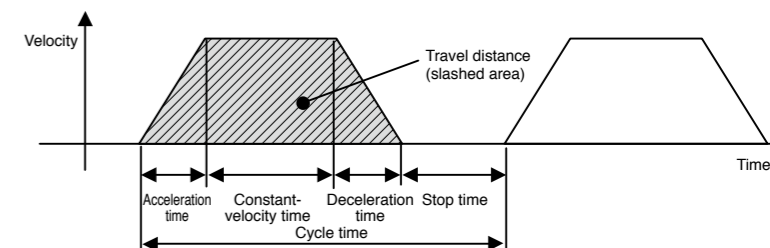
Example of motor selection for timing belt mechanism

1. Mechanism
- Workpiece weight WA = 2[kg] (including belt)
  - Pulley diameter PD = 0.05[m]
  - Pulley weight WP = 0.5[kg] (Use manufacturer-specified catalog value, or calculation value.)
  - Mechanical efficiency Bη = 0.8
  - Coupling inertia Jc = 0 (Direct connection to motor shaft)
  - Belt mechanism inertia JB
  - Pulley inertia JP



2. Running pattern

- Acceleration time ta = 0.1[s]
- Constant-velocity time tb = 0.8[s]
- Deceleration time td = 0.1[s]
- Cycle time tc = 2[s]
- Travel distance 1[m]



3. Load inertia JL = Jc + JB + JP

$= Jc + \frac{1}{4}WA \times PD^2 + \frac{1}{8}WP \times PD^2 \times 2$   
 $= 0 + \frac{1}{4} \times 2 \times 0.05^2 + \frac{1}{8} \times 0.5 \times 0.05^2 \times 2 = 0.00156 = 15.6 \times 10^{-4}$  [kg·m<sup>2</sup>]

4. Provisional motor selection

In case of MSMF 750 W motor : JM = 0.96 × 10<sup>-4</sup> [kg·m<sup>2</sup>]

5. Calculation of inertia ratio

JL / JM = 15.6 × 10<sup>-4</sup> / 0.96 × 10<sup>-4</sup> Therefore, the inertia ratio is "16.3" (less than "20")

6. Calculation of maximum velocity (Vmax)

$$\frac{1}{2} \times \text{Acceleration time} \times V_{\max} + \text{Constant-velocity time} \times V_{\max} + \frac{1}{2} \times \text{Deceleration time} \times V_{\max} = \text{Travel distance}$$

$$\frac{1}{2} \times 0.1 \times V_{\max} + 0.8 \times V_{\max} + \frac{1}{2} \times 0.1 \times V_{\max} = 1$$

$$0.9 \times V_{\max} = 1$$

$$V_{\max} = 1 / 0.9 = 1.111 [\text{m/s}]$$

7. Calculation of motor velocity (N [r/min])

A single rotation of pulley :  $\pi \times PD = 0.157 [\text{m}]$

$$N = 1.111 / 0.157 = 7.08 [\text{r/s}]$$

$$= 7.08 \times 60 = 424.8 [\text{r/min}] < 3000 [\text{r/min}] \text{ (Rated velocity of MSMF 750 W motor)}$$

8. Calculation of torque

Traveling torque  $T_f = \frac{PD}{2\gamma} (\mu g W_A + F) = \frac{0.05}{2 \times 0.8} (0.1 \times 9.8 \times 3 + 0)$

$$= 0.061 [\text{N}\cdot\text{m}]$$

Acceleration torque  $T_a = \frac{(J_L + J_M) \times 2\pi N [\text{r/s}]}{\text{Acceleration time} [\text{s}]} + \text{Traveling torque}$

$$= \frac{(15.6 \times 10^{-4} + 0.96 \times 10^{-4}) \times 2\pi \times 7.08}{0.1} + 0.061$$

$$= 0.736 + 0.061 = 0.797 [\text{N}\cdot\text{m}]$$

Deceleration torque  $T_d = \frac{(J_L + J_M) \times 2\pi N [\text{r/s}]}{\text{Deceleration time} [\text{s}]} - \text{Traveling torque}$

$$= \frac{(15.6 \times 10^{-4} + 0.96 \times 10^{-4}) \times 2\pi \times 7.08}{0.1} - 0.061$$

$$= 0.736 - 0.061 = 0.675 [\text{N}\cdot\text{m}]$$

9. Verification of maximum torque

Acceleration torque  $T_a = 0.797 [\text{N}\cdot\text{m}] < 7.1 [\text{N}\cdot\text{m}]$  (Maximum torque of MSMF 750 W motor)

10. Verification of effective torque

$$T_{\text{rms}} = \sqrt{\frac{T_a^2 \times t_a + T_f^2 \times t_b + T_d^2 \times t_d}{t_c}}$$

$$= \sqrt{\frac{0.797^2 \times 0.1 + 0.061^2 \times 0.8 + 0.675^2 \times 0.1}{2}}$$

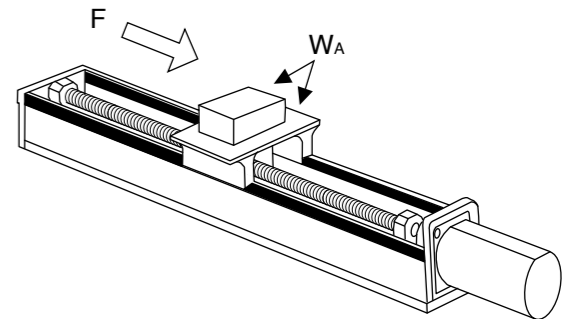
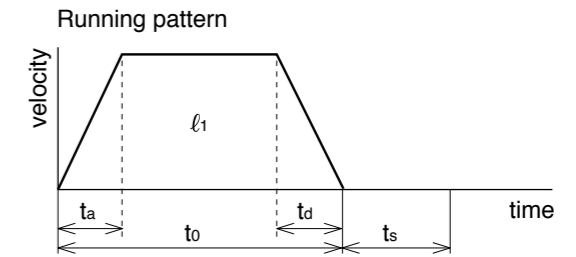
$$= 0.237 [\text{N}\cdot\text{m}] < 2.4 [\text{N}\cdot\text{m}] \text{ (Rated torque of MSMF 750 W motor)}$$

11. Judging from the above calculation result, selection of MSMF 750W motor is acceptable.

Request for motor selection I : Ball screw drive

1. Driven mechanism and running data

- 1) Travel distance of the work load per one cycle  mm
- 2) Cycle time  s  
(Fill in items 3) and 4) if required.)
- 3) Acceleration time  s
- 4) Deceleration time  s
- 5) Stopping time  s
- 6) Max. velocity  mm/s
- 7) External force  N
- 8) Positioning accuracy of the work load  mm
- 9) Total weight of the work load and the table  kg
- 10) Power supply voltage
- 11) Diameter of the ball screw
- 12) Total length of the ball
- 13) Lead of the ball screw



14) Traveling direction (horizontal, vertical etc.)

2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

Company name : \_\_\_\_\_

Department/Section : \_\_\_\_\_

Name : \_\_\_\_\_

Address : \_\_\_\_\_

Tel : \_\_\_\_\_

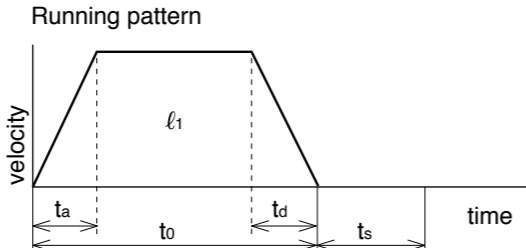
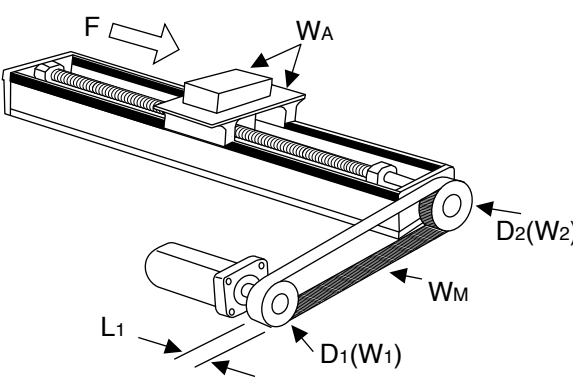
Fax : \_\_\_\_\_

E-mail address: \_\_\_\_\_

# Request Sheet for Motor Selection

## Request for motor selection II : Timing pulley + Ball screw drive

### 1. Driven mechanism and running data

		Motor side	Ball screw side
1) Travel distance of the work load per one cycle	$l_1$ : mm	15) Diameter of the pulley $D_1$ : mm	$D_2$ : mm
2) Cycle time	$t_0$ : s	16) Weight of the pulley $W_1$ : kg	$W_2$ : kg
(Fill in items 3) and 4) if required.)		(or item 17) and 18))	
3) Acceleration time	$t_a$ : s	17) Width of the pulley $L_1$ : mm	
4) Deceleration time	$t_d$ : s	18) Material of the pulley	
5) Stopping time	$t_s$ : s	19) Weight of the belt $W_M$ : kg	
6) Max. velocity	$V$ : mm/s		
7) External force	$F$ : N		
8) Positioning accuracy of the work load	$\pm$ mm		
9) Total weight of the work load and the table	$W_A$ : kg		
10) Power supply voltage	V		
11) Diameter of the ball screw	mm		
12) Total length of the ball screw	mm		
13) Lead of the ball screw	mm		
14) Traveling direction (horizontal, vertical etc.)			

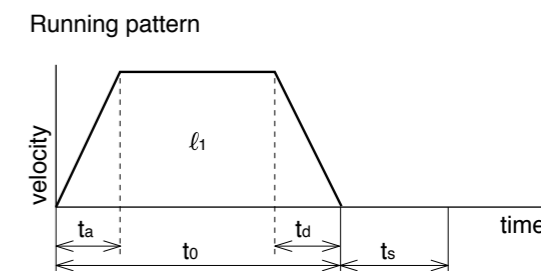
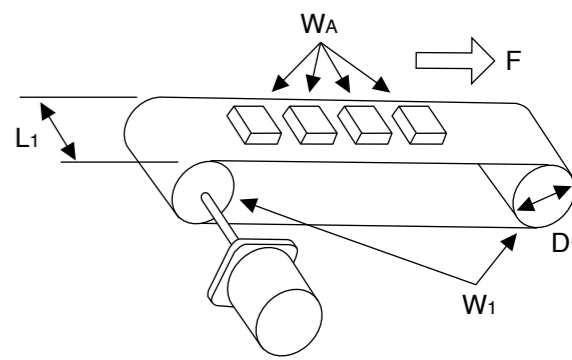
### 2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

	Company name :
	Department/Section :
	Name :
	Address :
	Tel :
	Fax :
	E-mail address:

# Request Sheet for Motor Selection

## Request for motor selection III : Belt drive

### 1. Driven mechanism and running data

1) Travel distance of the work load per one cycle	$l_1$ : mm	
2) Cycle time	$t_0$ : s	
(Fill in items 3) and 4) if required.)		
3) Acceleration time	$t_a$ : s	
4) Deceleration time	$t_d$ : s	
5) Stopping time	$t_s$ : s	
6) Max. velocity	$V$ : mm/s	
7) External force	$F$ : N	
8) Positioning accuracy of the work load	$\pm$ mm	(or item 14) and 15))
9) Total weight of the work load	$W_A$ : kg	14) Width of the pulley $L_1$ : mm
10) Power supply voltage	V	15) Material of the pulley
11) Weight of the belt	$W_M$ : kg	16) Traveling direction (horizontal, vertical etc.)
12) Diameter of the driving pulley	$D_1$ : mm	
13) Total weight of the pulley	$W_1$ : kg	

### 2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

	Company name :
	Department/Section :
	Name :
	Address :
	Tel :
	Fax :
	E-mail address:

## Request Sheet for Motor Selection

### Request for motor selection IV : Timing pulley + Belt drive

#### 1. Driven mechanism and running data

		Motor side	Belt side
1) Travel distance of the work load per one cycle	$l_1$ : mm	16) Diameter of the pulley $D_3$ : mm	$D_4$ : mm
2) Cycle time	$t_0$ : s	17) Weight of the pulley $W_3$ : kg	$W_4$ : kg

(Fill in items 3) and 4) if required.)

(or item 18) and 19))

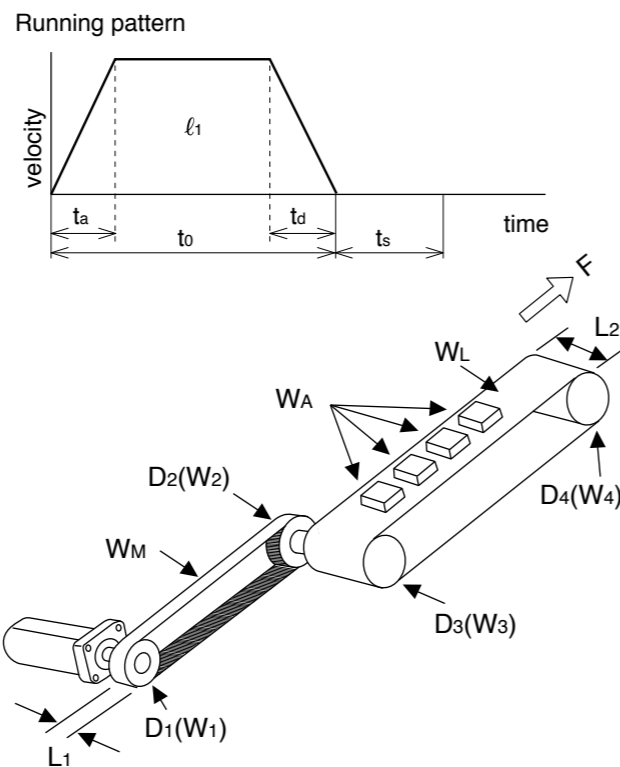
3) Acceleration time	$t_a$ : s	18) Width of the pulley	$L_2$ : mm
4) Deceleration time	$t_d$ : s	19) Material of the pulley	
5) Stopping time	$t_s$ : s	20) Weight of the belt	$W_L$ : kg
6) Max. velocity	$V$ : mm/s	21) Traveling direction (horizontal, vertical etc.)	

7) External force	$F$ : N
8) Positioning accuracy of the work load	$\pm$ mm
9) Total weight of the work load	$W_A$ : kg
10) Power supply voltage	V
11) Weight of motor side belt	$W_M$ : kg

		Motor side	Belt side
12) Diameter of the pulley	$D_1$ : mm	$D_2$ : mm	
13) Weight of the pulley	$W_1$ : kg	$W_2$ : kg	

(or item 14) and 15))

14) Width of the belt	$L_1$ : mm
15) Material of the pulley	



#### 2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

	Company name : _____ Department/Section : _____ Name : _____ Address : _____ Tel : _____ Fax : _____ E-mail address: _____
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## Request Sheet for Motor Selection

### Request for motor selection V : Turntable drive

#### 1. Driven mechanism and running data

		Prism	Cylinder
1) Travel distance of the work load per one cycle	$d_1$ : deg	14) Dimensions of the work load $a$ : mm	$a$ : mm
2) Cycle time	$t_0$ : s	$b$ : mm	$b$ : mm
		$c$ : mm	$c$ : mm

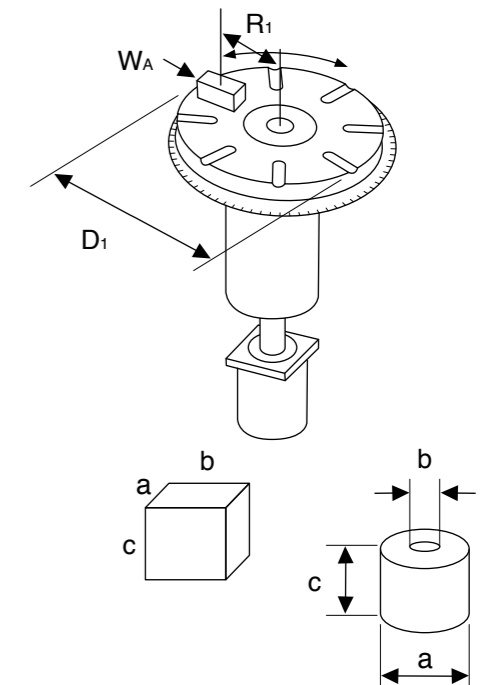
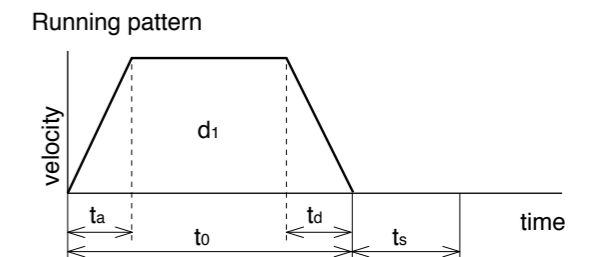
(Fill in items 3) and 4) if required.)

15) Number of work loads \_\_\_\_\_ pcs

3) Acceleration time	$t_a$ : s
4) Deceleration time	$t_d$ : s
5) Stopping time	$t_s$ : s
6) Max. rotational speed of the table	$v$ : deg/s

(or)  $V$ : r/s

7) Positioning accuracy of the work load	$\pm$ deg
8) Weight of one work load	$W_A$ : kg
9) Driving radius of the center of gravity of the work	$R_1$ : mm
10) Diameter of the table	$D_1$ : mm
11) Mass of the table	$W_1$ : kg
12) Diameter of the table support	$T_1$ : mm
13) Power supply voltage	V



#### 2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

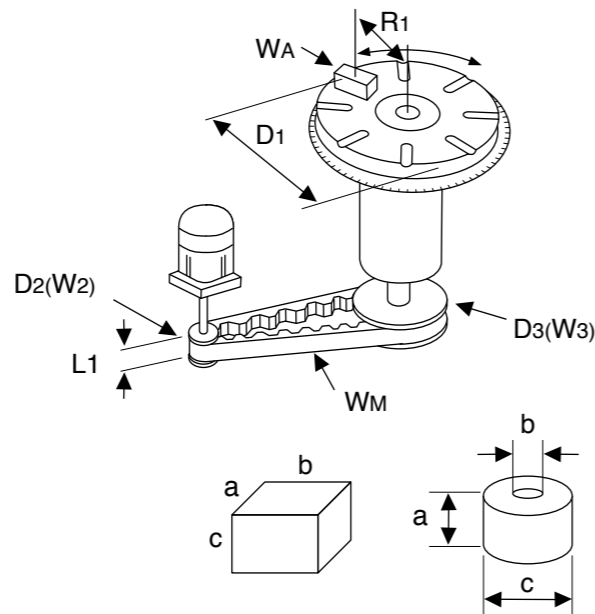
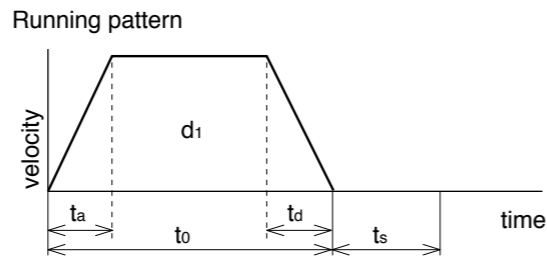
	Company name : _____ Department/Section : _____ Name : _____ Address : _____ Tel : _____ Fax : _____ E-mail address: _____
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# Request Sheet for Motor Selection

## Request for motor selection VI : Timing pulley + Turntable drive

### 1. Driven mechanism and running data

		Motor side	Turntable side
1) Travel distance of the work load per one cycle	$d_1$ : deg	16) Diameter of the pulley $D_2$ : mm	$D_3$ : mm
2) Cycle time	$t_o$ : s	17) Weight of the pulley $W_2$ : kg	$W_3$ : kg
(Fill in items 3) and 4) if required.)		(or item 18) and 19))	
3) Acceleration time	$t_a$ : s	18) Width of the pulley $L_1$ : mm	
4) Deceleration time	$t_d$ : s	19) Material of the pulley	
5) Stopping time	$t_s$ : s	20) Weight of the belt $W_M$ : kg	
6) Max. rotational speed of the table	$v$ : deg/s		
(or)	$V$ : r/s		
7) Positioning accuracy of the work load	$\pm$ deg		
8) Weight of one work load	$W_A$ : kg		
9) Driving radius of the center of gravity of the work	$R_1$ : mm		
10) Diameter of the table	$D_1$ : mm		
11) Mass of the table	$W_1$ : kg		
12) Diameter of the table support	$T_1$ : mm		
13) Power supply voltage	V		
14) Dimension of the work load	(Prism) a: mm	(Cylinder) a: mm	
	b: mm	b: mm	
	c: mm	c: mm	
15) Number of work loads	pcs		



### 2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

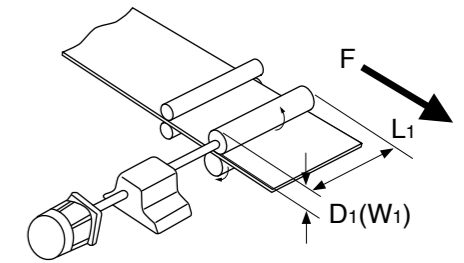
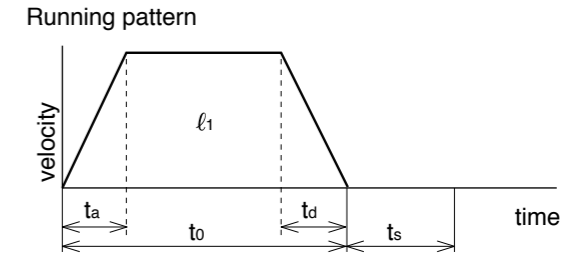
	Company name : _____
	Department/Section : _____
	Name : _____
	Address : _____
	Tel : _____
	Fax : _____
	E-mail address: _____

# Request Sheet for Motor Selection

## Request for motor selection VII : Roller feed drive

### 1. Driven mechanism and running data

1) Travel distance of the work load per one cycle	$l_1$ : mm		
2) Cycle time	$t_o$ : s		
(Fill in items 3) and 4) if required.)			
3) Acceleration time	$t_a$ : s		
4) Deceleration time	$t_d$ : s		
5) Stopping time	$t_s$ : s		
6) Max. velocity	$v$ : mm/s		
7) External pulling force	$F$ : N		
8) Positioning accuracy of the work load	$\pm$ mm		
9) Number of rollers	pcs		
10) Power supply voltage	V		
11) Diameter of the roller	$D_1$ : mm	13) Width of the roller $L_1$ : mm	
12) Mass of the roller	$W_1$ : kg	14) Material of the roller	



(or item 13) and 14))

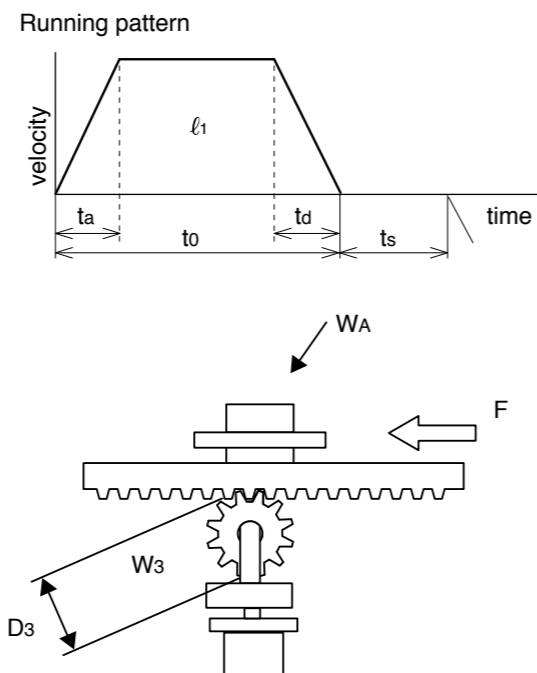
### 2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

	Company name : _____
	Department/Section : _____
	Name : _____
	Address : _____
	Tel : _____
	Fax : _____
	E-mail address: _____

## Request for motor selection VIII : Driving with Rack & Pinion

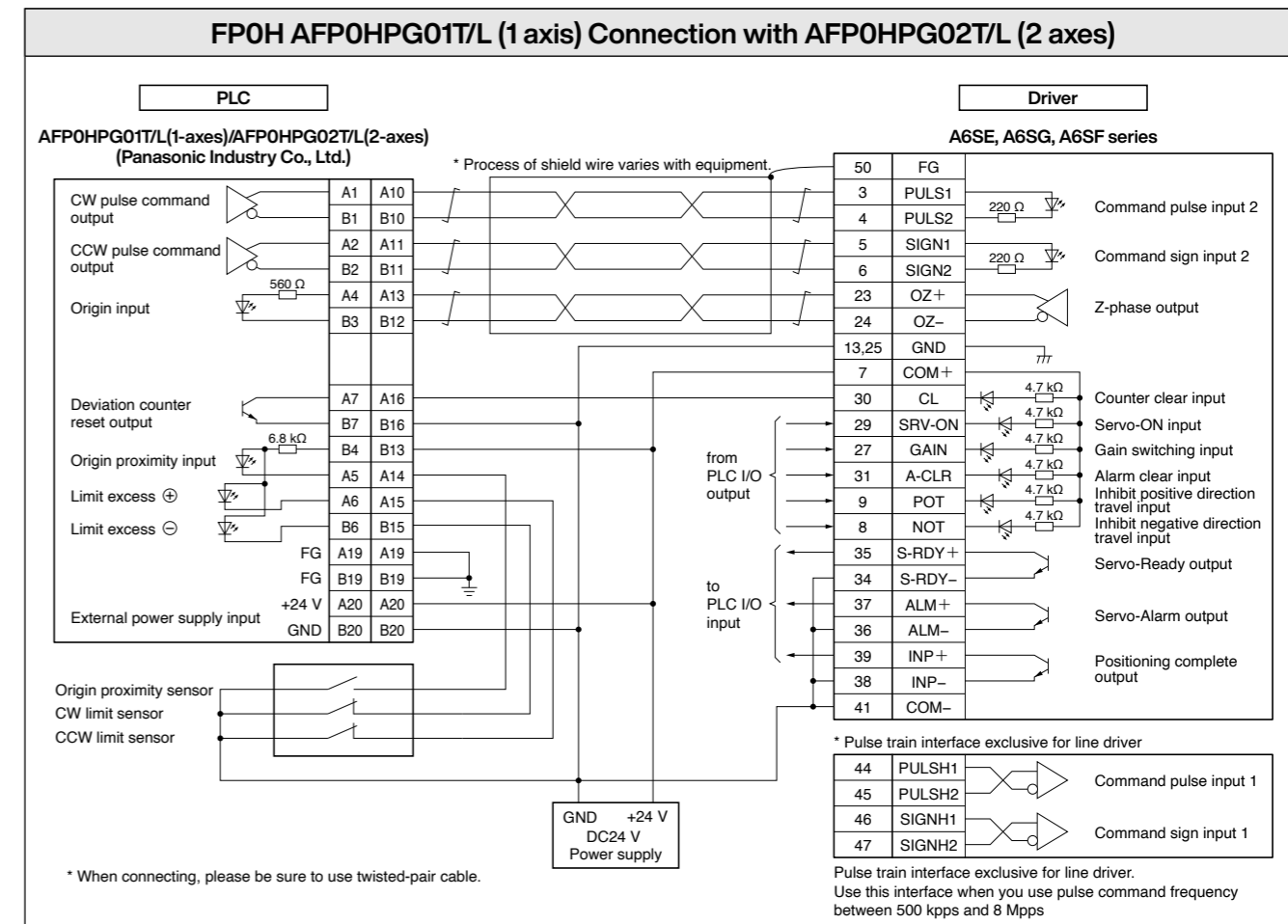
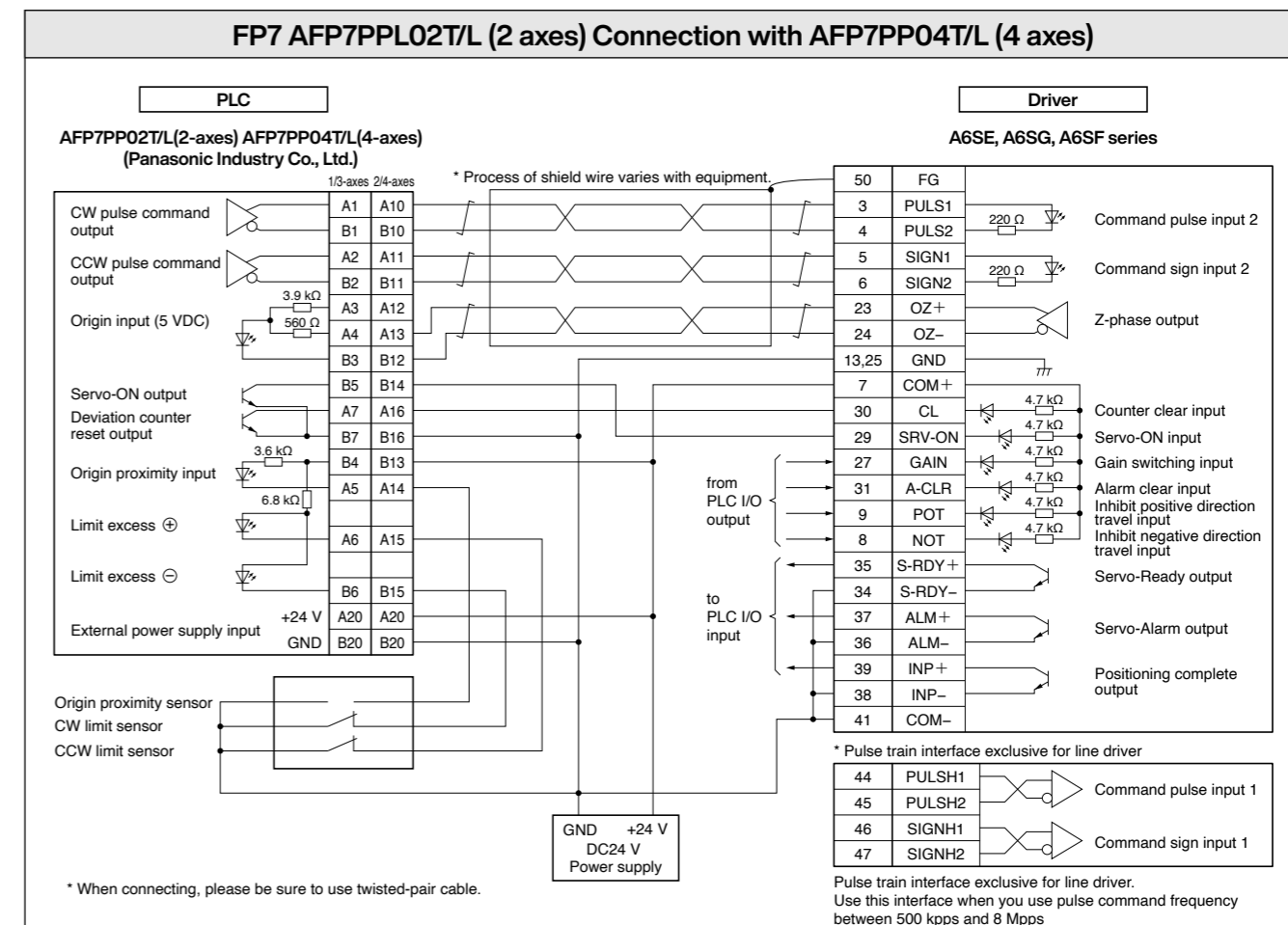
### 1. Driven mechanism and running data

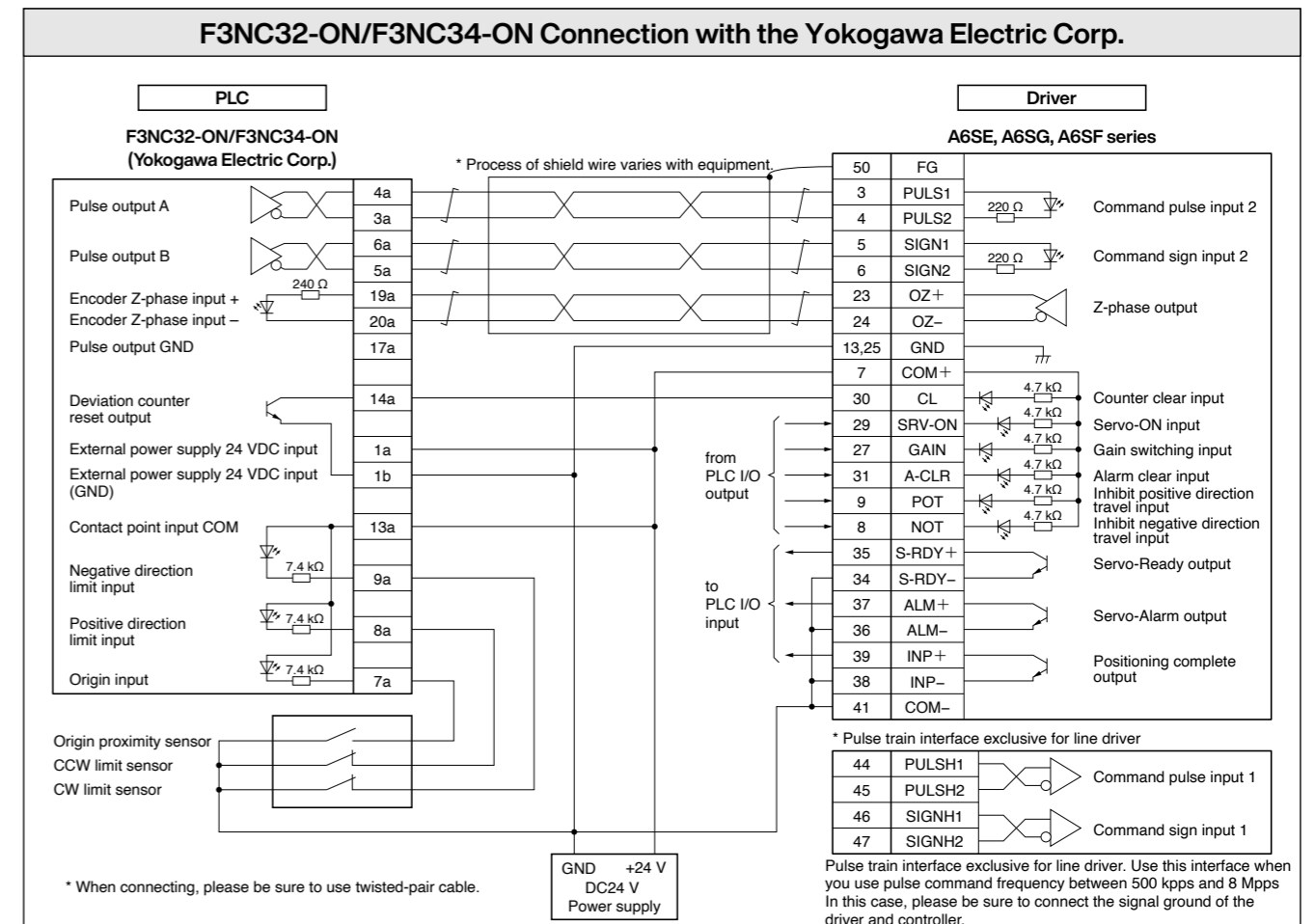
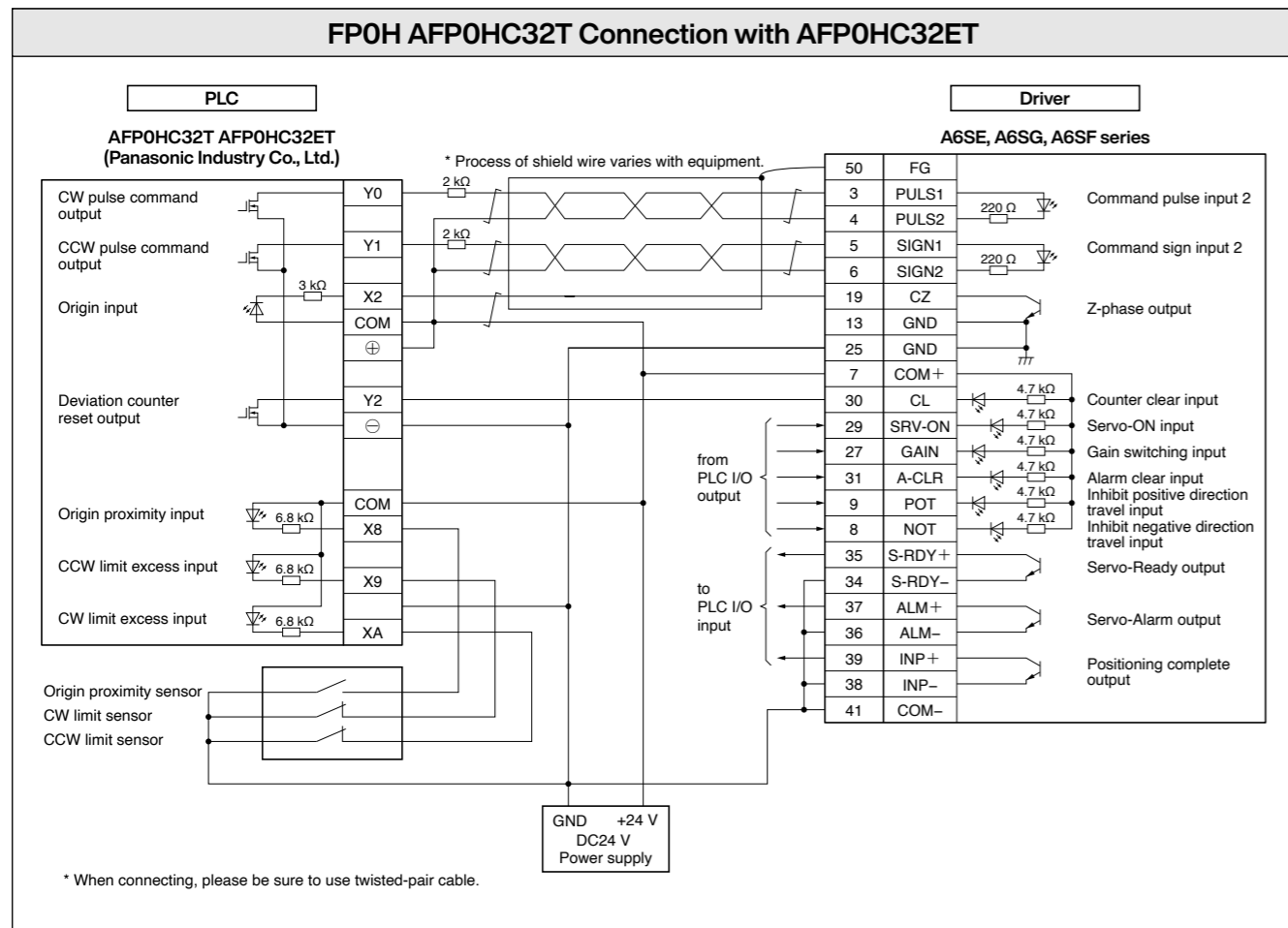
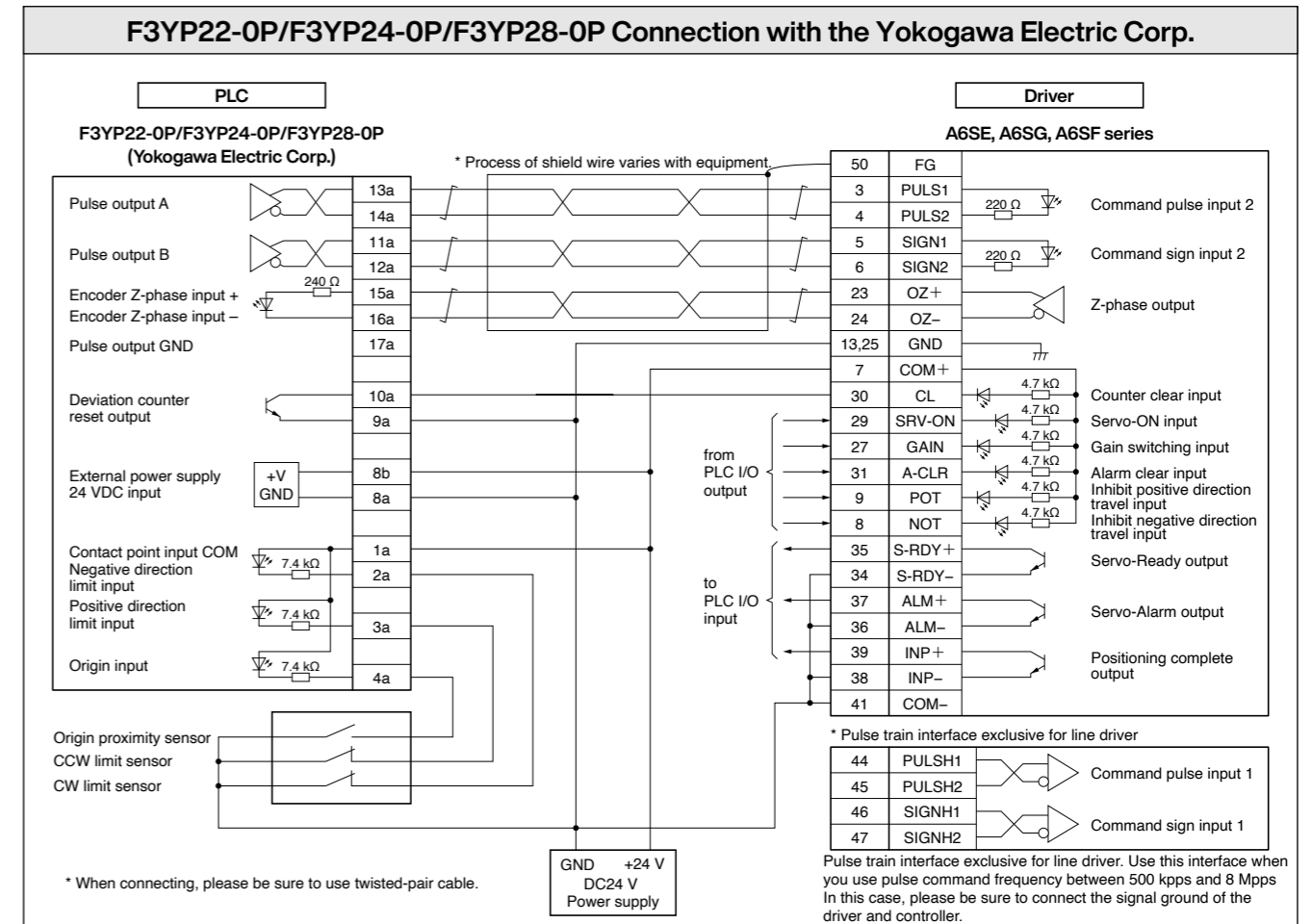
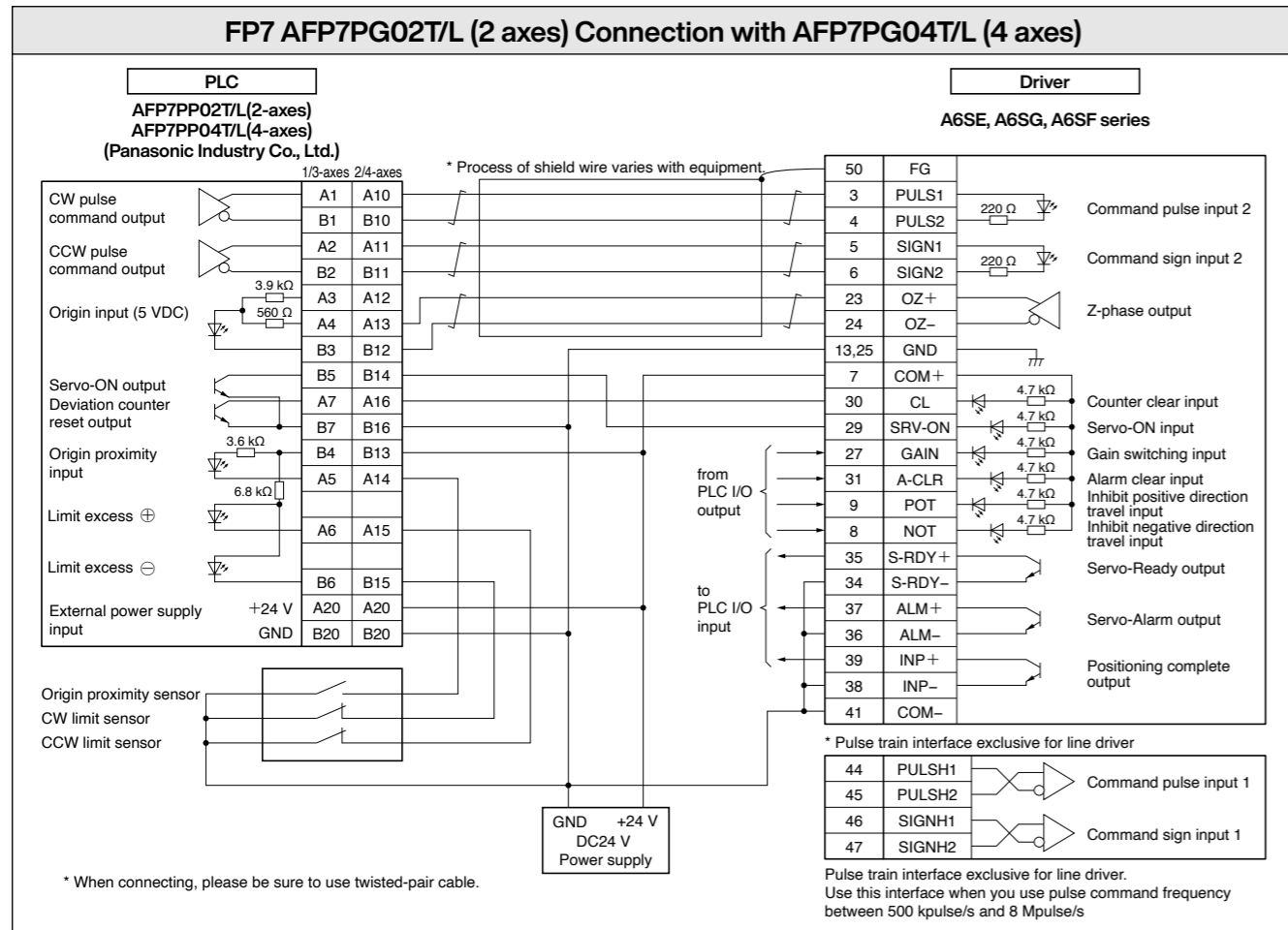
- 1) Travel distance of the work load per one cycle mm
- 2) Cycle time s
- (Fill in items 3) and 4) if required.)
- 3) Acceleration time s
- 4) Deceleration time s
- 5) Stopping time s
- 6) Max. velocity mm/s
- 7) External force N
- 8) Positioning accuracy of the work load mm
- 9) Total weight of the work load kg
- 10) Power supply voltage V
- 11) Diameter of the pinion mm
- 12) Mass of the pinion kg
- 13) Traveling direction (horizontal, vertical, etc.)



### 2. Other data (Fill the details on specific mechanism and its configurations in the following blank.)

Company name :	
Department/Section :	
Name :	
Address :	
Tel :	
Fax :	
E-mail address:	





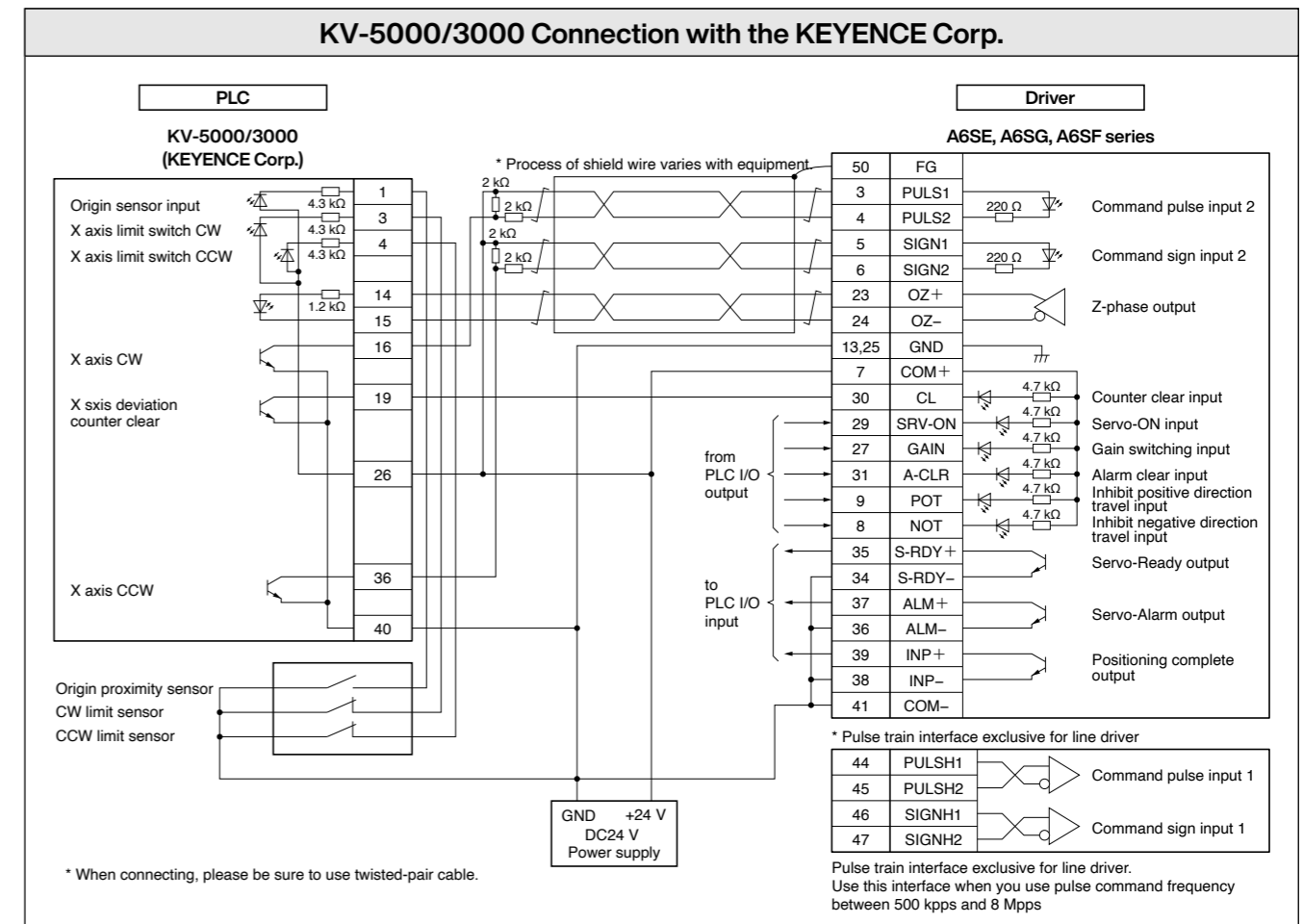
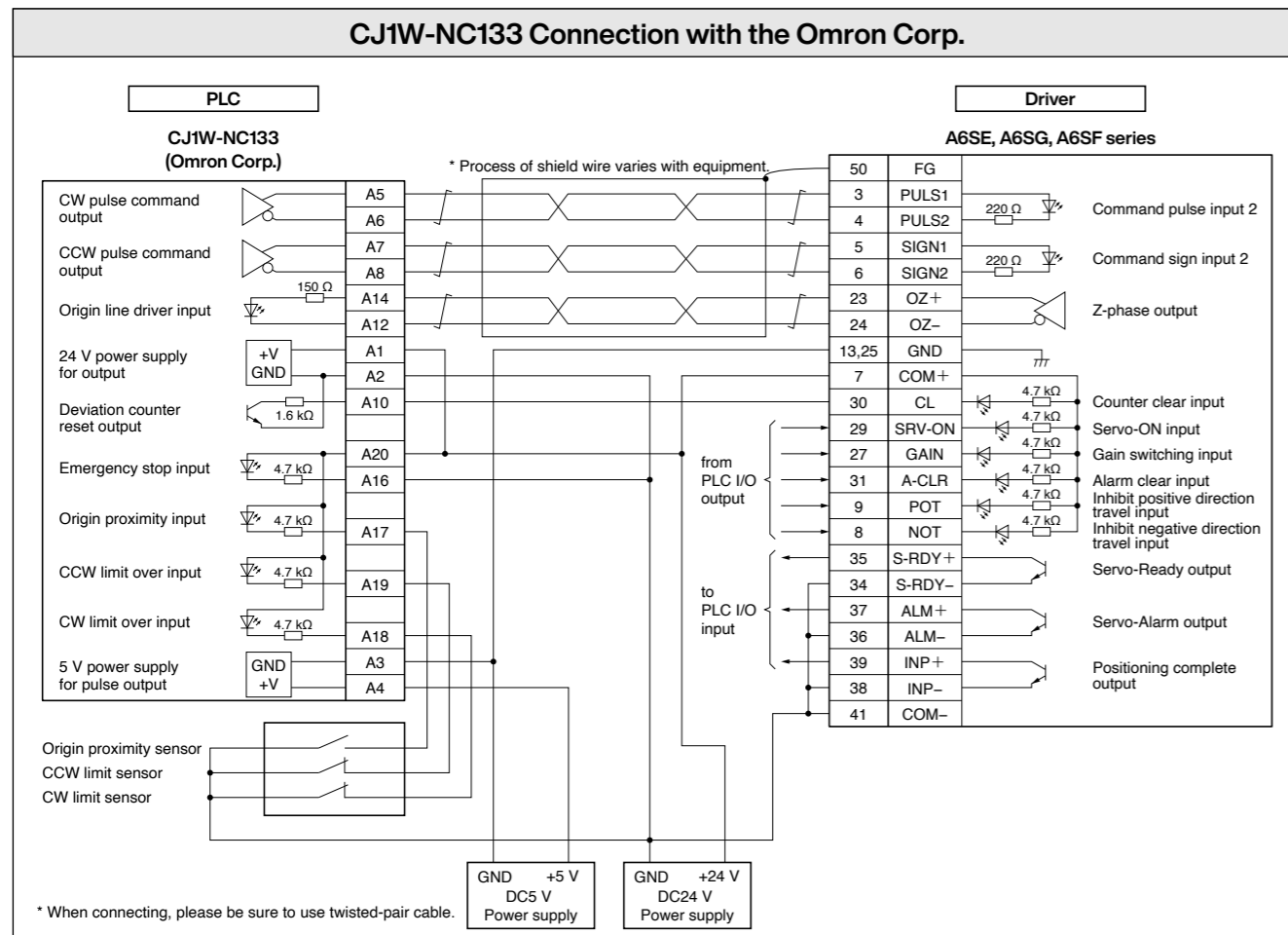
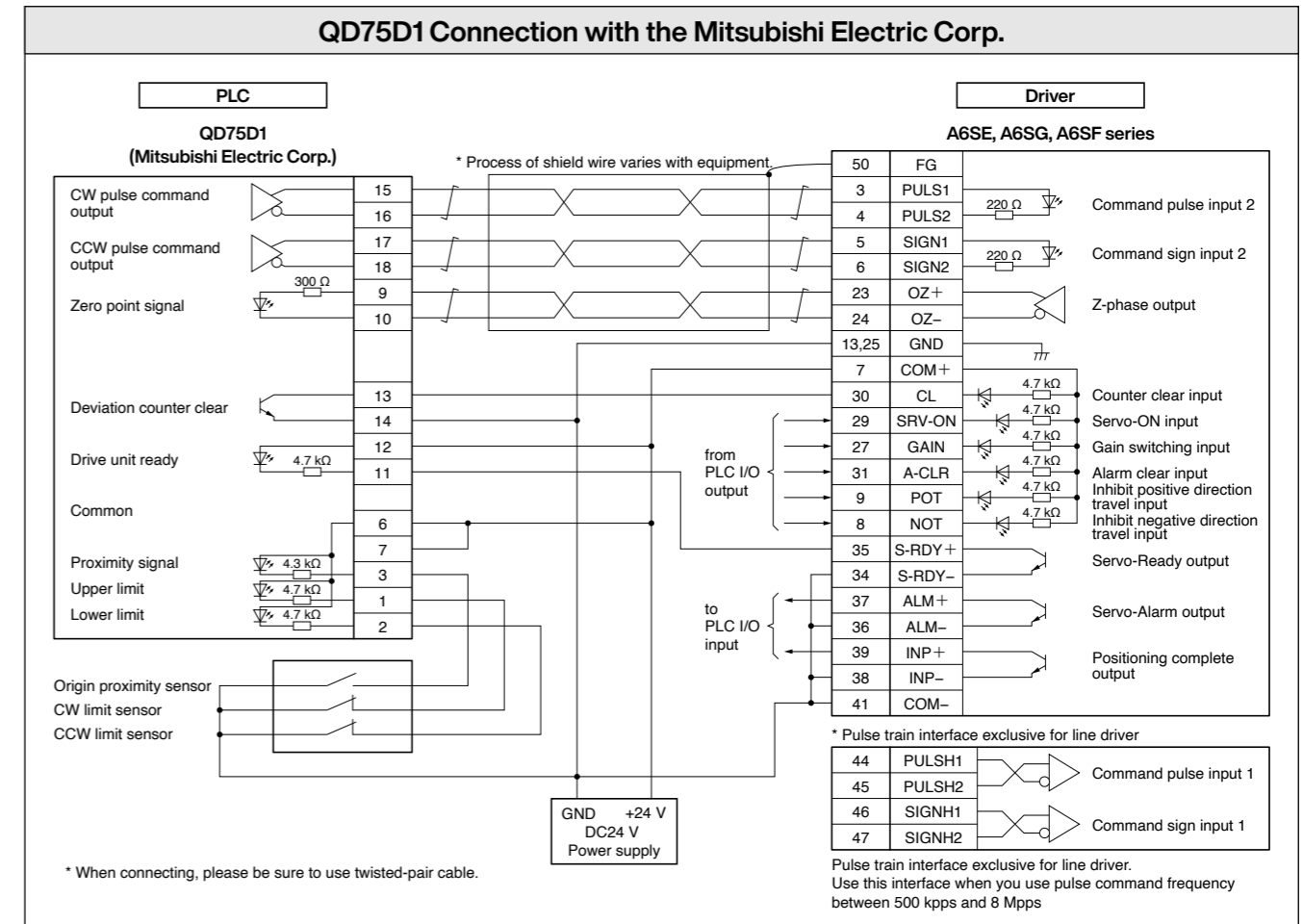
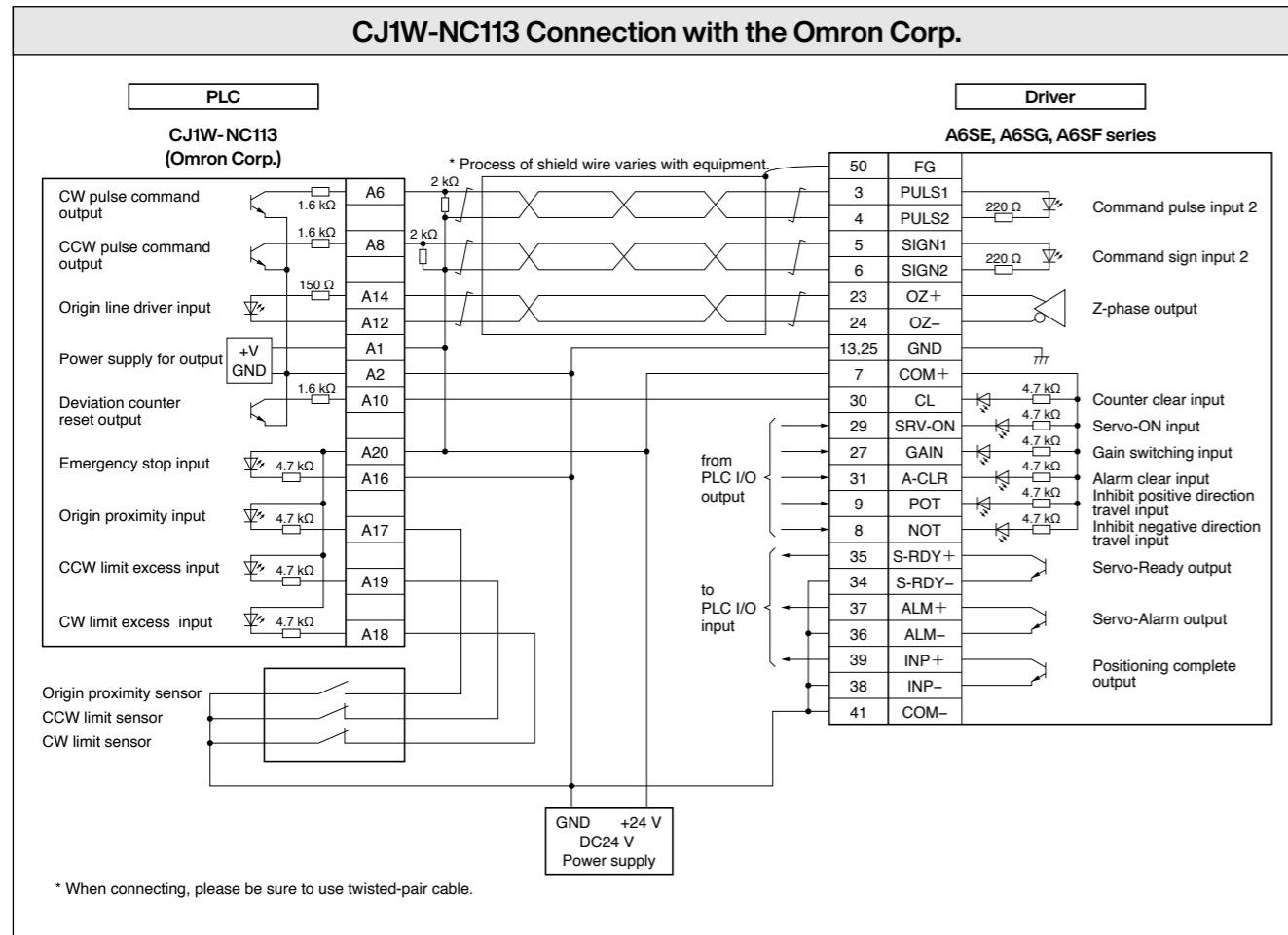
A6 Series

A6N Series

A6B Series  
Special Order Product

E Series

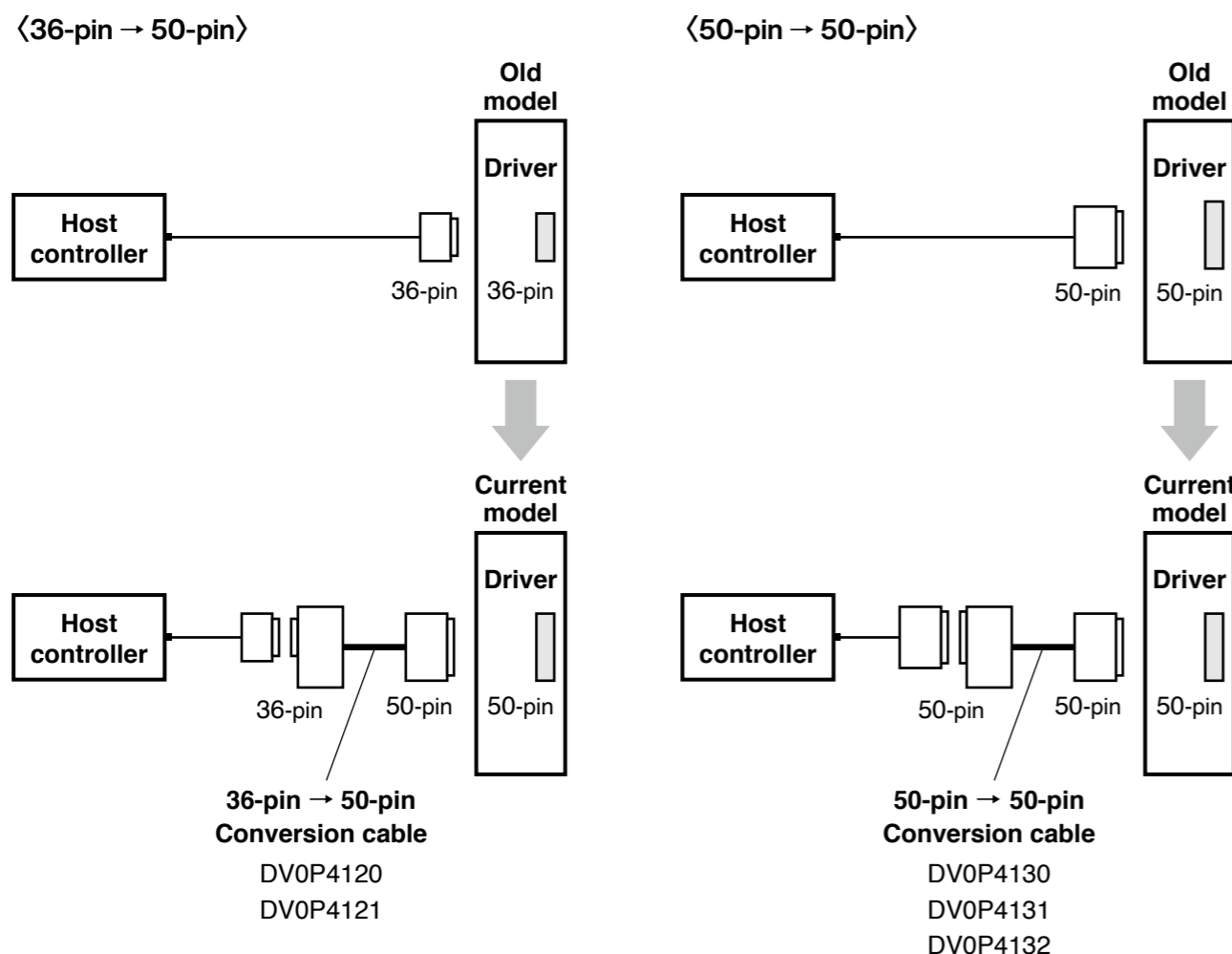
Information



A6 Series  
A6N Series  
A6B Series  
E Series  
Information



For easier replacement of old driver (MINAS X/XX/V series) with A6 series, use the interface conversion connector.



When selecting the cable, refer to the table below because the part number of the cable is specific to the control mode of the old model.

Old model	Control mode	Conversion cable part No.	Conversion wiring table
X series XX series (36-pin)	Position/velocity control	DV0P4120	P.440
	Torque control	DV0P4121	
V series (50-pin)	Position control	DV0P4130	P.441
	Velocity control	DV0P4131	
	Torque control	DV0P4132	P.442

\* For external dimensions, refer to P.322.

### Conversion Wiring Table

Pin No. on Old Model	DV0P4120			DV0P4121		
	Pin No. on Current Model	Signal Name	Symbol	Pin No. on Current Model	Signal Name	Symbol
1	23	Z-phase output	OZ+	23	Z-phase output	OZ+
2	24	Z-phase output	OZ-	24	Z-phase output	OZ-
3	13	Signal ground	GND	13	Signal ground	GND
4	19	Z-phase output	CZ	19	Z-phase output	CZ
5	4	Command pulse input 2	PULS2	4	Command pulse input 2	PULS2
6	3	Command pulse input 2	PULS1	3	Command pulse input 2	PULS1
7	6	Command pulse sign input 2	SIGN2	6	Command pulse sign input 2	SIGN2
8	5	Command pulse sign input 2	SIGN1	5	Command pulse sign input 2	SIGN1
9	33	Command pulse inhibition input	INH	33	Command pulse inhibition input	INH
10	26	Speed zero clamp input	ZEROSPD	26	Speed zero clamp input	ZEROSPD
11	7	Power supply for control signal (+)	COM+	7	Power supply for control signal (+)	COM+
12	29	Servo-ON input	SRV-ON	29	Servo-ON input	SRV-ON
13	30	Deviation counter clear input	CL	30	Deviation counter clear input	CL
14	14	Speed command input	SPR	NC		
15	15	Signal ground	GND	15	Signal ground	GND
16	43	Speed monitor output	SP	43	Speed monitor output	SP
17	25	Signal ground	GND	25	Signal ground	GND
18	50	Frame ground	FG	50	Frame ground	FG
19	21	A-phase output	OA+	21	A-phase output	OA+
20	22	A-phase output	OA-	22	A-phase output	OA-
21	48	B-phase output	OB+	48	B-phase output	OB+
22	49	B-phase output	OB-	49	B-phase output	OB-
23	NC			NC		
24	NC			NC		
25	39	Positioning complete output Speed arrival output	COIN+ AT-SPEED+	39	Positioning complete output Speed arrival output	COIN+ AT-SPEED+
26	37	Servo-Alarm output	ALM+	37	Servo-Alarm output	ALM+
27	35	Servo-Ready output	S-RDY+	35	Servo-Ready output	S-RDY+
28	34	Positioning complete output (-) Speed arrival output (-)	COIN- AT-SPEED-	34	Positioning complete output (-) Speed arrival output (-)	COIN- AT-SPEED-
	36	Servo-Alarm output (-)	ALM-	36	Servo-Alarm output (-)	ALM-
	38	Servo-Ready output (-)	S-RDY-	38	Servo-Ready output (-)	S-RDY-
	41	Power supply for control signal (-)	COM-	41	Power supply for control signal (-)	COM-
29	8	CW over-travel inhibit input	CWL	8	CW over-travel inhibit input	CWL
30	9	CCW over-travel inhibit input	CCWL	9	CCW over-travel inhibit input	CCWL
31	31	Alarm clear input	A-CLR	31	Alarm clear input	A-CLR
32	32	Control mode switching input	C-MODE	32	Control mode switching input	C-MODE
33	18	CW direction torque limit input	CWTL	18	CW direction torque limit input	CWTL
34	16	CCW direction torque limit input	CCWTL	14	Torque command input	TRQR
35	17	Signal ground	GND	17	Signal ground	GND
36	42	Torque monitor output	IM	42	Torque monitor output	IM

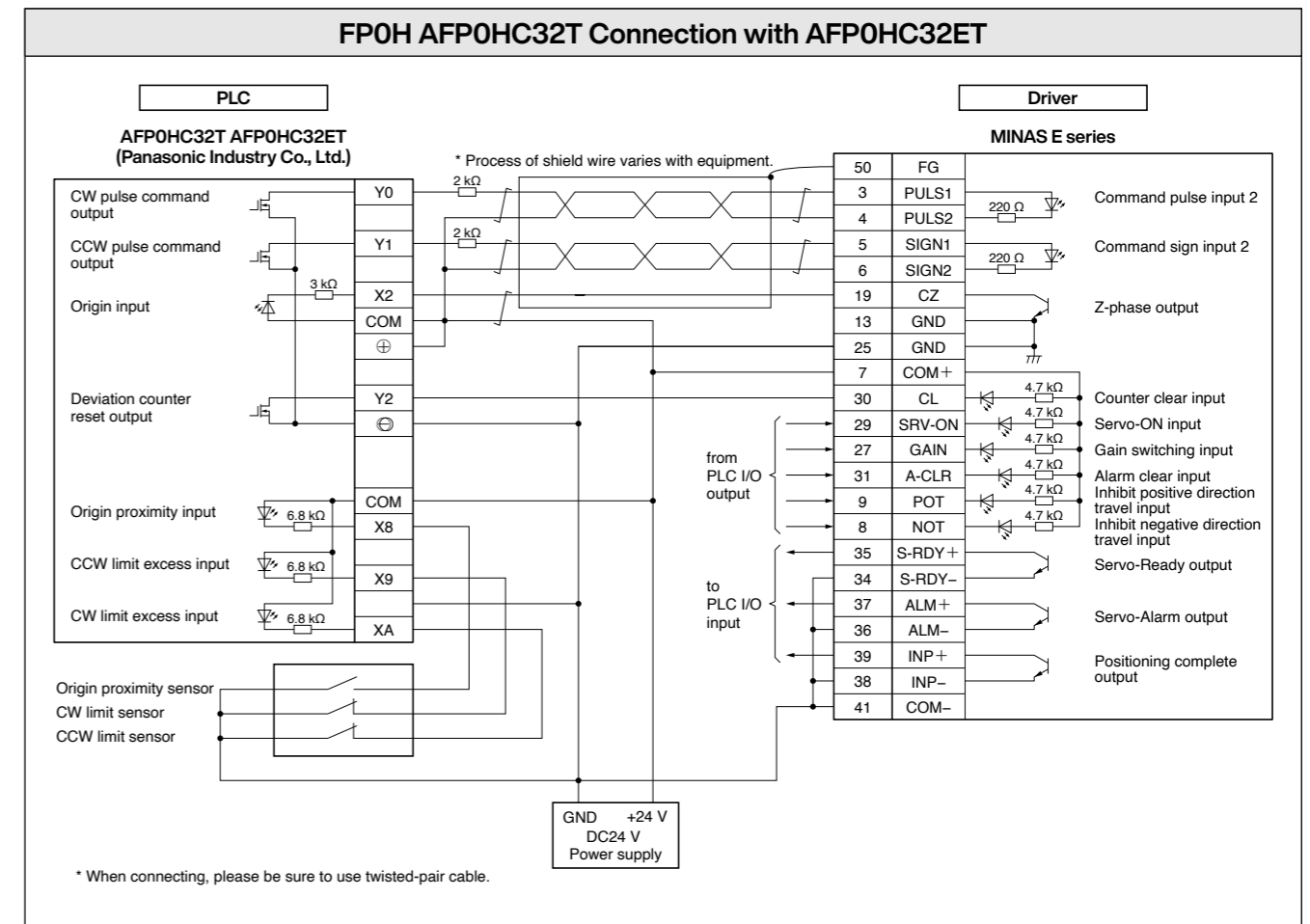
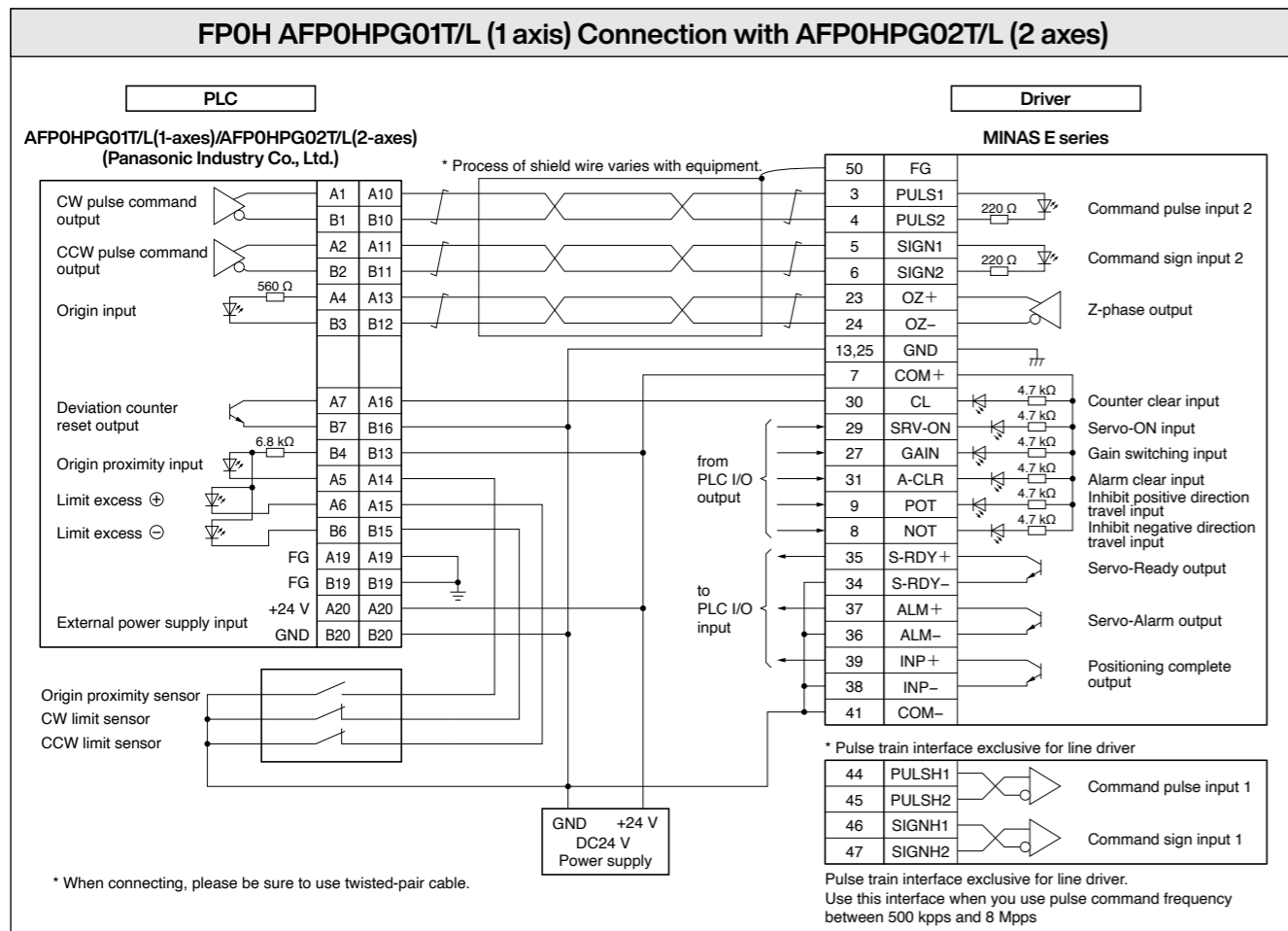
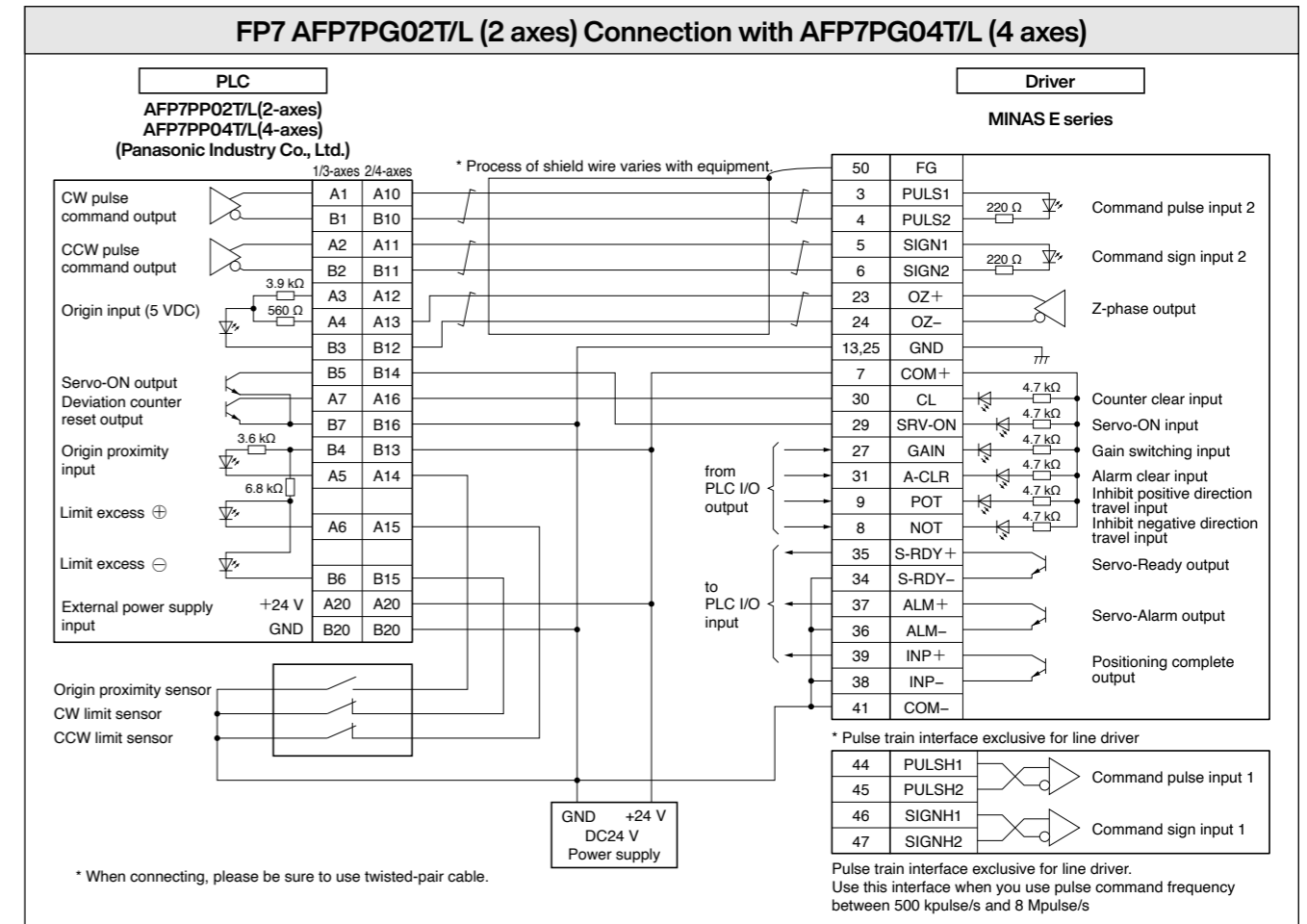
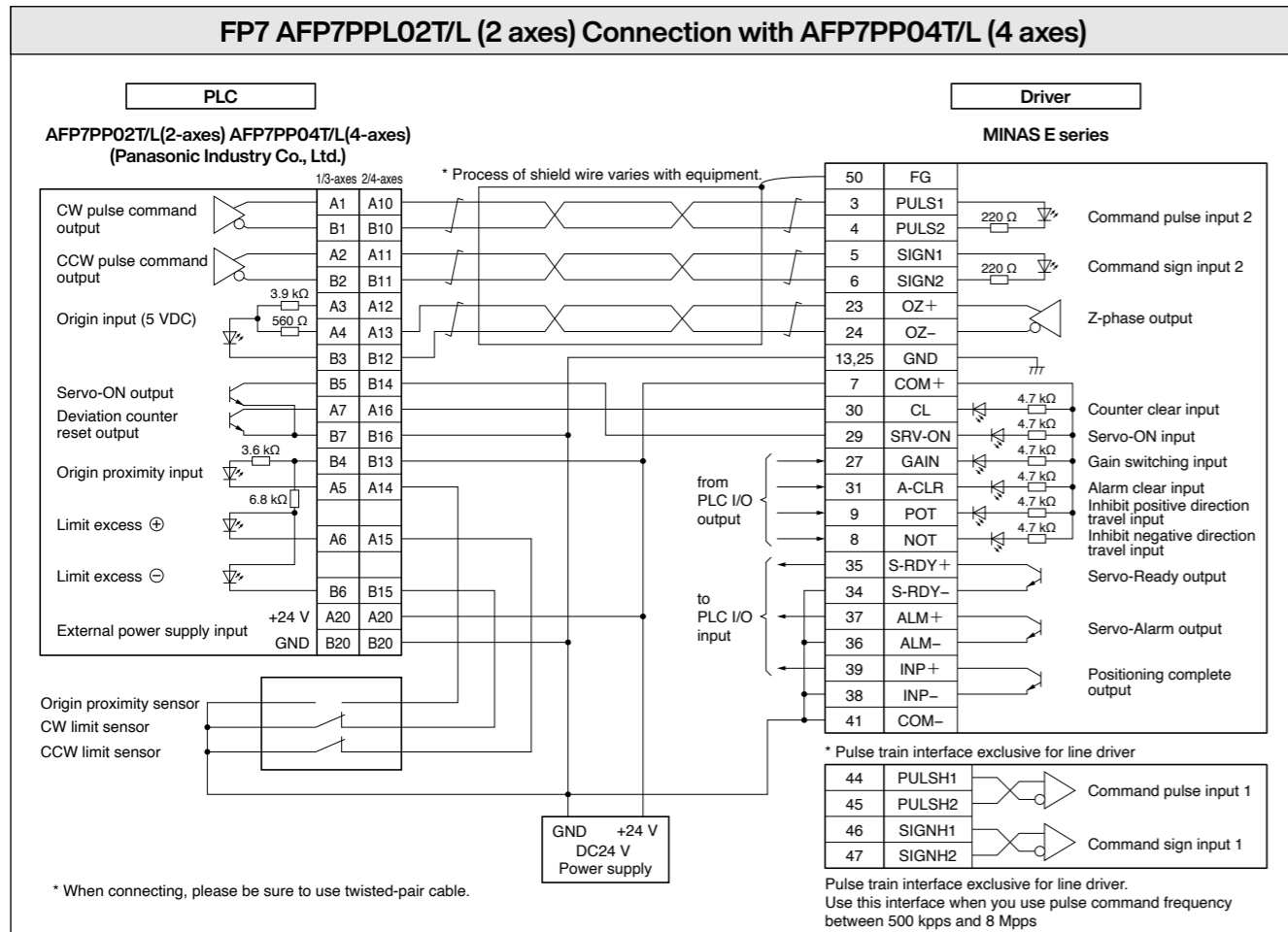
\* "NC" is no connect.

Pin No. on Old Model	DV0P4130			DV0P4131		
	Pin No. on Current Model	Signal Name	Symbol	Pin No. on Current Model	Signal Name	Symbol
1	8	CW over-travel inhibit input	CWL	8	CW over-travel inhibit input	CWL
2	9	CCW over-travel inhibit input	CCWL	9	CCW over-travel inhibit input	CCWL
3	3	Command pulse input 2	PULS1	NC		
4	4	Command pulse input 2	PULS2	NC		
5	5	Command pulse sign input 2	SIGN1	NC		
6	6	Command pulse sign input 2	SIGN2	NC		
7	7	Power supply for control signal (+)	COM+	7	Power supply for control signal (+)	COM+
8	NC			NC		
9	NC			NC		
10	NC			NC		
11	11	External brake release signal	BRK-OFF+	11	External brake release signal	BRK-OFF+
12	12	Zero-speed detection output signal	ZSP	12	Zero-speed detection output signal	ZSP
13	13	Torque in-limit signal output	TLC	13	Torque in-limit signal output	TLC
14	NC			14	Speed command input	SPR
15	15	Signal ground	GND	15	Signal ground	GND
16	16	CCW direction torque limit input	CCWTL	16	CCW direction torque limit input	CCWTL
17	17	Signal ground	GND	17	Signal ground	GND
18	18	CW direction torque limit input	CWTL	18	CW direction torque limit input	CWTL
19	19	Z-phase output	CZ	19	Z-phase output	CZ
20	NC			NC		
21	21	A-phase output	OA+	21	A-phase output	OA+
22	22	A-phase output	OA-	22	A-phase output	OA-
23	23	Z-phase output	OZ+	23	Z-phase output	OZ+
24	24	Z-phase output	OZ-	24	Z-phase output	OZ-
25	50	Frame ground	FG	50	Frame ground	FG
26	26	Speed zero clamp input	ZEROSPD	26	Speed zero clamp input	ZEROSPD
27	27	Gain switching input	GAIN	27	Gain switching input	GAIN
28	NC			33	Selection 1 input of internal command speed	INTSPD1
29	29	Servo-ON input	SRV-ON	29	Servo-ON input	SRV-ON
30	30	Deviation counter clear input	CL	NC		
31	31	Alarm clear input	A-CLR	31	Alarm clear input	A-CLR
32	32	Control mode switching input	C-MODE	32	Control mode switching input	C-MODE
33	33	Command pulse inhibition input	INH	NC		
34	NC			NC		
35	35	Servo-Ready output	S-RDY+	35	Servo-Ready output	S-RDY+
36	NC			NC		
37	37	Servo-Alarm output	ALM+	37	Servo-Alarm output	ALM+
38	NC			NC		
39	39	Positioning complete output	COIN+	39	Speed arrival output	AT-SPEED+
40	40	Torque in-limit signal output	TLC	40	Torque in-limit signal output	TLC
41	10	External brake release signal (-)	BRK-OFF-	10	External brake release signal (-)	BRK-OFF-
	34	Positioning complete output (-)	COIN-	34	Speed arrival output (-)	AT-SPEED-
	36	Servo-Alarm output (-)	ALM-	36	Servo-Alarm output (-)	ALM-
	38	Servo-Ready output (-)	S-RDY-	38	Servo-Ready output (-)	S-RDY-
	41	Power supply for control signal (-)	COM-	41	Power supply for control signal (-)	COM-
42	42	Torque monitor output	IM	42	Torque monitor output	IM
43	43	Speed monitor output	SP	43	Speed monitor output	SP
44	25	Signal ground	GND	25	Signal ground	GND
45	25	Signal ground	GND	25	Signal ground	GND
46	25	Signal ground	GND	25	Signal ground	GND
47	NC			NC		
48	48	B-phase output	OB+	48	B-phase output	OB+
49	49	B-phase output	OB-	49	B-phase output	OB-
50	50	Frame ground	FG	50	Frame ground	FG

\* "NC" is no connect.

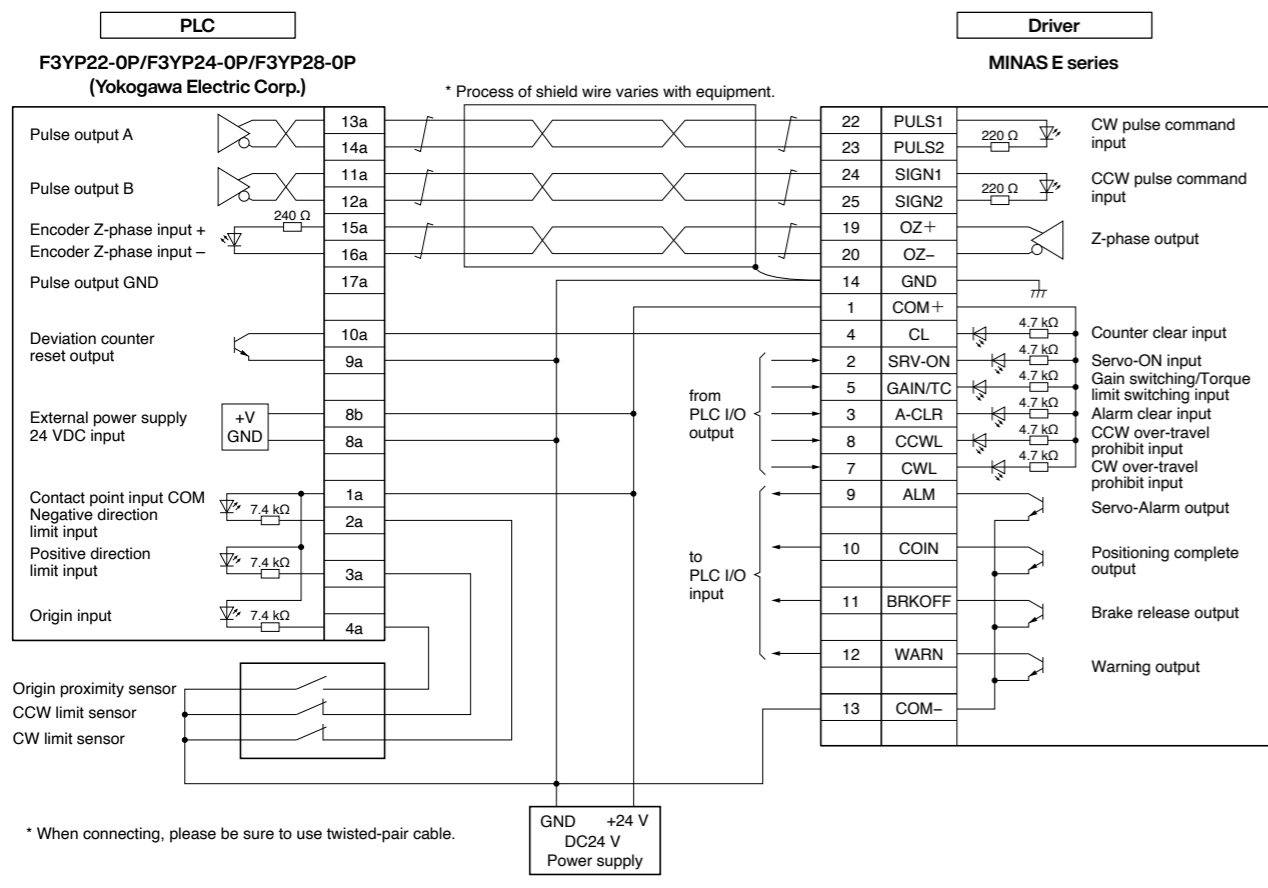
Pin No. on Old Model	DV0P4132		
	Pin No. on Current Model	Signal Name	Symbol
1	8	CW over-travel inhibit input	CWL
2	9	CCW over-travel inhibit input	CCWL
3	NC		
4	NC		
5	NC		
6	NC		
7	7	Power supply for control signal (+)	COM+
8	NC		
9	NC		
10	NC		
11	11	External brake release signal	BRK-OFF+
12	12	Zero-speed detection output signal	ZSP
13	13	Torque in-limit signal output	TLC
14	NC		
15	15	Signal ground	GND
16	16	Torque command input	TRQR
17	17	Signal ground	GND
18	18	CW direction torque limit input	CWTL
19	19	Z-phase output	CZ
20	NC		
21	21	A-phase output	OA+
22	22	A-phase output	OA-
23	23	Z-phase output	OZ+
24	24	Z-phase output	OZ-
25	50	Frame ground	FG
26	26	Speed zero clamp input	ZEROSPD
27	27	Gain switching input	GAIN
28	NC		
29	29	Servo-ON input	SRV-ON
30	NC		
31	31	Alarm clear input	A-CLR
32	32	Control mode switching input	C-MODE
33	NC		
34	NC		
35	35	Servo-Ready output	S-RDY+
36	NC		
37	37	Servo-Alarm output	ALM+
38	NC		
39	39	Speed arrival output	AT-SPEED+
40	40	Torque in-limit signal output	TLC
41	10	External brake release signal (-)	BRK-OFF-
	34	Speed arrival output (-)	AT-SPEED-
	36	Servo-Alarm output (-)	ALM-
	38	Servo-Ready output (-)	S-RDY-
	41	Power supply for control signal (-)	COM-
42	42	Torque monitor output	IM
43	43	Speed monitor output	SP
44	25	Signal ground	GND
45	25	Signal ground	GND
46	25	Signal ground	GND
47	NC		
48	48	B-phase output	OB+
49	49	B-phase output	OB-
50	50	Frame ground	FG

\* "NC" is no connect.

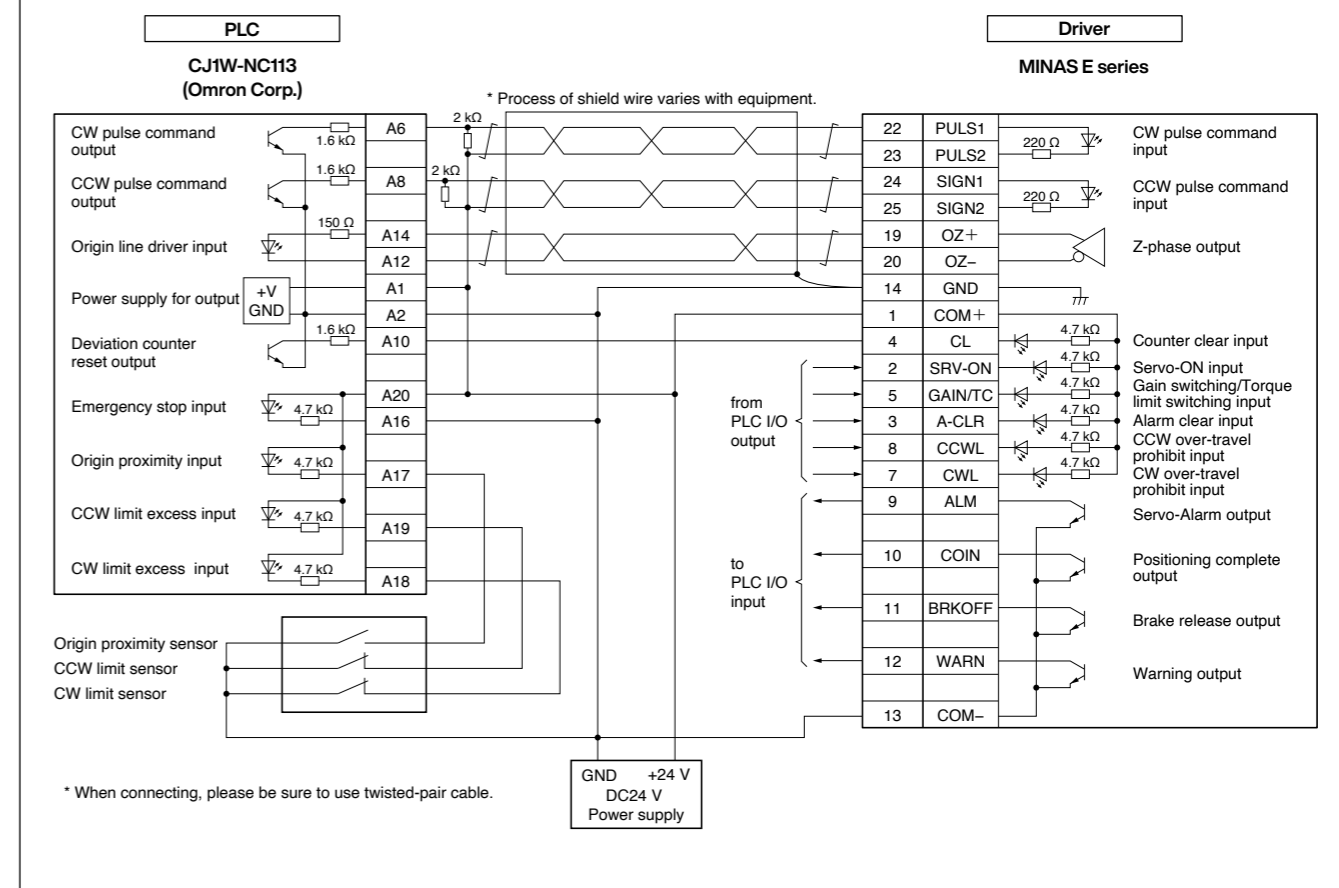


A6 Series  
A6N Series  
A6B Series  
Special Order Product  
E Series  
Information

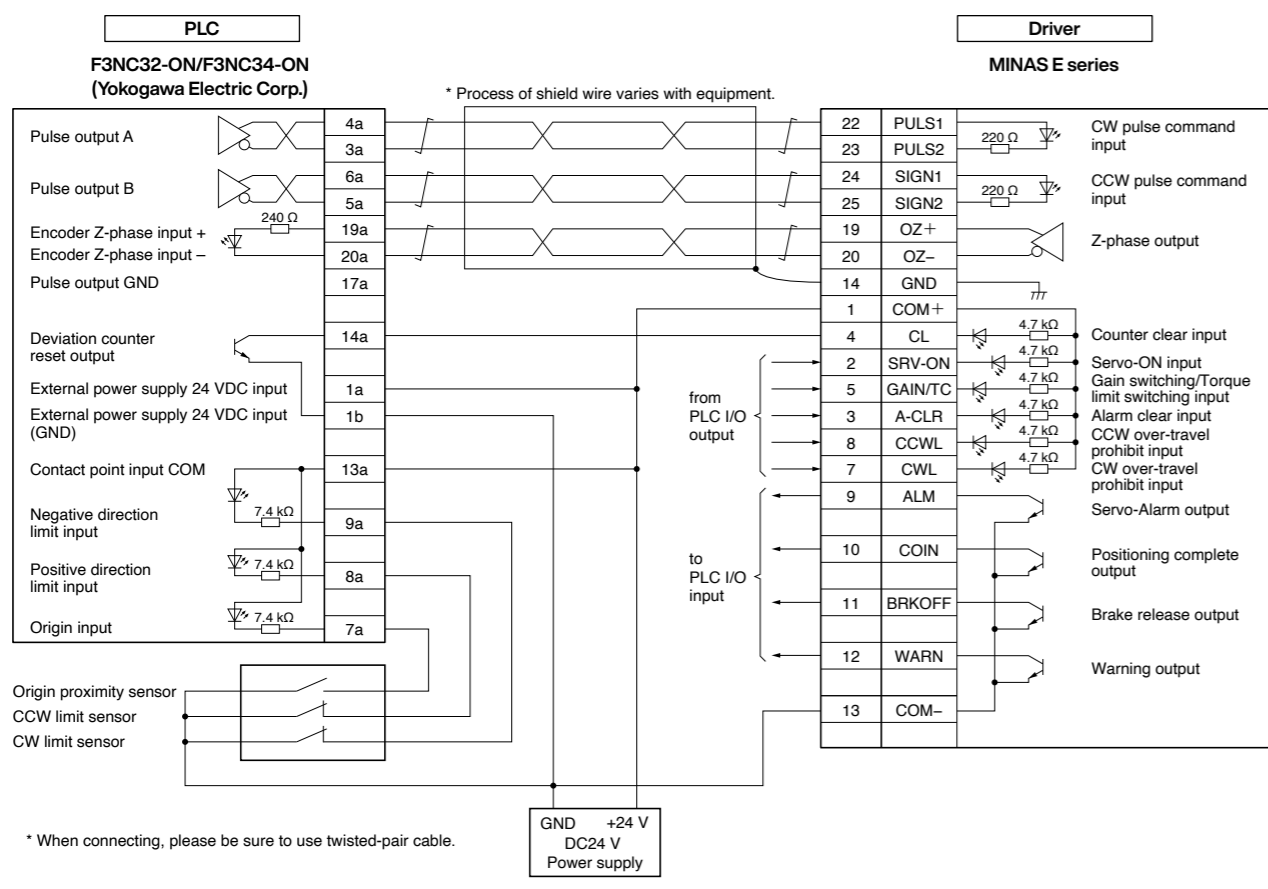
F3YP22-0P/F3YP24-0P/F3YP28-0P Connection with the Yokogawa Electric Corp.



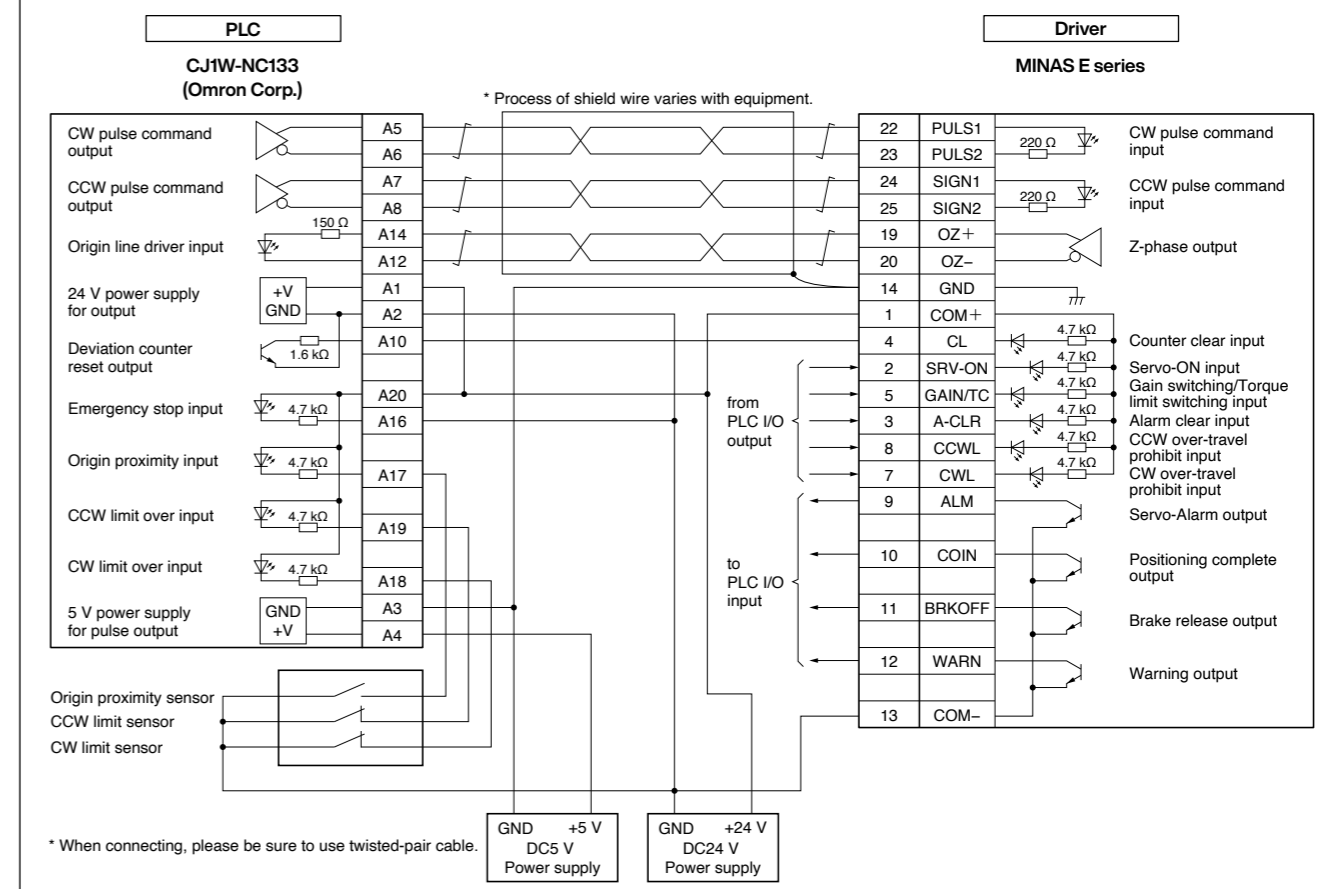
CJ1W-NC113 Connection with the Omron Corp.

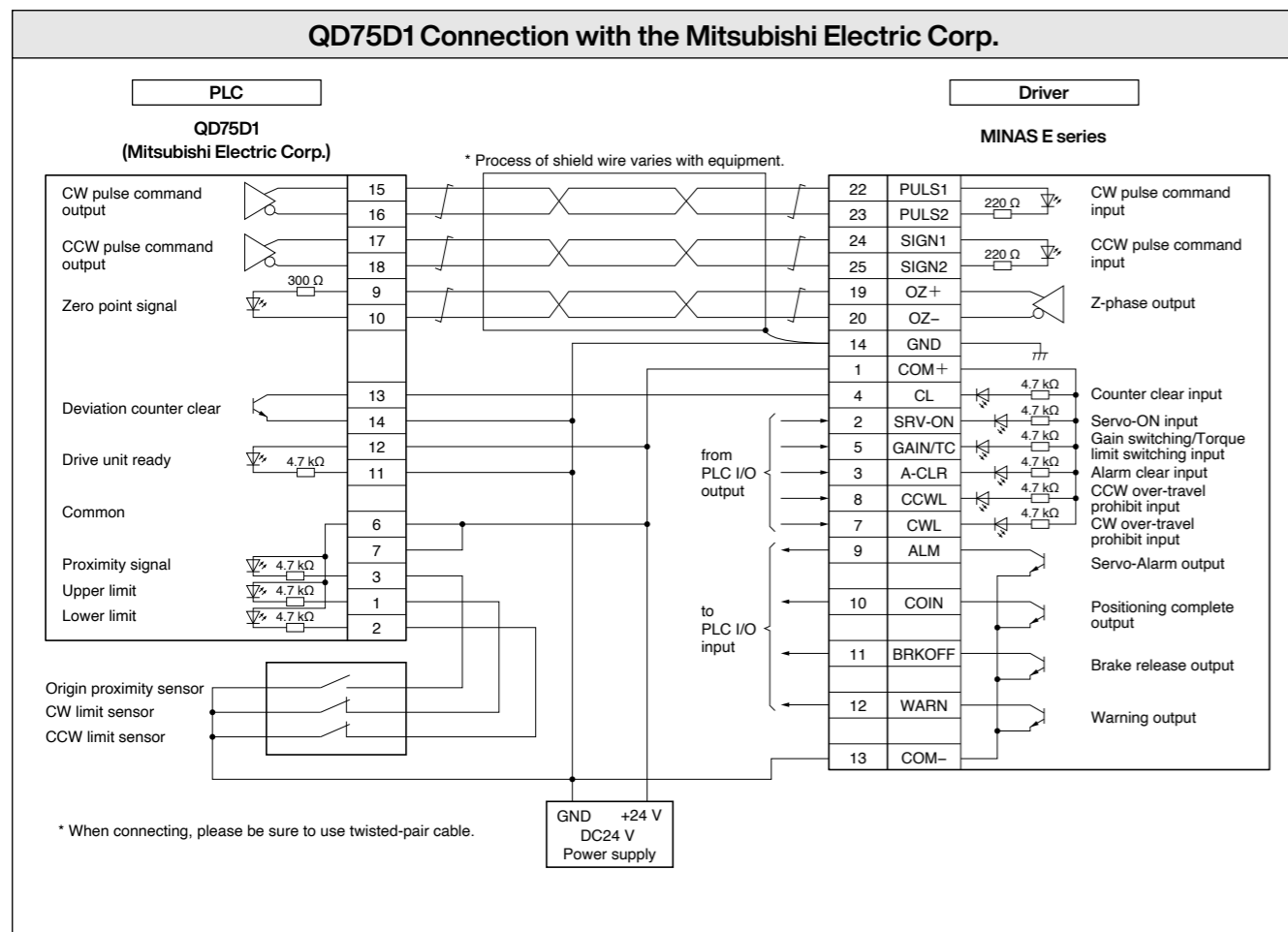


F3NC32-ON/F3NC34-ON Connection with the Yokogawa Electric Corp.



CJ1W-NC133 Connection with the Omron Corp.





DVOP	Part No.	Title	Page
DVOP0770	Connector kit for external peripheral equipment	368,402	
DVOP0800	Interface cable	368,403	
DVOP1450	Surge absorber (3-phase)	413,416	
DVOP1460	Ferrite core	416	
DVOP1960	Communication cable	403	
DVOP220	Reactor	342,405	
DVOP221	Reactor	342	
DVOP222	Reactor	342	
DVOP223	Reactor	342	
DVOP224	Reactor	342	
DVOP225	Reactor	342	
DVOP227	Reactor	342,405	
DVOP228	Reactor	342,405	
DVOP2870	Connector kit for power supply connection	401	
DVOP2890	External regenerative resistor	404	
DVOP2891	External regenerative resistor	404	
DVOP2990	Battery for absolute encoder	338	
DVOP3410	Noise filter	412	
DVOP3670	Connector kit for motor/encoder connection	401	
DVOP37300	Cable set (3 m)	400	
DVOP3811	DIN rail mounting unit	404	
DVOP39200	Cable set (5 m)	400	
DVOP4120	Interface conversion cable	439	
DVOP4121	Interface conversion cable	439	
DVOP4130	Interface conversion cable	439	
DVOP4131	Interface conversion cable	439	
DVOP4132	Interface conversion cable	439	
DVOP4170	Noise filter	412	
DVOP4190	Surge absorber (Single phase)	413,416	
DVOP4220	Noise Filter	412	
DVOP4280	External regenerative resistor: 50 Ω 25 W	343	
DVOP4281	External regenerative resistor: 100 Ω 25 W	343	
DVOP4282	External regenerative resistor: 25 Ω 50 W	343	
DVOP4283	External regenerative resistor: 50 Ω 50 W	343	
DVOP4284	External regenerative resistor: 30 Ω 100 W	343	
DVOP4285	External regenerative resistor: 20 Ω 130 W	343	
DVOP4290	Connector kit for motor/encoder connection	326	
DVOP4310	Connector kit for motor/encoder connection	331	
DVOP4320	Connector kit for motor/encoder connection	332	
DVOP4330	Connector kit for motor/encoder connection	331	
DVOP4340	Connector kit for motor/encoder connection	332	
DVOP4350	Interface connector	324	
DVOP4360	Interface cable	322	
DVOP4420	Console	403	
DVOP4430	Battery box	338	
DVOP4460	Setup support software "PANATERM" for MINAS series AC servo motor & driver	398	
DVOPM20010	Connector Kit: Encoder	324	
DVOPM20026	Connector kit: External scale	324	
DVOPM20032	Connector for power supply input connection (A-frame to D-frame (Single row type))	325	
DVOPM20033	Connector for power supply input connection (A-frame to D-frame (Double row type))	325	
DVOPM20034	Connector for motor connection (A-frame to D-frame)	326	
DVOPM20035	Connector kit for motor/encoder connection	327	
DVOPM20036	Connector kit for motor/encoder connection	331	
DVOPM20037	Connector kit for motor/encoder connection	332	
DVOPM20038	Connector kit for motor/encoder connection	331	
DVOPM20039	Connector kit for motor/encoder connection	332	
DVOPM20040	Connector kit for motor/brake connection	337	
DVOPM20042	Noise filter	412	
DVOPM20043	Noise filter	412	
DVOPM20044	Connector for power supply input connection (E-frame)	325	
DVOPM20045	Connector for regenerative resistor (E-frame 200 V/400 V common)	325	
DVOPM20046	Connector for motor connection (E-frame 200 V/400 V common)	326	
DVOPM20047	Reactor	342	
DVOPM20056	Connector kit for motor/encoder connection	334	
DVOPM20057	Connector kit for motor/encoder connection	334	
DVOPM20094	Safety by-pass plug	323	

DVOP	Part No.	Title	Page
DVOPM20100	Mounting bracket for A-frame and B-frame	340	
DVOPM20101	Mounting bracket for C-frame and D-frame	341	
DVOPM20102	Connector kit: RS485, 232	323	
DVOPM20103	Connector kit: Safety	323	
DVOPM20107	Connector kit for motor/encoder connection	333	
DVOPM20108	Connector kit for motor/encoder connection	333	
DVOPM20109	Connector kit for motor/encoder connection	335	
DVOPM20110	Connector kit for motor/encoder connection	335	
DVOPM20111	Connector kit for motor/encoder connection	333	
DVOPM20112	Connector kit for motor/encoder connection	334	
DVOPM20113	Connector kit for motor/encoder connection	335	
DVOPM20114	Connector kit for motor/encoder connection	336	
DVOPM20115	Connector kit for motor/encoder connection	336	
DVOPM20116	Connector kit for motor/encoder connection	336	
DVOPM24581	Connector kit for motor/encoder connection	328	
DVOPM24582	Connector kit for motor/encoder connection	328	
DVOPM24583	Connector kit for motor/encoder connection	329	
DVOPM24584	Connector kit for motor/encoder connection	330	
DVOPM24585	Connector kit for motor/encoder connection	329	
DVOPM24586	Connector kit for motor/encoder connection	330	
DVOPM24587	Connector kit for motor/encoder connection	329	
DVOPM24588	Connector kit for motor/encoder connection	330	
DVOPM24589	Connector kit for motor/encoder connection	329	
DVOPM24590	Connector kit for motor/encoder connection	330	
DVOPM24610	Daisy Chain	345	

MADL	Part No.	Title	Page
MADLN01NE	A6NE series driver: A-frame	361,362	
MADLN01SE	A6SE series driver: A-frame	45,46	
MADLN01SG	A6SG series driver: A-frame	45,46	
MADLN05NE	A6NE series driver: A-frame	361,362	
MADLN05SE	A6SE series driver: A-frame	45,46	
MADLN05SG	A6SG series driver: A-frame	45,46	
MADLN11NE	A6NE series driver: A-frame	361,362	
MADLN11SE	A6SE series driver: A-frame	45,46	
MADLN11SG	A6SG series driver: A-frame	45,46	
MADLN15NE	A6NE series driver: A-frame	361,362	
MADLN15SE	A6SE series driver: A-frame	45,46	
MADLN15SG	A6SG series driver: A-frame	45,46	
MADLT01NF	A6NF series driver: A-frame	359,360	
MADLT01SF	A6SF series driver: A-frame	43,44	
MADLT05NF	A6NF series driver: A-frame	359,360	
MADLT05SF	A6SF series driver: A-frame	43,44	
MADLT11NF	A6NF series driver: A-frame	359,360	
MADLT11SF	A6SF series driver: A-frame	43,44	
MADLT15NF	A6NF series driver: A-frame	359,360	
MADLT15SF	A6SF series driver: A-frame	43,44	

MBDL	Part No.	Title	Page
MBDLN21NE	A6NE series driver: B-frame	361,362	
MBDLN21SE	A6SE series driver: B-frame	45,46	
MBDLN21SG	A6SG series driver: B-frame	45,46	
MBDLN25NE	A6NE series driver: B-frame	361,362	
MBDLN25SE	A6SE series driver: B-frame	45,46	
MBDLN25SG	A6SG series driver: B-frame	45,46	
MBDLT21NF	A6NF series driver: B-frame	359,360	
MBDLT21SF	A6SF series driver: B-frame	43,44	
MBDLT25NF	A6NF series driver: B-frame	359,360	
MBDLT25SF	A6SF series driver: B-frame	43,44	

MCDL	Part No.	Title	Page
MCDLN31NE	A6NE series driver: C-frame	361,362	
MCDLN31SE	A6SE series driver: C-frame	45,46	
MCDLN31SG	A6SG series driver: C-frame	45,46	
MCDLN35NE	A6NE series driver: C-frame	361,362	
MCDLN35SE	A6SE series driver: C-frame	45,46	
MCDLN35SG	A6SG series driver: C-frame	45,46	
MCDLT31NF	A6NF series driver: C-frame	359,360	
MCDLT31SF	A6SF series driver: C-frame	43,44	















**Index**  
(Alphabetical Order)

MSMF (Low inertia)		
Part No.	Title	Page
MSMF302L1H7	MSMF 3.0 kW 200 V Motor	76
MSMF302L1H8	MSMF 3.0 kW 200 V Motor	76
MSMF302L1H8M	MSMF 3.0 kW 200 V Motor	220
MSMF402L1C5	MSMF 4.0 kW 200 V Motor	77
MSMF402L1C6	MSMF 4.0 kW 200 V Motor	77
MSMF402L1C6M	MSMF 4.0 kW 200 V Motor	221
MSMF402L1C7	MSMF 4.0 kW 200 V Motor	77
MSMF402L1C8	MSMF 4.0 kW 200 V Motor	77
MSMF402L1C8M	MSMF 4.0 kW 200 V Motor	221
MSMF402L1D5	MSMF 4.0 kW 200 V Motor	77
MSMF402L1D6	MSMF 4.0 kW 200 V Motor	77
MSMF402L1D6M	MSMF 4.0 kW 200 V Motor	221
MSMF402L1D7	MSMF 4.0 kW 200 V Motor	77
MSMF402L1D8	MSMF 4.0 kW 200 V Motor	77
MSMF402L1D8M	MSMF 4.0 kW 200 V Motor	221
MSMF402L1G5	MSMF 4.0 kW 200 V Motor	77
MSMF402L1G6	MSMF 4.0 kW 200 V Motor	77
MSMF402L1G6M	MSMF 4.0 kW 200 V Motor	221
MSMF402L1G7	MSMF 4.0 kW 200 V Motor	77
MSMF402L1G8	MSMF 4.0 kW 200 V Motor	77
MSMF402L1G8M	MSMF 4.0 kW 200 V Motor	221
MSMF402L1H5	MSMF 4.0 kW 200 V Motor	77
MSMF402L1H6	MSMF 4.0 kW 200 V Motor	77
MSMF402L1H6M	MSMF 4.0 kW 200 V Motor	221
MSMF402L1H7	MSMF 4.0 kW 200 V Motor	77
MSMF402L1H8	MSMF 4.0 kW 200 V Motor	77
MSMF402L1H8M	MSMF 4.0 kW 200 V Motor	221
MSMF502L1C5	MSMF 5.0 kW 200 V Motor	78
MSMF502L1C6	MSMF 5.0 kW 200 V Motor	78
MSMF502L1C6M	MSMF 5.0 kW 200 V Motor	222
MSMF502L1C7	MSMF 5.0 kW 200 V Motor	78
MSMF502L1C8	MSMF 5.0 kW 200 V Motor	78
MSMF502L1C8M	MSMF 5.0 kW 200 V Motor	222
MSMF502L1D5	MSMF 5.0 kW 200 V Motor	78
MSMF502L1D6	MSMF 5.0 kW 200 V Motor	78
MSMF502L1D6M	MSMF 5.0 kW 200 V Motor	222
MSMF502L1D7	MSMF 5.0 kW 200 V Motor	78
MSMF502L1D8	MSMF 5.0 kW 200 V Motor	78
MSMF502L1D8M	MSMF 5.0 kW 200 V Motor	222
MSMF502L1G5	MSMF 5.0 kW 200 V Motor	78
MSMF502L1G6	MSMF 5.0 kW 200 V Motor	78
MSMF502L1G6M	MSMF 5.0 kW 200 V Motor	222
MSMF502L1G7	MSMF 5.0 kW 200 V Motor	78
MSMF502L1G8	MSMF 5.0 kW 200 V Motor	78
MSMF502L1G8M	MSMF 5.0 kW 200 V Motor	222
MSMF502L1H5	MSMF 5.0 kW 200 V Motor	78
MSMF502L1H6	MSMF 5.0 kW 200 V Motor	78
MSMF502L1H6M	MSMF 5.0 kW 200 V Motor	222
MSMF502L1H7	MSMF 5.0 kW 200 V Motor	78
MSMF502L1H8	MSMF 5.0 kW 200 V Motor	78
MSMF502L1H8M	MSMF 5.0 kW 200 V Motor	222
MSMF5AZL1A1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1A2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1A2M	MSMF 50 W 100 V/200 V common Motor	211
MSMF5AZL1B1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1B2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1B2M	MSMF 50 W 100 V/200 V common Motor	211
MSMF5AZL1C1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1C2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1C2M	MSMF 50 W 100 V/200 V common Motor	211
MSMF5AZL1D1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1D2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1D2M	MSMF 50 W 100 V/200 V common Motor	211
MSMF5AZL1S1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1S2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1S2M	MSMF 50 W 100 V/200 V common Motor	211
MSMF5AZL1T1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1T2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1T2M	MSMF 50 W 100 V/200 V common Motor	211
MSMF5AZL1U1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1U2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1U2M	MSMF 50 W 100 V/200 V common Motor	211

MSMF (Low inertia)		
Part No.	Title	Page
MSMF5AZL1V1	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1V2	MSMF 50 W 100 V/200 V common Motor	63,64
MSMF5AZL1V2M	MSMF 50 W 100 V/200 V common Motor	211

MUMA (Low inertia MINAS E series Motor)		
Part No.	Title	Page
MUMA011P1S	MUMA 100 W 100 V Incremental encoder	389,393
MUMA011P1T	MUMA 100 W 100 V Incremental encoder	389,393
MUMA012P1S	MUMA 100 W 200 V Incremental encoder	391,393
MUMA012P1T	MUMA 100 W 200 V Incremental encoder	391,393
MUMA021P1S	MUMA 200 W 100 V Incremental encoder	389,393
MUMA021P1T	MUMA 200 W 100 V Incremental encoder	389,393
MUMA022P1S	MUMA 200 W 200 V Incremental encoder	391,393
MUMA022P1T	MUMA 200 W 200 V Incremental encoder	391,393
MUMA042P1S	MUMA 400 W 200 V Incremental encoder	391,393
MUMA042P1T	MUMA 400 W 200 V Incremental encoder	391,393
MUMA5AZP1S	MUMA 50 W 100 V/200 V common Incremental encoder	389,391
MUMA5AZP1T	MUMA 50 W 100 V/200 V common Incremental encoder	389,391

MUMA (MINAS E series Motor with gear reducer)		
Part No.	Title	Page
MUMA011P31N	MUMA with reduction gear 100 W 100 V Incremental encoder	394,397
MUMA011P32N		394,397
MUMA011P34N		394,397
MUMA011P41N		394,397
MUMA011P42N		394,397
MUMA011P44N		394,397
MUMA012P31N	MUMA with reduction gear 100 W 200 V Incremental encoder	394,397
MUMA012P32N		394,397
MUMA012P34N		394,397
MUMA012P41N		394,397
MUMA012P42N		394,397
MUMA012P44N		394,397
MUMA021P31N	MUMA with reduction gear 200 W 100 V Incremental encoder	394,397
MUMA021P32N		394,397
MUMA021P34N		394,397
MUMA021P41N		394,397
MUMA021P42N		394,397
MUMA021P44N		394,397
MUMA022P31N	MUMA with reduction gear 200 W 200 V Incremental encoder	394,397
MUMA022P32N		394,397
MUMA022P34N		394,397
MUMA022P41N		394,397
MUMA022P42N		394,397
MUMA022P44N		394,397
MUMA042P31N	MUMA with reduction gear 400 W 200 V Incremental encoder	394,397
MUMA042P32N		394,397
MUMA042P34N		394,397
MUMA042P42N		394,397

**Sales Office**

[Panasonic Industry Co., Ltd. Sales Office of Motors]

(November 01, 2022)

Region	Company Name [Category]	City	Address	TEL
				FAX
U.S.A	Panasonic Industrial Devices Sales Company of America [Sales office]	New Jersey	Two Riverfront Plaza, 10th Floor Newark, NJ 07102-5490 U.S.A	+1-800-344-2112
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Brazil	Panasonic Do Brasil Limitada [Sales office]	Sao Paulo	Avenida do Cafe, 277 Torre A-8 Andar Jabaquara ZIP Code: 04311-900 Sao Paulo SP Brazil	—
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Germany	Panasonic Industry Europe GmbH European Headquarters [Sales office]	Munich	Caroline-Herschel-StraÙe 100, 85521 Ottobrunn, Germany	+49-89-45354-1000
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France	Panasonic Electric Works Sales Western Europe B.V. [Sales office]	Verrières-Le-Buisson	10, rue des petits ruisseaux, 91370 Verrières-Le-Buisson, France	+ 33 (0) 1-60-13-5757
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A6 Series  
A6N Series  
A6B Series [Special Order Product]  
E Series  
Information

# Sales Office

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China	Panasonic Hong Kong Co., Limited (PHK) Panasonic Industrial Devices Sales (Hong Kong) Co., Ltd. [Sales office]	Hong Kong	Level 9, Tower II, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong	+852-2367-0181
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	Panasonic Industry (China) Co.,Ltd. [Sales office]	Shanghai	15F, 1601-03, No.18, Lane 666, Haiyang West Road, Pudong New District, Shanghai, 200126, China	+86-21-38552000
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India	Panasonic Life Solutions India Private Limited INDD - Industrial Devices Division- Sales & Marketing (Gurgaon(HQ)) [Sales office]	Delhi	12th Floor, Ambience Corporate Office, Tower-2, Ambience Island, NH-8, Gurgaon-122002, Haryana, India	+91-124-4871300
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	Singapore	Intermech Machinery Pte.Ltd. [Distributors]	Singapore	2 Woodlands Sector 1 #03-25, Woodlands Spectrum 1 Singapore 738068	+65-6751-5088
					+65-6759-2122
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	Web site http://www.intermech.com.sg				
	Malaysia	Panamech (Penang) Sdn. Bhd. [Distributors]	Penang	18, Persiaran Mahsuri 1/2, Sunway Tunas, Penang, 11900	+60-4-645-1635
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